Nano Linear Motor
NT···V

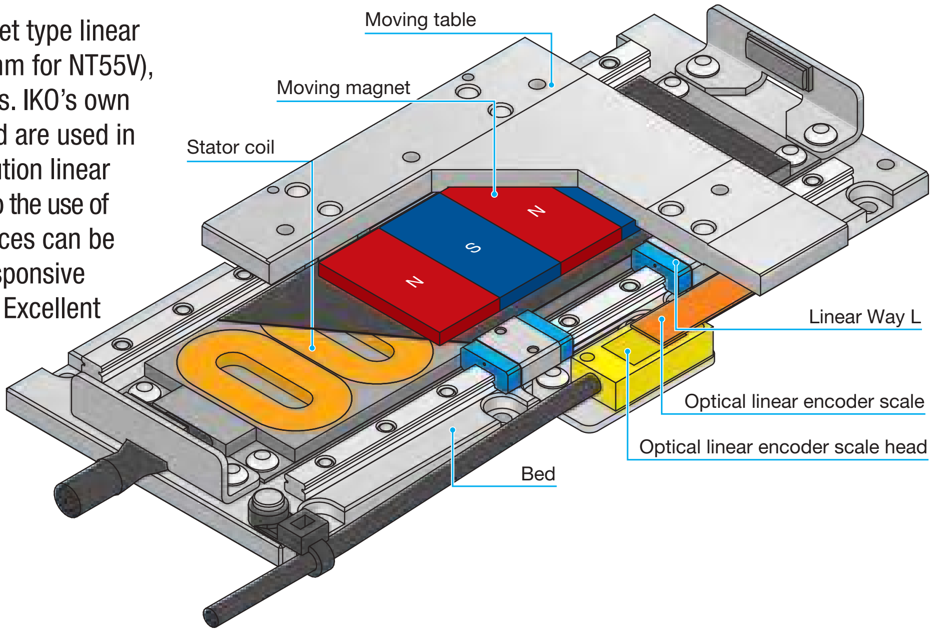
IKO

MECHATRONICS SERIES

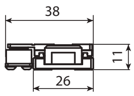
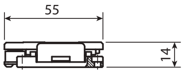
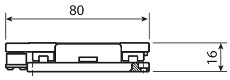
IKONT.COM

NT···V

Nano Linear NT series is a family of moving magnet type linear motor tables with extremely low profile (only 14 mm for NT55V), high performance, and excellent cost effectiveness. IKO's own miniature Linear Ways guide the moving table, and are used in combination with the linear motor and high-resolution linear encoder to realize highly accurate positioning. Due to the use of high-strength neodymium magnets, large thrust forces can be produced and therefore high-speed and highly responsive positioning is possible, despite its very small size. Excellent reliability and cleanliness is realized thanks to adoption of moving magnet driving method which eliminates moving cables. EtherCAT and Ethernet IP drivers are also available and in combination with streamlined wiring result in smoother and higher speed accurate motion.

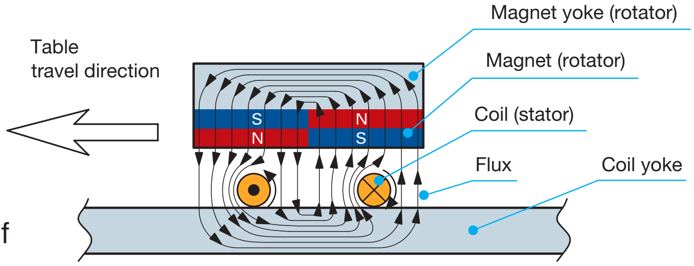


Nano Linear NT Specifications List

Model and size		Standard type NT···V																		
		NT38V10		NT38V18		NT55V25			NT55V65			NT80V25			NT80V65			NT80V120		
																				
Sectional shape		 38 11 26				 55 14						 80 16								
Maximum thrust	N	3		3		25			25			36			36			36		
Rated thrust	N	0.6		0.8		7			7			8			8			8		
Maximum load mass	kg	0.5		0.5		5			5			5			5			5		
Effective stroke length	mm	10		18		25			65			25			65			120		
Resolution	μm	0.1	0.5	0.1	0.5	0.1		0.5	0.1		0.5	0.1		0.5	0.1		0.5	0.1		0.5
Maximum speed	mm/s	270	500	270	500	270	1000	1300	270	1000	1300	270	1000	1300	270	1000	1300	270	1000	1300
Positioning repeatability	μm	±0.5		±0.5		±0.5			±0.5			±0.5			±0.5			±0.5		

Operating principle of Nano Linear NT

Nano Linear NT is designed like an electric motor, such that the magnet and optical linear encoder act as the 'Rotor', whereas an air-core coil and optical linear encoder scale head act as the 'Stator'. As shown in the diagram on the right, the coil is subjected to a horizontal force due to a flux in the vertical direction that is generated by the magnet and coil yoke and this in turn generates a rotational flux around the coil. By switching the coil current to a certain direction, continuous thrust force in one direction can be obtained, producing linear motion of the rotor. Travel and positional accuracy are facilitated using acceleration control which is itself governed by current amount and linear encoder feedback.



Identification Number

Example of identification number of NT...V

①	②	①	③		④	⑤	⑥	⑦	⑧
NT	55	V	25	/	5		L	SC	1

① Model
② Size
③ Stroke length
④ Resolution of linear encoder
⑤ Cover
⑥ Cord direction
⑦ Designation of sensor
⑧ Specification number

Identification Number and Specification

① Model	NT…V: Nano Linear NT…V
② Size	38: Width 38mm 55: Width 55mm 80: Width 80mm
③ Stroke length	10: 10mm (applicable to NT38V) 18: 18mm (applicable to NT38V) 25: 25mm (applicable to NT55V and NT80V) 65: 65mm (applicable to NT55V and NT80V) 120: 120mm (applicable to NT80V)
④ Resolution of linear encoder	1 : 0.1μm 5 : 0.5μm
⑤ Cover	No symbol: Without cover D: With cover (applicable to NT38V)
⑥ Cord direction	L : Leftward (Standard) R : Rightward
⑦ Designation of sensor	No symbol : Without sensor SC : With sensor (limit and pre-origin) and sensor bracket Applicable to NT55V and NT80V
⑧ Specification number	1: Specification number 1 The specification number is limited to 1.

Drive/Control for Easy Setup – Operation of NT Actuators

The Copley Controls BPL drive (BPL-090-06) is a high-performance, DC powered drive capable of position, velocity, and/or force control of IKO's NT series linear actuators.

Offering a high degree of flexibility, the drive is capable of operating either as an:

- **Intelligent Control with the ability to store motion programs (sequences) on-board. Sequences can be selected and initiated from a PLC or PC via RS-232(ASCII) or discrete I/O. It is also possible to set a sequence to run on power-up permitting "stand-alone" operation. Sequences are easily constructed and loaded to the drive using a "drag-and-drop" programming method, free CME2 setup software. Up to 32 sequences can be stored on board, and these can include motion, logic, math, conditional branching, and I/O control. For those desiring a *Script programming* method, a separate software programming tool is available permitting this.**
- **Servo-drive with abilities to work with any of the following command interfaces:**
  - **±10V force/velocity/position**
  - **Stepper commands (Pulse & Direction, Count-up / Count-down)**
  - **Master encoder following (Gearing/Camming. Up to 10 Cam Tables can be stored in the drive.)**
  - **PWM velocity/force command**
  - **CANopen**
  - **RS232 (ASCII or Binary , multi-drop Networking supported).**
  - **EtherCAT is optional – consult IKO.**

When operating on a CANopen network, the drive operates as a CANopen DS-402 node. Supported modes include: Profile Position-Velocity-Torque, Interpolated Position Mode (PVT), and Homing.

Feedback from both incremental and absolute encoders is supported. Absolute protocols include: SSI, EnDat, and BISS (B & C).

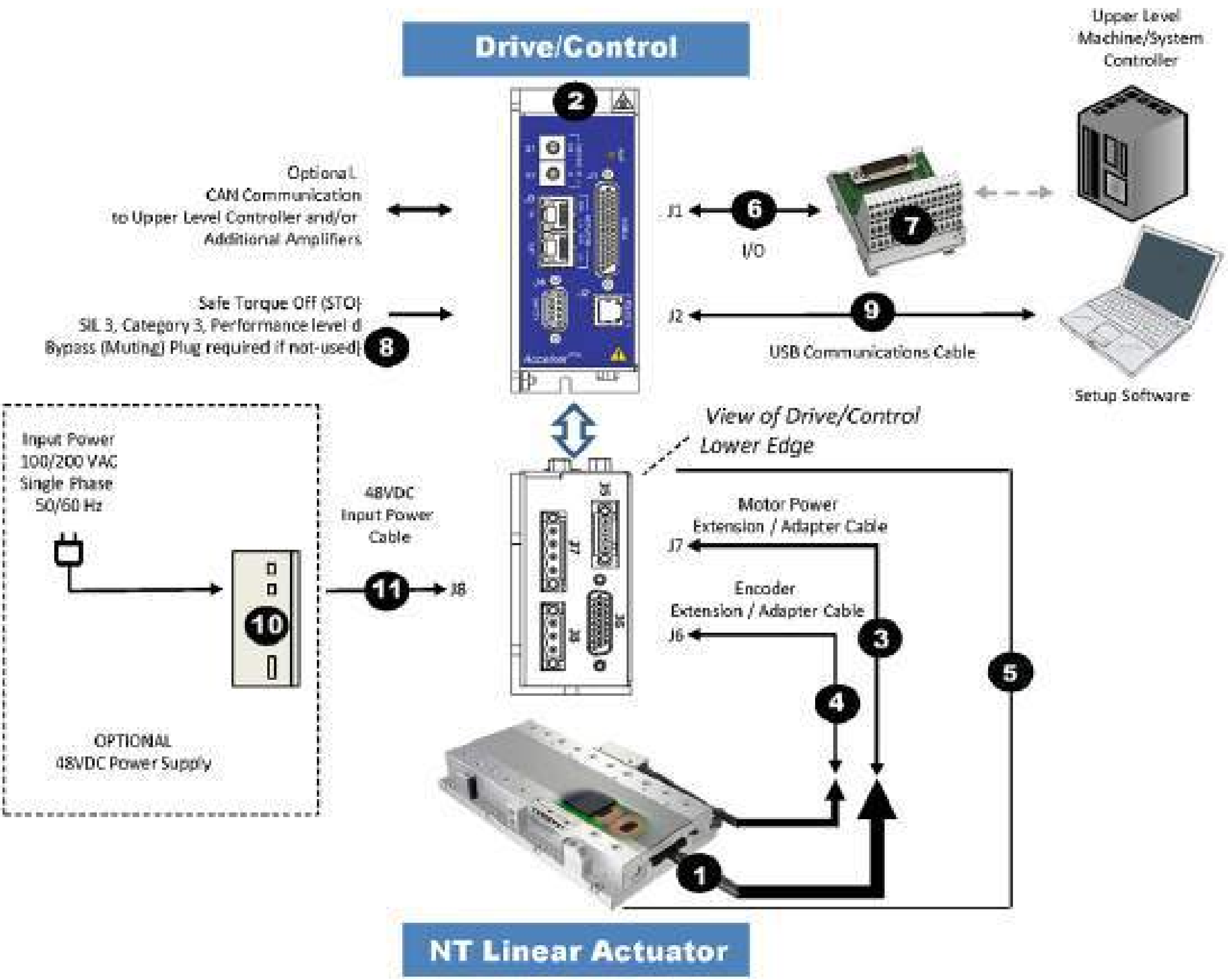
A "multi-mode encoder port" functions as either an additional encoder input, or, an encoder output (allowing encoder feedback to be passed on to an upper-level-control) .

The drive is equipped with 11 digital inputs, 4 digital outputs, and 1 analog input (12-bit).

Drive power is transformer-isolated DC from regulated or unregulated power supplies. An AuxHV input is provided for "keep-alive" operation permitting the drive power stage to be completely powered down without losing position information, or communications with the control system.

Safe-Torque-Off (STO) functionality is included as standard, compliant to IEC 61800-5-2. (SIL3 , Category 3, PL d). This "Hardware only" safety circuit de-energized the drive's power-stage, preventing it from being operated by the digital control core.

copley controls



Item	Product	Part Number	Description
1	IKO Nano Linear Stage	NTxxV	
2	Copley Drive/Controller	BPL-090-06	Digital Drive for Brushless/Brush Motors
3	Motor Power Extension Cable	SA0164251	CA, PWR, NT-SERIES, BPL, 3 meters
4	Motor Encoder Extension Cable	SA0164252	CA, ENC, NT-SERIES, BPL, 2 meters
5	Motor Limit Extension Cable	SA0164253	CA, LIM, NT-SERIES, BPL, 2 meters
6	I/O Cable	SA0164254	CA, IO, BPL, 0.5 meter
7	I/O Breakout Module	X0119366	44 Pos Male HD DSub Breakout 11104 IMHD 44M
8	STO Bypass Plug	SA0164256	CA, BPL STO BYPASS PLUG
9	USB Programming Cable	D0166023	USB to Serial RS232 Adapter
10	DC Power Supply Kit	SA0164769	Puls Power Supply AC Line Cable, 2 meters
		CP5.481	Power Supply, 120W, 100-240VAC 1PH, 48-56VDC, 2.5-2.1A
11	Drive DC Power Cable	SA0166090	DC Power Cable, Copley BPL Drive,1 meter*

*Cables can be made available in any custom length required.

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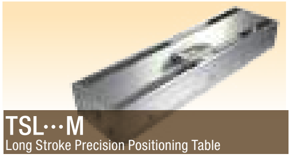
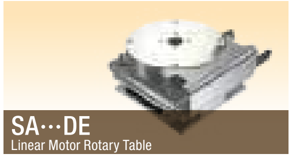
About Olympus Controls

Olympus Controls is an Engineering Services company that specializes in the integration of motion control, machine vision, and robotic technologies. We help our clients with the ideation of innovative and robust solutions; then we collaborate with them to take their machine automation solution from concept to reality. Bringing thousands of unique automation projects to market has helped us develop an extensive range of technology and industry-process knowledge. These capabilities and know-how enable our Automation Team to set the benchmark for machine automation solutions.


TSL···M
Long Stroke Precision Positioning Table


TU
Standard Precision Positioning Table

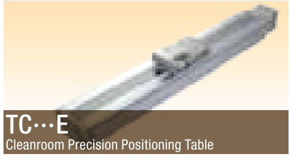

SA···DE
Linear Motor Rotary Table


LT
Long Stroke Linear Motor Table


TE
Low Profile Positioning Table

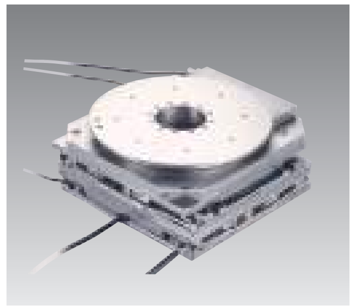

TM
Miniature Table


TX···M
High Rigidity Precision Positioning Table


TC···E
Cleanroom Precision Positioning Table


CTLH
High Rigidity X-Y Stage


TZ
Precision Elevating Table



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Oil Minimum
IKO Gentle to The Earth

ISO 9001 Certified
ISO 14001 Certified
ISO 9001 & 14001 Quality system registration certificate

https://www.ikont.co.jp/eg/

CAT-3750E

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IKO

New

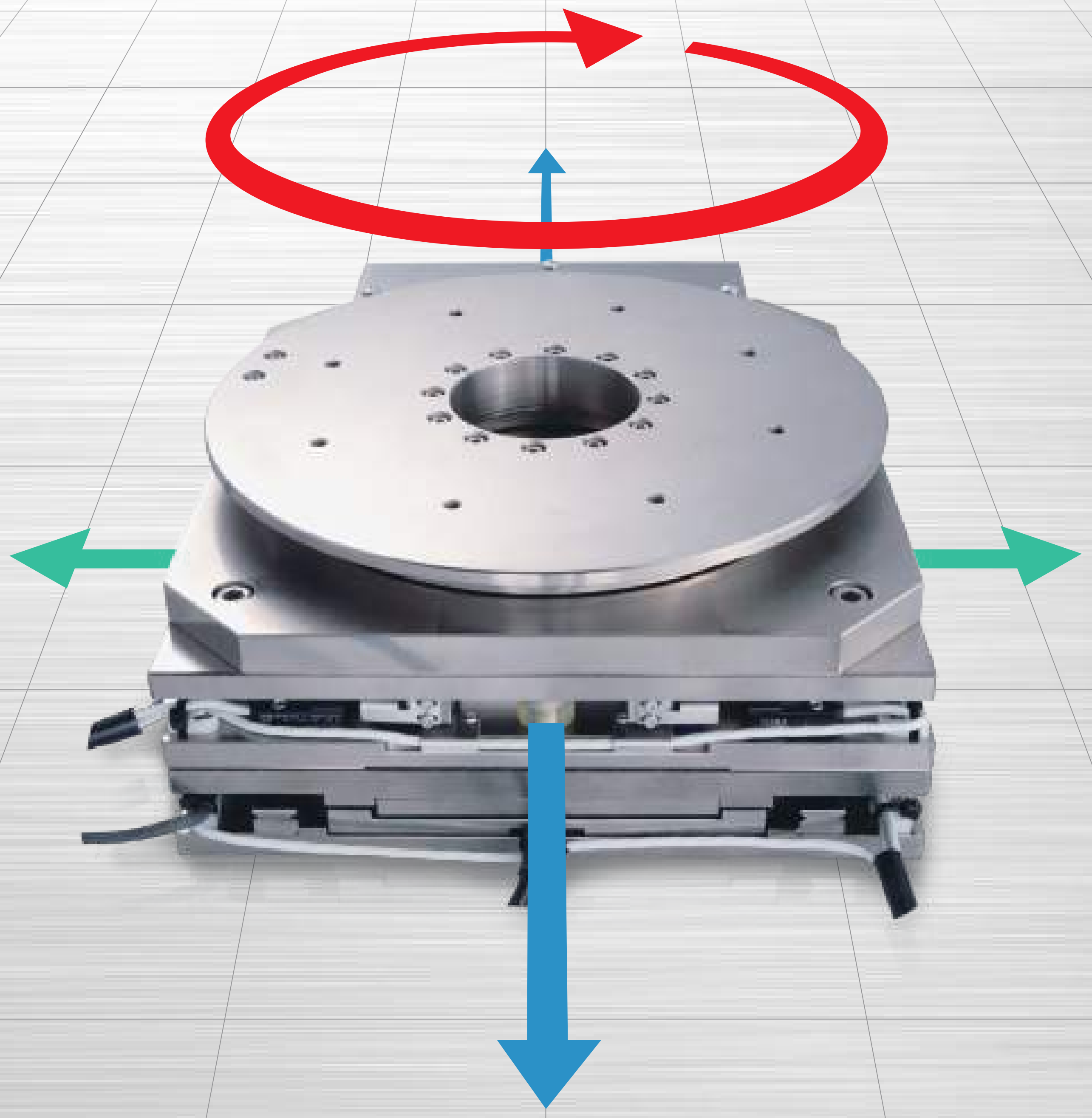
Alignment Stage

SA200DE

X-axis added for improved θ-axis torque

NIPPON THOMPSON CO., LTD.

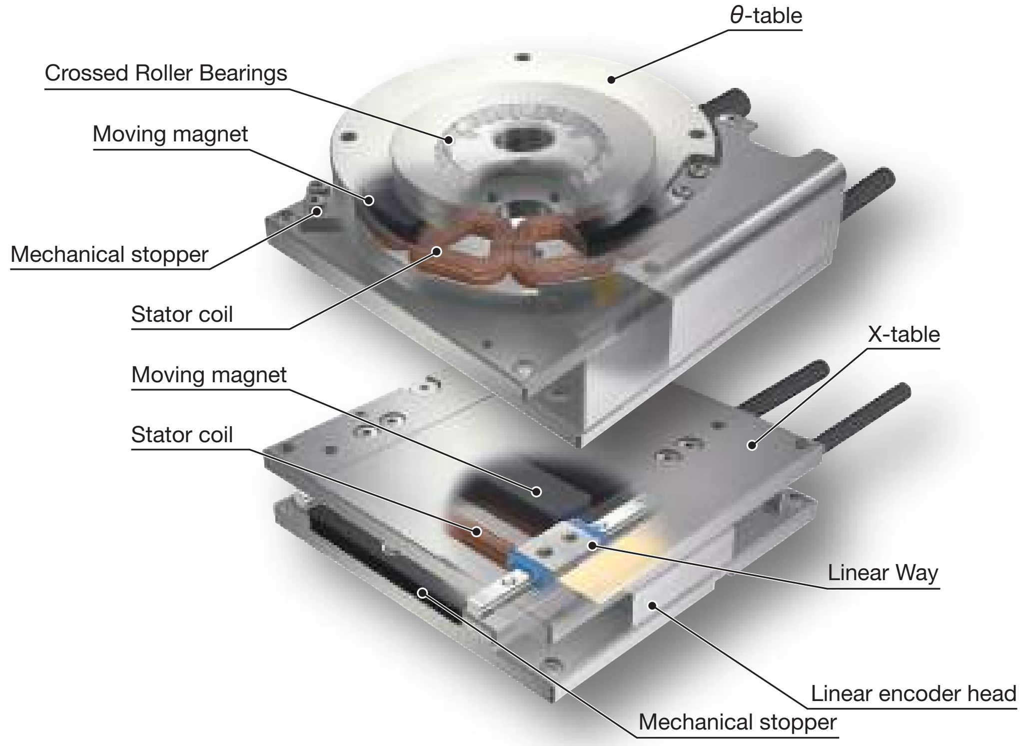
Updated SA200DE



The SA Series Alignment Stage (200 size) has been updated with a standard-equipped X-axis and higher torque on the *θ*-axis

Alignment Stage SA Structure

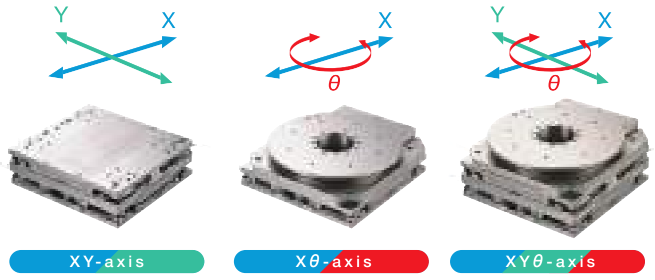
Since this alignment stage uses IKO Miniature Linear Ways in the linear motion guiding parts, IKO Crossed Roller Bearings in the rotation part and direct drive method in the drive section, it has a low profile and compact XY*θ* motion.



SA200DE Features

Easy combination of X, Y, and *θ* axes

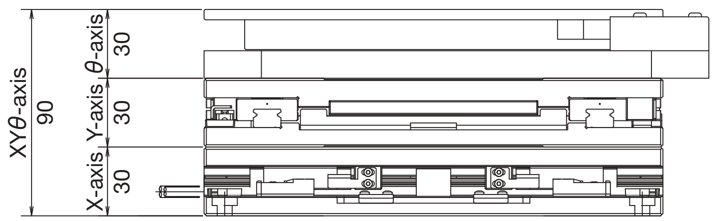
The SA200DE/X linear positioning X-table is now included as a standard feature. When combined with SA200DE/S for rotational positioning, it is easy to configure an extremely compact alignment stage with three directions of movement (X, Y, and *θ* axes).



Thin and Compact

With a coreless linear motor and IKO Linear Way L and IKO Crossed Roller Bearings built in, it has an extremely low cross sectional height as compared with ball screw-driven stages.

SA200DE/XYS

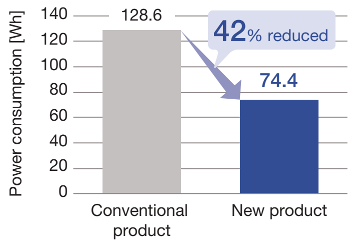


Low Power and High Tact

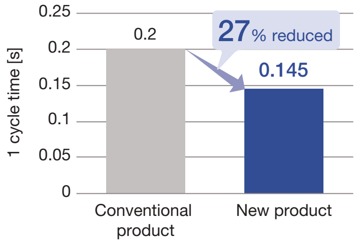
The design of the *θ*-axis (SA200DE/S) motor has been revised for higher torque. Compared with conventional products, it operates at lower power and with a reduced tact time.

<Operating conditions>
SA200DE *θ*-axis
Carrying mass: 10kg
Operation velocity: 80deg/s

Power consumption under same cycle conditions



Duration of 1 cycle under same power consumption conditions



Remarks These results are theoretical values.
They may differ from values during actual operation.

Identification Number

Example	SA	200	DE	/	5	XYS	R	4
	①	②	①		③	④	⑤	⑥

① Model

Model code
SA···DE: Alignment Stage SA

② Size

Symbol	Table size [mm]
200	□200, ϕ200

③ Resolution

Symbol	Resolution value
1	0.1μm
5	0.5μm

Specify the resolution of the encoder for X-axis or XY-axis.
When selecting only S: θ -axis in the entry of section ④ , set "No symbol" for the resolution.

④ Axial configuration

Symbol	Axial configuration
X	Only X-axis
S	Only θ -axis
XY	X and Y-based two-axis configuration
XS	X and θ -based two-axis configuration
XYS	X, Y, and θ -based three-axis configuration

⑤ Surface treatment

Symbol	Surface treatment
No symbol	Electroless nickel plating
R	Black chrome surface treatment

Surface treatment is performed on the surfaces of table and bed.

⑥ Specification number

Symbol	Specification number
4	Specification number 4

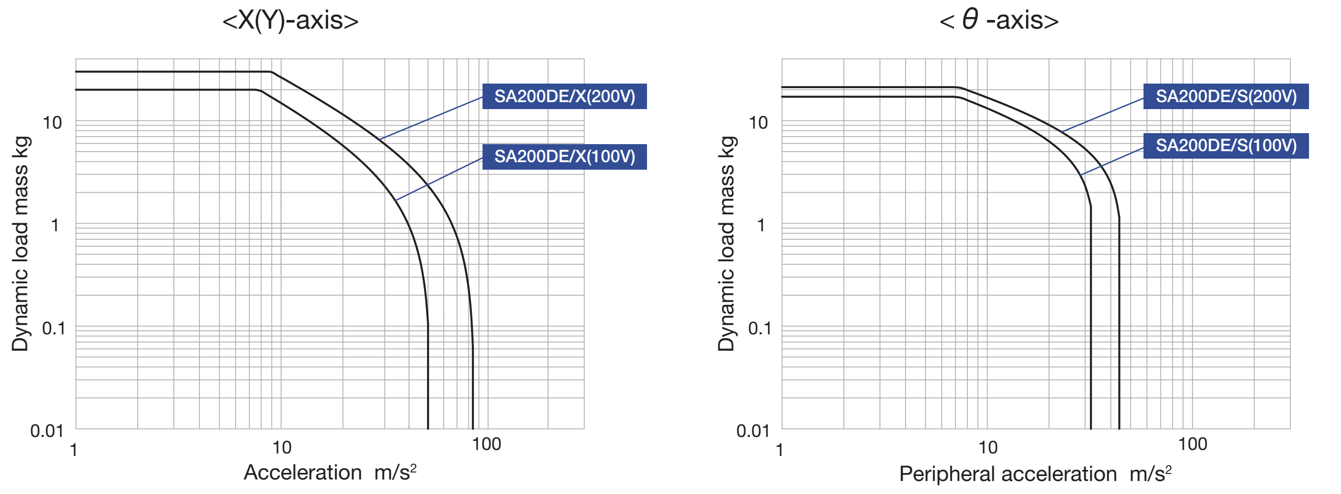
The specification number is limited to 4.

Specifications and Performance

Model and size	SA200DE/1X	SA200DE/5X	SA200DE/S
Maximum thrust/torque(1)	400(250)N(6)		8.0(6.0)N·m(6)
Rated thrust/torque(2)	70N		2.0N·m
Maximum load mass	30.0(20.0)kg(6)		21.2(17.1)kg(6)
Effective stroke length, operating angle	20mm		280 degree
Resolution	0.1μm	0.5μm	0.25 sec 14400 pulse/deg
Maximum speed(3)	270mm/s	800mm/s	270 deg/sec
Positioning repeatability(4)	±0.5μm		±0.5 sec
Mass of moving table	3.4kg		-
Inertia moment of moving table	-		0.013kg·m²
Total mass(5)	7.2kg		6.0kg
Ambient temperature and humidity in operation	0~40°C, 20~80%RH (keep condensation free)		

Notes (1) The duration of maximum thrust/torque is up to 1 second.
(2) This is based on the case of mounting on a metal mating member material at an ambient temperature of 20°C.
(3) For the case of exceeding the displayed speed, please contact IKO.
(4) When the temperature of the product is constant.
(5) Mass of the cord is not included.
(6) Numbers in parentheses indicate values when used with an ADVA-R5ML driver.

Dynamic load mass



Remark: Dynamic load mass of θ -axis is a value calculated as cube of steel.
Acceleration is converted as value of stage periphery.

Mounting

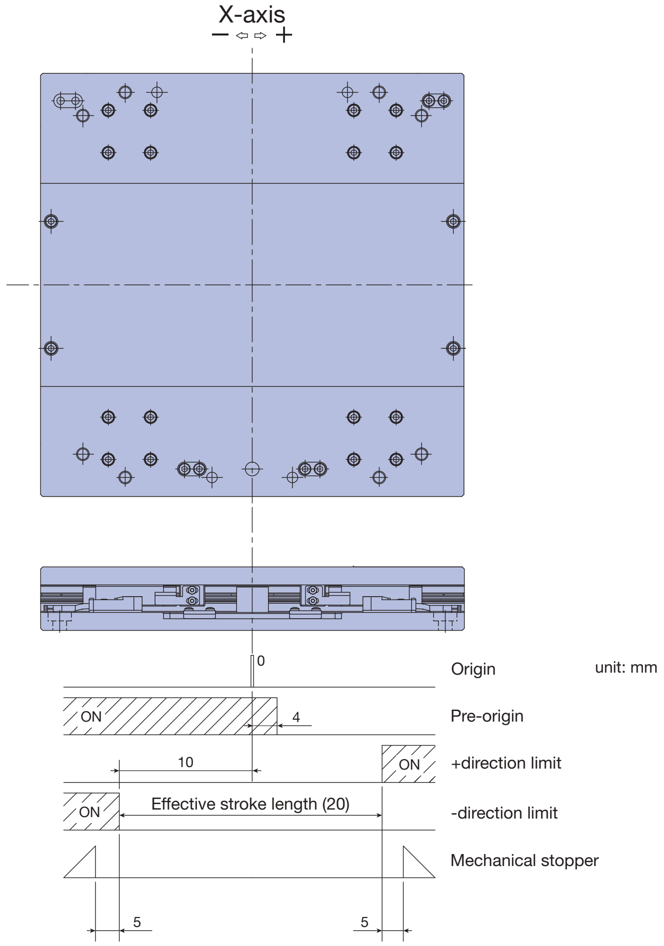
The typical tightening torque to be used when fixing SA200DE in place is indicated in the following table. When high accuracy is required with no vibration and shock, it is recommended to tighten the screws with a lower torque than that indicated in the table and use an adhesive to prevent screws from loosening.

unit: N·m

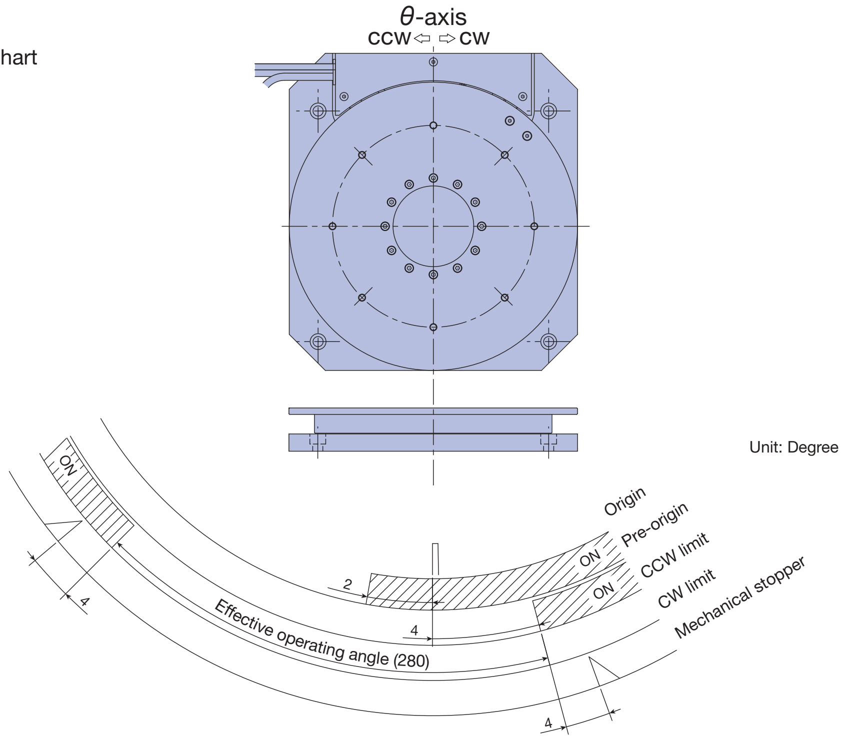
Bolt size	Female thread component		
	Steel	Aluminum alloy	
			Screw insert
M6 × 1	13.3	About 60% of steel value	About 80% of steel value
M5 × 0.8	7.9		

Sensor Specifications

SA200DE
X-axis sensor timing chart



SA200DE
θ-axis sensor timing chart



Remarks: 1. Respective values are for reference and are not guaranteed values. For detailed dimensions, please contact IKO.
2. For detailed specifications of respective sensors, please see the sensor specifications section in IKO Mechatronics Series General Catalog.

System Configuration

Two series of dedicated drivers, ADVA and MR-J4, are available for the Alignment Stage SA, and the system configuration varies depending on the driver used. For ADVA, two types of specification, pulse train specification and high speed network EtherCAT specification, are available. For MR-J4, only high speed network SSCNET III/H specification is available. The following table shows an example of an ADVA identification number, as well as the identification numbers of tables and applicable MR-J4. For detailed driver specifications, please see the driver specification section in IKO Mechatronics Series General Catalog.

Identification number of ADVA

ADVA	**-**	**01NL**	**EC**	**/**	**SA200DE-S2**
(1) Model		(2)	(3)		(4)

(2) Power supply voltage	
01NL	Single-phase / three-phase 200V
R5ML	Single-phase 100V

(3) Command type	
No symbol	Pulse train command
EC	EtherCAT

(4) Applicable alignment stage model	
SA200DE-X	SA200DE/X
SA200DE-S2	SA200DE/S

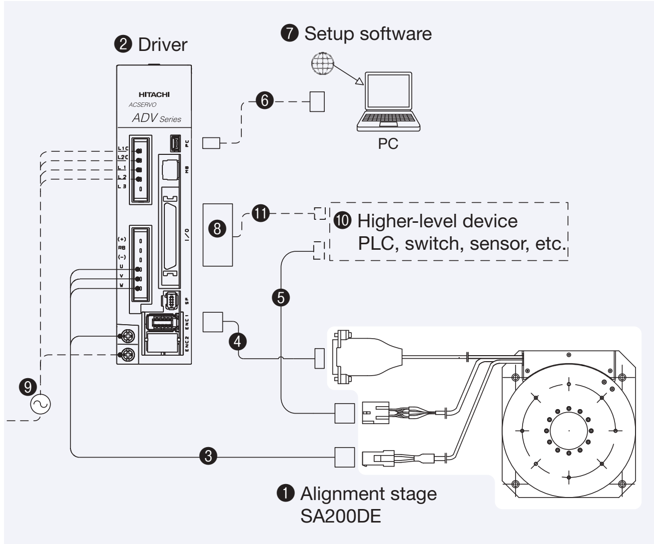
Identification numbers of SA200DE and applicable MR-J4

Identification number of table	Identification number of driver
SA200DE/X	MR-J4-10B-RJ/SA200DE-X
SA200DE/S	MR-J4-10B-RJ/SA200DE-S2

● Setup Software

To operate Alignment Stage SA, an initial setting of driver parameters is required. Driver parameter setting is performed using the setup software. It can also be used for gain adjustment and operational status check.
The setup software and PC connection cable are not provided with the driver. These can be shared with other drivers but at least one set is required. Please obtain these on your own or place an order separately according to your requirement.

System configuration for SA200DE with driver ADVA

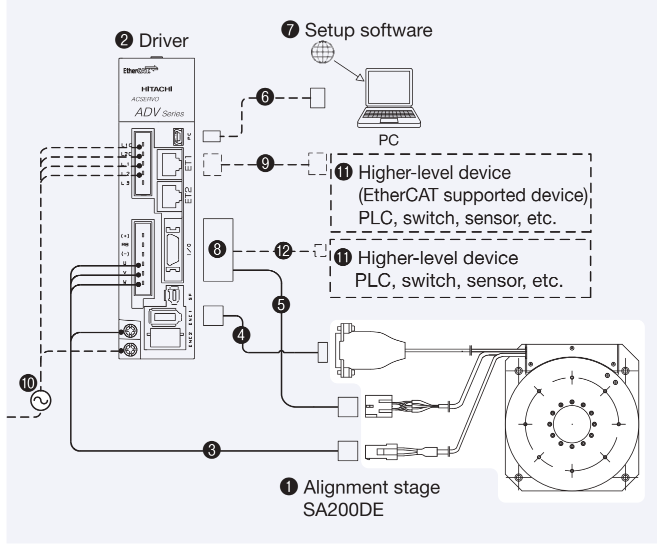


No.	Name	Identification number
❸	Motor extension cord (3m)(1)	TAE20V3-AM03
❹	Encoder extension cord (2m)(1)	TAE20V4-EC02
❺	Sensor extension cord(2)	TAE10V8-LC□□
❻	PC connection cable	USB mini B cable This must be prepared by the customer.
❼	Setup software	ProDriveNext Please download from the official website of Hitachi Industrial Equipment Systems Co., Ltd.
❽	I/O connector	TAE20R5-CN (3)
❾	Power cord	This must be prepared by the customer.
❿	Higher-level device	
⓫	I/O connector connection cable	

Note (1) For specific cord length, please contact IKO.
(2) The length of the sensor extension cord are specified in the □□ located at the end of the identification number for length of 3 to 10m in units of 1m.
(3) I/O connector TAE20R5-CN is a combined product of 10150-3000PE (connector) and 10350-52F0-008 (cover) from 3M Japan Limited.

System Configuration

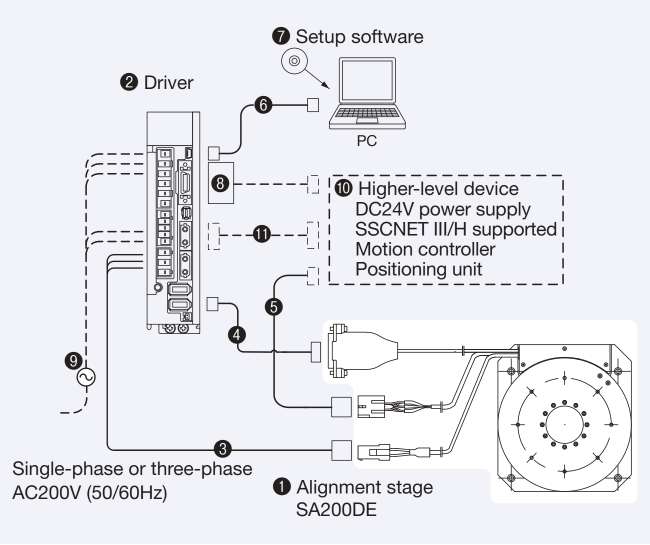
System configuration for SA200DE with driver ADVA···EC



No.	Name	Identification number
❸	Motor extension cord (3m)(1)	TAE20V3-AM03
❹	Encoder extension cord (2m)(1)	TAE20V4-EC02
❺	Sensor extension cord(2)	TAE10V8-LC□□
❻	PC connection cable	USB mini B cable This must be prepared by the customer.
❼	Setup software	ProDriveNext Please download from the official website of Hitachi Industrial Equipment Systems Co., Ltd.
❽	I/O connector	TAE20V5-CN (3)
❾	Ethernet cable	This must be prepared by the customer.
❿	Power cord	
⓫	Higher-level device	
⓬	I/O connector connection cable	

Note (1) For specific cord length, please contact IKO.
(2) The length of the sensor extension cord are specified in the □□ located at the end of the identification number for length of 3 to 10m in units of 1m.
(3) I/O connector TAE20V5-CN is a combined product of 10120-3000PE (connector) and 10320-52F0-008 (cover) from 3M Japan Limited.

System configuration (SSCNET III/H supported) for SA200DE with driver MR-J4-10B

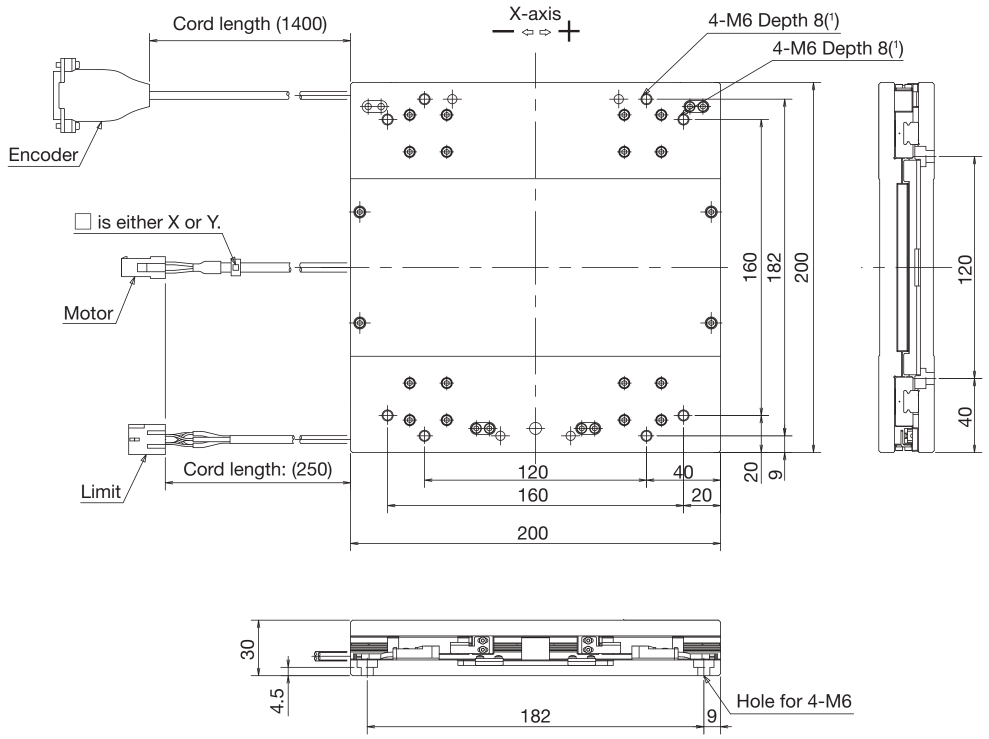


No.	Name	Identification number
❸	Motor extension cord (3m)(1)	TAE20V3-AM03
❹	Encoder extension cord (2m)(1)	TAE20V6-EC02
❺	Sensor extension cord(2)	TAE10V8-LC□□
❻	PC connection cable (3m)	MR-J3USBCBL3M
❼	Setup software	SW1DNC-MRC2-J
❽	Connectors for input/output connection	MR-CCN1 (3)
❾	Power cord	This must be prepared by the customer.
❿	Higher-level device(4)	
⓫	Connection cable for SSCNET III/H	

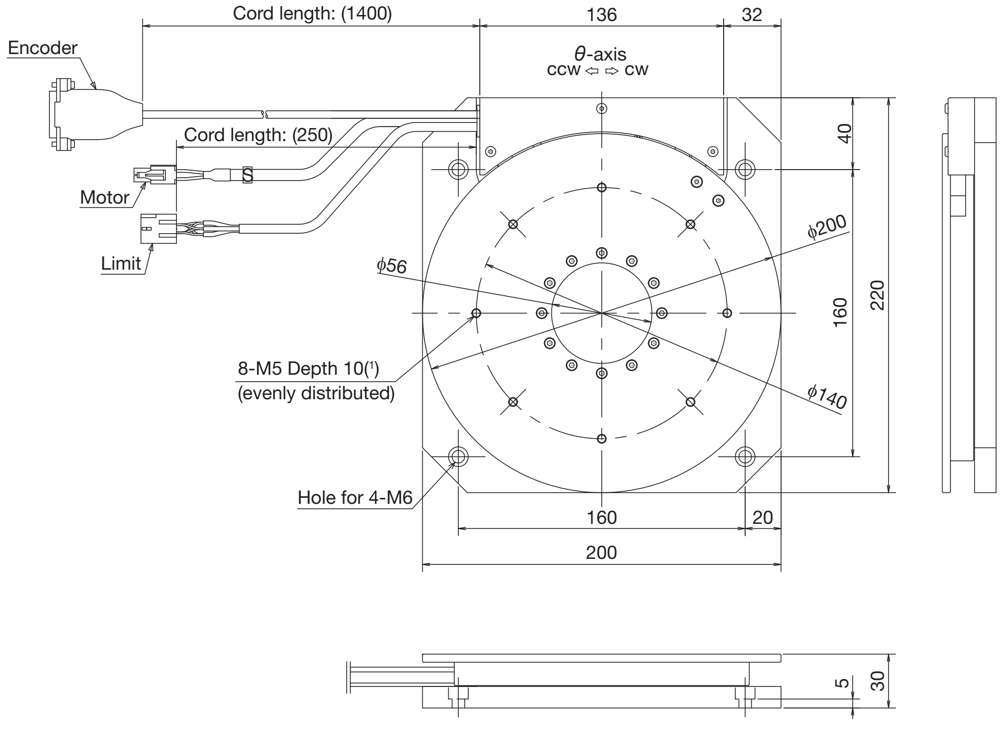
Note (1) For specific cord length, please contact IKO.
(2) The length of the sensor extension cord are specified in the □□ located at the end of the identification number for length of 3 to 10m in units of 1m.
(3) I/O connector MR-CCN1 is a combined product of 10120-3000PE (connector) and 10320-52F0-008 (cover) from 3M Japan Limited.
(4) The higher-level devices are a motion controller, positioning unit, and DC24V power supply ready for SSCNETⅢ/H from Mitsubishi Electric Corporation.

Product Dimensions

SA200DE/X

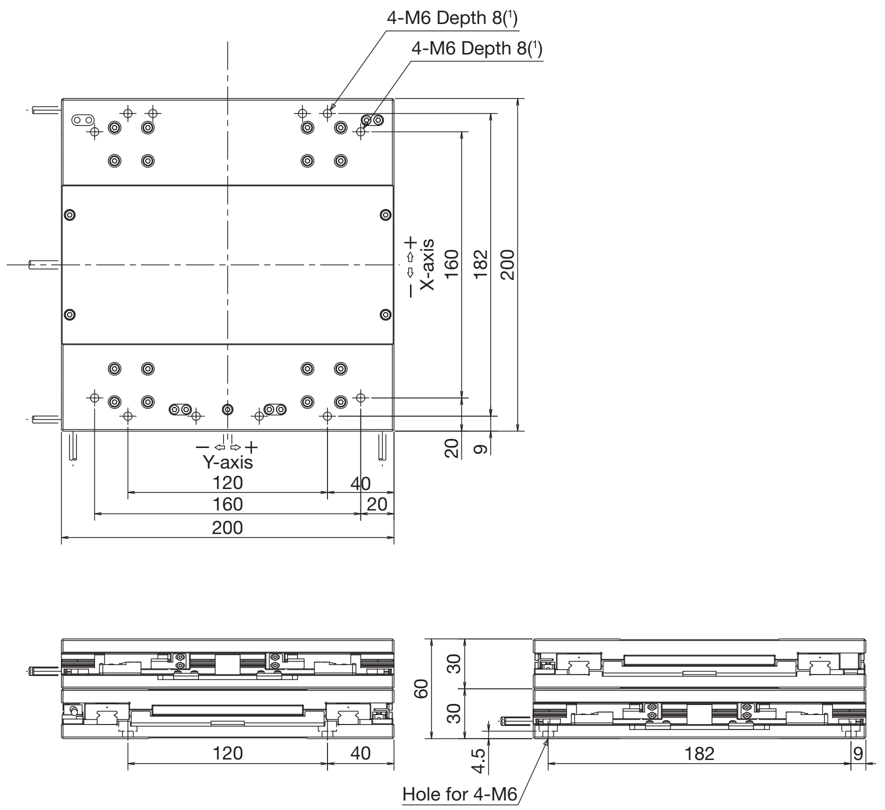


SA200DE/S

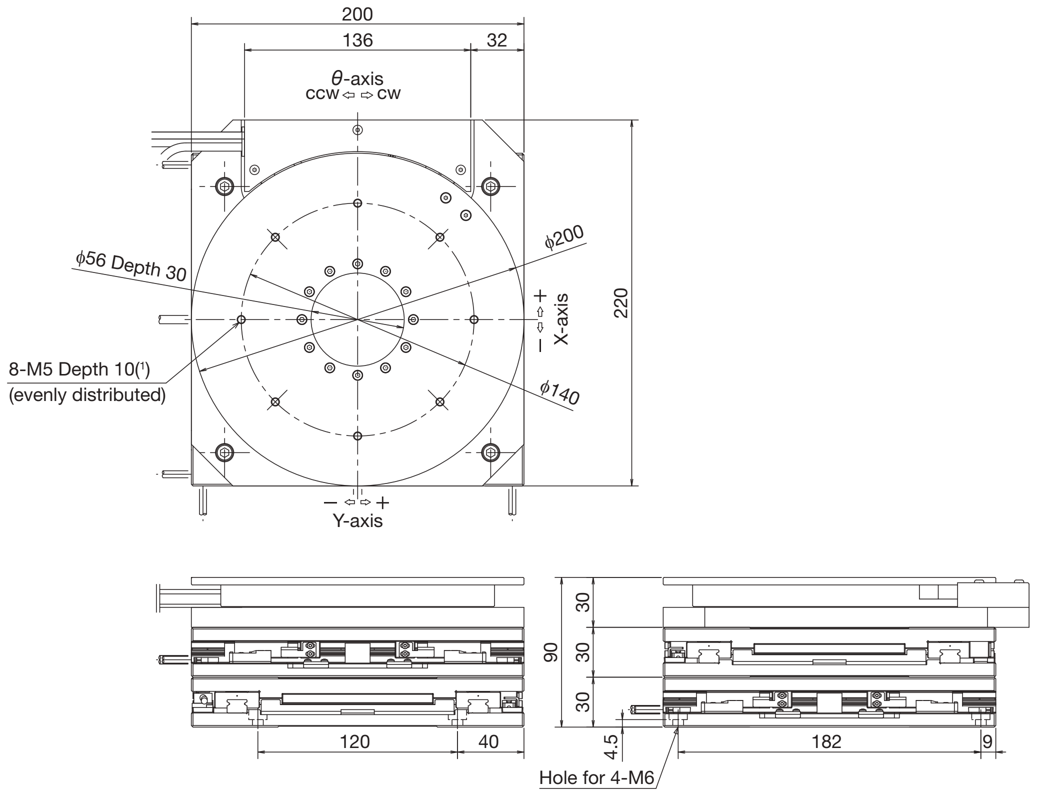


Product Dimensions

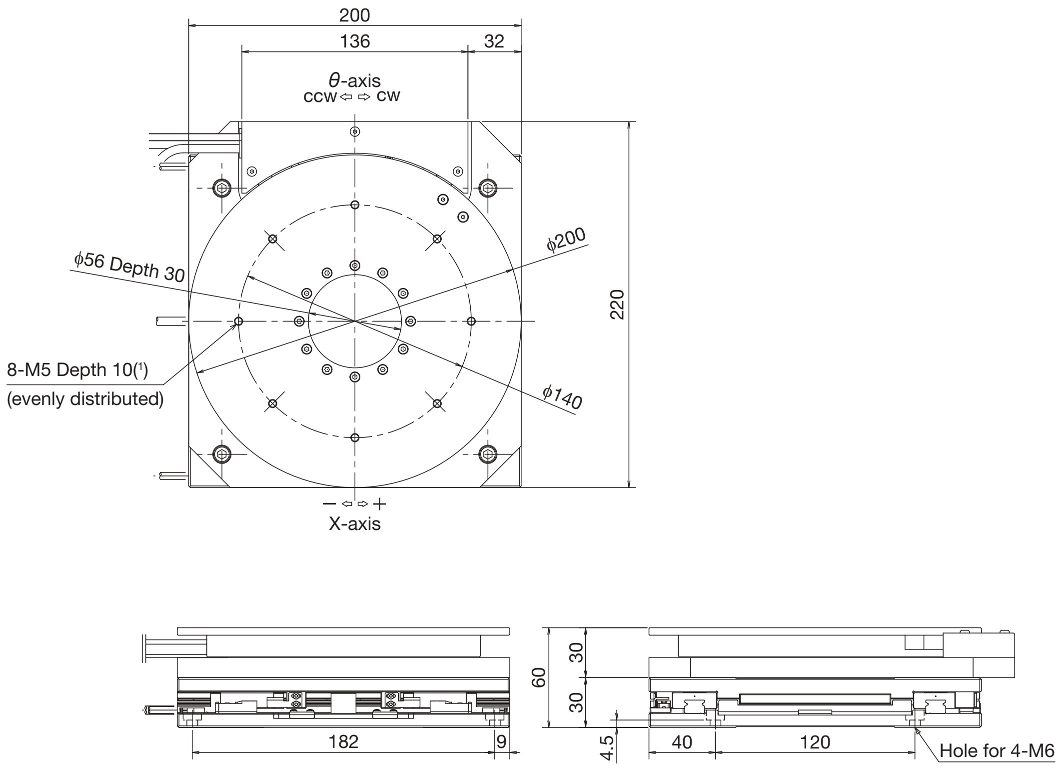
SA200DE/XY

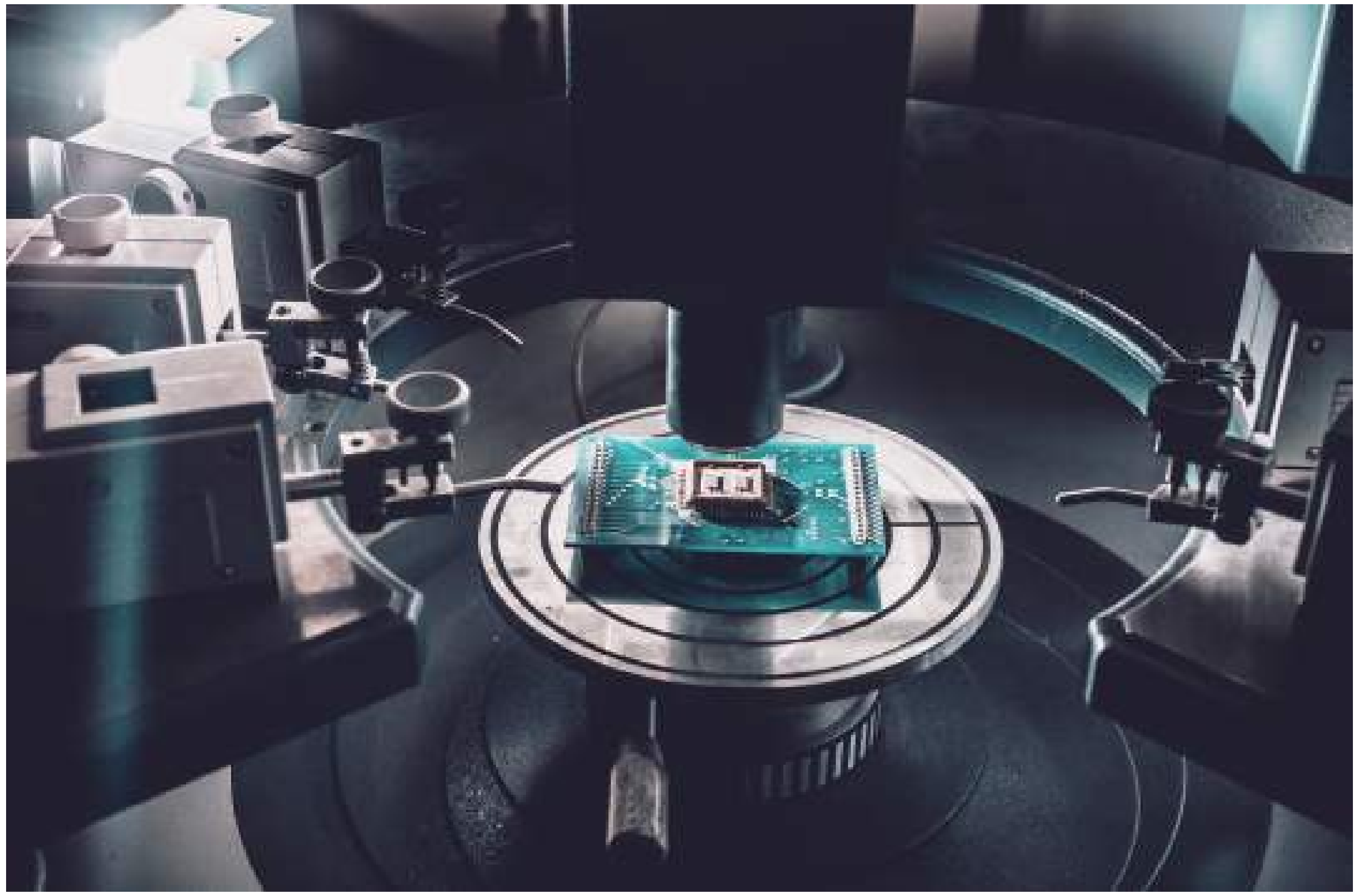


SA200DE/XYS



SA200DE/XS





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IKO

New

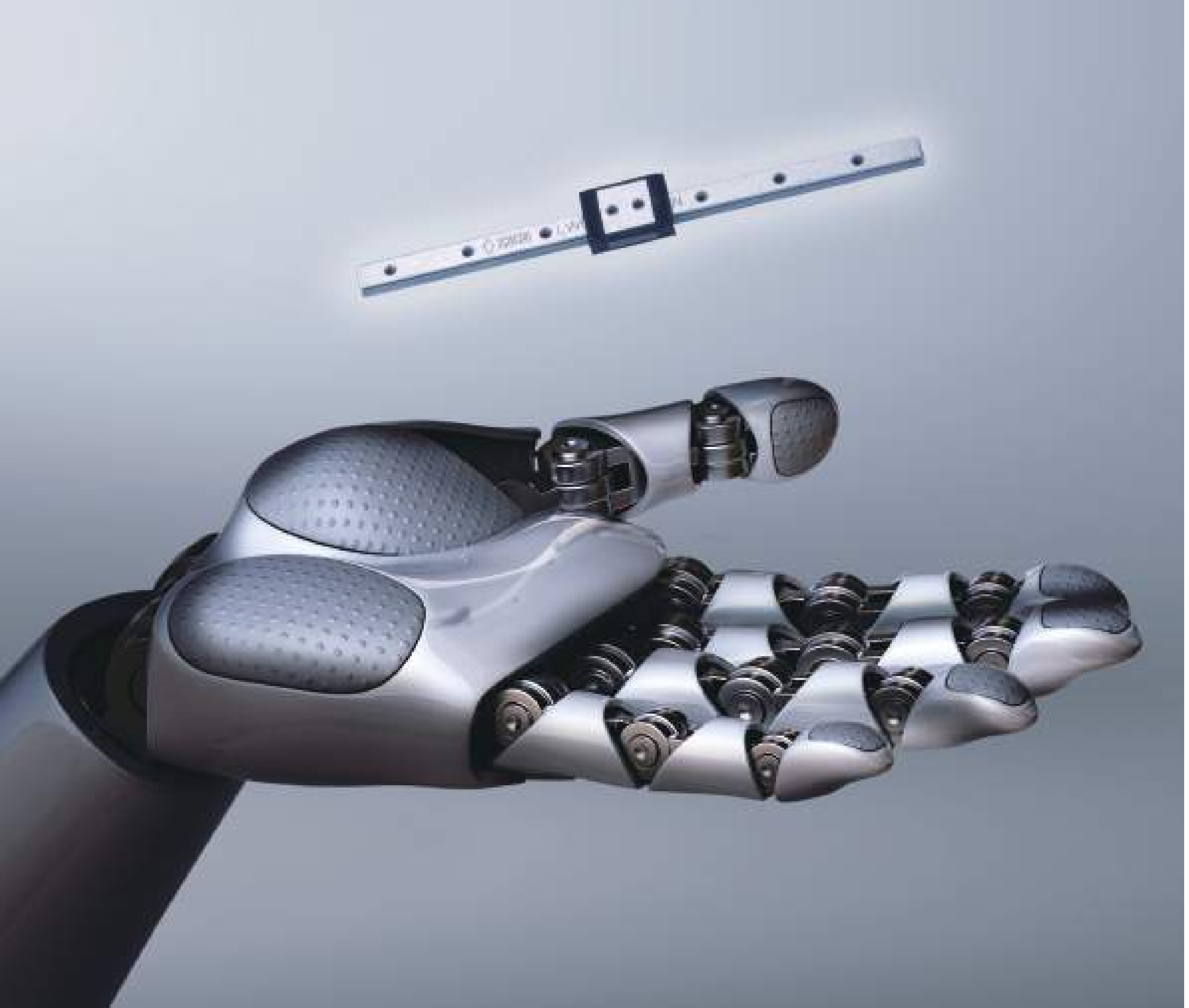
Micro Linear Way L

LWLF2

The smallest size available in the
Linear Way L Series (wide rail type)

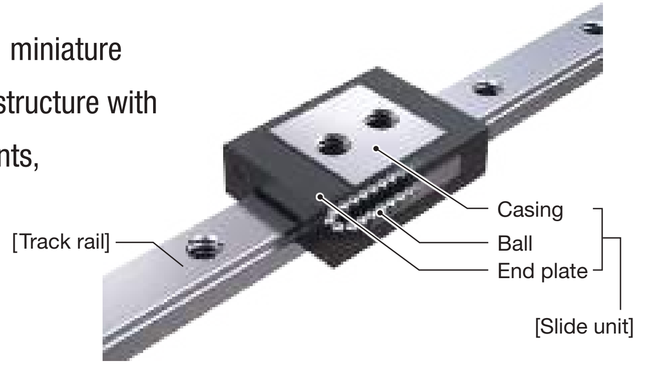
NIPPON THOMPSON CO., LTD.

HIGH PRECISION
AND
ULTRA SMALL SIZE



Structure

Ultra-small linear motion rolling guide produced by original miniature technology. Despite its very small body, and thanks to the structure with two rows of balls that contact with the raceway at four points, stable accuracy and rigidity can be achieved even in applications where load has variable direction and size or complex load is applied.

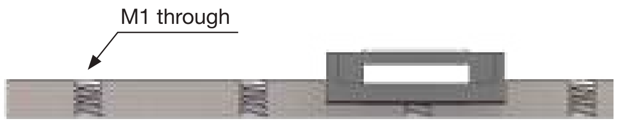


Features

1

Simple assembly

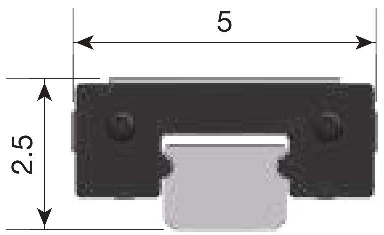
A tapped rail (mounted from the bottom) is used as the track rail for stability.



2

Ultra-small size

Original miniature technology provides the lowest sectional height in the industry.

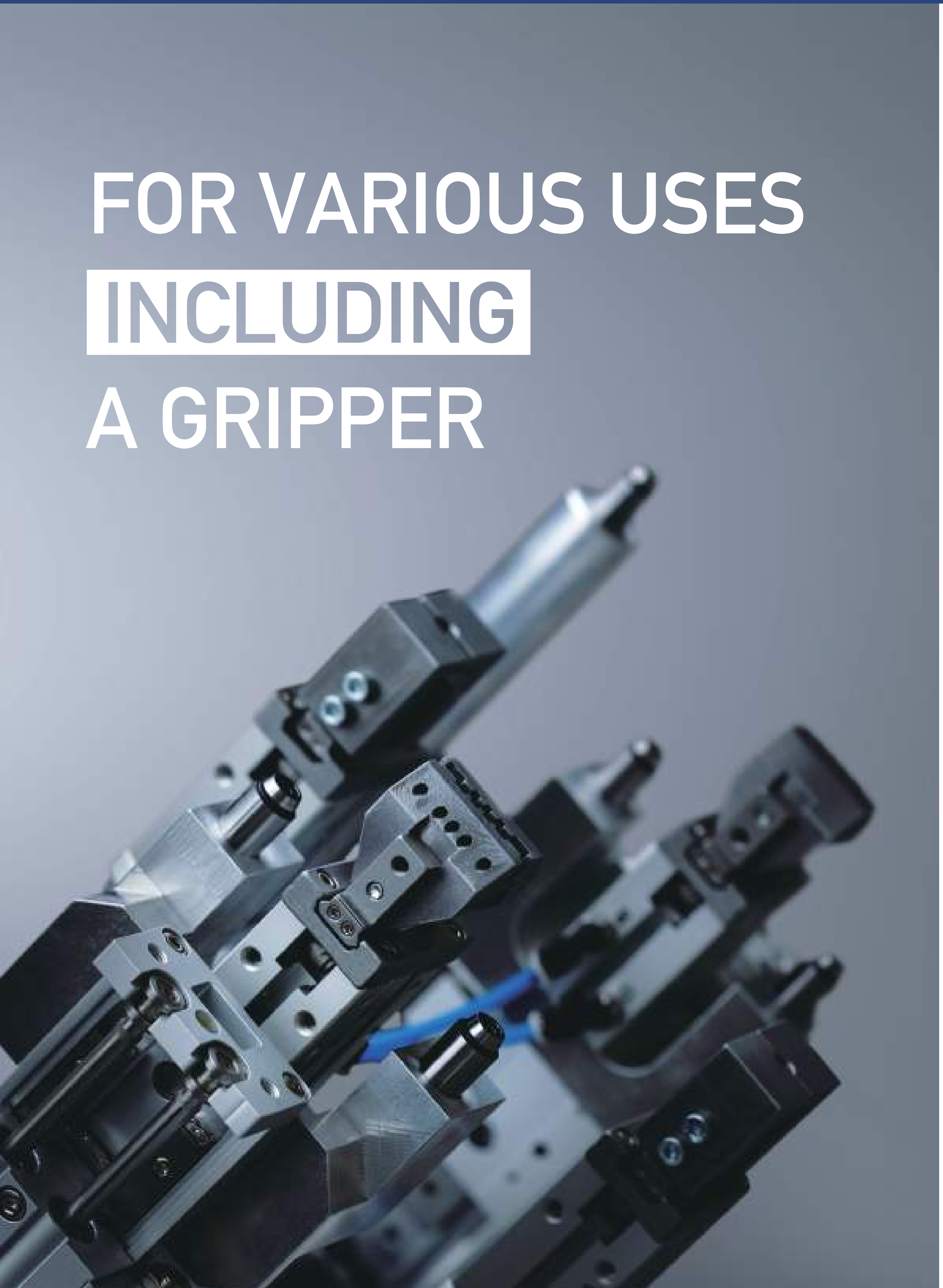


3

Stainless steel for excellent corrosion resistance

Stainless steel, which is highly resistant to corrosion, is used as the basic specification, making these products suitable for applications where rust prevention oil is not preferred, such as in a cleanroom environment.

FOR VARIOUS USES INCLUDING A GRIPPER



Models and Sizes

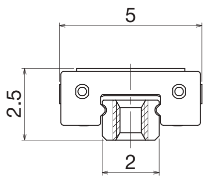
Shape	Length of slide unit		Model	Size									
				1(1)(2)	2(1)(3)	3(1)(3)	5	7	9	12	15	20	25
Standard type 	Short		LWLC	—	—	☆	☆	☆	☆	☆	☆	☆	☆
	Standard		LWL	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆
	Long		LWLG	—	—	—	—	☆	☆	☆	☆	☆	☆

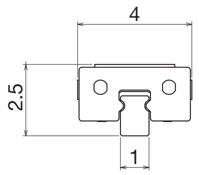
Shape	Length of slide unit		Model	Size								
				2(1)(3)	4 (1)	6 (1)	10	14	18	24	30	42
Wide rail type 	Short		LWLFC	—	—	☆	☆	☆	☆	☆	☆	☆
	Standard		LWLF	New ☆	☆	☆	☆	☆	☆	☆	☆	☆
	Long		LWLFG	—	—	—	—	☆	☆	☆	☆	☆

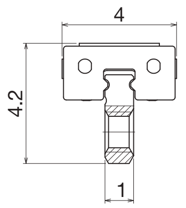
Notes (1) Balls are not retained. No end seal is attached.
(2) Either tapped rail specification (mounted from lateral) or solid rail specification is used for the track rail.
(3) Tapped rail specification (mounted from bottom) is used for the track rail.

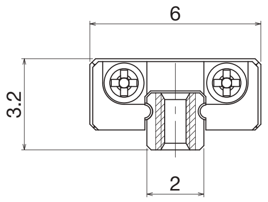
Remark: ☐ shows that there is interchangeable specification that allows free combination between slide units and track rails.

Micro Linear Way Specification Comparison









Identification number		New LWLF2	LWL1	LWL1···Y	LWL2
Total height		2.5	2.5	4.2	3.2
Width	Slide unit [mm]	5	4	4	6
	Track rail [mm]	2	1	1	2
Mass	Slide unit [g]	0.21	0.16	0.16	0.9
	Track rail (per 100mm) [g]	2.0	1.0	2.1	2.8
Track rail model		Tapped rail specification mounted from bottom 	Solid rail specification (no mounting hole) 	Tapped rail specification mounted from lateral 	Tapped rail specification mounted from bottom 
Basic dynamic load rating C [N]		66.8	66.8	66.8	221
Basic static load rating C_0 [N]		113	113	113	381
Static moment rating	T_0 [N·m]	0.12	0.06	0.06	0.42
	T_X [N·m]	0.07	0.07	0.07	0.54
	T_Y [N·m]	0.09	0.09	0.09	0.64
Features		Compact at the same sectional height as LWL1, with excellent track rail mounting	The smallest Linear Way with a track rail width of only 1mm	Simple track rail mounting with the same width as LWL1	Minimal size with excellent load capacity

Identification number

Example	LWLF	2	C1	R18	T₀	H	/I
	①	②	③	④	⑤	⑥	⑦

① Model

Model	
LWLF	Wide rail type

② Size

Size
2

③ Number of slide units

Number of slide units (C○)
Specifies the number of slide units assembled on one track rail.

④ Length of track rail

Length of track rail (R○)
Indicates the length of track rail in mm. For standard and maximum lengths, see Table 1.

⑤ Preload amount

Preload amount	
T₀: Clearance	For details of the preload amount, see Table 2.

⑥ Accuracy class

Accuracy class	
H: High	For details of accuracy class, see Table 3.
P: Precision	

⑦ Special Specification

Special Specification	
/E	Specified rail mounting hole positions
/I	Inspection sheet
/W	A group of multiple assembled sets

Details of specifications

Table 1 Standard and maximum lengths of track rail

unit: mm

Item / Identification number		LWLF2
Standard length L(1)		18 (3) 30 (5) 42 (7) 54 (9)
Pitch of mounting holes F		6
E		3
Standard E dimensions	or higher	2.5
	below	5.5
Maximum length		102

Note (1) The value in ( ) indicates the number of mounting holes.

Remark: If not directed, E dimensions for both ends will be the same within the range of standard E dimensions. To change the dimensions, indicate the specified rail mounting hole positions /E of special specification.

Table 2 Preload amount

unit: mm

Preload type (preload symbol)	Clearance (T₀)
Preload amount [N]	0 (1)
Operating conditions	Very light motion

Note (1) Zero or minimal clearance.

Table 3 Tolerance and allowance

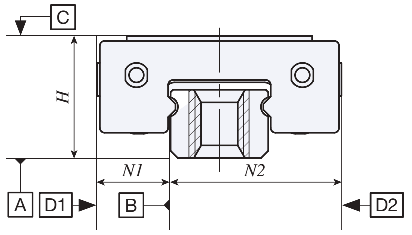
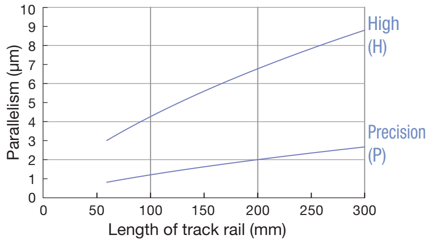


Fig. 1 Parallelism in operation



Item / Class (classification symbol)	High (H)	Precision (P)
H deviation	±0.020	±0.010
$N1$ and $N2$ deviation	±0.025	±0.015
H deviation variation (1)	0.015	0.007
N deviation variation (1)	0.020	0.010
Parallelism in operation of the slide unit C surface to A surface	See Fig. 1. (If the track rail length is less than 60mm, the value will be the same as 60mm)	
Parallelism in operation of the slide unit D1 (D2) surface to B surface	See Fig. 1. (If the track rail length is less than 60mm, the value will be the same as 60mm)	

Note (1) The value shows variation of slide units incorporated in the same track rail.

Mounting methods

Properly align the reference mounting surface B and D1 or D2 of the track rail and slide unit with the reference mounting surface of the table and bed, and fix them in place.

The reference mounting surfaces B and D1, and D2 and mounting surfaces A and C are precisely ground. Machining the mating mounting surface (of the machine, device, etc.) to a high degree of accuracy and mounting them properly will ensure stable linear motion with high accuracy.

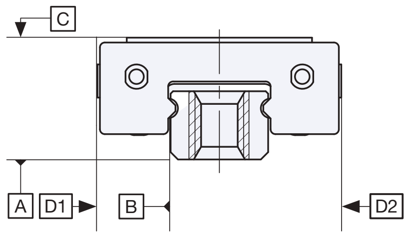
The track rail reference mounting surface B is identified by the mark on the top surface of the track rail. It is the side surface above the mark (in the direction of the arrow).

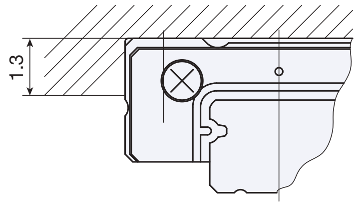
The reference mounting surface of the slide unit is located at both right and left sides (D1 and D2).

It is recommended to add a shoulder to the mating reference mounting surface as shown in the figure to the right. The shoulder height of the track rail should be set to a position (height) where it does not interfere with the slide unit.

The recommended screw tightening torque when mounting the product to a steel mating member material is shown in the table below.

It is recommended to use a tightening torque of 70 to 80% of the value in the table for slide unit mounting holes.

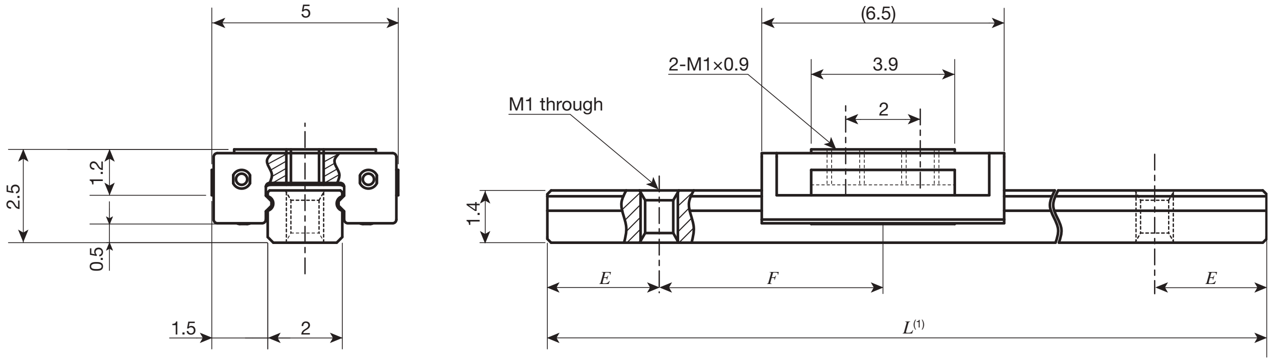




Mounting part of slide unit

Bolt size	Tightening torque N·m
	Stainless steel-made screw
M1 × 0.25	0.04

Product dimensions



Identification number	Mass (Ref.)		Mounting bolt for track rail	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
	Slide unit g	Track rail (per 100mm) g	mm (2)	C N	C_0 N	T_0 N·m	T_X N·m	T_Y N·m
LWLF2	0.21	2.0	M1× ☐ (4)	66.8	113	0.12	0.07 0.47	0.09 0.56

Note (1) The dimensions of track rail are described in Table 1.

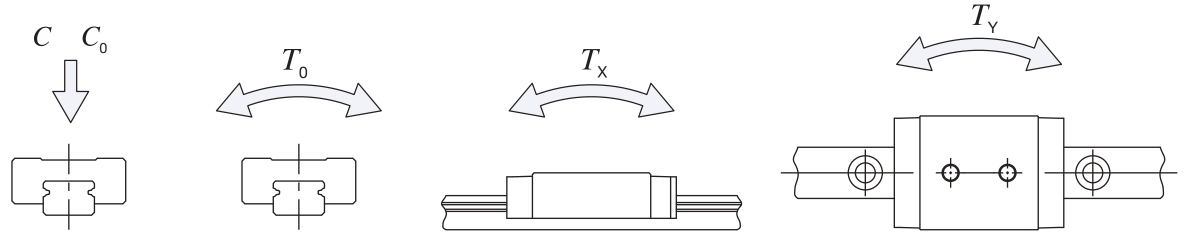
(2) Track rail mounting bolts are not appended.

(3) The directional values for basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the figures below.
The upper values of T_X and T_Y are for one slide unit, and the lower values are for two slide units in close contact.

(4) Concerning screw length ☐ , prepare the screws whose fixing thread depth is less than the track rail height dimension.

Remarks (1) Balls are not retained. No end seal is attached.

(2) No oil hole is prepared. For re-greasing, apply the grease directly to the raceway of the track rail.



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IKO

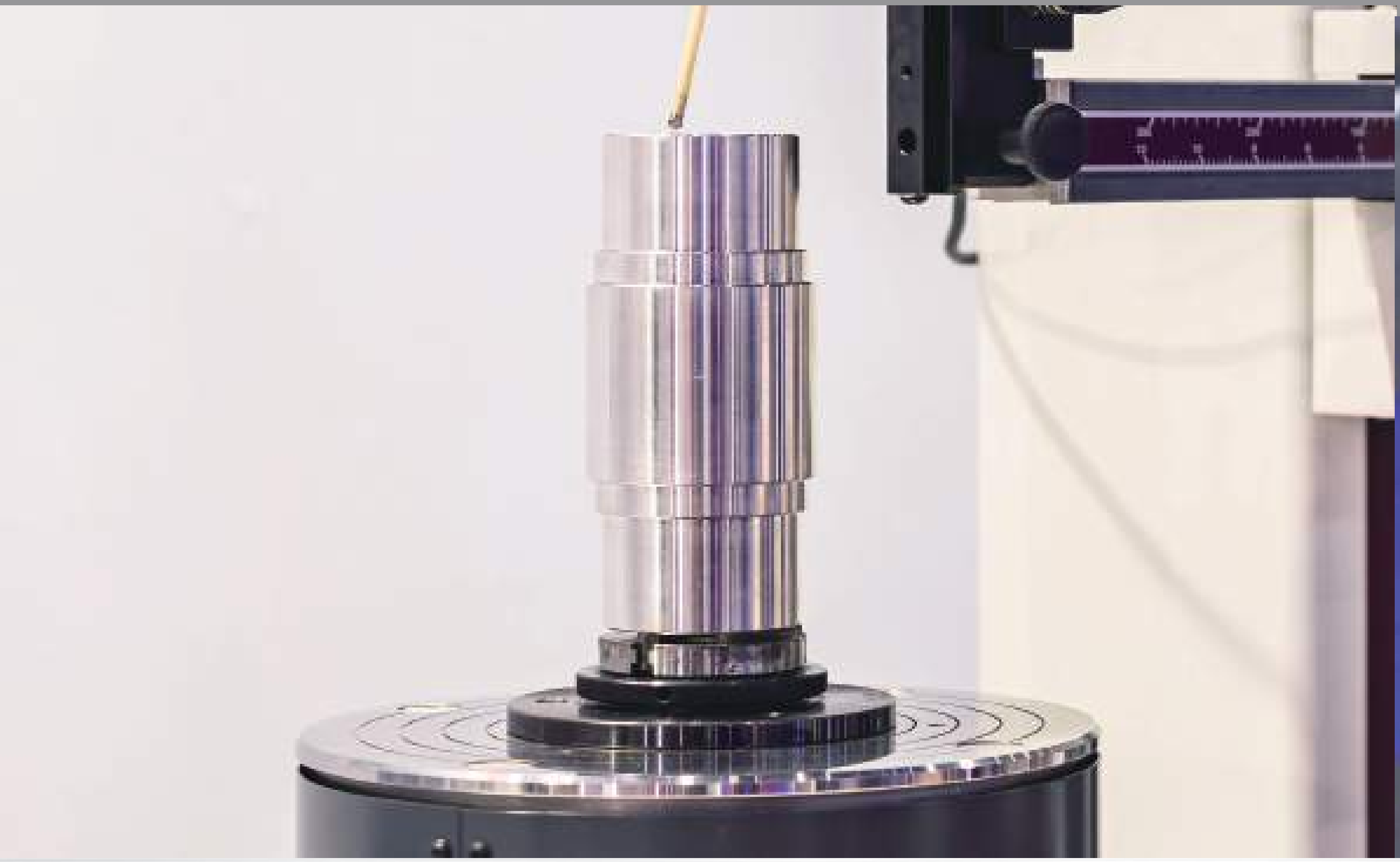
New

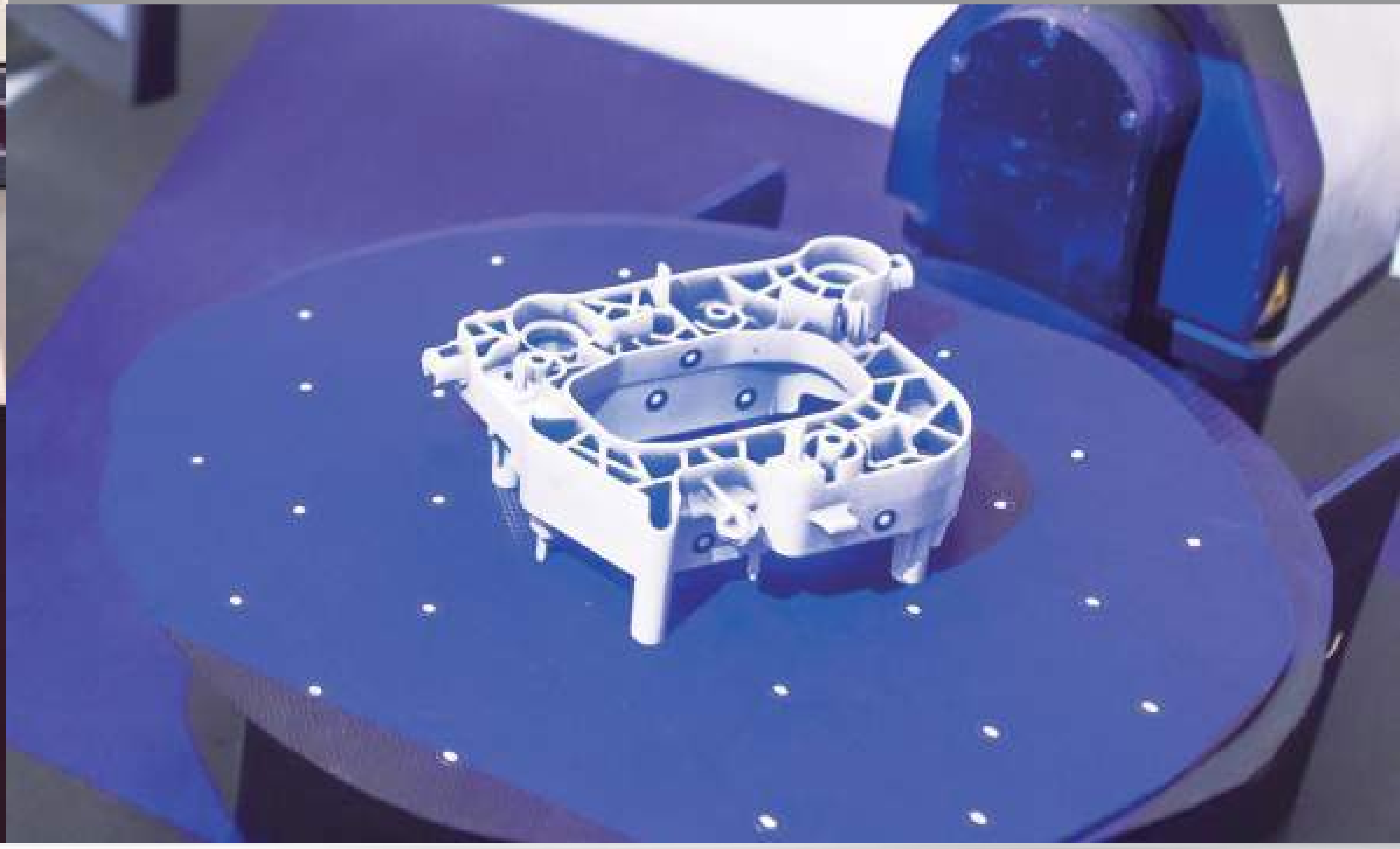
Rotation Stage

SK···W

A new rotation stage
with precision positioning!

NIPPON THOMPSON CO., LTD.

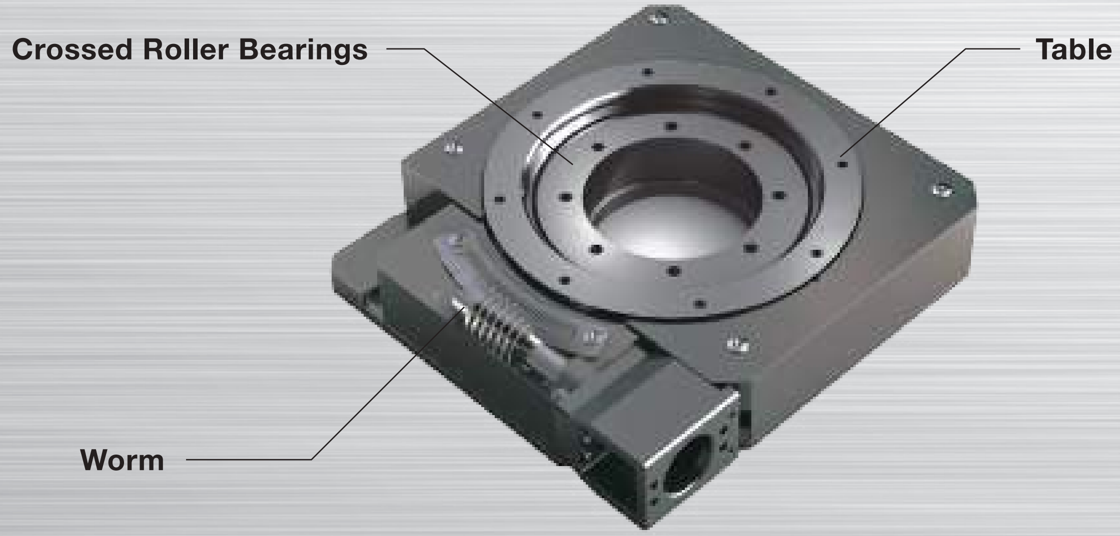




The new SK···W Rotation Stage provides smooth positioning with high accuracy and high rigidity!

SK···W Structure

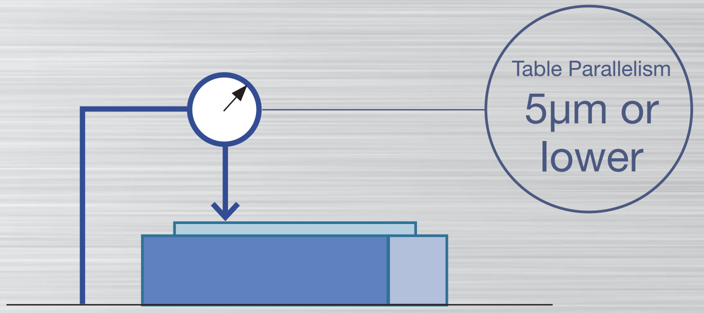
The SK···W is an unlimited rotation stage that employs a worm gear mechanism. IKO Crossed Roller Bearings are used in the rotation guiding parts and utilized directly as a table to achieve high-precision rotational runout, high rigidity and a low profile.



SK···W Features

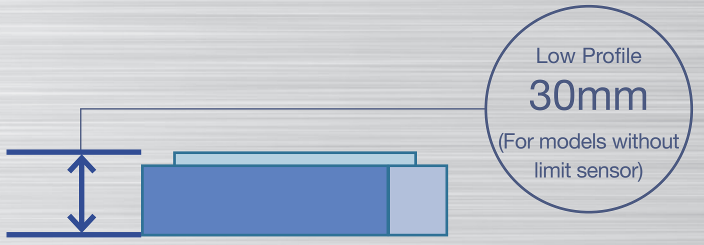
High Accuracy

IKO Crossed Roller Bearings are used in the rotation guiding parts and can achieve deflection on the table upper surface of 5μm or less.



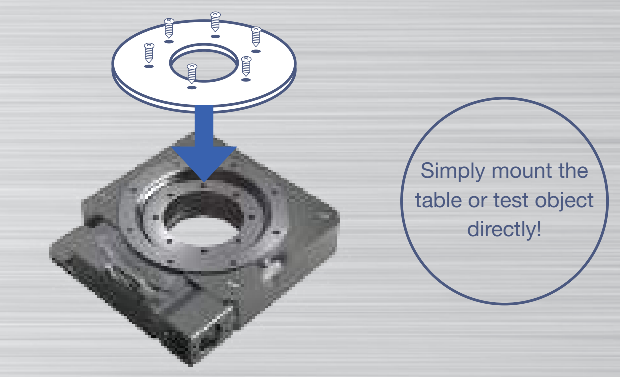
Low Profile, High Rigidity

IKO Crossed Roller Bearings with high rigidity in all directions are used in the rotation guiding parts. In addition, since Crossed Roller Bearings are used directly as the table, a low profile is also achieved.



Reduced Design Work

The device table or test object can be mounted directly to the table. The use of mechanical parts reduces the labor hours required to design a rotating table from scratch.



Identification Number

Example

SK	120	W	/	ATB01	SC
①	②	①		③	④

① Model

Model
SK···W: Rotation Stage SK···W

② Size

Symbol	Table diameter (mm)
120	115 (120)

Remarks: Dimensions in parentheses are for models with a limit sensor.

③ Designation of Motor Attachment

Select a motor attachment symbol from Table 1.

- Motor should be prepared by customer.
- Please specify motor attachment applicable to motor use.
- Couplings shown in Table 2 are temporarily fixed in the main body before shipment. Final position adjustment should be performed by customer.

Table 1 Application of motor attachment

Motor attachment symbol	Motor to be used					Flange (mm)
	Type	Manufacturer	Series	Model	Rated output (W)	
ATB01	Five-phase stepper motor	ORIENTAL MOTOR Co., Ltd.	PK	PK525HPB		□ 28
ATB02	Two-phase stepper motor (bi-polar)	MinebeaMitsumi, Inc.	10PM-K	10PM-K406CNVA6098 (1)		□ 25
ATB03	AC Servomotor	Mitsubishi Electric Corporation	J4	HG-AK0136	30	□ 25

Note (1) Dedicated IKO model number. Available for purchase from NMB Sales Co., Ltd.

Table 2 Coupling models

Motor attachment	Coupling models	Manufacturer	Coupling inertia (J_c × 10^{-5}kg · m^2)
ATB01 and ATB02	MSTS-12C-5 × 5	Nabeya Bi-tech Kaisha	0.022
ATB03	XGS-15C-5 × 5	Nabeya Bi-tech Kaisha	0.020

④ Limit Sensor Designation

Symbol	Limit sensor specification
No symbol	No limit sensor (built-in origin sensor is included)
SC	Includes limit sensor (includes upper table)

Specifications / Accuracy

Table 3 Specification

Operating angle range (1) (degrees)	360
Resolution (2) (s)	1.08
Maximum number of table revolutions (min^{-1})	5
Maximum number of worm axis revolutions (min^{-1})	600
Moment rigidity (s/N · cm)	0.04
Allowable load (3) (N)	50

Note (1) Values shown are for models without a limit sensor. When models with a limit sensor are used, adjustments can be performed to any angle within a range of up to 320 degrees.
(2) The resolution indicates a value when fraction sizes of the motor are 10,000 pulses/rev.
(3) Allowable load refers to the maximum load that can be applied without affecting functions or performance.

Table 4 Accuracy

Positioning accuracy (s)	21.6
Positioning repeatability (s)	±7.2
Lost motion (s)	32.4
Backlash (s)	32.4
Parallelism of upper table surface to mounting surface (μm)	20 (40)
Radial runout of table diameter (μm)	5 (15)
Deflection on table upper surface (μm)	5 (25)

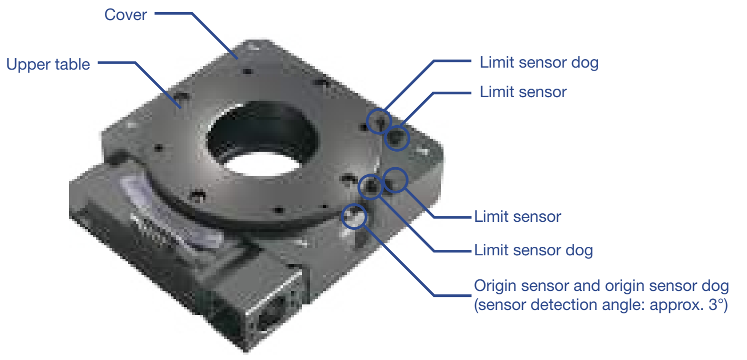
Remarks: Values in parentheses are for models with a limit sensor.

Sensor Specification

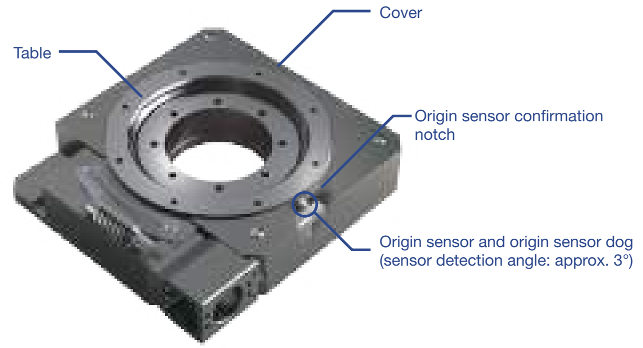
The SK···W is fitted with an origin sensor (E2S-W13B 1M produced by Omron Corporation) as standard.

There is no precision regulation of the relative positions of the origin sensor and the table mounting hole, precise adjustment of the return to origin position should be performed by performing offset adjustment through a higher-level controller. For models with a limit sensor, a limit sensor (E2S-W14 1M produced by Omron Corporation) and an upper table are added. The position of the limit sensor dog can be adjusted. The operating range can be set to any position up to 320 degrees.

With limit sensor



Without limit sensor



* For models with a limit sensor, check the position of the origin sensor dog with the cover removed.
* The cover cannot be removed after limit sensor dog adjustment. Perform limit sensor dog adjustment after fixing the base of the product to the mounting surface and mounting the cover.

* The origin sensor position can be checked from the cover notch.

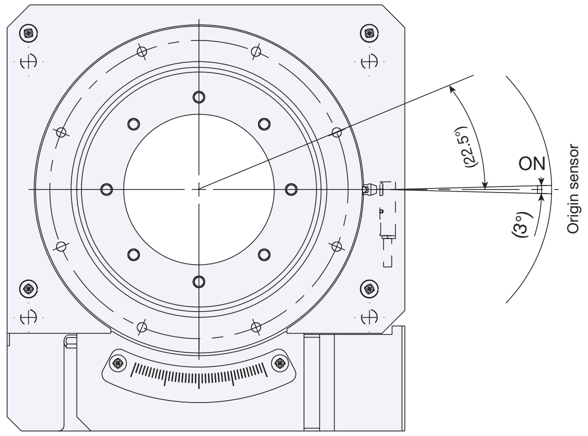


Fig. 1 Origin sensor timing chart

Mounting

To mount the SK···W, remove the cover and use screws to fix the base to the mounting surface.

The typical tightening torque to be used when fixing the SK···W in place is indicated in Table 5.

When high accuracy is required with no vibration and shock, it is recommended to tighten the screws with a lower torque than that indicated in the table and use an adhesive to prevent screws from loosening.

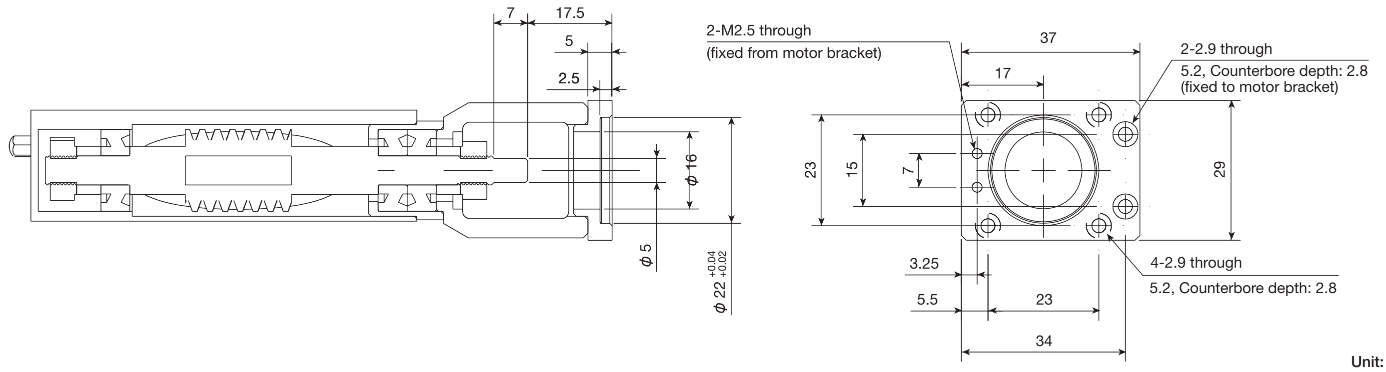
Table 5 Screw tightening torque

unit: N·m

Bolt size	Female thread component		
	Steel	Aluminum alloy	
			Screw insert
M4 × 0.7	4.0	About 60% of steel value	About 80% of steel value
M5 × 0.8	7.9		

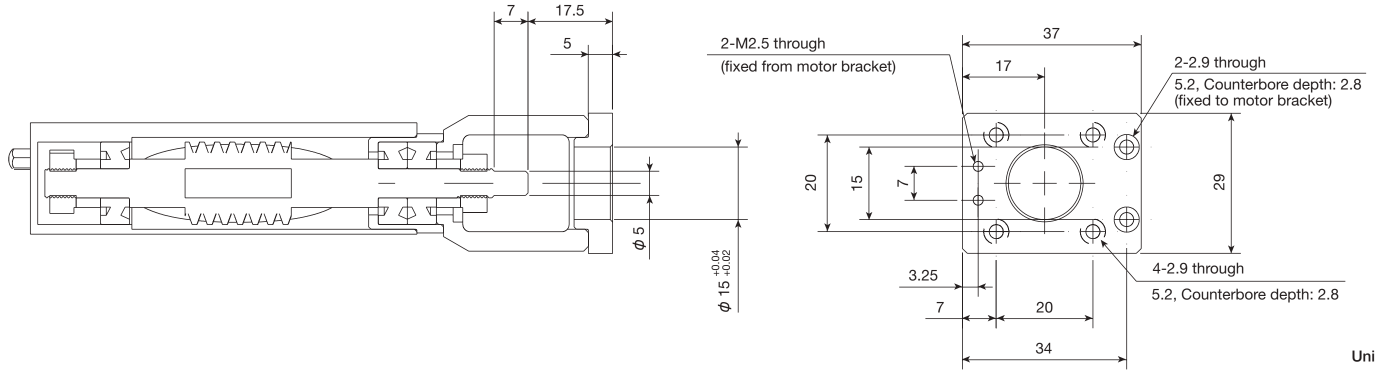
Dimensions of Motor Attachment

ATB01



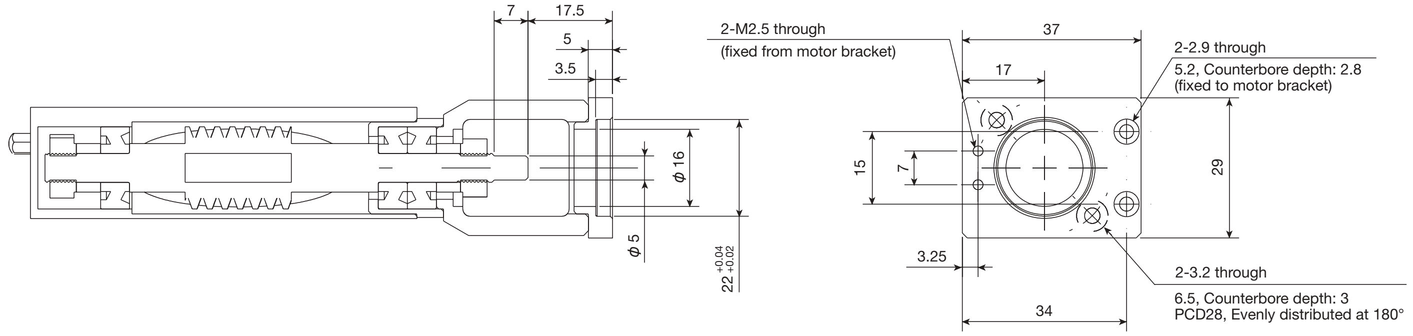
Unit: mm

ATB02



Unit: mm

ATB03

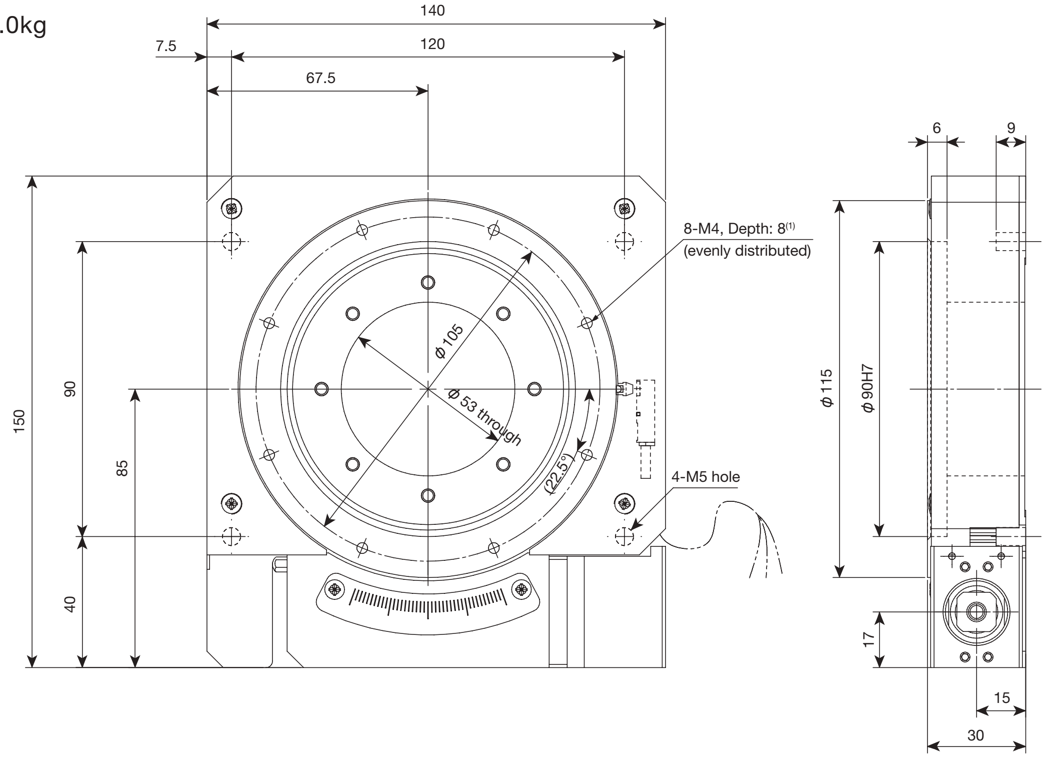


Unit: mm

Product dimensions

SK120W: Without limit sensor

Mass: 2.0kg

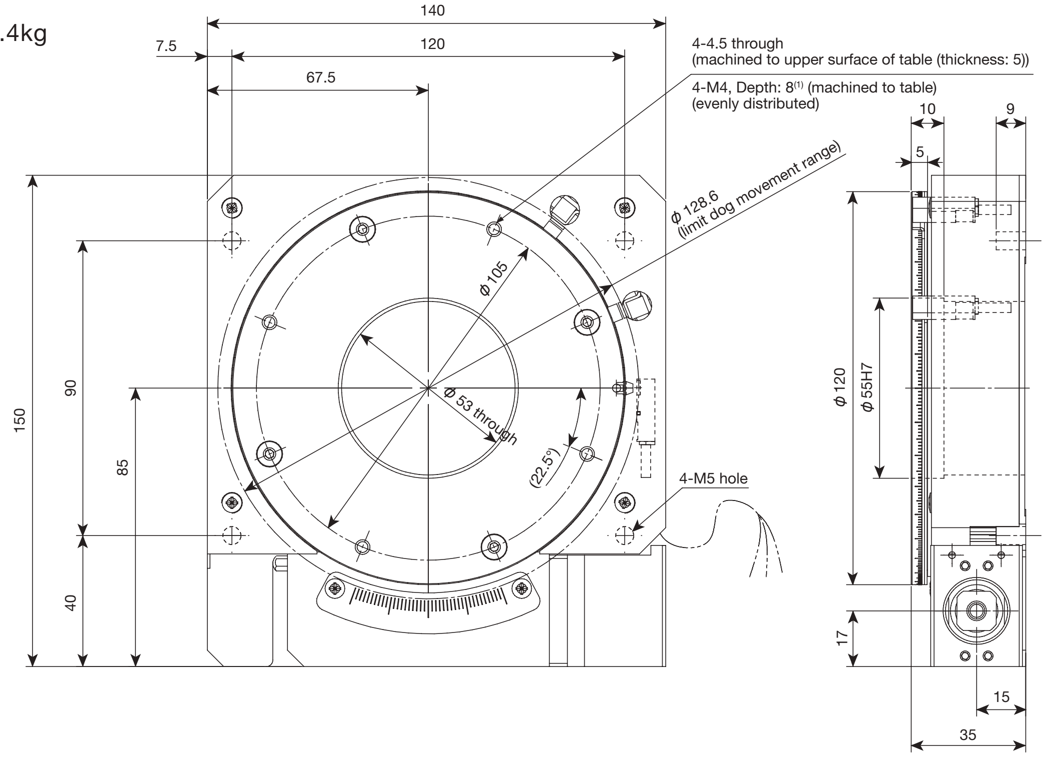


Unit: mm

Note (1) Inserting mounting screws too deeply may affect the rotation performance of the table. Never insert a screw longer than the depth of the through hole.

SK120W: With limit sensor/with upper table

Mass: 2.4kg



Unit: mm

Note (1) Inserting mounting screws too deeply may affect the rotation performance of the table. Never insert a screw longer than the depth of the through hole.

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ISO 9001 & 14001 Quality system registration certificate

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IKO

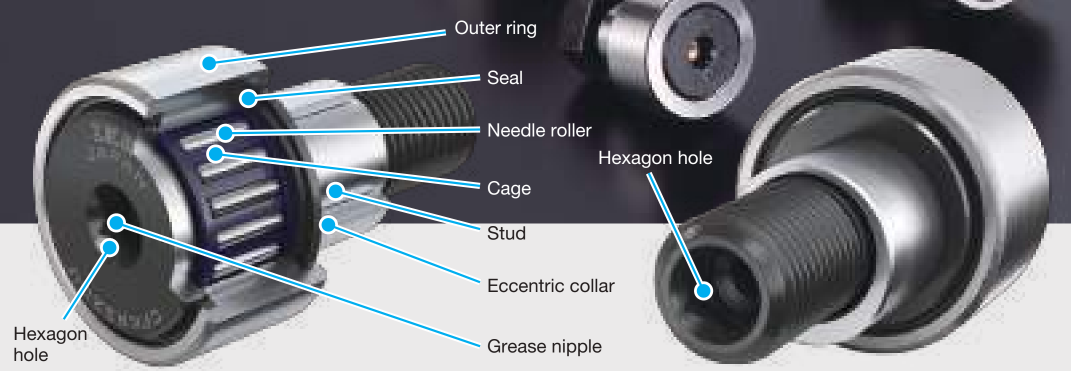
New

Eccentric Type Cam Followers

CFKRE

NIPPON THOMPSON CO., LTD.

The *New* CFKRE Eccentric Type Cam Follower has double hex holes for easy mounting!

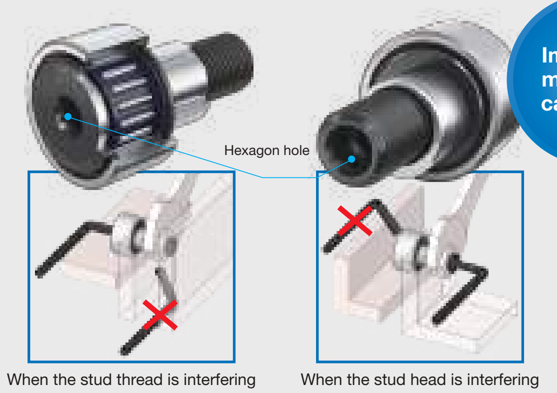


Variations of CFKRE

Model of bearing	Roller guide method	Shape of outer ring outside surface	Shape of seal	Identification number	Size (outside dia. of outer ring)												
					22	26	30	32	35	40	47	52	62	72	80	85	90
Eccentric Type Cam Followers CFKRE	With cage	Crowned outer ring	Shield type	CFKRE…R *New*	○	○	○	○	○	○	○	○	○	○	○	○	○
			Sealed type	CFKRE…UUR	○	○	○	○	○	○	○	○	○	○	○	○	○
		Cylindrical outer ring	Shield type	CFKRE	○	○	○	○	○	○	○	○	○	○	○	○	○
			Sealed type	CFKRE…UU	○	○	○	○	○	○	○	○	○	○	○	○	○
	Full complement	Crowned outer ring	Shield type	CFKRE…VR	○	○	○	○	○	○	○	○	○	○	○	○	○
			Sealed type	CFKRE…VUUR	○	○	○	○	○	○	○	○	○	○	○	○	○
		Cylindrical outer ring	Shield type	CFKRE…V	○	○	○	○	○	○	○	○	○	○	○	○	○
			Sealed type	CFKRE…VUU	○	○	○	○	○	○	○	○	○	○	○	○	○

Two Major Features of CFKRE

1 CFKRE has hexagon holes at the end of each stud, making it possible to mount from any location.



When the stud thread is interfering

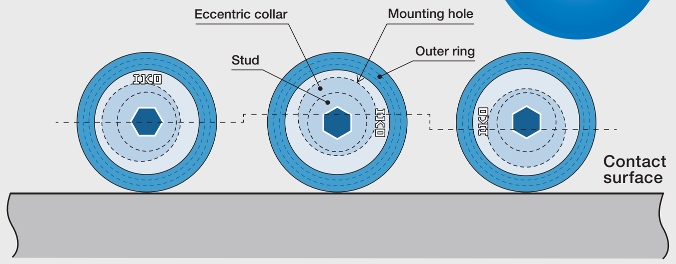
When the stud head is interfering

Improved mounting capability!

2 With the eccentric collar, it is easy to adjust the radial positioning.

When used along a straight line, the CFKRE can be aligned by adjusting the outer ring contact surface position with the eccentric collar, even without high mounting hole accuracy.

Rotate the body to adjust the height.



Example of Identification Number

CFKRE ① **30** ② **V** ③ **UU** ④ **R** ⑤

① Model	
CFKRE	Eccentric Type Cam Followers

② Dimensions
Shows the outer ring outside diameter. (unit: mm)

③ Roller guide method	
No symbol	With cage
V	Full complement

④ Seal structure	
No symbol	Shield type
UU	Sealed type

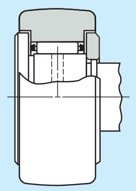
⑤ Shape of outer ring outside surface	
No symbol	Cylindrical outer ring
R	Crowned outer ring

Wide Selection of Product Specifications for Your Use

Roller guide method

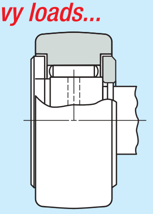
Caged type has a smaller friction coefficient and is best suited for high speed rotation.
Full complement is best suited for low speed rotation, oscillatory movement or heavy loads.

For high speed rotation...



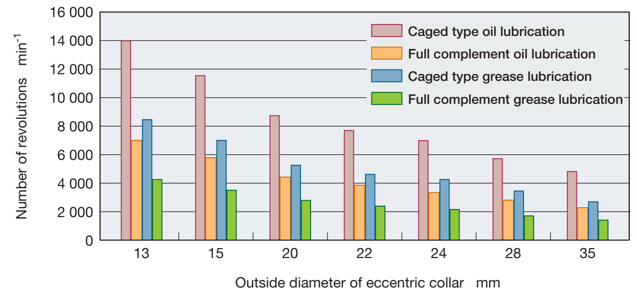
<With cage>

For low speed rotation or heavy loads...

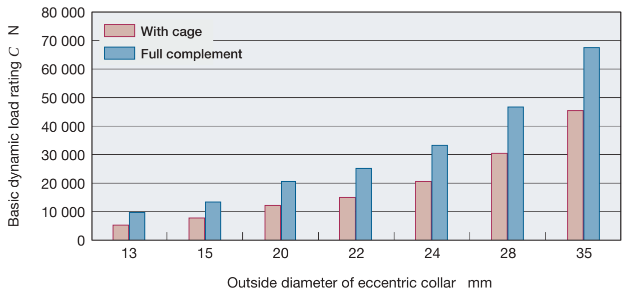


<Full complement>

Allowable rotational speed comparison



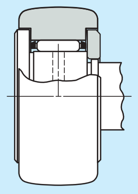
Dynamic load rating comparison



Seal structure

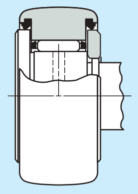
The shield type has narrow clearances between the outer ring and the stud flange and between the outer ring and the side plate that form labyrinths.
The sealed type incorporates seals to prevent the penetration of foreign particles.

For general use...



<Shield type>

For dust prevention and grease leak prevention...

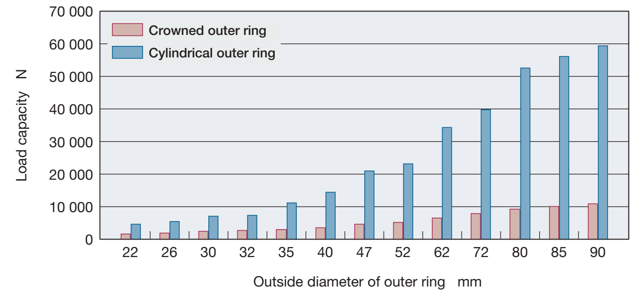


<Sealed type>

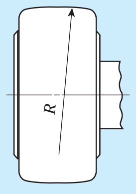
Shape of outer ring outside surface

The crowned outer ring is effective in moderating the edge load caused by mounting errors. The cylindrical outer ring is suitable for applications where the applied load is large or the cam guide surface is not hard enough.

Track capacity comparison

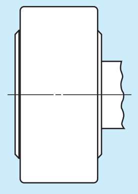


For reducing mounting errors...



<Crowned outer ring>

For high applied loads...
For cam guide surfaces that aren't hard enough...



<Cylindrical outer ring>

Accuracy

Table 1 Tolerance unit: μm

Item / Name	Crowned outer ring	Cylindrical outer ring
Outside dia. of outer ring D	0 -50	See Table 2
Width of outer ring C	0 -120	

Remark The recommended tolerance class for eccentric collar mounting holes is H7.

Table 2 Tolerance and allowance of outer ring (cylindrical outer ring) unit: μm

D Nominal outside diameter of outer ring mm		Δ_{Dmp} Single plane mean outside diameter deviation		K_{ea} Radial runout (Maximum)
Over	Incl.	High	Low	
18	30	0	- 9	15
30	50	0	-11	20
50	80	0	-13	25
80	120	0	-15	35

Mounting

Notes about mounting methods

① When mounting cam followers, fix in place by holding the hexagon hole with a hex wrench and using a wrench to tighten the nut (See Fig. 1).
Mounting by turning the hexagon hole itself can cause damage to the hexagon hole of the cam follower.

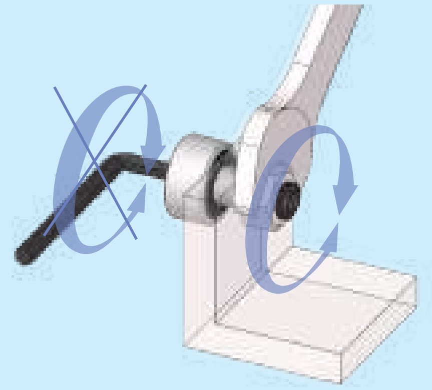


Fig. 1 Methods of mounting

② When tightening the nut, the tightening torque should not exceed the values shown in the dimension table. If the tightening torque is too large, the threaded portion of the stud may break. When loosening, a special nut such as a lock nut, spring washer, or self-locking nut should be used.

③ Direct-fixing the cam follower without nuts for mounting (See Fig. 2) is NOT recommended since it may be difficult to achieve sufficient tightening torque. If the screw loosens, stress concentrated on the thread can cause the stud to break.

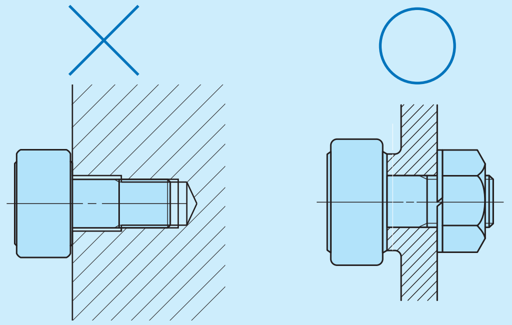


Fig. 2 Methods of mounting

Mounting methods for Eccentric Type Cam Followers

① Eccentric Type Cam Followers are mounted with a reference position where the mark on the stud head is located (See Fig.3). The outer ring position can be adjusted by rotating it using the hexagon hole on the stud head. The stud is fixed with a nut and a spring washer, etc. The tightening torque should not exceed the maximum tightening torque values shown in the dimension table. When shock loads are applied and the adjusted eccentricity must be maintained, it is recommended to make holes in the housing, stud and eccentric collar, and to fix the stud with a dowel pin.

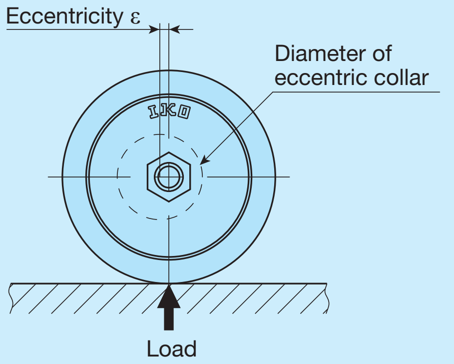


Fig. 3 Reference position for adjustment of Eccentric Type Cam Followers

② For Eccentric Type Cam Followers, the length of the mounting hole should be more than the B3 dimension (eccentric collar width) shown in the dimension table (See Fig. 4).

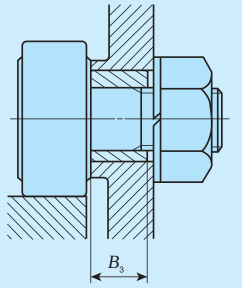
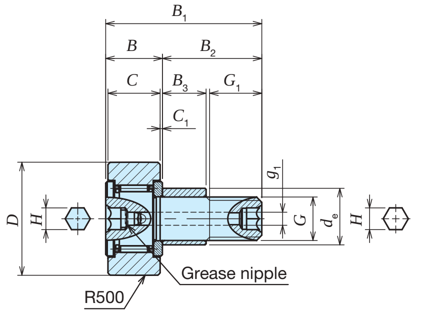


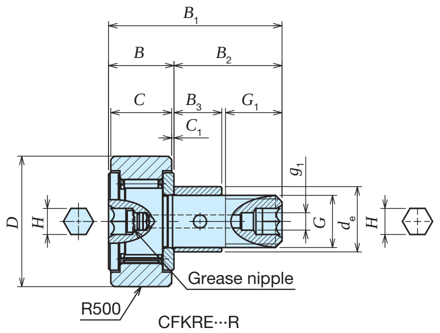
Fig. 4 Length of mounting hole for Eccentric Type Cam Followers

Eccentric Type Cam Followers / With Cage

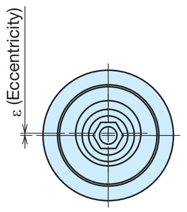
Type of material	No symbol	High carbon steel
	F	Stainless steel
Roller guide method	No symbol	With cage
	V	Full complement
Seal structure	No symbol	Shield type
	UU	Sealed type
Shape of outer ring outside surface	No symbol	Cylindrical outer ring
	R	Crowned outer ring

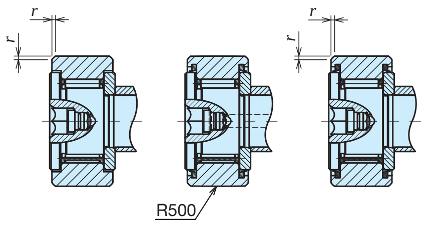


CFKRE···R
Outside diameter of eccentric collar d_e 13mm

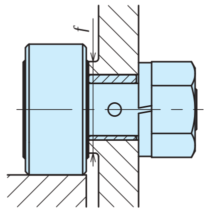


CFKRE···R
Outside diameter of eccentric collar d_e 15-35mm





CFKRE CFKRE···UUR CFKRE···UU



Outside diameter of eccentric collar mm	Identification number (1)				Mass (Ref.)	Boundary dimensions mm														Eccentricity	Mounting related dimensions	Maximum tightening torque	Basic dynamic load rating	Basic static load rating	Maximum allowable static load	Track capacity (3) N	
	Shield type		Sealed type																								
	Crowned outer ring	Cylindrical outer ring	Crowned outer ring	Cylindrical outer ring	g	D	C	d_e	G	G_1		B max	B_1 max	B_2	B_3	C_1	g_1	H	$r_{s\,min}$ (2)	ε	f Min. mm	N·m	C N	C_0 N	N	Crowned outer ring	Cylindrical outer ring
13	CFKRE 22 R	CFKRE 22	CFKRE 22 UUR	CFKRE 22 UU	47	22	12	13	M10X1.0	12		13.2	36.2	23	10	0.6	3	5	0.3	0.5	16	13.0	5 430	6 890	6 890	1 610	4 680
	CFKRE 26 R	CFKRE 26	CFKRE 26 UUR	CFKRE 26 UU	62	26																				2 030	5 530
15	CFKRE 30 R	CFKRE 30	CFKRE 30 UUR	CFKRE 30 UU	100	30	14	15	M12X1.5	13		15.2	40.2	25	11	0.6	4	6	0.6	0.5	21	21.9	7 910	9 790	9 790	2 470	7 010
	CFKRE 32 R	CFKRE 32	CFKRE 32 UUR	CFKRE 32 UU	110	32																				2 710	7 480
20	CFKRE 35 R	CFKRE 35	CFKRE 35 UUR	CFKRE 35 UU	177	35	18	20	M16X1.5	17		19.6	52.1	32.5	14	0.8	4	8	0.6	1	26	58.5	12 000	18 300	18 300	3 060	11 200
22	CFKRE 40 R	CFKRE 40	CFKRE 40 UUR	CFKRE 40 UU	264	40	20	22	M18X1.5	19		21.6	58.1	36.5	16	0.8	6	8	1	1	29	86.2	14 800	25 200	25 200	3 660	14 500
24	CFKRE 47 R	CFKRE 47	CFKRE 47 UUR	CFKRE 47 UU	397	47	24	24	M20X1.5	21		25.6	66.1	40.5	18	0.8	6	10	1	1	34	119	20 700	34 600	34 600	4 530	21 000
	CFKRE 52 R	CFKRE 52	CFKRE 52 UUR	CFKRE 52 UU	472	52																				5 190	23 200
28	CFKRE 62 R	CFKRE 62	CFKRE 62 UUR	CFKRE 62 UU	823	62	29	28	M24X1.5	25		30.6	80.1	49.5	22	0.8	6	14	1	1	40	215	30 500	52 600	52 000	6 580	34 300
	CFKRE 72 R	CFKRE 72	CFKRE 72 UUR	CFKRE 72 UU	1150	72																				8 020	39 800
35	CFKRE 80 R	CFKRE 80	CFKRE 80 UUR	CFKRE 80 UU	1920	80	35	35	M30X1.5	32		37	100	63	29	1	6	14	1	1.5	49	438	45 400	85 100	85 100	9 220	52 700
	CFKRE 85 R	CFKRE 85	CFKRE 85 UUR	CFKRE 85 UU	2080	85																				9 990	56 000
	CFKRE 90 R	CFKRE 90	CFKRE 90 UUR	CFKRE 90 UU	2270	90																				10 800	59 300

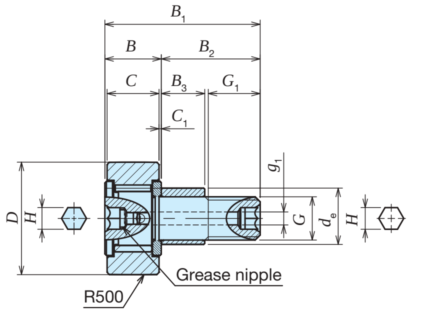
Note (1) The identification number indicates the outer ring outside diameter. Note (2) Minimum allowable value of chamfer dimension r. Note (3) Value when the mating surface hardness is 40HRC.

Remark Grease is pre-packed if the eccentric collar outer diameter d_e of the shield type is 13 mm or less or if the seal structure is the sealed type.
Other models are not provided with pre-packed grease. Perform proper lubrication for use.

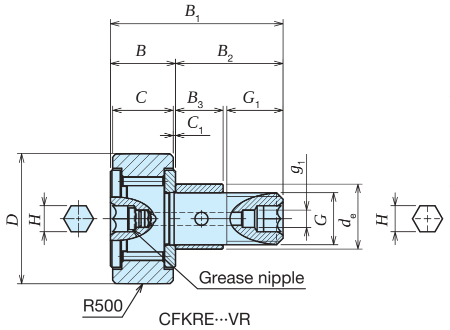
1N ≈ 0.102 kgf

Eccentric Type Cam Followers / Full Complement

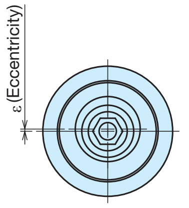
Type of material	No symbol	High carbon steel
	F	Stainless steel
Roller guide method	No symbol	With cage
	V	Full complement
Seal structure	No symbol	Shield type
	UU	Sealed type
Shape of outer ring outside surface	No symbol	Cylindrical outer ring
	R	Crowned outer ring

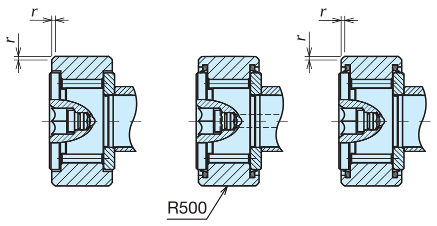


CFKRE···VR
Outside diameter of eccentric collar d_e 13mm

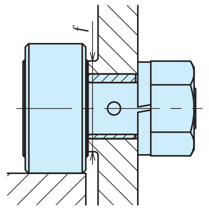


CFKRE···VR
Outside diameter of eccentric collar d_e 15-35mm





CFKRE···V CFKRE···VUUR CFKRE···VUU



Outside diameter of eccentric collar mm	Identification number (1)				Mass (Ref.)	Boundary dimensions mm														Eccentricity	Mounting related dimensions	Maximum tightening torque	Basic dynamic load rating	Basic static load rating	Maximum allowable static load	Track capacity (3) N	
	Shield type		Sealed type																								
	Crowned outer ring	Cylindrical outer ring	Crowned outer ring	Cylindrical outer ring	g	D	C	d_e	G	G_1		B max	B_1 max	B_2	B_3	C_1	g_1	H	$r_{s\,min}$ (2)	ε	f Min. mm	N·m	C N	C_0 N	N	Crowned outer ring	Cylindrical outer ring
13	CFKRE 22 VR	CFKRE 22 V	CFKRE 22 VUUR	CFKRE 22 VUU	48	22	12	13	M10X1.0	12		13.2	36.2	23	10	0.6	3	5	0.3	0.5	16	13.0	9 570	14 500	7 920	1 610	4 680
	CFKRE 26 VR	CFKRE 26 V	CFKRE 26 VUUR	CFKRE 26 VUU	63	26																				2 030	5 530
15	CFKRE 30 VR	CFKRE 30 V	CFKRE 30 VUUR	CFKRE 30 VUU	101	30	14	15	M12X1.5	13		15.2	40.2	25	11	0.6	4	6	0.6	0.5	21	21.9	13 500	19 700	13 200	2 470	7 010
	CFKRE 32 VR	CFKRE 32 V	CFKRE 32 VUUR	CFKRE 32 VUU	111	32																				2 710	7 480
20	CFKRE 35 VR	CFKRE 35 V	CFKRE 35 VUUR	CFKRE 35 VUU	180	35	18	20	M16X1.5	17		19.6	52.1	32.5	14	0.8	4	8	0.6	1	26	58.5	20 700	37 600	23 200	3 060	11 200
22	CFKRE 40 VR	CFKRE 40 V	CFKRE 40 VUUR	CFKRE 40 VUU	269	40	20	22	M18X1.5	19		21.6	58.1	36.5	16	0.8	6	8	1	1	29	86.2	25 300	51 300	31 100	3 660	14 500
24	CFKRE 47 VR	CFKRE 47 V	CFKRE 47 VUUR	CFKRE 47 VUU	402	47	24	24	M20X1.5	21		25.6	66.1	40.5	18	0.8	6	10	1	1	34	119	33 200	64 500	37 500	4 530	21 000
	CFKRE 52 VR	CFKRE 52 V	CFKRE 52 VUUR	CFKRE 52 VUU	477	52																				5 190	23 200
28	CFKRE 62 VR	CFKRE 62 V	CFKRE 62 VUUR	CFKRE 62 VUU	828	62	29	28	M24X1.5	25		30.6	80.1	49.5	22	0.8	6	14	1	1	40	215	46 600	92 000	52 000	6 580	34 300
	CFKRE 72 VR	CFKRE 72 V	CFKRE 72 VUUR	CFKRE 72 VUU	1150	72																				8 020	39 800
35	CFKRE 80 VR	CFKRE 80 V	CFKRE 80 VUUR	CFKRE 80 VUU	1920	80	35	35	M30X1.5	32		37	100	63	29	1	6	14	1	1.5	49	438	67 700	144 000	85 900	9 220	52 700
	CFKRE 85 VR	CFKRE 85 V	CFKRE 85 VUUR	CFKRE 85 VUU	2080	85																				9 990	56 000
	CFKRE 90 VR	CFKRE 90 V	CFKRE 90 VUUR	CFKRE 90 VUU	2270	90																				10 800	59 300

Note (1) The identification number indicates the outer ring outside diameter. Note (2) Minimum allowable value of chamfer dimension r. Note (3) Value when the mating surface hardness is 40HRC.

Remark Provided with prepacked grease.

1N ≈ 0.102 kgf

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IKO

New

Mounting Holed Type Super Slim Crossed Roller Bearings

CRBTF

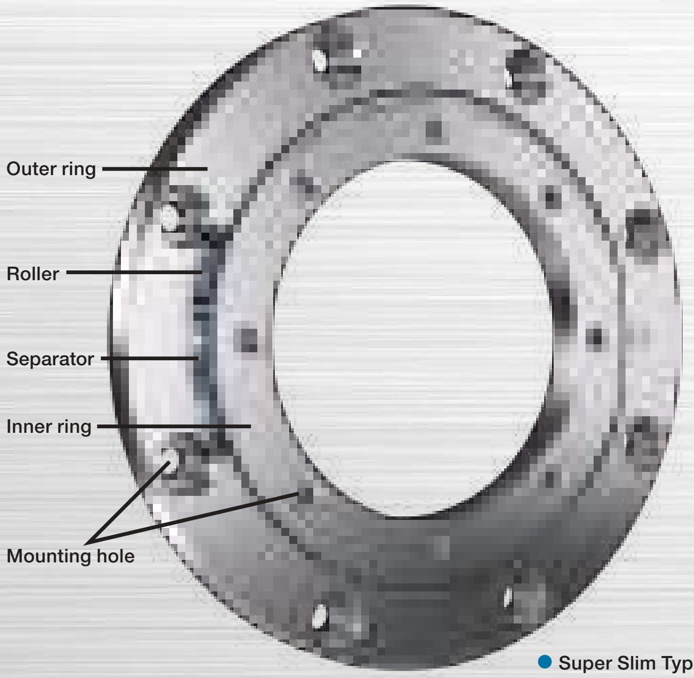
NIPPON THOMPSON CO., LTD.

Mounting Holed Type Super Slim Crossed Roller Bearings

CRBTF

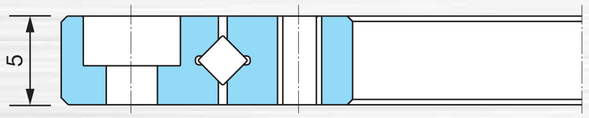
Super Slim Crossed Roller Bearings now available with mounting hole specification! Slim design and easy mounting can reduce the size and weight of your equipment.

CRBTF Structure and Features



1. Make your equipment more compact with this super slim design!

Mounting Holed Type Super Slim Crossed Roller Bearings have an ultra-slim 5 mm bearing width, made possible thanks to IKO's technological expertise in miniature bearing production.

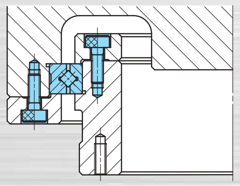


2. Easy bolt-on mounting eliminates complex mounting procedures.

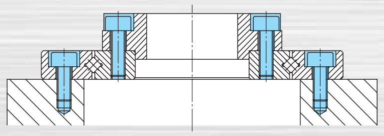
Mounting Holed Type Super Slim Crossed Roller Bearings can be mounted directly to the mounting surface. No housing or pressure plate required.

- **Super Slim Type Crossed Roller Bearing Mounting Method**

Until now...
Housing and pressure plates were required.



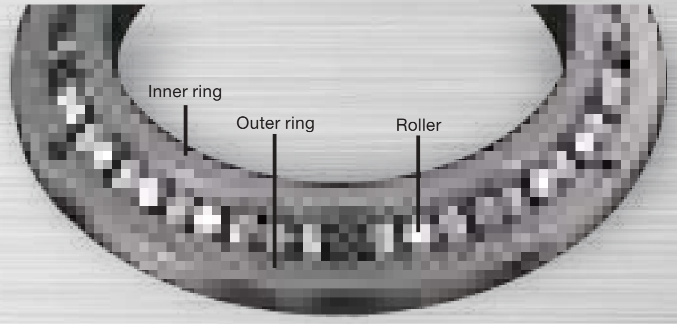
- **Mounting Holed Type Super Slim Crossed Roller Bearing Mounting Method**



*It is recommended to use a housing for applications with large loads or moment loads.

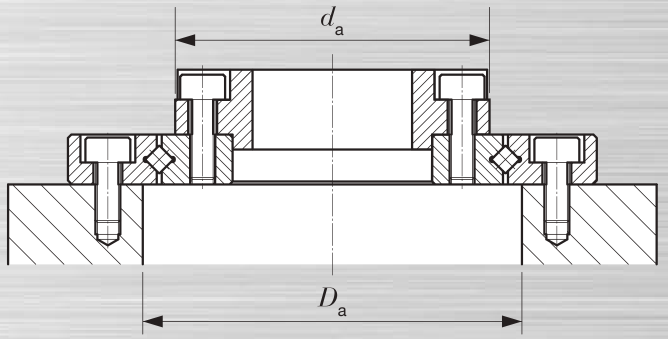
What are Crossed Roller Bearings?

IKO Crossed Roller Bearings are compact bearings with their rollers alternately crossed at right angles to each other between inner and outer rings. The orthogonal array of the rollers allows a single bearing to handle complex loads simultaneously from any direction, making mounting possible without worrying about load direction.



Mounting

- The shoulder height diameters (d_a and D_a) which are related to mounting must meet the values shown in the dimension tables.
- When used with a housing, it is recommended to use a slight interference fit adjusted to the actual measured dimensions of the outer and inner ring. In addition, the depth of the housing bore is recommended to be equal to or larger than the bearing width.
- Mounting Holed Type Super Slim Crossed Roller Bearings have a plug hole for inserting cylindrical rollers. When mounting the bearings, position the plug away from the maximum load. The plug is located by the pin on the side.



Tighten the fixing screws (M2.5 x 0.4) at 0.58 N·m torque.

Dimensions/Accuracy/Clearance

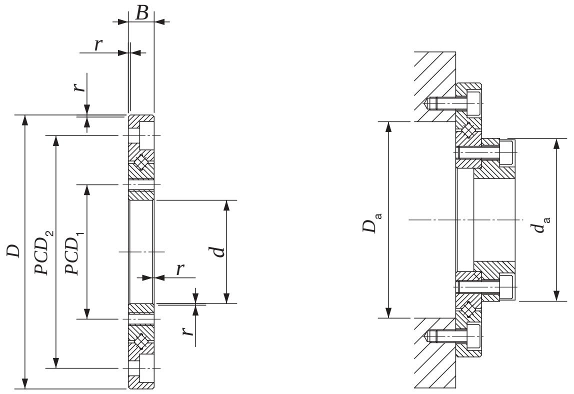


Table 2. Accuracy/Internal radial clearance

unit: μm

d Nominal bore diameter mm	Δ_{dmp} Bore diameter deviation		Δ_{Dmp} Outside diameter deviation		Δ_{Bs} and Δ_{Cs} Inner/outer ring width deviation		K_{ia} and S_{ia} Radial and axial runout of assembled bearing inner ring	K_{ea} and S_{ea} Radial and axial runout of assembled bearing outer ring	Radial internal clearance C1	
	High	Low	High	Low	High	Low	Maximum	Maximum	Min.	Maximum
10	0	-8	0	-11	0	-75	13	20	0	15
20	0	-10	0	-13	0	-75	13	20	0	15
30	0	-10	0	-13	0	-75	15	25	0	15
40	0	-12	0	-13	0	-75	15	25	0	15

Table 1. Dimensions

Shaft diameter mm	Identification number	Mass (Ref.) g	Boundary dimensions mm				Mounting holes mm				Mounting dimensions mm		Basic dynamic load rating C N	Basic static load rating C_0 N
							Inner ring		Outer ring					
			d	D	B	$r_{min}^{(1)}$	PCD_1	Mounting holes	PCD_2	Mounting holes	d_a	D_a		
10	**CRBTF 105 AT**	46	10	43	5	0.15	16	6-M2.5 through	35	6-ϕ 2.9 through ϕ5.5 Counterbore depth 2.8	21.5	28	1 500	1 410
20	**CRBTF 205 AT**	66	20	53	5	0.15	26	6-M2.5 through	45	6-ϕ 2.9 through ϕ5.5 Counterbore depth 2.8	31.5	38	1 890	2 150
30	**CRBTF 305 AT**	83	30	63	5	0.15	36	8-M2.5 through	55	8-ϕ 2.9 through ϕ5.5 Counterbore depth 2.8	41.5	47.5	2 140	2 750
40	**CRBTF 405 AT**	103	40	73	5	0.15	46	8-M2.5 through	65	8-ϕ 2.9 through ϕ5.5 Counterbore depth 2.8	51.5	58	2 440	3 490

Note (1) Minimum allowable single value of chamfer dimension r. Remarks 1. No oil hole is provided. 2. Provided with pre-packed grease.

1N ≈ 0.102 kgf

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ISO 9001 & 14001 Quality system registration certificate

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IKO

New

Super Slim Crossed Roller Bearings

CRBT105A

Compact size and high rigidity

NIPPON THOMPSON CO., LTD.

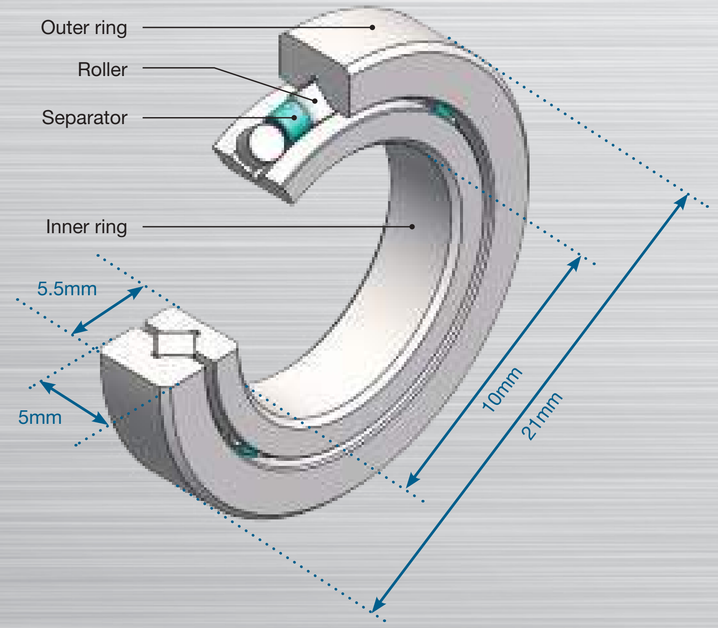
Now Available! Super Slim Type Crossed Roller Bearings with a bore diameter of just 10mm and outside diameter of 21mm.

Smaller size can help reduce the size of your equipment.

Super Slim Type Crossed Roller Bearings

CRBT105A

CRBT105A Structure and Features

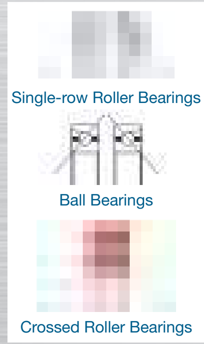


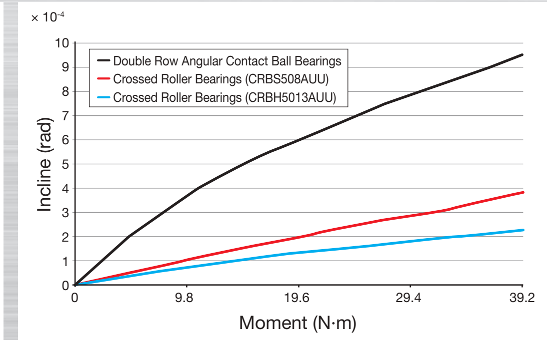
1. Ultra-Slim and Ultra-Small!

These Crossed Roller Bearings are ultra-slim and small with a 10mm bearing bore, 21mm outside diameter, and 5mm bearing width. The compact size is made possible thanks to IKO's technological expertise in miniature bearing production.

2. High Rigidity and a Compact Size!

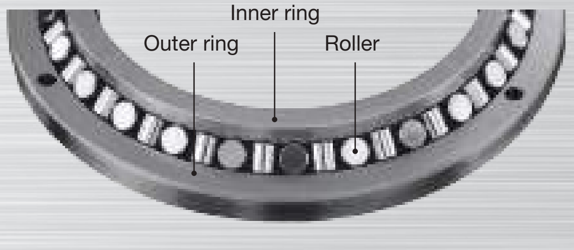
In Crossed Roller Bearings, the orthogonal array of rollers reduces the cross sectional area of rear-mounted 45° contact angle single-row roller bearings or ball bearings by half, creating a compact structure.
Even though they are more compact, the rigidity is 3 to 4 times greater than double-row angular contact ball bearings.





What are Crossed Roller Bearings?

Crossed Roller Bearings are compact bearings with their rollers alternately crossed at right angles to each other between inner and outer rings. The orthogonal array of the rollers allows the bearing to handle complex loads simultaneously from any direction, which makes assembly possible without needing to worry about load direction.



CRBT105A Usage Examples

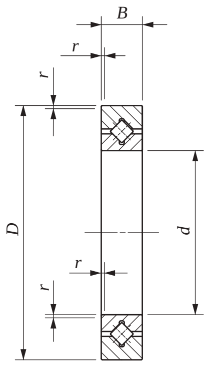
Compact Hand Robot

Crossed Roller Bearings feature high rotational accuracy and high rigidity which minimizes deflection, making them ideal for the swivel parts of hand robots, that require accurate positioning motion.

Compact Surveillance Camera

Crossed Roller Bearings can receive complex loads from various directions, making them ideal bearings for supporting surveillance cameras which are in constant 24-hour operation.

Dimensions/Accuracy/Radial Clearance



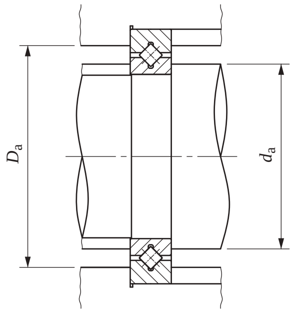


Table 1. Dimensions

Shaft diameter mm	Identification number	Mass (Ref.)	Boundary dimensions mm				Mounting dimensions mm		Basic dynamic load rating	Basic static load rating
		g	d	D	B	$r_{\min}$ (1)	d_a	D_a	C N	C_0 N
10	CRBT 105 A	9.0	10	21	5	0.15	12.5	17	1120	811
15	CRBT 155 A	11.9	15	26	5	0.15	17.5	22	1320	1110
20	CRBT 205 A	14.8	20	31	5	0.15	22.5	27	1400	1290
30	CRBT 305 A	20.7	30	41	5	0.15	32.5	37	1770	1970
40	CRBT 405 A	26.5	40	51	5	0.15	42.5	47	2000	2520
50	CRBT 505 A	32.3	50	61	5	0.15	52.5	57	2280	3200

Note (1) Minimum allowable single value of chamfer dimension r. **Remarks** 1. No oil hole is provided. 2. Provided with pre-packed grease.

1N ≈ 0.102 kgf

Table 2. Tolerances, allowable values, and radial internal clearances of Super Slim Type Crossed Roller Bearings

unit: μm

d Nominal bore diameter mm	Δ_{dmp} Single plane mean bore diameter deviation		Δ_{Dmp} Single plane mean outside diameter deviation		Δ_{Bs} and Δ_{Cs} Actual inner ring and outer ring width deviation		K_{ia} and S_{ia} Radial and axial runout of assembled bearing inner ring	K_{ea} and S_{ea} Radial and axial runout of assembled bearing outer ring	Radial internal clearance C_1	
	High	Low	High	Low	High	Low	Maximum	Maximum	Min.	Maximum
10	0	-8	0	-9	0	-75	10	15	0	15
15	0	-8	0	-9	0	-75	10	15	0	15
20	0	-10	0	-11	0	-75	13	20	0	15
30	0	-10	0	-11	0	-75	13	20	0	15
40	0	-12	0	-13	0	-75	15	25	0	15
50	0	-12	0	-13	0	-75	15	25	0	15

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IKO

New

Inch Series Cam Followers With ThrustDisk Seals™

CR···VBS

Model variation is now expanded!

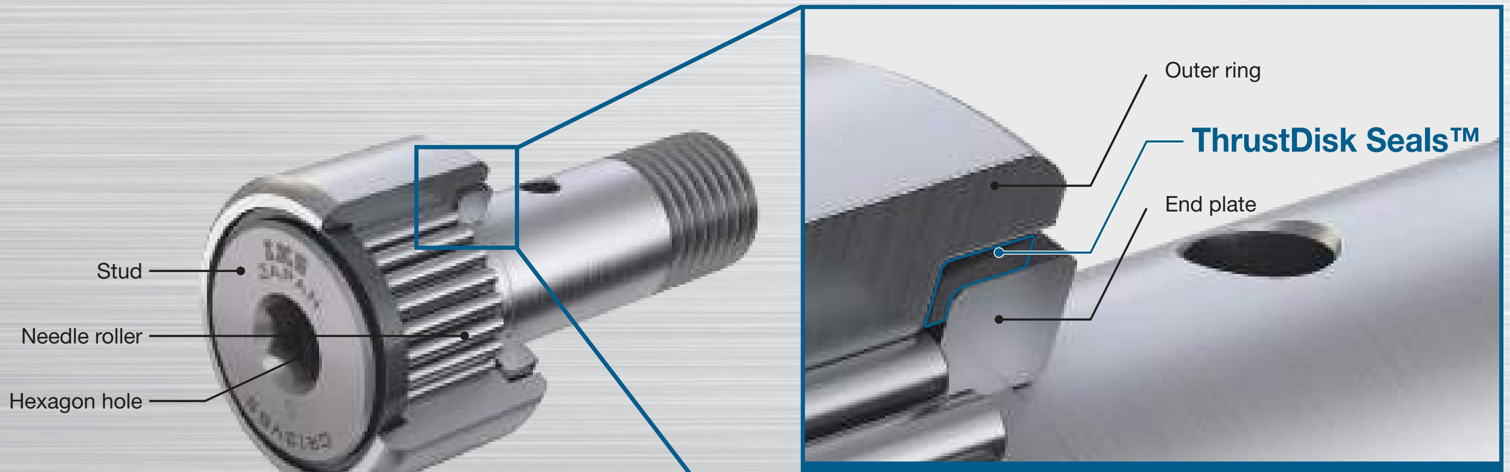
NIPPON THOMPSON CO., LTD.

IKO Inch Series Cam Followers with ThrustDisk Seals™ now have a variety of sizes!
Protects against internal bearing damage caused by mounting errors.

Sealed Type Inch Series Cam Followers
with Integrated Thrust Washer

CR···VBS

Structure and Features of CR···VBS:



Newly designed ThrustDisk Seals™

The design of IKO ThrustDisk Seals™ prevents grease from flowing out, and foreign substances from entering into the bearing. This unique design prevents metal contact between the outer ring and side plate caused by mounting errors, which can improve the life of the bearing.

Inch Series Cam Followers CR···B Variations

Name	Shape of stud head	Roller guide method	Seal structure	Shape of outer ring outside surface	Identification number	Size 8	8-1	10	10-1	12	14	16	18	20	22	24	26	28	30	32	36
Inch Series Cam Followers CR	With hexagon socket	Cage	Shield type	Crowned outer ring	CR···BR	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
				Cylindrical outer ring	CR···B	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
			Sealed type	Crowned outer ring	CR···BUUR	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
				Cylindrical outer ring	CR···BUU	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
		Full complement	Shield type	Crowned outer ring	CR···VBR	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
				Cylindrical outer ring	CR···VB	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
			Sealed type	Crowned outer ring	CR···VBUUR	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
				Cylindrical outer ring	CR···VBUU	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
			Sealed type with integrated thrust washer	Crowned outer ring	CR···VBSR	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
				Cylindrical outer ring	CR···VBS	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

NEW

Example of Identification Number

CR 12 V B S R
(1) (2) (3) (4) (5) (6)

Note (1) The sealed type with ThrustDisk Seals™ is compatible with the full complement specification only.
Note (2) Only the hexagon socket specification is compatible with the sealed type with ThrustDisk Seals™

(1) Model	
CR	Inch Series Cam Followers

(2) Dimensions
The outer diameter of the outer ring is indicated in units of 1/16 inch.

(3) Roller guide method (1)	
No symbol	With cage
V	Full complement

(4) Shape of stud head (2)	
No symbol	With screwdriver slot
B	With hexagon socket

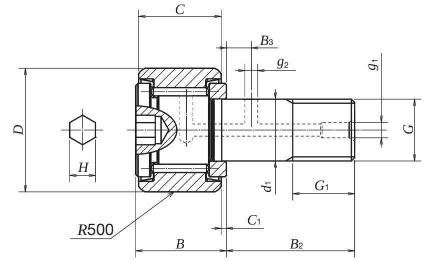
(5) Seal structure	
No symbol	Shield type
UU	Sealed type
S	Sealed type with integrated thrust washer

(6) Shape of outer ring outside surface	
R	Crowned outer ring
No symbol	Cylindrical outer ring

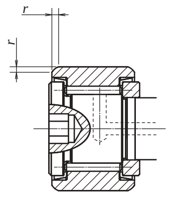
Model Comparison Table

IKO	NTN	NSK	Mc.GILL
CR...VBR	CRV··H	CRBC···	CCF···B
CR···VB	CRV··XH	CRB···	CF···B
CR···VBUUR	CRV··LLH	CRSBC···	CCF···SB
CR···VBUU	CRV··XLLH	CRSB···	CF···SB
CR···VBSR	-	-	CCF···SB
CR···VBS	-	-	CF···SB

Dimensions



CR···VBSR



CR···VBS

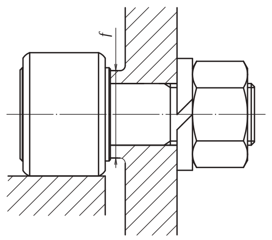


Table 1: Tolerance unit: μm

Name \ Item	Inch Series Cam Followers: Crowned outer ring	Cylindrical outer ring
Outside dia. of outer ring D	0 -50	See Table 2
Stud diameter d_1	+25 0	
Width of outer ring C	0 -130	

Table 2: Tolerance and allowance of outer ring (cylindrical outer ring) unit: μm

D Nominal outside diameter of outer ring mm		Δ_{Dmp} Single plane mean outside diameter deviation		V_{Dsp} Outside diameter variation in a single radial plane (maximum)	V_{Dmp} Single plane mean bore diameter variation (maximum)	K_{ea} Radial runout (maximum)
Over	Incl.	High	Low			
6	18	0	-25	10	6	15
18	30			12	7	15
30	50			14	8	20
50	80			16	10	25

Stud diameter mm (inch)	Identification number: Sealed type with integrated thrust washer		Mass (Ref.)	Boundary dimensions mm (inch)													Mounting related dimensions	Maximum tightening torque	Basic dynamic load rating	Basic static load rating	Track capacity (1)		Radial internal clearance	
	Crowned outer ring	Cylindrical outer ring	g	D	C	d_1	G UNF	G_1	B max	B_2	B_3	C_1	g_1	g_2	H	r	f Minimum mm (inch)	N·m	C N	C_0 N	N Crowned outer ring	Cylindrical outer ring	μm Min.	Maximum
4.826	CR8VBSR	CR8VBS	9	12.700 (1/2)	8.731 (11/32)	4.826	No.10-32	6.350 (1/4)	10.2 (0.40)	12.700 (1/2)	- (-)	0.794 (1/32)	- (-)	- (-)	3.175 (1/8)	0.397 (1/64)	8.334 (21/64)	1.4	3 790	4 100	770	2 140	3	17
	CR8-1VBSR	CR8-1VBS	10	12.700 (1/2)	9.525 (3/8)	4.826	No.10-32	6.350 (1/4)	10.9 (0.43)	15.875 (5/8)	- (-)	0.794 (1/32)	- (-)	- (-)	3.175 (1/8)	0.397 (1/64)	8.334 (21/64)	1.4	4 260	4 750	770	2 360	3	17
6.350 (1/4)	CR10VBSR	CR10VBS	19	15.875 (5/8)	10.319 (13/32)	6.350 (1/4)	1/4-28	7.938 (5/16)	11.8 (0.46)	15.875 (5/8)	- (-)	0.794 (1/32)	- (-)	- (-)	3.175 (1/8)	0.397 (1/64)	11.509 (29/64)	3.4	5 310	6 780	1 030	3 210	5	20
	CR10-1VBSR	CR10-1VBS	21	15.875 (5/8)	11.112 (7/16)	6.350 (1/4)	1/4-28	7.938 (5/16)	12.5 (0.49)	19.050 (3/4)	- (-)	0.794 (1/32)	- (-)	- (-)	3.175 (1/8)	0.397 (1/64)	11.509 (29/64)	3.4	5 830	7 660	1 030	3 480	5	20
9.525 (3/8)	CR12VBSR	CR12VBS	34	19.050 (3/4)	12.700 (1/2)	9.525 (3/8)	3/8-24	9.525 (3/8)	14.2 (0.56)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	0.794 (1/32)	13.494 (17/32)	10.8	7 400	11 100	1 340	4 500	5	25
	CR14VBSR	CR14VBS	45	22.225 (7/8)	12.700 (1/2)	9.525 (3/8)	3/8-24	9.525 (3/8)	14.2 (0.56)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	0.794 (1/32)	15.081 (19/32)	10.8	7 400	11 100	1 340	5 250	5	25
11.112 (7/16)	CR16VBSR	CR16VBS	73	25.400 (1)	15.875 (5/8)	11.112 (7/16)	7/16-20	12.700 (1/2)	17.3 (0.68)	25.400 (1)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	3.175 (3/32)	6.350 (3/16)	1.191 (3/64)	17.859 (45/64)	17.4	12 000	20 300	1 970	7 280	5	25
	CR18VBSR	CR18VBS	100	28.575 (1 1/8)	15.875 (5/8)	11.112 (7/16)	7/16-20	12.700 (1/2)	17.3 (0.68)	25.400 (1)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	3.175 (3/32)	6.350 (3/16)	1.588 (1/16)	19.050 (3/4)	17.4	12 000	20 300	2 300	7 710	5	25
12.700 (1/2)	CR20VBSR	CR20VBS	136	31.750 (1 1/4)	19.050 (3/4)	12.700 (1/2)	1/2 -20	15.875 (5/8)	20.4 (0.80)	31.750 (1 1/4)	7.938 (5/16)	0.794 (1/32)	4.762 (3/16)	3.175 (3/32)	6.350 (1/4)	1.588 (1/16)	21.828 (55/64)	27.7	22 000	29 000	2 680	10 700	5	25
	CR22VBSR	CR22VBS	159	34.925 (1 3/8)	19.050 (3/4)	12.700 (1/2)	1/2 -20	15.875 (5/8)	20.4 (0.80)	31.750 (1 1/4)	7.938 (5/16)	0.794 (1/32)	4.762 (3/16)	3.175 (3/32)	6.350 (1/4)	1.588 (1/16)	21.828 (55/64)	27.7	22 000	29 000	3 050	11 800	5	25
15.875 (5/8)	CR24VBSR	CR24VBS	230	38.100 (1 1/2)	22.225 (7/8)	15.875 (5/8)	5/8 -18	19.050 (3/4)	23.6 (0.93)	38.100 (1 1/2)	9.525 (3/8)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	26.196 (1 1/64)	55.7	26 400	36 900	3 410	15 400	10	30
	CR26VBSR	CR26VBS	265	41.275 (1 5/8)	22.225 (7/8)	15.875 (5/8)	5/8 -18	19.050 (3/4)	23.6 (0.93)	38.100 (1 1/2)	9.525 (3/8)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	26.196 (1 1/64)	55.7	26 400	36 900	3 820	16 700	10	30
19.050 (3/4)	CR28VBSR	CR28VBS	368	44.450 (1 3/4)	25.400 (1)	19.050 (3/4)	3/4 -16	22.225 (7/8)	26.8 (1.06)	44.450 (1 3/4)	11.112 (7/16)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	32.543 (1 9/32)	100	32 200	49 500	4 210	21 000	10	30
	CR30VBSR	CR30VBS	413	47.625 (1 7/8)	25.400 (1)	19.050 (3/4)	3/4 -16	22.225 (7/8)	26.8 (1.06)	44.450 (1 3/4)	11.112 (7/16)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	32.543 (1 9/32)	100	32 200	49 500	4 610	22 500	10	30
22.225 (7/8)	CR32VBSR	CR32VBS	620	50.800 (2)	31.750 (1 1/4)	22.225 (7/8)	7/8 -14	25.400 (1)	33.5 (1.32)	50.800 (2)	12.700 (1/2)	0.794 (1/32)	4.762 (3/16)	4.762 (3/16)	11.112 (7/16)	1.588 (1/16)	37.306 (1 15/32)	162	42 600	73 700	5 050	30 900	10	30
	CR36VBSR	CR36VBS	753	57.150 (2 1/4)	31.750 (1 1/4)	22.225 (7/8)	7/8 -14	25.400 (1)	33.5 (1.32)	50.800 (2)	12.700 (1/2)	0.794 (1/32)	4.762 (3/16)	4.762 (3/16)	11.112 (7/16)	1.588 (1/16)	37.306 (1 15/32)	162	42 600	73 700	5 900	34 700	10	30

Note (1) This is defined as the load which can be continuously applied without causing deformation or indentation on the mating member material when the outer ring makes contact with the mating track surface. Value when the mating surface hardness is 40HRC.

1N ≈ 0.102 kgf

Remarks

1. No oil hole is provided if the stud diameter d_1 is 6.35 mm or less. An oil hole is provided for the outside surface and the end of the stud on other models. 2. Grease (Shell Lubricants Japan K.K. ALVANIA GREASE S2) is prepacked. 3. For the maximum allowable static load, please contact IKO. 4. This product includes a hexagon nut. If the nut should become loose, use a spring washer, self-locking nut, etc.

5. A mounting hole with a tolerance class of F7 is recommended for mounting the stud. The mounting hole diameter should be prepared without play in the fit area, especially when shock loads are applied. 6. The operating temperature range is from -20 to 80°C. 7. The allowable rotational speed is around d_1n=42000 for grease lubrication, and around d_1n=70000 for oil lubrication. If an axial load is applied, it is recommended to use 1/10 the d_1n value. 8. When mounting, do not hit the cam followers directly with a hammer, etc. It may lead to rotation failure or cracking.

ROTARY MOTION
PRODUCTS:
CAM FOLLOWERS

MAINTENANCE-FREE THRUSTDISK™ SEALS

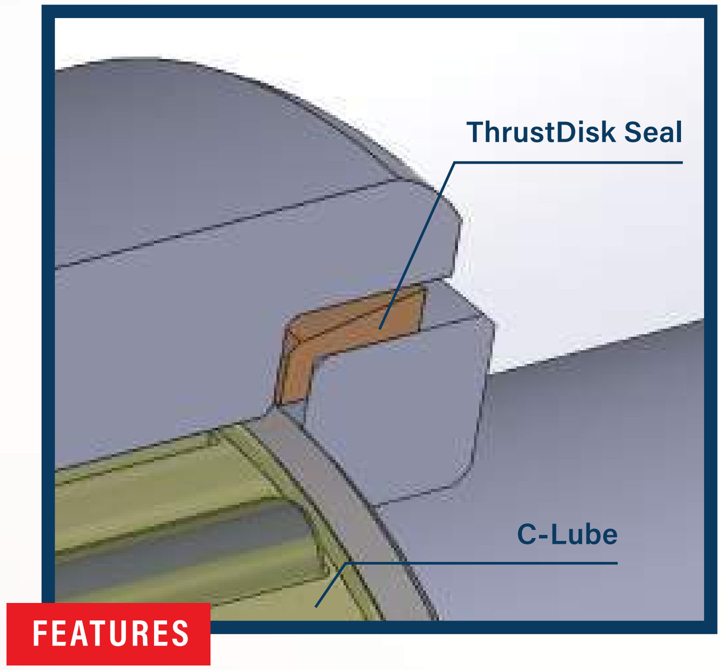
CR···BSE

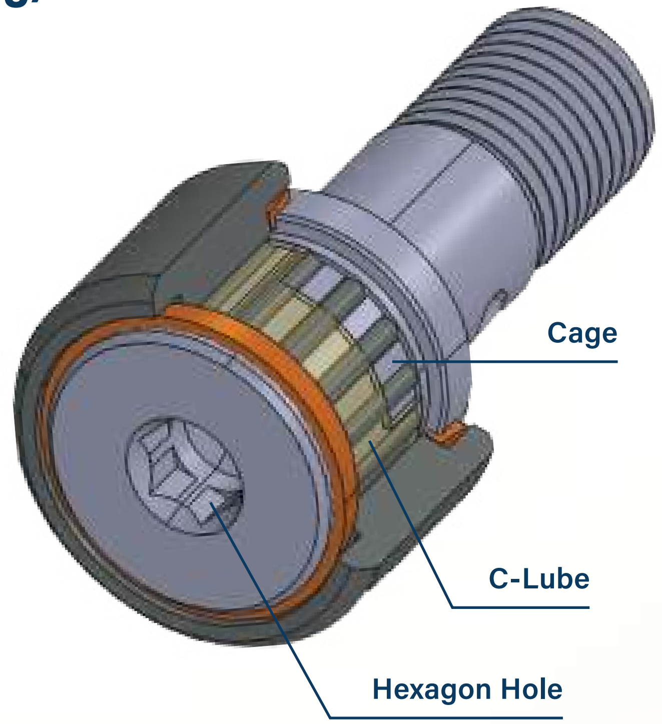
Resist thrust loads and wear, prevent contamination and achieve long-lasting, maintenance-free operation

IKO
Innovation, Know-how & Originality

IKO Clean Lubrication
C-Lube

Our Latest Inch Series Cam Followers Combine Two IKO Innovations to Prevent Failure and Ensure a Long, Reliable Lifetime





FEATURES

IKO’s CR...BSE Series cam followers are a versatile, reliable way to convert rotary motion to linear motion. Designed to eliminate the main factors that can cause bearings to fail, these heavy-duty cam followers feature two IKO innovations:

ThrustDisk™ seals, which slide into the outer ring’s contact areas to handle axial loads caused by misalignment issues due to improper mounting. The seals also resist heat and contamination to improve bearing life.

C-Lube, a built-in system that slowly releases the right volume of lubricant to prevent maintenance errors and provide long-lasting smooth motion.

CR...BSE Inch Series cam followers also offer a low coefficient of friction, good rotational performance and easy mounting. Stud diameters range from 0.19 to 0.375 inches.

TOLERANCE	μm
Outside diameter of Outer Ring, D	0 / -25
Stud diameter, d1	+25 / 0
Width of Outer Ring, C	0 / -130

Remarks

1. For the maximum allowable static load, please contact IKO.
2. This product includes a hexagon nut. If the nut should become loose, use a spring washer, self-locking nut, etc.
3. A mounting hole with a tolerance class of F7 is recommended for mounting the stud. The mounting hole diameter should be prepared without play in the fit area, especially when shock loads are applied.
4. The operating temperature range is from -15 to 80°C. For continuous operation, below +60°C is recommended
5. The allowable rotational speed is around $d1n$=10000.
6. When mounting, do not hit the cam followers directly with a hammer, etc. It may lead to rotation failure or cracking.

To ensure normal rotation of the bearing, apply a 1% or more of the basic dynamic load rating at use.

Never wash C-Lube Bearing with organic solvent and/or white kerosene which have the ability to remove fat, or leave the bearing in contact with these agents.

C-LUBE PERFORMANCE TEST

Lubrication can be maintained for long-term, maintenance-free operation.

Rotational Endurance Test

Test condition

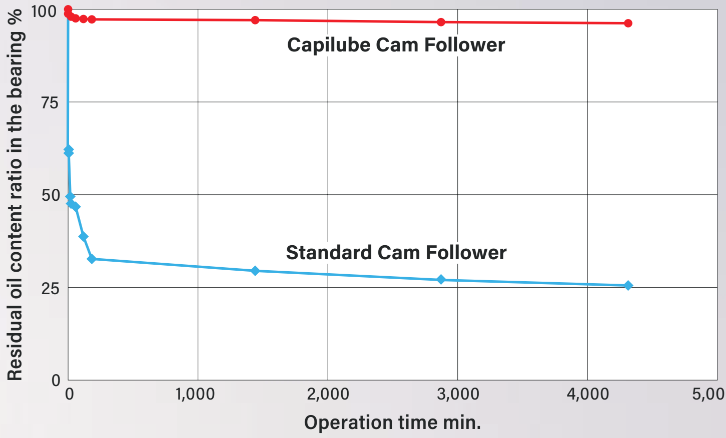
Test product

IKO Capilube Cam Follower: CF10/SG

IKO Standard Cam Follower: CF10

Rotational Speed: 1,000rpm

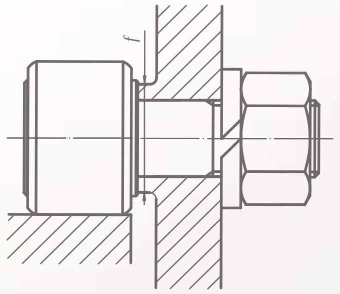
Ambient Temperature: Room Temperature

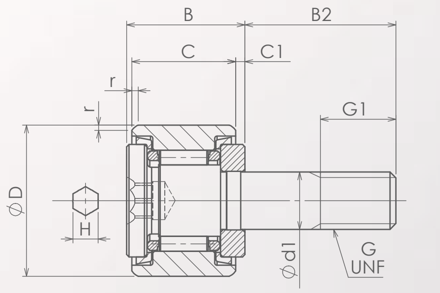


CR·BSE SERIES VARIATIONS

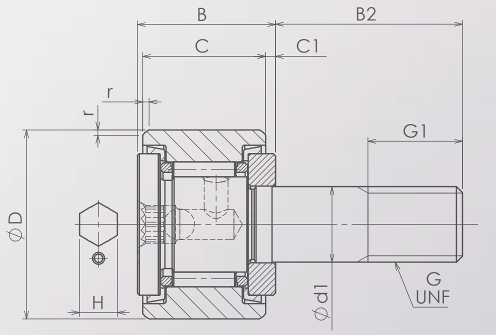
NAME	SHAPE OF STUD HEAD	ROLLER GUIDE METHOD	SEAL STRUCTURE	SHAPE OF OUTER RING OUTSIDE SURFACE	IDENTIFICATION NUMBER	SIZE															
						8	8-1	10	10-1	12	14	16	18	20	22	24	26	28	30	32	36
Inch Series Cam Followers **CR**	With Hexagon Socket	Cage	Shield Type	Crowned outer ring	CR···BR	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
				Cylindrical outer ring	CR···B	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
			Sealed Type	Crowned outer ring	CR···BUUR	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
				Cylindrical outer ring	CR···BUU	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
		Full Complement	Shield Type	Crowned outer ring	CR···VBR	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
				Cylindrical outer ring	CR···VB	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
			Sealed Type	Crowned outer ring	CR···VBUUR	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
				Cylindrical outer ring	CR···VBUU	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
			Sealed Type *with Integrated Thrust Washer*	Crowned outer ring	CR···VBSR	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
				Cylindrical outer ring	CR···VBS	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
NEW Maintenance-Free Inch Series Cam Followers **CR**	With Hexagon Socket	Cage	Sealed Type *with Integrated Thrust Washer*	Cylindrical outer ring	CR···BSE	○	○	○	○	○	○	***COMING SOON***									

DIMENSIONS

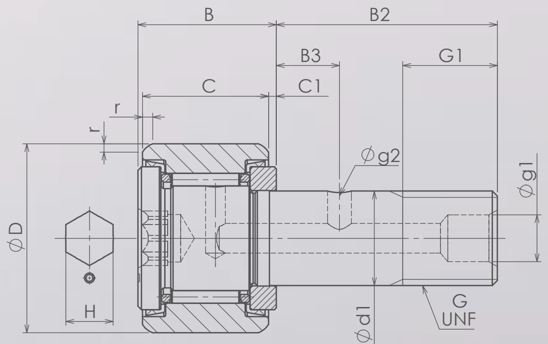




CR 8-14BSE01
CR 8-17BSE01



CR 10-17BSE01
CR 10-20BSE01



CR 12-23BSE01
CR 14-23BSE01

BOUNDARY DIMENSIONS mm (in)																Radial Clearance μm	Basic Dynamic Load Rates C [N]	Basic Static Load Rates Co [N]	f mm	Max Mounting Torque Nm	Track Capacity[1] N
d1	Mass (g)	BEARING NUMBER	D	C	G (UNF)	G1	B (max)	B2	B3	C1	g1	g2	H	r							
4.826 (N/A)	9	CR 8-14BSE01 *(CR 8BS/SG EQUIVALENT)*	12.70 (½)	8.731 (11/32)	No. 10-32	6.350 (¼)	10.2 (0.40)	12.70 (½)	N/A	0.794 (1/32)	N/A	N/A	3.175 (⅛)	0.397 (1/64)		3~17	2010	1780	8.334	1.4	2140
4.826 (N/A)	11	CR 8-17BSE01 *(CR 8-1BS/SG EQUIVALENT)*	12.70 (½)	9.525 (⅜)	No. 10-32	6.350 (¼)	10.9 (0.43)	15.875 (⅝)	N/A	0.794 (1/32)	N/A	N/A	3.175 (⅛)	0.397 (1/64)		3~17	2330	2140	8.334	1.4	2360
6.350 (¼)	19	CR 10-17BSE01 *(CR 10BS/SG EQUIVALENT)*	15.875 (⅝)	10.319 (13/32)	1/4-28	7.938 (5/16)	11.6 (0.46)	15.875 (⅝)	N/A	0.794 (1/32)	N/A	N/A	3.175 (⅛)	0.397 (1/64)		5~20	2970	3150	11.509	3.4	3210
6.350 (¼)	20	CR 10-20BSE01 *(CR 10-1BS/SG EQUIVALENT)*	15.875 (⅝)	11.112 (7/16)	1/4-28	7.938 (5/16)	12.5 (0.49)	19.050 (¾)	N/A	0.794 (1/32)	N/A	N/A	3.175 (⅛)	0.397 (1/64)		5~20	3330	3650	11.509	3.4	3480
9.525 (⅜)	36	CR 12-23BSE01 *(CR 12BS/SG EQUIVALENT)*	19.050 (¾)	12.70 (½)	3/8-24	9.525 (⅜)	14.2 (0.56)	22.225 (⅞)	6.350 (¼)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	0.794 (1/32)		5~25	4200	5270	13.494	10.8	4500
9.525 (⅜)	46	CR 14-23BSE01 *(CR 14BS/SG EQUIVALENT)*	22.225 (⅞)	12.70 (½)	3/8-24	9.525 (⅜)	14.2 (0.56)	22.225 (⅞)	6.350 (¼)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	0.794 (1/32)		5~25	4200	5270	15.081	10.8	5250

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[1] This is defined as the load which can be continuously applied without causing deformation or indentation on the mating member material when the outer ring makes contact with the mating track surface. Value when the mating surface hardness is 40HRC.

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Innovation, Know-how & Originality

Oil Minimum
IKO Gentle to The Earth

ISO 9001 Certified
ISO 14001 Certified

ISO 9001 & 14001 Quality system registration certificate

Recognizing that conservation of the global environment is the top-priority challenge for the world's population, Nippon Thompson will conduct its activities with consideration of the environment as a corporate social responsibility, reduce its negative impact on the environment, and help foster a rich global environment.

ISO 9001 & 14001 Quality system registration certificate

ISO 9001 Certified

ISO 14001 Certified

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IKO LINEAR MOTION ROLLING GUIDE BLUE

CAT-1591E

LINEAR WAYS

Good Environment and Good Quality











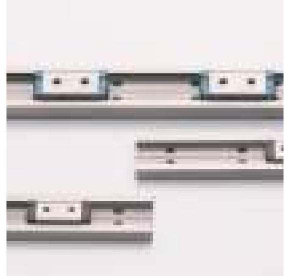








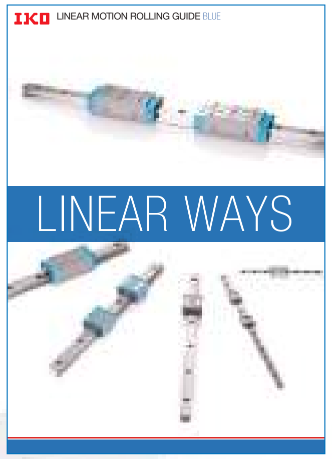



IKO Linear Motion Rolling Guides are used with satisfactory results for various applications requiring precision positioning such as semi-conductor manufacturing equipment, large sized machine tools, industrial robots, and precision equipment.
In contrast to conventional rolling bearings used in rotating parts, Linear Motion Rolling Guides are the products applicable to plane sliding surfaces, and meet the increasing needs for linear motion and precision positioning in machines and equipment.
Linear Way and Linear Roller Way of Rail Guide Type, Linear Ball Spline of Shaft Guide Type, and other products, recognized for their high quality and excellent features, are available.

LINEAR MOTION ROLLING GUIDE SERIES Full Lineup

Linear Motion Rolling Guide Series General Catalog BLUE



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Linear Motion Rolling Guide Series General Catalog RED

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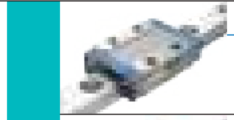
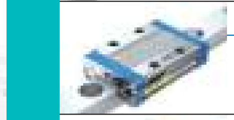
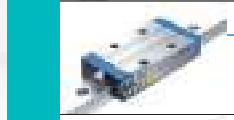
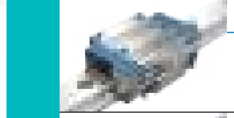
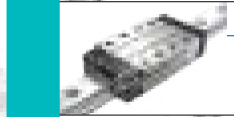
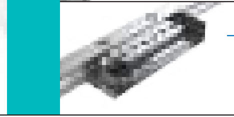
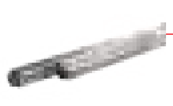
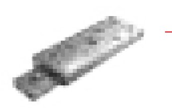
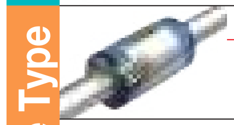
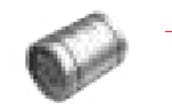
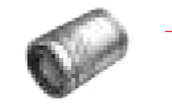
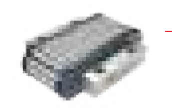
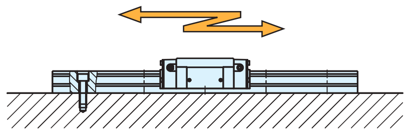
				C-Lube Maintenance Free Series			
Linear Way Linear Roller Way	Rail Guide Type		**Ball Type Miniature Series** Super small-size linear motion rolling guide produced by original small sizing technology	**C-Lube Linear Way ML** ML : Standard type MLF : Wide type	**Linear Way L** LWL : Standard type LWLF : Wide type		
			**Ball Type Miniature Value Series** Economical linear motion rolling guides without changing the superior performance of Ball Type Miniature Series	**C-Lube Linear Way MLV** MLV			
			**Ball Type Low Profile/Light Weight Series** Super low profile and super light weight linear motion rolling guides with high load capacity	**C-Lube Linear Way MV** MV			
			**Ball Type Compact Series** Versatile linear motion rolling guides pursuing compactness in every aspect	**C-Lube Linear Way ME** ME : Flange type mounting from bottom MET : Flange type mounting from top MES : Block type mounting from top	**Linear Way E** LWE : Flange type mounting from bottom LWET : Flange type mounting from top LWES : Block type mounting from top	**Low Decibel Linear Way E** LWE ···Q : Flange type mounting from bottom LWET···Q : Flange type mounting from top LWES···Q : Block type mounting from top	
			**Ball Type High Rigidity Series** High rigidity linear motion rolling guides designed to evenly support high load capacity by incorporating large-diameter balls	**C-Lube Linear Way MH** MH : Flange type mounting from bottom MHT : Flange type mounting from top MHD : Block type mounting from top MHS : Compact block type mounting from top	**Linear Way H** LWH : Flange type mounting from bottom LWHT : Flange type mounting from top LWHD : Block type mounting from top LWHS : Compact block type mounting from top LWHY : Side mounting type		
			**Ball Type Wide Rail Type Series** Linear motion rolling guide suitable to single-row use due to having resistance to across-the-width moment load by using a wide track rail		**Linear Way F** LWFH : Flange type mounting from top / bottom LWFF : Flange type mounting from top / bottom LWFS : Block type mounting from top		
			**Ball Type U-Shaped Track Rail Series** Linear motion rolling guide of high track rail rigidity with U-shaped track rail	**C-Lube Linear Way MUL** MUL : Small type	**Linear Way U** LWU ···B : Standard ball-retained type		
			**Roller Type** Linear motion rolling guide that has achieved the highest level of performance in all characteristics utilizing the roller's superior characteristic	**C-Lube Linear Roller Way Super MX** MX : Flange type mounting from top / bottom MXD : Block type mounting from top MXS : Compact block type mounting from top MXN : Low profile flange type mounting from top / bottom MXNS : Low profile block type mounting from top	**Linear Roller Way Super X** LRX : Flange type mounting from top / bottom LRXD : Block type mounting from top LRXS : Compact block type mounting from top		
			**Roller Type** Roller type linear motion rolling guide with cylindrical rollers in four-rows		**Linear Roller Way X** LRWX : Block type mounting from top LRWXH : Flange type mounting from bottom		
			**Module Type** Minimum compact linear motion rolling guide with both a track rail and slide member provided		**Linear Way Module** LWLM : Ball type small type LRWM: Roller type		
Crossed Roller Way			**Crossed Roller Way** Linear motion rolling guide incorporating a roller cage between two ways whose two V-shaped surfaces are used as track groove		**Anti-Creep Cage Crossed Roller Way** CRWG **Anti-Creep Cage Crossed Roller Way Unit** CRWUG	**Anti-Creep Cage Crossed Roller Way H** CRWG···H **Crossed Roller Way Unit** CRWU / CRWU···R / CRWU···RS	**Crossed Roller Way** CRW : Standard type CRWM : Module type
Linear Slide Unit			**Linear Slide Unit** Light weight, small, and compact linear motion rolling guide that has achieved light and smooth motion		**High Rigidity Precision Linear Slide Unit** BWU	**Precision Linear Slide Unit** BSP : Limited linear motion type BSPG : Built-in rack & pinion type BSR : Endless linear motion type	**Linear Slide Unit** BSU···A
Linear Ball Spline	Shaft Guide Type		**Linear Ball Spline** Linear motion rolling guide capable of performing linear motion and torque transmission using an external cylinder along the spline shaft.	**C-Lube Linear Ball Spline MAG** MAG : Standard type MAGF : Flange type	**Linear Ball Spline G** LSAG : Standard type LSAGF : Flange type		
Linear Bushing			**Linear Bushing** A wide variety of linear motion rolling guides facilitating the rolling motion in bush guide portion		**Linear Bushing G** LMG	**Linear Bushing** LM / LME / LMB	**Miniature Linear Bushing** LMS
Stroke Rotary Bushing			**Stroke Rotary Bushing** Linear motion rolling guide enabling the rolling motion and rotary and linear motion in axial direction		**Stroke Rotary Bushing** ST : Ordinary type ST···B : For heavy load	**Miniature Stroke Rotary Bushing** STSI : Assembled set with a shaft STS : Assembled set without a shaft	**Stroke Rotary Cage** BG
Roller Way & Flat Roller Cage	Flat Guide Type		**Roller Way & Flat Roller Cage** High accuracy linear motion rolling guide providing high rigidity in load direction		**Roller Way** RW / SR / GSN	**Flat Roller Cage** FT : Single row type FTW···A : Double row angle type	

Types of Linear Motion Rolling Guides

Guide Type

Rail Guide Type

The Rail Guide Type achieves linear motion along a rail. This product can receive a complex load and features high performance, excellent total balance and easy handling.



Endless linear motion

Linear Way

Linear Roller Way

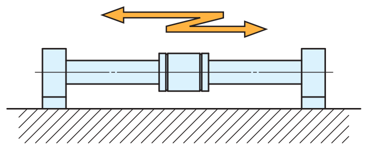
Limited linear motion

Crossed Roller Way

Linear Slide Unit

Shaft Guide Type

The Shaft Guide Type achieves linear motion along a shaft. This product is easy to handle and suitable for relatively low load conditions. Some shaft guide products can achieve both rotation and reciprocating linear motion.



Endless linear motion

Linear Ball Spline

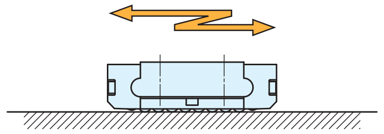
Linear Bushing

Limited linear motion + rotation

Stroke Rotary Bushing

Flat Guide Type

The Flat Guide Type achieves linear motion on a surface. This product can receive only a unidirectional load but feature high rigidity in the load direction.



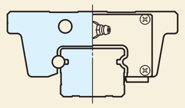
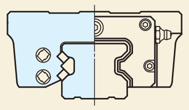
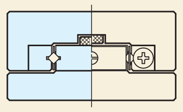
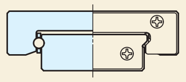
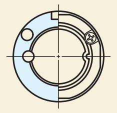
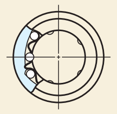
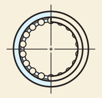
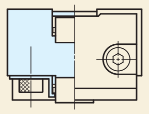
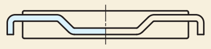
Endless linear motion

Roller Way

Limited linear motion

Flat Roller Cage

Specifications of Linear Motion Rolling Guides

			Type of rolling element	Type of motion	Load direction and load carrying capacity	Rigidity	Frictional characteristic	Ease of mounting	General applications	Item-listed catalog
Rail Guide Type	Endless linear motion	Linear Way 	Ball	Endless linear motion	Complex load, medium to heavy load	○	○	◎	• NC machine tool • Precision working machine • Robot • Transfer machine	BLUE
		Linear Roller Way 	Roller	Endless linear motion	Complex load, heavy to extra-heavy load	◎	○	◎	• Heavy duty machine tool • Large working machine • High-rigidity robot	BLUE
	Limited linear motion	Crossed Roller Way 	Roller	Limited linear motion	Complex load, medium load	○	◎	◎	• Precision working machine • Electronic parts assembling machine • Precision measuring instrument	RED
		Linear Slide Unit 	Ball	Limited linear motion	Complex load, light to medium load	△	◎	◎	• Electronic parts assembling machine	RED
Shaft Guide Type	Endless linear motion	Linear Ball Spline 	Ball	Endless linear motion	Complex load, medium to heavy load	○	○	○	• Robot • Testing and inspection equipment • Transfer machine	RED
		Linear Bushing 	Ball	Endless linear motion	Radial load, light load	△	○	○	• Packaging machine • Measuring instrument • Medical instrument	RED
	Limited linear motion + rotation	Stroke Rotary Bushing 	Ball	Limited linear motion + rotation	Radial load, light load	△	◎	○	• Printing press • Press die set • Precision measuring instrument	RED
Flat Guide Type	Endless linear motion	Roller Way 	Roller	Endless linear motion	Unidirectional load, extra-heavy load	◎	○	△	• NC machine tool • Precision working machine	RED
	Limited linear motion	Flat Roller Cage 	Roller	Limited linear motion	Unidirectional load, extra-heavy load	◎	◎	○	• Precision working machine • Optical measuring instrument	RED

Code description ◎Excellent ○Good △Fair

Ball Type Miniature Series

C-Lube Linear Way ML

Linear Way L / Micro Linear Way L

ML LWL

Super small-size linear motion rolling guide produced by original small sizing technology

Ⅱ-5

Ball Type Miniature Value Series

C-Lube Linear Way MLV

MLV

Economical linear motion rolling guides without changing the superior performance of Ball Type Miniature Series

Ⅱ-41

Ball Type Low Profile/Light Weight Series

C-Lube Linear Way MV

MV

Super low profile and super light weight linear motion rolling guides with high load capacity

Ⅱ-51

Ball Type Compact Series

C-Lube Linear Way ME

Linear Way E / Low Decibel Linear Way E

ME LWE

Versatile linear motion rolling guides pursuing compactness in every aspect

Ⅱ-63

Ball Type High Rigidity Series

C-Lube Linear Way MH

Linear Way H

MH LWH

High rigidity linear motion rolling guides designed to evenly support high load capacity by incorporating large-diameter balls

Ⅱ-89

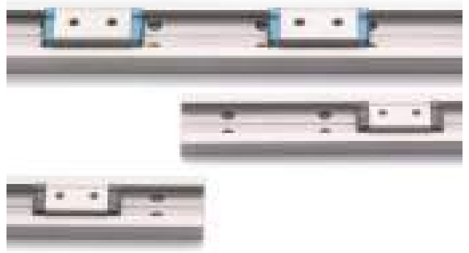
Ball Type Wide Type Series

Linear Way F

LWFS LWFF LWFH

Linear motion rolling guide suitable to single-row use due to having resistance to across-the-width moment load by using a wide track rail

Ⅱ-135



Ball Type U-Shaped Track Rail Series

C-Lube Linear Way MUL

Linear Way U

MUL LWU

Linear motion rolling guide of high track rail rigidity with U-shaped track rail

Ⅱ-157

Roller Type

C-Lube Linear Roller Way Super MX

Linear Roller Way Super X

MX LRX

Linear motion rolling guide that has achieved the highest level of performance in all characteristics utilizing the roller's superior characteristic

Ⅱ-171

Roller Type

Linear Roller Way X

LRWX

Roller type linear motion rolling guide with cylindrical rollers in four-rows

Ⅱ-219

Module Type

Linear Way Module

LWLM LRWM

Minimum compact linear motion rolling guide with both a track rail and slide member provided

Ⅱ-233

IKO Gentle to The Earth

Nippon Thompson Co., Ltd. is working to develop global environment-friendly products.
It is committed to developing products that make its customer's machinery and equipment more reliable, thereby contributing to preserving the global environment.
This development stance manifests well in the keyword **"Oil Minimum"**.

Oil Minimum
IKO Gentle to The Earth

Our pursuit of Oil Minimum has led to the creation of IKO's proprietary family of lubricating parts as "C-Lube".

"C-Lube" minimizes usage of lubrication oil and supplies the optimal amount of lubrication oil for long period of time. So it realizes long term maintenance free and contributes to the global environment preservation.

IKO
C-Lube
Maintenance-free

The "Interchangeable" is a result of our consideration to the environment and radical pursuit of elimination of material and inventory waste.

Interchangeable is a collective name of **"systems of products selection from users' perspective"** which allows free interchange and replacement totally retaining the accuracy and preload of slide units and track rails.

The integration of maintenance free and advanced interchangeable system with C-Lube is the "Free & Interchangeable".

Oil Minimum
IKO Gentle to The Earth

Eco-friendly specification

Reducing usage of lubrication oil

IKO C-Lube Maintenance-free

U.S. PATENTED

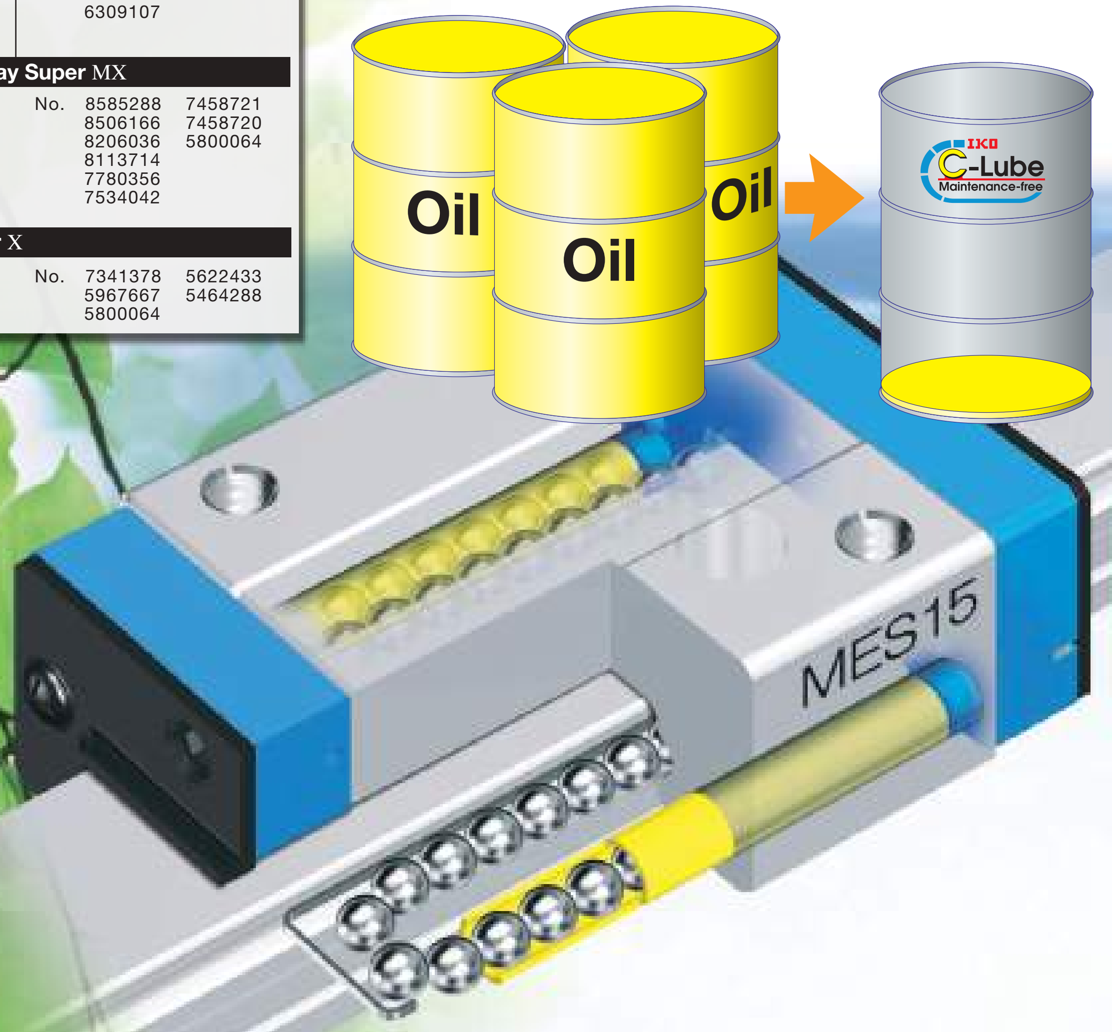
Product	No.
C-Lube Linear Way ML	7677804 7252435 6729761 6712511
C-Lube Linear Way MLV	8465206
C-Lube Linear Way MV	6712511 6729761
C-Lube Linear Way ME	7748905 7677804 6729761 6712511
C-Lube Linear Way MH	7832929 7762723 7748905 7677804 6729761 6712511
C-Lube Linear Way MUL	5435649
Linear Way L	7258486 6517244 6176617 6082899 5967667
Linear Way E	7677804 6176617 5967667
Linear Way H	7677804 6517244 6461045 6250805 6176617 6082899 5967667 5622433
Linear Way F	6176617 5967667
Linear Way U	6880975 6851857 6517244 6461045 6309107 6176617 6082899 5967667
C-Lube Linear Roller Way Super MX	8403563 8403562 8123408 8113714 8033730 7997800 7950852 7927016 7862234 7832930 8585288 8506166 8206036 8113714 7780356 7534042 7458721 7458720 5800064
Linear Roller Way Super X	7832930 7458721 7458720 6766897 6461045 6176617 7341378 5967667 5800064 5622433 5464288

Eco-friendly

Consumption of precious oil resource is minimized! And elimination of oil feeder and its piping reduces the initial cost!

Contributes to reduction of total cost and environmental loads!!

Oil usage reduction effect

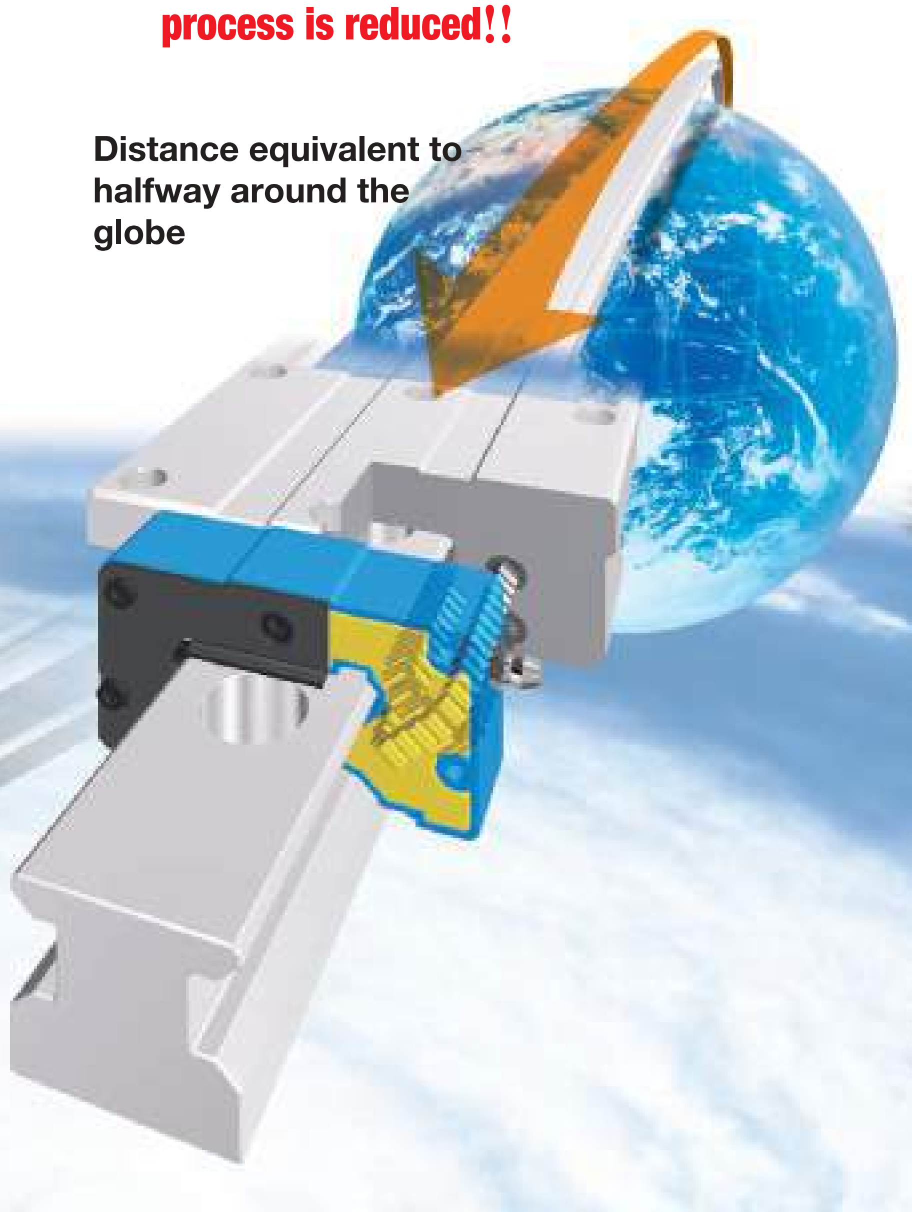


Maintenance free

Endures running over 20,000 km without oil feeding!

Troublesome lubrication maintenance process is reduced!!

Distance equivalent to halfway around the globe

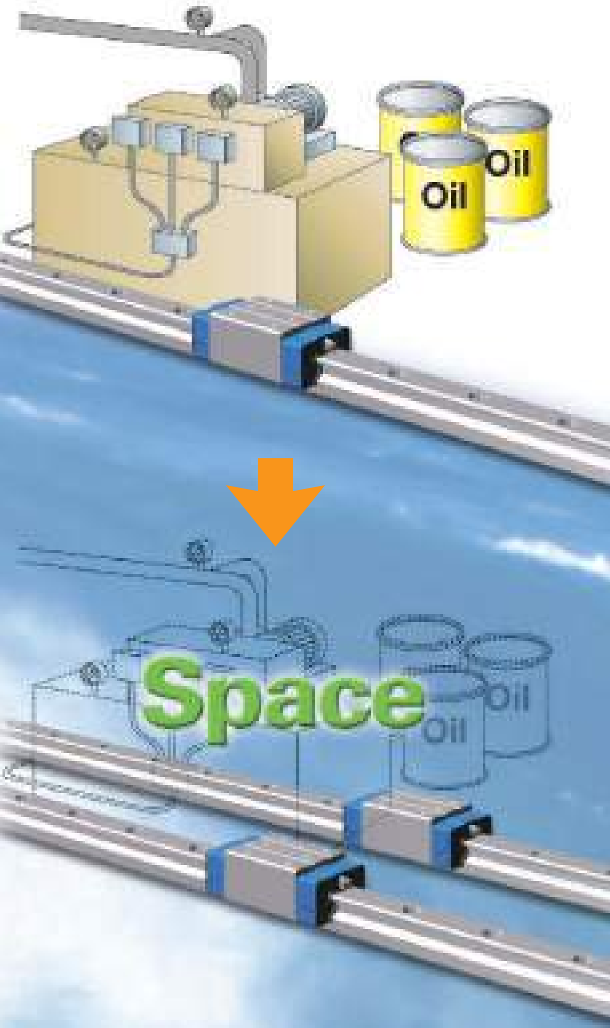


Compactness

The space consuming oil feeder is eliminated to save the space!

Freedom of machine designing is expanded for user!!

Efficient use of space

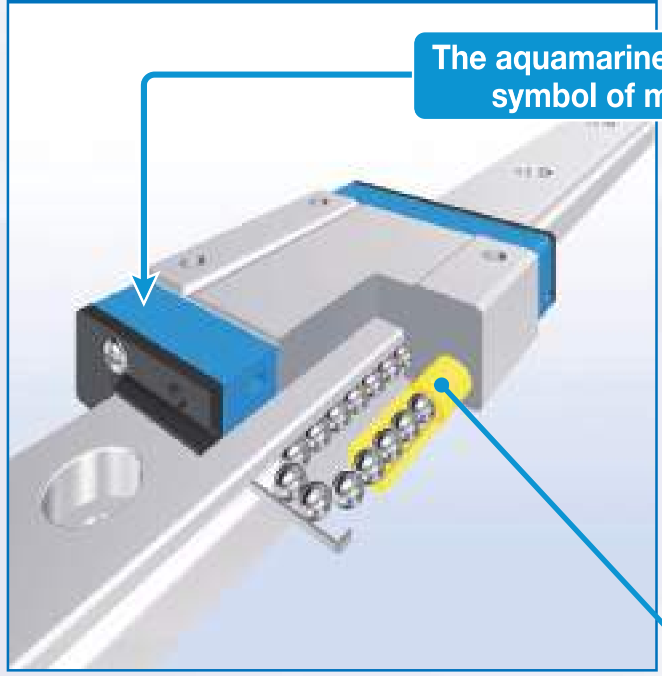


Oil Minimum
IKO Gentle to The Earth

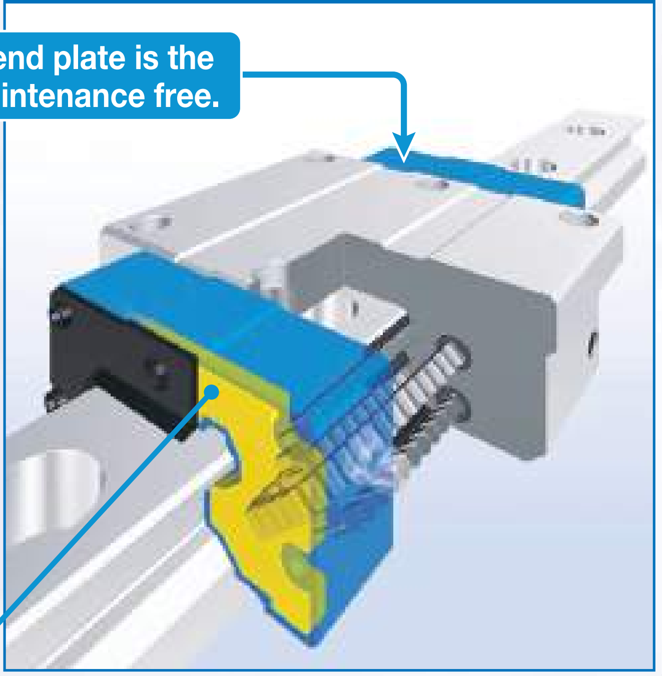
Features of C-Lube Linear Way and C-Lube Linear Roller Way

Original and world's first structure with [C-Lube]

C-Lube Linear Way



C-Lube Linear Roller Way

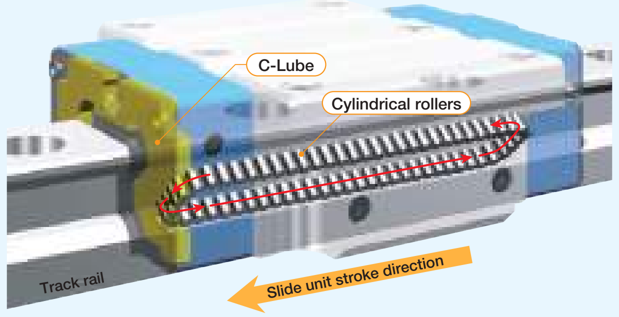


The aquamarine end plate is the symbol of maintenance free.

C-Lube integrated

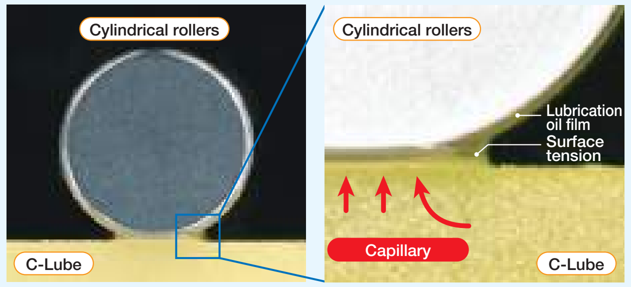
Lubrication oil is carried through circulation of rolling elements

The lubrication oil is supplied directly to the rolling elements, not to the track rail.
When rolling elements make contact with the capillary lubricating element integrated with the circulation path of slide unit rolling elements, the lubrication oil is supplied to surfaces of rolling elements and carried to the loading area through circulation of rolling elements.
This results in adequate lubrication oil being properly maintained in the loading area and lubrication performance will last for a long time.



Lubrication oil is directly supplied to surfaces of the rolling elements

The surface of capillary lubricating element is always covered with the lubrication oil.
Lubrication oil is continuously supplied to the surface of rolling elements by surface tension in the contact of capillary lubricating element surface and rolling elements.
On the surface of capillary lubricating element with which the rolling elements make contact, new lubrication oil is always supplied from the other sections.



Long term maintenance free is realized with oil impregnated with C-Lube only !!

IKO C-Lube Maintenance-free

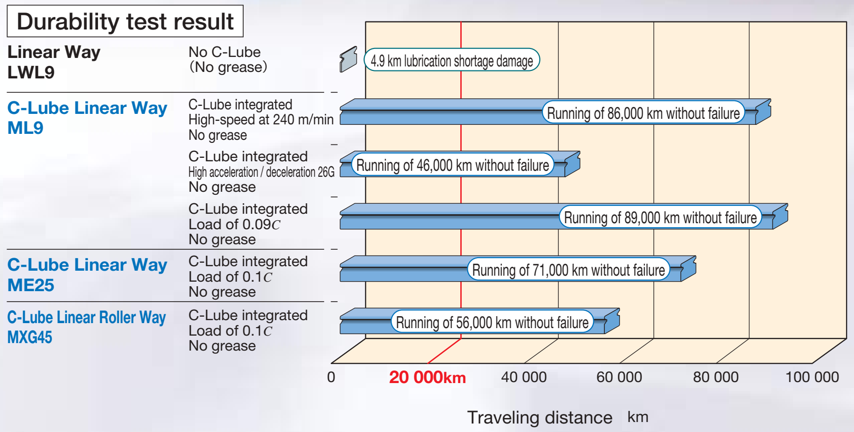
Maintenance free

This endures running over 20,000 km without oil feeding with lubrication oil in the C-Lube only.
Furthermore, grease is pre-packed in the slide unit so long term maintenance free can be realized.

Maintenance free is achieved until the end of device life[*1]*!*

[*1] Typical device life is assumed. Re-greasing may be necessary depending on use conditions.

Durability test result

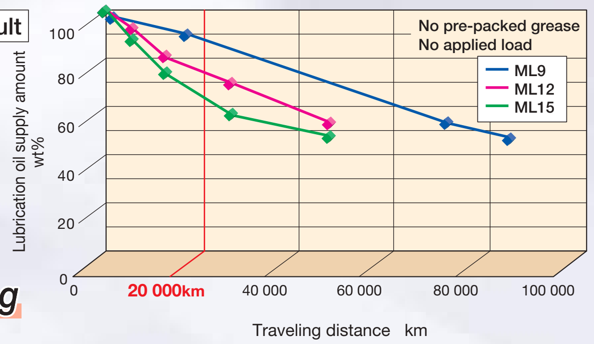


Eco-friendly

As lubrication oil in C-Lube is supplied by the amount necessary to maintain lubrication performance of the rolling guide, the consumption of lubrication oil is reduced and lubrication performance is maintained even when it run for a long period.

Eco-friendly specification reducing usage of lubrication oil!

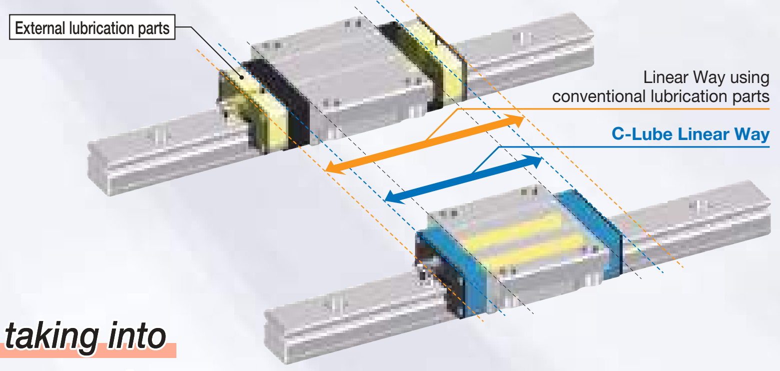
Oil supply test result



Compact

As C-Lube Linear Way and C-Lube Linear Roller Way are integrated with lubrication part C-Lube, their slide units are not long unlike types with external lubrication parts.
Replacement of conventional parts is easy free from constraints of mounting space and stroke length.

Compact design taking into account compactness!

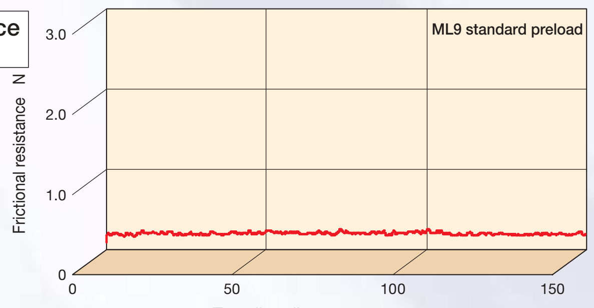


Smooth

C-Lube Linear Way and C-Lube Linear Roller Way do not generate slide resistance unlike lubrication parts external to the slide unit that make contact with the track rail.
Driving force follow-up property is superior and energy is saved by improvement of accuracy and reduction of friction loss.

Light and smooth motion is achieved!

Frictional resistance test result

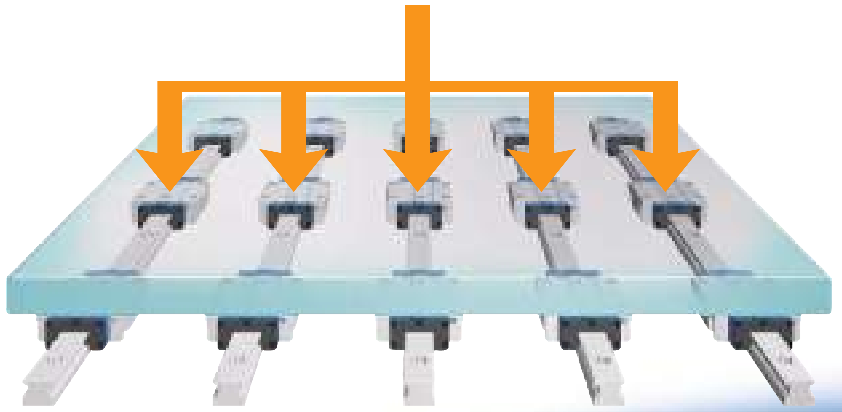


Ultimate Interchangeable system by radical pursuit of elimination of any waste

Accuracy interchangeability

Three accuracy classes are available!
Height variation can be controlled
with multiple assembled sets!

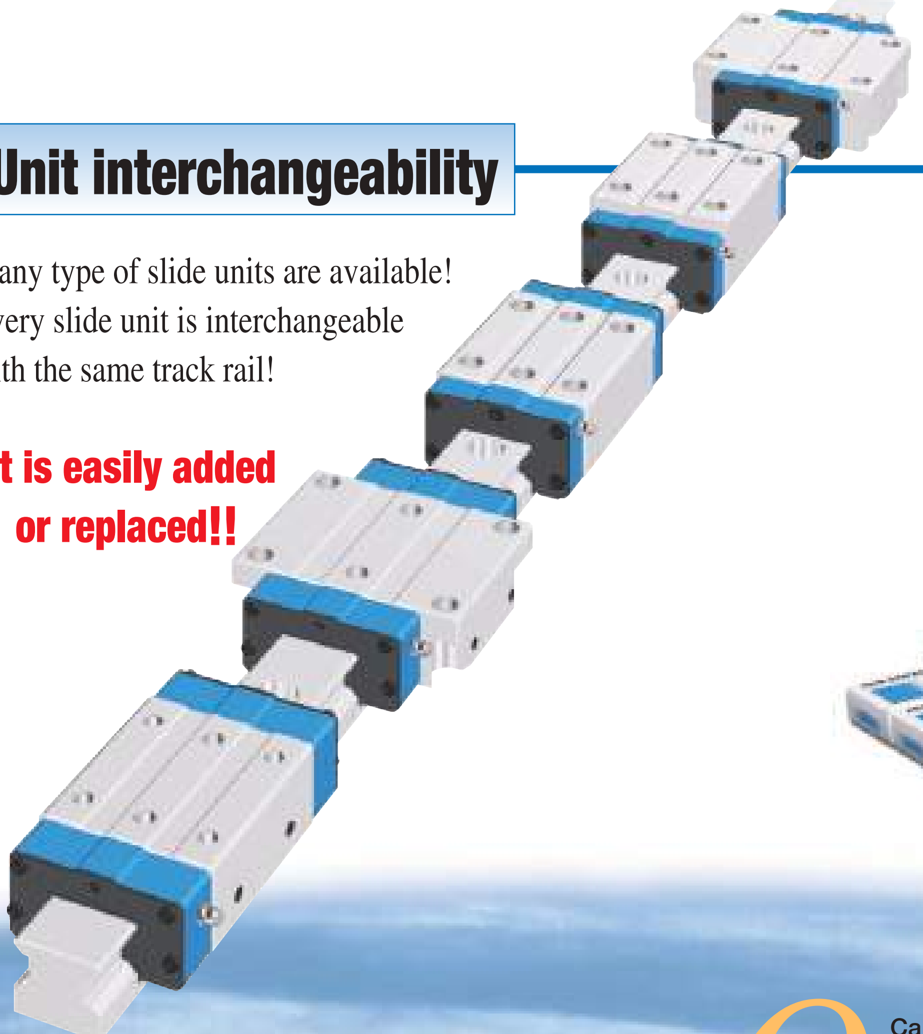
High accuracy of the device can be maintained in the multiple-use environment!!



Unit interchangeability

Many type of slide units are available!
Every slide unit is interchangeable
with the same track rail!

It is easily added or replaced!!

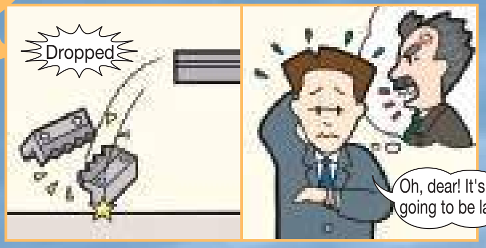


Short delivery products

Separate delivery of slide unit and track rail!

You may order what you need by any quantity at any time!!

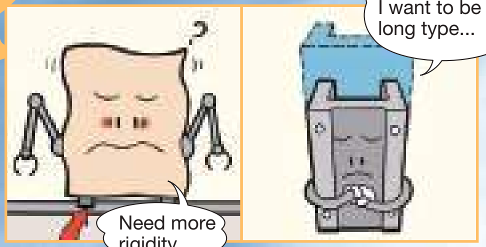
Q I dropped the Linear Way unit by mistake, and the unit is damaged. Can I replace it?



A **Unit interchangeability**

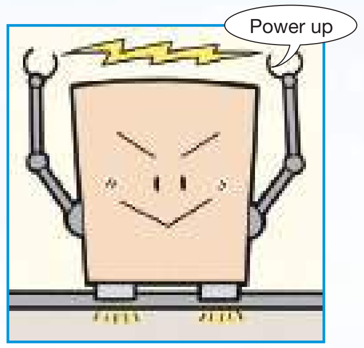
If you use Linear Way of Interchangeable specification, you may need to replace only slide unit.

Q I need to increase the rigidity of the unit because of sudden specification change.

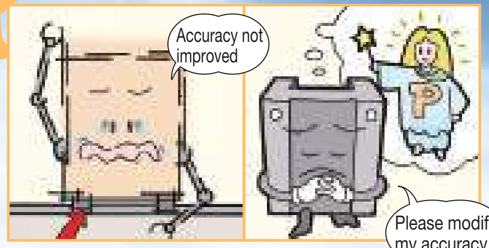


A **Unit interchangeability**

The rigidity can be improved easily by increasing the unit length.

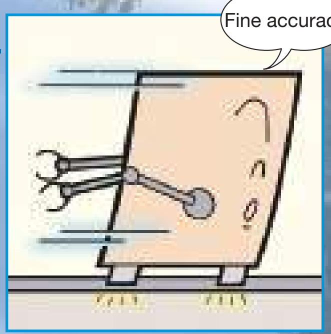


Q Calculated accuracy cannot be achieved after assembly of the device?

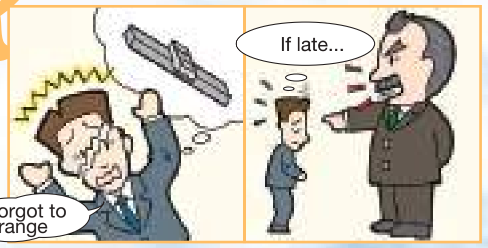


A **Accuracy interchangeability, preload interchangeability**

How do you like to use accuracy higher by one class or higher preload type?
As accuracy of the interchangeable products is controlled strictly by parts, setting can be modified.



Q I carelessly forgot to arrange some parts, but I need them urgently. Can it be delivered soon?



A **Short delivery available**

Interchangeable parts are available for short delivery, they can be delivered quickly with our perfect inventory system.
Slide unit and track rail can be ordered individually.

Free combination is enabled for model, accuracy, preload!!

Ultimate interchangeable system

Interchangeable specification

Interchangeable specification has realized the incomparable high interchangeability by severely managing the dimensions of slide unit and track rail with the background of unique high processing technology.
This feature allows independent handling of slide unit and track rail, thus allowing you to select free combination and to order any products for any volume at any necessary time.

Requirements of ;

- Wish to improve the rigidity and life of machines
- Wish to improve the accuracy of machines
- Wish to replace the slide unit immediately
- The number of slide units is in short
- Wish to replace the track rail immediately
- The length of track rail is not sufficient
- Wish to store only the slide units in stock for emergency

Help

Interchangeable specification realizes ;

- Wish to prepare for a sudden design change
- Wish to select freely the combination of high accuracy and preload
- Slide unit and track rail are separately handled
- Free combination of slide unit and track rail can be selected
- Compactness-independent storing of slide units and track rails

Sorted out

Select the products as many as you wish.

Slide unit

\+

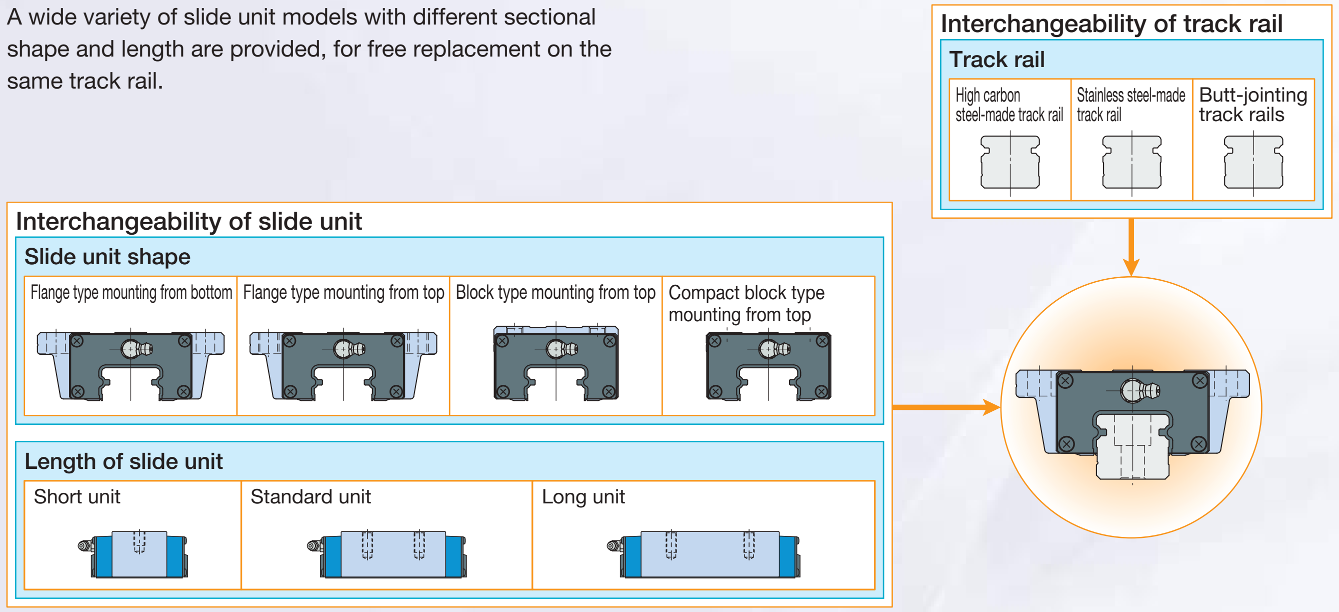
Track rail

=

Set condition

Unit interchangeability

A wide variety of slide unit models with different sectional shape and length are provided, for free replacement on the same track rail.



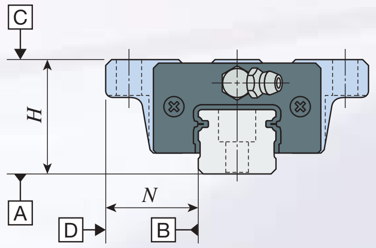
Free selection is possible for slide units and track rails!

Accuracy interchangeability

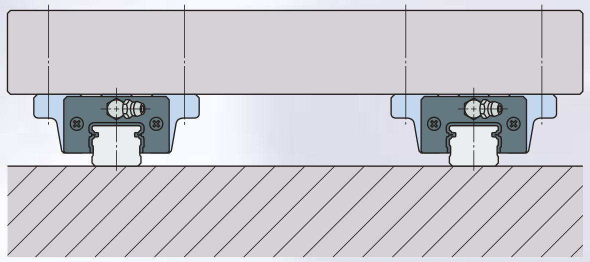
Three accuracy classes of Ordinary, High and Precision class are provided, to support even high traveling accuracy purposes. In addition, as height variation of multiple assembled sets is managed with high accuracy, you may use parallel track rails at ease.

Standard setting up to precision

- Tolerances of dimensions H and N
- Variation of dimensions H and N in 1 set
- Parallelism in operation of the C surface to A surface
- Parallelism in operation of the D surface to B surface



It allows the accuracy improvement of units without design changes!



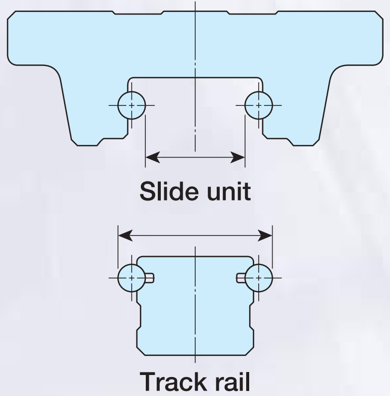
Corresponding to parallel arrangement of multiple assembled sets as standard

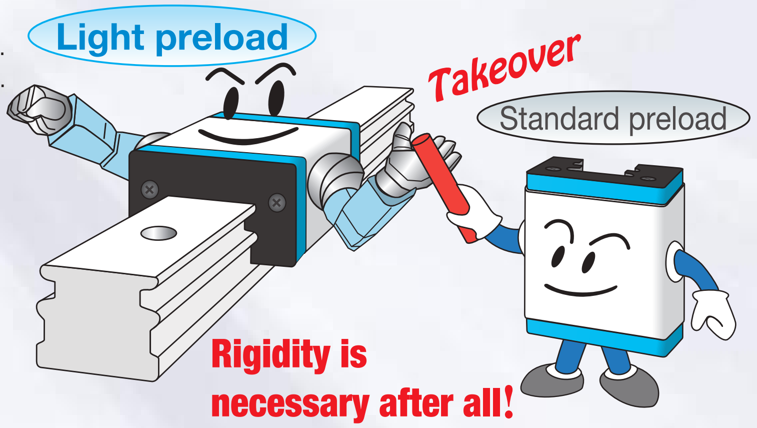
- Variation of dimensions H of multiple assembled sets is specified

Preload interchangeability

The high accuracy dimensions management utilizing the simple structure achieved the interchangeability of preloaded slide units. It supports the applications requiring the rigidity of one higher rank.

High preload setting is possible thanks to high accuracy dimensions control





It allows the rigidity improvement of units without design changes!

Maintenance free is achieved only by replacing the slide unit!

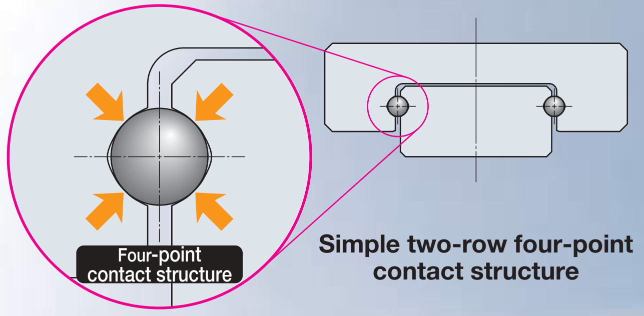
By replacing the interchangeable Linear Way or Linear Roller Way slide unit with C-Lube Linear Way or C-Lube Linear Roller Way slide unit, maintenance free is achieved while using the same track rail.

IKO's excellent features realized by a simple structure by four-points contact in two-row raceways

Two-row four-point contact type simple structure

IKO adopts two-row four-point contact type for every Linear Way series. Thanks to our design know how and production technologies having been fostered for long time, high accuracy and smooth motion are realized in the micro series.

In addition, load in every direction can be received evenly and therefore stable high accuracy and rigidity can be achieved even in applications where load has variable direction and size or complex load is applied.



Essential for micro sizing!

Micro Linear Way L realized by simple structure

Micro Linear Way L for further needs of miniaturization produced by original small sizing technology.
Wide variety of track rail width from 1 mm to 6 mm is available and high accuracy of micro positioning mechanism is realized.

IKO Micro Linear Way L

LWL1

World's smallest size!

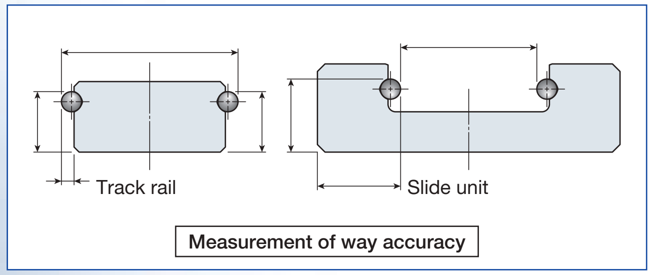
- **High accuracy even with the smallest size of 1 mm*!**
  *Track rail width of 1 mm
- **Even the smallest size of 1 mm can be securely mounted and fixed**!**
  **Tapped rail specification
- **Even the smallest size of 1 mm can ensure stable operation!**

LWL1 can be used for further super miniaturization of machines and devices with free-minded thinking.

Interchangeable

The simple structure of four-contact in two-row raceway yields small manufacturing errors or accuracy measurement errors, allowing the maintenance of each raceway in the high dimensions accuracy.

This technology realizes interchangeable specification and high interchangeable system in every series!



As the ball is stabilized during track groove measurement, measurement of high accuracy and precise preload management are possible.

Variety of models and size variations

A wide variety of models and sizes, such as super miniature size of only 1 mm track rail width, is provided for your selection to meet each requirement.

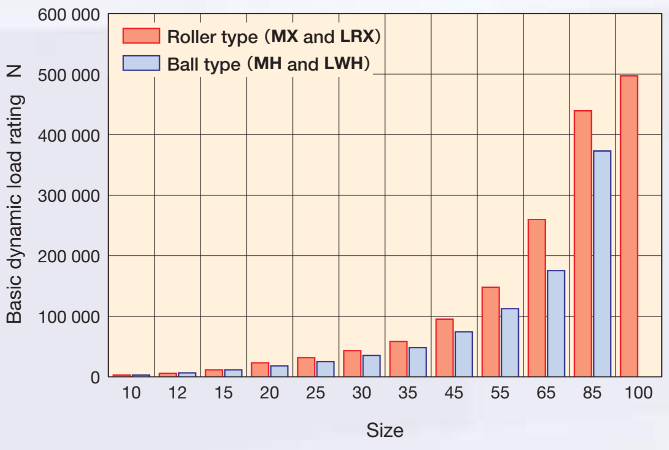
Series		Model	Size	Track rail width Min		Max
C-Lube Linear Way ML	ML	20 models	15 sizes	3	~	42 mm
Linear Way L	LWL	22 models	19 sizes	1	~	42 mm
C-Lube Linear Way MLV	MLV	1 model	3 sizes	7	~	12 mm
C-Lube Linear Way MV	MV	1 model	3 sizes	20	~	30 mm
C-Lube Linear Way ME	ME	18 models	6 sizes	15	~	45 mm
Linear Way E	LWE	21 models	6 sizes	15	~	45 mm
C-Lube Linear Way MH	MH	17 models	9 sizes	8	~	45 mm
Linear Way H	LWH	19 models	11 sizes	8	~	65 mm
Linear Way F	LWF	4 models	7 sizes	33	~	90 mm
C-Lube Linear Way MUL	MUL	1 model	2 sizes	25	~	30 mm
Linear Way U	LWU	1 model	4 sizes	40	~	86 mm

Ultimate high performance produced by world's first roller guide structure of IKO

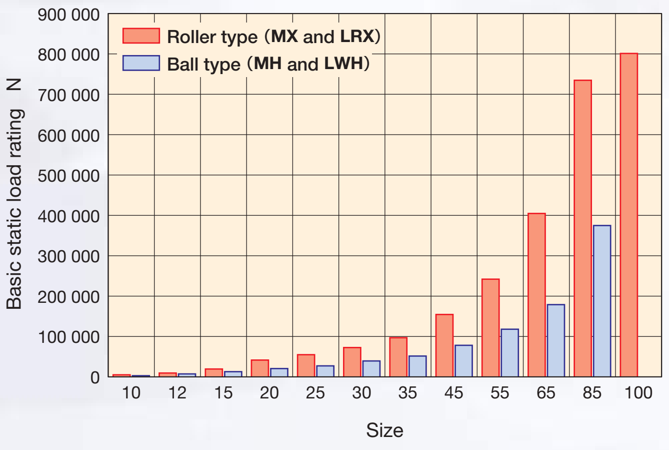
Super high load capacity

The Linear Roller Way Super X has a large contact area with the way and a number of cylindrical rollers with excellent load capacity, which allows to achieve larger load rating.

Comparison of basic dynamic load rating



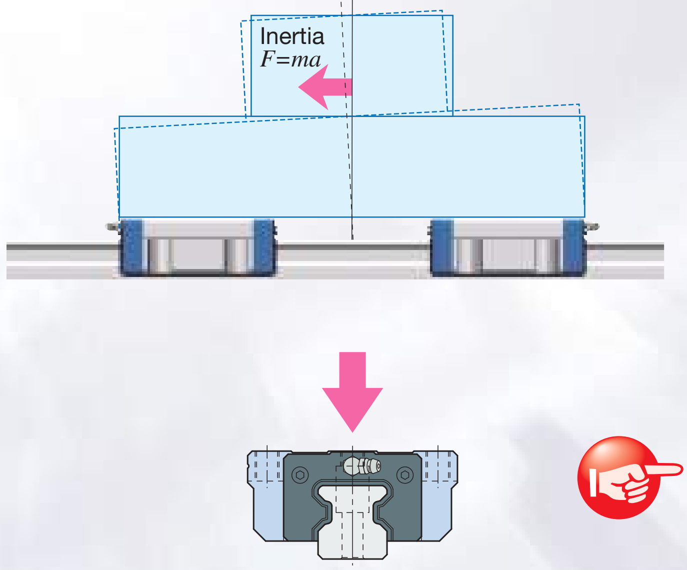
Comparison of basic static load rating



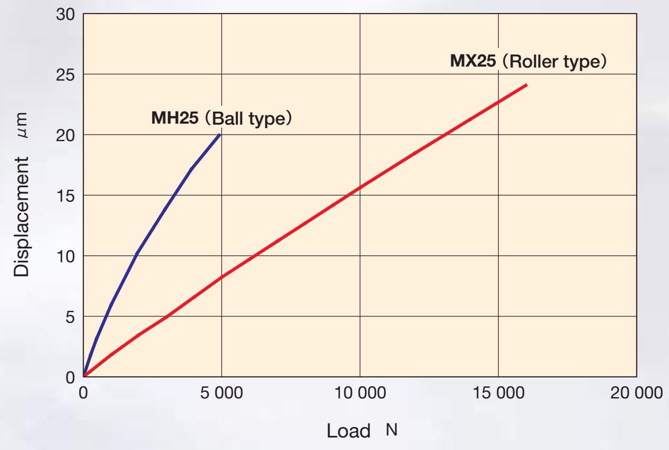
Size smaller by one size than the ball type can be used!

Super high rigidity

The rigidity of linear motion rolling guide significantly affects properties of machines and devices to be incorporated.
The Linear Roller Way Super X achieves high rigidity as a number of small cylindrical rollers with smaller elastic deformation relative to load than that of balls are incorporated in the slide unit.



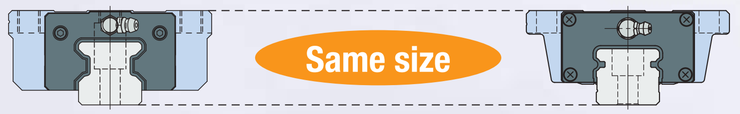
Comparison of elastic deformation



Well-balanced high rigidity is realized in every direction!

Long life

《Roller Type》**MXG45** 《Ball Type》**MHG45**



《Roller Type》MXG45	《Ball Type》MHG45
C = 124 000 N C_0 = 223 000 N	C = 95 200 N C_0 = 114 000 N

C : Basic dynamic load rating N
C_0 : Basic static load rating N
L : Life km
P : Applied load N

Roller type has large basic dynamic load rating C and long life due to the different "index"!

【Life calculation example】

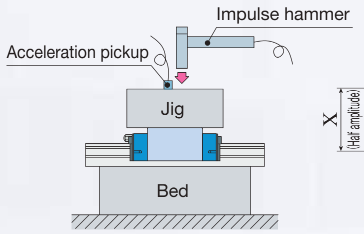
	Roller Type	Ball Type
	$L=50\left(\frac{C}{P}\right)^{10/3}$	$L=50\left(\frac{C}{P}\right)^{3}$
Applied load In case of 10000 N	$L \fallingdotseq$ 220 000 km	$L \fallingdotseq$ 43 000 km

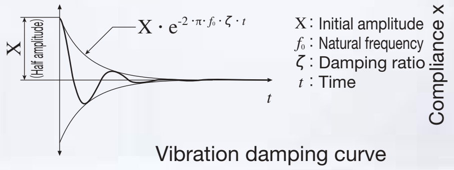
Significant increase!

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Vibration characteristics

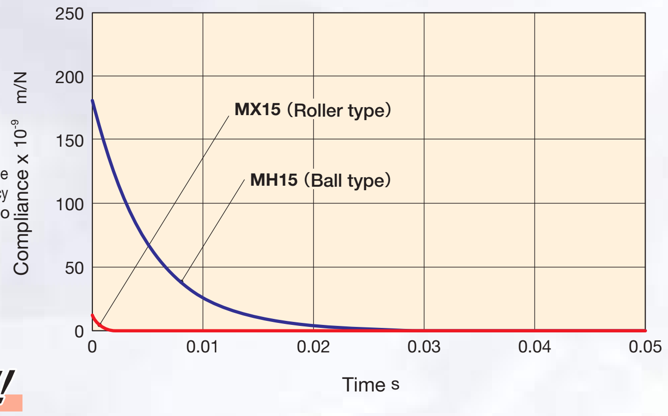
The Linear Roller Way Super X has high rigidity relative to ball types of the same size, so deformation amount is low relative to repeated fluctuating load, natural frequency is high and vibration damping time is short.





Vibration damping curve

Vibration damping curve in downward vibration (Half amplitude)



Positioning time can be shortened!

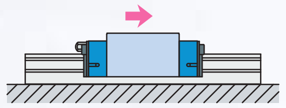
Allows accurate positioning with excellent frictional characteristic

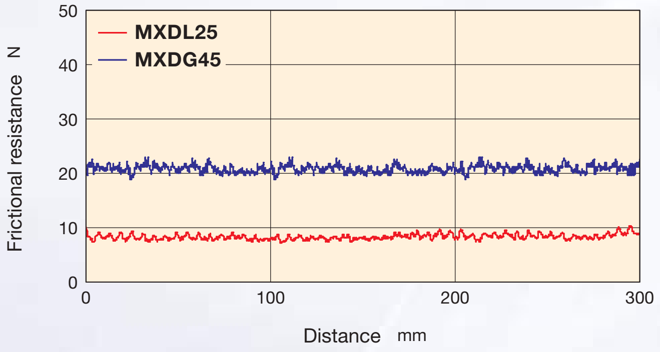
The Linear Roller Way Super X prevents skew of cylindrical roller and achieves smooth motion by adopting unique retaining method to accurately guide cylindrical roller ends with retaining plate.

The Linear Roller Way Super X has good response characteristics to micro-feeding and allows for accurate positioning, thanks to small frictional resistance against preload and load and excellent frictional characteristics relative to plain guides and ball type linear motion rolling guide.

MXDL25 and **MXDG45** T_3 preload frictional resistance

Test portion	Extra long unit **MXDL25** Long unit **MXDG45**
Preload	T_3 preload
Velocity	0.6 m/min
Lubrication	C-Lube integrated, with grease





High follow-up property is ensured even for micro-feeding!

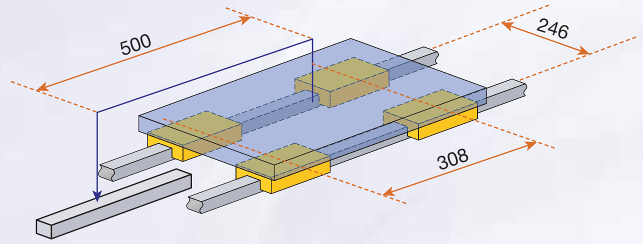
High running accuracy

Optimal design based on analysis of re-circulation behavior of cylindrical roller circulation realizes smooth and quiet motion. In addition, load is applied to many cylindrical rollers and therefore the micro deflection during running is minimized. Extra long unit is optimal for applications requiring higher running accuracy. (For details, see page I -29)

Deflection amount during running

unit: μ m

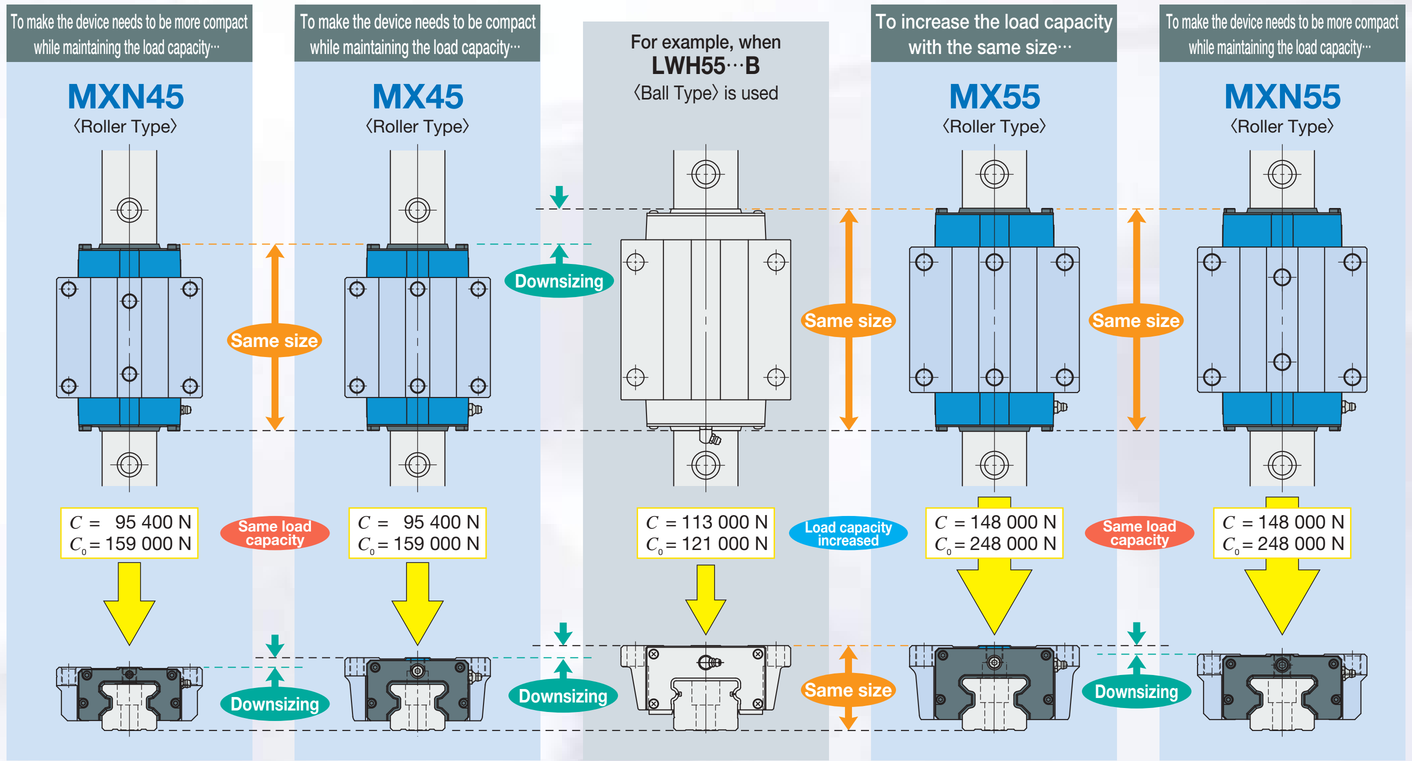
MXDG30 T_3 preload	0.12



Stable running accuracy is achieved!

Corresponding to compactification

Roller type with significantly higher load capacity than the ball type. The Linear Roller Way Super X allows for downsizing from many size variations for compactification of devices.

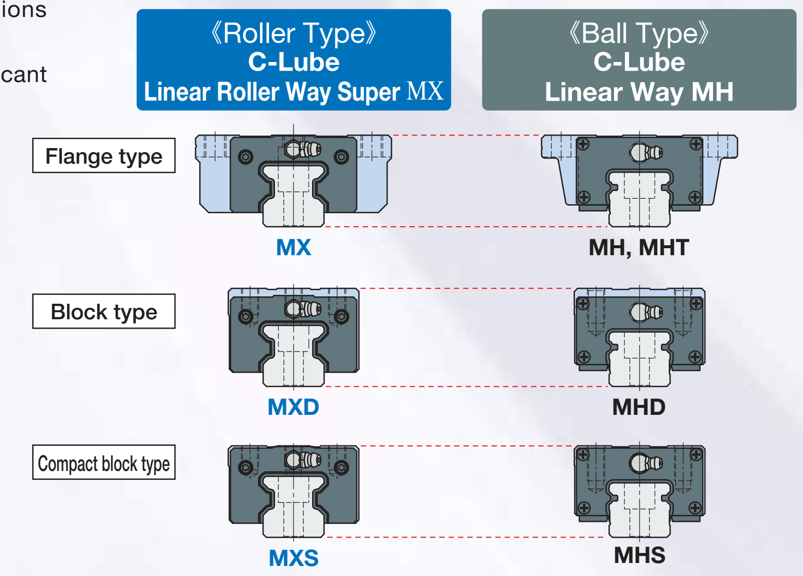


Downsizing and increased load capacity!

Roller type with large increase of load capacity!

Compatible ball type and mounting dimensions

The Linear Roller Way Super X has mounting dimensions compatible with the ball type Linear Way H.
Replacement with roller type is possible without significant design change to machine or device.



Downsizing and increased load capacity are possible!

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

A variety of models and size variations

Ball Type Miniature Series

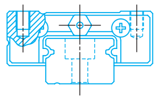
C-Lube Linear Way ML
C-Lube Linear Way MLV
Linear Way L

Thanks to the structure with two rows of balls to contact with the way at four points, stable accuracy and rigidity can be achieved even in applications where load has variable direction and size or complex load is applied, despite its very small body.

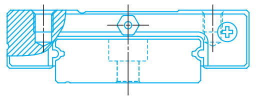
Micro Linear Way L

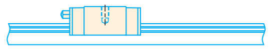
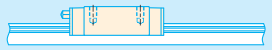
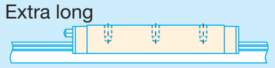
As the lineup of track rail width from 1 mm to 6 mm is available, you can select an optimal product for the specifications of your machine and device. For LWL1, world's smallest size is realized: track rail width of 1 mm, slide unit width of 4 mm and assembly height of 2.5 mm.

Standard type
ML
LWL



Wide type
MLF
LWLF



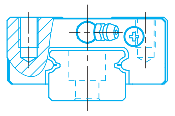
Length of slide unit	
C	Short 
No symbol	Standard 
G	Long 
L	Extra long 

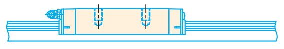
Size	
Standard type	1, 2, 3, 5, 7, 9, 12, 15, 20, 25
Wide type	2, 4, 6, 10, 14, 18, 24, 30, 42

Ball Type Low Profile/Light Weight Series

C-Lube Linear Way MV

Despite its extra low profile and extra light weight, this linear motion rolling guide has the maximum load rating among the ball types while achieving high load capacity.



Length of slide unit
Standard 

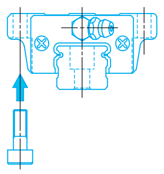
Size
20, 25, 30

Ball Type Compact Series

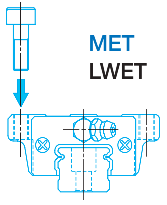
C-Lube Linear Way ME
Linear Way E
Low Decibel Linear Way E

Versatile linear motion rolling guide that has achieved utility pursuing compactness in every aspect. Low decibel types with resin separator to prevent direct contact between balls are also available.

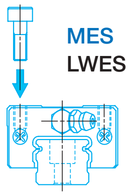
Flange type
mounting from bottom
ME
LWE

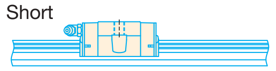
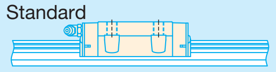
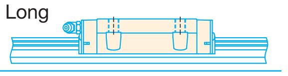


Flange type
mounting from top
MET
LWET



Block type
mounting from top
MES
LWES



Length of slide unit	
C	Short 
No symbol	Standard 
G	Long 

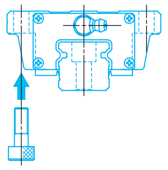
Size
15, 20, 25, 30, 35, 45

Ball Type High Rigidity Series

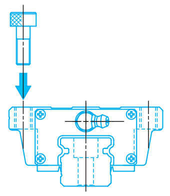
C-Lube Linear Way MH
Linear Way H

High rigidity linear motion rolling guides designed to evenly support high load capacity by incorporating large-diameter balls. Stable accuracy and rigidity can be achieved even in applications where load with variable direction and size and complex load are applied.

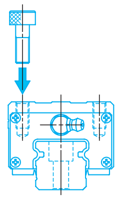
Flange type
mounting from bottom
MH
LWH



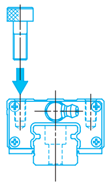
Flange type
mounting from top(1)
MHT
LWHT



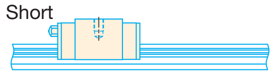
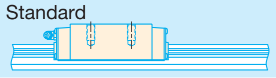
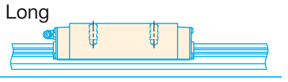
Block type
mounting from top
MHD
LWHD



Compact block type
mounting from top
MHS
LWHS



Note (1) Some models may be mounted from bottom.

Length of slide unit	
C	Short 
No symbol	Standard 
G	Long 

Size
8, 10, 12, 15, 20, 25, 30, 35, 45, 55, 65

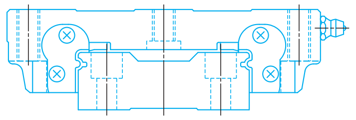
A variety of models and size variations

Ball Type Wide Type Series

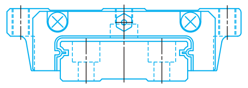
Linear Way F

As wide track rail is used and the distance between the load points is long, this is a linear motion rolling guide suitable to single-row use due to the structure resistant to across-the-width moment load. It is also resistant to complex load.

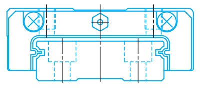
Flange type
mounting from top / bottom
LWFH

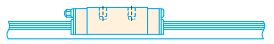


Flange type
mounting from top / bottom
LWFF



Block type
mounting from top
LWFS



Length of slide unit	
No symbol	Standard 

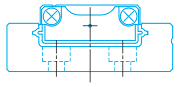
Size	
LWFH	40,60,90
LWFF	33,37,42,69
LWFS	33,37,42

Ball Type U-Shaped Track Rail Series

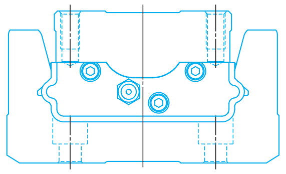
C-Lube Linear Way MUL
Linear Way U

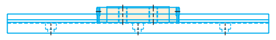
Linear motion rolling guide of the structure with way inside the track rail of U-shaped section and slide unit therein. With the U-shaped track rail, rigidity against the track rail moment load and torsion is significantly improved.

Small type
MUL



Standard type
LWU



Length of slide unit	
No symbol	Standard 

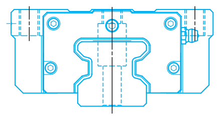
Size	
MUL	25, 30
LWU	40, 50, 60, 86

Roller Type

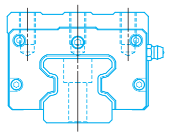
C-Lube Linear Roller Way Super MX
Linear Roller Way Super X

Linear motion rolling guide that has achieved the highest level of performance in all characteristics utilizing the roller's superior characteristic, such as rigidity, load capacity, running accuracy and vibration damping property. With extra long unit with the maximum slide unit length, load capacity and rigidity are improved and running performance with super high accuracy is realized.

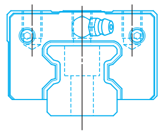
Flange type
mounting from top / bottom
MX (1)
LRX (1)



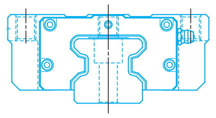
Block type
mounting from top
MXD
LRXD



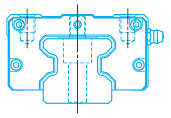
Compact block type
mounting from top
MXS
LRXS



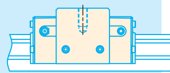
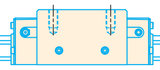
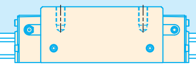
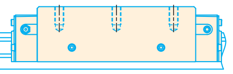
Low profile flange type
mounting from top
MXN



Low profile block type
mounting from top
MXNS



Note (1) Size 20 series allows only for mounting from top and model mounting from bottom is MXH and LRXH.

Length of slide unit			
C	No symbol	G	L
Short	Standard	Long	Extra long
			

Size
10, 12, 15, 20, 25, 30, 35, 45, 55, 65, 85, 100

Four-row roller guide of world's smallest size
Track rail width of 10 mm

Super high rigidity
Super high load capacity
High running performance
Excellent frictional characteristics

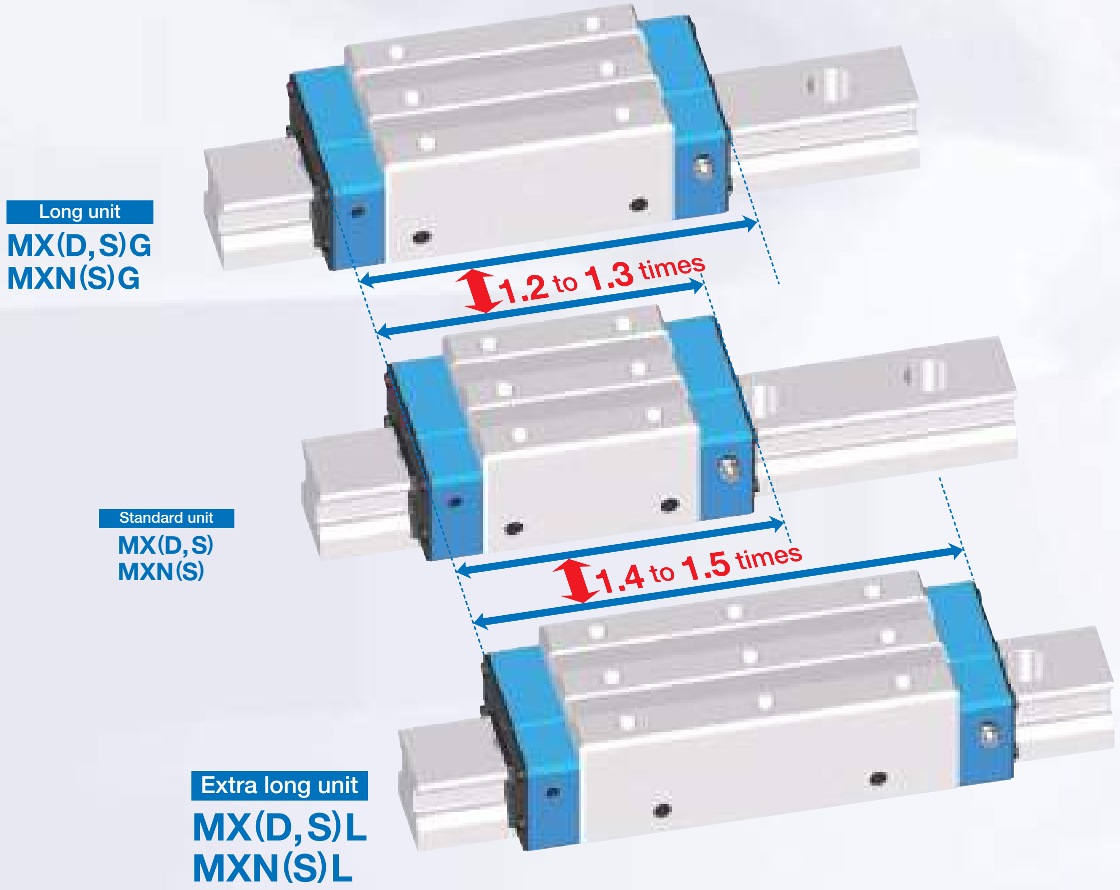
Stainless steel made
LRXD10…SL

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Features of extra long unit

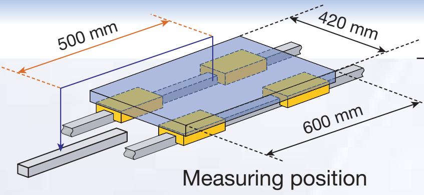
C-Lube Linear Roller Way Super MX

Length of slide unit is **1.4 to 1.5 times longer** than that of standard unit



Super accurate feeding mechanism is realized

As running accuracy is as low as a half of that of long unit, feeding mechanism with super high accuracy can be realized.



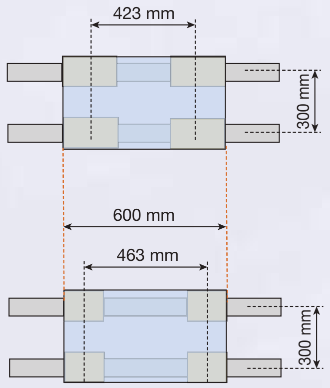
Measuring position

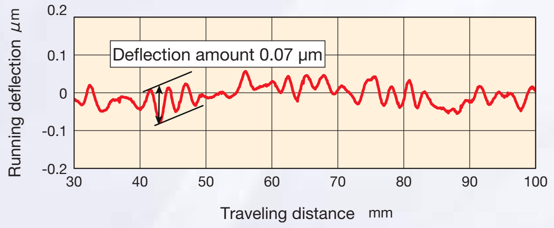
Test conditions

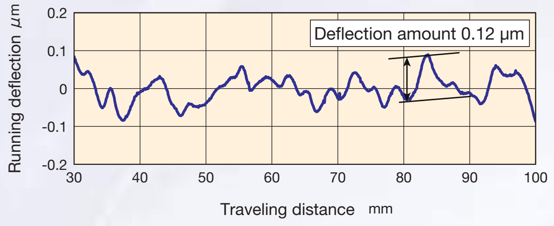
Test portion	Extra long unit **MXDL45**
Preload	T_3 preload

Test conditions

Test portion	Long unit **MXDG45**
Preload	T_3 preload







High accuracy running performance is realized without major change of machine or design (1)!

Note (1) Position of the slide unit mounting hole is changed.

Further improvement of running accuracy

Load capacity and rigidity are significantly improved!!

Load capacity of machine or device is improved

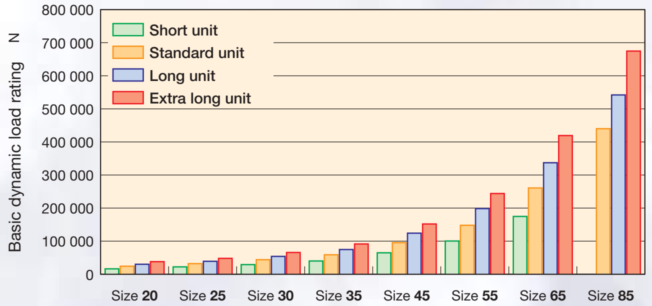
As its basic dynamic load rating and basic static load rating are larger than those of Long type by 122% and 129%, respectively, life and margin safety of machine or device are improved.

Comparison of basic dynamic load rating

Increased to 158% relative to standard unit!

Increased to 122% relative to long unit!

(In case of MXL45)

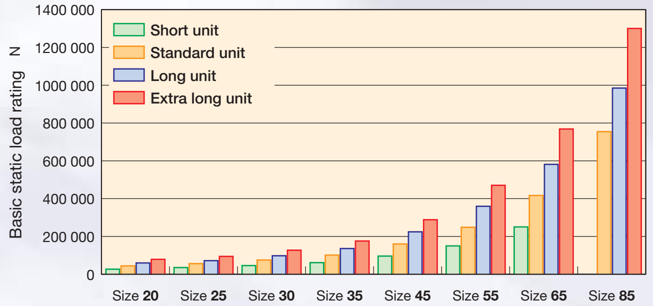


Comparison of basic static load rating

Increased to 181% relative to standard unit!

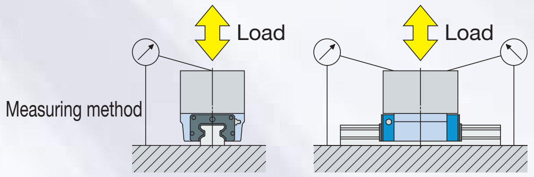
Increased to 129% relative to long unit!

(In case of MXL45)



Contributing to improvement of machine or device rigidity

Elastic deformation relative to load is small in comparison with long unit, device rigidity is improved, accuracy is improved, and resonance can be avoided.

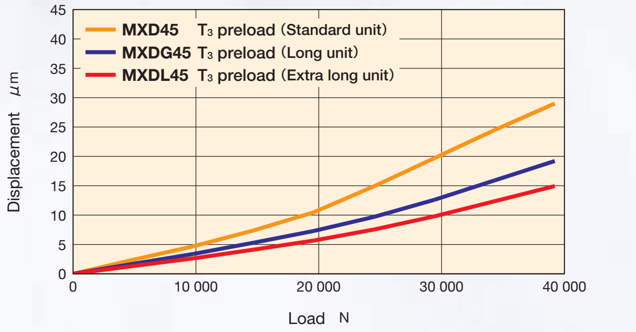


Comparison of elastic deformation under downward load

Rigidity increased to 155% relative to standard unit!

Rigidity increased to 117% relative to long unit!

(With displacement of 10 μm for Size 45)

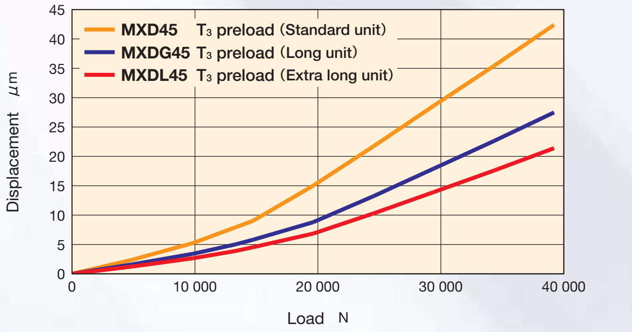


Comparison of elastic deformation under upward load

Rigidity increased to 152% relative to standard unit!

Rigidity increased to 113% relative to long unit!

(With displacement of 10 μm for Size 45)

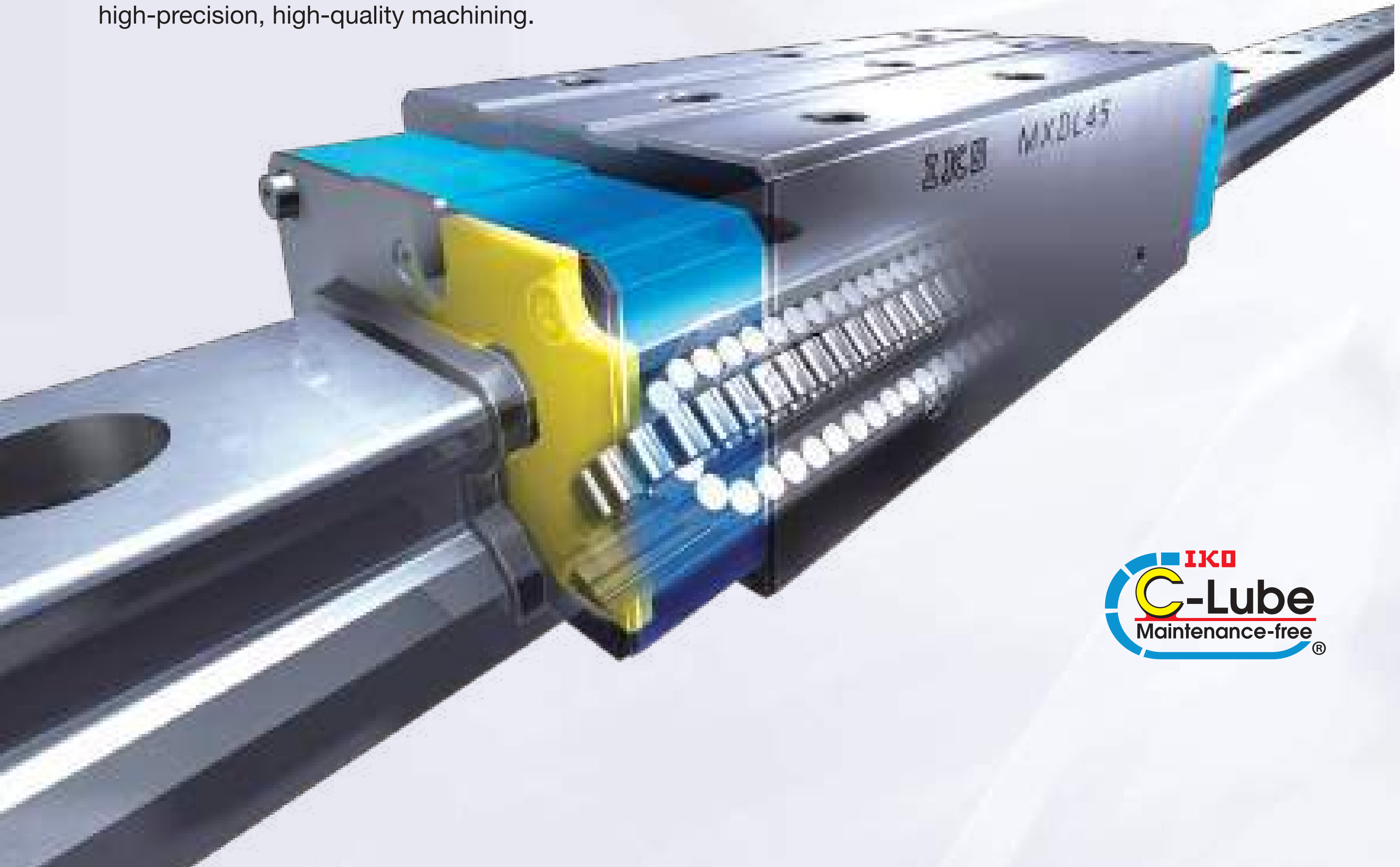


1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

C-Lube Linear Roller Way Super MX
MX MASTER GRADE

Introducing the low fluctuation specifiication product, for superb high-precision feed!

The C-Lube Linear Roller Way Super MX low fluctuation specifiication MX Master Grade has special precision processing on the roller raceway surface, significantly reducing fluctuation compared to the standard extra long unit and thus making it the ideal product for ultra-precision working machine shaft guides, which require high-precision, high-quality machining.



Applicable products

Series	C-Lube Linear Roller Way Super MX
Supported models	MXL、MXDL、MXSL、MXNL、MXNSL
Size	30·35·45·55

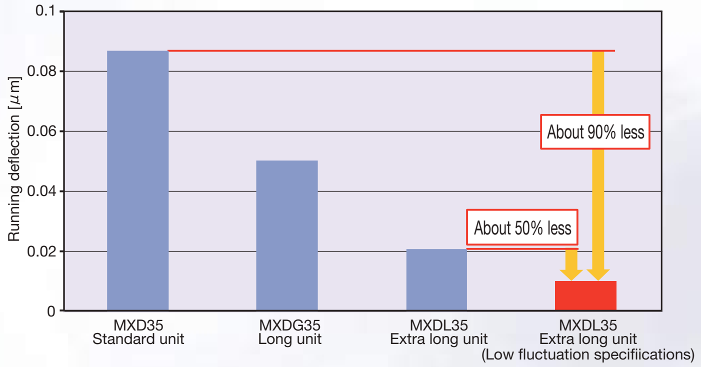
MX Master Grade (low fluctuation specifiications) is a special order product; if needed please contact IKO.

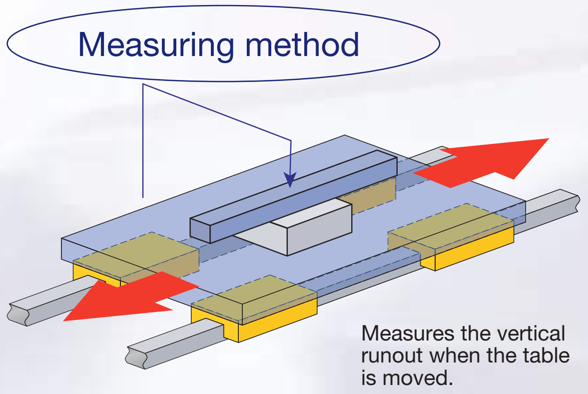
Features

1 Special raceway processing suppresses miniscule running deflection and significantly reduces pulsation compared to standard extra long units.

Fluctuation comparison data

Pulsation: Refers to the running deflection related to movement of the rolling elements within the Linear Roller Way.



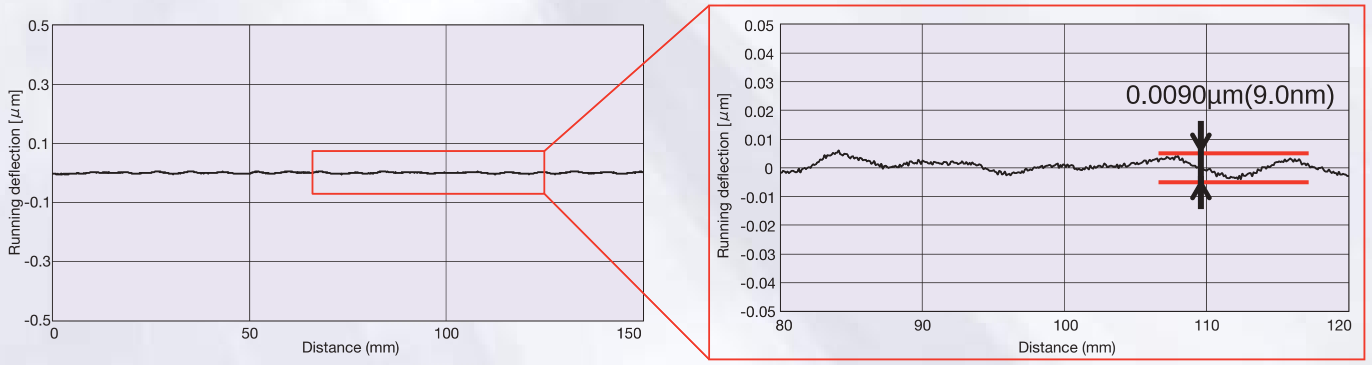


Super low fluctuation is achieved!

About 50% less fluctuation compared with the standard extra long unit!

2 Low fluctuation makes it ideal for ultra-precision working machine shaft guides, which require high-precision, high-quality machining.

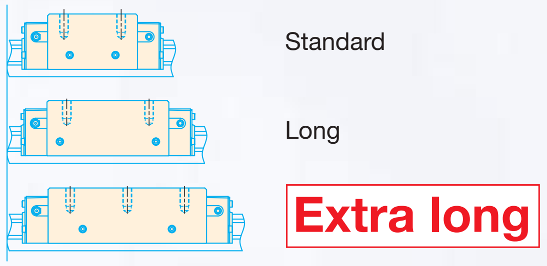
Fluctuation data



The **running deflection value** is within **0.0090μm(9.0nm)** in actual measurement!

Improve machining quality with the use of MX Master Grade!

3 The extra long unit contributes to improved load capacity and rigidity in mechanical equipment.



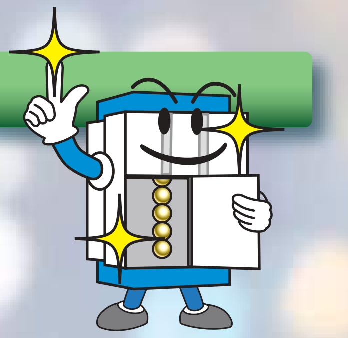
Elastic deformation relative to load is low in comparison with the standard and long types, device rigidity is improved, accuracy is improved, and resonance can be avoided.

IKO Features of Special Environment Linear Way and Linear Roller Way ①

IKO's unique ideas and experiences are utilized to explore new world for special environment applications.

IKO Linear Way and Linear Roller Way are available for various special environment by using different materials and grease, surface treatment and dust protection measures, etc. Typical application fields and major countermeasures are described below.

Clean Environment



When the Linear Way or Linear Roller Way is used in clean environment such as a clean room, it is required that the environment is not polluted by dust-generation by the Linear Way or Linear Roller Way and it must have excellent rust prevention property as rust prevention oil cannot be used.

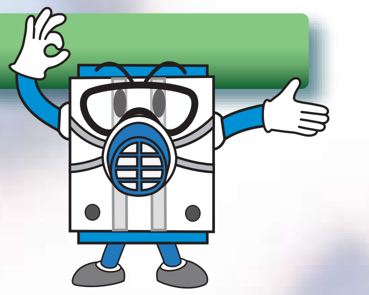
Vacuum Environment

When the Linear Way or Linear Roller Way is used in vacuum environment, it is required that the gas discharged from the Linear Way or Linear Roller Way does not pollute the environment or reduce the degree of vacuum, and it must have excellent rust prevention property as rust prevention oil cannot be used.

Heat Resistance Measures

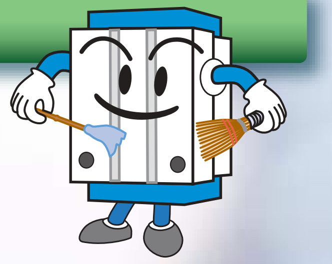
When the Linear Way is used in an environment where temperature is higher than usual, heat resistance of synthetic resin components and metal parts will be an issue.

Dust Protection



If dust such as metal or wooden chips get into the way of the Linear Way or Linear Roller Way, reduction of life and accuracy may be caused. Therefore, measures to prevent foreign substances from entering into the way are necessary.

Spatter Protection



Spatter of welding, etc. is so hot that it adheres to components. Foreign substances adhering to the track rail firmly cannot be fully removed by normal dust protection measures, so measures to avoid adherence and enhanced foreign substances removal measures are necessary.

Clean

○ LCL Linear Way and Linear Roller Way
○ Stainless Linear Way and Linear Roller Way
● Black chrome surface treatment
● Specified grease (CG2 or CGL grease)
◇ Fluorine grease

Corrosion resistance

○ Hybrid C-Lube Linear Way L
○ Non-magnetic stainless Linear Roller Way Super X
○ Stainless Linear Way and Linear Roller Way
● Black chrome surface treatment

Vacuum

○ LCL Linear Way and Linear Roller Way
● No end seal
● Stainless steel end plate
◇ Fluorine grease

Heat resistance

● Stainless steel end plate
● Special environment seal
◇ High temperature grease

Foreign substances (wood chips and metal powder, etc.)

○ Linear Way H Ultra seal specification
○ Track rail mounting from bottom
● Double end seals
● Scrapers
● C-Wiper
● Caps for rail mounting holes
● Rail cover plate for track rail
● Rail cover sheet
● Female threads for bellows
● Specific bellows

Spatter

● Scrapers
● Caps for rail mounting holes (aluminum alloy)
● Rail cover sheet
● Fluorine black chrome surface treatment
● Stainless steel end plate

○ **Linear motion rolling guide series for special environment :**
Collective name of linear motion rolling guide series models corresponding to special environment.

● **Special specification for special environment :**
Special specification corresponding to special environment by combination of linear motion rolling guide series.

◇ **Lubricant :**
Lubricant suitable for each special environment can be selected.

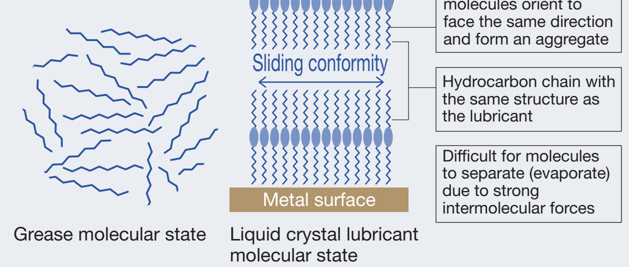
LCL Linear Way and Linear Roller Way

Neither grease nor oil

World's first Liquid Crystal Lubricant

Liquid Crystal Lubricants are completely different from greases composed of base oils and thickeners. **Liquid Crystal Lubricants are composed only of liquid crystal compounds, forming a new type of lubricant never seen before.** Conventional grease base oils lubricate using dissimilar molecules, causing difficulties with adhesion to metal surfaces and evaporation. Liquid Crystal Lubricant forms molecular aggregates, improving adhesion to metal surfaces and minimizing evaporation. The Liquid Crystal Lubricant used in the LCL Linear Way and Linear Roller Way is the world's first Liquid Crystal Lubricant for bearings, achieving excellent lubrication functionality even under high contact pressure during rolling contact and successfully creating revolutionary new functions.

■Liquid crystal lubricant structure



Features

Superior load durability

Long-term durability exceeds 40 times that of fluorine grease at room temperature and atmospheric pressure.
2 to 6 times greater durability than other types of grease, even in high-temperature environments.

Superior low dust-generation properties

Dust generation is less than 1/10 of lithium soap based grease.

Excellent outgas properties

The outgassing characteristics in high vacuum environments show excellent performance even even at high temperatures.

Minimizes lubricant evaporation

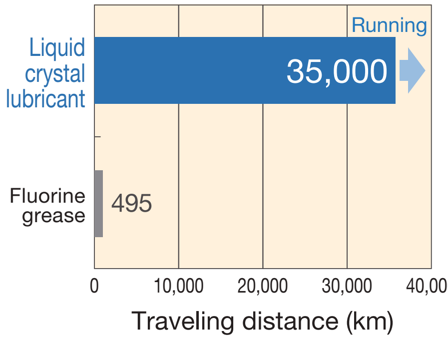
Zero mass loss even at 100˚C. Liquid crystal lubricants have no loss due to evaporation.

Light and smooth sliding

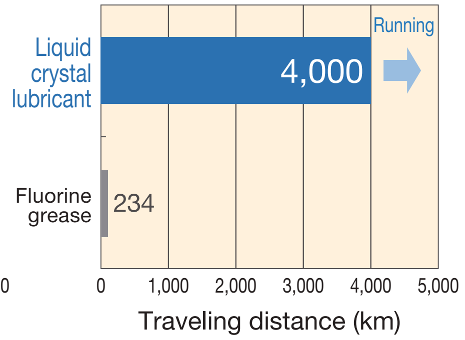
The rolling resistance is lower than that of fluorine grease or lithium soap-based grease.

Performance

Load durability (room temperature)

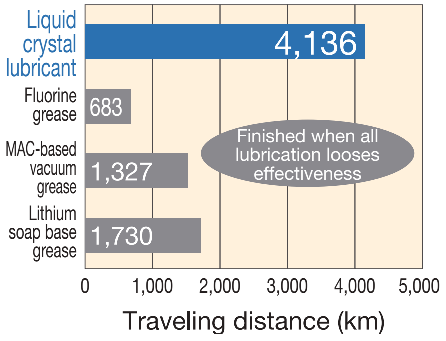


Test conditions ① Model number: LWL9···B
Speed: 1m/s Load: 181N



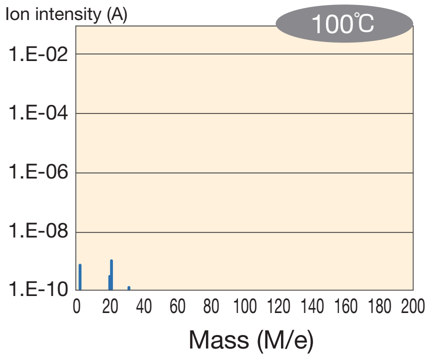
Test conditions ② Model number: LRXD20SL
Speed: 1m/s Load: 1150N

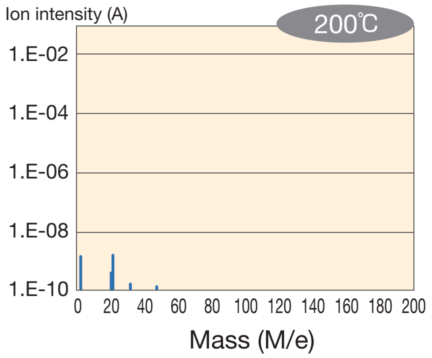
Load durability (high temperature)



Test conditions Model number: LWLF18···B Speed: 1m/s Temperature: 120℃
Load: 114N Evaluation: Traveling distance until lubrication failure

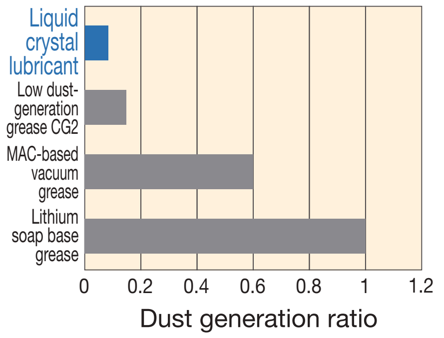
Outgas properties





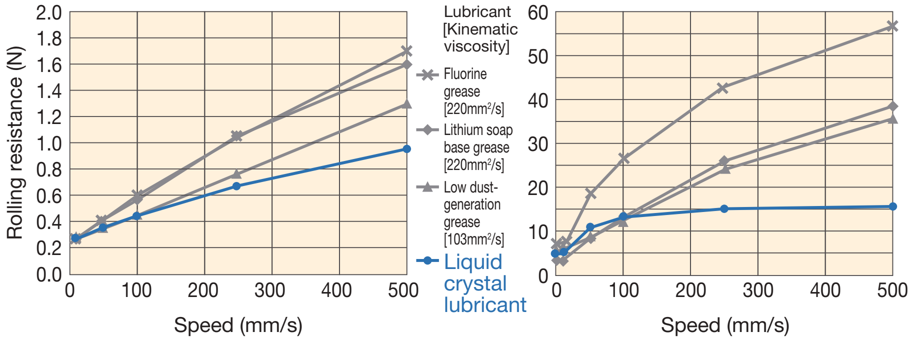
Measuring conditions Vacuum level: 10^{-5}Pa Conditions: Liquid crystal lubricant only

Low dust-generation properties



Test conditions Model number: LWL9···B/N Load: 80N Speed: 1m/s
Evaluation time: 45 hrs Measured particle size: 0.5μm or more

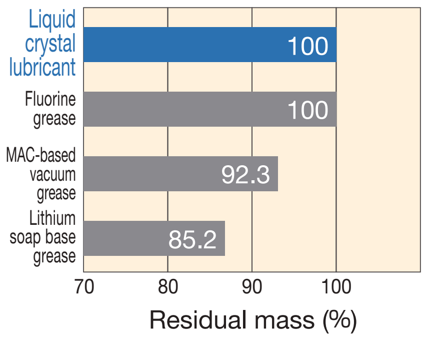
Rolling resistance



Test conditions Model number: LWL9···B/N

Test conditions Model number: LRXSG20

Evaporation characteristics



Test conditions Environment: Open atmosphere
Temperature: 100℃ Time: 770 hours

● Applicable products

Compatible series	· Linear Way L Series · Linear Way E Series · Linear Way H Series · Linear Way F Series · Linear Roller Way Super X Series

Remark 1. Applicable for stainless steel models from each series.
Remark 2. LCL Linear Ways and Linear Roller Ways are individually made to order.
If needed, please contact IKO.

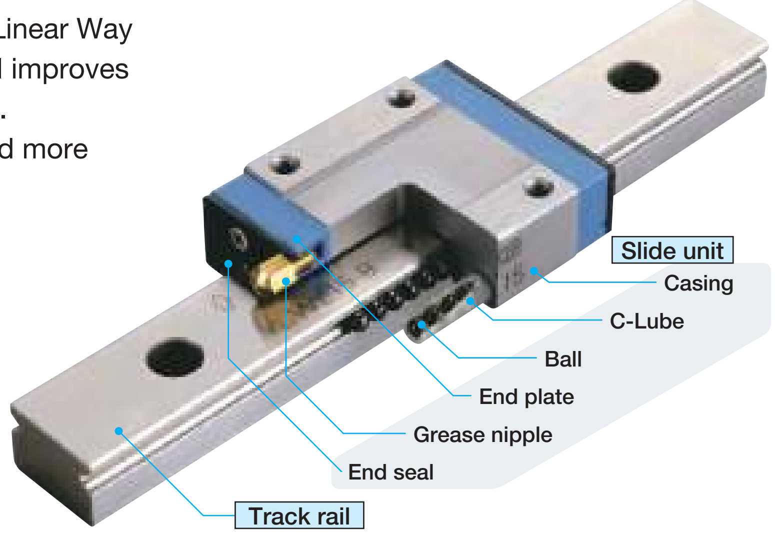
Hybrid C-Lube Linear Way ML

ML…/HB

While maintenance free performance of C-Lube Linear Way ML is maintained, the silicon nitride ceramics ball improves high-speed performance and reduces noise level. Ceramics has more resistance to deformation and more rigidity than bearing steel and stainless steel.

■ Standard specification

Casing	Martensitic stainless steel
Track rail	Martensitic stainless steel
Ball	Silicon nitride ceramics
C-Lube	Capillary lubricating element (Porous resin)



Features

Superior high-speed performance ··· More than three times durability

Noise reduction ·········· Noise reduction by about 4.5 dB

High rigidity ·········· Displacement volume reduced by about 10%

Superior abrasion resistance ··· Preload reduction volume is about one fourth

※ All of the above based on comparison with our C-Lube Linear Way ML

+

Maintenance free
Achieved long term maintenance free

Eco-friendly
Minimized lubrication oil consumption

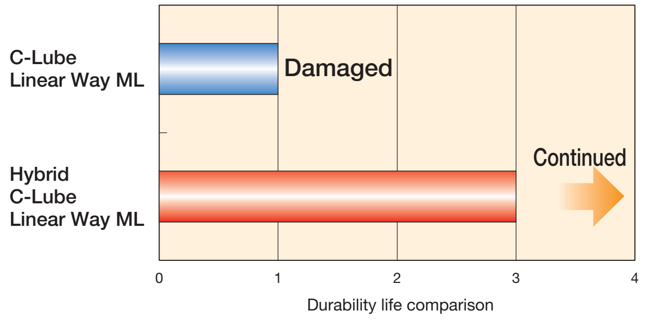
Compact
Integral lubrication parts

Smooth
Excellent sliding characteristic

Performance

More than three times durability

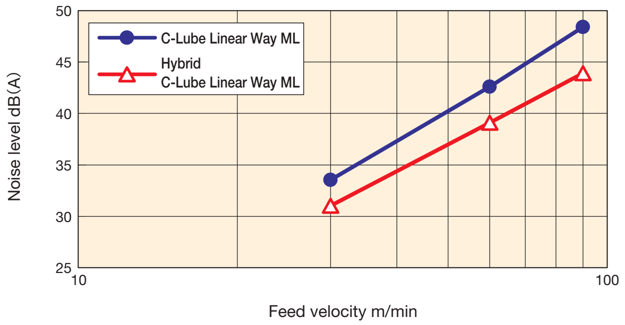
High-speed performance



Test conditions	Model : ML12 Velocity: 300 m/min Acceleration: 40 G

Noise reduction by about 4.5 dB

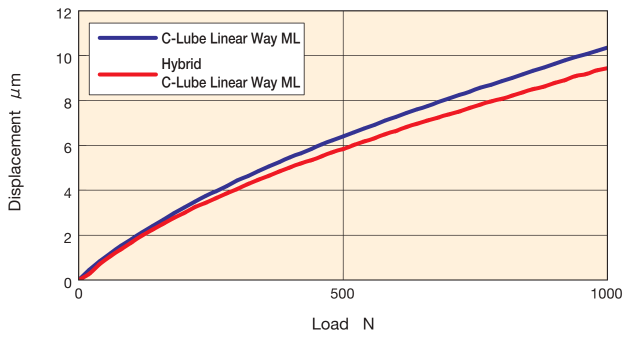
Low decibel



Test conditions	Model : ML12 Measurement velocity: 30, 60, 90 m/min

Small deformation of rolling elements and excellent rigidity

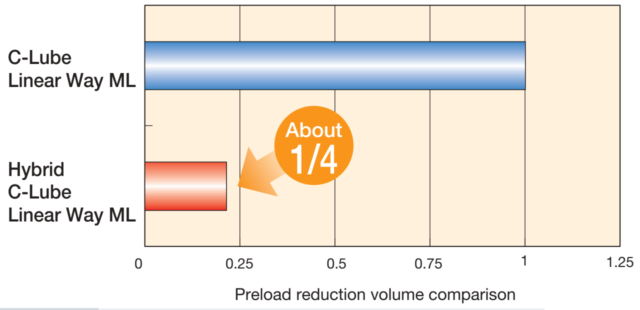
High rigidity



Test conditions	Model : ML12 Preload: Standard Preload Load direction: Downward

Low preload reduction volume and accuracy maintained after operation

Abrasion resistance

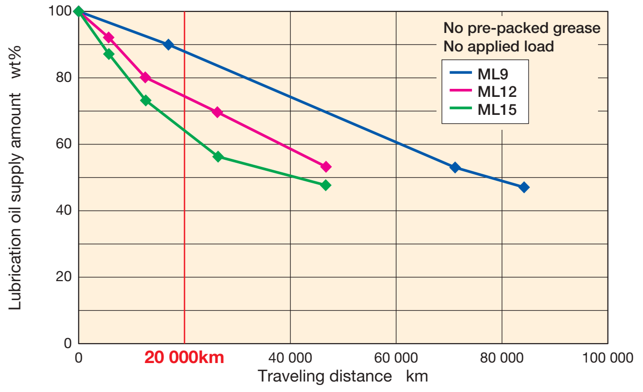


Test conditions	Model : ML12 Velocity: 300 m/min Acceleration: 40 G Traveling distance: 13,000 km

Basic performance of C-Lube Linear Way

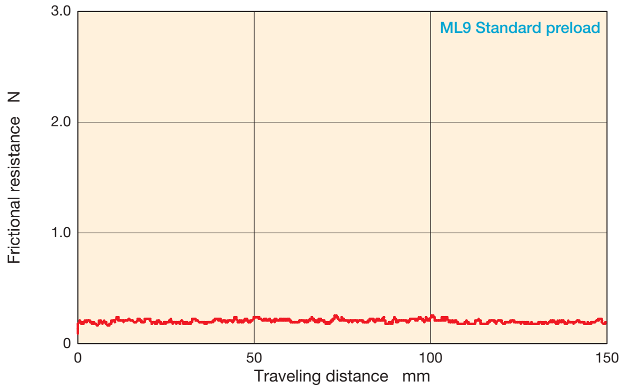
Achieved long term maintenance free

Maintenance free



Achieved light and smooth sliding

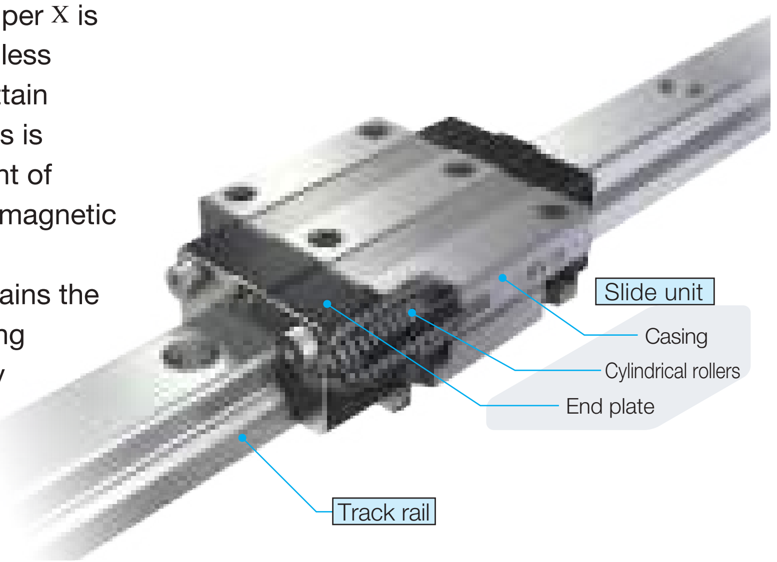
Sliding characteristic

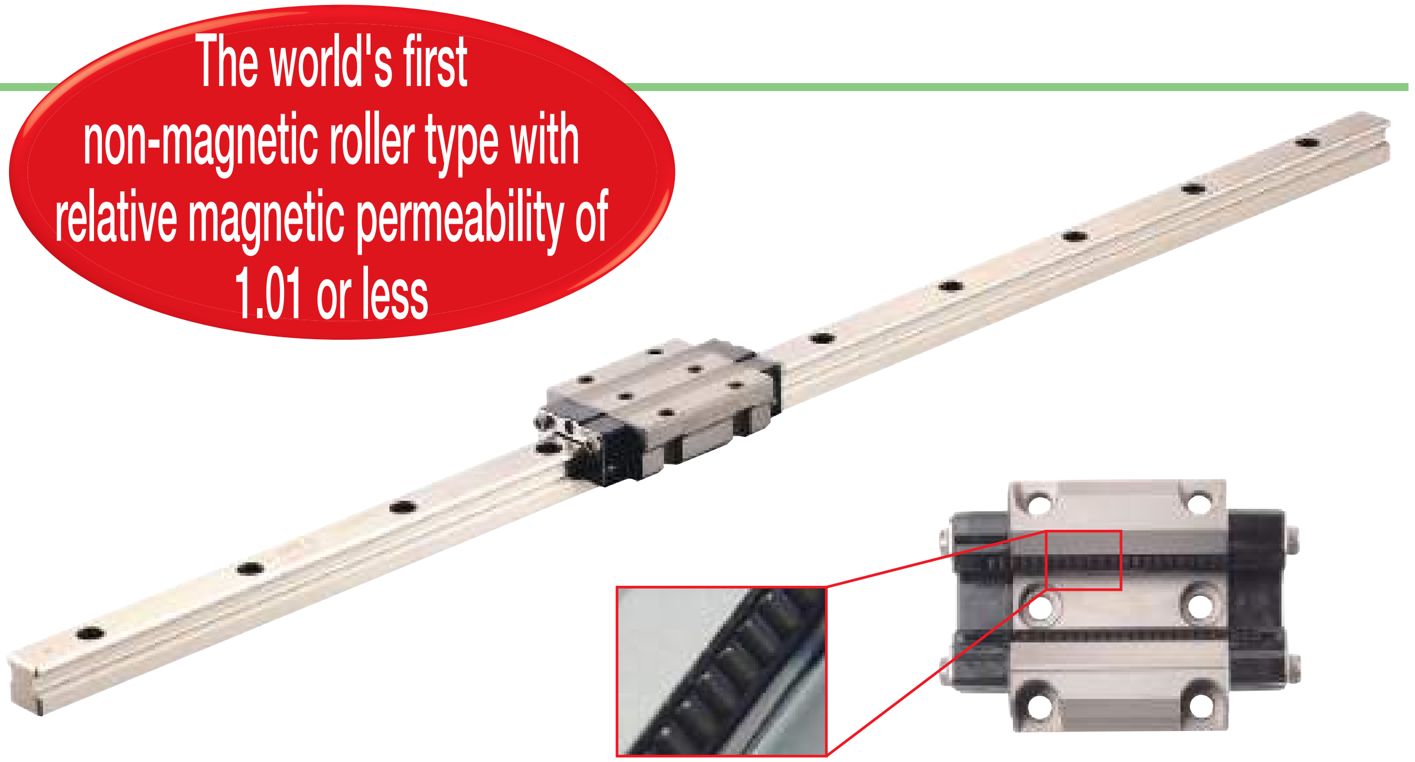


1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Non-magnetic stainless Linear Roller Way Super X

The non-magnetic stainless Linear Roller Way Super X is the world's first non-magnetic stainless steel endless motion roller type linear motion rolling guide to attain relative magnetic permeability of 1.01 or less. This is accomplished through the dedicated development of silicon nitride ceramic cylindrical rollers and non-magnetic stainless steel casings and track rails.
Despite being non-magnetic material it still maintains the superior vibration characteristics, excellent running accuracy, and friction characteristics provided by the Linear Roller Way Super X. This allows for accurate and rapid positioning in environments affected by minimal magnetism.





Features

World first for roller types

The first non-magnetic specifications ever realized in the world for endless motion roller type linear motion rolling guides

Relative magnetic permeability 1.01 or less

Allows for accurate and rapid positioning in environments affected by minimal magnetism

High corrosion resistance

Optimal for use in clean environment thanks to non-magnetic stainless steel

High running accuracy

The superb vibration characteristics of roller type linear motion rolling guides allow superior running accuracy

Non-magnetic stainless steel characteristics

Characteristics \ Material name	Non-magnetic stainless steel	Silicon nitride ceramics
Relative magnetic permeability ⁽¹⁾	1.01 or less (1.005)	1 (0.999991)
Electric conductivity	○	×
Hardness (HV)	380~450	1400~1600
Linear expansion coefficient (×10^{-6}/°C)	19.0 (20~400°C)	3.2 (20~400°C)
Specific gravity (g/cm)	7.9	3.2
Main ingredients	Fe, Mn, Cr	Si_3N_4
Cost	○	△
Remarks	—	Good corrosion resistance

Note(¹) (　) is only an example of the measurement value.

Selection of lubricant

By setting appropriate lubricants such as vacuum grease and low dust-generating grease, any operating environment can be supported.

●Applicable products

Series	Linear Roller Way Super X
Main model	LRX15, LRXD15, LRXS15

For detailed specifications or manufacturing information, please contact IKO.

■Main component materials

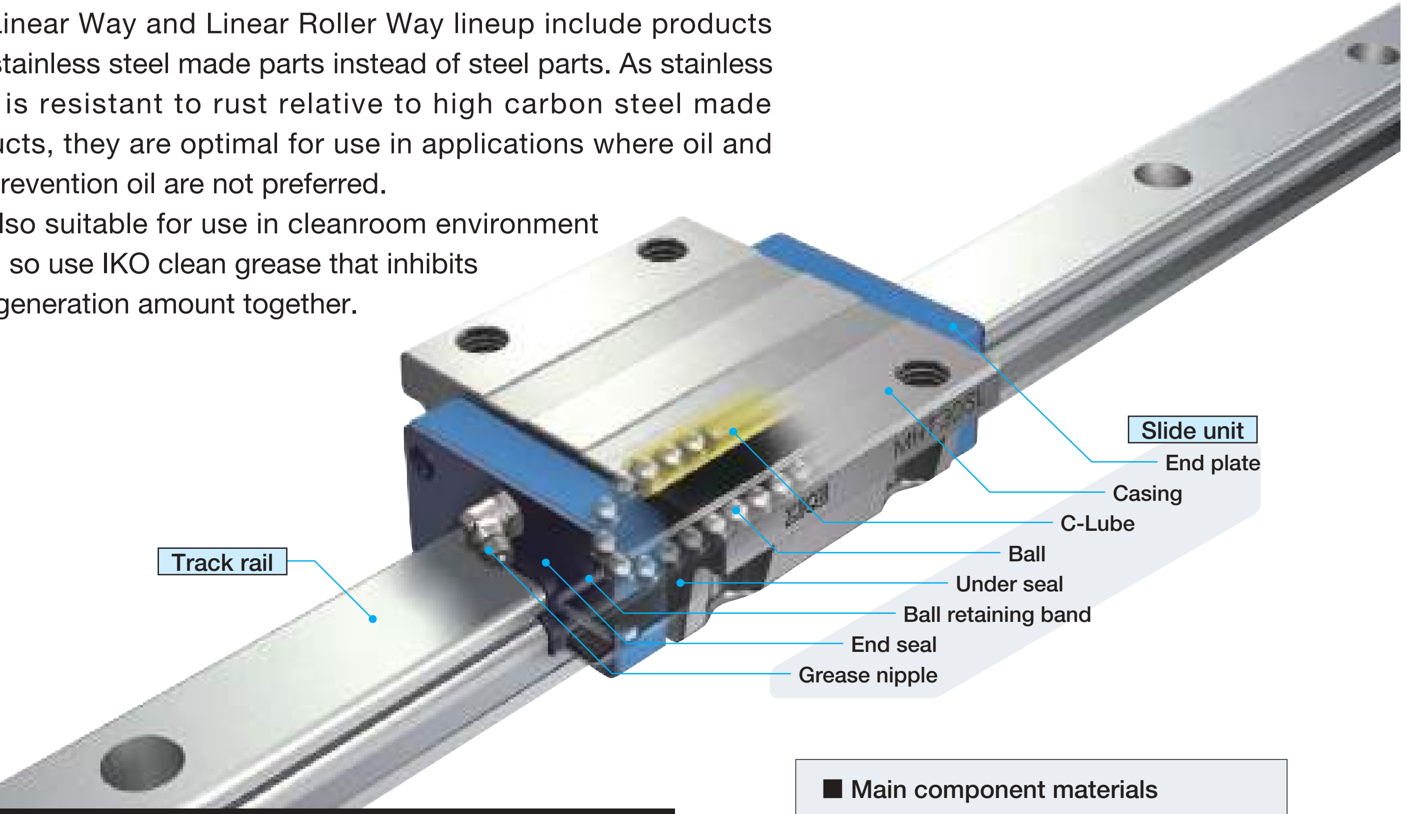
Casing	Non-magnetic stainless steel
Track rail	Non-magnetic stainless steel
Cylindrical roller	Silicon nitride ceramics
End plate	Engineering plastic

Ball types can also be manufactured upon request.
For detailed information, please contact IKO.

Stainless Linear Way and Linear Roller Way

A variety of stainless steel series

IKO Linear Way and Linear Roller Way lineup include products with stainless steel made parts instead of steel parts. As stainless steel is resistant to rust relative to high carbon steel made products, they are optimal for use in applications where oil and rust prevention oil are not preferred.
It is also suitable for use in cleanroom environment room, so use IKO clean grease that inhibits dust-generation amount together.



■ Main component materials

Casing	Martensitic stainless steel
Track rail	Martensitic stainless steel
Ball	Martensitic stainless steel
Ball retaining band	Stainless steel
End plate	Engineering plastic
End seal	Stainless steel + Synthetic rubber
Grease nipple	Brass

Series name

Linear Way

Ball Type Miniature Series

C-Lube Linear Way ML
C-Lube Linear Way MLV
Linear Way L
Micro Linear Way L

Ball Type Compact Series

C-Lube Linear Way ME
Linear Way E

Ball Type High Rigidity Series

C-Lube Linear Way MH
Linear Way H

Ball Type Wide Type Series

Linear Way F

Ball Type U-Shaped Track Rail Series

C-Lube Linear Way MUL

Linear Roller Way

Roller Type

C-Lube Linear Roller Way Super MX
Linear Roller Way Super X

Combination with special specification corresponds to use in special environment!

Rust prevention

Black chrome surface treatment /L

Black chrome surface treatment on the track rail and slide unit improves rust prevention capacity.

Fluorine black chrome surface treatment /LF

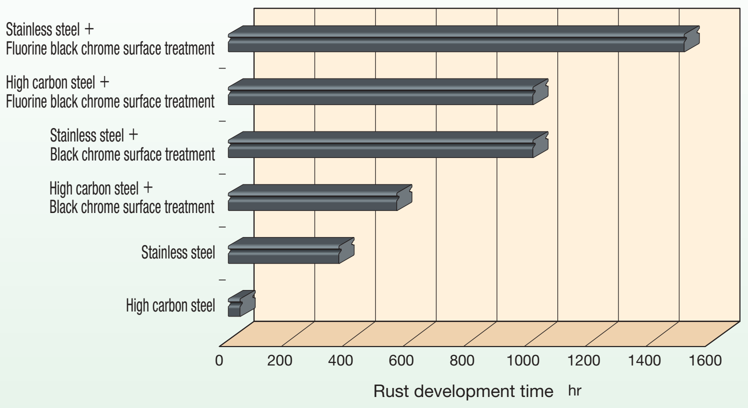
Coating of fluorinated resin is applied over the black chrome surface treatment to prevent foreign substances from sticking and improve the rust prevention capacity.

Black chrome surface treatment

Features

1. Thin film
2. Uniform film
3. Strong adhesion
4. Excellent rust prevention capacity
5. Low temperature processing to prevent distortion
6. No peeling and no effects on life and cleanroom environment

Corrosion resistance comparison based on humidity cabinet test



Test conditions	Temperature 50℃, Relative humidity 95%RH

Special specification for special environment

IKO Linear Way and Linear Roller Way lineup include following special specifications to correspond to various special environments.

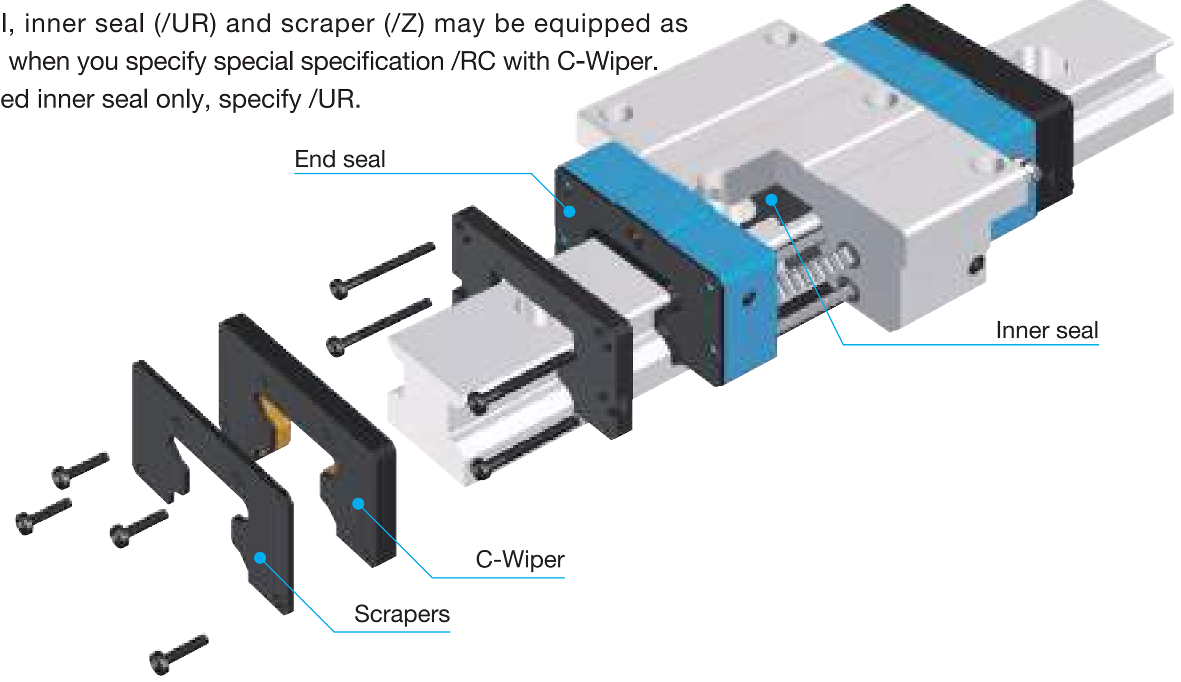
Dust protection

C-Wiper /RC

A lubricated C-Wiper can be installed on the outside of the end seal. It can be used for a long period of time because it enhances the dustproof effect and suppresses the increase in frictional resistance even in harsh environments where dust, chips, cutting fluid, etc. are present.

End seal, inner seal (/UR) and scraper (/Z) may be equipped as standard when you specify special specification /RC with C-Wiper.

If you need inner seal only, specify /UR.



Applicable C-Wiper size

Model	Length of slide unit	Model code	Size								
			12	15	20	25	30	35	45	55	65
Flange type mounting from top / bottom	Short	**MXC**	–	–	○(1)	○	○	○	○	○	○
	Standard	**MX**	–	–	○(1)	○	○	○	○	○	○
	Long	**MXG**	–	–	○(1)	○	○	○	○	○	○
	Extra long	**MXL**	–	–	○(1)	○	○	○	○	○	○
Block type mounting from top	Short	**MXDC**	–	–	○	○	○	○	○	○	○
	Standard	**MXD**	–	–	○	○	○	○	○	○	○
	Long	**MXDG**	–	–	○	○	○	○	○	○	○
	Extra long	**MXDL**	–	–	○	○	○	○	○	○	○
Compact block type mounting from top	Short	**MXSC**	–	–	○	○	○	–	–	–	–
	Standard	**MXS**	–	–	○	○	○	○	○	○	–
	Long	**MXSG**	–	–	○	○	○	○	○	○	–
	Extra long	**MXSL**	–	–	○	○	○	–	–	–	–
Low profile flange type mounting from top	Standard	**MXN**	–	–	–	–	○	○	○	○	–
	Long	**MXNG**	–	–	–	–	○	○	○	○	–
	Extra long	**MXNL**	–	–	–	–	○	○	○	○	–
Low profile block type mounting from top	Standard	**MXNS**	–	–	–	–	○	○	○	○	–
	Long	**MXNSG**	–	–	–	–	○	○	○	○	–
	Extra long	**MXNSL**	–	–	–	–	○	○	○	○	–

Note (1) Also applicable to models mounting from bottom (MXHC20, MXH20, MXHG20, MXHL20).

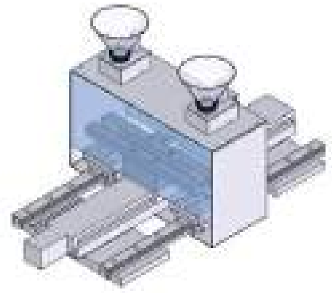
Dust protection

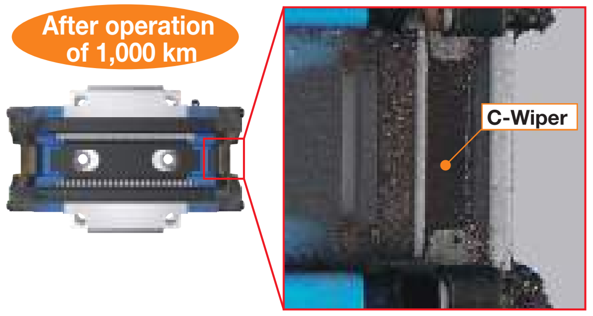
Durability test result backing excellent dust protection effect of [C-Wiper]!

Durability test in environment with foreign substances

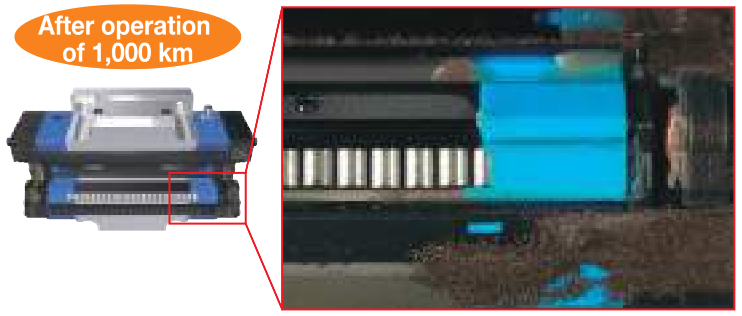
Test conditions

Test portion	**MX35** T3 preload / caps for rail mounting holes and C-Wiper included
Maximum velocity	18 m/min
Stroke length	500 mm
Foreign substances	Fine metal chips Particle diameter lower than 125 μm Hardness 40 ～ 50HRC Application dose 1 g/hr (total dose: 1 kg)





Only few foreign substances may get into the slide unit.

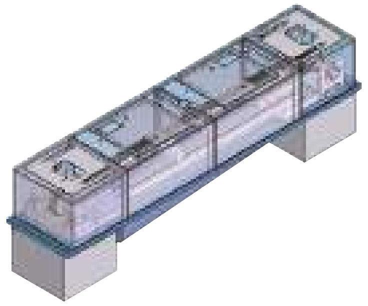


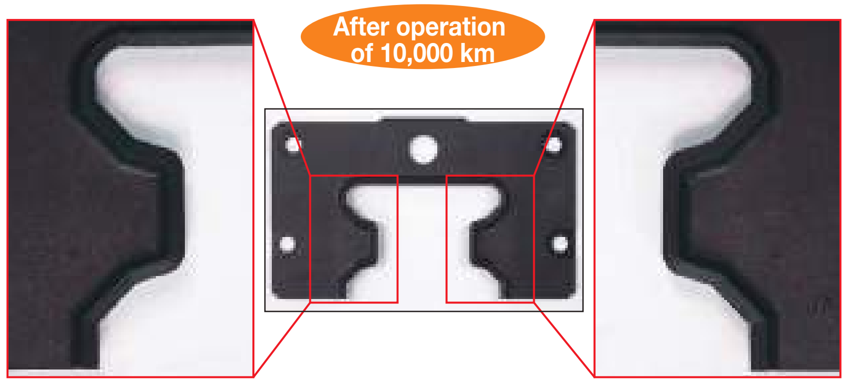
Only few foreign substances get into the way!

Durability test in coolant mist environment

Test conditions

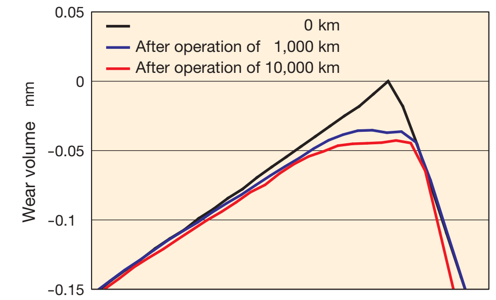
Test portion	**MX35** T3 preload / caps for rail mounting holes and C-Wiper included
Maximum velocity	115.2 m/min
Stroke length	300 mm
Coolant	Soluble type Dilute strength 20 times Spray amount 5 cc/hr





End seal is not damaged.

Wear condition of end seal lip tip



Wear on the end seal is negligible!

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Special specification for special environment

Dust protection

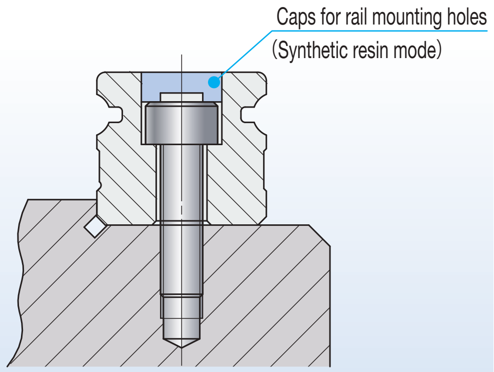
Rail cover sheet

Rail cover sheet that consists of steel plate and adhesive tape and fastened to the dedicated track rail with groove on the track rail prevents foreign substances from entering into the slide unit.

Caps for rail mounting holes /F

Caps for rail mounting holes close the track rail mounting holes to prevent foreign substances from entering into the slide unit.

Contact IKO for aluminum alloy caps for rail mounting holes.

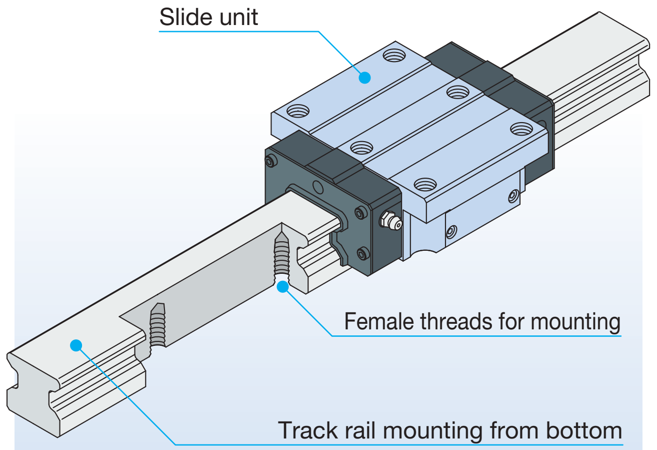


Rail cover plate /PS

Rail cover plate totally covers the upper surface of the track rail to prevent foreign substances from entering into the track rail.

Track rail mounting from bottom

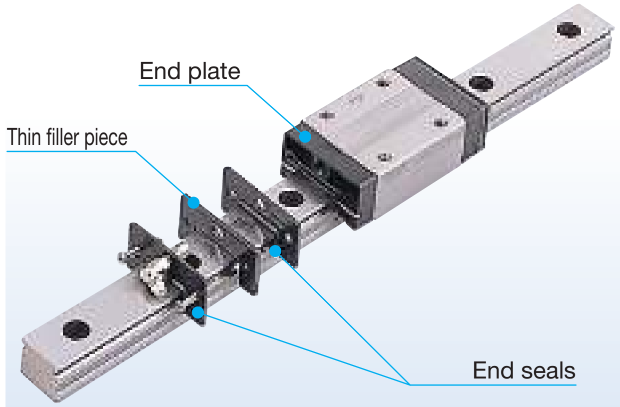
This is the specification that track rail is fixed from the mounting surface side. As there are no mounting holes on the track rail upper surface, adherence with the seal is superior and better dust protection effect is achieved.



Dust protection

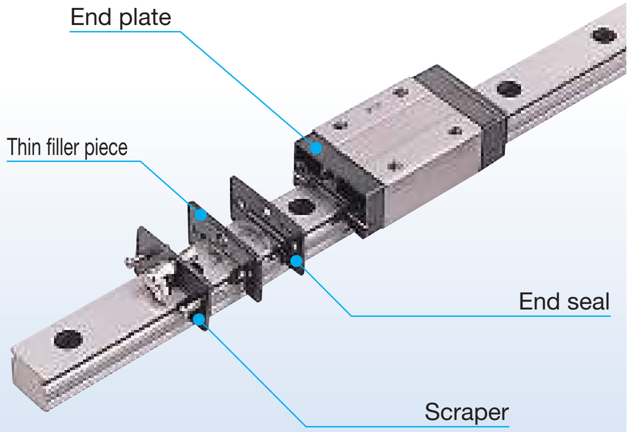
Double end seals /V

Double end seals improve the dust protection property further.



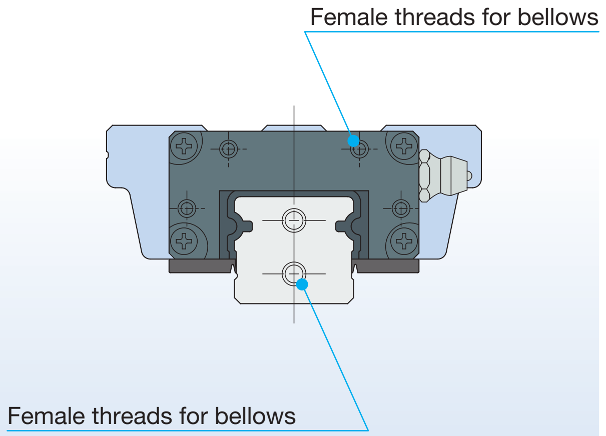
Scraper /Z

Mounted to the outside of end seal, it may remove large foreign substances adhering to the track rail.



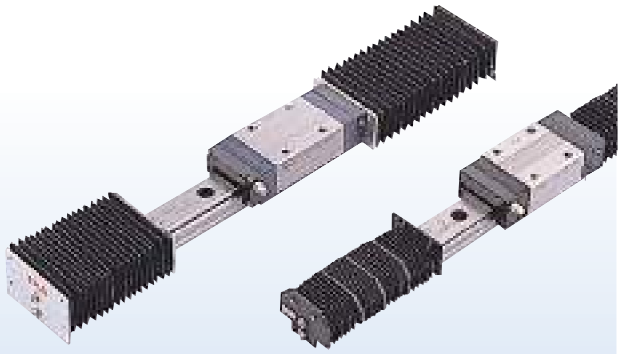
Female threads for bellows /J

Female threads for bellows are prepared on the slide unit and track rail ends.



Specific bellows

Dust protection cover over the exposed part of the track rail.

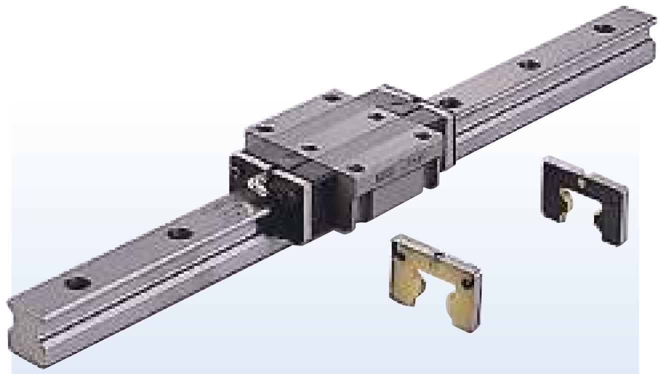


Special specification for special environment

Lubrication

With C-Lube plate /Q

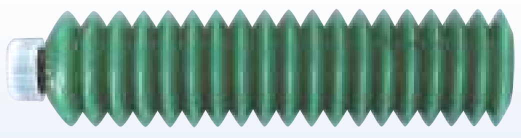
Lubrication parts to substantially reduce the need for lubrication management, i.e. grease job.



Low Dust-Generation Grease for Clean Environment CGL /YCL

For this grease, mixed soap is used as thickener and synthetic oil and low pour point mineral oil are mixed with base oil, so it has excellent low dust generating performance, rolling resistance, lubrication, and rust prevention property.

Bellows cartridge (80 g)
JG80 /CGL

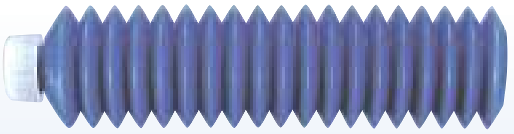


With miniature greaser (2.5 ml)
MG2.5B /CGL

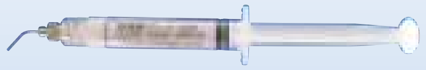
Low Dust-Generation Grease for Clean Environment CG2 /YCG

For this grease, urea is used as thickener and synthetic oil is used as base oil, so it has excellent low dust generating performance, operating temperature range, lubrication property, rust prevention property and oxidation stability.

Bellows cartridge (80 g)
JG80 /CG2



With miniature greaser (2.5 ml)
MG2.5B /CG2

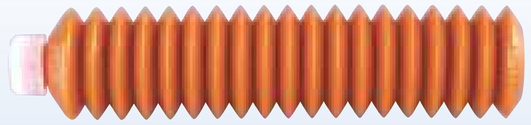


MG10 /CG2 with 10 ml are also available.

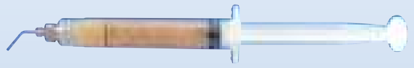
Anti-Fretting Corrosion Grease AF2 /YAF

Grease with excellent fretting-proof corrosion property.

Bellows cartridge (80 g)
JG80 /AF2



With miniature greaser (2.5 ml)
MG2.5B /AF2



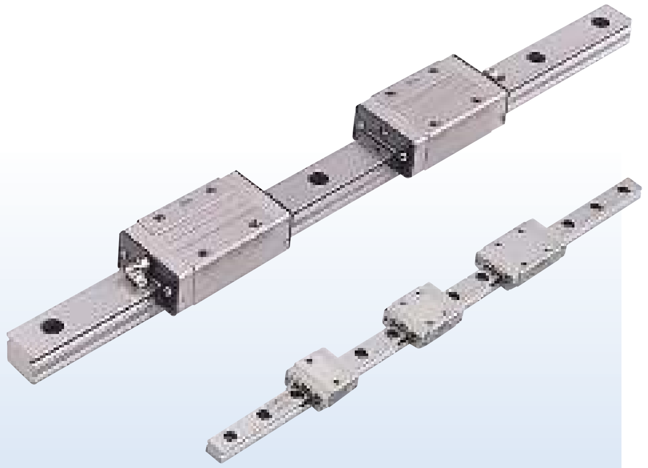
Other special grease

For special grease for vacuum or high temperature, please contact IKO.

Others

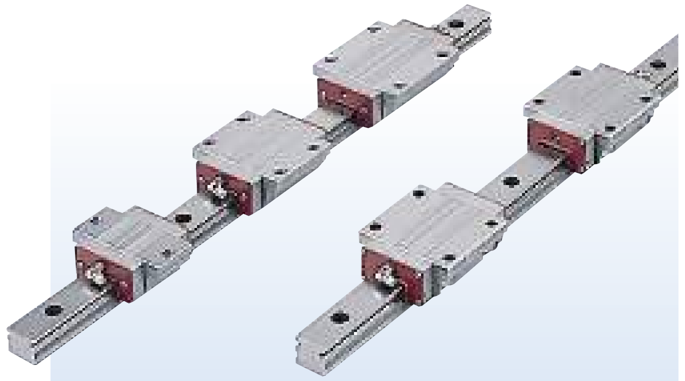
Stainless steel end plate /BS

End plate is changed to stainless steel.



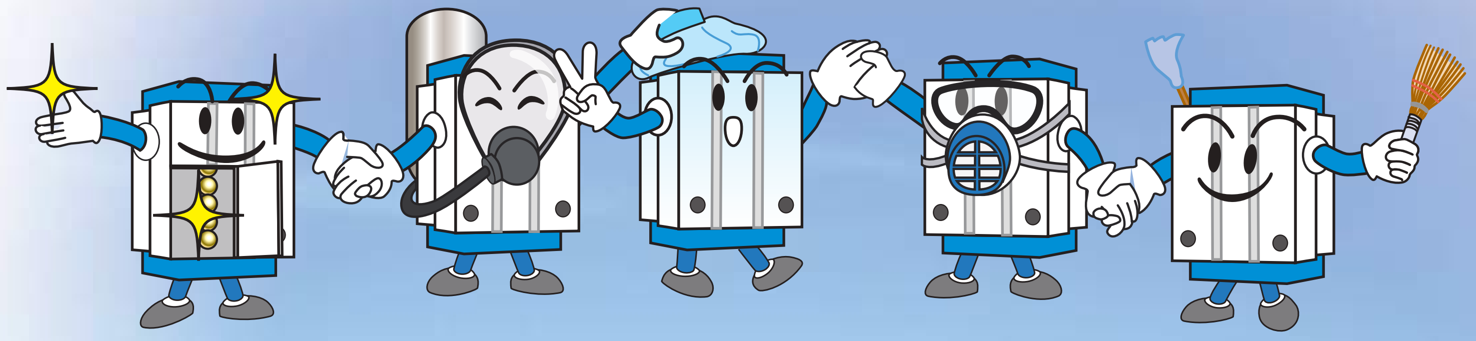
Special environment seal /RE

The end and under seals are replaced with end seals for special environment that can be used at high temperatures. When it is used in high temperature environment, stainless steel end plate (/BS) and high temperature grease should be combined.

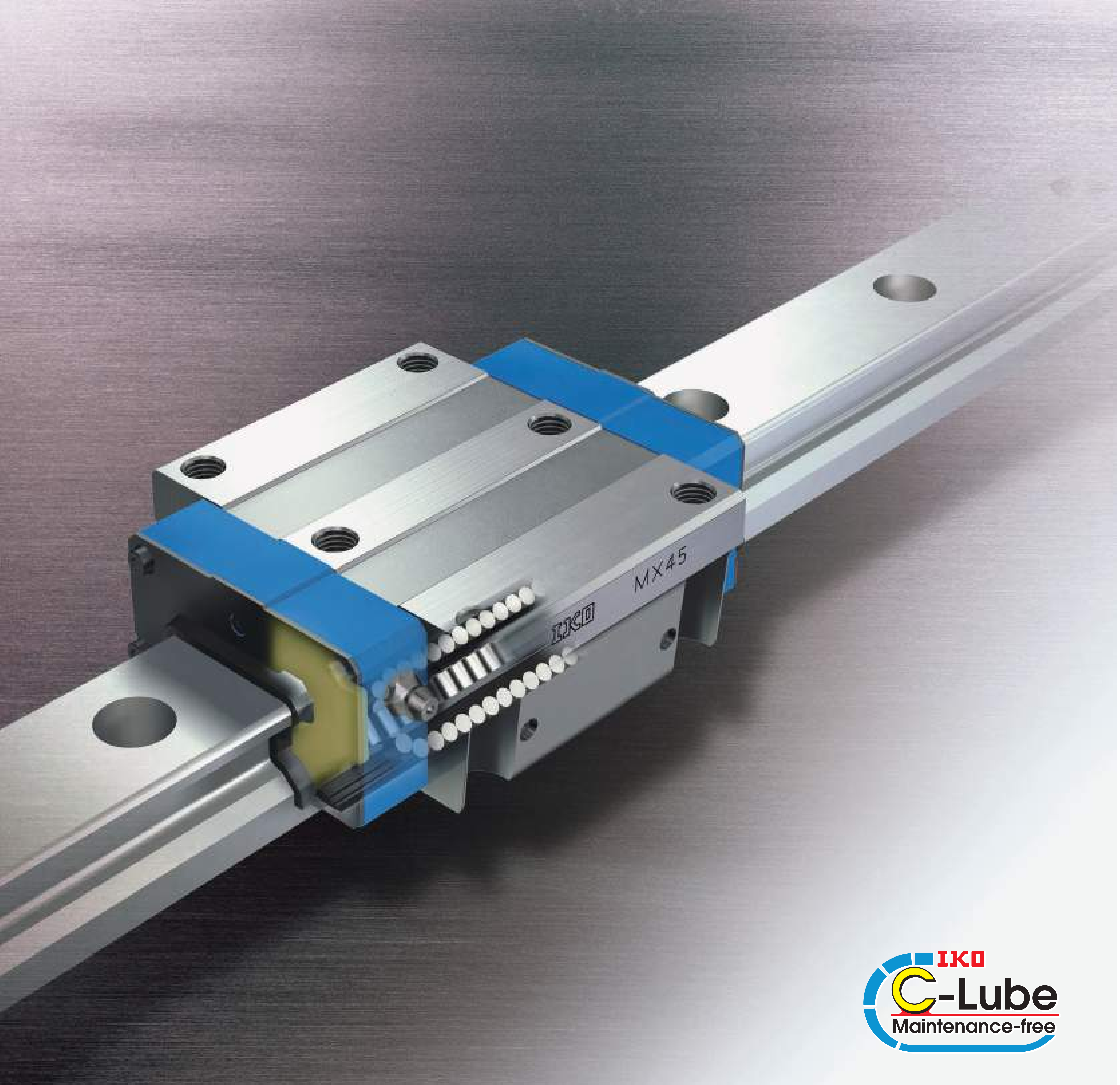


The photo shows a combination of special environment seal (/RE) and stainless steel end plate (/BS).

IKO can offer products for special environment!



If needed, please contact IKO.



Explanation and Dimension Table for Respective Product Series

Rail Guide Type

● C-Lube Linear Way ML
Linear Way L

● C-Lube Linear Way MLV

● C-Lube Linear Way MV

● C-Lube Linear Way ME
Linear Way E

● C-Lube Linear Way MH
Linear Way H

● Linear Way F

● C-Lube Linear Way MUL
Linear Way U

● C-Lube Linear Roller Way Super MX
Linear Roller Way Super X

● Linear Roller Way X

● Linear Way Module

General Explanation

C-Lube Linear Way ML
Linear Way L

C-Lube Linear Way ML

Points

1 Extremely small size realized by simple structure

For details ➲ P.I-19

Super small-size linear motion rolling guide produced by two-row four-point contact simple structure and original small sizing technology. The track rail width of LWL1, the smallest size, is only 1mm.

2 Wide range of variations for your needs

For details ➲ P.I-25

The slide unit shape can be selected from two types, the standard type and the wide type suited for single-row track rail uses, and there are four types with different lengths of slide unit with same section. Furthermore, the track rail has the variation of standard type and tapped rail type with the screw thread implanted, allowing you to select an optimal product for the specifications of your machine and device.

3 Ball retained type for easy operation

The slide unit of ball retained type incorporates the ball retaining band, which prevents the ball from dropping down when the slide unit is removed from the track rail. This safety structure brings you an easy operation to the machines / equipment.

4 Stainless steel selections for excellent corrosion resistance

For details ➲ P.I-41

Stainless steel highly corrosion-resistant is used as the basic specification, so that the products are suitable for applications where rust prevention oil is not preferred, such as in cleanroom environment. High carbon steel products suited to general purposes are also provided.

5 Widely supports special environment uses

For details ➲ P.I-33

C-Lube Linear Way ML for special environment uses are provided as a series. Increasingly varied special environment uses are supported, such as by high-speed / low-noise specifications by combining silicon nitride ceramics and low dust-generation specifications.

Identification Number and Specification

Example of an identification number

The specifications of ML(F) and LWL(F) series are indicated by the identification number. Indicate the identification number, consisting of a model code, dimensions, a part code, a material code, a preload symbol, a classification symbol, an interchangeable code, and any supplemental codes for each specification to apply.

	①	②	④	⑤	⑥	③	⑦	⑧	⑨	⑩	⑪
Non-interchangeable specification											
Assembled set	ML	C	12	C1	R200			T_1	P		/U
Interchangeable specification											
Single slide unit	ML	C	12	C1				T_1	P	S1	/U
Single track rail (¹)	LWL		12		R200	B			P	S1	
Assembled set	ML	C	12	C1	R200			T_1	P	S1	/U

① Model	Model code	Page Ⅱ－7
② Length of slide unit		
③ Structure		
④ Size	Dimensions	Page Ⅱ－7
⑤ Number of slide units	Part code	Page Ⅱ－7
⑥ Length of track rail		
⑦ Material type	Material code	Page Ⅱ－7
⑧ Preload amount	Preload symbol	Page Ⅱ－13
⑨ Accuracy class	Classification symbol	Page Ⅱ－14
⑩ Interchangeable	Interchangeable code	Page Ⅱ－15
⑪ Special specification	Supplemental code	Page Ⅱ－15

Note (¹) Indicate "LWL···B" or "LWLF···B" for the model code of the single track rail regardless of the series and the combination of slide unit models.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Identification Number and Specification

— Model · Length of Slide Unit · Structure · Size · Number of Slide Unit · Length of Track Rail · Material Type —

1 Model

C-Lube Linear Way ML (ML(F) series)
Standard type : ML
Wide type : MLF

Linear way L (1) (LWL (F) series)
Standard type : LWL
Wide type : LWLF

For applicable models and sizes, see Table 2.1 and Table 2.2.

Indicate "LWL…B" or "LWLF…B" for the model code of the single track rail regardless of the series and the combination of slide unit models.

Note (1) This model has no built-in C-Lube.

2 Length of slide unit

Short : C
Standard : No symbol
Long : G
Extra long : L

For applicable models and sizes, see Table 2.1 and Table 2.2.

3 Structure

Table 1.1 Structure of ML and LWL

Model	Types and sizes of track rails			Structure	
ML	Standard rail specification		Size: 5～25	Ball retained type	: No symbol
	Tapped rail specification		Size: 3	Ball non-retained type	: No symbol
			Size: 5, 7, 9	Ball retained type	: N
LWL	Standard rail specification			Ball retained type	: B
	Tapped rail specification	Mounting from bottom	Size: 2, 3	Ball non-retained type	: No symbol
			Size: 5, 7, 9	Ball retained type	: N
		Mounting from lateral	Size: 1	Ball non-retained type	: Y
	Solid rail specification		Size: 1	Ball non-retained type	: No symbol

Table 1.2 Structure of MLF and LWLF

Model	Types of track rails		Structure	
MLF	Standard rail specification	Size: 6	Ball non-retained type	: No symbol
		Size: 10～42	Ball retained type	
	Tapped rail specification	Size: 6	Ball non-retained type	: N
		Size: 10～18	Ball retained type	
LWLF	Standard rail specification	Size: 4, 6	Ball non-retained type	: No symbol
		Size: 10～42	Ball retained type	: B
	Tapped rail specification	Size: 2	Ball non-retained type	: No symbol
		Size: 6	Ball non-retained type	: N
		Size: 10～18	Ball retained type	

For applicable models and sizes, see Table 2.1 and Table 2.2.

4 Size

Standard type 1, 2, 3, 5, 7, 9, 12, 15, 20, 25
Wide type 2, 4, 6, 10, 14, 18, 24, 30, 42

For applicable models and sizes, see Table 2.1 and Table 2.2.

5 Number of slide units

: C○

For an assembled set, indicates the number of slide units assembled on a track rail. For a single slide unit, only "C1" is specified.

6 Length of track rail

: R○

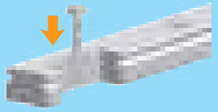
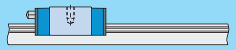
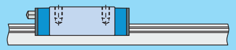
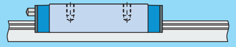
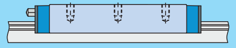
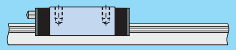
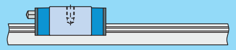
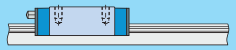
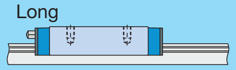
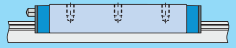
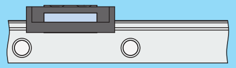
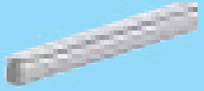
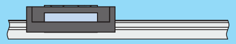
Indicate the length of track rail in mm. For standard and maximum lengths, see Table 3.1, Table 3.2, and Table 3.3.

7 Material type

Stainless steel made : No symbol
High carbon steel made : CS

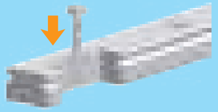
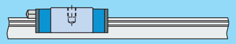
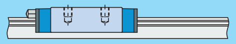
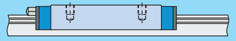
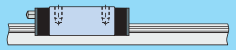
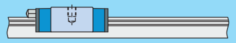
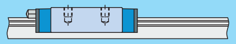
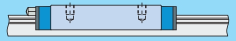
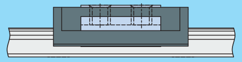
For applicable models and sizes, see Table 2.1 and Table 2.2.

Table 2.1 Models and sizes of standard type ML(F) and LWL(F) series

Types of track rails	Material type	Length of slide unit	Structure	Model	Size									
					1	2	3	5	7	9	12	15	20	25
Standard rail specification 	Stainless steel made	Short 	Ball retained type	MLC	—	—	—	○	○	○	○	○	○	○
				LWLC…B	—	—	—	○	○	○	○	○	○	○
		Standard 		ML	—	—	—	○	○	○	○	○	○	○
				LWL…B	—	—	—	○	○	○	○	○	○	○
		Long 		MLG	—	—	—	—	○	○	○	○	○	○
				LWLG…B	—	—	—	—	○	○	○	○	○	○
		Extra long 		MLL	—	—	—	—	—	○	○	○	—	—
	High carbon steel made	Standard 		LWL…BCS	—	—	—	—	—	○	○	○	○	—
Tapped rail specification Mounting from bottom 	Stainless steel made	Short 	Ball non-retained type	MLC	—	—	○	—	—	—	—	—	—	—
				LWLC	—	—	○	—	—	—	—	—	—	—
			Ball retained type	MLC…N	—	—	—	○	○	○	—	—	—	—
				LWLC…N	—	—	—	○	○	○	—	—	—	—
		Standard 	Ball non-retained type	ML	—	—	○	—	—	—	—	—	—	—
				LWL	—	○	○	—	—	—	—	—	—	—
			Ball retained type	ML…N	—	—	—	○	○	○	—	—	—	—
				LWL…N	—	—	—	○	○	○	—	—	—	—
		Long 	Ball retained type	MLG…N	—	—	—	—	○	○	—	—	—	—
				LWLG…N	—	—	—	—	○	○	—	—	—	—
		Extra long 	Ball retained type	MLL…N	—	—	—	—	—	○	—	—	—	—
Tapped rail specification Mounting from lateral 		Standard 	Ball non-retained type	LWL…Y	○	—	—	—	—	—	—	—	—	—
Solid rail specification 		Standard 	Ball non-retained type	LWL	○	—	—	—	—	—	—	—	—	—

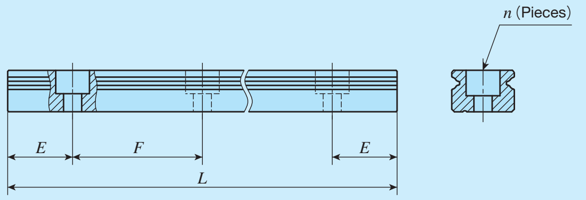
Remark: For the models indicated in ▭, the interchangeable specification is available.

Table 2.2 Models and sizes of wide type ML(F) and LWL(F) series

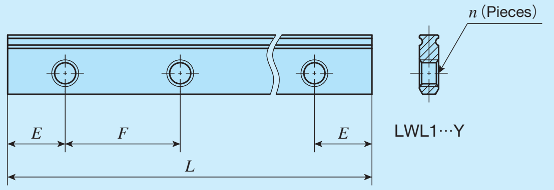
Types of track rails	Material type	Length of slide unit	Structure	Model	Size								
					2	4	6	10	14	18	24	30	42
Standard rail specification 	Stainless steel made	Short 	Ball retained type	MLFC	–	–	–	○	○	○	○	○	○
				LWLFC···B	–	–	–	○	○	○	○	○	○
			Ball non-retained type	MLFC	–	–	○	–	–	–	–	–	–
				LWLFC	–	–	○	–	–	–	–	–	–
		Standard 	Ball retained type	MLF	–	–	–	○	○	○	○	○	○
				LWLF···B	–	–	–	○	○	○	○	○	○
			Ball non-retained type	MLF	–	–	○	–	–	–	–	–	–
				LWLF	–	○	○	–	–	–	–	–	–
		Long 	Ball retained type	MLFG	–	–	–	–	○	○	○	○	○
				LWLFG···B	–	–	–	–	○	○	○	○	○
	High carbon steel made	Standard 	Ball retained type	LWLF···BCS	–	–	–	–	–	○	○	○	○
Tapped rail specification Mounting from bottom 	Stainless steel made	Short 	Ball retained type	MLFC···N	–	–	–	○	○	○	–	–	–
				LWLFC···N	–	–	–	○	○	○	–	–	–
			Ball non-retained type	MLFC···N	–	–	○	–	–	–	–	–	–
				LWLFC···N	–	–	○	–	–	–	–	–	–
		Standard 	Ball retained type	MLF···N	–	–	–	○	○	○	–	–	–
				LWLF···N	–	–	–	○	○	○	–	–	–
			Ball non-retained type	MLF···N	–	–	○	–	–	–	–	–	–
				LWLF···N	–	–	○	–	–	–	–	–	–
		Long 	Ball retained type	MLFG···N	–	–	–	–	○	○	–	–	–
				LWLFG···N	–	–	–	–	○	○	–	–	–
		Standard 	Ball non-retained type	LWLF	○	–	–	–	–	–	–	–	–

Remark: For the models indicated in ▭, the interchangeable specification is available.

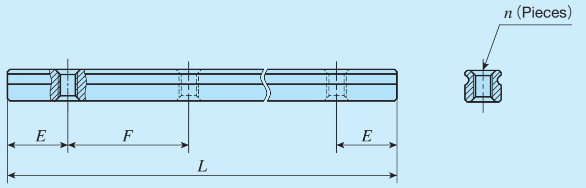
Table 3.1 Standard and maximum length of stainless steel track rail (Standard type)



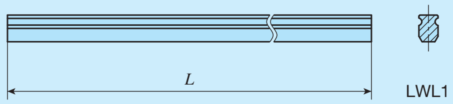
Standard rail specification



Tapped rail specification
Mounting from lateral



Tapped rail specification
Mounting from bottom



Solid rail specification

unit: mm

Item \ Identification number		LWL1···Y	LWL1	LWL2	ML 3 LWL3	ML 5 LWL5···B	ML 7 LWL7···B
Standard length L (n)		18 (3) 30 (5) 42 (7)	18 (–) 30 (–) 42 (–)	32 (4) 40 (5) 56 (7) 80 (10)	30 (3) 40 (4) 60 (6) 80 (8) 100 (10)	60 (4) 90 (6) 105 (7) 120 (8) 150 (10)	60 (4) 90 (6) 120 (8) 150 (10) 180 (12) 240 (16)
Pitch of mounting holes F		6	–	8	10	15	15
E		3	–	4	5	7.5	7.5
Standard E dimensions (1)	or higher	2.5	–	2.5	3	4	4.5
	below	5.5	–	6.5	8	11.5	12
Maximum length (2)		102	102	104 (200)	150 (300)	210 (510)	300 (990)
Maximum number of butt-jointing track rail (3)		–	–	–	–	5	7
Maximum length of butt-jointing track rail (3)		–	–	–	–	915	1 905

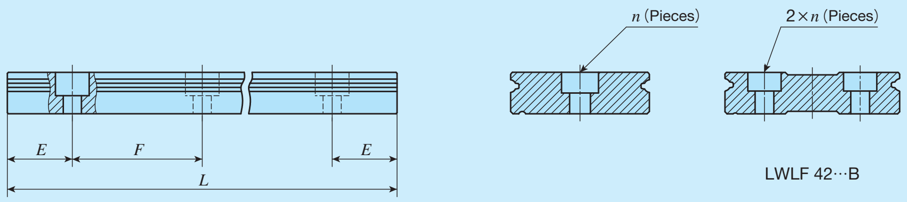
Item \ Identification number		ML 9 LWL9···B	ML 12 LWL12···B	ML 15 LWL15···B	ML 20 LWL20···B	ML 25 LWL25···B
Standard length L (n)		60 (3) 80 (4) 120 (6) 160 (8) 220 (11) 280 (14)	100 (4) 150 (6) 200 (8) 275 (11) 350 (14) 475 (19)	160 (4) 240 (6) 320 (8) 440 (11) 560 (14) 680 (17)	180 (3) 240 (4) 360 (6) 480 (8) 660 (11) 840 (14)	240 (4) 300 (5) 360 (6) 480 (8) 660 (11) 900 (15)
Pitch of mounting holes F		20	25	40	60	60
E		10	12.5	20	30	30
Standard E dimensions (1)	or higher	4.5	5	5.5	8	9
	below	14.5	17.5	25.5	38	39
Maximum length (2)		860 (1 200)	1 000 (1 450)	1 000 (1 480)	960 (1 800)	960 (1 800)
Maximum number of butt-jointing track rail (3)		2	2	2	2	2
Maximum length of butt-jointing track rail (3)		1 660	1 925	1 880	1 740	1 740

Notes (1) Not applicable to track rail with stopper pins (supplemental code "/S").
(2) Length up to the value in ( ) can be produced. If needed, please contact IKO.
(3) Not applicable to interchangeable specifications or tapped rail specifications.

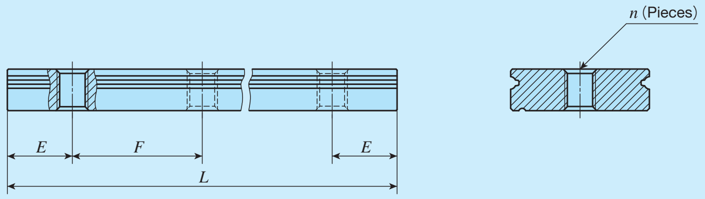
Remarks 1. A typical identification number is indicated, but is applied to all models of the same size.
2. Indicate "LWL···B" for the model code of the single track rail regardless of the series and the combination of slide unit models.
3. If not directed, E dimensions for both ends will be the same within the range of standard E dimensions. To change the dimensions, indicate the specified rail mounting hole positions "/E" of special specification. For more information, see page Ⅲ－30.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Table 3.2 Standard and maximum length of stainless steel track rail (Wide type)



Standard rail specification



Tapped rail specification
Mounting from bottom

unit: mm

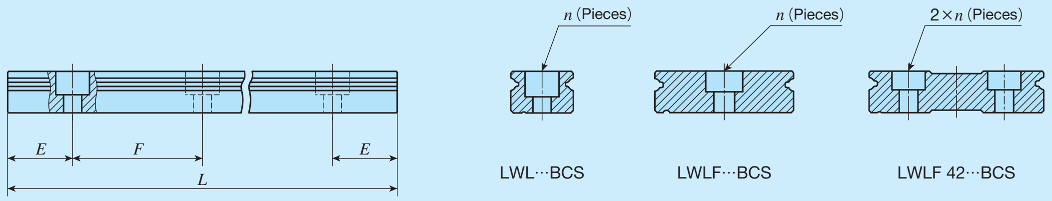
Item \ Identification number		LWLF2	LWLF4	MLF 6 LWLF6	MLF 10 LWLF 10···B	MLF 14 LWLF 14···B
Standard length L (n)		18 (3) 30 (5) 42 (7) 54 (9)	40 (4) 60 (6) 70 (7) 80 (8) 100 (10)	60 (4) 90 (6) 105 (7) 120 (8) 150 (10)	60 (3) 80 (4) 120 (6) 160 (8) 220 (11) 280 (14)	90 (3) 120 (4) 150 (5) 180 (6) 240 (8) 300 (10)
Pitch of mounting holes F		6	10	15	20	30
E		3	5	7.5	10	15
Standard E dimensions (1)	or higher	2.5	3.5	4.5	4.5	5.5
	below	5.5	8.5	12	14.5	20.5
Maximum length (2)		102	180 (300)	240 (300)	300 (500)	300 (990)
Maximum number of butt-jointing track rail (3)		–	–	–	7	8
Maximum length of butt-jointing track rail (3)		–	–	–	1 840	1 950

Item \ Identification number		MLF 18 LWLF 18···B	MLF 24 LWLF 24···B	MLF 30 LWLF 30···B	MLF 42 LWLF 42···B
Standard length L (n)		90 (3) 120 (4) 150 (5) 180 (6) 240 (8) 300 (10)	120 (3) 160 (4) 240 (6) 320 (8) 400 (10) 480 (12)	160 (4) 240 (6) 320 (8) 440 (11) 560 (14) 680 (17)	160 (4) 240 (6) 320 (8) 440 (11) 560 (14) 680 (17)
Pitch of mounting holes F		30	40	40	40
E		15	20	20	20
Standard E dimensions (1)	or higher	5.5	6.5	6.5	6.5
	below	20.5	26.5	26.5	26.5
Maximum length (2)		690 (1 860)	680 (1 960)	680 (2 000)	680 (2 000)
Maximum number of butt-jointing track rail (3)		3	3	3	3
Maximum length of butt-jointing track rail (3)		1 920	1 840	1 840	1 840

Notes (1) Not applicable to track rail with stopper pins (supplemental code "/S").
(2) Length up to the value in ( ) can be produced. If needed, please contact IKO.
(3) Not applicable to interchangeable specifications or tapped rail specifications.

Remarks 1. A typical identification number is indicated, but is applied to all models of the same size.
2. Indicate "LWLF···B" for the model code of the single track rail regardless of the series and the combination of slide unit models.
3. If not directed, E dimensions for both ends will be the same within the range of standard E dimensions. To change the dimensions, indicate the specified rail mounting hole positions "/E" of special specification. For more information, see page Ⅲ−30.

Table 3.3 Standard and maximum length of high carbon steel track rail (Standard type, Wide type)



unit: mm

Item \ Identification number		LWL 9···BCS	LWL12···BCS	LWL15···BCS	LWL20···BCS
Standard length L (n)		80 (4) 160 (8) 220 (11) 280 (14) 380 (19) 500 (25) 600 (30)	100 (4) 200 (8) 275 (11) 350 (14) 475 (19) 600 (24) 700 (28)	160 (4) 320 (8) 440 (11) 560 (14) 680 (17) 800 (20) 920 (23)	180 (3) 240 (4) 360 (6) 480 (8) 660 (11) 900 (15) 1 020 (17)
Pitch of mounting holes F		20	25	40	60
E		10	12.5	20	30
Standard E dimensions (1)	or higher	4.5	5	5.5	8
	below	14.5	17.5	25.5	38
Maximum length		1 000	1 500	1 520	1 560

Item \ Identification number		LWLF18···BCS	LWLF24···BCS	LWLF30···BCS	LWLF42···BCS
Standard length L (n)		90 (3) 180 (6) 240 (8) 300 (10) 420 (14) 510 (17) 600 (20)	120 (3) 240 (6) 320 (8) 400 (10) 600 (15) 720 (18) 800 (20)	160 (4) 320 (8) 440 (11) 560 (14) 680 (17) 800 (20) 920 (23)	160 (4) 320 (8) 440 (11) 560 (14) 680 (17) 800 (20) 920 (23)
Pitch of mounting holes F		30	40	40	40
E		15	20	20	20
Standard E dimensions (1)	or higher	5.5	6.5	6.5	6.5
	below	20.5	26.5	26.5	26.5
Maximum length		1 500	1 520	1 600	1 600

Note (1) Not applicable to track rail with stopper pins (supplemental code "/S").

Remarks 1. A typical identification number is indicated, but is applied to all models of the same size.
2. If not directed, E dimensions for both ends will be the same within the range of standard E dimensions. To change the dimensions, indicate the specified rail mounting hole positions "/E" of special specification. For more information, see page Ⅲ−30.

8 Preload amount

Clearance	: T₀	Specify this item for an assembled set or a single slide unit.
Standard	: No symbol	For details of the preload amount, see Table 4.
Light preload	: T₁	For applicable preload types, see Table 5.1 and Table 5.2.

Table 4 Preload amount

Item / Preload type	Preload symbol	Preload amount N	Operational conditions
Clearance	T₀	0 (1)	· Very light motion
Standard	(No symbol)	0 (2)	· Light and precise motion
Light preload	T₁	0.02 C_0	· Almost no vibrations · Load is evenly balanced · Light and precise motion

Notes (1) There is zero or subtle clearance.
(2) Indicates zero or minimal amount of preload.
Remark: C_0 indicates the basic static load rating.

Table 5.1 Application of preload (Standard type)

Size	Preload type (preload symbol)		
	Clearance (T₀)	Standard (No symbol)	Light preload (T₁)
1	○	–	–
2	○	–	–
3	○	–	–
5	○	○	–
7	○ (1)	○	○ (1)
9	○ (1)	○	○ (1)
12	○ (1)	○	○ (1)
15	○ (1)	○	○ (1)
20	○	○	○
25	○	○	○

Note (1) Not applicable when /HB is specified.
Remark: The mark ▨ indicates that interchangeable specification products are available.

Table 5.2 Application of preload (Wide type)

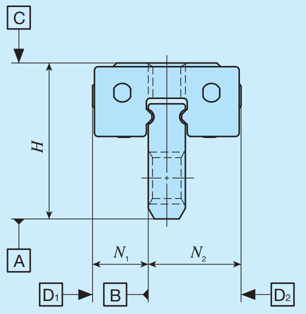
Size	Preload type (preload symbol)		
	Clearance (T₀)	Standard (No symbol)	Light preload (T₁)
2	○	–	–
4	○	–	–
6	○	–	–
10	○	○	–
14	○	○	○
18	○	○	○
24	○	○	○
30	○	○	○
42	○	○	○

Remark: The mark ▨ indicates that interchangeable specification products are available.

9 Accuracy class

High	: H	For interchangeable specification products, assemble a slide unit and a track rail of the same accuracy class.
Precision	: P	Size 1 series have "No symbols." For the details of accuracy class, see Table 6.1 and 6.2.

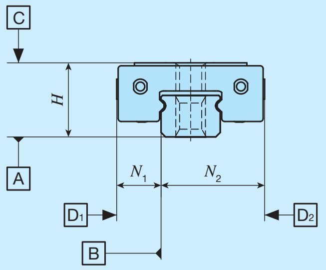
Table 6.1 Tolerance and allowable values (Series of size 1)



unit: mm

Item	Tolerance
Dim. H tolerance	±0.020
Dim. N_1 and Dim. N_2 tolerance	±0.025

Table 6.3 Tolerance and allowance (LWLF 2)

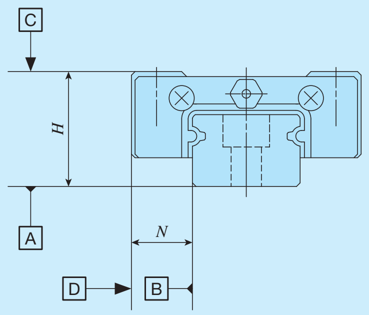


unit: mm

Item / Class (classification symbol)	High (H)	Precision (P)
Dim. H tolerance	±0.020	±0.010
Dim. N_1 and Dim. N_2 tolerance	±0.025	±0.015
Dim. variation of H (1)	0.015	0.007
Dim. variation of N (1)	0.020	0.010
Parallelism in operation of the slide unit C surface to A surface	See Fig. 1 (If the track rail length is less than 60mm, the value will be the same as 60mm.)	
Parallelism in operation of the slide unit D surface to B surface	See Fig. 1 (If the track rail length is less than 60mm, the value will be the same as 60mm.)	

Note (1) It means the size variation between slide units mounted on the same track rail.

Table 6.2 Tolerance and allowance (Series of size 2 or larger excluding LWLF2)



unit: mm

Item / Class (classification symbol)	High (H)	Precision (P)
Dim. H tolerance	±0.020	±0.010
Dim. N tolerance	±0.025	±0.015
Dim. variation of H (1)	0.015	0.007
Dim. variation of N (1)	0.020	0.010
Dim. variation of H for multiple assembled sets (2)	0.030	0.020
Parallelism in operation of the slide unit C surface to A surface	See Fig. 1	
Parallelism in operation of the slide unit D surface to B surface	See Fig. 1	

Notes (1) It means the size variation between slide units mounted on the same track rail.
(2) Applicable to the interchangeable specification.

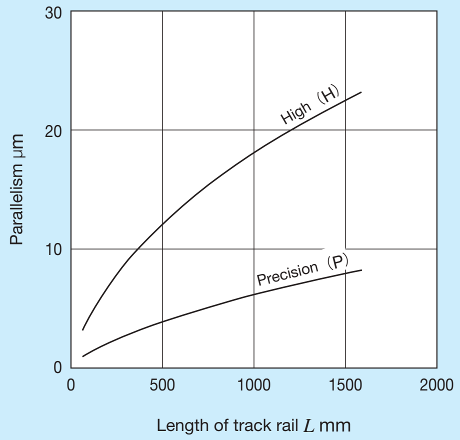


Fig. 1 Parallelism in operation (Series of size 2 or higher)

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

10 Interchangeable

S1 specification : S1
S2 specification : S2
Non-interchangeable specification : No symbol

This is specified for the interchangeable specifications. Assemble a track rail and a slide unit with the same interchangeable code. When using in combination with different interchangeable codes, please contact IKO. Note that the combination of interchangeable codes will not have any effect on accuracy.
For applicable models and sizes, see Table 2.1 and Table 2.2.
"No symbol" is indicated for non-interchangeable specification.

11 Special specification

/A, /BS, /D, /E, /HB, /I, /LR, /MN, /N, /Q, /RE, /S, /U, /W○, /Y○

For applicable special specifications, see Tables 7.1, 7.2, 7.3, and 7.4.
For combination of multiple special specifications, see Table 8.
For details of special specification, see page Ⅲ－29.

Table 7.1 Application of special specifications (Interchangeable specification, single slide unit)

Special specification	Supplemental code	Size									
		1	2	3	5	7	9	12	15	20	25
		–	4	6	10	14	18	24	30	42	–
No end seal	/N	–	–	–	○	○	○	○	○	○	○
With C-Lube plate (1)	/Q	–	–	–	○	○	○	○	○	○	○
Under seal	/U	–	–	–	×	×	○	○	○	○	○

Note (1) Applicable to LWL(F) series.

Table 7.2 Application of special specifications (Interchangeable specification, single track rail)

Special specification	Supplemental code	Size									
		1	2	3	5	7	9	12	15	20	25
		–	4	6	10	14	18	24	30	42	–
Specified rail mounting hole positions	/E	–	–	–	○	○	○	○	○	○	○
Without track rail mounting bolt	/MN	–	–	–	○	○	○	○	○	○	○

Table 7.3 Application of special specifications (Interchangeable specification, assembled set)

Special specification	Supplemental code	Size									
		1	2	3	5	7	9	12	15	20	25
		–	4	6	10	14	18	24	30	42	–
Opposite reference surfaces arrangement	/D	–	–	–	○	○	○	○	○	○	○
Specified rail mounting hole positions	/E	–	–	–	○	○	○	○	○	○	○
Without track rail mounting bolt (1)	/MN	–	–	–	○	○	○	○	○	○	○
No end seal	/N	–	–	–	○	○	○	○	○	○	○
With C-Lube plate (2)	/Q	–	–	–	○	○	○	○	○	○	○
Under seal	/U	–	–	–	×	×	○	○	○	○	○

Notes (1) Not applicable to tapped rail specification.
(2) Applicable to LWL(F) series.

Table 7.4 Application of special specifications (Non-interchangeable specification, standard type)

Special specification	Supplemental code	Size									
		1	2	3	5	7	9	12	15	20	25
Butt-jointing track rails (1) (2)	/A	×	×	×	○	○	○	○	○	○	○
Stainless steel end plate (3)	/BS	×	○	○	○	○	○	○	○	○	×
Opposite reference surfaces arrangement	/D	×	○	○	○	○	○	○	○	○	○
Specified rail mounting hole positions	/E	×	○	○	○	○	○	○	○	○	○
Hybrid C-Lube Linear Way	/HB	×	×	×	×	○	○	○	○	×	×
Inspection sheet	/I	×	○	○	○	○	○	○	○	○	○
Black chrome surface treatment (track rail) (2)	/LR	×	×	×	×	○	○	○	○	○	○
Without track rail mounting bolt (2)	/MN	×	×	×	○	○	○	○	○	○	○
No end seal	/N	×	×	×	○	○	○	○	○	○	○
With C-Lube plate (3)	/Q	×	×	×	○	○	○	○	○	○	○
Special environment seal (3)	/RE	×	×	×	○	○	○	○	○	○	×
Track rail with stopper pins	/S	×	×	×	○	○	○	○	○	○	○
Under seal	/U	×	×	×	×	×	○	○	○	○	○
A group of multiple assembled sets	/W○	×	○	○	○	○	○	○	○	○	○
Specified grease (4)	/Y○	×	○(5)	○	○	○	○	○	○	○	○

Notes (1) Not applicable to high carbon steel made products.
(2) Not applicable to tapped rail specification.
(3) Applicable to LWL series.
(4) ML series is applicable only to /YCG.
(5) Applicable only to /YNG.

Table 7.5 Application of special specifications (Non-interchangeable specification, wide type)

Special specification	Supplemental code	Size								
		2	4	6	10	14	18	24	30	42
Butt-jointing track rails (1) (2)	/A	×	×	×	○	○	○	○	○	○
Stainless steel end plate (3)	/BS	×	×	×	○	○	○	○	○	○
Opposite reference surfaces arrangement	/D	×	○	○	○	○	○	○	○	○
Specified rail mounting hole positions	/E	○	○	○	○	○	○	○	○	○
Inspection sheet	/I	○	○	○	○	○	○	○	○	○
Black chrome surface treatment (track rail) (2)	/LR	×	×	×	×	○	○	○	○	○
Without track rail mounting bolt (2)	/MN	×	○	○	○	○	○	○	○	○
No end seal	/N	×	×	×	○	○	○	○	○	○
With C-Lube plate (3)	/Q	×	×	×	○	○	○	○	○	○
Special environment seal (3)	/RE	×	×	×	○	○	○	○	○	○
Track rail with stopper pins	/S	×	×	×	○	○	○	○	○	○
Under seal	/U	×	×	×	×	×	○	○	○	○
A group of multiple assembled sets	/W○	○	○	○	○	○	○	○	○	○
Specified grease (4)	/Y○	×	○(5)	○	○	○	○	○	○	○

Notes (1) Not applicable to high carbon steel made products.
(2) Not applicable to tapped rail specification.
(3) Applicable to LWLF series.
(4) MLF series is applicable only to /YCG.
(5) Applicable only to /YNG.

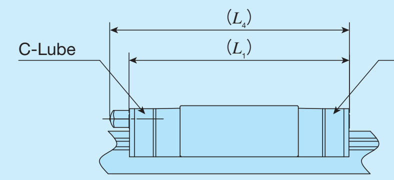
Table 8 Combination of supplemental codes

BS	○													
D	○	○												
E	–	○	–											
HB	○	–	○	○										
I	○	○	○	○	○									
LR	–	○	○	○	○	○								
MN	○	○	○	○	○	○	○							
N	○	○	○	○	○	○	○	○						
Q	○	○	○	○	–	○	○	○	○					
RE	○	○	○	○	–	○	○	○	–	○				
S	○	○	○	○	○	○	○	○	○	○	○			
U	○	○	○	○	○	○	○	○	–	○	–	○		
W	○	○	○	–	○	○	○	○	○	○	○	○	○	
Y	○	○	○	○	–	○	○	○	○	–	○	○	○	○
	A	BS	D	E	HB	I	LR	MN	N	Q	RE	S	U	W

Remarks 1. The combination of " – " shown in the table is not available.
2. When using multiple types for combination, please indicate by arranging the symbols in alphabetical order.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Table 9 Dimension of slide unit with C-Lube plate (Supplemental code /Q)



unit: mm

Identification number	L_1	L_4	Identification number	L_1	L_4
LWLC 5…B	22	–	LWLFC 10…B	26.5	–
LWL 5…B	25	–	LWLF 10…B	30.5	–
LWLC 7…B	27	–	LWLFC 14…B	30.5	–
LWL 7…B	31.5	–	LWLF 14…B	39.5	–
LWLG 7…B	39	–	LWLFG 14…B	50	–
LWLC 9…B	30	–	LWLFC 18…B	34.5	–
LWL 9…B	39	–	LWLF 18…B	46.5	–
LWLG 9…B	49	–	LWLFG 18…B	58.5	–
LWLC 12…B	33	–	LWLFC 24…B	38.5	–
LWL 12…B	42	–	LWLF 24…B	52	–
LWLG 12…B	52	–	LWLFG 24…B	67	–
LWLC 15…B	42	47	LWLFC 30…B	45.5	50
LWL 15…B	52	57	LWLF 30…B	59.5	64
LWLG 15…B	67	72	LWLFG 30…B	78.5	83
LWLC 20…B	48	53	LWLFC 42…B	51.5	56
LWL 20…B	60	65	LWLF 42…B	65	70
LWLG 20…B	78	83	LWLFG 42…B	84.5	89
LWLC 25…B	63.5	74			
LWL 25…B	87.5	98			
LWLG 25…B	107.5	117			

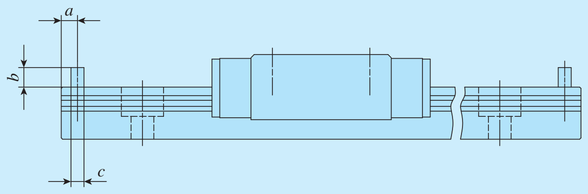
Remarks 1. The dimensions of the slide unit with C-Lube at both ends are indicated.
2. A typical identification number is indicated, but is applied to all LWL(F) series models of the same size.

Table 10 Load rating / static moment rating of Hybrid C-Lube Linear Way (Supplemental code /HB)

Identification number	C N	C_0 N	T_0 N·m	T_X(1) N·m	T_Y(1) N·m
MLC 7…/HB	937	965	3.5	1.6 12.6	1.3 10.6
ML 7…/HB	1 330	1 610	5.9	4.0 23.9	3.3 20.1
MLG 7…/HB	1 690	2 250	8.2	7.5 43.1	6.3 36.2
MLC 9…/HB	1 180	1 260	5.9	2.4 18.2	2.1 15.3
ML 9…/HB	1 810	2 340	10.9	7.7 43.4	6.5 36.4
MLG 9…/HB	2 370	3 420	15.9	15.9 83.6	13.4 70.1
MLL 9…/HB	2 870	4 500	20.9	27.1 134	22.7 112
MLC 12…/HB	2 210	2 030	12.6	4.5 35.5	3.8 29.8
ML 12…/HB	3 330	3 650	22.6	13.1 79.2	11.0 66.4
MLG 12…/HB	4 310	5 270	32.7	26.0 143	21.9 120
MLL 12…/HB	5 820	8 110	50.3	59.3 288	49.8 242
MLC 15…/HB	3 490	3 310	25.5	9.9 71.8	8.3 60.3
ML 15…/HB	4 980	5 520	42.5	25.3 146	21.2 122
MLG 15…/HB	6 620	8 280	63.7	54.3 288	45.5 241
MLL 15…/HB	8 370	11 600	89.2	104 497	86.9 417

Note (1) The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

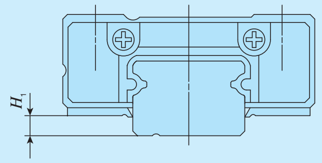
Table 11 Dimension of track rail with stopper pins (Supplemental code /S)



unit: mm

Size		a	b	c
5	–	2	2	1.6
7	–	2.5	2.5	2
9	–		3	
–	10		2	1.6
12	–		3	2
–	14			
15	–		4	
–	18		3	
20	–		5	
–	24		3	
25	–	3.5	5	
–	30	2.5	4	
–	42		5	

Table 12 H_1 dimension with under seal (Supplemental code /U)



unit: mm

Size		H_1
9	–	1
12	–	2
15	–	3
–	18	2
20	–	4
–	24	2
25	–	5(1)
–	30	2
–	42	3

Note (1) The dimensions are the same as those before mounting of under seal.

Lubrication

Lithium-soap base grease (MULTEMP PS No.2 [KYODO YUSHI CO., LTD.]) is pre-packed in ML(F) and LWL(F) series. Additionally, ML(F) series has C-Lube placed in the recirculation part of balls, so that the interval for reapplicating lubricant can be extended and maintenance works such as grease job can be reduced significantly.

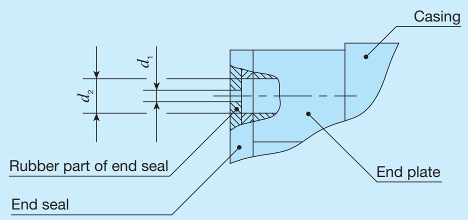
ML(F) series and LWL(F) series have grease nipple or oil hole as indicated in Table 14. Since the Size 1, 2, 3, 4 and 6 series do not have an oil hole, apply grease directly to the raceway part of the track rail for re-greasing. Supply nozzles fit to each shapes of grease nipple and dedicated supplying equipment (miniature greasers) fit to oil holes are also available. For order of these parts for lubrication, see Table 13 and Table 14.1 on Page Ⅲ－23, and Table 15 on page Ⅲ－24.

Dust Protection

The slide units of ML(F) series and LWL(F) series are equipped with end seals as standard for dust protection. However, if large amount of contaminant or dust are floating, or if large particles of foreign substances such as chips or sand may adhere to the track rail, it is recommended to attach a protective cover to the linear motion mechanism.

No end seal is provided for size 1, 2, 3, 4 or 6 series. For applications in the environment not clean enough, cover the entire unit with a protective case, etc. to prevent harmful foreign substances such as dust and particles from outside to enter.

Table 13 Oil hole specifications



unit: mm

Size		d_1	d_2
5	10	0.5	1.1
7	14		1.2
9	18		1.5
12	24		2

Table 14 Parts for lubrication

Size		Grease nipple type (1)	Applicable supply nozzle type	Bolt size of female threads for piping
5, 7, 9, 12	10, 14, 18, 24	Oil hole	Miniature greaser MG10B/MT2	–
15, 20	30, 42	A-M3	A-5120V A-5240V B-5120V B-5240V	
25	–	B-M4	A-8120V B-8120V	M4

Note (1) For grease nipple specification, see Table 14.1 on page Ⅲ－23.
Remark: Stainless steel grease nipple is also available. If needed, please contact IKO.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Precaution for Use

❶ Mounting surface, reference mounting surface and general mounting structure

When mounting the ML(F) series and LWL(F) series, properly align the reference mounting surfaces B and D (D1 or D2)of the track rail and slide unit with the reference mounting surface of the table and bed and fix them. (See Fig. 2)
Reference mounting surfaces B and D (D1 or D2) and mounting surfaces A and C are precisely ground. By machining the mounting surface of the mating member, such as machine or device, to high accuracy and mounting them properly, stable linear motion with high accuracy is obtained.
The LWL1···Y track rail has the mounting structure in the lateral direction. Two types of mounting structures are available (as shown in Fig. 3.1 and Fig. 3.2).
The reference mounting surfaces of the slide unit LWL1 (Y) and LWLF2 are located at both the left and right sides (D1 and D2). (See Fig. 5.1)
Excluding LWL1 (Y) and LWLF2, the reference mounting surface of the slide unit is on the opposite side of the IKO mark. (See Fig. 5.2)
The reference mounting surface of the track rail, with the exception of LWL1 (Y), is identified by locating the IKO mark on the top surface of the track rail. It is the side surface above the mark (in the direction of the arrow). (See Fig. 5.1 and Fig. 5.2)

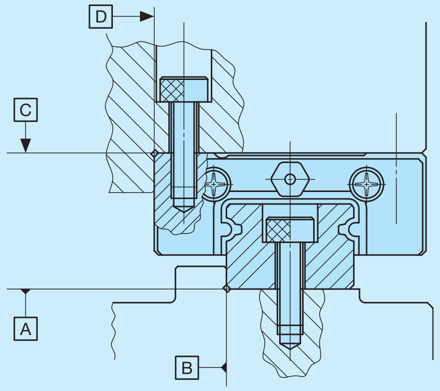


Fig. 2 Reference mounting surface and typical mounting structure

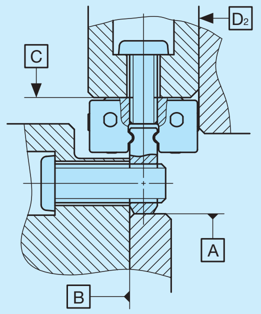


Fig. 3.1 Reference mounting surface of LWL1···Y and typical mounting structure ①

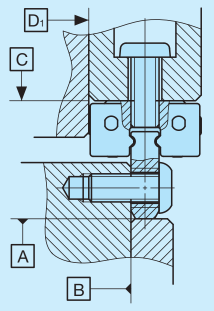


Fig. 3.2 Reference mounting surface of LWL1···Y and typical mounting structure ②

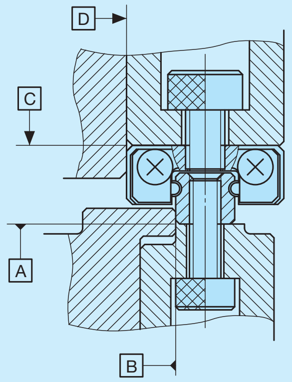


Fig. 4 Reference mounting surface of size 2, 3, 4 and 6 series and typical mounting structure

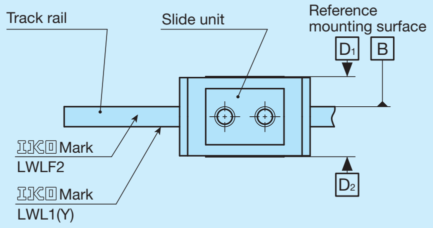


Fig. 5.1 Reference mounting surface of LWL1 (Y) and LWLF2

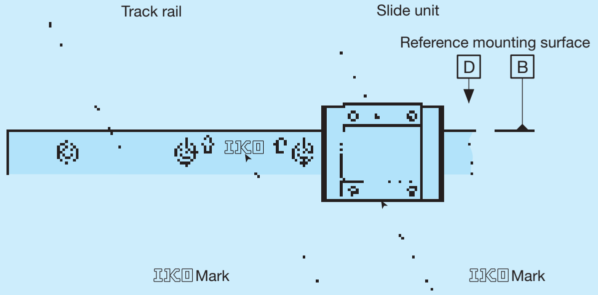


Fig. 5.2 Reference mounting surface of products other than LWL1 (Y) and LWLF2

❷ Mounting screws for slide unit

To mount a slide unit, tightly fasten the bolt against female thread of slide unit.
The female thread is created through holes of the slide unit for size 1 series, and also through holes for the slide unit and track rail for size 2, 3, 4 and 6 series. When the fixing thread depth of the mounting screw goes too deep, it can interfere with the track rail and impact the running accuracy or product life so that the fixing thread depth should be within the screwing depth specified in the dimension table.
Also prepare the small screws dedicated to precision devices (head diameter 1.8 mm or smaller) for the mounting bolt of slide unit of size 1 and LWLF2.

❸ Mounting screws for track rail

In the size 2 and 3 series and tapped rail specifications, track rail mounting bolts are not appended. Prepare mounting bolts whose fixing thread depth is less than H_4 in dimension table.

❹ Shoulder height and corner radius of the reference mounting surface

For the opposite corner of the mating reference mounting, it is recommended to have relieved fillet as indicated in Fig. 6
Recommended value for the shoulder height on the mating side is indicated in Table 16.

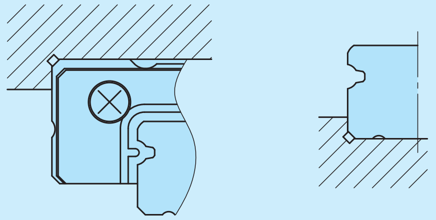


Fig. 6 Corner of the mating reference mounting

❺ Tightening torque for fixing screw

Typical tightening torque for mounting ML(F) series and LWL(F) series to the steel mating member material is indicated in Table 15. When vibration and shock of the machine or device are large, fluctuating load is large, or moment load is applied, fix it by using the torque 1.2 to 1.5 times larger than the value indicated in the table as necessary. If the mating member material is cast iron or aluminum alloy, reduce the tightening torque depending on the strength characteristics of the mating member material.

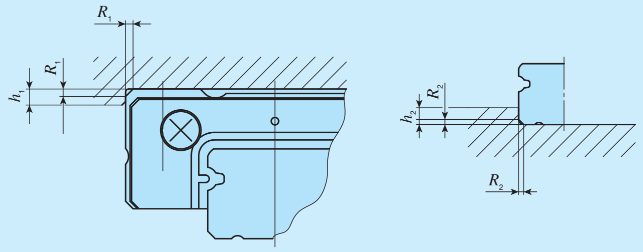
Table 15 Tightening torque for fixing screw

Bolt size	Tightening torque N・m	
	Stainless steel-made screw	High carbon steel-made screw
M1 ×0.25	0.04	–
M1.4×0.3	0.10	–
M1.6×0.35	0.15	–
M2 ×0.4	0.31	–
M2.5×0.45	0.62	–
M3 ×0.5	1.1	1.3
M4 ×0.7	2.5	2.9
M5 ×0.8	5.0	5.7
M6 ×1	8.5	–

Remarks 1. The tightening torque is calculated based on strength division 8.8 and property division A2-70.
2. It is recommended that the tightening torque of slide unit mounting holes for series size 1 is to be 70 to 80 % of the values in the table.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Table 16 Shoulder height and corner radius of the reference mounting surface



Mounting part of slide unit   Mounting part of track rail

unit: mm

Identification number		Mounting part of slide unit		Mounting part of track rail	
		Shoulder height h_1	Corner radius R_1 (Maximum)	Shoulder height (1) h_2	Corner radius R_2 (Maximum)
–	LWL 1…Y	1.3	–	2	–
–	LWL 1			–	
–	LWL 2	1	0.1	0.5	0.05
ML 3	LWL 3	1.2	0.15	0.8	0.1
ML 5	LWL 5…B	2	0.3	0.8	0.2
ML 7	LWL 7…B	2.5	0.2	1.2	0.2
ML 9	LWL 9…B	3	0.2	1.5	0.2
–	LWL 9…BCS		0.4		
ML 12	LWL 12…B	4	0.2	2.5	0.2
–	LWL 12…BCS		0.4		
ML 15	LWL 15…B	4.5	0.2	3	0.2
–	LWL 15…BCS		0.4		
ML 20	LWL 20…B	5	0.2	4	0.2
–	LWL 20…BCS		0.4		
ML 25	LWL 25…B	6.5	0.7	4	0.7
–	LWLF 2	1.3	–	–	–
–	LWLF 4	1.5	0.1	0.8	0.1
MLF 6	LWLF 6	2	0.1	0.8	0.1
MLF 10	LWLF 10…B	2	0.3	1.2	0.2
MLF 14	LWLF 14…B	2.5	0.2	1.2	0.2
MLF 18	LWLF 18…B	3	0.2	2.5	0.2
–	LWLF 18…BCS		0.4		
MLF 24	LWLF 24…B	4	0.2	2.5	0.2
–	LWLF 24…BCS		0.4		
MLF 30	LWLF 30…B	4.5	0.2	2.5	0.2
–	LWLF 30…BCS		0.4		
MLF 42	LWLF 42…B	5	0.2	3	0.2
–	LWLF 42…BCS		0.4		

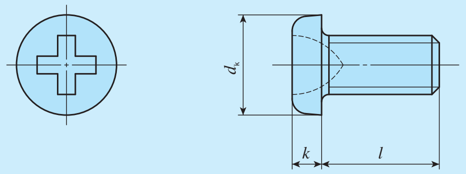
Note (1) For models with under seals (supplemental code "/U"), it is recommended to use the values 1mm smaller than the values in the table. However for the models of size 9 with under seal, 0.8 mm is recommended.

Remark: A typical identification number is indicated, but is applied to all models of the same size.

Track rail mounting bolts for slide unit and tapped rail specification

For LWL(F) series, track rail mounting bolts for slide unit and tapped rail specification shown in Table 17 and Table 18 are available. If these parts are necessary, please contact IKO. Note that the dimensions are different from the appended track rail mounting bolts.

Table 17 Cross-recessed pan head screw for precision equipment

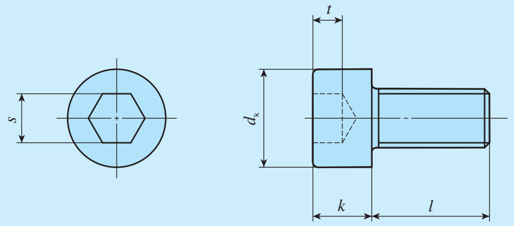


unit: mm

Bolt size (d)	Pitch of screw P	d_k	k	l
M1	0.25	1.8	0.45	3, 4, 5
M1.4 (1)	0.3	2.5	0.8	2.5, 3, 4
M1.6 (1)	0.35	2.8	0.85	4, 5, 6
M2 (1)	0.4	3.5	1	3, 4, 5

Note (1) Based on cross-recessed head screw for precision equipment (Number 0) in Japan Camera Industry Standard JCIS 10-70.

Table 18 Hexagon socket head bolt



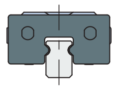
unit: mm

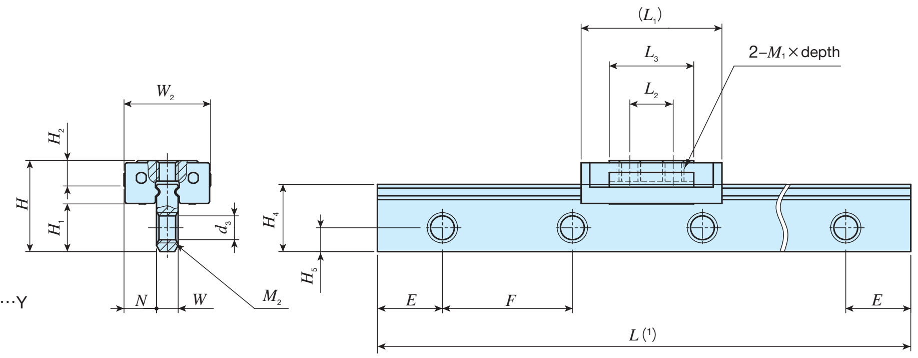
Bolt size (d)	Pitch of screw P	d_k	k	s	t	l
M1.4	0.3	2.6	1.4	1.3	0.6	2.5, 3, 4
M1.6 (1)	0.35	3	1.6	1.5	0.7	4, 5, 6
M2 (1)	0.4	3.8	2	1.5	1	3, 4, 5

Note (1) Based on hexagon socket head bolts equivalent to JIS B 1176.

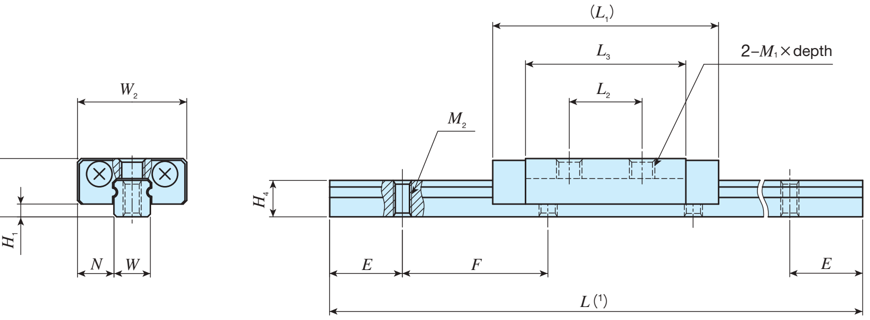
IKO C-Lube Linear Way ML

Standard type

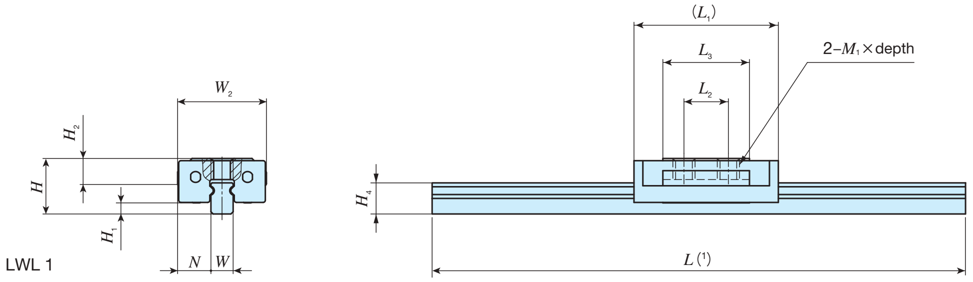
Shape	**ML** ・ **LWL** 
Size	1 | 2 | 3 | 5 | 7 9 | 12 | 15 | 20 | 25



LWL 1…Y



LWL 2
MLC 3、LWLC 3
ML 3、LWL 3

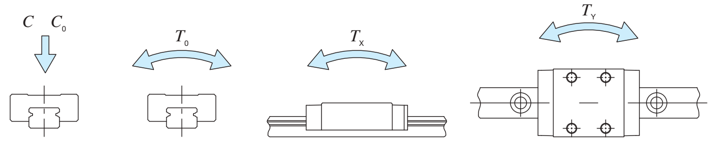


LWL 1

Identification number		Interchangeable	Mass (Ref.) g		Dimensions of assembly mm			Dimensions of slide unit mm						Dimensions of track rail mm							Mounting bolt for track rail (2) mm	Basic dynamic load rating (5)	Basic static load rating (5)	Static moment rating (5)		
ML series	LWL series (No C-Lube)		Slide unit	Track rail (per 100 mm)	H	H_1	N	W_2	L_1	L_2	L_3	M_1×depth	H_2	W	H_4	H_5	M_2	d_3	E	F	Bolt size×ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
–	LWL 1…Y	–	0.16	2.1	4.2	2.2	1.5	4	6.5	2	3.9	M1 ×0.9	1.2	1	3.1	1.1	M1.4 Through	1.1	3	6	M1×ℓ or M1.4×ℓ (3)	66.8	113	0.06	0.07 0.47	0.09 0.56
–	LWL 1	–		1.0	2.5	0.5									1.4	–	–	–	–	–	–					
–	LWL 2	–	0.9	2.8	3.2	0.7	2	6	12.5	4	8.8	M1.4×1.1	–	2	2	–	M1 Through	–	4	8	M1 ×ℓ (4)	211	381	0.42	0.54 2.9	0.64 3.5
MLC 3		–	0.9	5.3	4	1	2.5	8	10.5	3.5	7	M1.6×1.3	–	3	2.6	–	M1.6 Through	–	5	10	M1.6×ℓ (4)	272	406	0.65	0.49 2.7	0.58 3.2
	LWLC 3	–	1.0						11.5		6.7											251	361	0.58	0.39 2.7	0.47 3.2
ML 3		–	1.3						14.5	5.5	11	M2 ×1.3										371	632	1.0	1.1 5.6	1.3 6.6
	LWL 3	–	1.6						15.5		10.7											353	587	0.94	0.98 5.6	1.2 6.7

Notes (1) Track rail lengths L are shown in Table 3.1 on page Ⅱ−10.
(2) Track rail mounting bolts are not appended.
(3) Prepare screws according to mounting structure.
(4) Choose screws whose dimension allow fixing thread depth into track rail ℓ to be less than H_4.
(5) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below.
The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

Remarks 1. Metal parts are made of stainless steel.
2. Do not disassemble a slide unit from the track rail because steel balls are not retained. No end seal is attached.
3. The specification of small size mounting bolts (M2 and less) are show on page Ⅱ−22. If needed, please contact IKO.



Example of identification number of assembled set

Model code		Dimensions	Part code		Model code	Preload symbol	Classification symbol	Supplemental code
LWL		2	C2	R80		T0	P	/D
1	2	3	4	5	1	6	7	8

① Model	
ML	Standard type
LWL	
LWL…Y	

② Length of slide unit	
C	Short
No symbol	Standard

③ Size
1, 2, 3

④ Number of slide unit (2)

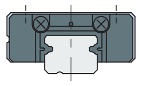
⑤ Length of track rail (80 mm)

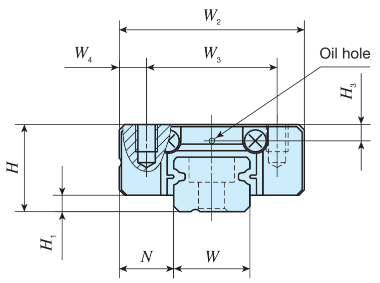
⑥ Preload amount	
T0	Clearance

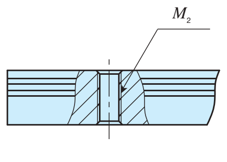
⑦ Accuracy class	
No symbol	Ordinary
H	High
P	Precision

⑧ Special specification
BS, D, E, Ⅰ, W, Y

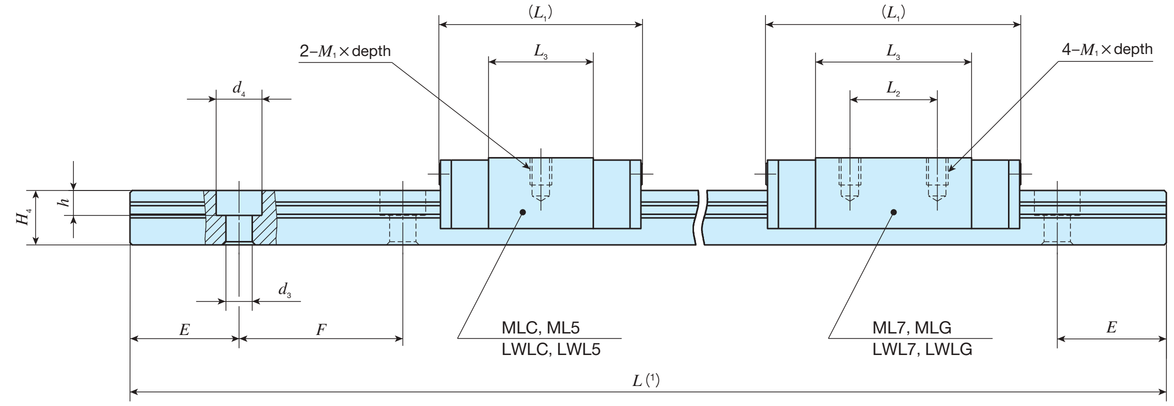
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Standard type					
	ML • **LWL**				
Shape					
Size	1	2	3	5	7
	9	12	15	20	25





Tapped rail specification
LWL…N



Identification number		Interchangeable	Mass (Ref.) g		Dimensions of assembly mm			Dimensions of slide unit mm								Dimensions of track rail mm								Appended mounting bolt for track rail (2) mm	Basic dynamic load rating (4)	Basic static load rating (4)	Static moment rating (4)		
ML series	LWL series (No C-Lube)		Slide unit	Track rail (per 100 mm)	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	M_1×depth	H_3	W	H_4	M_2	d_3	d_4	h	E	F	Bolt size×ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MLC 5	LWLC 5…B	○	3.4	12	6	1	3.5	12	8	2	16	–	9.6	M2×1.5	1.2	5	3.7	–	2.4	3.6	0.8	7.5	15	Cross-recessed pan head screw for precision equipment M2×6	562	841	2.2	1.4 8.5	1.2 7.2
MLC 5…N*	LWLC 5…N*	–		13														M2.5 Through	–	–	–			M2.5×ℓ (3) (Not appended)					
ML 5		○	4.3	12							19		12.6					–	2.4	3.6	0.8			Cross-recessed pan head screw for precision equipment M2×6	676	1 090	2.9	2.3 12.8	1.9 10.8
	LWL 5…B	○	4.4																										
ML 5…N*		–	4.3	13														M2.5 Through	–	–	–			M2.5×ℓ (3) (Not appended)					
	LWL 5…N*	–	4.4																										
MLC 7		○	6.7	22	8	1.5	5	17	12	2.5	19	–	9.6	M2×2.5	1.5	7	5	–	2.4	4.2	2.3	7.5	15	Hexagon socket head bolt M2×6	937	1 140	4.1	1.8 14.9	1.5 12.5
	LWLC 7…B	○	7.1																										
MLC 7…N*		–	6.7	24														M3 Through	–	–	–			M3×ℓ (3) (Not appended)					
	LWLC 7…N*	–	7.1																										
ML 7		○	9.1	22							23.5	8	14.3					–	2.4	4.2	2.3			Hexagon socket head bolt M2×6	1 330	1 890	6.9	4.7 28.2	3.9 23.6
	LWL 7…B	○	10																										
ML 7…N*		–	9.1	24														M3 Through	–	–	–			M3×ℓ (3) (Not appended)					
	LWL 7…N*	–	10																										
MLG 7		○	13	22							31	12	21.6					–	2.4	4.2	2.3			Hexagon socket head bolt M2×6	1 690	2 650	9.7	8.8 50.7	7.4 42.5
	LWLG 7…B	○	14																										
MLG 7…N*		–	13	24														M3 Through	–	–	–			M3×ℓ (3) (Not appended)					
	LWLG 7…N*	–	14																										

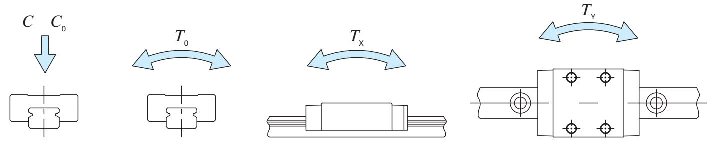
Notes (1) Track rail lengths L are shown in Table 3.1 on page Ⅱ–10.

(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176 or JCIS10-70 cross-recessed pan head screw for precision equipment.

(3) Choose screws whose dimension allow fixing thread depth into track rail ℓ to be less than H_4.

(4) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below.
The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.
If hybrid C-Lube Linear Way specification (supplemental code "/HB") is selected in MLC7, ML7, and MLG7, see Table 10 on page Ⅱ–17.

Remarks 1. The specification of oil hole is shown in Table 13 on page Ⅱ–18.
2. The identification numbers with * are our semi-standard items.



Example of identification number of assembled set

Model code		Dimensions	Part code		Model code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
ML	C	7	C2	R120		T1	P		/D
①	②	③	④	⑤	①	⑥	⑦	⑧	⑨

① Model	
ML LWL…B LWL…N	Standard type

② Length of slide unit	
C	Short
No symbol	Standard
G	Long

③ Size
5, 7

④ Number of slide unit (2)

⑤ Length of track rail (120 mm)

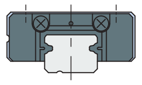
⑥ Preload amount	
T0	Clearance
No symbol	Standard
T1	Light preload

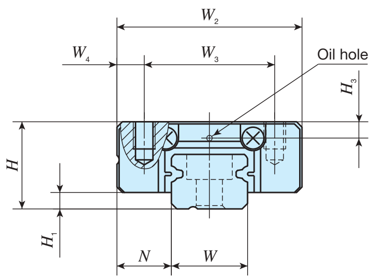
⑦ Accuracy class	
H	High
P	Precision

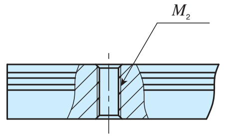
⑧ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

⑨ Special specification
A, BS, D, E, HB, Ⅰ, LR MN, N, Q, RE, S, W, Y

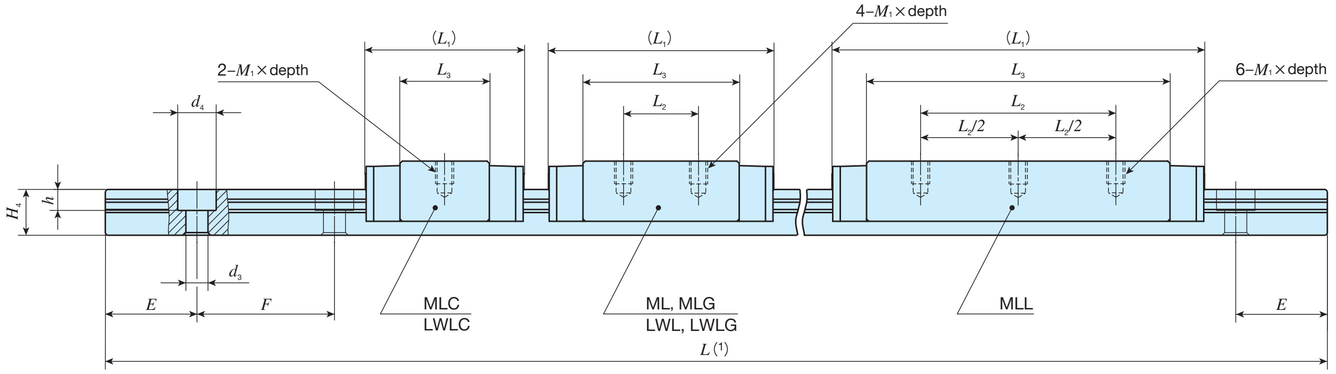
IKO C-Lube Linear Way ML

Standard type					
Shape	**ML** • **LWL** 				
Size	1	2	3	5	7
	9	12	15	20	25





Tapped rail specification
LWL…N



Identification number		Interchangeable	Mass (Ref.) g		Dimensions of assembly mm			Dimensions of slide unit mm								Dimensions of track rail mm								Appended mounting bolt for track rail (2) mm	Basic dynamic load rating (4)	Basic static load rating (4)	Static moment rating (4)		
ML series	LWL series (No C-Lube)		Slide unit	Track rail (per 100 mm)	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	M_1×depth	H_3	W	H_4	M_2	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MLC 9	LWLC 9…B	○	11	35	10	2	5.5	20	15	2.5	21.5	–	11.9	M3×3	2.2	9	6	–	3.5	6	3.5	10	20	M3×8	1 180	1 480	6.9	2.9 21.4	2.4 18.0
MLC 9…N*	LWLC 9…N*	–		37														M4 Through	–	–	–			M4× ℓ (3) (Not appended)					
ML 9		○	18	35							30	10	20.8					–	3.5	6	3.5			M3×8	1 810	2 760	12.8	9.1 51.1	7.6 42.9
	LWL 9…B	○	19																										
–	LWL 9…BCS	○																											
ML 9…N*		–	18	37														M4 Through	–	–	–			M4× ℓ (3) (Not appended)					
	LWL 9…N*	–	19																										
MLG 9		○	26	35							40.5	15	30.9					–	3.5	6	3.5			M3×8	2 370	4 030	18.7	18.7 98.3	15.7 82.5
	LWLG 9…B	○	28																										
MLG 9…N*		–	26	37														M4 Through	–	–	–			M4× ℓ (3) (Not appended)					
	LWLG 9…N*	–	28																										
MLL 9	–	○	34	35							50	26	40.4					–	3.5	6	3.5			M3×8	2 870	5 300	24.6	31.9 157	26.7 132
MLL 9…N*	–	–		37														M4 Through	–	–	–			M4× ℓ (3) (Not appended)					
MLC 12	LWLC 12…B	○	22	65	13	3	7.5	27	20	3.5	25	–	13	M3×3.5	2.7	12	8	–	3.5	6.5	4.5	12.5	25	M3×8	2 210	2 380	14.8	5.3 41.7	4.5 35.0
ML 12		○	34								34	15	21.6												3 330	4 290	26.6	15.4 93.1	12.9 78.2
	LWL 12…B	○	35																										
–	LWL 12…BCS	○																											
MLG 12		○	48								44	20	32												4 310	6 200	38.4	30.6 168	25.7 141
	LWLG 12…B	○	51																										
MLL 12	–	○	70								59.5	30	47.3												5 820	9 540	59.1	69.8 339	58.6 285

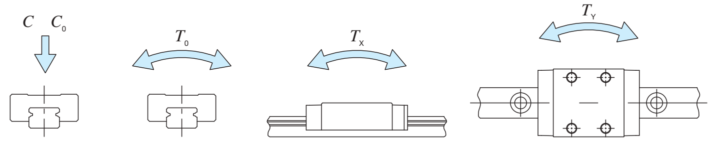
Notes (1) Track rail lengths L are shown in Table 3.1 on page Ⅱ－10 and Table 3.3 on page Ⅱ－12.

(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. For stainless steel model, stainless steel bolts are appended.

(3) Choose screws whose dimension allow fixing thread depth into track rail ℓ to be less than H_4.

(4) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below.
The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.
If hybrid C-Lube Linear Way specification (supplemental code "/HB") is selected in ML series, see Table 10 on page Ⅱ－17.

Remarks 1. The specification of oil hole is shown in Table 13 on page Ⅱ－18.
2. The identification numbers with * are our semi-standard items.



Example of identification number of assembled set

Model code	Dimensions		Part code	Model code	Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
ML	G	9	C2	R160			T1	P		/D

ML	G	9	C2	R160			T1	P		/D
①	②	③	④	⑤	①	⑥	⑦	⑧	⑨	⑩

① Model	
ML	Standard type
LWL…B	
LWL…N	

② Length of slide unit	
C	Short
No symbol	Standard
G	Long
L	Extra high rigidity long

③ Size
9, 12

④ Number of slide unit (2)

⑤ Length of track rail (160 mm)

⑥ Material type	
No symbol	Stainless steel made
CS	High carbon steel made

⑦ Preload amount	
T0	Clearance
No symbol	Standard
T1	Light preload

⑧ Accuracy class	
H	High
P	Precision

⑨ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

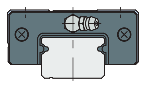
⑩ Special specification
A, BS, D, E, HB, Ⅰ, LR, MN
N, Q, RE, S, U, W, Y

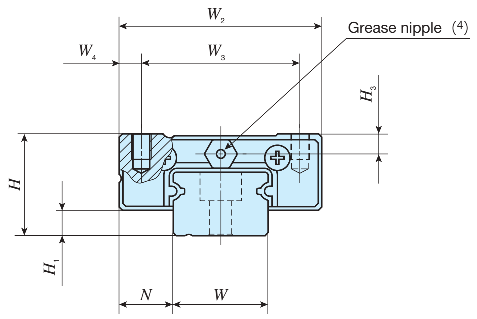
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

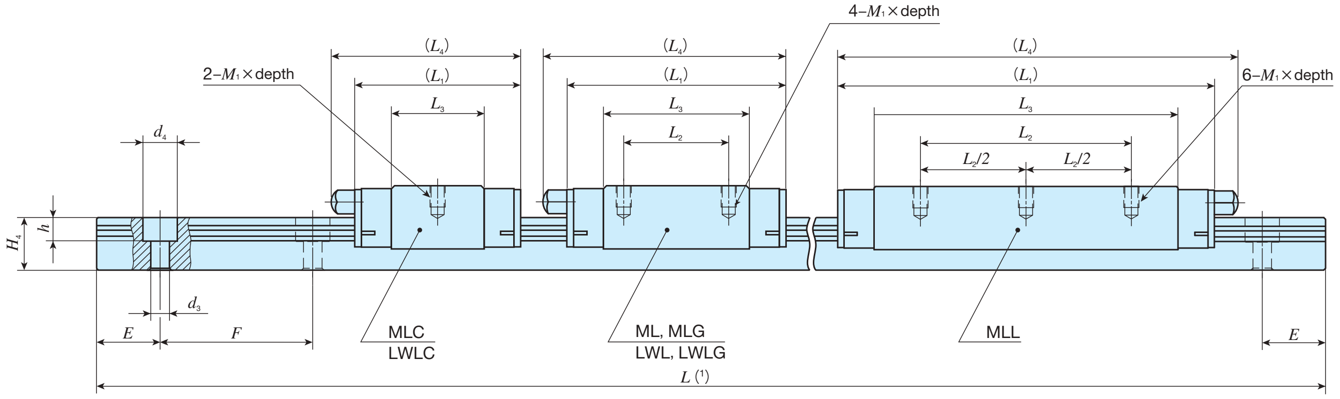
IKO C-Lube Linear Way ML

Standard type

Shape	**ML • LWL**
Size	1, 2, 3, 5, 7, 9, 12, **15**, **20**, **25**







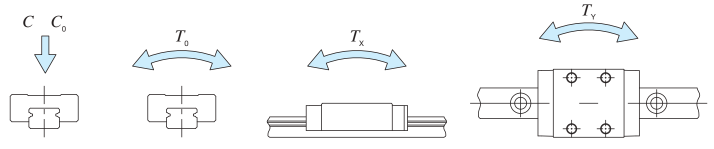
Identification number		Interchangeable	Mass (Ref.) g		Dimensions of assembly mm			Dimensions of slide unit mm									Dimensions of track rail mm								Appended mounting bolt for track rail (2) mm	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
ML series	LWL series (No C-Lube)		Slide unit	Track rail (per 100 mm)	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	M_1×depth	H_3	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MLC 15		○	43	107	16	4	8.5	32	25	3.5	32	−	17.8	37	M3×4	3.1	15	10	3.5	6.5	4.5	20	40	M3×10	3 490	3 890	30.0	11.7 84.5	9.8 70.9
	LWLC 15…B	○	42										17.7																
ML 15		○	63								42	20	27.9	47											4 980	6 490	50.0	29.7 172	24.9 144
	LWL 15…B	○	64										27.8																
−	LWL 15…BCS	○																											
MLG 15		○	93								57	25	42.8	62											6 620	9 740	75.0	63.9 338	53.6 284
	LWLG 15…B	○	95										42.7																
MLL 15	−	○	122								72	40	57.7	76											8 370	13 600	105	122 585	102 491
MLC 20	LWLC 20…B	○	89	156	20	5	10	40	30	5	38	−	22.3	43	M4×6	4.2	20	11	6	9.5	5.5	30	60	M5×14	4 580	5 300	54.0	19.4 134	16.3 112
ML 20		○	130								50	25	34.6	55											6 650	9 080	92.6	52.7 280	44.2 235
	LWL 20…B	○	133																										
−	LWL 20…BCS	○																											
MLG 20		○	189								68	30	52.3	73											8 510	12 900	131	102 529	85.7 444
	LWLG 20…B	○	196																										
MLC 25		○	189	243	25	5	12.5	48	35	6.5	54.5	−	31.9	64	M6×7	5	23	15	7	11.0	9.0	30	60	M6×16	9 120	10 600	128	57.4 376	48.1 316
	LWLC 25…B	○	190																										
ML 25		○	305								78	35	55.7	88											13 500	18 500	223	163 887	137 744
	LWL 25…B	○	310																										
MLG 25		○	405								98	40	75.5	108											16 700	25 200	303	293 1 480	246 1 240
	LWLG 25…B	○	413																										

Notes (1) Track rail lengths L are shown in Table 3.1 on page Ⅱ−10 and Table 3.3 on page Ⅱ−12.

(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. For stainless steel model, stainless steel bolts are appended.

(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below.
The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.
If hybrid C-Lube Linear Way specification (supplemental code "/HB") is selected in MLC15, ML15, MLG15, and MLL15, see Table 10 on page Ⅱ−17.

(4) The shapes of grease nipple vary by size. The specifications are shown in Table 14 on page Ⅱ−18.



Example of identification number of assembled set

Model code		Dimensions	Part code		Model code	Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
ML	G	15	C2	R320			T1	P		/D
①	②	③	④	⑤	①	⑥	⑦	⑧	⑨	⑩

① Model

ML	Standard type
LWL…B	

② Length of slide unit

C	Short
No symbol	Standard
G	Long
L	Extra high rigidity long

③ Size

15, 20, 25

④ Number of slide unit (2)

⑤ Length of track rail (320 mm)

⑥ Material type

No symbol	Stainless steel made
CS	High carbon steel made

⑦ Preload amount

T0	Clearance
No symbol	Standard
T1	Light preload

⑧ Accuracy class

H	High
P	Precision

⑨ Interchangeable

No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

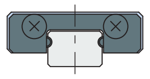
⑩ Special specification

A, BS, D, E, HB, Ⅰ, LR, MN
N, Q, RE, S, U, W, Y

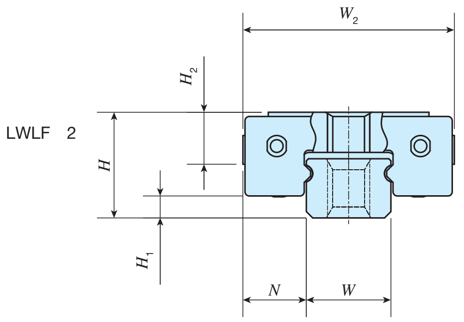
IKO C-Lube Linear Way ML

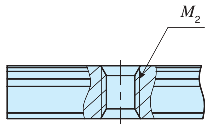
Wide type

Shape	**MLF ・ LWLF**

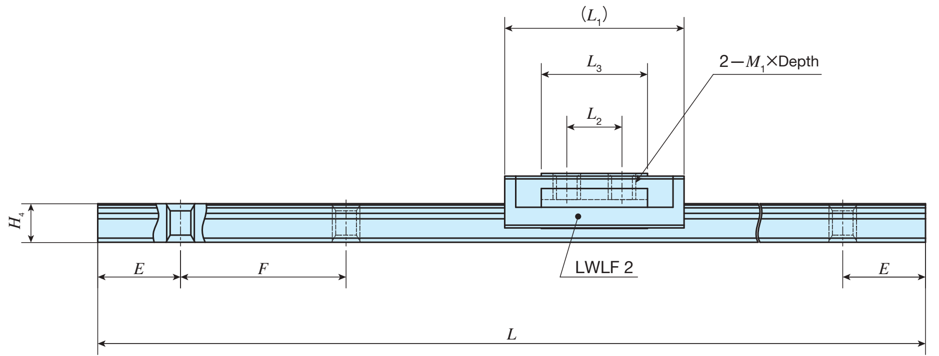


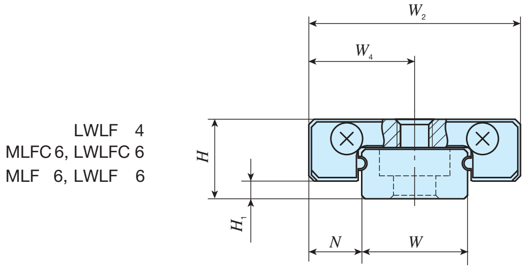
Size				
2	4	6	10	14
18	24	30	42	

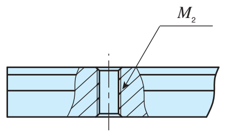




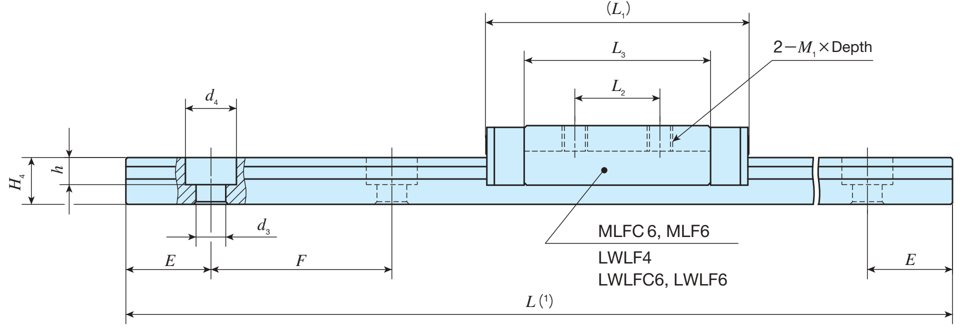
Tapped rail specification
LWLF2







Tapped rail specification
LWLF6…N

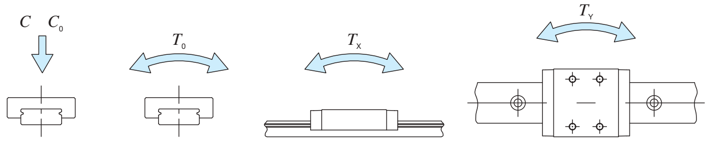


Identification number MLF series	Identification number LWLF series (No C-Lube)	Interchangeable	Mass (Ref.) g Slide unit	Mass (Ref.) g Track rail (per 100 mm)	Dimensions of assembly mm H	H_1	N	Dimensions of slide unit mm W_2	W_3	W_4	L_1	L_2	L_3	$M_1\times$depth	H_2	H_3	Dimensions of track rail mm W	H_4	M_2	d_3	d_4	h	E	F	Appended mounting bolt for track rail mm Bolt size× ℓ	Basic dynamic load rating (4) C N	Basic static load rating (4) C_0 N	Static moment rating (4) T_0 N·m	T_X N·m	T_Y N·m
–	LWLF 2(2)	–	0.21	2	2.5	0.5	1.5	5	–	–	6.5	2	3.9	M1 × 0.9	1.2	–	2	1.4	M1 Through	–	–	–	3	6	M1× ℓ (3) (Not appended)	66.8	118	0.12	0.07 0.47	0.09 0.56
–	LWLF 4(2)	–	2.1	6.8	4	1	3	10	–	5	17	6.5	11.9	M2 × 1.3	–	–	4	2.6	–	1.8	2.8	0.75	5	10	Cross-recessed pan head screw for precision equipment M1.6×5	390	677	1.4	1.3 7.1	1.5 8.4
MLFC 6(2)		–	2.1	13	4.5	1	3	12	–	6	15	4.5	9.8	M2 × 1.6	–	–	6	2.8	–	2.4	4	1.5	7.5	15	Cross-recessed pan head screw for precision equipment M2×4	334	542	1.7	0.84 5.1	1.0 6.1
	LWLFC 6(2)	–	2.4																											
MLFC 6…N(2)*		–	2.1	12															M3 Through	–	–	–			M3× ℓ (3) (Not appended)					
	LWLFC 6…N(2)*	–	2.4																											
MLF 6(2)		–	3.1	13							20	8	14.6						–	2.4	4	1.5			Cross-recessed pan head screw for precision equipment M2×4	443	813	2.5	1.8 9.9	2.2 11.8
	LWLF 6(2)	–	3.4																											
MLF 6…N(2)*		–	3.1	12															M3 Through	–	–	–			M3× ℓ (3) (Not appended)					
	LWLF 6…N(2)*	–	3.4																											

1N≒0.102kgf

Notes (1) Track rail lengths L are shown in Table 3.2 on page Ⅱ－11.
(2) Steel balls are not retained. No end seal is attached.
(3) Choose screws whose dimension allow fixing thread depth into track rail ℓ to be less than H_4.
(4) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below.
The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

Remarks 1. The identification numbers with * are our semi-standard items.
2. There is no oil hole on the slide unit.



Example of identification number of assembled set

Model code		Dimensions	Part code		Model code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MLF	C	6	C2	R120		T0	P		/D
❶	❷	❸	❹	❺	❶	❻	❼	❽	❾

① Model	
MLF	Wide type
LWLF	
LWLF…N	

② Length of slide unit	
C	Short
No symbol	Standard

③ Size
2, 4, 6, 10

④ Number of slide unit (2)

⑤ Length of track rail (120 mm)

⑥ Preload amount	
T0	Clearance
No symbol	Standard

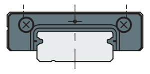
⑦ Accuracy class	
H	High
P	Precision

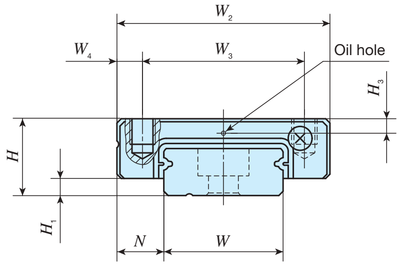
⑧ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

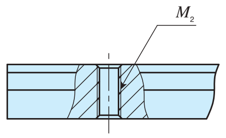
⑨ Special specification
A, BS, D, E, Ⅰ, MN, N, Q
RE, S, W, Y

IKO C-Lube Linear Way ML

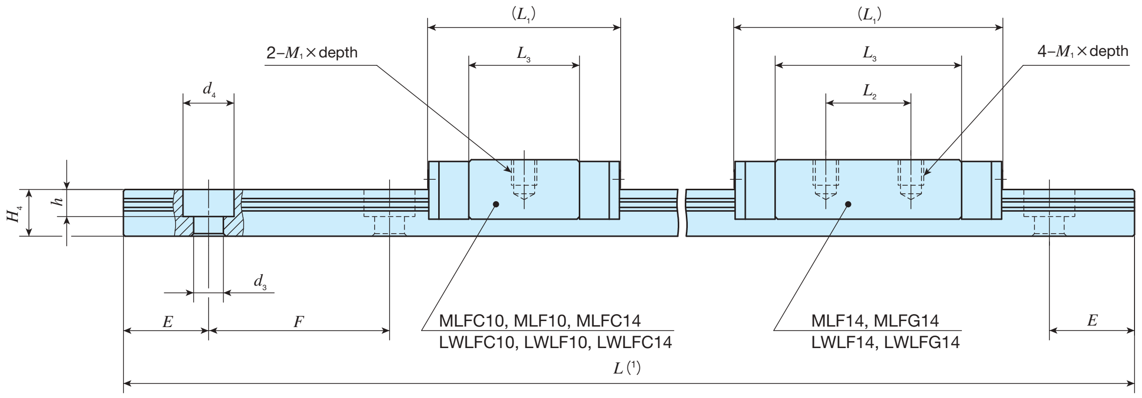
Wide type

Shape	**MLF** • **LWLF** 
Size	2 4 6 **10** **14** 18 24 30 42





Tapped rail specification
LWLF···N

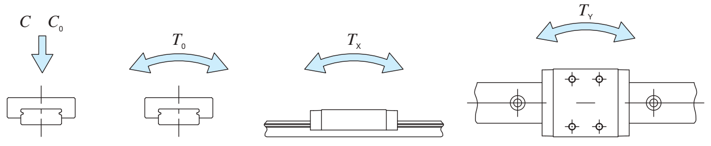


Identification number		Interchangeable	Mass (Ref.) g		Dimensions of assembly mm			Dimensions of slide unit mm								Dimensions of track rail mm								Appended mounting bolt for track rail (2) mm	Basic dynamic load rating (4)	Basic static load rating (4)	Static moment rating (4)		
MLF series	LWLF series (No C-Lube)		Slide unit	Track rail (per 100 mm)	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	M_1×depth	H_3	W	H_4	M_2	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N·m	T_X N·m	T_Y N·m
MLFC 10		○	6.1	28	6.5	1.5	3.5	17	13	2	20.5	–	13.6	M2.5×1.5	1.3	10	4	–	2.9	4.8	1.6	10	20	Cross-recessed pan head screw for precision equipment M2.5×7	712	1 180	6.1	2.6 14.9	2.2 12.5
	LWLFC 10···B	○	5.9																										
MLFC 10···N*		–	6.1	29														M3 Through	–	–	–			M3× ℓ (3) (Not appended)					
	LWLFC 10···N*	–	5.9																										
MLF 10		○	7.6	28							24.5		17.6					–	2.9	4.8	1.6			Cross-recessed pan head screw for precision equipment M2.5×7	849	1 510	7.8	4.2 22.4	3.5 18.8
	LWLF 10···B	○	7.5																										
MLF 10···N*		–	7.6	29														M3 Through	–	–	–			M3× ℓ (3) (Not appended)					
	LWLF 10···N*	–	7.5																										
MLFC 14	LWLFC 14···B	○	13	54	9	2	5.5	25	19	3	22.5	–	13	M3 ×3	1.7	14	5.5	–	3.5	6	3.2	15	30	M3×8	1 240	1 700	12.2	3.8 24.6	3.2 20.7
MLFC 14···N*	LWLFC 14···N*	–		56														M4 Through	–	–	–			M4× ℓ (3) (Not appended)					
MLF 14		○	20	54							31.5	10	22					–	3.5	6	3.2			M3×8	1 770	2 840	20.3	10.1 54.7	8.4 45.9
	LWLF 14···B	○	21																										
MLF 14···N*		–	20	56														M4 Through	–	–	–			M4× ℓ (3) (Not appended)					
	LWLF 14···N*	–	21																										
MLFG 14		○	29	54							42	19	32.5					–	3.5	6	3.2			M3×8	2 320	4 160	29.8	21.0 104	17.6 87.6
	LWLFG 14···B	○	31																										
MLFG 14···N*		–	29	56														M4 Through	–	–	–			M4× ℓ (3) (Not appended)					
	LWLFG 14···N*	–	31																										

1N≒0.102kgf

Notes (1) Track rail lengths L are shown in Table 3.2 on page Ⅱ−11.
(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176.
(3) Choose screws whose dimension allow fixing thread depth into track rail ℓ to be less than H_4.
(4) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below.
The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

Remarks 1. The specification of oil hole is shown in Table 13 on page Ⅱ−18.
2. The identification numbers with * are our semi-standard items.



Example of identification number of assembled set

Model code		Dimensions	Part code		Model code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MLF	G	14	C2	R240		T1	P		/D
❶	❷	❸	❹	❺	❶	❻	❼	❽	❾

① Model

MLF	Wide type
LWLF···B	
LWLF···N	

② Length of slide unit

C	Short
No symbol	Standard
G	Long

③ Size

10, 14

④ Number of slide unit (2)

⑤ Length of track rail (240 mm)

⑥ Preload amount

T0	Clearance
No symbol	Standard
T1	Light preload

⑦ Accuracy class

H	High
P	Precision

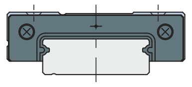
⑧ Interchangeable

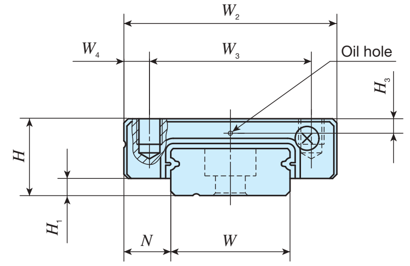
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

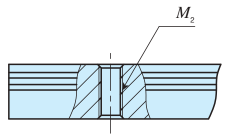
⑨ Special specification

A, BS, D, E, Ⅰ, LR, MN
N, Q, RE, S, W, Y

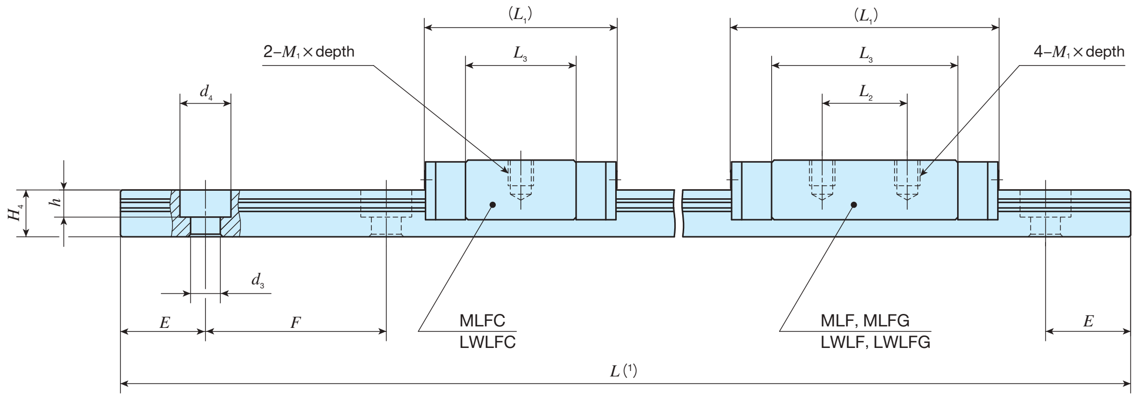
Wide type					
Shape	**MLF** • **LWLF**				
Size	2	4	6	10	14
	18	**24**	30	42	







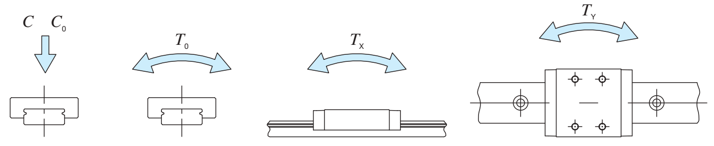
Tapped rail specification
LWLF···N



Identification number		Interchangeable	Mass (Ref.) g		Dimensions of assembly mm			Dimensions of slide unit mm								Dimensions of track rail mm								Appended mounting bolt for track rail (2) mm	Basic dynamic load rating (4)	Basic static load rating (4)	Static moment rating (4)		
MLF series	LWLF series (No C-Lube)		Slide unit	Track rail (per 100 mm)	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	M_1×depth	H_3	W	H_4	M_2	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MLFC 18	LWLFC 18···B	○	26	90	12	3	6	30	21	4.5	26.5	–	16.6	M3×3	2.5	18	7	–	3.5	6.5	4.5	15	30	M3×8	1 510	2 120	19.4	5.5 35.9	4.7 30.1
MLFC 18···N*	LWLFC 18···N*	–		92														M4 Through	–	–	–			M4× ℓ (3) (Not appended)					
MLF 18		○	42	90							38.5	12	28.6					–	3.5	6.5	4.5			M3×8	2 280	3 810	34.9	16.9 88.8	14.2 74.5
	LWLF 18···B	○	44																										
–	LWLF 18···BCS	○																											
MLF 18···N*		–	42	92														M4 Through	–	–	–			M4× ℓ (3) (Not appended)					
	LWLF 18···N*	–	44																										
MLFG 18		○	59	90					23	3.5	50.5	24	40.4					–	3.5	6.5	4.5			M3×8	2 870	5 300	48.5	31.9 159	26.7 134
	LWLFG 18···B	○	61																										
MLFG 18···N*		–	59	92														M4 Through	–	–	–			M4× ℓ (3) (Not appended)					
	LWLFG 18···N*	–	61																										
MLFC 24		○	46	139	14	3	8	40	28	6	30.5	–	17.7	M3×3.5	3.2	24	8	–	4.5	8	4.5	20	40	M4×10	2 800	3 340	40.7	9.7 67.6	8.2 56.8
	LWLFC 24···B	○	45																										
MLF 24		○	74								44	15	31												4 310	6 200	75.6	30.6 168	25.7 141
	LWLF 24···B	○	76																										
–	LWLF 24···BCS	○																											
MLFG 24		○	108								59	28	46.3												5 620	9 060	111	63.3 321	53.1 270
	LWLFG 24···B	○	111																										

Notes (1) Track rail lengths L are shown in Table 3.2 on page Ⅱ−11 and Table 3.3 on page Ⅱ−12.
(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. For stainless steel model, stainless steel bolts are appended.
(3) Choose screws whose dimension allow fixing thread depth into track rail ℓ to be less than H_4.
(4) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below.
The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

Remarks 1. The specification of oil hole is shown in Table 13 on page Ⅱ−18.
2. The identification numbers with * are our semi-standard items.



Example of identification number of assembled set

Model code	Dimensions		Part code		Model code	Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MLF	G	18	C2	R300			T1	P		/D
❶	❷	❸	❹	❺	❶	❻	❼	❽	❾	❿

① Model	
MLF	Wide type
LWLF···B	
LWLF···N	

② Length of slide unit	
C	Short
No symbol	Standard
G	Long

③ Size
18, 24

④ Number of slide unit (2)

⑤ Length of track rail (300 mm)

⑥ Material type	
No symbol	Stainless steel made
CS	High carbon steel made

⑦ Preload amount	
T0	Clearance
No symbol	Standard
T1	Light preload

⑧ Accuracy class	
H	High
P	Precision

⑨ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

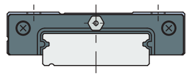
⑩ Special specification
A, BS, D, E, Ⅰ, LR, MN N, Q, RE, S, U, W, Y

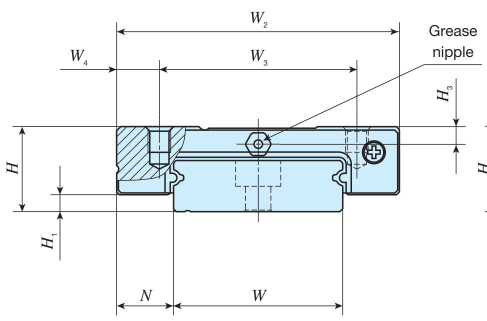
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

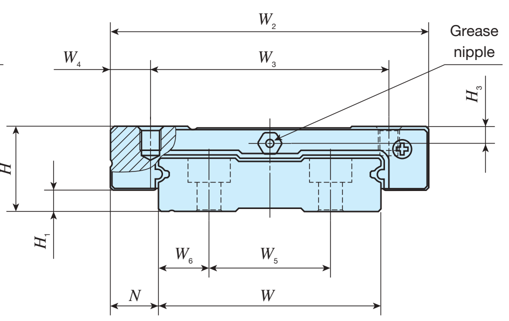
IKO C-Lube Linear Way ML

Wide type

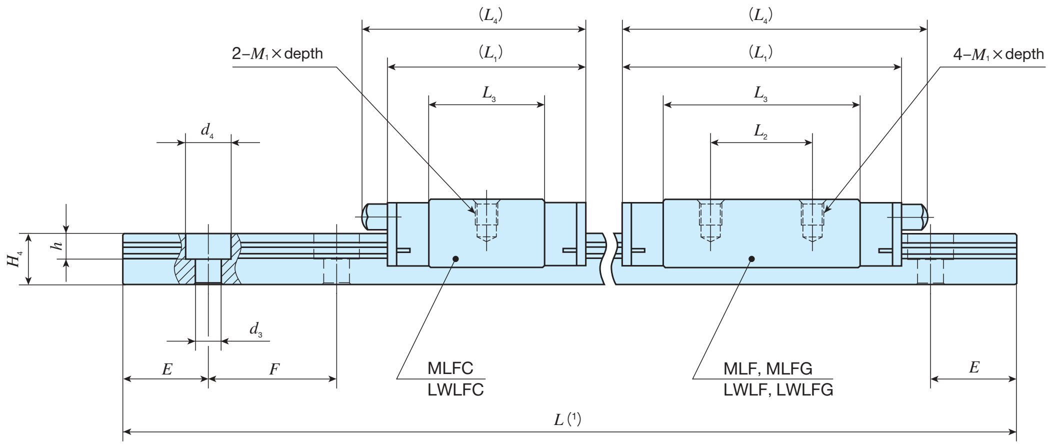
Shape	**MLF** • **LWLF**
Size	2, 4, 6, 10, 14, 18, 24, **30**, **42**







MLFC 42, LWLFC 42
MLF 42, LWLF 42
MLFG 42, LWLFG 42



Identification number MLF series	Identification number LWLF series (No C-Lube)	Interchangeable	Mass (Ref.) g Slide unit	Mass (Ref.) g Track rail (per 100 mm)	Dimensions of assembly mm H	H_1	N	Dimensions of slide unit mm W_2	W_3	W_4	L_1	L_2	L_3	L_4	M_1×depth	H_3	Dimensions of track rail mm W	H_4	W_5	W_6	d_3	d_4	h	E	F	Appended mounting bolt for track rail (2) mm Bolt size× ℓ	Basic dynamic load rating (3) C N	Basic static load rating (3) C_0 N	Static moment rating (3) T_0 N・m	T_X N・m	T_Y N・m
MLFC 30	LWLFC 30…B	○	70	198	15	3	10	50	35	7.5	35.5	–	20.5	40	M4×4.5	3.1	30	9	–	–	4.5	8	4.5	20	40	M4×12	3 890	4 540	69.1	15.4 107	13.0 89.9
MLF 30		○	111								49.5	18	34.8	54													5 970	8 440	128	48.7 256	40.8 215
	LWLF 30…B	○	112																												
–	LWLF 30…BCS	○																													
MLFG 30		○	167								68.5	35	53.8	73													7 810	12 300	187	100 508	84.3 426
	LWLFG 30…B	○	170																												
MLFC 42		○	95	294	16	4	9	60	45	7.5	41.5	–	25.7	46	M4×4.5	3.2	42	10	23	9.5	4.5	8	4.5	20	40	M4×12	5 440	6 810	144	30.8 180	25.8 151
	LWLFC 42…B	○											25.3														5 030	6 050	128	24.8 164	20.8 137
MLF 42		○	138								55	20	39.4	60													7 050	9 840	209	61.3 333	51.4 280
	LWLF 42…B	○	140										39																		
–	LWLF 42…BCS	○																													
MLFG 42		○	200								74.5	35	58.7	79													9 520	15 100	321	140 674	117 565
	LWLFG 42…B	○	204										58.3														9 200	14 400	305	126 644	106 541

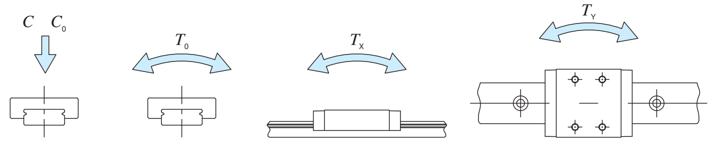
Notes (1) Track rail lengths L are shown in Table 3.2 on page Ⅱ−11 and Table 3.3 on page Ⅱ−12.

(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. For stainless steel model, stainless steel bolts are appended.

(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below.

The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

Remark: The specifications of grease nipple are shown in Table 14 on page Ⅱ−18.



Example of identification number of assembled set

Model code	Model code	Dimensions	Part code	Part code	Model code	Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MLF	G	42	C2	R320			T_1	P		/D
❶	❷	❸	❹	❺	❶	❻	❼	❽	❾	❿

① Model

MLF	Wide type
LWLF…B	

② Length of slide unit

C	Short
No symbol	Standard
G	Long

③ Size

30, 42

④ Number of slide unit (2)

⑤ Length of track rail (320 mm)

⑥ Material type

No symbol	Stainless steel made
CS	High carbon steel made

⑦ Preload amount

T_0	Clearance
No symbol	Standard
T_1	Light preload

⑧ Accuracy class

H	High
P	Precision

⑨ Interchangeable

No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

⑩ Special specification

A, BS, D, E, Ⅰ, LR, MN
N, Q, RE, S, U, W, Y

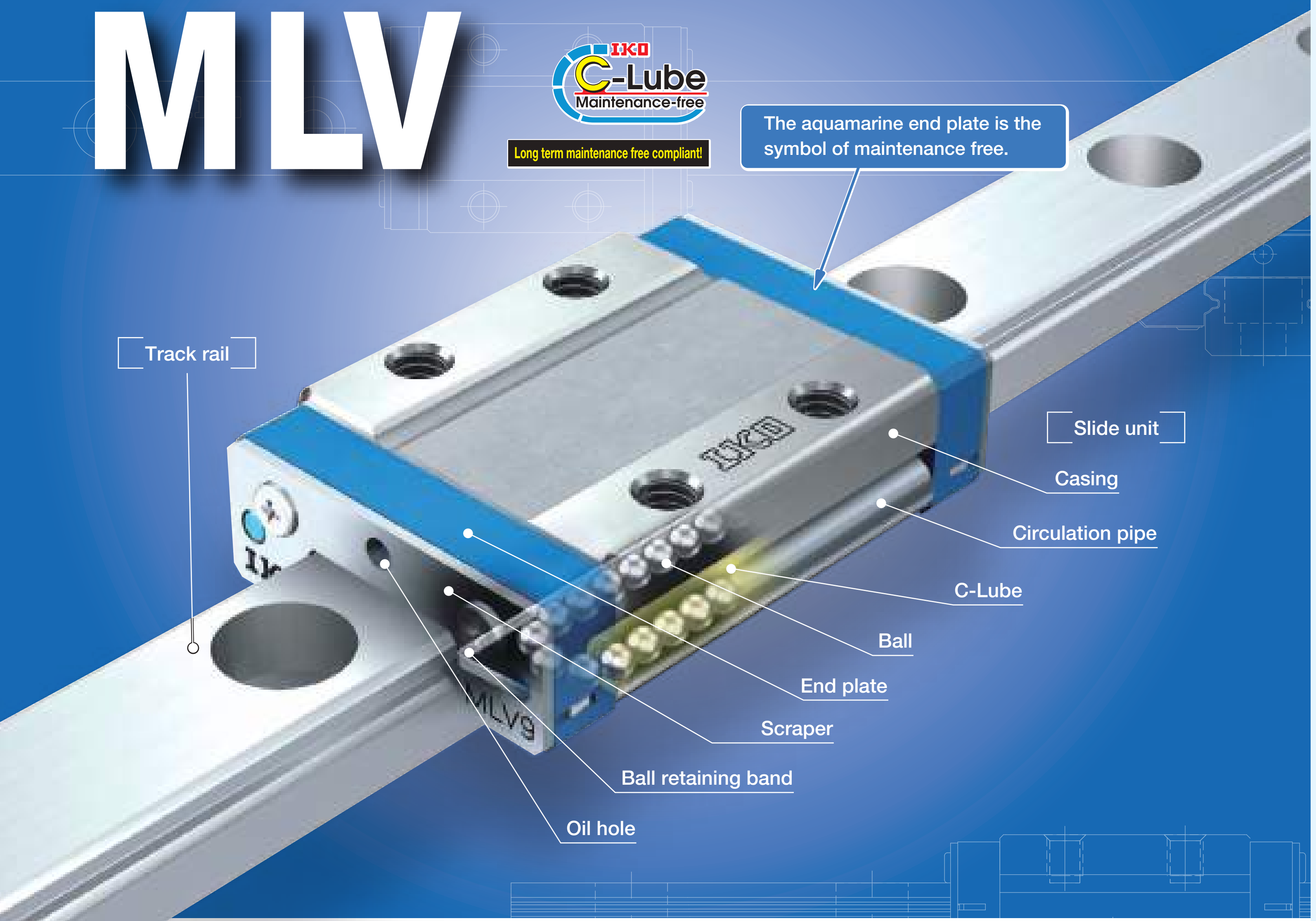
C-Lube Linear Way MLV

C-Lube Linear Way MLV

MLV

IKO C-Lube Maintenance-free

Long term maintenance free compliant!



Points

- **Extremely small size realized by simple structure** For details ➲ P.Ⅰ-19

1 Super small-size linear motion rolling guide produced by two-row four-point contact simple structure and original small sizing technology.

- **Long term maintenance free** For details ➲ P.Ⅰ-11

2 The built-in "C-Lube", the capillary lubricating element, in the ball circulation pipes of the slide unit makes it long term maintenance free.

Lubrication oil is continuously supplied to the surface of rolling elements by surface tension in the contact of the capillary lubricating element surface and rolling elements.

- **Cost performance**

3 Preserving the basic performance of C-Lube Linear Way ML as is, lower cost has been achieved by reviewing the structure including the ball recirculation part.

- **Ball retained type for easy operation**

4 The slide unit incorporates the ball retaining band, which prevents the ball from dropping down when the slide unit is removed from the track rail. This safety structure brings you an easy operation to the machines/equipment.

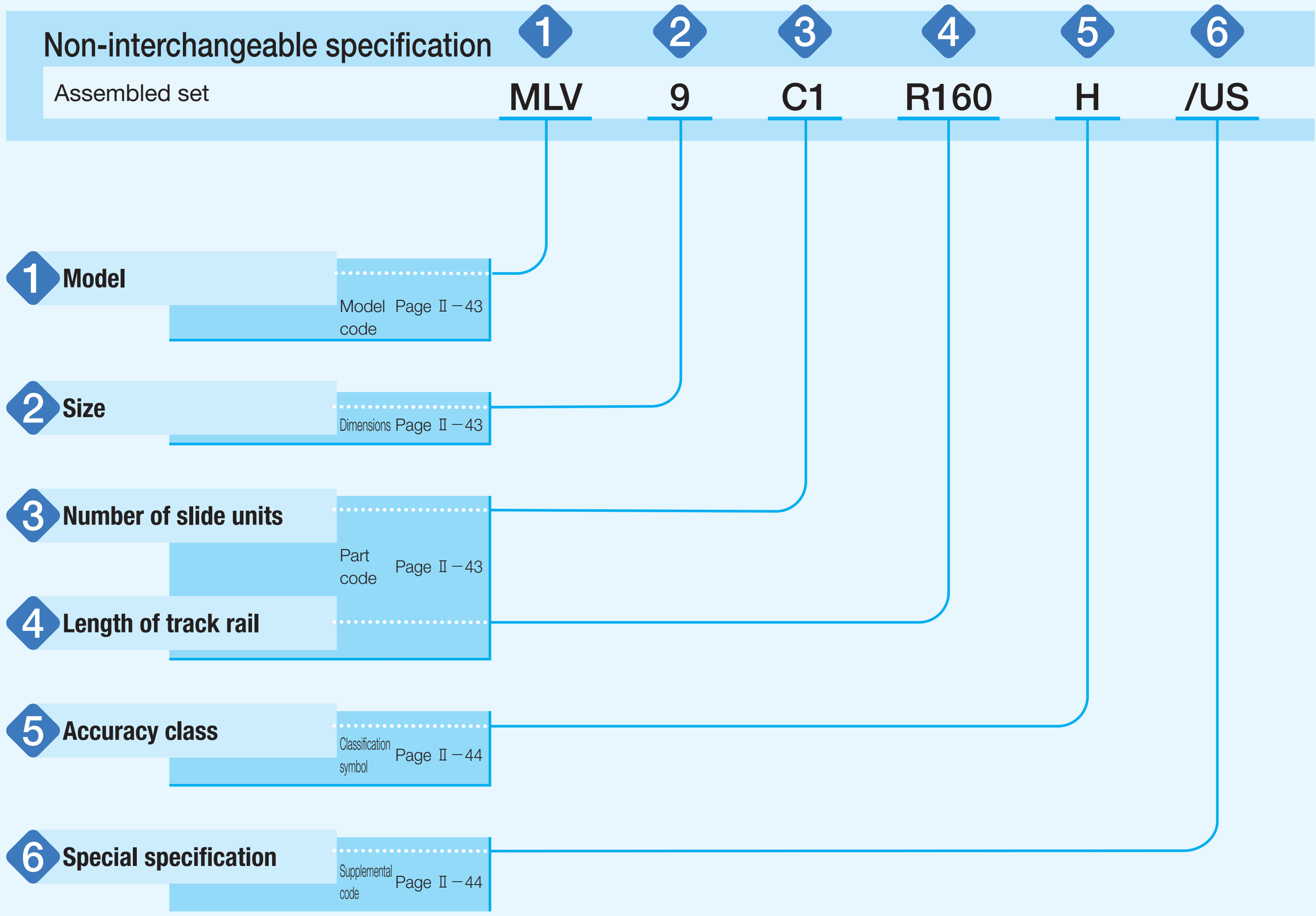
- **Stainless steel selections for excellent corrosion resistance** For details ➲ P.Ⅰ-41

5 Stainless steel highly corrosion-resistant is used as the basic specification, so that the products are suitable for applications where rust prevention oil is not preferred, such as in cleanroom environment.

Identification Number and Specification

Example of an Identification Number

The specifications of the MLV series are indicated by the identification number. Indicate the identification number, consisting of a model code, dimensions, a part code, a classification symbol, and any supplemental codes for each specification to apply.



Non-interchangeable specification

Assembled set

	①	②	③	④	⑤	⑥
Assembled set	MLV	9	C1	R160	H	/US

No.	Item	Code	Reference
1	**Model**	Model code	Page Ⅱ－43
2	**Size**	Dimensions	Page Ⅱ－43
3	**Number of slide units**	Part code	Page Ⅱ－43
4	**Length of track rail**		
5	**Accuracy class**	Classification symbol	Page Ⅱ－44
6	**Special specification**	Supplemental code	Page Ⅱ－44

Identification Number and Specification — Model · Size · Number of Slide Unit · Length of Track Rail —

1 Model

C-Lube Linear Way MLV (MLV series) : MLV

2 Size

7, 9, 12

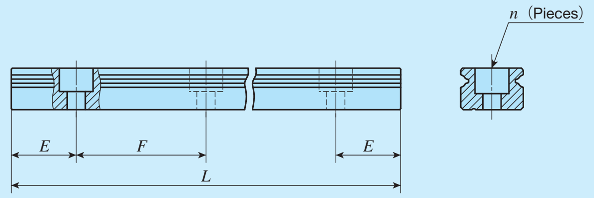
3 Number of slide units

: C○ Indicates the number of slide units assembled on a track rail.

4 Length of track rail

: R○ Indicate the length of track rail in mm.
For standard and maximum lengths, see Table 1.

Table 1 Standard and maximum lengths of track rail



unit: mm

Identification number / Item		MLV 7	MLV 9	MLV 12
Standard length L (n)		60 (4) 90 (6) 120 (8) 150 (10) 180 (12) 240 (16)	60 (3) 80 (4) 120 (6) 160 (8) 220 (11) 280 (14)	100 (4) 150 (6) 200 (8) 275 (11) 350 (14) 475 (19)
Pitch of mounting holes F		15	20	25
E		7.5	10	12.5
Standard E dimensions	or higher	4.5	4.5	5
	below	12	14.5	17.5
Maximum length		300	860	1 000

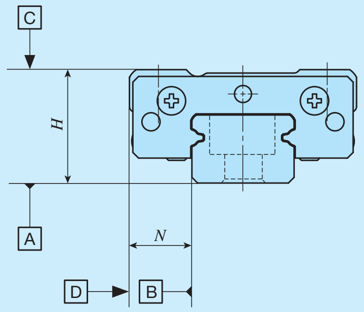
Remark: If not directed, E dimensions for both ends will be the same within the range of standard E dimensions. To change the dimensions, indicate the specified rail mounting hole positions "/E" of special specification. For more information, see page Ⅲ−30.

—Accuracy Class · Special Specification—

5 Accuracy class

High : H For details of accuracy class, see Table 2.

Table 2 Tolerance and allowance



Unit: mm

Class (Classification symbol) / Item	High (H)
Dim. H tolerance	±0.020
Dim. N tolerance	±0.025
Dim. variation of H (¹)	0.015
Dim. variation of N (¹)	0.020
Parallelism in operation of the slide unit C surface to A surface	See Fig. 1.
Parallelism in operation of the slide unit D surface to B surface	See Fig. 1.

Note (¹) It means the size variation between slide units mounted on the same track rail.

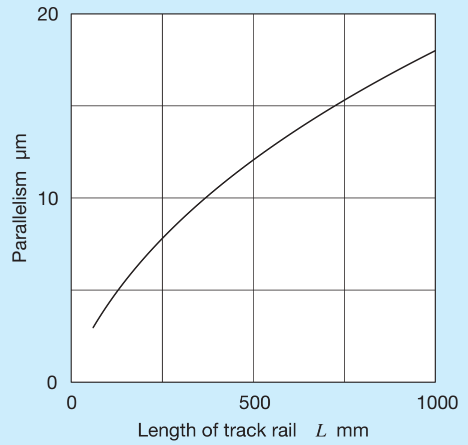


Fig. 1 Parallelism in operation

6 Special specification

/D, /E, /MN, /US, /W○, /YCG For applicable special specifications, see Table 3.
For combination of multiple special specifications, see Table 4.
For details of special specifications, see page Ⅲ−29.

Table 3 Application of special specifications

Special specification	Supplemental code	Size 7	Size 9	Size 12
Opposite reference surfaces arrangement	/D	○	○	○
Specified rail mounting hole positions	/E	○	○	○
Without track rail mounting bolt	/MN	○	○	○
End seal	/US	○	○	○
A group of multiple assembled sets	/W○	○	○	○
Specified grease (Low Dust-Generation Grease for Clean Environment CG2)	/YCG	○	○	○

Table 4 Combination of supplemental codes

	D	E	MN	US	W
E	−				
MN	○	○			
US	○	○	○		
W	○	−	○	○	
YCG	○	○	○	○	○

Remarks: 1. The combination of "−" shown in the table is not available.
2. When using multiple types for combination, please indicate by arranging the symbols in alphabetical order.

Preload

Preload for the MLV series is adjusted to have subtle clearance or minimal amount of preload.

Lubrication

Lithium-soap base grease (MULTEMP PS No.2 [KYODO YUSHI CO., LTD.]) is pre-packed in MLV series. Additionally, MLV series has C-Lube placed in the recirculation part of balls, so that the interval for reapplicating lubricant can be extended and maintenance works such as grease job can be reduced significantly.

MLV series have an oil hole. (See Table 5)

Dedicated supplying equipment (miniature greasers) fit to oil holes are also available (MG10B/MT2). To order these parts, see Table 13 on Page Ⅲ-23.

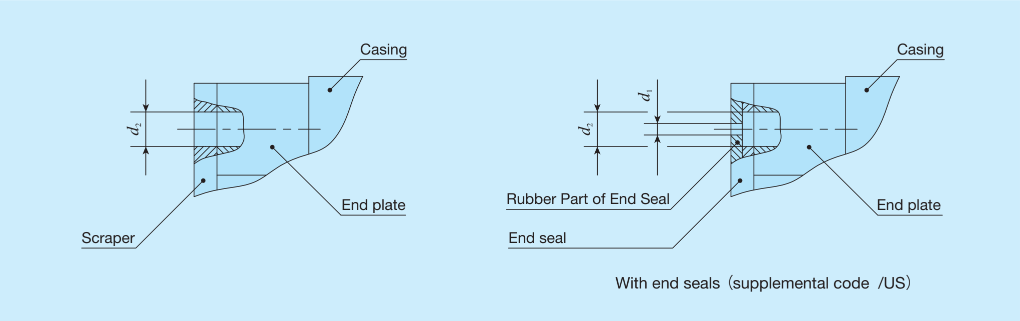
Dust Protection

No end seal is provided for the MLV series. For applications in other than clean environment, cover the whole unit with a protective case, etc. to prevent harmful foreign substances such as dust and particles from entering.

We can also attach end seals (supplemental code "/US") on both sides of the slide unit. If needed, indicate the supplemental code.

Even with the use of the end seals to prevent dust from entering, if large amount of contaminants or dust are floating, or if large particles of foreign substances such as chips or sand may adhere to the track rail, it is recommended to attach a protective cover to the linear motion mechanism.

Table 5 Oil hole specifications



unit: mm

Size	d_1	d_2
7	0.5	1.2
9		1.5
12		2

Precaution for Use

❶ Handling

A strong grip on the circulation pipes of the MLV series slide unit, will distort the circulation path, which may affect the operating performance; handle with care.

❷ Mounting surface, reference mounting surface and typical mounting structure

When mounting the MLV series, properly align the reference mounting surfaces B and D of the track rail and the slide unit with the reference mounting surface of the table and the bed and fix them. (See Fig.2)

The reference mounting surfaces B and D and mounting surfaces A and C are precisely ground. Machining the mounting surface of the table and bed, such as machine or device, to high accuracy and mounting them properly will ensure stable linear motion with high accuracy.

Reference mounting surface of the slide unit is the upper surface when you see the IKO mark on the C surface in normal position. The track rail reference mounting surface is identified by locating the IKO mark on the top surface of the track rail. It is the side surface above the mark (in the direction the arrow point). (See Fig.3)

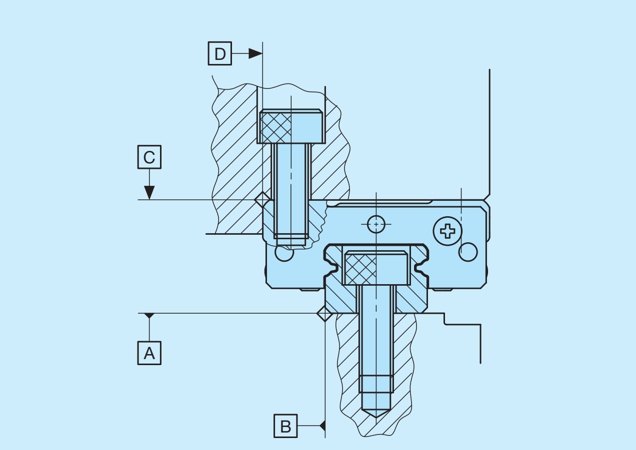


Fig. 2 Reference mounting surface and typical mounting structure

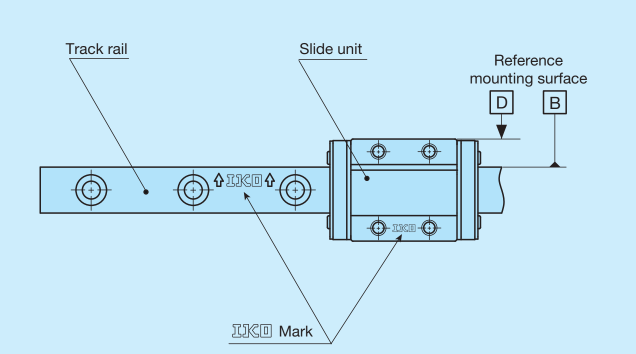


Fig. 3 Reference mounting surface

❸ Shoulder height and corner radius of the reference mounting surface

For the opposite corner of the mating reference mounting, it is recommended to have relieved fillet as indicated in Fig. 4.

Recommended value for the shoulder height on the mating side is indicated in Table 6.

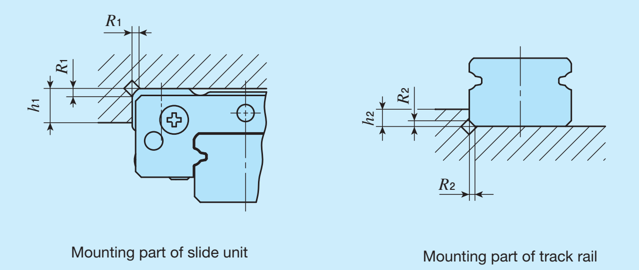


Fig. 4 Corner of the mating reference mounting

Table 6 Shoulder height and corner radius of the reference mounting surface

Size	Mounting part of slide unit		Mounting part of track rail	
	Shoulder height h_1	Corner radius R_1 (maximum)	Shoulder height h_2	Corner radius R_2 (maximum)
7	2.5	0.2	1.2	0.2
9	3	0.2	1.5	0.2
12	4	0.2	2.5	0.2

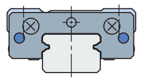
❹ Tightening torque for fixing screw

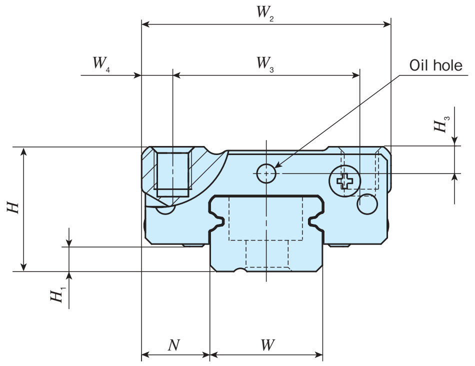
Typical tightening torque for mounting of the MLV series to the steel mating member material is indicated in Table 7. When vibration and shock of the machine or device are large, fluctuating load is large, or moment load is applied, fix it by using the torque 1.2 to 1.5 times larger than the value indicated in the table as necessary. If the mating member material is cast iron or aluminum alloy, reduce the tightening torque depending on the strength characteristics of the mating member material.

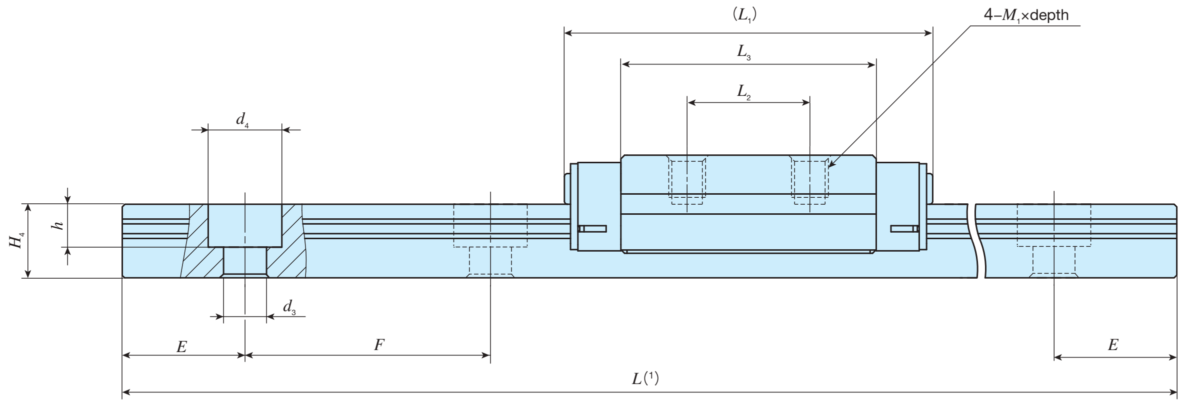
Table 7 Tightening torque for fixing screw

Bolt size	Tightening torque N・m
	Stainless steel-made screw
M2×0.4	0.31
M3×0.5	1.1

Remark: The tightening torque is calculated based on the property division A2-70.

Standard type			
Shape	MLV 		
Size	7	9	12





Identification number	Mass (Ref.) g		Dimensions of assembly mm			Dimensions of slide unit mm									Dimensions of track rail mm							Appended mounting bolt for track rail (2) mm	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
	Slide unit	Track rail (Per 100 mm)	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	M_1×depth	H_3		W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MLV 7	8.4	22	8	1.5	5	17	12	2.5	23.5	8	14.3	M2×2	1.5		7	5	2.4	4.2	2.3	7.5	15	M2×6	1 330	1 890	6.9	4.7 28.2	3.9 23.6
MLV 9	17	35	10	2	5.5	20	15	2.5	30	10	20.8	M3×3	2.2		9	6	3.5	6	3.5	10	20	M3×8	1 810	2 760	12.8	9.1 51.1	7.6 42.9
MLV 12	31	65	13	3	7.5	27	20	3.5	34	15	21.6	M3×3.5	2.7		12	8	3.5	6.5	4.5	12.5	25	M3×8	3 330	4 290	26.6	15.4 93.1	12.9 78.2

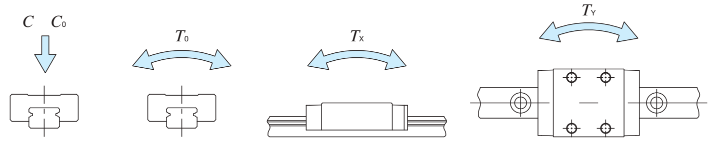
Notes (1) Track rail lengths L are shown in Table 1 on page Ⅱ－43.

(2) The appended track rail mounting bolts are stainless steel hexagon socket head bolts equivalent to JIS B 1176.

(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below.

The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

Remark: The specification of oil holes is shown in Table 5 on page Ⅱ－45.



Example of identification number of assembled set

Model code	Dimensions	Part code		Classification symbol	Supplemental code
MLV	7	C2	R120	H	/US
❶	❷	❸	❹	❺	❻

① Model

MLV	C-Lube Linear Way MLV

② Size

7, 9, 12

③ Number of slide units (2)

④ Length of Track Rail (120mm)

⑤ Accuracy class

H	High

⑥ Special specification

D, E, MN, US, W, YCG

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

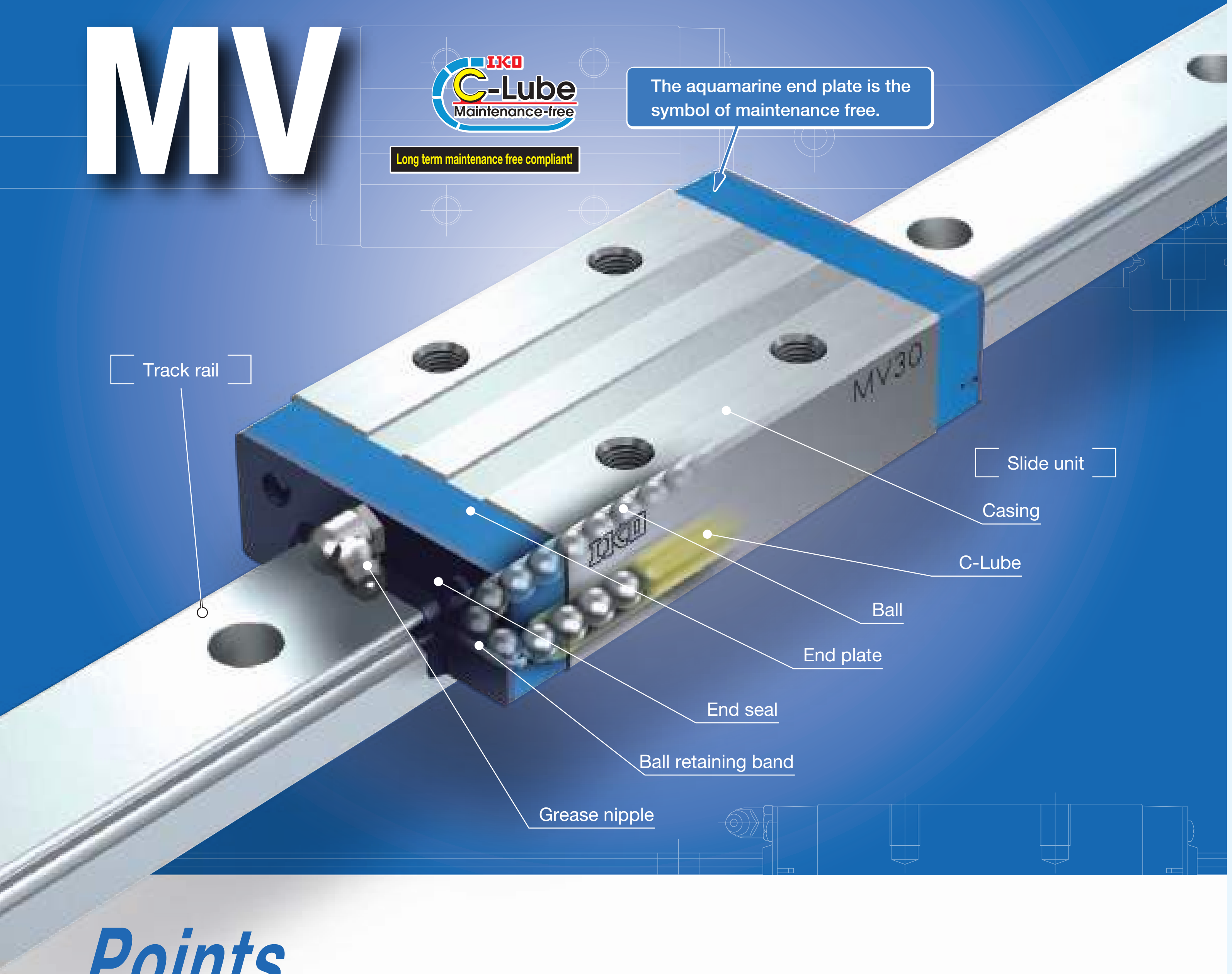
C-Lube Linear Way MV

C-Lube Linear Way MV

MV

IKO C-Lube Maintenance-free

Long term maintenance free compliant!


The aquamarine end plate is the symbol of maintenance free.

Points

1 ● Ultimate ball type linear motion rolling guide pursuing extra low profile and extra light weight

For details ➔ P.I-19

A linear motion rolling guide with extra low profile and extra light weight, achieved only because of the simple mechanism of two-row four-point contact structure.

2 ● High load capacity

Despite its extra low profile and extra light weight, it has the maximum load rating among the ball types and contributes to long life and increases safety of machine or device.

3 ● Long term maintenance free

For details ➔ P.I-11

The built-in "C-Lube", the capillary lubricating element, in the ball circulation paths of the slide unit makes it long term maintenance free.
Lubrication oil is continuously supplied to the surface of rolling elements by surface tension in the contact of the capillary lubricating element surface and rolling elements.

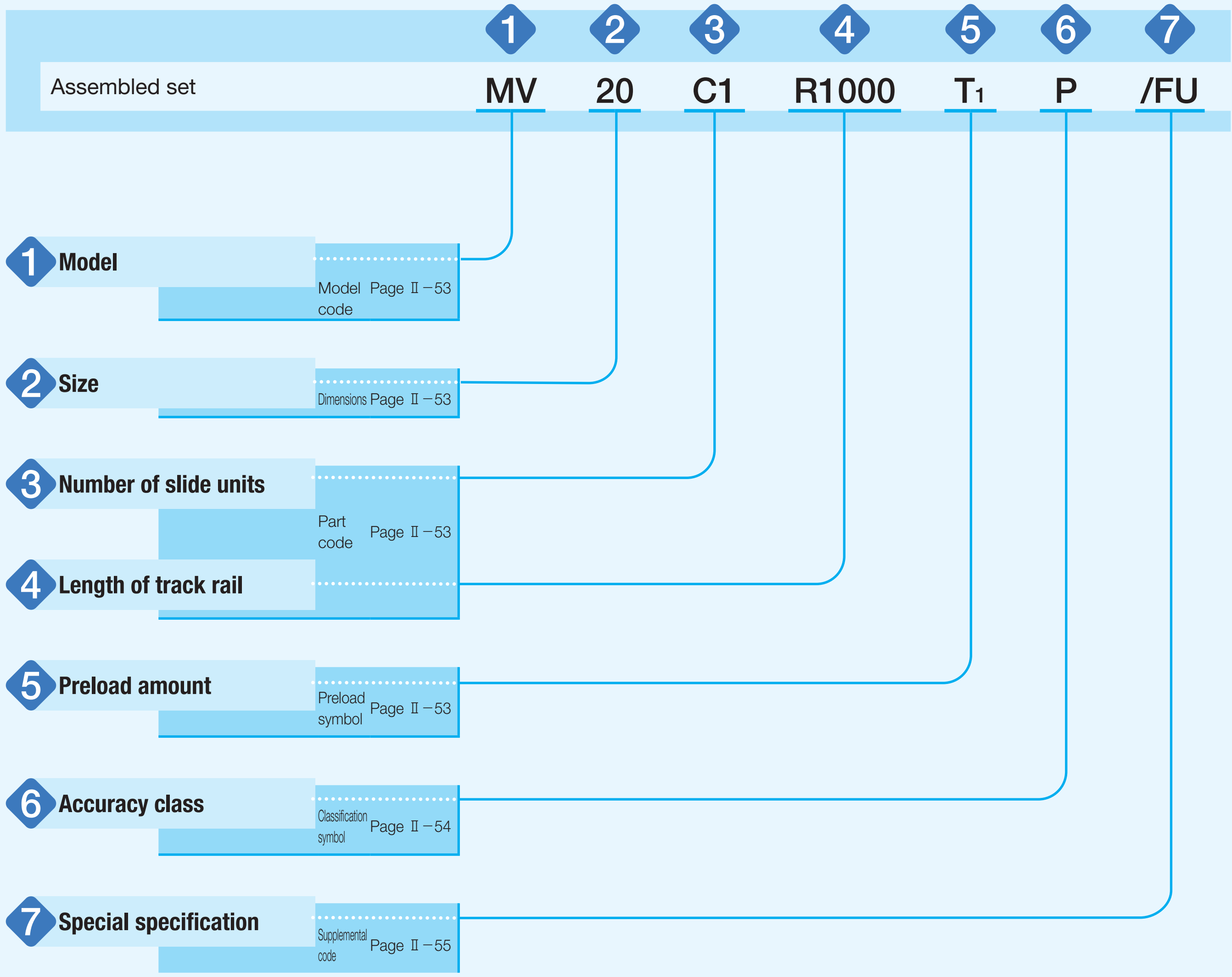
4 ● Ball retained type for easy operation

The slide unit incorporates the ball retaining band, which prevents the ball from dropping down when the slide unit is removed from the track rail. This safety structure brings you an easy operation to the machines/equipment.

Designation of Identification Number and Specification

Example of an Identification Number

The specifications of the MV series are indicated by the identification number.
Indicate the identification number, consisting of a model code, dimensions, a part code, a preload symbol, a classification symbol, and any supplemental codes for each specification to apply.



	1	2	3	4	5	6	7
Assembled set	MV	20	C1	R1000	T_1	P	/FU

No.	Specification	Code	Page
1	**Model**	Model code	Page Ⅱ－53
2	**Size**	Dimensions	Page Ⅱ－53
3	**Number of slide units**	Part code	Page Ⅱ－53
4	**Length of track rail**		
5	**Preload amount**	Preload symbol	Page Ⅱ－53
6	**Accuracy class**	Classification symbol	Page Ⅱ－54
7	**Special specification**	Supplemental code	Page Ⅱ－55

Identification Number and Specification – Model · Size · Number of Slide Unit · Length of Track Rail · Preload amount –

① Model

C-Lube Linear Way MV : MV
(MV series)

② Size

20, 25, 30

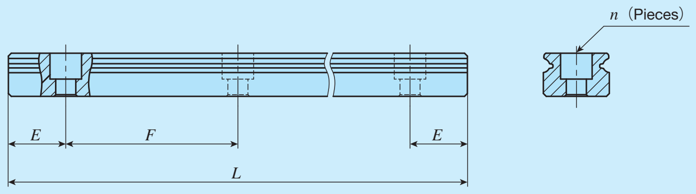
③ Number of slide units

: C○ Indicates the number of slide units assembled on a track rail.

④ Length of track rail

: R○ Indicate the length of track rail in mm.
For standard and maximum lengths, see Table 1.

Table 1 Standard and maximum lengths of track rail



unit: mm

Identification number / Item		MV 20	MV 25	MV 30
Standard length L (n)		220 (4) 280 (5) 340 (6) 460 (8) 640 (11) 820 (14) 1 000 (17) 1 240 (21)	220 (4) 280 (5) 340 (6) 460 (8) 640 (11) 820 (14) 1 000 (17) 1 240 (21) 1 600 (27)	280 (4) 440 (6) 600 (8) 760 (10) 1 000 (13) 1 240 (16) 1 640 (21) 2 040 (26) 2 520 (32) 3 000 (38)
Pitch of mounting holes F		60	60	80
E		20	20	20
Standard E dimensions	or higher	8	9	9
	below	38	39	49
Maximum length (1)		2 200 (2 980)	2 980	3 000

Note (1) Length up to the value in ( ) can be produced. If needed, please contact IKO.
Remark: If not directed, E dimensions for both ends will be the same within the range of E reference dimensions. To change the dimensions, indicate the specified rail mounting hole positions "/E" of special specification. For more information, see page Ⅱ－30.

⑤ Preload amount

Clearance	: $\mathrm{T_C}$	For details of the preload amount, see Table 2.
Standard	: No symbol	
Light preload	: $\mathrm{T_1}$	

Table 2 Preload amount

Item / Preload type	Preload symbol	Preload amount N	Operational conditions
Clearance	$\mathrm{T_C}$	0 (1)	· Very light motion · To absorb slight errors
Standard	(No symbol)	0 (2)	· Light and precise motion
Light preload	$\mathrm{T_1}$	$0.02C_0$	· Almost no vibrations · Load is evenly balanced · Light and precise motion

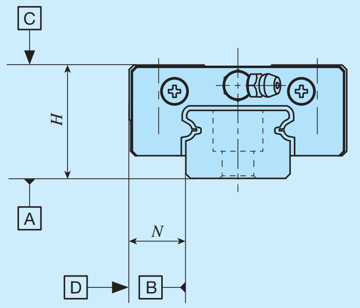
Notes (1) Clearance of about 10μm
(2) Indicates zero or minimal amount of preload.
Remark: C_0 indicates the basic static load rating.

–Accuracy Class–

⑥ Accuracy class

Ordinary	: No symbol	For details of accuracy class, see Table 3.
High	: H	For applicable combinations of accuracy class and preload amount, see Table 4.
Precision	: P	
Super precision	: SP	

Table 3 Tolerance and allowance



unit: mm

Class (Classification symbol) / Item	Ordinary (No symbol)	High (H)	Precision (P)	Super precision (SP)
Dim. H tolerance	±0.080	±0.040	±0.020	±0.010
Dim. N tolerance	±0.100	±0.050	±0.025	±0.015
Dim. variation of H (1)	0.025	0.015	0.007	0.005
Dim. variation of N (1)	0.030	0.020	0.010	0.007
Parallelism in operation of the slide unit C surface to A surface	See Fig. 1.			
Parallelism in operation of the slide unit D surface to B surface	See Fig. 1.			

Note (1) It means the size variation between slide units mounted on the same track rail.

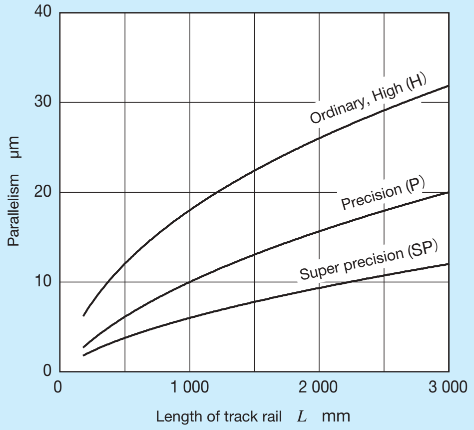


Fig. 1 Parallelism in operation

Table 4 Combination of accuracy class and preload

Classification (Classification symbol) / Item (preload symbol)	Ordinary (No symbol)	High (H)	Precision (P)	Super precision (SP)
Clearance ($\mathrm{T_C}$)	○	–	–	–
Standard (no symbol)	○	○	○	○
Light preload ($\mathrm{T_1}$)	–	○	○	○

7 Special specification

/A, /D, /E, /F, /I, /L○, /LF○, /MA,
/N, /U, /V○, /W○, /YCG, /Z○

For applicable special specifications, see Table 5.
For combination of multiple special specifications, see Table 6.
For details of special specifications, see page Ⅲ－29.

Table 5 Application of special specifications

Special specification	Supplemental code
Butt-jointing track rails	/A
Opposite reference surfaces arrangement	/D
Specified rail mounting hole positions	/E
Caps for rail mounting holes	/F
Inspection sheet	/ I
Black chrome surface treatment	/L○
Fluorine black chrome surface treatment	/LF○
With track rail mounting bolt	/MA
No seal	/N
Under seal	/U
Double seals	/V○
A group of multiple assembled sets	/W○
Specified grease (IKO Low Dust-Generation Grease for Clean Environment CG2)	/YCG
Scraper	/Z○

Table 6 Combination of supplemental codes

D	○												
E	－	－											
F	○	○	○										
I	○	○	○	○									
L	○	○	○	○	○								
LF	○	○	○	○	○	－							
MA	○	○	○	○	○	○	○						
N	○	○	○	－	○	○	○	○					
U	○	○	○	○	○	○	○	○	－				
V	○	○	○	○	○	○	○	○	－	○			
W	○	○	－	○	○	○	○	○	○	○	○		
YCG	○	○	○	○	○	○	○	○	○	○	○	○	
Z	○	○	○	○	○	○	○	○	－	○	○	○	○
	A	D	E	F	I	L	LF	MA	N	U	V	W	YCG

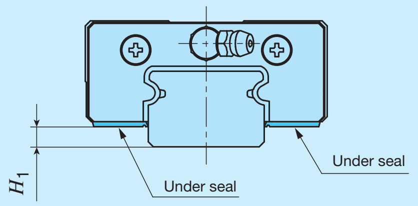
Remarks: 1. The combination of "－" shown in the table is not available.
2. When using multiple types for combination, please indicate by arranging the symbols in alphabetical order.

Table 7 Track rail mounting bolt size (Supplemental code /MA)

Size	Bolt size for track rail
20	M5×14
25	M6×20
30	M6×20

Remark: Hexagon socket head bolts equivalent to JIS B 1176.

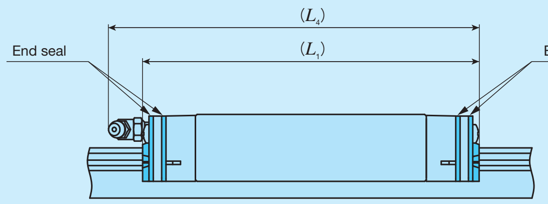
Table 8 H_1 dimension with under seal (Supplemental code: /U)



unit: mm

Size	H_1
20	4
25	4
30	4.5

Table 9 Dimension of slide unit with double end seals (Supplemental code /V /VV)

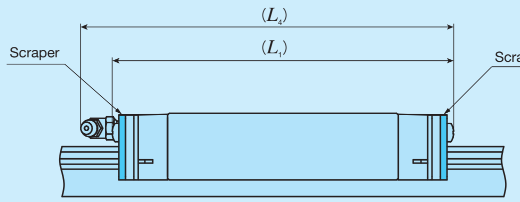


unit: mm

Size	L_1	L_4
20	81	83
25	101	111
30	125	141

Remark: The dimensions of the slide unit with double end seals at both ends are indicated.

Table 10 Dimension of slide unit with scrapers (Supplemental code: /Z /ZZ)



unit: mm

Size	L_1	L_4
20	82	84
25	103	112
30	127	142

Remark: The dimensions of the slide unit with scraper at both ends are indicated.

Lubrication

Lithium-soap base grease with extreme-pressure additive (Alvania EP grease 2 [Shell Lubricants Japan K.K.]) is pre-packed in MV series. Additionally, MV series has C-Lube placed in the recirculation part of balls, so that the interval for reapplicating lubricant can be extended and maintenance works such as grease job can be reduced significantly.

MV series has grease nipple as indicated in Table 11. Supply nozzles fit to each shapes of grease nipple are also available. When these parts are desired, see Tables 14.1 and 14.2 on page Ⅲ-23 and Table 15 on page Ⅲ-24 to order.

Table 11 Parts for lubrication

Size	Grease nipple type (¹)	Applicable supply nozzle type	Bolt size of female threads for piping
20	A-M3	A-5120V A-5240V B-5120V B-5240V	–
25	B-M4	A-8120V B-8120V	M4
30	B-M6	Grease gun available on the market	M6

Note (¹) For grease nipple specification, see Table 14.1 and 14.2 on page Ⅲ－23.

Remark: Stainless steel grease nipple is also available. If needed, please contact IKO.

Dust Protection

MV Series slide units are equipped with end seals as standard for dust protection. However, if there is a great deal of contaminants or dust floating, or if large particles of foreign substances such as cutting chips or sand may adhere to the track rail, it is recommended to mount a protective cover on the linear motion mechanism.

It is also effective to use special options such as caps for rail mounting holes, under seals, double end seals and scrapers, depending on the use environment.

Precaution for Use

❶ Mounting surface, reference mounting surface and typical mounting structure

When mounting the MV series, properly align the reference mounting surface B and D of the track rail and slide unit with the reference mounting surface of the table and bed and fix them. (See Fig.2)

The reference mounting surfaces B and D and mounting surfaces A and C are precisely ground. Machining the mounting surface of the table and bed, such as machine or device, to high accuracy and mounting them properly will ensure stable linear motion with high accuracy.

Reference mounting surface of the slide unit is the opposite side of the IKO mark. The track rail reference mounting surface is identified by locating the IKO mark on the top surface of the track rail. It is the side surface above the mark (in the direction of the arrow). (See Fig.3)

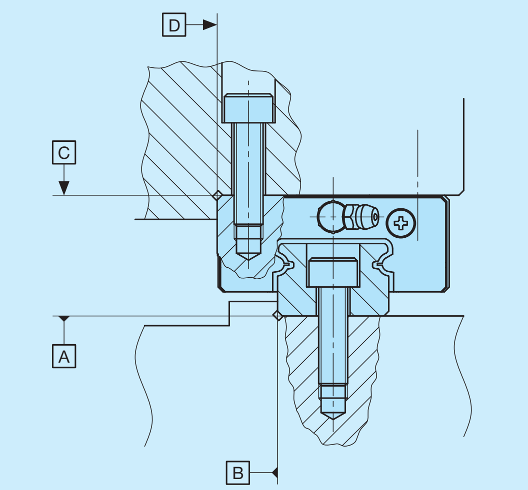


Fig. 2 Reference mounting surface and typical mounting structure

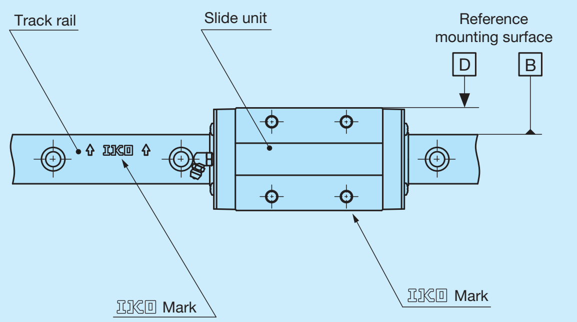


Fig. 3 Reference mounting surface

❷ Shoulder height and corner radius of the reference mounting surface

For the opposite corner of the mating reference mounting, it is recommended to have relieved fillet as indicated in Fig.4. Recommended value for the shoulder height and corner radius on the mating side is indicated in Table 12.

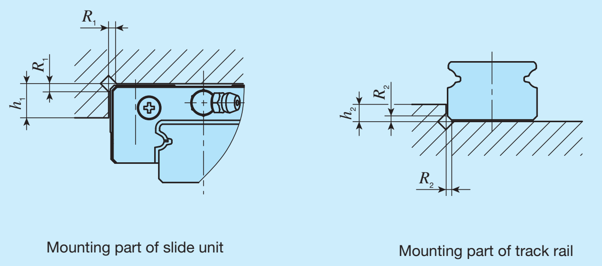


Fig. 4 Corner of the mating reference mounting

Table 12 Shoulder height and corner radius of the reference mounting surface

Size	Mounting part of slide unit		Mounting part of track rail	
	Shoulder height h_1	Corner radius R_1 (maximum)	Shoulder height h_2	Corner radius R_2 (maximum)
20	5	0.2	3	0.5
25	5	0.5	3	0.5
30	5	0.5	3	0.5

❸ Tightening torque for fixing screw

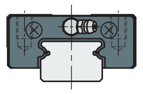
Typical tightening torque for mounting of the MV series to the steel mating member material is indicated in Table 13. When vibration and shock of the machine or device are large, fluctuating load is large, or moment load is applied, fix it by using the torque 1.2 to 1.5 times larger than the value indicated in the table as necessary. If the mating member material is cast iron or aluminum alloy, reduce the tightening torque depending on the strength characteristics of the mating member material.

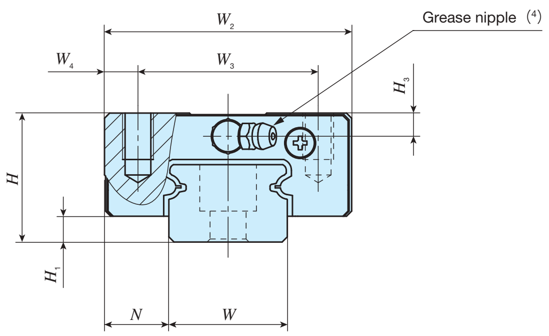
Table 13 Tightening torque for fixing screw

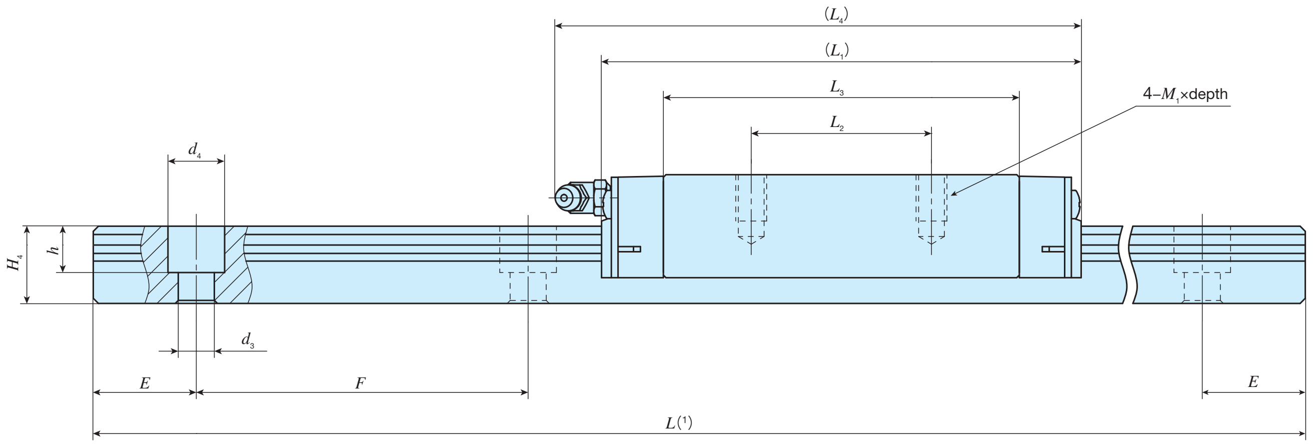
Bolt size	Tightening torque N・m	
	High carbon steel-made screw	Stainless steel-made screw
M5×0.8	8.0	5.0
M6×1	13.6	8.5
M8×1.25	32.7	20.4

Remark: The tightening torque is calculated based on strength division 12.9 and property division A2-70.

Standard type

	MV		
Shape			
Size	20	25	30

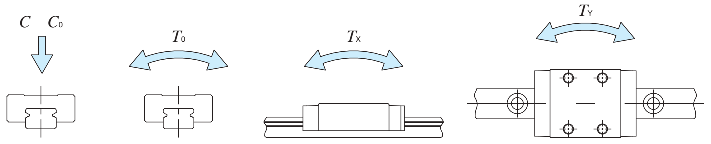




Identification number	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm										Dimensions of track rail mm							Appended mounting bolt for track rail (2) mm	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
	Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	M_1×depth	H_3		W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MV 20	0.18	1.66	20	5	11	42	32	5	73	32	51.2	76	M5×6	3.5		20	12	6	9.5	8.5	20	60	M5×14	19 600	25 600	138	115 624	102 555
MV 25	0.36	2.37	25	5	12.5	48	35	6.5	94	35	69.1	103	M6×9	4.5		23	15	7	11	9	20	60	M6×20	31 900	42 500	264	260 1 320	230 1 170
MV 30	0.72	3.33	30	6	16	60	40	10	116	40	86.6	126	M8×11	5		28	17	7	11	9	20	80	M6×20	46 300	61 800	468	467 2 350	414 2 090

1N=0.102 kgf

Notes (1) Track rail lengths L are shown in Table 1 on page Ⅱ－53.
(2) Track rail mounting bolts are not appended. Hexagon socket head bolts of JIS B 1176 with strength division 12.9 are recommended.
(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.
(4) For specifications of grease nipple, see Table 11 on page Ⅱ－57.



Example of identification number of assembled set

Model code	Dimensions	Part code		Preload symbol	Classification symbol	Supplemental code
MV	25	C2	R1000	T_1	SP	/FU
❶	❷	❸	❹	❺	❻	❼

① Model

MV	C-Lube Linear Way MV

② Size

20, 25, 30

③ Number of slide units (2)

④ Length of Track Rail (1000mm)

⑤ Preload amount

T_C	Clearance
No symbol	Standard
T_1	Light preload

⑥ Accuracy class

No symbol	Ordinary
H	High
P	Precision
SP	Super precision

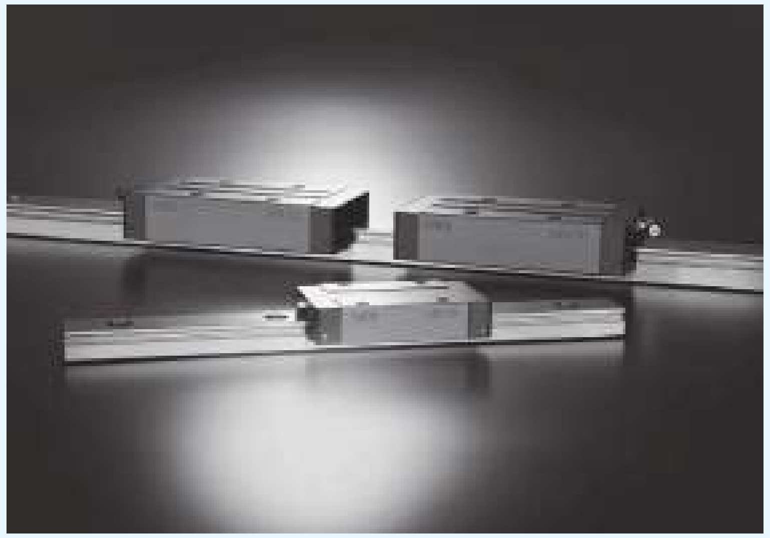
⑦ Special specification

A, D, E, F, Ⅰ, L, LF, MA, N, U, V, W, YCG, Z

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

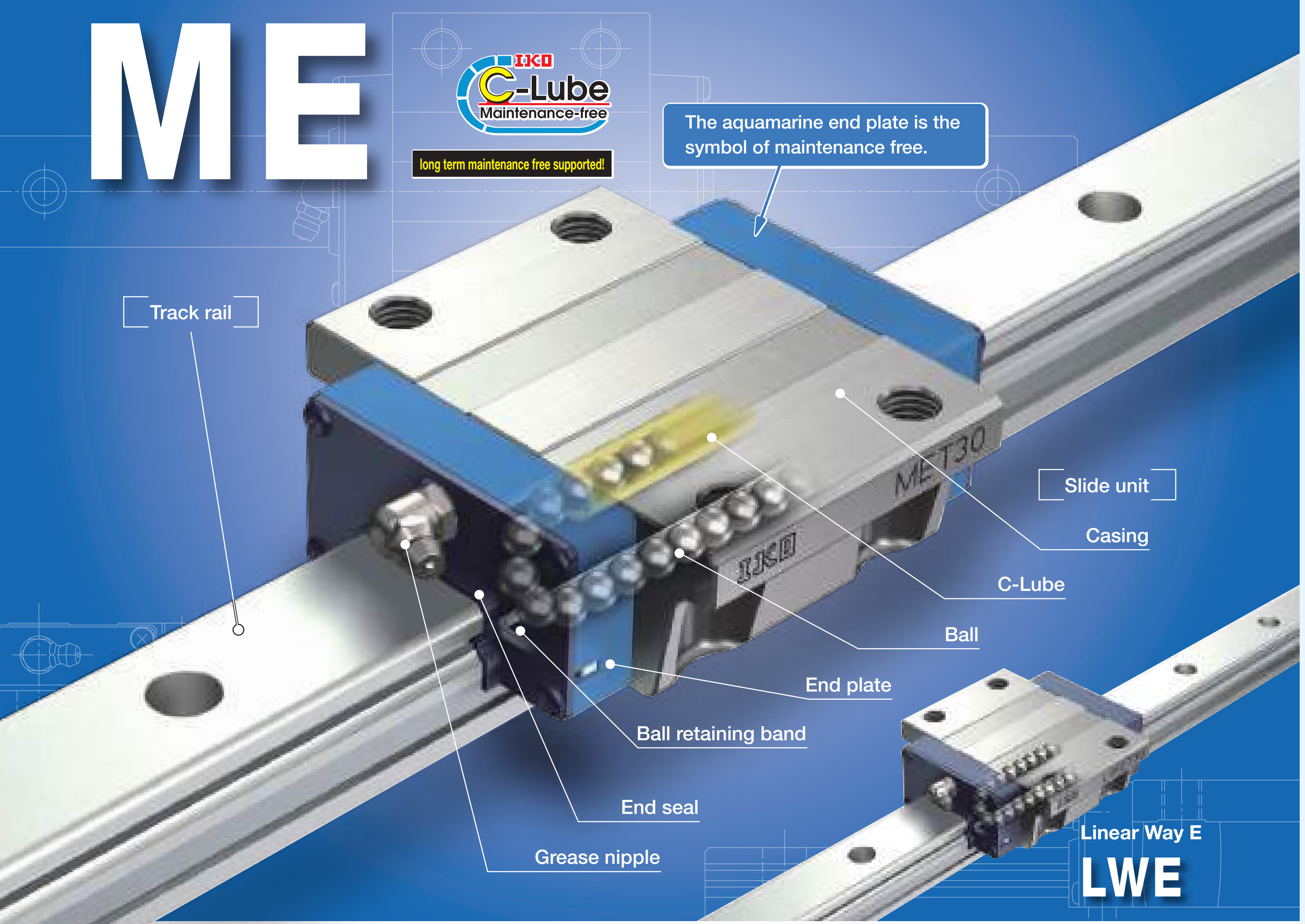
C-Lube Linear Way ME
Linear Way E

ME・LWE



C-Lube Linear Way ME

ME



Points

● Compact and versatile series with utility

1 Versatile linear motion rolling guide that has achieved utility pursuing compactness in every aspect.

● Wide range of variations for your needs

For details ➲ P.I-26

2 As two shapes of slide unit, flange type and block type (with small width) and 3 types with different slide unit length with same section are available, you can select an optimal product for the specifications of your machine and device.

● Stainless steel selections superior in corrosion resistance are listed on lineup.

For details ➲ P.I-41

3 Products made of stainless steel are highly resistant to corrosion, so that they are suitable for applications where rust prevention oil is not preferred, such as in cleanroom environment.

● Achieved smooth and quiet motion Low Decibel Linear Way E

4 Due to resin separator built-in balls, Low Decibel Linear Way E achieved smooth and quiet motion by eliminating of direct contact of balls each other. This feature reduces noise level in factory and contributes to a human-friendly environment.

Identification Number and Specification

Example of an identification number

The specifications of ME and LWE (···Q) series are indicated by the identification number. Indicate the identification number, consisting of a model code, dimensions, a part code, a material code, a preload symbol, a classification symbol, an interchangeable code, and any supplemental codes for each specification to apply.

	1	2	3	4	5	1	6	7	8	9	10
Non-interchangeable specification											
Assembled set	ME	C	20	C1	R1000			T_1	P		/FU
Interchangeable specification											
Single slide unit	ME	C	20	C1				T_1	P	S1	/U
Single track rail (¹)	LWE		20		R1000				P	S1	/F
Assembled set	ME	C	20	C1	R1000			T_1	P	S1	/FU

① Model	Model code	Page Ⅱ－65
② Length of slide unit	Model code	Page Ⅱ－65
③ Size	Dimensions	Page Ⅱ－65
④ Number of slide units	Part code	Page Ⅱ－65
⑤ Length of track rail	Part code	Page Ⅱ－65
⑥ Material type	Material code	Page Ⅱ－65
⑦ Preload amount	Preload symbol	Page Ⅱ－68
⑧ Accuracy class	Classification symbol	Page Ⅱ－68
⑨ Interchangeable	Interchangeable code	Page Ⅱ－69
⑩ Special specification	Supplemental code	Page Ⅱ－69

Note (¹) Indicate "LWE" for the model code of the single track rail regardless of the series and the combination of slide unit model.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Identification Number and Specification —Model · Length of Slide Unit · Size · Number of Slide Unit · Length of Track Rail · Material—

① Model

C-Lube Linear Way ME (ME series)	Flange type mounting from bottom	: ME
	Flange type mounting from top	: MET
	Block type mounting from top	: MES
Linear Way E ⁽¹⁾ (LWE series)	Flange type mounting from bottom	: LWE
	Flange type mounting from top	: LWET
	Block type mounting from top	: LWES
Low Decibel Linear Way E ⁽¹⁾ (LWE···Q series)	Flange type mounting from bottom	: LWE···Q
	Flange type mounting from top	: LWET···Q
	Block type mounting from top	: LWES···Q

For applicable models and sizes, see Table 1.
Indicate "LWE" for the model code of single track rail regardless of the series and the slide unit model to be combined.

Note ⁽¹⁾ This model has no built-in C-Lube.

② Length of slide unit

Short	: C	For applicable models and sizes, see Table 1.
Standard	: No symbol	
Long	: G	

③ Size

15,20,25,30,35,45 For applicable models and sizes, see Table 1.

④ Number of slide units

: C○ For an assembled set, indicates the number of slide units assembled on a track rail. For a single slide unit, only "C1" is specified.

⑤ Length of track rail

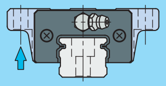
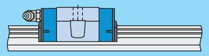
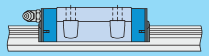
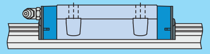
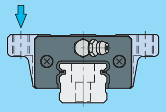
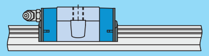
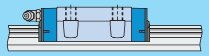
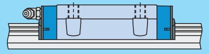
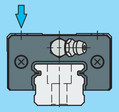
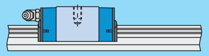
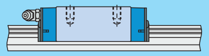
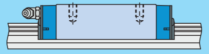
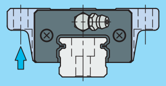
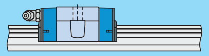
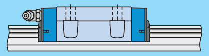
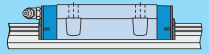
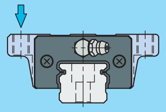
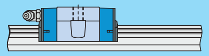
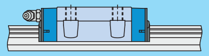
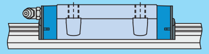
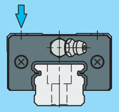
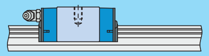
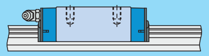
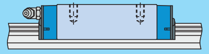
: R○ Indicate the length of track rail in mm. For standard and maximum lengths, see Tables 2.1 and 2.2.

⑥ Material type

High carbon steel made	: No symbol	For applicable models and sizes, see Table 1.
Stainless steel made ⁽²⁾	: SL	

Note ⁽²⁾ Mount a standard grease nipple (brass) on the stainless steel type, too.
Stainless steel grease nipple is also available. If needed, please contact IKO.

Table 1 Models and sizes of ME and LWE (···Q) series

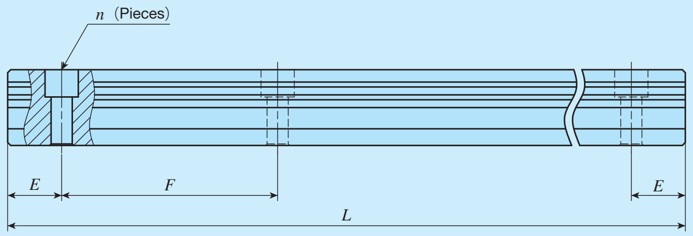
Material	Shape	Slide unit Length	Model	Size 15	20	25	30	35	45
High carbon steel made	Flange type mounting from bottom 	Short 	MEC	○	○	○	○	○	–
			LWEC	○	○	○	○	○	–
		Standard 	ME	○	○	○	○	○	○
			LWE	○	○	○	○	○	○
			LWE···Q	○	○	○	○	○	–
		Long 	MEG	○	○	○	○	–	–
			LWEG	○	○	○	○	–	–
	Flange type mounting from top 	Short 	METC	○	○	○	○	○	–
			LWETC	○	○	○	○	○	–
		Standard 	MET	○	○	○	○	○	○
			LWET	○	○	○	○	○	○
			LWET···Q	○	○	○	○	○	–
		Long 	METG	○	○	○	○	–	–
			LWETG	○	○	○	○	–	–
	Block type mounting from top 	Short 	MESC	○	○	○	○	○	–
			LWESC	○	○	○	○	○	–
		Standard 	MES	○	○	○	○	○	○
			LWES	○	○	○	○	○	○
			LWES···Q	○	○	○	○	○	–
		Long 	MESG	○	○	○	○	–	–
			LWESG	○	○	○	○	–	–
Stainless steel made	Flange type mounting from bottom 	Short 	MEC···SL	○	○	○	○	–	–
			LWEC···SL	○	○	○	○	–	–
		Standard 	ME···SL	○	○	○	○	–	–
			LWE···SL	○	○	○	○	–	–
		Long 	MEG···SL	○	○	○	○	–	–
			LWEG···SL	○	○	○	○	–	–
	Flange type mounting from top 	Short 	METC···SL	○	○	○	○	–	–
			LWETC···SL	○	○	○	○	–	–
		Standard 	MET···SL	○	○	○	○	–	–
			LWET···SL	○	○	○	○	–	–
		Long 	METG···SL	○	○	○	○	–	–
			LWETG···SL	○	○	○	○	–	–
	Block type mounting from top 	Short 	MESC···SL	○	○	○	○	–	–
			LWESC···SL	○	○	○	○	–	–
		Standard 	MES···SL	○	○	○	○	–	–
			LWES···SL	○	○	○	○	–	–
		Long 	MESG···SL	○	○	○	○	–	–
			LWESG···SL	○	○	○	○	–	–

Remark: For the models indicated in ▭ , the interchangeable specification is available.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

—Length of Track Rail—

Table 2.1 Standard and maximum lengths of high carbon steel track rails



unit: mm

Item \ Identification number	ME 15 LWE 15 LWE 15···Q	ME 20 LWE 20 LWE 20···Q	ME 25 LWE 25 LWE 25···Q	ME 30 LWE 30 LWE 30···Q	ME 35 LWE 35 LWE 35···Q	ME 45 LWE 45
Standard length L (n)	160 (3) 220 (4) 280 (5) 340 (6) 460 (8) 640 (11) 820 (14)	220 (4) 280 (5) 340 (6) 460 (8) 640 (11) 820 (14) 1 000 (17) 1 240 (21)	220 (4) 280 (5) 340 (6) 460 (8) 640 (11) 820 (14) 1 000 (17) 1 240 (21) 1 600 (27)	280 (4) 440 (6) 600 (8) 760 (10) 1 000 (13) 1 240 (16) 1 640 (21) 2 040 (26) 2 520 (32) 3 000 (38)	280 (4) 440 (6) 600 (8) 760 (10) 1 000 (13) 1 240 (16) 1 640 (21) 2 040 (26) 2 520 (32) 3 000 (38)	570 (6) 885 (9) 1 200 (12) 1 620 (16) 2 040 (20) 2 460 (24) 2 985 (29)
Pitch of mounting holes F	60	60	60	80	80	105
E (1)	20	20	20	20	20	22.5
Standard E dimensions (2) or higher	6	8	9	9	10	12
Standard E dimensions (2) below	36	38	39	49	50	64.5
Maximum length (3)	1 600 (2 980)	2 200 (2 980)	2 980 (4 000)	3 000 (3 960)	3 000 (3 960)	2 985 (3 930)

Notes (1) When specifying a butt-jointing track rail (supplemental code "/T"), pay attention to the E dimension at the butt-jointing part.
(2) Not applicable to the track rail with female threads for bellows (supplemental code "/J").
(3) Length up to the value in ( ) can be produced. If needed, please contact IKO. The values in ( ) is not applicable to LWE···Q series.

Remarks 1. A typical identification number is indicated, but is applied to all models of the same size.
2. Indicate "LWE" for the model code of single track rail regardless of the series and the slide unit model to be combined.
3. If not directed, E dimensions for both ends will be the same within the range of standard E dimensions. To change the dimensions, indicate the specified rail mounting hole positions "/E" of special specification. For more information, see page Ⅲ−30.

Table 2.2 Standard and maximum lengths of stainless steel track rails

unit: mm

Item \ Identification number	ME 15···SL LWE 15···SL	ME 20···SL LWE 20···SL	ME 25···SL LWE 25···SL	ME 30···SL LWE 30···SL
Standard length L (n)	160 (3) 220 (4) 280 (5) 340 (6) 460 (8) 640 (11) 820 (14)	220 (4) 280 (5) 340 (6) 460 (8) 640 (11) 820 (14) 1 000 (17)	220 (4) 280 (5) 340 (6) 460 (8) 640 (11) 820 (14) 1 000 (17)	280 (4) 440 (6) 600 (8) 760 (10) 1 000 (13)
Pitch of mounting holes F	60	60	60	80
E (1)	20	20	20	20
Standard E dimensions (2) or higher	6	8	9	9
Standard E dimensions (2) below	36	38	39	49
Maximum length (3)	1 200 (1 600)	1 200 (1 960)	1 200 (1 960)	1 200 (1 960)

Notes (1) When specifying a butt-jointing track rail (supplemental code "/T"), pay attention to the E dimension at the butt-jointing part.
(2) Not applicable to the track rail with female threads for bellows (supplemental code "/J").
(3) Length up to the value in ( ) can be produced. If needed, please contact IKO.

Remarks 1. A typical identification number is indicated, but is applied to all models of the same size.
2. Indicate "LWE" for the model code of single track rail regardless of the series and the slide unit model to be combined.
3. If not directed, E dimensions for both ends will be the same within the range of standard E dimensions. To change the dimensions, indicate the specified rail mounting hole positions "/E" of special specification. For more information, see page Ⅲ−30.

—Preload Amount・Accuracy Class—

7 Preload amount

Clearance : Tc
Standard : No symbol
Light preload : T₁
Medium preload : T₂

Specify this item for an assembled set or a single slide unit.
For details of the preload amount, see Table 3.
For applicable combinations of accuracy class and preload amount, see Table 4.

8 Accuracy class

Ordinary : No symbol
High : H
Precision : P
Super precision : SP

For interchangeable specification products, assemble a slide unit and a track rail of the same accuracy class.
For details of accuracy class, see Table 5.
For applicable combinations of accuracy class and preload amount, see Table 4.

Table 3 Preload amount

Preload type \ Item	Preload symbol	Preload amount N	Operational conditions
Clearance	Tc	0 (1)	· Very light motion · To absorb slight errors
Standard	(No symbol)	0 (2)	· Light and precise motion
Light preload	T₁	$0.02C_0$	· Almost no vibrations · Load is evenly balanced · Light and precise motion
Medium preload	T₂	$0.05C_0$	· Medium vibration · Medium overhung load

Notes (1) Clearance of about 10 μm
(2) Indicates zero or minimal amount of preload

Remark: C_0 indicates the basic static load rating.

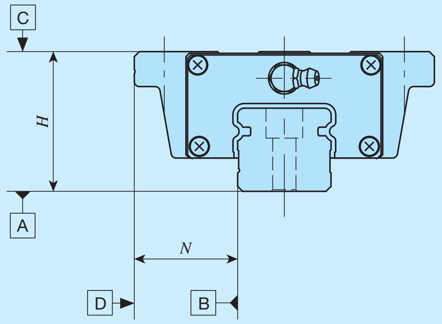
Table 4 Combination of accuracy class and preload

Preload type (preload symbol) \ Classification (classification symbol)	Ordinary (No symbol)	High (H)	Precision (P)	Super precision (SP)
Clearance (Tc) (1)	○	−	−	−
Standard (no symbol)	○	○	○	○
Light preload (T₁)	−	○	○	○
Medium preload (T₂) (1)	−	○	○	○

Note (1) Not applicable to LWE···Q series.

Remark: The mark ▨ indicates that interchangeable specification products are available.

Table 5 Tolerance and allowance



unit: mm

Item \ Class (classification symbol)	Ordinary (No symbol)	High (H)	Precision (P)	Super precision (SP)
Dim. H tolerance	±0.080	±0.040	±0.020	±0.010
Dim. N tolerance	±0.100	±0.050	±0.025	±0.015
Dim. variation of H (1)	0.025	0.015	0.007	0.005
Dim. variation of N (1)	0.030	0.020	0.010	0.007
Dim. variation of H for multiple assembled sets (2)	0.045	0.035	0.025	−
Parallelism in operation of the slide unit C surface to A surface	See Fig. 1.			
Parallelism in operation of the slide unit D surface to B surface	See Fig. 1.			

Notes (1) It means the size variation between slide units mounted on the same track rail.
(2) Applicable to the interchangeable specification.

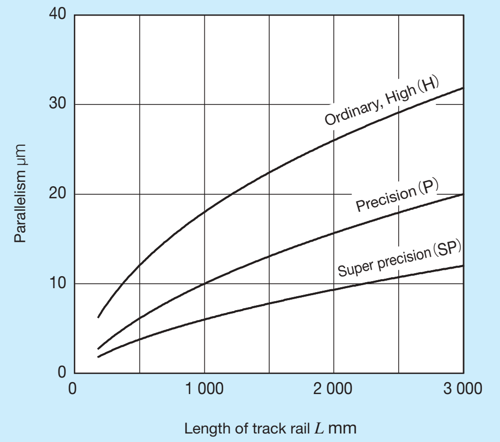


Fig. 1 Parallelism in operation

9 Interchangeable

S1 specification : S1
S2 specification : S2
Non-interchangeable specification : No symbol

This is specified for the interchangeable specifications. Assemble a track rail and a slide unit with the same interchangeable code. When using in combination with different interchangeable codes, please contact IKO. Note that the combination of interchangeable codes will not have any effect on accuracy.
For applicable models and sizes, see Table 1.
"No symbol" is indicated for non-interchangeable specification.

10 Special specification

/A, /BS, /D, /E, /F, / I , /J○, /L○, /LF○, /MA, /M4, /N, /Q, /RE, /T, /U, /V○, /W○, /Y○, /Z○

For applicable special specifications, see Tables 6.1, 6.2, 6.3, and 6.4.
For combination of multiple special specifications, see Table 7.
For details of special specifications, see page Ⅲ−29.

Table 6.1 Application of special specifications (Interchangeable specification, single slide unit)

Special specification	Supplemental code	Size					
		15	20	25	30	35	45
Female threads for bellows (1)	/J○	○	○	○	○	○	○
No end seal	/N	○	○	○	○	○	○
With C-Lube plate (2)	/Q	○	○	○	○	○	○
Special environment seal (2)	/RE	○	○	○	○	×	×
Under seal	/U	○	○	○	○	○	○
Double end seals	/V○	○	○	○	○	○	○
Scrapers	/Z○	○	○	○	○	○	○

Notes (1) Not applicable to stainless steel made products.
(2) Applicable to LWE series.

Table 6.2 Application of special specifications (Interchangeable specification, single track rail)

Special specification	Supplemental code	Size					
		15	20	25	30	35	45
Specified rail mounting hole positions	/E	○	○	○	○	○	○
Caps for rail mounting holes	/F	○	○	○	○	○	○
Female threads for bellows (1)	/J	○	○	○	○	○	○
Black chrome surface treatment	/LR	○	○	○	○	○	○
With track rail mounting bolt	/MA	○	○	○	○	○	○
Changed size of mounting holes	/M4	○	×	×	×	×	×
Butt-jointing track rails	/T	○	○	○	○	○	○

Note (1) Not applicable to stainless steel made products.

Table 6.3 Application of special specifications (Interchangeable specification, assembled set)

Special specification	Supplemental code	Size					
		15	20	25	30	35	45
Stainless steel end plate (1)	/BS	○	○	○	○	×	×
Opposite reference surfaces arrangement	/D	○	○	○	○	○	○
Specified rail mounting hole positions	/E	○	○	○	○	○	○
Caps for rail mounting holes	/F	○	○	○	○	○	○
Female threads for bellows (2)	/J○	○	○	○	○	○	○
Black chrome surface treatment	/L○	○	○	○	○	○	○
Fluorine black chrome surface treatment	/LF○	○	○	○	○	○	○
With track rail mounting bolt	/MA	○	○	○	○	○	○
Changed size of mounting holes	/M4	○	×	×	×	×	×
No end seal	/N	○	○	○	○	○	○
With C-Lube plate (1)	/Q	○	○	○	○	○	○
Special environment seal (1)	/RE	○	○	○	○	×	×
Butt-jointing track rails	/T	○	○	○	○	○	○
Under seal	/U	○	○	○	○	○	○
Double end seals	/V○	○	○	○	○	○	○
Specified grease (3)	/Y○	○	○	○	○	○	○
Scrapers	/Z○	○	○	○	○	○	○

Notes (1) Applicable to LWE series.
(2) Not applicable to stainless steel made products.
(3) ME series is applicable only to /YCG.

Table 6.4 Application of special specifications (Non-interchangeable specification)

Special specification	Supplemental code	Size					
		15	20	25	30	35	45
Butt-jointing track rails (1)	/A	○	○	○	○	○	○
Stainless steel end plate (2)	/BS	○	○	○	○	×	×
Opposite reference surfaces arrangement	/D	○	○	○	○	○	○
Specified rail mounting hole positions	/E	○	○	○	○	○	○
Caps for rail mounting holes	/F	○	○	○	○	○	○
Inspection sheet	/I	○	○	○	○	○	○
Female threads for bellows	/J○	○	○	○	○	○	○
Black chrome surface treatment	/L○	○	○	○	○	○	○
Fluorine black chrome surface treatment	/LF○	○	○	○	○	○	○
With track rail mounting bolt	/MA	○	○	○	○	○	○
Changed size of mounting holes	/M4	○	×	×	×	×	×
No end seal (1)	/N	○	○	○	○	○	○
With C-Lube plate (3)	/Q	○	○	○	○	○	○
Special environment seal (2)	/RE	○	○	○	○	×	×
Under seal (1)	/U	○	○	○	○	○	○
Double end seals	/V○	○	○	○	○	○	○
A group of multiple assembled sets	/W○	○	○	○	○	○	○
Specified grease (4)	/Y○	○	○	○	○	○	○
Scrapers	/Z○	○	○	○	○	○	○

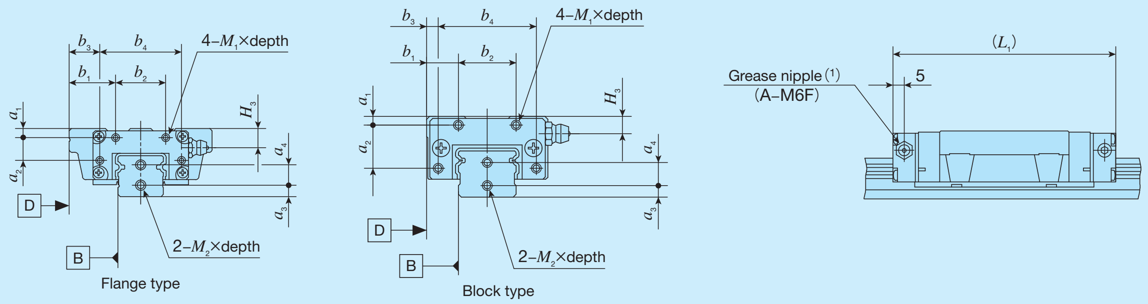
Notes (1) Not applicable to LWE…Q series.
(2) Applicable to LWE series.
(3) Applicable to LWE (…Q) series.
(4) ME series is applicable only to /YCG.

Table 7 Combination of supplemental codes

BS	○																		
D	○	○																	
E	—	○	—																
F	○	○	○	○															
I	○	○	○	○	○														
J	○	○	○	○	○	○													
L	○	○	○	○	○	○	○												
LF	○	○	○	○	○	○	○	—											
MA	○	○	○	○	○	○	○	○	○										
M4	○	○	○	○	○	○	○	○	○	○(1)									
N	○	○	○	○	—	○	—	○	○	○	○								
Q	○	○	○	○	○	○	—	○	○	○	○	○							
RE	○	○	○	○	○	○	○	○	○	○	○	—	○						
T	—	○	○	○	○	—	—	○	○	○	○	○	○	○					
U	○	○	○	○	○	○	○	○	○	○	○	—	○	○	○				
V	○	○	○	○	○	○	●	○	○	○	○	—	—	○	○	○			
W	○	○	○	—	○	○	○	○	○	○	○	○	○	○	—	○	○		
Y	○	○	○	○	○	○	○	○	○	○	○	○	—	○	○	○	○	○	
Z	○	○	○	○	○	○	●	○	○	○	○	—	—	○	○	○	●	○	○
	A	BS	D	E	F	I	J	L	LF	MA	M4	N	Q	RE	T	U	V	W	Y

Note (1) When combining "/MA" and "/M4", indicate "/MA4".
Remarks 1. The combination of "—" shown in the table is not available.
2. Contact IKO for the combination of the interchangeable specification marked with ●.
3. When using multiple types for combination, please indicate by arranging the symbols in alphabetical order.

Table 8 Dimension of female threads for bellows (Supplemental code Single unit: /J Assembled set: /J /JJ)



unit: mm

Identification number			Slide unit									Track Rail		
			a_1	a_2	b_1	b_2	b_3	b_4	M_1×depth	L_1(2)	H_3	a_3	a_4	M_2×depth
ME(T)C 15	LWE(T)C 15	–	3	12	18	16	12	28	M3×6	58	5.7	4	7	M3× 6
ME(T) 15	LWE(T) 15	LWE(T)15…Q								74				
ME(T)G 15	LWE(T)G 15	–								87				
MESC 15	LWESC 15	–			9		3			58				
MES 15	LWES 15	LWES 15…Q								74				
MESG 15	LWESG 15	–								87				
ME(T)C 20	LWE(T)C 20	–	3	15	19.5	20	12.5	34	M3×6	64	6	4	8	M3× 6
ME(T) 20	LWE(T) 20	LWE(T)20…Q								83				
ME(T)G 20	LWE(T)G 20	–								99				
MESC 20	LWESC 20	–			11		4			64				
MES 20	LWES 20	LWES 20…Q								83				
MESG 20	LWESG 20	–								99				
ME(T)C 25	LWE(T)C 25	–	3.5	17	23.5	26	16.5	40	M3×6	76	7	5	9	M4× 8
ME(T) 25	LWE(T) 25	LWE(T)25…Q								100				
ME(T)G 25	LWE(T)G 25	–								119				
MESC 25	LWESC 25	–			11		4			76				
MES 25	LWES 25	LWES 25…Q								100				
MESG 25	LWESG 25	–								119				
ME(T)C 30	LWE(T)C 30	–	5	17	28	34	20	50	M3×6	83	11	6	14	M4× 8
ME(T) 30	LWE(T) 30	–								112				
–	–	LWE(T)30…Q		20	25	40				111	10			
ME(T)G 30	LWE(T)G 30	–		17	28	34				144	11			
MESC 30	LWESC 30	–		17	13	34	5			83	11			
MES 30	LWES 30	–								112				
–	–	LWES 30…Q		20	10	40				111	10			
MESG 30	LWESG 30	–		17	13	34				144	11			
ME(T)C 35	LWE(T)C 35	–	6	20	30	40	20	60	M3×6	93	13	7	15	M4× 8
ME(T) 35	LWE(T) 35	–								126				
–	–	LWE(T)35…Q								125	11			
MESC 35	LWESC 35	–			15		5			93	13			
MES 35	LWES 35	–								126				
–	–	LWES 35…Q								125	11			
ME(T) 45	LWE(T) 45	–	7	26	35	50	23	74	M4×8	138	15	8	19	M5×10
MES 45	LWES 45	–			18		6							

Notes (1) The specification and mounting positions of grease nipple are different from those of the standard specification product. Provided grease nipple for size 15 models is NPB2 type (special specification).
For details of dimensions, please contact IKO.
(2) Dimensions of the specification that female threads for bellows are fitted to both ends of the slide unit are indicated.

Remark: This is also applicable to stainless steel models of the same size.

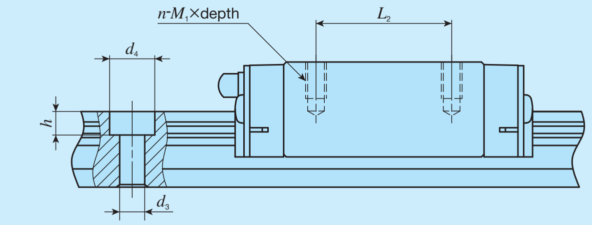
Table 9 Track rail mounting bolt size (Supplemental code /MA)

Size	Bolt size for track rail
15	M 3×16 M 4×16(1)
20	M 5×16
25	M 6×20
30	M 6×25
35	M 8×30
45	M10×35

Note (1) Applicable to the track rail of supplemental code "/M4" of special specification.

Remarks 1. Hexagon socket head bolts equivalent to JIS B 1176
2. For stainless steel model, stainless steel made bolts are appended.

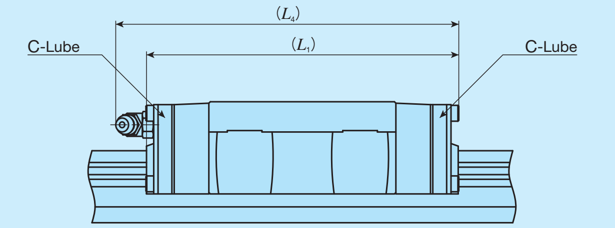
Table 10 Changed dimensions of mounting holes (Supplemental code /M4)



unit: mm

Size	d_3	d_4	h
15	4.5	8	6

Table 11 Dimension of slide unit with C-Lube plate (Supplemental code /Q)

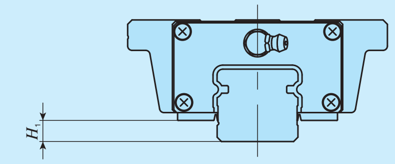


unit: mm

Identification number		L_1	L_4
LWEC 15	–	52	55
LWE 15	–	68	71
–	LWE15…Q		70
LWEG 15	–	81	83
LWEC 20	–	58	70
LWE 20	LWE20…Q	78	90
LWEG 20	–	94	105
LWEC 25	–	70	82
LWE 25	LWE25…Q	94	106
LWEG 25	–	113	125
LWEC 30	–	80	91
LWE 30	LWE30…Q	109	119
LWEG 30	–	141	151
LWEC 35	–	90	102
LWE 35	–	123	135
–	LWE35…Q	124	
LWE 45	–	138	148

Remarks 1. The dimensions of the slide unit with C-Lube at both ends are indicated.
2. A typical identification number is indicated, but is applied to all LWE (…Q) series models of the same size.

Table 12 H_1 dimension with under seal (Supplemental code /U)

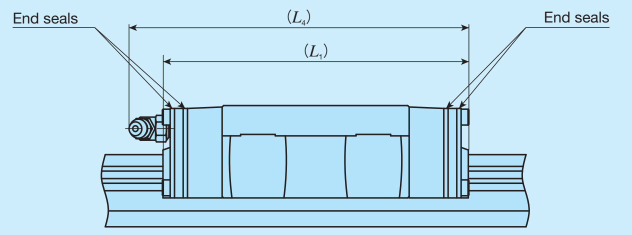


unit: mm

Identification number		H_1
ME 15	LWE 15	5
ME 20	LWE 20	5
ME 25	LWE 25	6
ME 30		9
	LWE 30	7
	LWEC 30	8.5
ME 35		10
	LWE 35	8
	LWEC 35	9.5
ME 45		13
	LWE 45	14

Remarks 1. A typical identification number is indicated, but is applied to all models of the same size.
2. LWE 30 and LWE 35 have different H_1 dimensions only when the slide unit length is short.

Table 13 Dimension of slide unit with double end seals (Supplemental code Single unit: /V Assembled set: /V /VV)

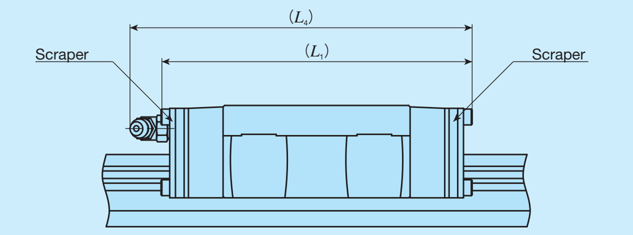


unit: mm

Identification number			L_1	L_4
MEC 15	LWEC 15	–	48	50
ME 15	LWE 15	LWE15…Q	64	66
MEG 15	LWEG 15	–	76	78
MEC 20	LWEC 20	–	54	68
ME 20	LWE 20	LWE20…Q	73	87
MEG 20	LWEG 20	–	89	103
MEC 25	LWEC 25	–	67	80
ME 25	LWE 25	LWE25…Q	91	104
MEG 25	LWEG 25	–	110	123
MEC 30	LWEC 30	–	78	89
ME 30	LWE 30	LWE30…Q	107	118
MEG 30	LWEG 30	–	138	150
MEC 35	LWEC 35	–	88	101
ME 35	LWE 35	LWE35…Q	121	134
ME 45	LWE 45	–	137	148

Remarks 1. The dimensions of the slide unit with double end seals at both ends are indicated.
2. A typical identification number is indicated, but is applied to all models of the same size.

Table 14 Dimension of slide unit with scrapers (Supplemental code Single unit: /Z Assembled set: /Z /ZZ)



unit: mm

Identification number			L_1	L_4
MEC 15	LWEC 15	–	48	50
ME 15	LWE 15	LWE15…Q	64	66
MEG 15	LWEG 15	–	77	79
MEC 20	LWEC 20	–	55	69
ME 20	LWE 20	LWE20…Q	75	88
MEG 20	LWEG 20	–	91	104
MEC 25	LWEC 25	–	69	81
ME 25	LWE 25	LWE25…Q	93	105
MEG 25	LWEG 25	–	112	124
MEC 30	LWEC 30	–	79	90
ME 30	LWE 30	–	108	119
–	–	LWE30…Q	109	
MEG 30	LWEG 30	–	140	151
MEC 35	LWEC 35	–	89	101
ME 35	LWE 35	–	122	134
–	–	LWE35…Q	123	135
ME 45	LWE 45	–	138	148

Remarks 1. The dimensions of the slide unit with scraper at both ends are indicated.
2. A typical identification number is indicated, but is applied to all models of the same size.

Lubrication

Lithium-soap base grease with extreme-pressure additive (Alvania EP grease 2 [Shell Lubricants Japan K.K.]) is pre-packed in ME and LWE (…Q) series. Additionally, ME series has C-Lube placed in the recirculation part of balls, so that the interval for reapplicating lubricant can be extended and maintenance works such as grease job can be reduced significantly.

ME and LWE (…Q) series have grease nipple as indicated in Table 15. Supply nozzles fit to each shapes of grease nipple are also available. For order of these parts for lubrication, see Table 14.1 on page Ⅲ–23 and Table 15 on page Ⅲ–24.

Dust Protection

The slide units of ME and LWE (…Q) series are equipped with end seals as standard for dust protection. However, if large amount of contaminant or dust are floating, or if large particles of foreign substances such as chips or sand may adhere to the track rail, it is recommended to cover the whole unit with bellows or telescope type shield, etc.

ME series and LWE (…Q) series are provided with specific bellows. The bellows are easy to mount and provide excellent dust protection. If needed, please refer to Ⅲ–26 for ordering.

Table 15 Parts for lubrication

Size	Grease nipple type (1)	Applicable supply nozzle type	Bolt size of female threads for piping
15	A-M4	A-5120V A-5240V B-5120V B-5240V	M4
20	B-M6	Grease gun available on the market	M6
25			
30			
35	JIS type 4		PT1/8
45			

Note (1) For grease nipple specification, see Tables 14.1 and 14.2 on page Ⅲ–23.
Remark: Stainless steel grease nipple is also available. If needed, please contact IKO.

Precaution for Use

❶ Mounting surface, reference mounting surface, and typical mounting structure

When mounting the ME and LWE (…Q) series, properly align the reference mounting surface B and D of the track rail and slide unit with the reference mounting surface of the table and bed and fix them. (See Fig. 2)

The reference mounting surfaces B and D and mounting surfaces A and C are precisely ground. Machining the mounting surface of the table and bed, such as machine or device, to high accuracy and mounting them properly will ensure stable linear motion with high accuracy.

Reference mounting surface of the slide unit is the opposite side of the IKO mark. The track rail reference mounting surface is identified by locating the IKO mark on the top surface of the track rail. It is the side surface above the mark (in the direction of the arrow). (See Fig. 3.)

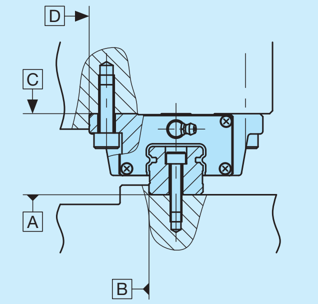


Fig. 2 Reference mounting surface and typical mounting structure

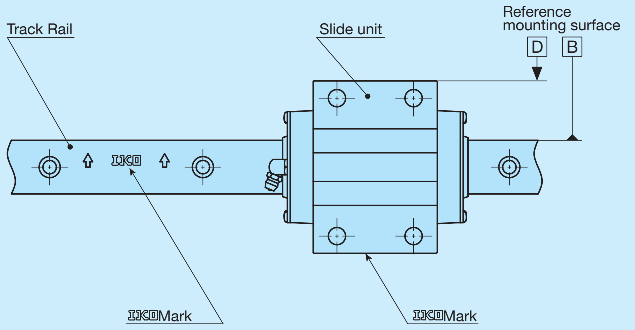


Fig. 3 Reference mounting surface

❷ Shoulder height and corner radius of the reference mounting surface

For the opposite corner of the mating reference mounting, it is recommended to have relieved fillet as indicated in Fig. 4. Recommended value for the shoulder height on the mating side is indicated in Table 17.

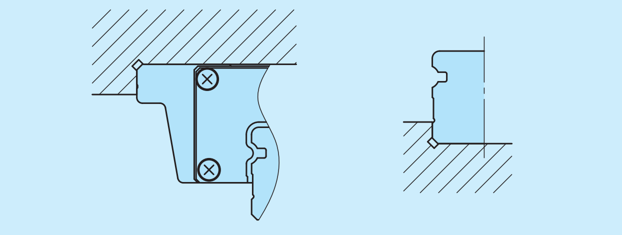


Fig. 4 Corner of the mating reference mounting

❸ Tightening torque for fixing screw

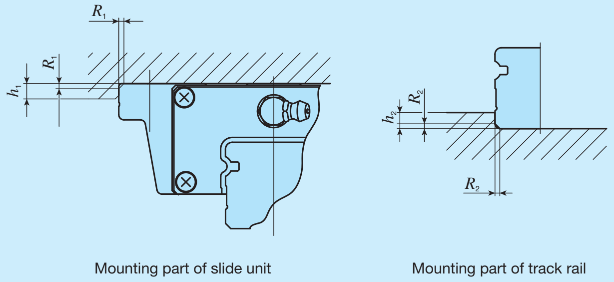
Typical tightening torque for mounting of the ME and LWE (…Q) series to the steel mating member material is indicated in Table 16. When vibration and shock of the machine or device are large, fluctuating load is large, or moment load is applied, fix it by using the torque 1.2 to 1.5 times larger than the value indicated in the table as necessary. If the mating member material is cast iron or aluminum alloy, reduce the tightening torque depending on the strength characteristics of the mating member material.

Table 16 Tightening torque for fixing screw

Bolt size	Tightening torque N・m	
	High carbon steel-made screw	Stainless steel-made screw
M 3×0.5	1.8	1.1
M 4×0.7	4.1	2.5
M 5×0.8	8.0	5.0
M 6×1	13.6	8.5
M 8×1.25	32.7	20.4
M10×1.5	63.9	–
M12×1.75	110	–

Remark: The tightening torque is calculated based on strength division 12.9 and property division A2-70.

Table 17 Shoulder height and corner radius of the reference mounting surface



unit: mm

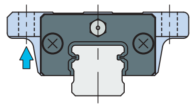
Size	Mounting part of slide unit		Mounting part of track rail	
	Shoulder height h_1	Corner radius R_1 (maximum)	Shoulder height h_2	Corner radius R_2 (maximum)
15	4	1 (0.5) (1)	3	0.5
20	5	1 (0.5) (1)	3	0.5
25	6	1	4	1
30	8	1	5	1
35	8	1	6	1
45	8	1.5	7	1.5

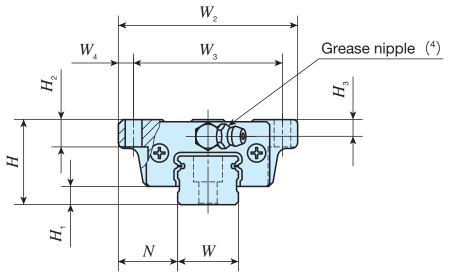
Note (1) The values in ( ) are applied to MES and LWES (…Q).

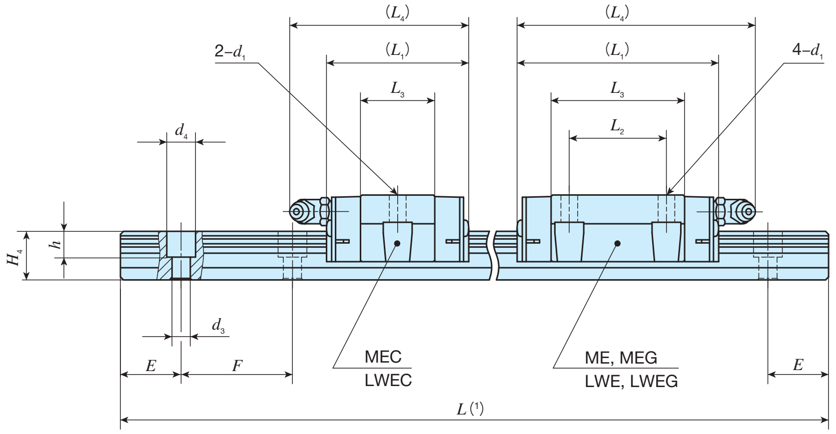
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO C-Lube Linear Way ME

Flange type mounting from bottom

Shape	**ME** · **LWE** 		
Size	15	20	25
	30	35	45





Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm										Dimensions of track rail mm							Recommended mounting bolt for track rail (2) mm	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
ME series	LWE series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	d_1	H_2	H_3	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MEC 15	LWEC 15	○	0.11	1.57	24	5.8	18.5	52	41	5.5	41	–	22.4	45	4.5	7	4.5	15	14.5	3.6 (4.5)	6.5 (8)	4.5 (6)	20	60	M3×16 (M4×16)	5 240	5 480	43.8	21.3 149	21.3 149
MEC 15···SL	LWEC 15···SL	○																												
ME 15	LWE 15	○	0.18								57	26	38.4	61												7 640	9 390	75.1	57.6 333	57.6 333
ME 15···SL	LWE 15···SL	○																												
–	LWE 15···Q	–				5							38.3													6 550	8 610	68.9	53.0 307	53.0 307
MEG 15	LWEG 15	○	0.24			5.8					70	36	51.1	73												9 340	12 500	100	99.5 533	99.5 533
MEG 15···SL	LWEG 15···SL	○																												
MEC 20		○	0.18	2.28	28	6	19.5	59	49	5	47	–	24.7	58	5.5	9	5.5	20	16	6	9.5	8.5	20	60	M5×16	7 580	7 340	78.9	31.5 235	31.5 235
	LWEC 20	○											24.5													7 570				
MEC 20···SL		○											24.7													7 580				
	LWEC 20···SL	○											24.5													7 570				
ME 20		○	0.30								67	32	44.2	78												11 600	13 400	145	95.6 566	95.6 566
	LWE 20	○											44																	
ME 20···SL		○											44.2																	
	LWE 20···SL	○											44																	
–	LWE 20···Q	–				5																				10 500			100 562	100 562
MEG 20		○	0.40			6					83	45	60.1	94												14 400	18 300	197	172 930	172 930
	LWEG 20	○											59.9																	
MEG 20···SL		○											60.1																	
	LWEG 20···SL	○											59.9																	

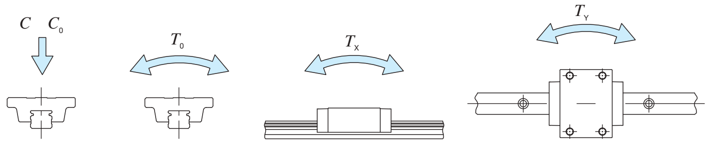
Notes (1) Track rail lengths L are shown in Tables 2.1 and 2.2 on page Ⅱ−67.

(2) Track rail mounting bolts are not appended. Hexagon socket head bolts of JIS B 1176 with strength division 12.9 are recommended.

(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

(4) The shapes of grease nipple vary by size. The specifications are shown in Table 15 on page Ⅱ−73.

Remark: The value in ( ) represents dimensions when the track rail mounting hole dimension is set for M4 holes. Indicate the identification number with /M4 at the end.



Example of identification number of assembled set

Model code		Dimensions	Part code		Model code	Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
ME	G	15	C2	R340			T_1	P		/U
①	②	③	④	⑤	①	⑥	⑦	⑧	⑨	⑩

① Model

ME	Flange type mounting from bottom
LWE	
LWE···Q	

② Length of slide unit

C	Short
No symbol	Standard
G	Long

③ Size

15, 20

④ Number of slide unit (2)

⑤ Length of track rail (340 mm)

⑥ Material type

No symbol	High carbon steel made
SL	Stainless steel made

⑦ Preload amount

T_C	Clearance
No symbol	Standard
T_1	Light preload
T_2	Medium preload

⑧ Accuracy class

No symbol	Ordinary
H	High
P	Precision
SP	Super precision

⑨ Interchangeable

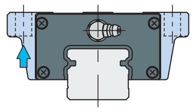
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

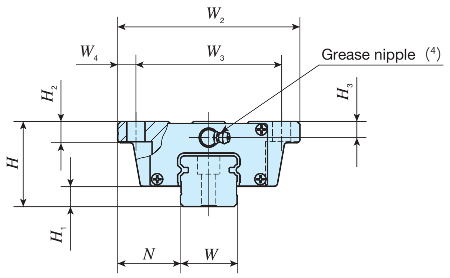
⑩ Special specification

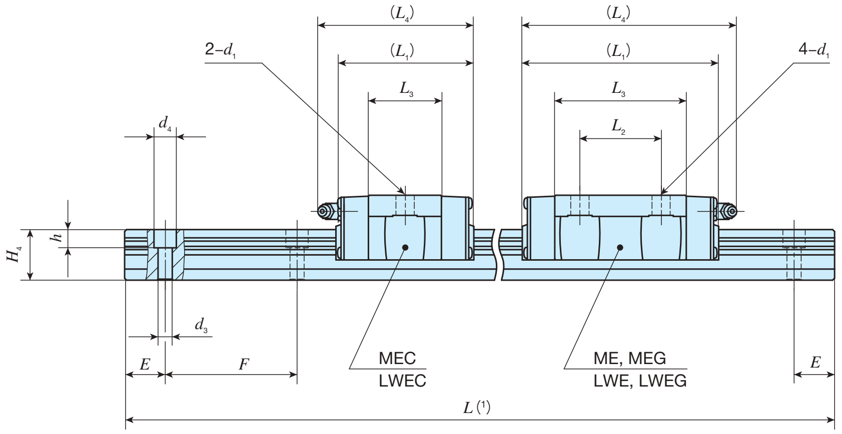
A, BS, D, E, F, Ⅰ, J, L, LF, MA
M4, N, Q, RE, T, U, V, W, Y, Z

IKO C-Lube Linear Way ME

Flange type mounting from bottom

Shape	**ME** ・ **LWE** 		
Size	15	20	25
	30	35	45





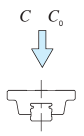
Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm										Dimensions of track rail mm							Recommended mounting bolt for track rail (2) mm	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
ME series	LWE series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	d_1	H_2	H_3	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MEC 25	LWEC 25	○	0.33	3.09	33	7	25	73	60	6.5	59	–	32	70	7	10	6.5	23	19	7	11	9	20	60	M 6×20	12 400	12 300	153	71.8 480	71.8 480
MEC 25…SL	LWEC 25…SL	○																												
ME 25	LWE 25	○	0.56								83	35	56	94												18 100	21 100	262	195 1 090	195 1 090
ME 25…SL	LWE 25…SL	○																												
–	LWE 25…Q	–				6																				15 500	19 400	240	175 1 010	175 1 010
MEG 25	LWEG 25	○	0.73			7					102	50	75	113												22 200	28 200	349	336 1 740	336 1 740
MEG 25…SL	LWEG 25…SL	○																												
MEC 30	LWEC 30	○	0.58	5.09	42	10	31	90	72	9	68	–	36	78	9	10	8	28	25	7	11	9	20	80	M 6×25	20 600	18 800	287	129 855	129 855
MEC 30…SL	LWEC 30…SL	○																												
ME 30	LWE 30	○	0.99								97	40	64.8	107												29 500	31 300	479	328 1 920	328 1 920
ME 30…SL	LWE 30…SL	○																												
–	LWE 30…Q	–	0.97	5.04							96			106												21 600	26 400	398	278 1 580	278 1 580
MEG 30	LWEG 30	○	1.50	5.09							129	60	96.5	139												39 200	47 000	718	704 3 690	704 3 690
MEG 30…SL	LWEG 30…SL	○																												
MEC 35	LWEC 35	○	0.84	6.85	48	11	33	100	82	9	78	–	41.6	90	9	13	10	34	28	9	14	12	20	80	M 8×30	29 900	26 800	412	176 1 190	162 1 100
ME 35	LWE 35	○	1.52								111	50	74.6	123												42 900	44 700	686	448 2 660	412 2 450
–	LWE 35…Q	–	1.53	6.84							110		76.6	122												30 500	37 600	687	482 2 550	482 2 550
ME 45	LWE 45	○	2.46	11.2	60	14	37.5	120	100	10	125	60	81.4	136	11	15	13	45	34	11	17.5	14	22.5	105	M10×35	61 100	60 200	1 210	672 4 070	618 3 750

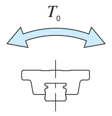
Notes (1) Track rail lengths L are shown in Tables 2.1 and 2.2 on page Ⅱ−67.

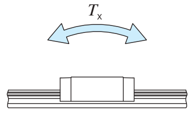
(2) Track rail mounting bolts are not appended. Hexagon socket head bolts of JIS B 1176 with strength division 12.9 are recommended.

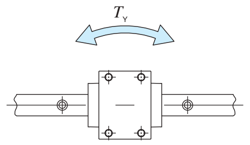
(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

(4) The shapes of grease nipple vary by size. The specifications are shown in Table 15 on page Ⅱ−73.









Example of identification number of assembled set

Model code		Dimensions	Part code		Model code	Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
ME	**G**	**30**	**C2**	**R440**			**T_1**	**P**		**/U**
①	②	③	④	⑤	①	⑥	⑦	⑧	⑨	⑩

① Model	
ME	Flange type mounting from bottom
LWE	
LWE…Q	

② Length of slide unit	
C	Short
No symbol	Standard
G	Long

③ Size
25, 30, 35, 45

④ Number of slide unit (2)

⑤ Length of track rail (440 mm)

⑥ Material type	
No symbol	High carbon steel made
SL	Stainless steel made

⑦ Preload amount	
T_C	Clearance
No symbol	Standard
T_1	Light preload
T_2	Medium preload

⑧ Accuracy class	
No symbol	Ordinary
H	High
P	Precision
SP	Super precision

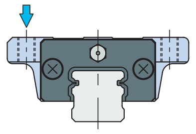
⑨ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

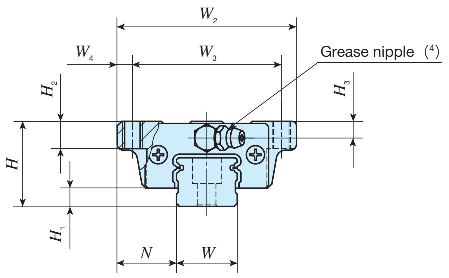
⑩ Special specification
A, BS, D, E, F, Ⅰ, J, L, LF, MA N, Q, RE, T, U, V, W, Y, Z

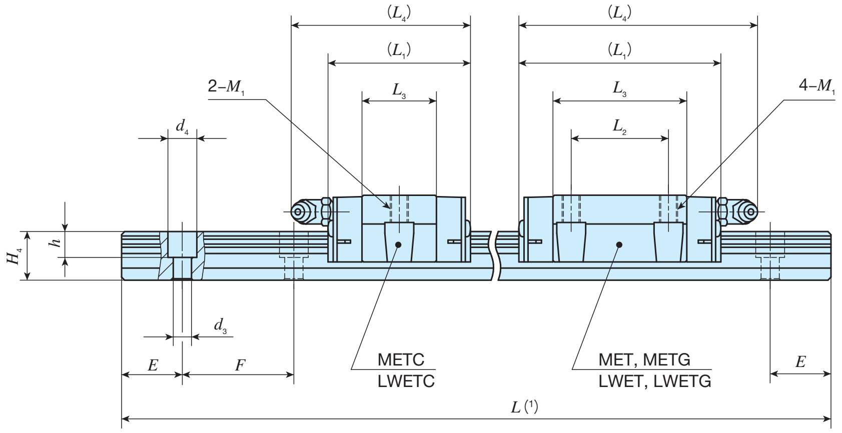
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO C-Lube Linear Way ME

Flange type mounting from top

Shape	**MET ・ LWET** 		
Size	15	20	25
	30	35	45





Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm								Dimensions of track rail mm									Recommended mounting bolt for track rail (2) mm	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
ME series	LWE series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	M_1	H_2	H_3	W	H_4	d_3	d_4	h	E	F	Bolt size × ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
METC 15	LWETC 15	○	0.11	1.57	24	5.8	18.5	52	41	5.5	41	–	22.4	45	M5	7	4.5	15	14.5	3.6 (4.5)	6.5 (8)	4.5 (6)	20	60	M3×16 (M4×16)	5 240	5 480	43.8	21.3 149	21.3 149
METC 15…SL	LWETC 15…SL	○																												
MET 15	LWET 15	○	0.18								57	26	38.4	61												7 640	9 390	75.1	57.6 333	57.6 333
MET 15…SL	LWET 15…SL	○																												
–	LWET 15…Q	–				5							38.3													6 550	8 610	68.9	53.0 307	53.0 307
METG 15	LWETG 15	○	0.24			5.8					70	36	51.1	73												9 340	12 500	100	99.5 533	99.5 533
METG 15…SL	LWETG 15…SL	○																												
METC 20		○	0.18	2.28	28	6	19.5	59	49	5	47	–	24.7	58	M6	9	5.5	20	16	6	9.5	8.5	20	60	M5×16	7 580	7 340	78.9	31.5 235	31.5 235
	LWETC 20	○											24.5													7 570				
METC 20…SL		○											24.7													7 580				
	LWETC 20…SL	○											24.5													7 570				
MET 20		○	0.30								67	32	44.2	78												11 600	13 400	145	95.6 566	95.6 566
	LWET 20	○											44																	
MET 20…SL		○											44.2																	
	LWET 20…SL	○											44																	
–	LWET 20…Q	–				5																				10 500			100 562	100 562
METG 20		○	0.40			6					83	45	60.1	94												14 400	18 300	197	172 930	172 930
	LWETG 20	○											59.9																	
METG 20…SL		○											60.1																	
	LWETG 20…SL	○											59.9																	

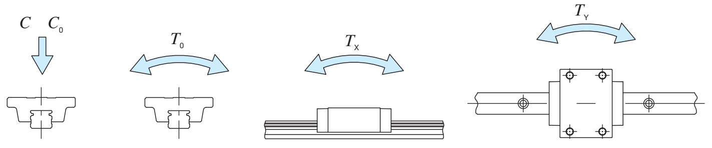
Notes (1) Track rail lengths L are shown in Tables 2.1 and 2.2 on page Ⅱ−67.

(2) Track rail mounting bolts are not appended. Hexagon socket head bolts of JIS B 1176 with strength division 12.9 are recommended.

(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

(4) The shapes of grease nipple vary by size. The specifications are shown in Table 15 on page Ⅱ−73.

Remark: The value in ( ) represents dimensions when the track rail mounting hole dimension is set for M4 holes. Indicate the identification number with /M4 at the end.



Example of identification number of assembled set

Model code		Dimensions	Part code		Model code	Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MET	G	15	C2	R340	___	___	T1	P	___	/U
❶	❷	❸	❹	❺	❶	❻	❼	❽	❾	❿

① Model	
MET	Flange type mounting from top
LWET	
LWET…Q	

② Length of slide unit	
C	Short
No symbol	Standard
G	Long

③ Size

15, 20

④ Number of slide unit (2)

⑤ Length of track rail (340 mm)

⑥ Material type	
No symbol	High carbon steel made
SL	Stainless steel made

⑦ Preload amount	
Tc	Clearance
No symbol	Standard
T1	Light preload
T2	Medium preload

⑧ Accuracy class	
No symbol	Ordinary
H	High
P	Precision
SP	Super precision

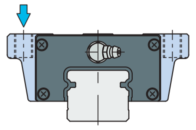
⑨ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

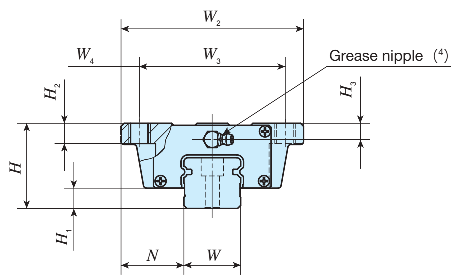
⑩ Special specification

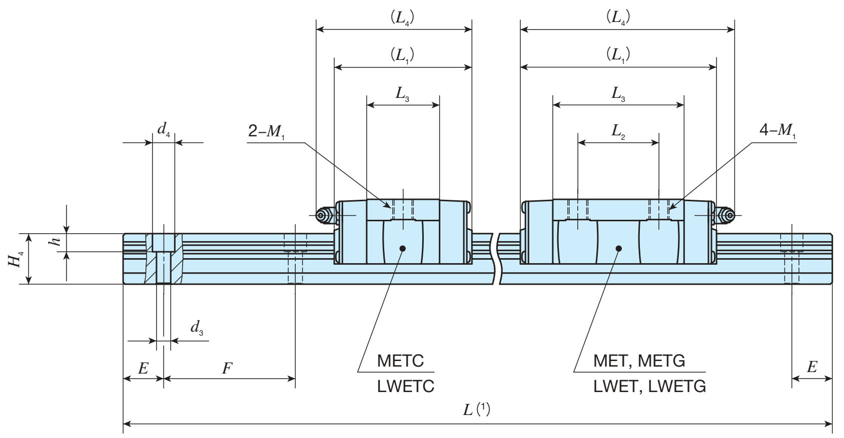
A, BS, D, E, F, Ⅰ, J, L, LF, MA
M4, N, Q, RE, T, U, V, W, Y, Z

C-Lube Linear Way ME

Flange type mounting from top

Shape	**MET** ・ **LWET** 		
Size	15	20	25
	30	35	45





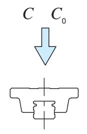
Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm										Dimensions of track rail mm							Recommended mounting bolt for track rail (2) mm	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
ME series	LWE series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	M_1	H_2	H_3	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
METC 25	LWETC 25	○	0.33	3.09	33	7	25	73	60	6.5	59	–	32	70	M 8	10	6.5	23	19	7	11	9	20	60	M 6×20	12 400	12 300	153	71.8 480	71.8 480
METC 25···SL	LWETC 25···SL	○																												
MET 25	LWET 25	○	0.56								83	35	56	94												18 100	21 100	262	195 1 090	195 1 090
MET 25···SL	LWET 25···SL	○																												
–	LWET 25···Q	–				6																				15 500	19 400	240	175 1 010	175 1 010
METG 25	LWETG 25	○	0.73			7					102	50	75	113												22 200	28 200	349	336 1 740	336 1 740
METG 25···SL	LWETG 25···SL	○																												
METC 30	LWETC 30	○	0.58	5.09	42	10	31	90	72	9	68	–	36	78	M10	10	8	28	25	7	11	9	20	80	M 6×25	20 600	18 800	287	129 855	129 855
METC 30···SL	LWETC 30···SL	○																												
MET 30	LWET 30	○	0.99								97	40	64.8	107												29 500	31 300	479	328 1 920	328 1 920
MET 30···SL	LWET 30···SL	○																												
–	LWET 30···Q	–	0.97	5.04							96			106												21 600	26 400	398	278 1 580	278 1 580
METG 30	LWETG 30	○	1.50	5.09							129	60	96.5	139												39 200	47 000	718	704 3 690	704 3 690
METG 30···SL	LWETG 30···SL	○																												
METC 35	LWETC 35	○	0.84	6.85	48	11	33	100	82	9	78	–	41.6	90	M10	13	10	34	28	9	14	12	20	80	M 8×30	29 900	26 800	412	176 1 190	162 1 100
MET 35	LWET 35	○	1.52								111	50	74.6	123												42 900	44 700	686	448 2 660	412 2 450
–	LWET 35···Q	–	1.53	6.84							110		76.6	122												30 500	37 600	687	482 2 550	482 2 550
MET 45	LWET 45	○	2.46	11.2	60	14	37.5	120	100	10	125	60	81.4	136	M12	15	13	45	34	11	17.5	14	22.5	105	M10×35	61 100	60 200	1 210	672 4 070	618 3 750

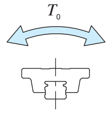
Notes (1) Track rail lengths L are shown in Tables 2.1 and 2.2 on page Ⅱ−67.

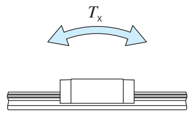
(2) Track rail mounting bolts are not appended. Hexagon socket head bolts of JIS B 1176 with strength division 12.9 are recommended.

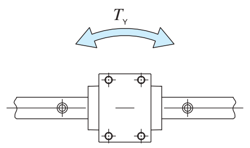
(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

(4) The shapes of grease nipple vary by size. The specifications are shown in Table 15 on page Ⅱ−73.









Example of identification number of assembled set

Model code	Dimensions	Part code		Model code	Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MET ①	G ②	30 ③	C2 ④	R440 ⑤	①	⑥	T1 ⑦	P ⑧	⑨	/U ⑩

① Model	
MET	Flange type mounting from top
LWET	
LWET···Q	

② Length of slide unit	
C	Short
No symbol	Standard
G	Long

③ Size

25, 30, 35, 45

④ Number of slide unit (2)

⑤ Length of track rail (440 mm)

⑥ Material type	
No symbol	High carbon steel made
SL	Stainless steel made

⑦ Preload amount	
T_C	Clearance
No symbol	Standard
T_1	Light preload
T_2	Medium preload

⑧ Accuracy class	
No symbol	Ordinary
H	High
P	Precision
SP	Super precision

⑨ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

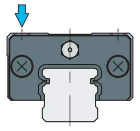
⑩ Special specification

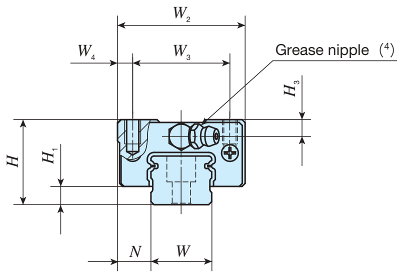
A, BS, D, E, F, Ⅰ, J, L, LF, MA
N, Q, RE, T, U, V, W, Y, Z

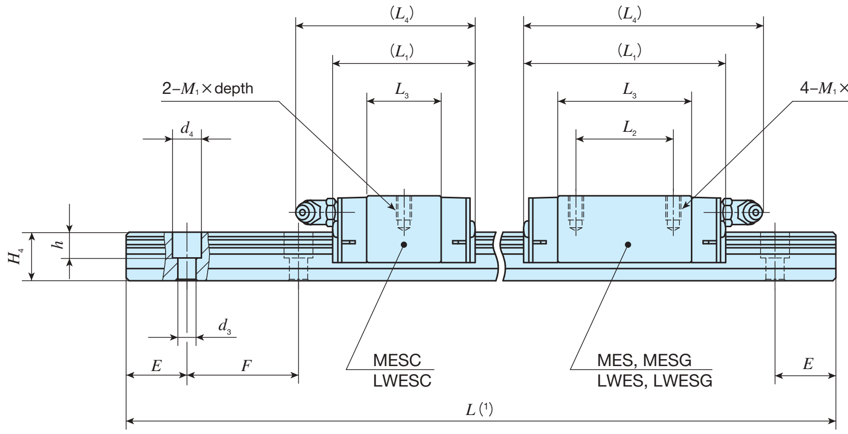
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO C-Lube Linear Way ME

Block type mounting from top

Shape	**MES** · **LWES** 		
Size	15	20	25
	30	35	45

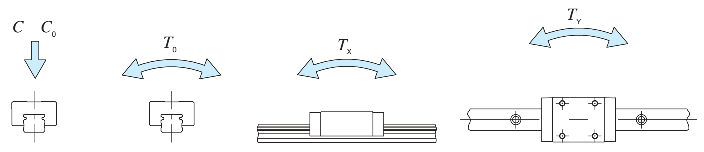




Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm									Dimensions of track rail mm							Recommended mounting bolt for track rail (2) mm	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
ME series	LWE series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	M_1×depth	H_3	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MESC 15	LWESC 15	○	0.09	1.57	24	5.8	9.5	34	26	4	41	–	22.4	45	M4×7	4.5	15	14.5	3.6 (4.5)	6.5 (8)	4.5 (6)	20	60	M3×16 (M4×16)	5 240	5 480	43.8	21.3 149	21.3 149
MESC 15…SL	LWESC 15…SL	○																											
MES 15	LWES 15	○	0.14								57	26	38.4	61											7 640	9 390	75.1	57.6 333	57.6 333
MES 15…SL	LWES 15…SL	○																											
–	LWES 15…Q	–				5							38.3												6 550	8 610	68.9	53.0 307	53.0 307
MESG 15	LWESG 15	○	0.18			5.8					70	36	51.1	73											9 340	12 500	100	99.5 533	99.5 533
MESG 15…SL	LWESG 15…SL	○																											
MESC 20		○	0.15	2.28	28	6	11	42	32	5	47	–	24.7	58	M5×8	5.5	20	16	6	9.5	8.5	20	60	M5×16	7 580	7 340	78.9	31.5 235	31.5 235
	LWESC 20	○											24.5												7 570				
MESC 20…SL		○											24.7												7 580				
	LWESC 20…SL	○											24.5												7 570				
MES 20		○	0.25								67	32	44.2	78											11 600	13 400	145	95.6 566	95.6 566
	LWES 20	○											44																
MES 20…SL		○											44.2																
	LWES 20…SL	○											44																
–	LWES 20…Q	–				5																			10 500			100 562	100 562
MESG 20		○	0.33			6					83	45	60.1	94											14 400	18 300	197	172 930	172 930
	LWESG 20	○											59.9																
MESG 20…SL		○											60.1																
	LWESG 20…SL	○											59.9																

Notes (1) Track rail lengths L are shown in Tables 2.1 and 2.2 on page Ⅱ−67.
(2) Track rail mounting bolts are not appended. Hexagon socket head bolts of JIS B 1176 with strength division 12.9 are recommended.
(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.
(4) The shapes of grease nipple vary by size. The specifications are shown in Table 15 on page Ⅱ−73.

Remark: The value in ( ) represents dimensions when the track rail mounting hole dimension is set for M4 holes. Indicate the identification number with /M4 at the end.



Example of identification number of assembled set

Model code		Dimensions	Part code		Model code	Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MES	G	15	C2	R340			T_1	P		/U
1	2	3	4	5	1	6	7	8	9	10

① Model

MES	Block type mounting from top
LWES	
LWES…Q	

② Length of slide unit

C	Short
No symbol	Standard
G	Long

③ Size

15, 20

④ Number of slide unit (2)

⑤ Length of track rail (340 mm)

⑥ Material type

No symbol	High carbon steel made
SL	Stainless steel made

⑦ Preload amount

T_C	Clearance
No symbol	Standard
T_1	Light preload
T_2	Medium preload

⑧ Accuracy class

No symbol	Ordinary
H	High
P	Precision
SP	Super precision

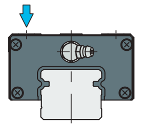
⑨ Interchangeable

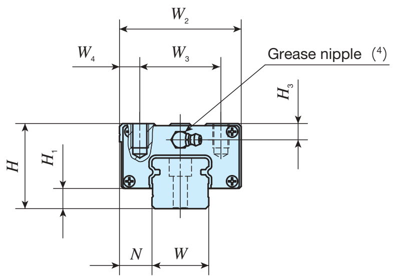
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

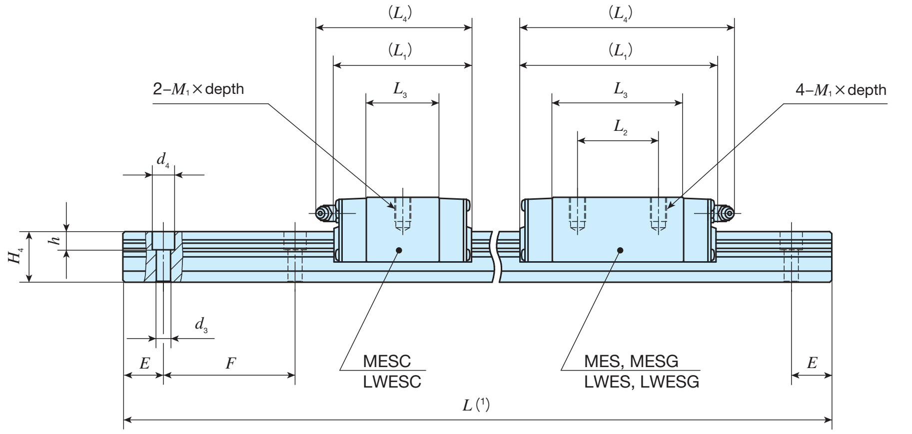
⑩ Special specification

A, BS, D, E, F, Ⅰ, J, L, LF, MA
M4, N, Q, RE, T, U, V, W, Y, Z

IKO C-Lube Linear Way ME

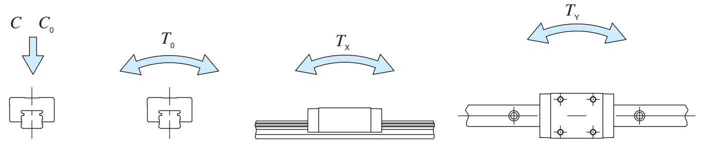
Block type mounting from top	
Shape	**MES** · **LWES** 
Size	15 20 25 30 35 45





Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm									Dimensions of track rail mm							Recommended mounting bolt for track rail (2) mm	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
ME series	LWE series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	M_1×depth	H_3	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N · m	T_X N · m	T_Y N · m
MESC 25	LWESC 25	○	0.26	3.09	33	7	12.5	48	35	6.5	59	–	32	70	M 6×9	6.5	23	19	7	11	9	20	60	M 6×20	12 400	12 300	153	71.8 480	71.8 480
MESC 25…SL	LWESC 25…SL	○																											
MES 25	LWES 25	○	0.43								83	35	56	94											18 100	21 100	262	195 1 090	195 1 090
MES 25…SL	LWES 25…SL	○																											
–	LWES 25…Q	–				6																			15 500	19 400	240	175 1 010	175 1 010
MESG 25	LWESG 25	○	0.55			7					102	50	75	113											22 200	28 200	349	336 1 740	336 1 740
MESG 25…SL	LWESG 25…SL	○																											
MESC 30	LWESC 30	○	0.46	5.09	42	10	16	60	40	10	68	–	36	78	M 8×12	8	28	25	7	11	9	20	80	M 6×25	20 600	18 800	287	129 855	129 855
MESC 30…SL	LWESC 30…SL	○																											
MES 30	LWES 30	○	0.78								97	40	64.8	107											29 500	31 300	479	328 1 920	328 1920
MES 30…SL	LWES 30…SL	○																											
–	LWES 30…Q	–	0.75	5.04							96			106											21 600	26 400	398	278 1 580	278 1 580
MESG 30	LWESG 30	○	1.13	5.09							129	60	96.5	139											39 200	47 000	718	704 3 690	704 3 690
MESG 30…SL	LWESG 30…SL	○																											
MESC 35	LWESC 35	○	0.67	6.85	48	11	18	70	50	10	78	–	41.6	90	M 8×12	10	34	28	9	14	12	20	80	M 8×30	29 900	26 800	412	176 1 190	162 1 100
MES 35	LWES 35	○	1.21								111	50	74.6	123											42 900	44 700	686	448 2 660	412 2 450
–	LWES 35…Q	–	1.20	6.84							110		76.6	122											30 500	37 600	687	482 2 550	482 2 550
MES 45	LWES 45	○	2.05	11.2	60	14	20.5	86	60	13	125	60	81.4	136	M10×15	13	45	34	11	17.5	14	22.5	105	M10×35	61 100	60 200	1 210	672 4 070	618 3 750

Notes (1) Track rail lengths L are shown in Tables 2.1 and 2.2 on page Ⅱ－67.
(2) Track rail mounting bolts are not appended. Hexagon socket head bolts of JIS B 1176 with strength division 12.9 are recommended.
(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.
(4) The shapes of grease nipple vary by size. The specifications are shown in Table 15 on page Ⅱ－73.



Example of identification number of assembled set

Model code		Dimensions	Part code		Model code	Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MES	G	30	C2	R440			T1	P		/U
①	②	③	④	⑤	①	⑥	⑦	⑧	⑨	⑩

① Model	
MES LWES LWES…Q	Block type mounting from top

② Length of slide unit	
C	Short
No symbol	Standard
G	Long

③ Size
25, 30, 35, 45

④ Number of slide unit (2)

⑤ Length of track rail (440 mm)

⑥ Material type	
No symbol	High carbon steel made
SL	Stainless steel made

⑦ Preload amount	
Tc	Clearance
No symbol	Standard
T1	Light preload
T2	Medium preload

⑧ Accuracy class	
No symbol	Ordinary
H	High
P	Precision
SP	Super precision

⑨ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

⑩ Special specification
A, BS, D, E, F, Ⅰ, J, L, LF, MA N, Q, RE, T, U, V, W, Y, Z

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

C-Lube Linear Way MH
Linear Way H

C-Lube Linear Way MH

MH

Points

1 High rigidity series with the largest-class load rating among ball types

High rigidity linear motion rolling guides designed to evenly support high load capacity by incorporating large-diameter balls.

2 Wide range of variations for your needs

For details ➲ P.Ⅰ-26

As the lineup of 5 types of slide unit shape including the flange type, block type with small width and side mounting type, etc., and 3 types with different slide unit length with same section are available, you can select an optimal product for the specifications of your machine and device.

3 Stainless steels selections superior in corrosion resistance are listed on lineup.

For details ➲ P.Ⅰ-41

Products made of stainless steel are highly resistant to corrosion, so that they are suitable for applications where rust prevention oil is not preferred, such as in cleanroom environment.

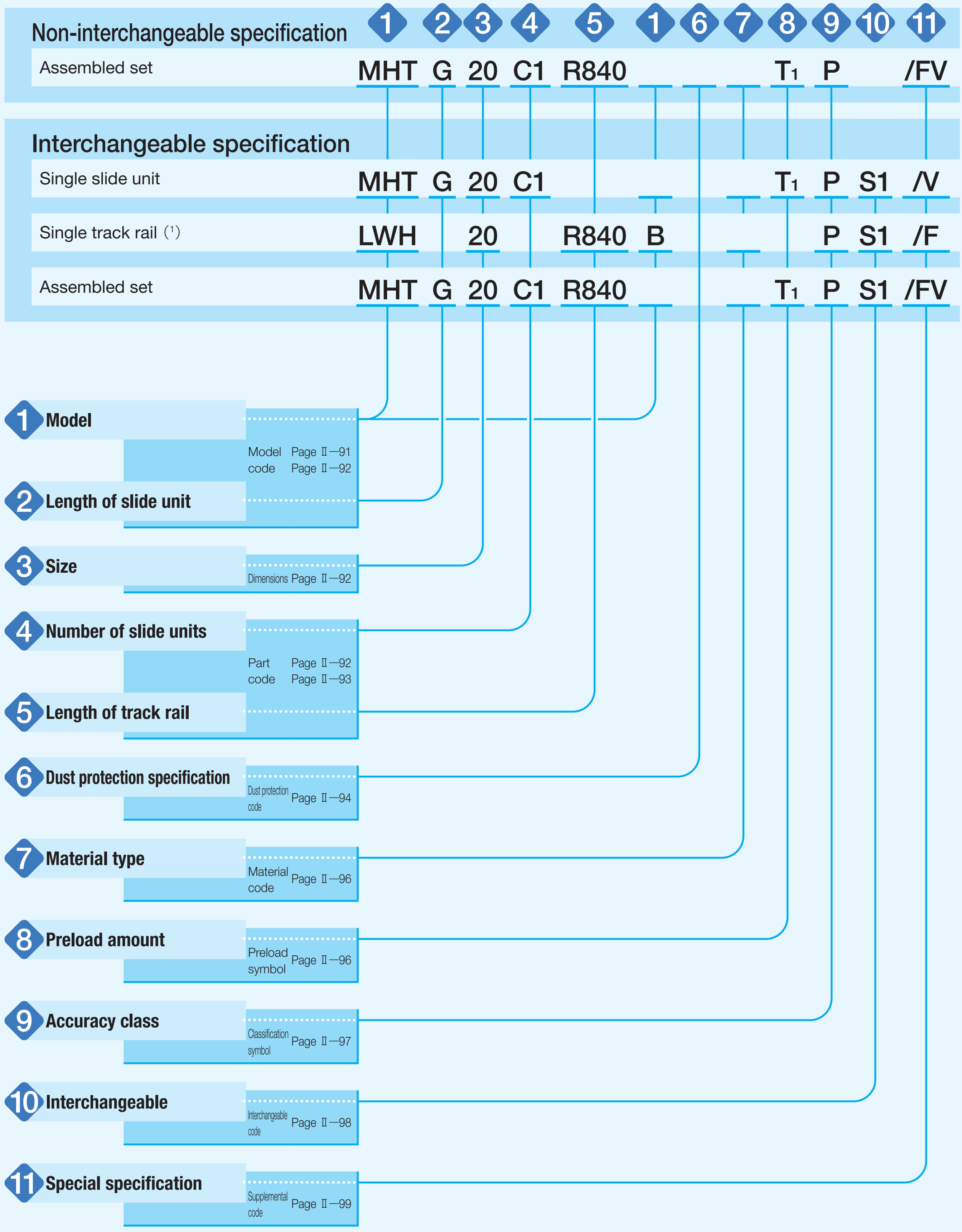
4 Series of ultra seal specification for excellent dust protection performance

Products of ultra seal specifications have excellent dust protection performance thanks to the combination of the dedicated track rail finished with total ground and slide unit with end seal and under seal of special shapes. Special specification with inner seal further improves dust protection property of the ball circulation section against foreign substances from the upper surface of the track rail.

Identification Number and Specification

Example of an identification number

The specifications of MH and LWH series are indicated by the identification number. Indicate the identification number, consisting of a model code, dimensions, a part code, a dust protection code, a material code, a preload symbol, a classification symbol, an interchangeable code, and any supplemental codes for each specification to apply.



	①	②	③	④	⑤	①	⑥	⑦	⑧	⑨	⑩	⑪
Non-interchangeable specification												
Assembled set	MHT	G	20	C1	R840				T_1	P		/FV
Interchangeable specification												
Single slide unit	MHT	G	20	C1					T_1	P	S1	/V
Single track rail (1)	LWH		20		R840	B				P	S1	/F
Assembled set	MHT	G	20	C1	R840				T_1	P	S1	/FV

① Model	Model code	Page Ⅱ—91 Page Ⅱ—92
② Length of slide unit		
③ Size	Dimensions	Page Ⅱ—92
④ Number of slide units	Part code	Page Ⅱ—92 Page Ⅱ—93
⑤ Length of track rail		
⑥ Dust protection specification	Dust protection code	Page Ⅱ—94
⑦ Material type	Material code	Page Ⅱ—96
⑧ Preload amount	Preload symbol	Page Ⅱ—96
⑨ Accuracy class	Classification symbol	Page Ⅱ—97
⑩ Interchangeable	Interchangeable code	Page Ⅱ—98
⑪ Special specification	Supplemental code	Page Ⅱ—99

Note (1) Indicate "LWH···B" or "LWH" for the model code of the single track rail regardless of the series and the combination of slide unit models.

Identification Number and Specification — Model —

1 Model

C-Lube Linear Way MH
(MH series)

Flange type mounting from bottom : MH
Flange type mounting from top (2) : MHT
Block type mounting from top : MHD
Compact block type mounting from top : MHS

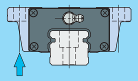
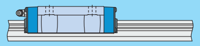
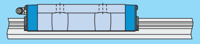
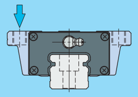
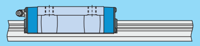
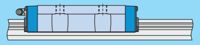
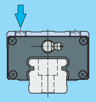
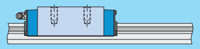
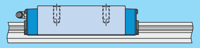
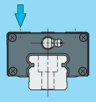
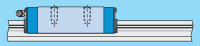
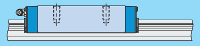
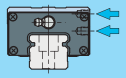
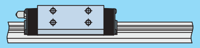
Linear Way H (1)
(LWH series)

Flange type mounting from bottom : LWH (…B)
Flange type mounting from top (2) : LWHT (…B)
Block type mounting from top : LWHD (…B)
Compact block type mounting from top : LWHS (…B)
Side mounting type : LWHY

For applicable models and sizes, see Table 1.1 and Table 1.2.
Indicate "LWH…B" or "LWH" for the model code of the single track rail regardless of the series and the combination of slide unit models.

Notes (1) This model has no built-in C-Lube.
(2) Some models may be mounted upward.

Table 1.1 Models and sizes of MH and LWH series

Material	Shape	Length of slide unit	Model	Size										
				8	10	12	15	20	25	30	35	45	55	65
High carbon steel made	Flange type mounting from bottom 	Standard 	MH	–	–	–	○	○	○	○	○	○	–	–
			LWH…B	–	–	–	○	○	○	○	○	○	○	○
			MH…M (U)	–	–	–	–	–	○	○	–	–	–	–
			LWH…M (U)	–	–	–	○	○	○	○	○	○	–	–
		Long 	MHG	–	–	–	–	○	○	○	○	○	–	–
			LWHG	–	–	–	–	○	○	○	○	○	○	○
	Flange type mounting from top 	Standard 	MHT	–	–	○(1)	○	○	○	○	○	○	–	–
			LWHT…B	–	–	○(1)(2)	○	○	○	○	○	○	○	○
			MHT…M (U)	–	–	–	–	–	○	○	–	–	–	–
			LWHT…M (U)	–	–	–	○	○	○	○	○	○	–	–
		Long 	MHTG	–	–	–	○(1)	○	○	○	○	○	–	–
			LWHTG	–	–	–	–	○	○	○	○	○	○	○
	Block type mounting from top 	Standard 	MHD	–	–	○	○	–	○	○	○	○	–	–
			LWHD…B	–	–	○(2)	○	–	○	○	○	○	○	○
			MHD…M (U)	–	–	–	–	–	○	○	–	–	–	–
			LWHD…M (U)	–	–	–	○	–	○	○	○	○	–	–
		Long 	MHDG	–	–	–	–	–	○	○	○	○	–	–
			LWHDG	–	–	–	–	–	○	○	○	○	○	○
	Compact block type mounting from top 	Standard 	MHS	–	–	–	○	○	○	○	–	–	–	–
			LWHS…B	–	–	–	○	○	○	○	–	–	–	–
			MHS…M (U)	–	–	–	–	–	○	○	–	–	–	–
			LWHS…M (U)	–	–	–	○	○	○	○	–	–	–	–
		Long 	MHSG	–	–	–	○	○	○	○	–	–	–	–
			LWHSG	–	–	–	–	○	○	○	–	–	–	–
	Side mounting type 	Standard 	LWHY	–	–	–	○	○	○	○	○	○	–	–

Notes (1) This may be mounted upward.
(2) "…B" is not included in the model code.
Remark: For the models indicated in ▭ , the interchangeable specification is available.

— Length of Slide Unit · Size · Number of Slide Unit —

2 Length of slide unit

Short : C
Standard : No symbol
Long : G

For applicable models and sizes, see Table 1.1 and Table 1.2.

3 Size

8, 10, 12, 15, 20, 25, 30, 35, 45, 55, 65

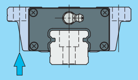
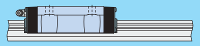
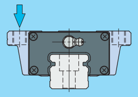
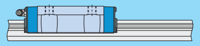
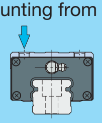
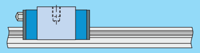
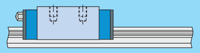
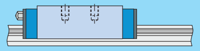
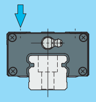
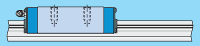
For applicable models and sizes, see Table 1.1 and Table 1.2.

4 Number of slide units

: C○

For an assembled set, indicates the number of slide units assembled on a track rail. For a single slide unit, only "C1" is specified.

Table 1.2 Models and sizes of MH and LWH series

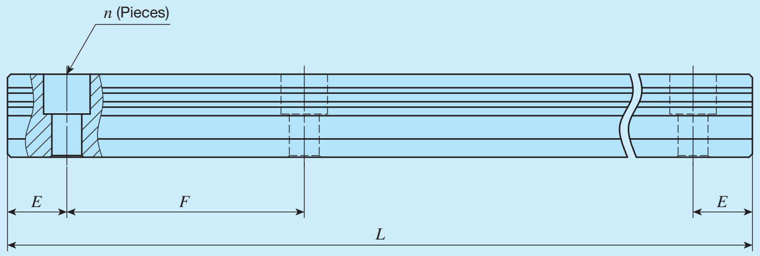
Material	Shape	Slide unit Length	Model	Size										
				8	10	12	15	20	25	30	35	45	55	65
Stainless steel made	Flange type mounting from bottom 	Standard 	LWH…SL	–	–	–	○	○	○	○	–	–	–	–
	Flange type mounting from top 	Standard 	MHT…SL	○(1)	○(1)	○(1)	○	○	○	○	–	–	–	–
			LWHT…SL	○(1)	○(1)	○(1)	○	○	○	○	–	–	–	–
	Block type mounting from top 	Short 	MHDC…SL	○	○	○	–	–	–	–	–	–	–	–
			LWHDC…SL	○	○	○	–	–	–	–	–	–	–	–
		Standard 	MHD…SL	○	○	○	–	–	–	–	–	–	–	–
			LWHD…SL	○	○	○	–	–	–	–	–	–	–	–
		Long 	MHDG…SL	○	○	○	–	–	–	–	–	–	–	–
			LWHDG…SL	○	○	○	–	–	–	–	–	–	–	–
	Compact block type mounting from top 	Standard 	MHS…SL	–	–	–	○	○	○	○	–	–	–	–
			LWHS…SL	–	–	–	○	○	○	○	–	–	–	–

Note (1) This may be mounted upward.
Remark: For the models indicated in ▭ , the interchangeable specification is available.

5 Length of track rail

Length of track rail	: R○	Indicate the length of track rail in mm. For standard and maximum length, see Table 2.1 and Table 2.2.

Table 2.1 Standard and maximum length of high carbon steel track rail



unit: mm

Item \ Identification number		MH 12 LWH12	MH 15 LWH15…B	MH 20 LWH20…B	MH 25 LWH25…B	MH 30 LWH30…B
Standard length *L* (*n*)		80 (2) 160 (4) 240 (6) 320 (8) 400 (10) 480 (12) 560 (14) 640 (16) 720 (18)	180 (3) 240 (4) 360 (6) 480 (8) 660 (11) 900 (15) 1 200 (20)	240 (4) 480 (8) 660 (11) 840 (14) 1 020 (17) 1 200 (20) 1 500 (25)	240 (4) 480 (8) 660 (11) 840 (14) 1 020 (17) 1 200 (20) 1 500 (25) 1 980 (33)	480 (6) 640 (8) 800 (10) 1 040 (13) 1 200 (15) 1 520 (19) 2 000 (25)
Pitch of mounting holes *F*		40	60	60	60	80
E		20	30	30	30	40
Standard *E* dimensions (1)	or higher	5.5	7	8	9	10
	below	25.5	37	38	39	50
Maximum length (2)		1 480	1 500 (3 000)	1 980 (3 000)	3 000 (3 960)	2 960 (4 000)

Item \ Identification number		MH 35 LWH35…B	MH 45 LWH45…B	LWH55…B	LWH65…B
Standard length *L* (*n*)		480 (6) 640 (8) 800 (10) 1 040 (13) 1 200 (15) 1 520 (19)	840 (8) 1 050 (10) 1 260 (12) 1 470 (14) 1 995 (19)	840 (7) 1 200 (10) 1 560 (13) 1 920 (16) 3 000 (25)	1 500 (10) 1 950 (13) 3 000 (20)
Pitch of mounting holes *F*		80	105	120	150
E		40	52.5	60	75
Standard *E* dimensions (1)	or higher	10	12.5	15	17
	below	50	65	75	92
Maximum length (2)		2 960 (4 000)	2 940 (3 990)	3 000 (3 960)	3 000 (3 900)

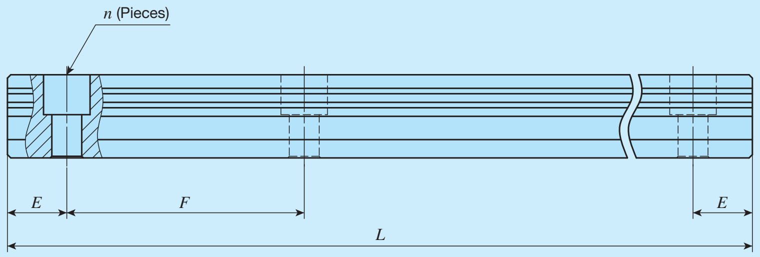
Notes (1) This does not apply to female threads for bellows (supplemental code "/J").
(2) Length up to the value in ( ) can be produced. If needed, please contact IKO.

Remarks 1. A typical identification number is indicated, but is applied to all models of the same size.
2. Indicate "LWH" for series of size 12 or "LWH…B" for series of size 15 or above for the model code of the single track rail regardless of the series and the combination of slide unit models.
3. For ultra seal specification, refer to Table 2.3 and Table 2.4.
4. If not directed, *E* dimensions for both ends will be the same within the range of standard *E* dimensions. To change the dimensions, indicate the specified rail mounting hole positions "/E" of special specification. For more information, see page Ⅲ−30.

6 Dust protection specification

Standard specification	: No symbol	For applicable models and sizes, see Table 1.1 and Table 1.2.
Ultra seal specification	: M	Each specification of ultra seal specification with track rail mounting from bottom is in compliance to the ultra seal specification.
Ultra seal specification with track rail mounting from bottom	: MU	Ultra seal specification with track rail mounting from bottom applies to products to fix the track rail on the mounting surface side by pressing in the aluminum alloy caps for rail mounting holes to the mounting hole of the track rail in advance. As the upper surface of the track rail is flat, adhesion to the seal is high and dust protection effect is improved further. For track rail specifications, see Table 2.3 and Table 2.4.

Table 2.2 Standard and maximum length of stainless steel track rail



unit: mm

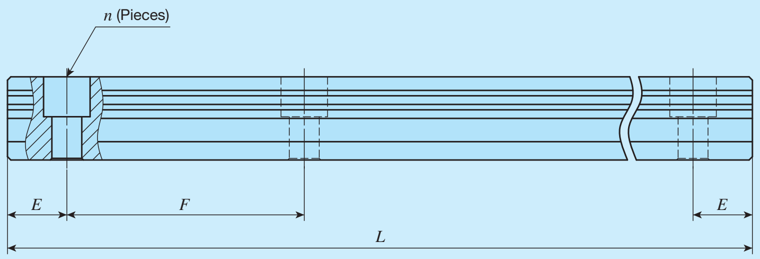
Item \ Identification number		MH 8…SL LWH8…SL	MH 10…SL LWH10…SL	MH 12…SL LWH12…SL	MH 15…SL LWH15…SL	MH 20…SL LWH20…SL	MH 25…SL LWH25…SL	MH 30…SL LWH30…SL
Standard length *L* (*n*)		40 (2) 80 (4) 120 (6) 160 (8) 200 (10) 240 (12) 280 (14)	50 (2) 100 (4) 150 (6) 200 (8) 250 (10) 300 (12) 350 (14) 400 (16) 450 (18) 500 (20)	80 (2) 160 (4) 240 (6) 320 (8) 400 (10) 480 (12) 560 (14) 640 (16) 720 (18)	180 (3) 240 (4) 360 (6) 480 (8) 660 (11)	240 (4) 480 (8) 660 (11) 840 (14)	240 (4) 480 (8) 660 (11) 840 (14)	480 (6) 640 (8) 800 (10) 1 040 (13)
Pitch of mounting holes *F*		20	25	40	60	60	60	80
E		10	12.5	20	30	30	30	40
Standard *E* dimensions (1)	or higher	4.5	5	5.5	7	8	9	10
	below	14.5	17.5	25.5	37	38	39	50
Maximum length (2)		480 (1 000)	850 (1 000)	1 000 (1 480)	1 200 (1 500)	1 200 (1 980)	1 200 (1 980)	1 200 (2 000)

Notes (1) This does not apply to female threads for bellows (supplemental code "/J").
(2) Length up to the value in ( ) can be produced. If needed, please contact IKO.

Remarks 1. A typical identification number is indicated, but is applied to all models of the same size.
2. Indicate "LWH" for the model code of the single track rail regardless of the series and the combination of slide unit models.
3. If not directed, *E* dimensions for both ends will be the same within the range of standard *E* dimensions. To change the dimensions, indicate the specified rail mounting hole positions "/E" of special specification. For more information, see page Ⅲ−30.

—Length of Track Rail—

Table 2.3 Standard and maximum length of ultra seal specification high carbon steel track rail



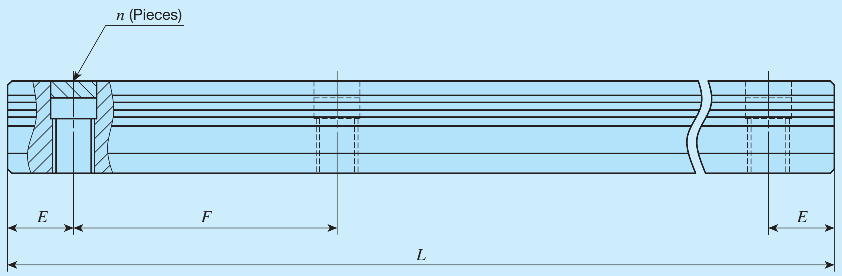
unit: mm

Item \ Identification number	LWH15…M	LWH20…M	MH 25…M LWH25…M	MH 30…M LWH30…M	LWH35…M	LWH45…M
Standard length L (n)	180 (3) 240 (4) 360 (6) 480 (8) 660 (11)	240 (4) 480 (8) 660 (11) 840 (14) 1 020 (17) 1 200 (20) 1 500 (25)	240 (4) 480 (8) 660 (11) 840 (14) 1 020 (17) 1 200 (20) 1 500 (25)	480 (6) 640 (8) 800 (10) 1 040 (13) 1 200 (15) 1 520 (19)	480 (6) 640 (8) 800 (10) 1 040 (13) 1 200 (15) 1 520 (19)	840 (8) 1 050 (10) 1 260 (12) 1 470 (14) 1 995 (19)
Pitch of mounting holes F	60	60	60	80	80	105
E	30	30	30	40	40	52.5
Standard E dimensions (1) or higher	7	8	9	10	10	12.5
Standard E dimensions (1) below	37	38	39	50	50	65
Maximum length	1 500	1 980	3 000	2 960	2 960	2 940
Maximum number of butt-jointing track rails	3	3	3	3	3	3
Maximum length of butt-jointing track rail	4 200	5 640	8 700	8 480	8 480	8 295

Note (1) This does not apply to female threads for bellows (supplemental code "/J").

Remarks 1. A typical identification number is indicated, but is applied to all models of the same size.
2. If not directed, E dimensions for both ends will be the same within the range of standard E dimensions. To change the dimensions, indicate the specified rail mounting hole positions "/E" of special specification. For more information, see page Ⅲ－30.

Table 2.4 Standard and maximum length of ultra seal specification with track rail mounting from bottom



unit: mm

Item \ Identification number	LWH15…MU	LWH20…MU	MH 25…MU LWH25…MU	MH 30…MU LWH30…MU	LWH35…MU	LWH45…MU
Standard length L (n)	180 (3) 240 (4) 360 (6) 480 (8) 660 (11)	240 (4) 480 (8) 660 (11) 840 (14) 1 020 (17) 1 200 (20) 1 500 (25)	240 (4) 480 (8) 660 (11) 840 (14) 1 020 (17) 1 200 (20) 1 500 (25)	480 (6) 640 (8) 800 (10) 1 040 (13) 1 200 (15) 1 520 (19)	480 (6) 640 (8) 800 (10) 1 040 (13) 1 200 (15) 1 520 (19)	840 (8) 1 050 (10) 1 260 (12) 1 470 (14) 1 995 (19)
Pitch of mounting holes F	60	60	60	80	80	105
E	30	30	30	40	40	52.5
Standard E dimensions (1) or higher	7	8	9	10	10	12.5
Standard E dimensions (1) below	37	38	39	50	50	65
Maximum length	1 500	1 980	3 000	2 960	2 960	2 940
Maximum number of butt-jointing track rails	3	3	3	3	3	3
Maximum length of butt-jointing track rail	4 200	5 640	8 700	8 480	8 480	8 295

Note (1) This does not apply to female threads for bellows (supplemental code "/J").

Remarks 1. A typical identification number is indicated, but is applied to all models of the same size.
2. Track rail mounting bolt is not included.
3. If not directed, E dimensions for both ends will be the same within the range of standard E dimensions. To change the dimensions, indicate the specified rail mounting hole positions "/E" of special specification. For more information, see page Ⅲ－30.

—Material Type・Preload Amount—

7 Material type

High carbon steel made : No symbol For applicable models and sizes, see Table 1.1 and Table 1.2.
Stainless steel made (1) : SL

Note (1) Mount a standard grease nipple (brass) on the stainless steel type, too. Stainless steel grease nipple is also available. If needed, please contact IKO.

8 Preload amount

Clearance : T_0
Standard : No symbol
Light preload : T_1
Medium preload : T_2
Heavy preload : T_3

Specify this item for an assembled set or a single slide unit.
For details of the preload amount, see Table 3.
For applicable preload types, see Table 4.

Table 3 Preload amount

Preload type \ Item	Preload symbol	Preload amount N	Operational conditions
Clearance	T_0	0 (2)	・Very light motion
Standard	(No symbol)	0 (3)	・Light and precise motion
Light preload	T_1	$0.02C_0$	・Almost no vibrations ・Load is evenly balanced ・Light and precise motion
Medium preload	T_2	$0.05C_0$	・Medium vibration ・Medium overhung load
Heavy preload	T_3	$0.08C_0$	・Operation with vibration and/or shock ・Overhanging load applied ・Heavy cutting

Notes (2) There is zero or subtle clearance.
(3) Indicates zero or minimal amount of preload.

Remark: C_0 indicates the basic static load rating.

Table 4 Application of preload

Size	Preload type (preload symbol)				
	Clearance (T_0)	Standard (No symbol)	Light preload (T_1)	Medium preload (T_2)	Heavy preload (T_3)
8	○	○	○	–	–
10	○	○	○	–	–
12	○	○	○	–	–
15	–	○	○	○	○
20	–	○	○	○	○
25	–	○	○	○	○
30	–	○	○	○	○
35	–	○	○	○	○
45	–	○	○	○	○
55	–	○	○	○	○
65	–	○	○	○	○

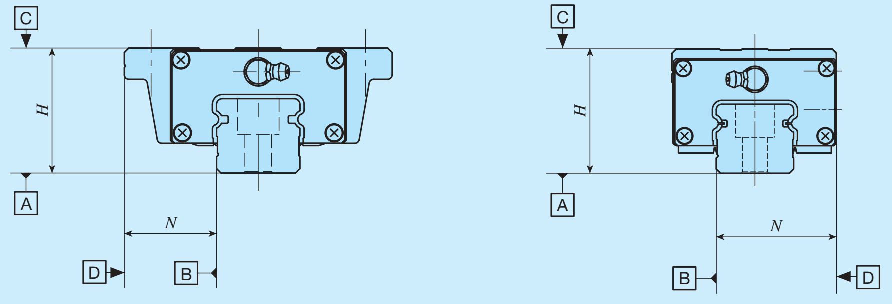
Remark: The mark ▭ indicates that interchangeable specification products are available.

9 Accuracy class

High : H
Precision : P
Super precision : SP

For interchangeable specification products, assemble a slide unit and a track rail of the same accuracy class.
For details of accuracy class, see Table 5.1 and Table 5.2.
For applicable accuracy class, see Table 6.

Table 5.1 Tolerance and allowance (Series of size 15 or higher)



Flange type, block type, and compact block type

Side mounting type

unit: mm

Item \ Class (classification symbol)	High (H)	Precision (P)	Super precision (SP)
Dim. H tolerance	±0.040	±0.020	±0.010
Dim. N tolerance	±0.050	±0.025	±0.015
Dim. variation of H (1)	0.015	0.007	0.005
Dim. variation of N (1)	0.020	0.010	0.007
Dim. variation of H for multiple assembled sets (2)	0.035	0.025	–
Slide unit against the A surface Parallelism during running on the C surface	See Fig. 1.1		
Slide unit against the B surface Parallelism during running on the D surface	See Fig. 1.1		

Notes (1) It means the size variation between slide units mounted on the same track rail.
(2) Applicable to the interchangeable specifications.

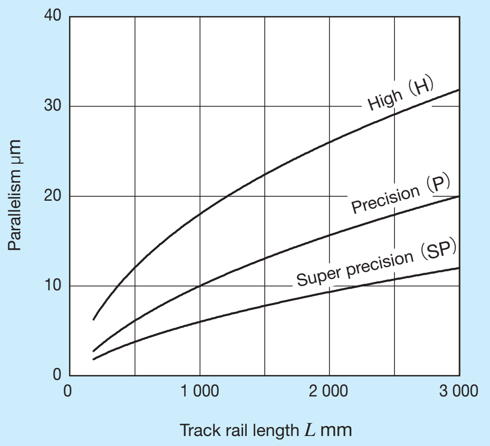
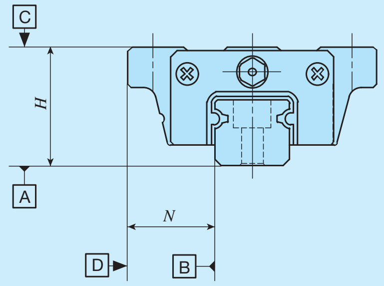


Fig. 1.1 Parallelism in operation (series of Size 15 or higher)

Table 5.2 Tolerance and allowance (Series of size 8 to 12)



unit: mm

Item \ Class (classification symbol)	High (H)	Precision (P)
Dim. H tolerance	±0.020	±0.010
Dim. N tolerance	±0.025	±0.015
Dim. variation of H (1)	0.015	0.007
Dim. variation of N (1)	0.020	0.010
Dim. variation of H for multiple assembled sets (2)	0.030	0.020
Parallelism in operation of the slide unit C surface to A surface	See Fig. 1.2	
Parallelism in operation of the slide unit D surface to B surface	See Fig. 1.2	

Notes (1) It means the size variation between slide units mounted on the same track rail.
(2) Applicable to the interchangeable specifications.

Table 6 Application of accuracy class

Size	Class (classification symbol)		
	High (H)	Precision (P)	Super precision (SP)
8	○	○	–
10	○	○	–
12	○	○	–
15	○	○	○
20	○	○	○
25	○	○	○
30	○	○	○
35	○	○	○
45	○	○	○
55	○	○	○
65	○	○	○

Remark: The mark ▭ indicates that interchangeable specification products are available.

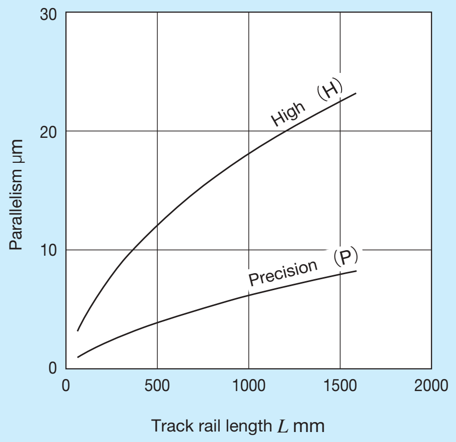


Fig. 1.2 Parallelism in operation (Series of size 8 to 12)

10 Interchangeable

S1 specification : S1
S2 specification : S2
Non-interchangeable specification : No symbol

This is specified for the interchangeable specifications. Assemble a track rail and a slide unit with the same interchangeable code. When using in combination with different interchangeable codes, please contact IKO. Note that the combination of interchangeable codes will not have any effect on accuracy.
For applicable models and sizes, see Table 1.1 and Table 1.2.
"No symbol" is indicated for non-interchangeable specification.

11 Special specification

/A, /BS, /D, /E, /F, /I, /J○,
/L○, /LF○, /MA, /MN, /N,
/PS, /Q, /RE, /T, /U, /UR,
/V○, /W○, /Y○, /Z○

For applicable special specifications, see Table 7.1, Table 7.2, Table 7.3, and Table 7.4.
For combination of multiple special specifications, see Table 8.
For details of special specification, see page Ⅲ−29.

Table 7.1 Application of special specifications (Interchangeable specification and slide unit specification)

Special specification	Supplemental code	Size										
		8	10	12	15	20	25	30	35	45	55	65
Stainless steel end plate (1)	/BS	×	×	×	○	○	○	○	×	×	×	×
Female threads for bellows (2)	/J○	×	×	×	○	○	○	○	○	○	○	○
No end seal	/N	○	○	○	○	○	○	○	○	○	○	○
With C-Lube plate (1)	/Q	○	○	○	○	○	○	○	○	○	○	○
Special environment seal (1)	/RE	×	×	×	○	○	○	○	×	×	×	×
Under seal	/U	○	○	○	×(3)	×(3)	×(3)	×(3)	×(3)	×(3)	×(3)	×(3)
Double end seals	/V○	×	×	×	○	○	○	○	○	○	○	○
Scrapers	/Z○	×	×	×	○	○	○	○	○	○	○	○

Notes (1) Applicable to LWH series.
(2) Not applicable to stainless steel made products.
(3) Attached as standard.

Table 7.2 Application of special specifications (Interchangeable specification and track rail specification)

Special specification	Supplemental code	Size										
		8	10	12	15	20	25	30	35	45	55	65
Specified rail mounting hole positions	/E	○	○	○	○	○	○	○	○	○	○	○
Caps for rail mounting holes	/F	×	×	○	○	○	○	○	○	○	○	○
Female threads for bellows (1)	/J	×	×	×	○	○	○	○	○	○	○	○
Black chrome surface treatment	/LR	×	×	×	○	○	○	○	○	○	○	○
Without track rail mounting bolt	/MN	○	○	○	○	○	○	○	○	○	○	○
Butt-jointing track rails	/T	×	×	×	○	○	○	○	○	○	○	○

Note (1) Not applicable to stainless steel made products.

Table 7.3 Application of special specifications (Interchangeable specification and assembled set)

Special specification	Supplemental code	Size										
		8	10	12	15	20	25	30	35	45	55	65
Stainless steel end plate (1)	/BS	×	×	×	○	○	○	○	×	×	×	×
Opposite reference surfaces arrangement	/D	○	○	○	○	○	○	○	○	○	○	○
Specified rail mounting hole positions	/E	○	○	○	○	○	○	○	○	○	○	○
Caps for rail mounting holes	/F	×	×	○	○	○	○	○	○	○	○	○
Female threads for bellows (2)	/J○	×	×	×	○	○	○	○	○	○	○	○
Black chrome surface treatment	/L○	×	×	×	○	○	○	○	○	○	○	○
Fluorine black chrome surface treatment	/LF○	×	×	×	○	○	○	○	○	○	○	○
With track rail mounting bolt (3)	/MA	○	○	○	○	○	○	○	○	○	×	×
Without track rail mounting bolt (1)	/MN	○	○	○	○	○	○	○	○	○	○	○
No end seal	/N	○	○	○	○	○	○	○	○	○	○	○
With C-Lube plate (1)	/Q	○	○	○	○	○	○	○	○	○	○	○
Special environment seal (1)	/RE	×	×	×	○	○	○	○	×	×	×	×
Butt-jointing track rails	/T	×	×	×	○	○	○	○	○	○	○	○
Under seal	/U	○	○	○	×(5)	×(5)	×(5)	×(5)	×(5)	×(5)	×(5)	×(5)
Double end seals	/V○	×	×	×	○	○	○	○	○	○	○	○
Specified grease (4)	/Y○	×	×	×	○	○	○	○	○	○	○	○
Scrapers	/Z○	×	×	×	○	○	○	○	○	○	○	○

Notes (1) Applicable to LWH series.
(2) Not applicable to stainless steel made products.
(3) Applicable to MH series.
(4) MH series is applicable only to /YCG.
(5) Attached as standard.

Table 7.4 Application of special specifications (Non-interchangeable specification)

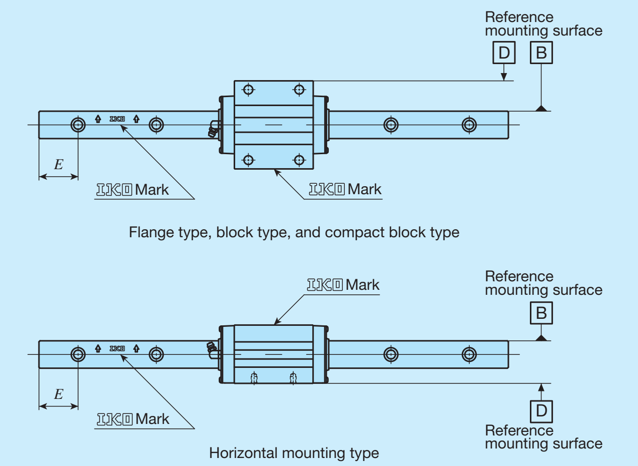
Special specification	Supplemental code	Size										
		8	10	12	15	20	25	30	35	45	55	65
Butt-jointing track rails	/A	○	○	○(1)	○	○	○	○	○	○	○	○
Stainless steel end plate (2) (3)	/BS	×	×	×	○	○	○	○	×	×	×	×
Opposite reference surfaces arrangement (3)	/D	○	○	○	○	○	○	○	○	○	○	○
Specified rail mounting hole positions	/E	○	○	○	○	○	○	○	○	○	○	○
Caps for rail mounting holes (4)	/F	×	×	○	○	○	○	○	○	○	○	○
Inspection sheet	/I	○	○	○	○	○	○	○	○	○	○	○
Female threads for bellows (3)	/J○	×	×	×	○	○	○	○	○	○	○	○
Black chrome surface treatment	/L○	○(5)	○(5)	○(5)	○	○	○	○	○	○	○	○
Fluorine black chrome surface treatment	/LF○	×	×	×	○	○	○	○	○	○	○	○
With track rail mounting bolt (6)	/MA	○	○	○	○	○	○	○	○	○	×	×
Without track rail mounting bolt (2) (4)	/MN	○	○	○	○	○	○	○	○	○	○	○
No end seal (7)	/N	○	○	○	○	○	○	○	○	○	○	○
Rail cover plate for track rail (7) (8)	/PS	×	×	×	×	×	○	○	○	○	○	○
With C-Lube plate (2) (3) (7)	/Q	○	○	○	○	○	○	○	○	○	○	○
Special environment seal (2) (7)	/RE	×	×	×	○	○	○	○	×	×	×	×
Under seal	/U	○	○	○	×(9)	×(9)	×(9)	×(9)	×(9)	×(9)	×(9)	×(9)
Inner seal (10)	/UR	×	×	×	×	×	○	○	×	×	×	×
Double end seals	/V○	×	×	×	○	○	○	○	○	○	○	○
A pair of multiple assembled sets (3)	/W○	○	○	○	○	○	○	○	○	○	○	○
Specified grease (11)	/Y○	○	○	○	○	○	○	○	○	○	○	○
Scrapers	/Z○	×	×	×	○	○	○	○	○	○	○	○

Notes (1) Not applicable to high carbon steel made products.
(2) Applicable to LWH series.
(3) This does not apply to side mounting type (LWHY).
(4) This does not apply to ultra seal specification with track rail mounting from bottom (LWH···MU).
(5) Applicable only to "LR".
(6) Applicable to MH series.
(7) This does not apply to ultra seal specification (LWH···M) and ultra seal specification with track rail mounting from bottom (LWH···MU).
(8) Not applicable to stainless steel made products.
(9) Attached as standard.
(10) Applicable only to MH···M(U).
(11) MH series is applicable only to /YCG.

Table 8 Combination of supplemental codes

BS	○																				
D	○	○																			
E	–	○	–																		
F	○	○	○	○																	
I	○	○	○	○	○																
J	○	○	○	○	○	○															
L	○(1)	○	○	○	○	○	○														
LF	○	○	○	○	○	○	○	–													
MA	○	–	○	○	○	○	○	○	○												
MN	○	○	○	○	○	○	○	○	○	–											
N	○	○	○	○	–	○	–	○	○	○	○										
PS	–	○	○	○	–	○	–	–	–	○	○	–									
Q	○	○	○	○	○	○	–	○	○	–	○	○	○								
RE	○	○	○	○	○	○	○	○	○	–	○	–	–	○							
T	–	○	○	○	○	–	–	○	○	○	○	○	–	○	○						
U	○	–	○	○	○	○	–	○	–	○	○	–	–	○	–	–					
UR	–	–	○	○	○	○	○	○	○	○	–	–	–	–	–	–	–				
V	○	○	○	○	○	○	●	○	○	○	○	–	○	–	○	○	–	○			
W	○	○	○	–	○	○	○	○	○	○	○	○	○	○	○	–	○	○	○		
Y	○	○	○	○	○	○	○	○	○	–	○	○	○	–	○	○	○	–	○	○	
Z	○	○	○	○	○	○	●	○	○	○	○	–	–	–	○	○	–	○	●	○	○
	A	BS	D	E	F	I	J	L	LF	MA	MN	N	PS	Q	RE	T	U	UR	V	W	Y

Note (1) Contact IKO for the case of size 8 to 12.
Remarks 1. The combination of "–" shown in the table is not available.
2. Contact IKO for the combination of the interchangeable specification marked with ●.
3. When using multiple types for combination, please indicate by arranging the symbols in alphabetical order.



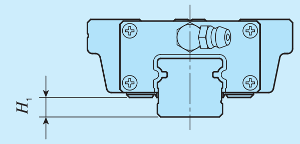
Flange type, block type, and compact block type

Horizontal mounting type

Fig. 2 Specified rail mounting hole positions (Supplemental code /E)

Remark: For details of specified rail mounting hole positions (supplemental code /E), see page Ⅲ－30.

Table 9 H_1 dimensions of stainless steel end plate (Supplemental code /BS)



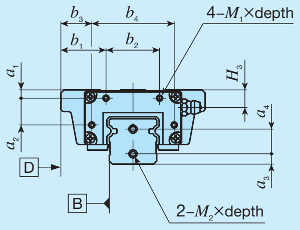
unit: mm

Identification number	H_1
LWH 20	5

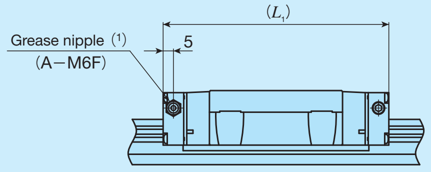
Remarks 1. Stainless steel end plate is not applicable to LWHY (lateral mounted type).

2. A typical identification number is shown, but it is applied to the LWH series size 20. The H_1 dimension of the semi-standard product is the same as the standard seal, even if the stainless steel end plate is applied.

Table 10.1 Dimension of female threads for bellows (Supplemental code Single unit: /J Assembled set: /J /JJ)



Flange type



unit: mm

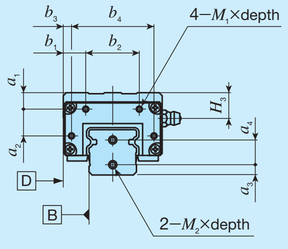
Identification number		Slide unit									Track rail		
		a_1	a_2	b_1	b_2	b_3	b_4	M_1×depth	L_1 (2)	H_3	a_3	a_4	M_2×depth
MH(T) 15	LWH(T) 15…B	3	7	15.5	16	9.5	28	M3× 6	83	6.5	4	8	M3× 6
–	LWH(T) 15…M								86				
MHTG 15	–								99				
MH(T) 20	LWH(T) 20…B	4	10	20.5	22	13.5	36	M3× 6	99	8.5	5	9	M4× 8
–	LWH(T) 20…M(U)								103				
MH(T)G 20	LWH(T)G 20								128				
MH(T) 25	LWH(T) 25…B	4	13	22	26	15	40	M3× 6	110	8.5	5	12	M4× 8
MH(T) 25…M(U)	LWH(T) 25…M(U)								115				
MH(T)G 25	LWH(T)G 25								133				
MH(T) 30	LWH(T) 30…B	5	17	28	34	20	50	M3× 6	128	11	6	14	M4× 8
MH (T) 30…M (U)	LWH(T) 30…M(U)								133				
MH(T)G 30	LWH(T)G 30								154				
MH(T) 35	LWH(T) 35…B	6	20	30	40	20	60	M3× 6	137	13	7	15	M4× 8
–	LWH(T) 35…M(U)								143				
MH(T)G 35	LWH(T)G 35								165				
MH(T) 45	LWH(T) 45…B	7	26	35	50	23	74	M4× 8	160	15	8	19	M5×10
–	LWH(T) 45…M(U)								167				
MH(T)G 45	LWH(T)G 45								203				
–	LWH(T) 55…B	7	32	40	60	27	86	M4× 8	196	17	8	25	M5×10
–	LWH(T)G 55								248				
–	LWH(T) 65…B	10	46	50	70	32	106	M5×10	240	20	10	28	M6×12
–	LWH(T)G 65								314				

Notes (1) The specification and mounting positions of grease nipple are different from those of the standard specification product. Provided grease nipple for size 15 models is NPB2 type (special specification). For details of dimensions, contact IKO.

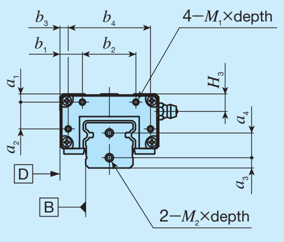
(2) Dimensions of the specification that female threads for bellows are fitted to both ends of the slide unit are indicated.

Remark: This is also applicable to stainless steel models of the same size.

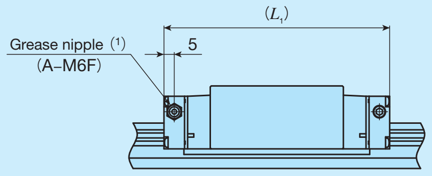
Table 10.2 Dimension of female threads for bellows (Supplemental code Single unit: /J Assembled set: /J /JJ)



Block type



Compact block type



unit: mm

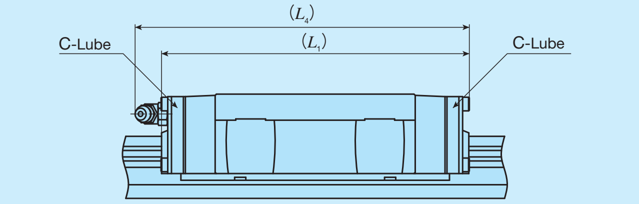
Identification number		Slide unit									Track rail		
		a_1	a_2	b_1	b_2	b_3	b_4	M_1×depth	L_1 (2)	H_3	a_3	a_4	M_2×depth
MHD 15	LWHD 15…B	7	7	9	16	3	28	M3× 6	83	10.5	4	8	M3× 6
–	LWHD 15…M								86				
MHS 15	LWHS 15…B	3	7	9	16	3	28	M3× 6	83	6.5	4	8	M3× 6
–	LWHS 15…M(U)								86				
MHSG 15	–								99				
MHS 20	LWHS 20…B	4	10	11	22	4	36	M3× 6	99	8.5	5	9	M4× 8
–	LWHS 20…M(U)								103				
MHSG 20	LWHSG 20								128				
MHD 25	LWHD 25…B	8	13	11	26	4	40	M3× 6	110	12.5	5	12	M4× 8
MHD 25…M(U)	LWHD 25…M(U)								115				
MHDG 25	LWHDG 25								133				
MHS 25	LWHS 25…B	4	13	11	26	4	40	M3× 6	110	8.5	5	12	M4× 8
MHS 25…M(U)	LWHS 25…M(U)								115				
MHSG 25	LWHSG 25								133				
MHD 30	LWHD 30…B	8	17	13	34	5	50	M3× 6	128	14	6	14	M4× 8
MHD 30…M(U)	LWHD 30…M(U)								133				
MHDG 30	LWHDG 30								154				
MHS 30	LWHS 30…B	5	17	13	34	5	50	M3× 6	128	11	6	14	M4× 8
MHS 30…M(U)	LWHS 30…M(U)								133				
MHSG 30	LWHSG 30								154				
MHD 35	LWHD 35…B	13	20	15	40	5	60	M3× 6	137	20	7	15	M4× 8
–	LWHD 35…M(U)								143				
MHDG 35	LWHDG 35								165				
MHD 45	LWHD 45…B	17	26	18	50	6	74	M4× 8	160	25	8	19	M5×10
–	LWHD 45…M(U)								167				
MHDG 45	LWHDG 45								203				
–	LWHD 55…B	17	32	20	60	7	86	M4× 8	196	27	8	25	M5×10
–	LWHDG 55								248				
–	LWHD 65…B	10	46	28	70	10	106	M5×10	240	20	10	28	M6×12
–	LWHDG 65								314				

Notes (1) The specification and mounting positions of grease nipple are different from those of the standard specification product. Provided grease nipple for size 15 models is NPB2 type (special specification). For details of dimensions, contact IKO.

(2) Dimensions of the specification that female threads for bellows are fitted to both ends of the slide unit are indicated.

Remark: This is also applicable to stainless steel models of the same size.

Table 11 Dimension of slide unit with C-Lube plate (Supplemental code /Q)

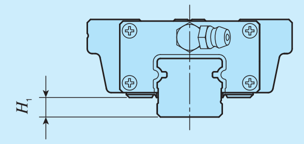


unit: mm

Identification number	L_1	L_4
LWHDC 8···SL	26	–
LWHT 8···SL	32	–
LWHD 8···SL		
LWHDG 8···SL	38.5	–
LWHDC 10···SL	34	–
LWHT 10···SL	42	–
LWHD 10···SL		
LWHDG 10···SL	50	–
LWHDC 12···SL	44	48
LWHT 12	56	60
LWHD 12		
LWHDG 12···SL	68	72
LWH 15···B	75	78
LWH 20···B	92	105
LWHG 20	121	134
LWH 25···B	105	116
LWHG 25	127	139
LWH 30···B	125	135
LWHG 30	151	161
LWH 35···B	134	146
LWHG 35	162	174
LWH 45···B	160	170
LWHG 45	203	214
LWH 55···B	196	207
LWHG 55	248	258
LWH 65···B	246	253
LWHG 65	321	328

Remarks 1. The dimensions of the slide unit with C-Lube at both ends are indicated.
2. A typical identification number is indicated, but is applied to all LWH series models of the same size.

Table 12.1 H_1 dimensions of special environment seal (Supplemental code /RE)

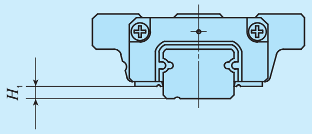


unit: mm

Identification number	H_1
LWH 20	5.5

Remarks 1. A typical identification number is shown, but it is applied to the LWH series size 20. However, semi-standard products other than LWHY (lateral mounted type) are not applicable.
2. The H_1 dimension in the identification number, other than the above, is the same as the standard seal.

Table 12.2 H_1 dimension with under seal (Supplemental code /U)

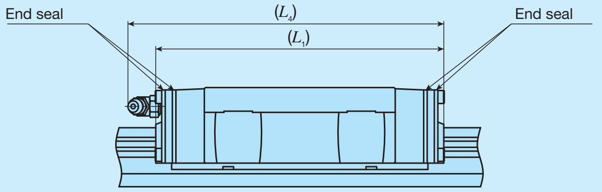


unit: mm

Size	H_1
8	1.5
10	1.8
12	3.2 (1)

Note (1) The dimensions are the same as those before mounting of under seal.

Table 13 Dimension of slide unit with double end seals (Supplemental code Single unit: /V Assembled set: /V /VV)

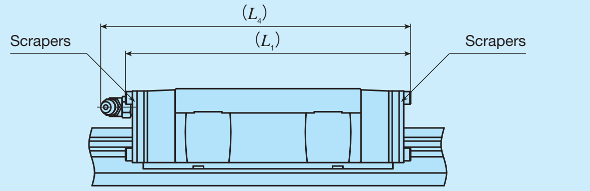


unit: mm

Identification number		L_1	L_4
MH 15	LWH 15···B	72	77
–	LWH 15···M(U)	71	76
MHTG 15	–	88	93
MH 20	LWH 20···B	91	104
–	LWH 20···M(U)	90	103
MHG 20	LWHG 20	119	133
MH 25	LWH 25···B	104	116
MH 25···M(U)	LWH 25···M(U)	103	115
MHG 25	LWHG 25	127	139
MH 30	LWH 30···B	122	134
MH 30···M(U)	LWH 30···M(U)	121	
MHG 30	LWHG 30	148	160
MH 35	LWH 35···B	133	146
–	LWH 35···M(U)		
MHG 35	LWHG 35	161	173
MH 45	LWH 45···B	159	170
–	LWH 45···M(U)	158	
MHG 45	LWHG 45	202	213
–	LWH 55···B	195	206
–	LWHG 55	247	258
–	LWH 65···B	241	251
–	LWHG 65	316	325

Remarks 1. The dimensions of the slide unit with double end seals at both ends are indicated.
2. A typical identification number is indicated, but is applied to all models of the same size.

Table 14 Dimension of slide unit with scrapers (Supplemental code Single unit: /Z Assembled set: /Z /ZZ)



unit: mm

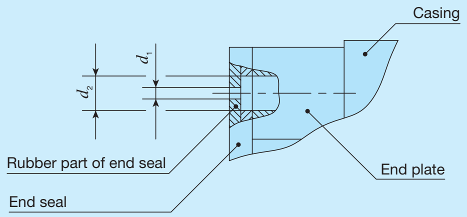
Identification number		L_1	L_4
MH 15	LWH 15···B	73	75
–	LWH 15···M(U)	72	74
MHTG 15	–	89	91
MH 20	LWH 20···B	91	104
–	LWH 20···M(U)	90	100
MHG 20	LWHG 20	119	133
MH 25	LWH 25···B	104	116
MH 25···M(U)	LWH 25···M(U)	103	112
MHG 25	LWHG 25	126	138
MH 30	LWH 30···B	124	135
MH 30···M(U)	LWH 30···M(U)	123	131
MHG 30	LWHG 30	150	161
MH 35	LWH 35···B	133	146
–	LWH 35···M(U)		
MHG 35	LWHG 35	161	174
MH 45	LWH 45···B	160	170
–	LWH 45···M(U)	159	
MHG 45	LWHG 45	203	214
–	LWH 55···B	196	207
–	LWHG 55	248	258
–	LWH 65···B	242	251
–	LWHG 65	317	326

Remarks 1. The dimensions of the slide unit with scraper at both ends are indicated.
2. A typical identification number is indicated, but is applied to all models of the same size.

Lubrication

In the series of size 8 to 12 of MH series and LWH series, lithium-soap base grease (MULTEMP PS No.2, KYODO YUSHI) is pre-packed, and in the series of size 15 to 65, lithium-soap base grease with extreme-pressure additive (Alvania EP grease 2, [Shell Lubricants Japan K.K.]) is pre-packed. Additionally, MH series has C-Lube placed in the recirculation part of balls, so that the interval for reapplicating lubricant can be extended and maintenance works such as grease job can be reduced significantly.
MH series and LWH series have grease nipple or oil hole as indicated in Table 16. Supply nozzles fit to each shapes of grease nipple and dedicated supplying equipment (miniature greasers) fit to oil holes are also available. For order of these parts for lubrication, see Table 13 and Table 14.1 on Page Ⅲ－23, and Table 15 on page Ⅲ－24.

Table 15 Oil hole specifications



unit: mm

Size	d_1	d_2
8	0.5	1.5
10		

Table 16 Parts for lubrication

Size	Grease nipple type (1)	Applicable supply nozzle type	Bolt size of female threads for piping
8	Oil hole	Miniature greaser MG10B/MT2	–
10			
12	A-M3	A-5120V A-5240V B-5120V B-5240V	–
15	A-M4		M4
20	B-M6	Grease gun available on the market	M6
25			
30			
35	JIS type 4		PT1/8
45			
55			
65			

Note (1) For grease nipple specification, see Table 14.1 and Table 14.2 on page Ⅲ－23.
Remark: Stainless steel grease nipple is also available. If needed, please contact IKO.

Dust Protection

The slide units of MH series and LWH series are equipped with end seals and under seals as standard for dust protection. However, if large amount of contaminant or dust are floating, or if large particles of foreign substances such as chips or sand may adhere to the track rail, it is recommended to cover the whole unit with bellows or telescope type shield, etc.

MH series and LWH series are provided with specific bellows. The bellows are easy to mount and provide excellent dust protection. If needed, please refer to Ⅲ−26 for ordering.

And, track rail mounting from bottom with no mounting hole on the upper surface of the track rail (Figure 3) is also available. If needed, contact IKO.

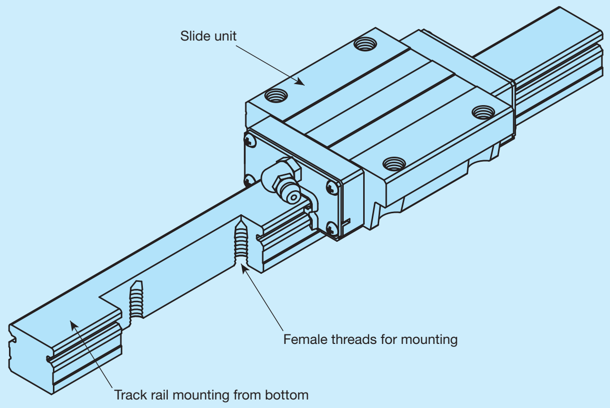


Fig. 3 Track rail mounting from bottom specification

Precaution for Use

❶ Mounting surface, reference mounting surface and typical mounting structure

When mounting the MH series and LWH series, properly align the reference mounting surfaces B and D of the track rail and slide unit with the reference mounting surface of the table and bed and fix them. (See Fig. 4.)

The reference mounting surfaces B and D and mounting surfaces A and C are precisely ground. Machining the mounting surface of the table and bed, such as machine or device, to high accuracy and mounting them properly will ensure stable linear motion with high accuracy.

Reference mounting surface of the slide unit is the opposite side of the IKO mark. The track rail reference mounting surface is identified by locating the IKO mark on the top surface of the track rail. It is the side surface above the mark (in the direction of the arrow). (See Fig. 5.)

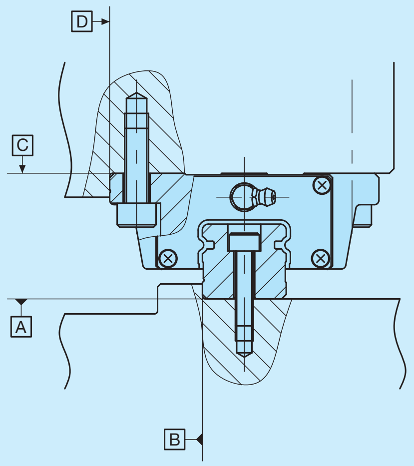
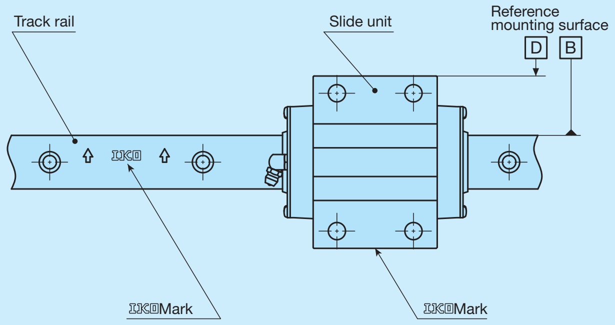
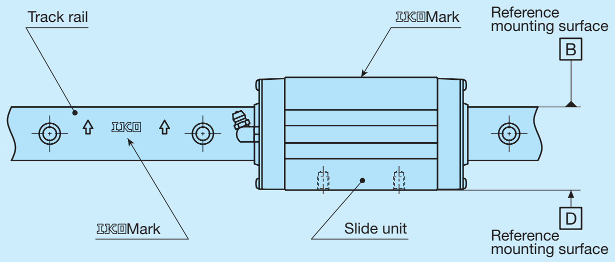


Fig. 4 Reference mounting surface and typical mounting structure



Flange type, block type, and compact block type



Horizontal mounting type

Fig. 5 Reference mounting surface

❷ Shoulder height and corner radius of the reference mounting surface

For the opposite corner of the mating reference mounting, it is recommended to have relieved fillet as indicated in Fig. 6. Recommended value for the shoulder height and corner radius on the mating side is indicated in Table 17.

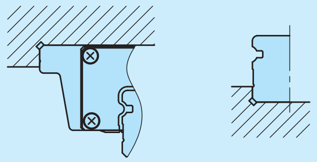
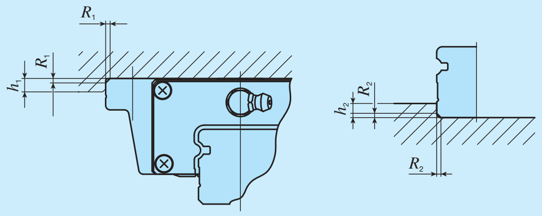


Fig. 6 Corner of the mating reference mounting

Table 17 Shoulder height and corner radius of the reference mounting surface



unit: mm

Size	Mounting part of slide unit		Mounting part of track rail	
	Shoulder height h_1	Corner radius R_1 (Maximum)	Shoulder height h_2	Corner radius R_2 (Maximum)
8	3.5(4) (1)	0.5	1.6 (2)	0.2
10	4.5(5) (1)	0.5	1.9 (2)	0.2
12	6	0.5	2.7 (2)	0.7
15	4	0.5	3	0.5
20	5	0.5	3	0.5
25	6	1	4	1
30	8	1	5	1
35	8	1	6	1
45	8	1.5	7	1.5
55	10	1.5	8	1.5
65	10	1.5	10	1.5

Notes (1) The values in ( ) are applied to MHD and LWHD.
(2) For models with under seals (supplemental code "/U"), it is recommended to use the values 0.6 mm smaller than the values in the table.

❸ Tightening torque for fixing screw

Typical tightening torque for mounting of the MH series and LWH series to the steel mating member material is indicated in Table 18. When vibration and shock of the machine or device are large, fluctuating load is large, or moment load is applied, fix it by using the torque 1.2 to 1.5 times larger than the value indicated in the table as necessary. If the mating member material is cast iron or aluminum alloy, reduce the tightening torque depending on the strength characteristics of the mating member material.

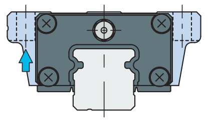
Table 18 Tightening torque for fixing screw

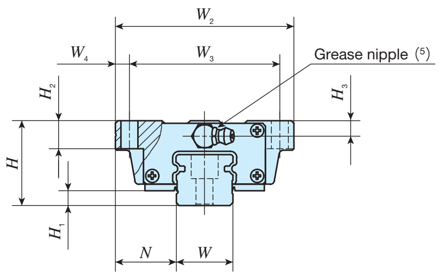
Bolt size	Tightening torque N・m		
	High carbon steel-made screw		Stainless steel-made screw
	Size: 12	Size: 15 to 65	
M 1.6×0.35	−	−	0.15
M 2 ×0.4	−	−	0.31
M 2.3×0.4	−	−	0.49
M 2.6×0.45	−	−	0.70
M 3 ×0.5	1.3	−	1.1
M 4 ×0.7	2.9	4.1	2.5
M 5 ×0.8	−	8.0	5.0
M 6 ×1	−	13.6	8.5
M 8 ×1.25	−	32.7	20.4
M10 ×1.5	−	63.9	40.0
M12 ×1.75	−	110	−
M14 ×2	−	175	−
M16 ×2	−	268	−

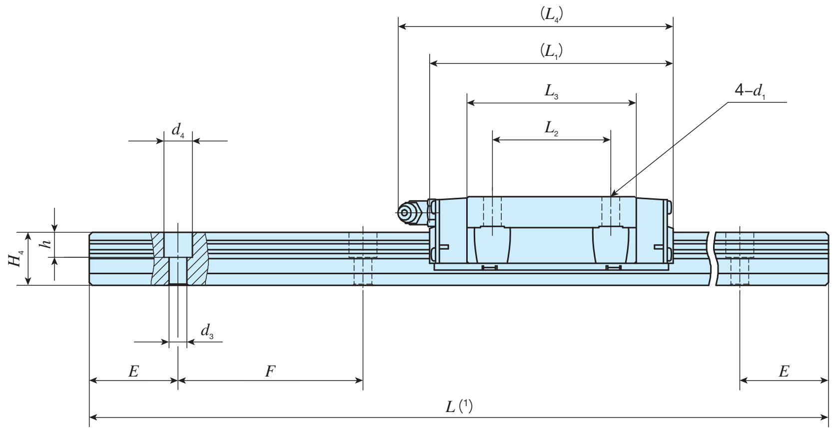
Remark: The tightening torque is calculated based on strength division 8.8 for high carbon steel bolts in product size 12, strength division 12.9 for carbon steel bolts in product size 15 to 65, and property division A2-70 for stainless steel bolts.

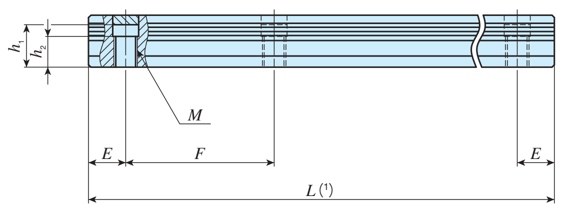
IKO C-Lube Linear Way MH

Flange type mounting from bottom

	MH ・ **LWH**			
Shape				
Size	15	20	25	30
	35	45	55	65







Ultra seal specification with track rail mounting from bottom

Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm										Dimensions of track rail mm										Appended mounting bolt for track rail (3) mm	Basic dynamic load rating (4)	Basic static load rating (4)	Static moment rating (4)		
MH series	LWH series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	d_1	H_2	H_3	W	H_4	d_3	d_4	h	M	h_1(2)	h_2	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MH 15		○	0.22	1.47	24	4.5	16	47	38	4.5	66	30	44.2	69	4.5	7	4.5	15	15	4.5	8	6	–	–	–	30	60	M4×16	11 600	13 400	112	95.6 556	95.6 556
	LWH 15…B	○											44.6																				
–	LWH 15…SL	○																															
–	LWH 15…M*	–																															
–	LWH 15…MU*	–																		–	–	–	M 6	12	9			–					
MH 20		○	0.48	2.56	30	6	21.5	63	53	5	83	40	56	94	6	10	5.5	20	18	6	9.5	8.5	–	–	–	30	60	M5×18	18 100	21 100	232	195 1 090	195 1 090
	LWH 20…B	○											57.2																				
–	LWH 20…SL	○																															
–	LWH 20…M*	–				5																											
–	LWH 20…MU*	–																		–	–	–	M 8	13.5	9.5			–					
MHG 20		○	0.71			6					112		84.8	122						6	9.5	8.5	–	–	–			M5×18	24 100	31 700	349	421 2 140	421 2 140
	LWHG 20	○											86																				
MH 25		○	0.70	3.50	36	8	23.5	70	57	6.5	95	45	63.9	105	7	10	6.5	23	22	7	11	9	–	–	–	30	60	M6×22	25 200	28 800	362	309 1 690	309 1 690
	LWH 25…B	○				6.5							64.7																				
–	LWH 25…SL	○																															
MH 25…M*		–											63.9																				
	LWH 25…M*	–											64.7																				
MH 25…MU*		–											63.9							–	–	–	M10	18	13			–					
	LWH 25…MU*	–											64.7																				
MHG 25		○	0.93			8					118		86.6	128						7	11	9	–	–	–			M6×22	30 800	38 300	483	533 2 740	533 2 740
	LWHG 25	○				6.5							87.4																				

Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ−93, Table 2.2 on page Ⅱ−94, and Tables 2.3 and 2.4 on page Ⅱ−95.

(2) Choose bolts whose dimension allow fixing thread depth into track rail to be less than h_1.

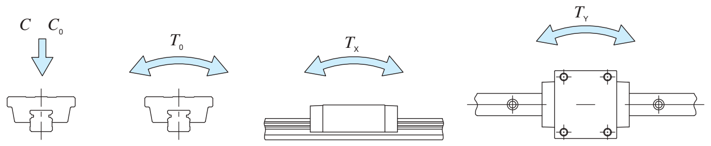
(3) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. For stainless steel model, stainless steel bolts are appended.

In an assembled set of MH series and LWH…MU model, track rail mounting bolts are not appended.

(4) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

(5) The shapes of grease nipple vary by size. The specifications are shown in Table 16 on page Ⅱ−104.

Remark: The identification numbers with * are our semi-standard items.



Example of identification number of assembled set

Model code	Dimensions	Part code			Model code	Dust protection code	Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MH	G	20	C2	R480				T1	P		/V
①	②	③	④	⑤	①	⑥	⑦	⑧	⑨	⑩	⑪

① Model	
MH LWH(…B)	Flange type mounting from bottom

② Length of slide unit	
No symbol	Standard
G	Long

③ Size
15, 20, 25

④ Number of slide unit (2)

⑤ Length of track rail (480 mm)

⑥ Dust protection code	
No symbol	Standard specification
M	Ultra seal specification
MU	Ultra seal specification with track rail mounting from bottom

⑦ Material type	
No symbol	High carbon steel made
SL	Stainless steel made

⑧ Preload amount	
No symbol	Standard
T1	Light preload
T2	Medium preload
T3	Heavy preload

⑨ Accuracy class	
H	High
P	Precision
SP	Super precision

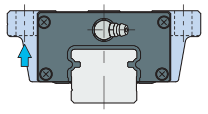
⑩ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

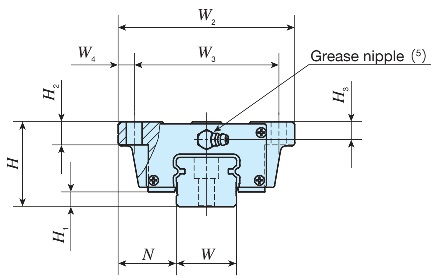
⑪ Special specification
A, BS, D, E, F, Ⅰ, J, L, LF, MA MN, N, PS, Q, RE, T, UR, V, W, Y, Z

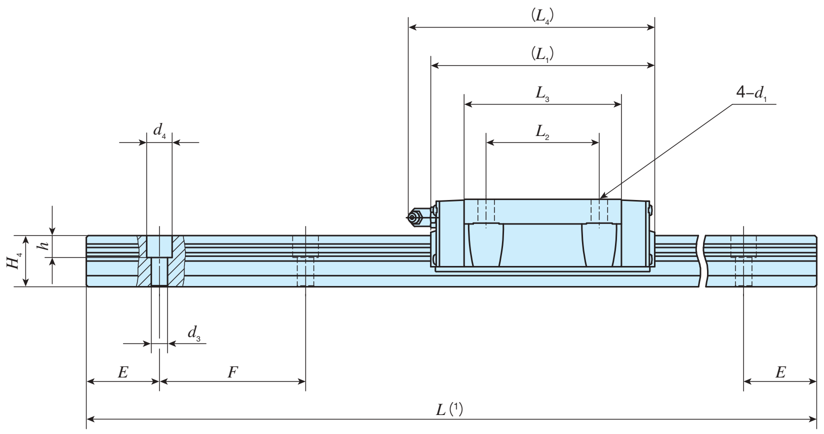
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

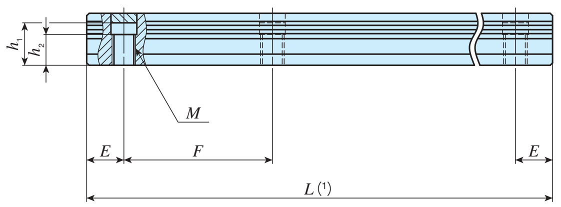
IKO C-Lube Linear Way MH

Flange type mounting from bottom

Shape	**MH** ・ **LWH** 
Size	15 20 25 **30** **35** **45** 55 65







Ultra seal specification with track rail mounting from bottom

Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm										Dimensions of track rail mm										Appended mounting bolt for track rail (3) mm	Basic dynamic load rating (4)	Basic static load rating (4)	Static moment rating (4)		
MH series	LWH series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	d_1	H_2	H_3	W	H_4	d_3	d_4	h	M	h_1 (2)	h_2	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MH 30		○	1.28	4.82	42	9	31	90	72	9	113	52	80.6	123	9	10	8	28	25	9	14	12	–	–	–	40	80	M 8×28	35 400	40 700	623	536 2 820	536 2 820
	LWH 30…B	○				7																											
–	LWH 30…SL	○																															
MH 30…M*		–																															
	LWH 30…M*	–																															
MH 30…MU*		–																		–	–	–	M12	20	13			–					
	LWH 30…MU*	–																															
MHG 30		○	1.69			9					139		106.6	149						9	14	12	–	–	–			M 8×28	42 700	53 200	814	894 4 460	894 4 460
	LWHG 30	○				7																											
MH 35		○	1.79	6.85	48	10	33	100	82	9	123	62	86.2	135	9	13	10	34	28	9	14	12	–	–	–	40	80	M 8×28	48 700	53 700	823	631 3 480	579 3 190
	LWH 35…B	○				8																											
–	LWH 35…M*	–																															
–	LWH 35…MU*	–																		–	–	–	M12	23	16			–					
MHG 35		○	2.35			10					151		114	163						9	14	12	–	–	–			M 8×28	59 500	71 600	1 100	1 090 5 570	1 000 5 110
	LWHG 35	○				8																											
MH 45		○	3.17	10.7	60	13	37.5	120	100	10	147	80	103.4	158	11	15	13	45	34	14	20	17	–	–	–	52.5	105	M12×35	74 600	80 200	1 610	1 150 6 190	1 060 5 690
	LWH 45…B	○				14																											
–	LWH 45…M*	–				10																											
–	LWH 45…MU*	–																		–	–	–	M16	29	17			–					
MHG 45		○	4.34			13					190		146.6	201						14	20	17	–	–	–			M12×35	95 200	114 000	2 280	2 240 11 100	2 050 10 200
	LWHG 45	○				14																											

Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ–93, Table 2.2 on page Ⅱ–94, and Tables 2.3 and 2.4 on page Ⅱ–95.

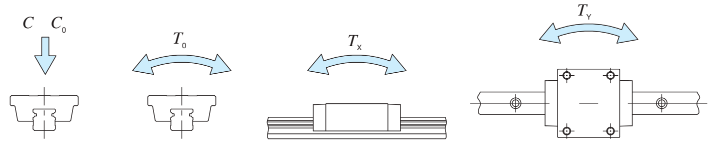
(2) Choose bolts whose dimension allow fixing thread depth into track rail to be less than h_1.

(3) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. For stainless steel model, stainless steel bolts are appended.
In an assembled set of MH series and LWH…MU model, track rail mounting bolts are not appended.

(4) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

(5) The shapes of grease nipple vary by size. The specifications are shown in Table 16 on page Ⅱ–104.

Remark: The identification numbers with * are our semi-standard items.



Example of identification number of assembled set

Model code		Dimensions	Part code		Model code	Dust protection code	Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MH	G	35	C2	R800				T_1	P		/V
①	②	③	④	⑤	①	⑥	⑦	⑧	⑨	⑩	⑪

① Model	
MH LWH(…B)	Flange type mounting from bottom

② Length of slide unit	
No symbol	Standard
G	Long

③ Size
30, 35, 45

④ Number of slide unit (2)

⑤ Length of track rail (800 mm)

⑥ Dust protection code	
No symbol	Standard specification
M	Ultra seal specification
MU	Ultra seal specification with track rail mounting from bottom

⑦ Material type	
No symbol	High carbon steel made
SL	Stainless steel made

⑧ Preload amount	
No symbol	Standard
T_1	Light preload
T_2	Medium preload
T_3	Heavy preload

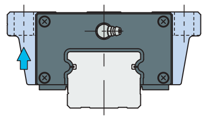
⑨ Accuracy class	
H	High
P	Precision
SP	Super precision

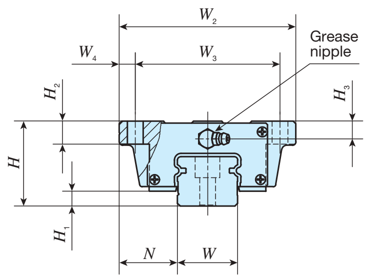
⑩ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

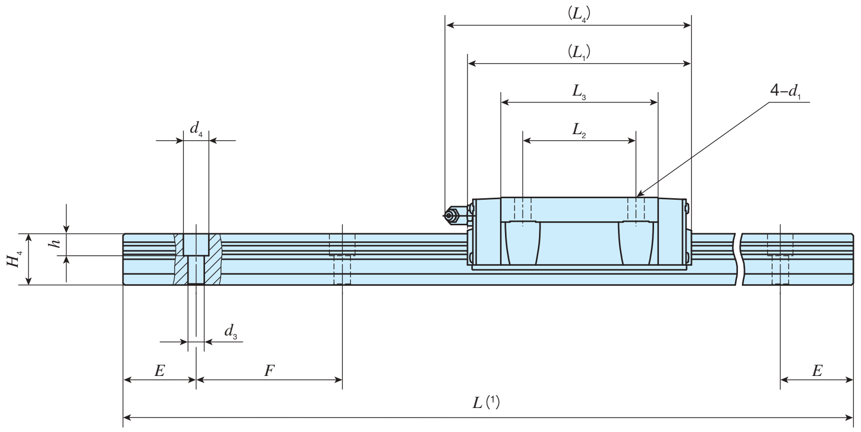
⑪ Special specification
A, BS, D, E, F, Ⅰ, J, L, LF, MA
MN, N, PS, Q, RE, T, UR, V, W, Y, Z

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Flange type mounting from bottom

	LWH			
Shape				
Size	15	20	25	30
	35	45	**55**	**65**

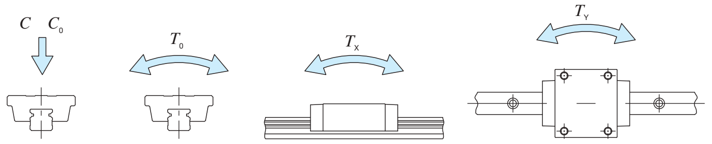




Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm											Dimensions of track rail mm							Appended mounting bolt for track rail (2) mm	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
MH series	LWH series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	d_1	H_2	H_3	H_5	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
–	**LWH 55…B**	○	5.30	15.5	70	17	43.5	140	116	12	183	95	132	194	14	17	14	–	53	41	16	23	20	60	120	M14×45	113 000	121 000	2 870	2 210 11 600	2 030 10 600
–	**LWHG 55**	○	7.40								235		183.6	246													142 000	168 000	3 970	4 120 20 200	3 780 18 500
–	**LWH 65…B**	○	12.3	22.2	90	18	53.5	170	142	14	229	110	164	239	16	23	20	–	63	48	18	26	22	75	150	M16×50	176 000	184 000	5 180	4 130 22 000	3 790 20 200
–	**LWHG 65**	○	17.6								303		238.8	313													229 000	269 000	7 560	8 530 41 500	7 810 38 100

Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ−93.
(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176.
(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

Remark: The specifications of grease nipple are shown in Table 16 on page Ⅱ−104.



Example of identification number of assembled set

Model code		Dimensions	Part code		Model code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
LWH	G	55	C2	R1200		T1	P		/N
1	2	3	4	5	1	6	7	8	9

① Model	
LWH(…B)	Flange type mounting from bottom

② Length of slide unit	
No symbol	Standard
G	Long

③ Size
55, 65

④ Number of slide unit (2)

⑤ Length of track rail (1,200 mm)

⑥ Preload amount	
No symbol	Standard
T1	Light preload
T2	Medium preload
T3	Heavy preload

⑦ Accuracy class	
H	High
P	Precision
SP	Super precision

⑧ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

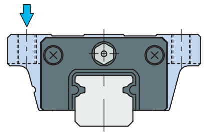
⑨ Special specification

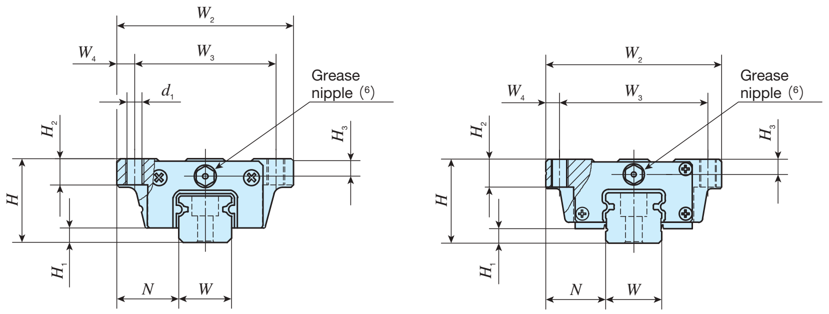
A, D, E, F, Ⅰ, J, L, LF, MN
N, PS, Q, T, V, W, Y, Z

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

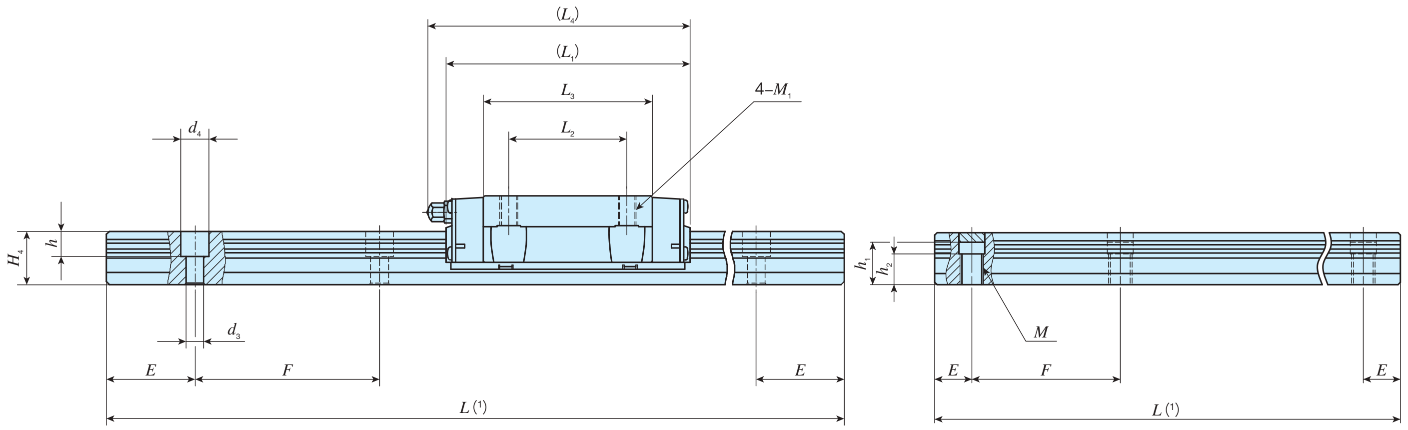
IKO C-Lube Linear Way MH

Flange type mounting from top

Shape	**MHT** ・ **LWHT** 
Size	8 10 12 15 20 25 30 35 45 55 65



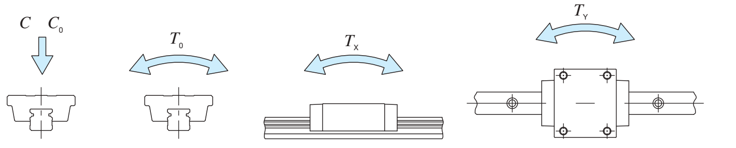
MHT 8 …SL, LWHT 8 …SL
MHT 10 …SL, LWHT 10 …SL
MHT 12（…SL）, LWHT 12（…SL）
MHTG 15



Ultra seal specification with track rail mounting from bottom

Identification number MH series	Identification number LWH series (No C-Lube)	Interchangeable	Mass (Ref.) Slide unit kg	Mass (Ref.) Track rail kg/m	Dimensions of assembly mm H	H_1	N	Dimensions of slide unit mm W_2	W_3	W_4	L_1	L_2	L_3	L_4	d_1 (2)	M_1	H_2	H_3	Dimensions of track rail mm W	H_4	d_3	d_4	h	M	h_1 (3)	h_2	E	F	Appended mounting bolt for track rail (4) mm Bolt size× ℓ	Basic dynamic load rating (5) C N	Basic static load rating (5) C_0 N	Static moment rating (5) T_0 N・m	T_X N・m	T_Y N・m
MHT 8…SL	LWHT 8…SL	○	0.015	0.32	10	2.1	8	24	19	2.5	24	10	15.3	−	1.9	M2.3	3.5	2	8	6	2.4	4.2	2.3	−	−	−	10	20	M2× 8	1 510	2 120	8.8	5.5 32.0	4.7 26.9
MHT 10…SL		○	0.031	0.47	12	2.4	10	30	24	3	32	12	21.4	−	2.6	M3	4.5	2.5	10	7	3.5	6	3.5	−	−	−	12.5	25	M3× 8	2 640	3 700	19.2	13.3 73.8	11.1 61.9
	LWHT 10…SL	○	0.032																															
MHT 12		○	0.108	0.86	19	3.2	14	40	32	4	46	15	31.6	50	3.4	M4	6	4	12	10.5	3.5	6	4.5	−	−	−	20	40	M3×12	6 260	8 330	51.6	44.7 237	37.5 199
	LWHT 12	○	0.11																															
MHT 12…SL		○	0.108																															
	LWHT 12…SL	○	0.11																															
MHT 15		○	0.22	1.47	24	4.5	16	47	38	4.5	66	30	44.2	69	−	M5	7	4.5	15	15	4.5	8	6	−	−	−	30	60	M4×16	11 600	13 400	112	95.6 556	95.6 556
	LWHT 15…B	○											44.6																					
MHT 15…SL		○											44.2																					
	LWHT 15…SL	○											44.6																					
−	LWHT 15…M*	−																																
−	LWHT 15…MU*	−																			−	−	−	M6	12	9			−					
MHTG 15	−	○	0.29								82		60.1	85	4.4						4.5	8	6	−	−	−			M4×16	14 400	18 300	153	172 918	172 918

Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ−93, Table 2.2 on page Ⅱ−94, and Tables 2.3 and 2.4 on page Ⅱ−95.
(2) Series of size 8 to 12 and MHTG15 can also be mounted in upward direction.
(3) Choose bolts whose dimension allow fixing thread depth into track rail to be less than h_1.
(4) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. For stainless steel model, stainless steel bolts are appended.
In an assembled set of MH series and LWHT…MU model, track rail mounting bolts are not appended.
(5) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.
(6) Series of size 8 and 10 are provided with an oil hole. The specifications of oil holes are shown in Table 15 on page Ⅱ−104.
The shapes of grease nipples of size 12 and 15 vary by size. The specifications are shown in Table 16 on page Ⅱ−104.
Remark: The identification numbers with * are our semi-standard items.



Example of identification number of assembled set

Model code	Dimensions	Part code			Model code	Dust protection code	Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MHT	G	15	C2	R900				T1	P		/N
❶	❷	❸	❹	❺	❶	❻	❼	❽	❾	❿	⓫

① Model

MHT LWHT(…B)	Flange type mounting from top

② Length of slide unit

No symbol	Standard
G	Long

③ Size

8, 10, 12, 15

④ Number of slide unit (2)

⑤ Length of track rail (900 mm)

⑥ Dust protection code

No symbol	Standard specification
M	Ultra seal specification
MU	Ultra seal specification with track rail mounting from bottom

⑦ Material type

No symbol	High carbon steel made
SL	Stainless steel made

⑧ Preload amount

T0	Clearance
No symbol	Standard
T1	Light preload
T2	Medium preload
T3	Heavy preload

⑨ Accuracy class

H	High
P	Precision
SP	Super precision

⑩ Interchangeable

No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

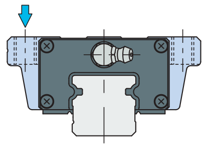
⑪ Special specification

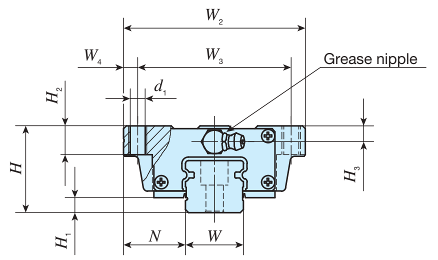
A, BS, D, E, F, Ⅰ, J, L, LF, MA
MN, N, Q, RE, T, U, V, W, Y, Z

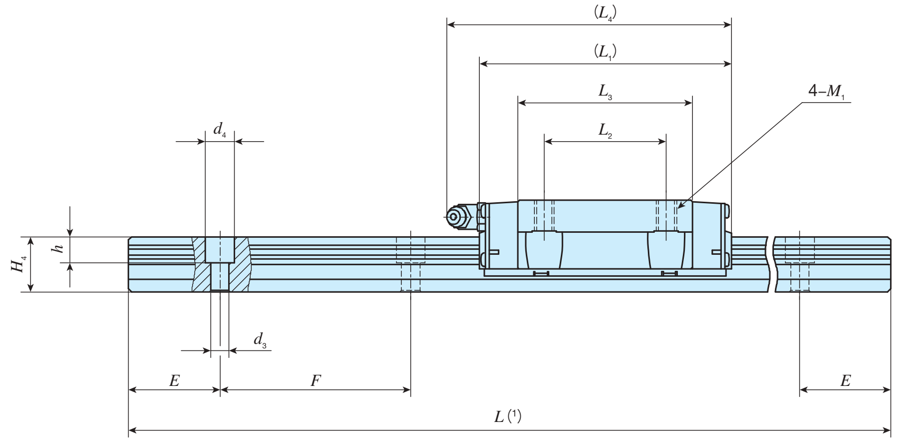
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

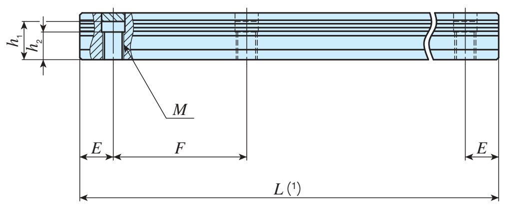
IKO C-Lube Linear Way MH

Flange type mounting from top

Shape	MHT ・ LWHT 					
Size	8	10	12	15	**20**	**25**
	30	35	45	55	65	







Ultra seal specification with track rail mounting from bottom

Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm											Dimensions of track rail mm										Appended mounting bolt for track rail (3) mm	Basic dynamic load rating (4)	Basic static load rating (4)	Static moment rating (4)		
MH series	LWH series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	d_1	M_1	H_2	H_3	W	H_4	d_3	d_4	h	M	h_1 (2)	h_2	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MHT 20		○	0.48	2.56	30	6	21.5	63	53	5	83	40	56	94	–	M6	10	5.5	20	18	6	9.5	8.5	–	–	–	30	60	M5×18	18 100	21 100	232	195 1 090	195 1 090
	LWHT 20…B	○											57.2																					
MHT 20…SL		○											56																					
	LWHT 20…SL	○											57.2																					
–	LWHT 20…M*	–				5																												
–	LWHT 20…MU*	–																			–	–	–	M 8	13.5	9.5			–					
MHTG 20		○	0.71			6					112		84.8	122							6	9.5	8.5	–	–	–			M5×18	24 100	31 700	349	421 2 140	421 2 140
	LWHTG 20	○											86																					
MHT 25		○	0.70	3.50	36	8	23.5	70	57	6.5	95	45	63.9	105	–	M8	10	6.5	23	22	7	11	9	–	–	–	30	60	M6×22	25 200	28 800	362	309 1 690	309 1 690
	LWHT 25…B	○				6.5							64.7																					
MHT 25…SL		○				8							63.9																					
	LWHT 25…SL	○				6.5							64.7																					
MHT 25…M*		–											63.9																					
	LWHT 25…M*	–											64.7																					
MHT 25…MU*		–											63.9								–	–	–	M10	18	13			–					
	LWHT 25…MU*	–											64.7																					
MHTG 25		○	0.93			8					118		86.6	128							7	11	9	–	–	–			M6×22	30 800	38 300	483	533 2 740	533 2 740
	LWHTG 25	○				6.5							87.4																					

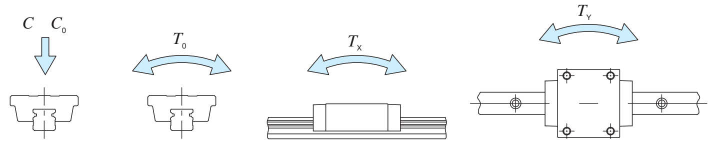
Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ－93, Table 2.2 on page Ⅱ－94, and Tables 2.3 and 2.4 on page Ⅱ－95.

(2) Choose bolts whose dimension allow fixing thread depth into track rail to be less than h_1.

(3) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. For stainless steel model, stainless steel bolts are appended.
In an assembled set of MH series and LWHT…MU model, track rail mounting bolts are not appended.

(4) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

Remarks 1. The specifications of grease nipple are shown in Table 16 on page Ⅱ－104.
2. The identification numbers with * are our semi-standard items.



Example of identification number of assembled set

Model code	Dimensions	Part code			Model code	Dust protection code	Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MHT	G	25	C2	R840				T1	P		/N
①	②	③	④	⑤	①	⑥	⑦	⑧	⑨	⑩	⑪

① Model	
MHT LWHT (…B)	Flange type mounting from top

② Length of slide unit	
No symbol	Standard
G	Long

③ Size
20, 25

④ Number of slide unit (2)

⑤ Length of track rail (840 mm)

⑥ Dust protection code	
No symbol	Standard specification
M	Ultra seal specification
MU	Ultra seal specification with track rail mounting from bottom

⑦ Material type	
No symbol	High carbon steel made
SL	Stainless steel made

⑧ Preload amount	
No symbol	Standard
T1	Light preload
T2	Medium preload
T3	Heavy preload

⑨ Accuracy class	
H	High
P	Precision
SP	Super precision

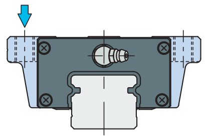
⑩ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

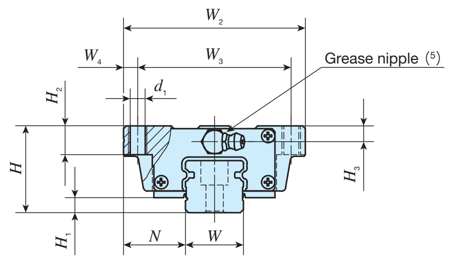
⑪ Special specification
A, BS, D, E, F, Ⅰ, J, L, LF, MA
MN, N, PS, Q, RE, T, UR, V, W, Y, Z

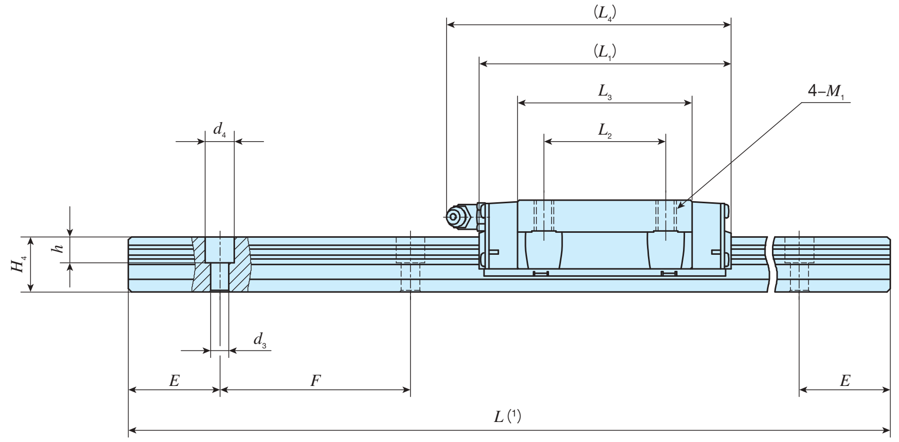
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

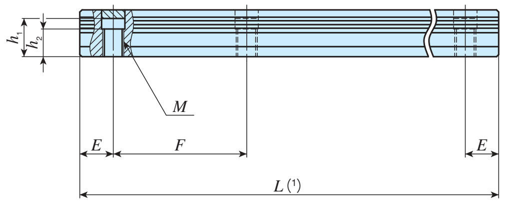
IKO C-Lube Linear Way MH

Flange type mounting from top

Shape	**MHT · LWHT** 
Size	8, 10, 12, 15, 20, 25 **30**, **35**, 45, 55, 65



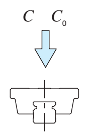


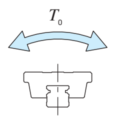


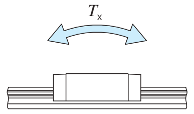
Ultra seal specification with track rail mounting from bottom

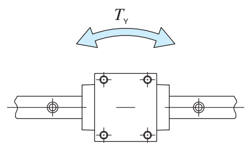
Identification number: MH series	Identification number: LWH series (No C-Lube)	Interchangeable	Mass (Ref.) Slide unit kg	Mass (Ref.) Track rail kg/m	Dimensions of assembly mm H	H_1	N	Dimensions of slide unit mm W_2	W_3	W_4	L_1	L_2	L_3	L_4	d_1	M_1	H_2	H_3	Dimensions of track rail mm W	H_4	d_3	d_4	h	M	h_1 (2)	h_2	E	F	Appended mounting bolt for track rail (3) mm Bolt size× ℓ	Basic dynamic load rating (4) C N	Basic static load rating (4) C_0 N	Static moment rating (4) T_0 N · m	T_X N · m	T_Y N · m
MHT 30		○	1.28	4.82	42	9	31	90	72	9	113	52	80.6	123	–	M10	10	8	28	25	9	14	12	–	–	–	40	80	M 8×28	35 400	40 700	623	536 2 820	536 2 820
	LWHT 30···B	○				7																												
MHT 30···SL		○				9																												
	LWHT 30···SL	○				7																												
MHT 30···M*		–																																
	LWHT 30···M*	–																																
MHT 30···MU*		–																			–	–	–	M12	20	13			–					
	LWHT 30···MU*	–																																
MHTG 30		○	1.69			9					139		106.6	149							9	14	12	–	–	–			M 8×28	42 700	53 200	814	894 4 460	894 4 460
	LWHTG30	○				7																												
MHT 35		○	1.79	6.85	48	10	33	100	82	9	123	62	86.2	135	–	M10	13	10	34	28	9	14	12	–	–	–	40	80	M 8×28	48 700	53 700	823	631 3 480	579 3 190
	LWHT 35···B	○				8																												
–	LWHT 35···M*	–																																
–	LWHT 35···MU*	–																			–	–	–	M12	23	16			–					
MHTG 35		○	2.35			10					151		114	163							9	14	12	–	–	–			M 8×28	59 500	71 600	1 100	1 090 5 570	1 000 5 110
	LWHTG35	○				8																												

Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ−93, Table 2.2 on page Ⅱ−94, and Tables 2.3 and 2.4 on page Ⅱ−95.
(2) Choose bolts whose dimension allow fixing thread depth into track rail to be less than h_1.
(3) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. For stainless steel model, stainless steel bolts are appended.
In an assembled set of MH series and LWHT···MU model, track rail mounting bolts are not appended.
(4) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.
(5) The shapes of grease nipple vary by size. The specifications are shown in Table 16 on page Ⅱ−104.
Remark: The identification numbers with * are our semi-standard items.









Example of identification number of assembled set

Model code	Dimensions	Part code			Model code	Dust protection code	Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MHT	G	35	C2	R1040				T1	P		/N
①	②	③	④	⑤	①	⑥	⑦	⑧	⑨	⑩	⑪

① Model	
MHT LWHT(···B)	Flange type mounting from top

② Length of slide unit	
No symbol	Standard
G	Long

③ Size
30, 35

④ Number of slide unit (2)

⑤ Length of track rail (1,040 mm)

⑥ Dust protection code	
No symbol	Standard specification
M	Ultra seal specification
MU	Ultra seal specification with track rail mounting from bottom

⑦ Material type	
No symbol	High carbon steel made
SL	Stainless steel made

⑧ Preload amount	
No symbol	Standard
T1	Light preload
T2	Medium preload
T3	Heavy preload

⑨ Accuracy class	
H	High
P	Precision
SP	Super precision

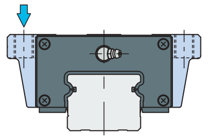
⑩ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

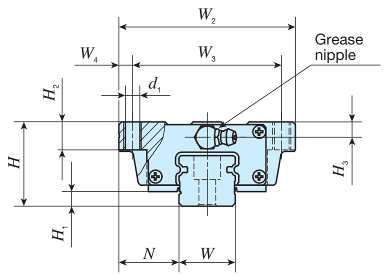
⑪ Special specification
A, BS, D, E, F, Ⅰ, J, L, LF, MA MN, N, PS, Q, RE, T, UR, V, W, Y, Z

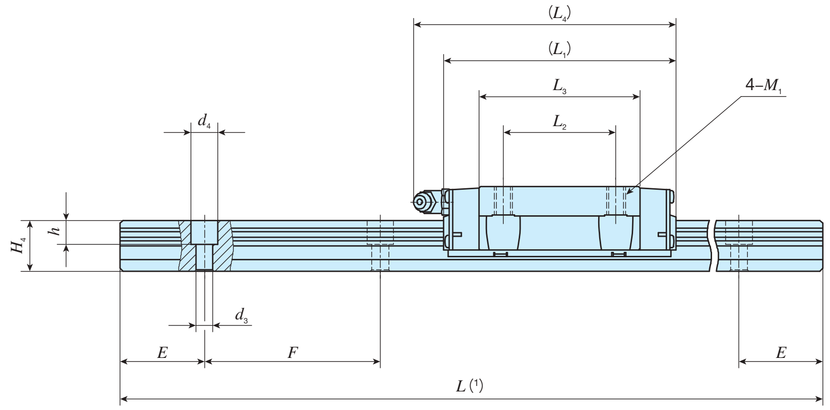
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

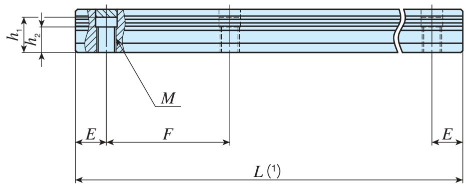
IKO C-Lube Linear Way MH

Flange type mounting from top

Shape	**MHT ・ LWHT** 
Size	8 10 12 15 20 25 30 35 **45 55 65**







Ultra seal specification with track rail mounting from bottom

Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm													Dimensions of track rail mm										Appended mounting bolt for track rail (3) mm	Basic dynamic load rating (4)	Basic static load rating (4)	Static moment rating (4)		
MH series	LWH series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	d_1	M_1	H_2	H_3	H_5	W	H_4	d_3	d_4	h	M	h_1 (2)	h_2	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MHT 45		○	3.17	10.7	60	13	37.5	120	100	10	147	80	103.4	158	—	M12	15	13	—	45	34	14	20	17	—	—	—	52.5	105	M12×35	74 600	80 200	1 610	1 150 6 190	1 060 5 690
	LWHT 45…B	○				14																													
—	LWHT 45…M*	—				10																													
—	LWHT 45…MU*	—																				—	—	—	M16	29	17			—					
MHTG 45		○	4.34			13					190		146.6	201								14	20	17	—	—	—			M12×35	95 200	114 000	2 280	2 240 11 100	2 050 10 200
	LWHTG45	○				14																													
—	LWHT 55…B	○	5.30	15.5	70	17	43.5	140	116	12	183	95	132	194	—	M14	17	14	—	53	41	16	23	20	—	—	—	60	120	M14×45	113 000	121 000	2 870	2 210 11 600	2 030 10 600
—	LWHTG55	○	7.40								235		183.6	246																	142 000	168 000	3 970	4 120 20 200	3 780 18 500
—	LWHT 65…B	○	12.3	22.2	90	18	53.5	170	142	14	229	110	164	239	—	M16	23	20	—	63	48	18	26	22	—	—	—	75	150	M16×50	176 000	184 000	5 180	4 130 22 000	3 790 20 200
—	LWHTG65	○	17.6								303		238.8	313																	229 000	269 000	7 560	8 530 41 500	7 810 38 100

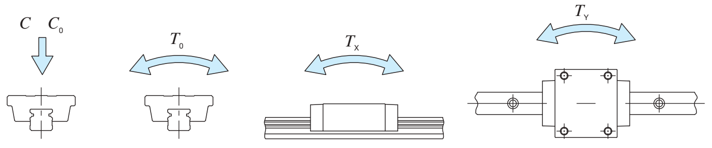
Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ−93 and Tables 2.3 and 2.4 on page Ⅱ−95.

(2) Choose bolts whose dimension allow fixing thread depth into track rail to be less than h_1.

(3) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176.
In an assembled set of MH series and LWHT…MU model, track rail mounting bolts are not appended.

(4) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

Remarks 1. The specifications of grease nipple are shown in Table 16 on page Ⅱ−104.
2. The identification numbers with * are our semi-standard items.



Example of identification number of assembled set

Model code	Dimensions	Part code			Model code	Dust protection code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MHT	G	45	C2	R1260			T1	P		/N
1	2	3	4	5	1	6	7	8	9	10

① Model	
MHT LWHT(…B)	Flange type mounting from top

② Length of slide unit	
No symbol	Standard
G	Long

③ Size
45, 55, 65

④ Number of slide unit (2)

⑤ Length of track rail (1,260 mm)

⑥ Dust protection code	
No symbol	Standard specification
M	Ultra seal specification
MU	Ultra seal specification with track rail mounting from bottom

⑦ Preload amount	
No symbol	Standard
T_1	Light preload
T_2	Medium preload
T_3	Heavy preload

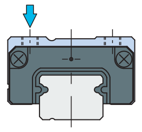
⑧ Accuracy class	
H	High
P	Precision
SP	Super precision

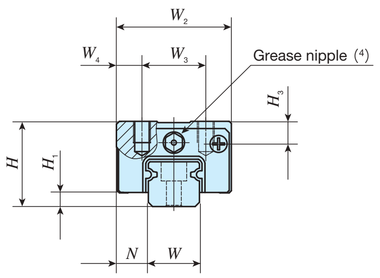
⑨ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

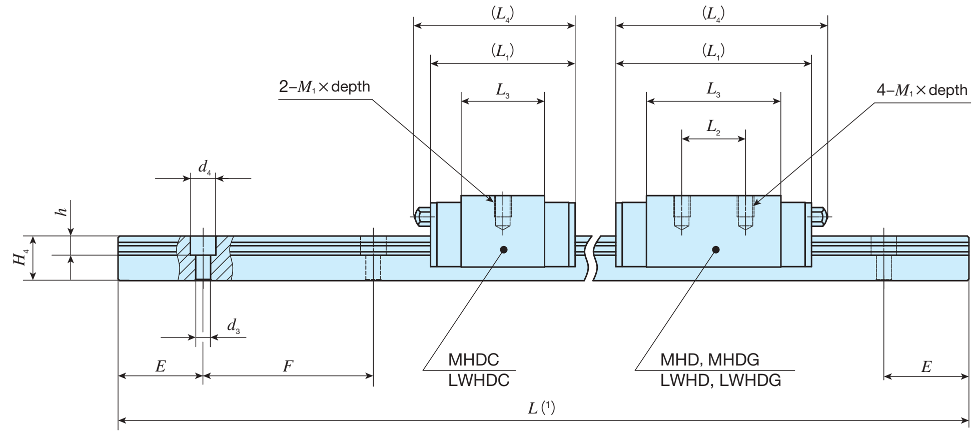
⑩ Special specification
A, BS, D, E, F, Ⅰ, J, L, LF, MA
MN, N, PS, Q, RE, T, V, W, Y, Z

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Block type mounting from top

Shape	MHD · LWHD 				
Size	8	10	12	15	25
	30	35	45	55	65





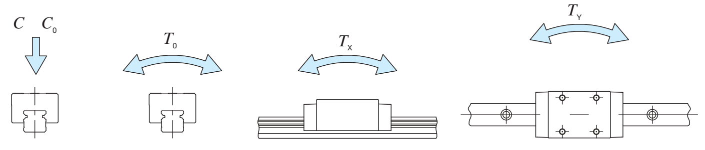
Identification number MH series	Identification number LWH series (No C-Lube)	Interchangeable	Mass (Ref.) Slide unit kg	Mass (Ref.) Track rail kg/m	Dimensions of assembly mm H	H_1	N	Dimensions of slide unit mm W_2	W_3	W_4	L_1	L_2	L_3	L_4	M_1×depth	H_3	Dimensions of track rail mm W	H_4	d_3	d_4	h	E	F	Appended mounting bolt for track rail (2) mm Bolt size× ℓ	Basic dynamic load rating (3) C N	Basic static load rating (3) C_0 N	Static moment rating (3) T_0 N・m	T_X N・m	T_Y N・m
MHDC 8…SL	LWHDC 8…SL	○	0.008	0.32	11	2.1	4	16	10	3	18	–	9.0	–	M2 ×2.5	3	8	6	2.4	4.2	2.3	10	20	M2× 8	1 050	1 270	5.3	2.2 15.5	1.8 13.0
MHD 8…SL	LWHD 8…SL	○	0.013								24	10	15.3												1 510	2 120	8.8	5.5 32.0	4.7 26.9
MHDG 8…SL	LWHDG 8…SL	○	0.018								30.5		21.7												1 910	2 970	12.3	10.4 55.4	8.8 46.4
MHDC 10…SL	LWHDC 10…SL	○	0.018	0.47	13	2.4	5	20	13	3.5	24	–	13.4	–	M2.6×3	3.5	10	7	3.5	6	3.5	12.5	25	M3× 8	1 920	2 350	12.2	5.8 37.1	4.8 31.2
MHD 10…SL		○	0.026								32	12	21.4												2 640	3 700	19.2	13.3 73.8	11.1 61.9
	LWHD 10…SL	○	0.027																										
MHDG 10…SL		○	0.035								40		29.4												3 280	5 050	26.2	23.8 123	20.0 103
	LWHDG 10…SL	○	0.036																										
MHDC 12…SL		○	0.057	0.86	20	3.2	7.5	27	15	6	34	–	19.6	38	M4 ×5	5	12	10.5	3.5	6	4.5	20	40	M3×12	4 560	5 300	32.8	19.4 117	16.3 98.5
	LWHDC 12…SL	○	0.058																										
MHD 12		○	0.089								46	15	31.6	50											6 260	8 330	51.6	44.7 237	37.5 199
	LWHD 12	○	0.091																										
MHD 12…SL		○	0.089																										
	LWHD 12…SL	○	0.091																										
MHDG 12…SL		○	0.115								58		43.6	62											7 780	11 400	70.4	80.4 399	67.5 335
	LWHDG 12…SL	○	0.118																										

Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ－93 and Table 2.2 on page Ⅱ－94.

(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. For stainless steel model, stainless steel bolts are appended.
In an assembled set of MH series, track rail mounting bolts are not appended.

(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

(4) Series of size 8 and 10 are provided with an oil hole. The specifications of oil holes are shown in Table 15 on page Ⅱ－104.
The specification of grease nipple for size 12 is shown in Table 16 on page Ⅱ－104.



Example of identification number of assembled set

Model code		Dimensions	Part code		Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MHD	G	12	C2	R320	SL	T1	P		/N
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩

① Model	
MHD LWHD	Block type mounting from top

② Length of slide unit	
C	Short
No symbol	Standard
G	Long

③ Size
8, 10, 12

④ Number of slide unit (2)

⑤ Length of track rail (320 mm)

⑥ Material type	
No symbol	High carbon steel made
SL	Stainless steel made

⑦ Preload amount	
T0	Clearance
No symbol	Standard
T1	Light preload

⑧ Accuracy class	
H	High
P	Precision

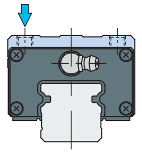
⑨ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

⑩ Special specification
A, D, E, F, Ⅰ, LR, MA MN, N, Q, U, W, Y

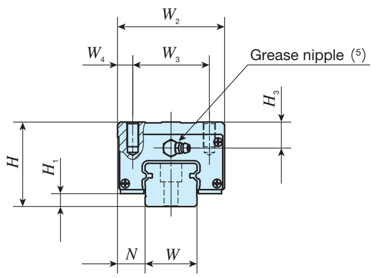
IKO C-Lube Linear Way MH

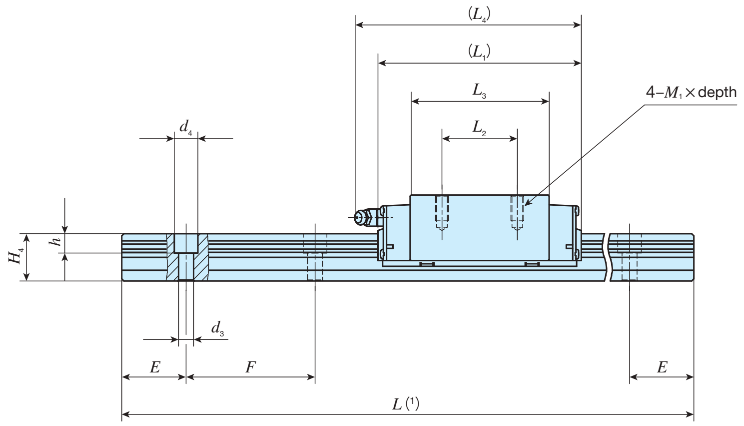
Block type mounting from top

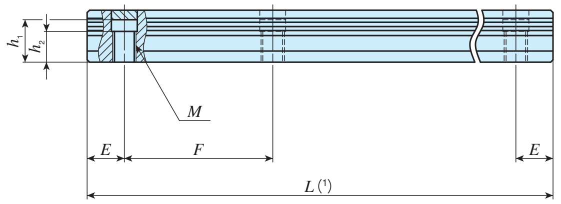
Shape	**MHD** · **LWHD**



Size					
	8	10	12	15	25
	30	35	45	55	65







Ultra seal specification with track rail mounting from bottom

Identification number: MH series	Identification number: LWH series (No C-Lube)	Interchangeable	Mass (Ref.): Slide unit kg	Mass (Ref.): Track rail kg/m	Dimensions of assembly mm: H	H_1	N	Dimensions of slide unit mm: W_2	W_3	W_4	L_1	L_2	L_3	L_4	M_1×depth	H_3	Dimensions of track rail mm: W	H_4	d_3	d_4	h	M	h_1(2)	h_2	E	F	Appended mounting bolt for track rail (3) mm: Bolt size× ℓ	Basic dynamic load rating (4): C N	Basic static load rating (4): C_0 N	Static moment rating (4): T_0 N・m	T_X N・m	T_Y N・m
MHD 15		○	0.23	1.47	28	4.5	9.5	34	26	4	66	26	44.2	69	M4×10	8.5	15	15	4.5	8	6	–	–	–	30	60	M4×16	11 600	13 400	112	95.6 556	95.6 556
	LWHD 15…B	○											44.6																			
–	LWHD 15…M*	–																														
–	LWHD 15…MU*	–																	–	–	–	M 6	12	9			–					
MHD 25		○	0.65	3.50	40	8	12.5	48	35	6.5	95	35	63.9	105	M6×12	10.5	23	22	7	11	9	–	–	–	30	60	M6×22	25 200	28 800	362	309 1 690	309 1 690
	LWHD 25…B	○				6.5							64.7																			
MHD 25…M*		–											63.9																			
	LWHD 25…M*	–											64.7																			
MHD 25…MU*		–											63.9						–	–	–	M10	18	13			–					
	LWHD 25…MU*	–											64.7																			
MHDG 25		○	0.80			8					118	50	86.6	128					7	11	9	–	–	–			M6×22	30 800	38 300	483	533 2 740	533 2 740
	LWHDG 25	○				6.5							87.4																			
MHD 30		○	1.12	4.82	45	9	16	60	40	10	113	40	80.6	123	M8×16	11	28	25	9	14	12	–	–	–	40	80	M8×28	35 400	40 700	623	536 2 820	536 2 820
	LWHD 30…B	○				7																										
MHD 30…M*		–																														
	LWHD 30…M*	–																														
MHD 30…MU*		–																	–	–	–	M12	20	13			–					
	LWHD 30…MU*	–																														
MHDG 30		○	1.44			9					139	60	106.6	149					9	14	12	–	–	–			M8×28	42 700	53 200	814	894 4 460	894 4 460
	LWHDG 30	○				7																										

Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ－93 and Tables 2.3 and 2.4 on page Ⅱ－95.

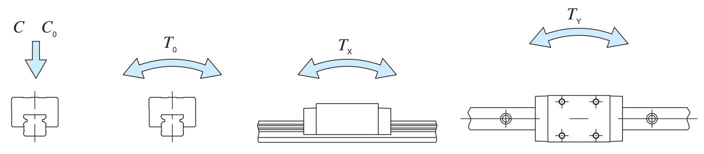
(2) Choose bolts whose dimension allow fixing thread depth into track rail to be less than h_1.

(3) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. In an assembled set of MH series and LWHD…MU model, track rail mounting bolts are not appended.

(4) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

(5) The shapes of grease nipple vary by size. The specifications are shown in Table 16 on page Ⅱ－104.

Remark: The identification numbers with * are our semi-standard items.



Example of identification number of assembled set

Model code		Dimensions	Part code		Model code	Dust protection code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MHD	G	25	C2	R840			T1	P		/V
1	2	3	4	5	1	6	7	8	9	10

① Model

MHD LWHD (…B)	Block type mounting from top

② Length of slide unit

No symbol	Standard
G	Long

③ Size

15, 25, 30

④ Number of slide unit (2)

⑤ Length of track rail (840 mm)

⑥ Dust protection code

No symbol	Standard specification
M	Ultra seal specification
MU	Ultra seal specification with track rail mounting from bottom

⑦ Preload amount

No symbol	Standard
T_1	Light preload
T_2	Medium preload
T_3	Heavy preload

⑧ Accuracy class

H	High
P	Precision
SP	Super precision

⑨ Interchangeable

No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

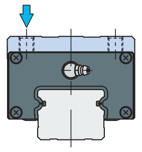
⑩ Special specification

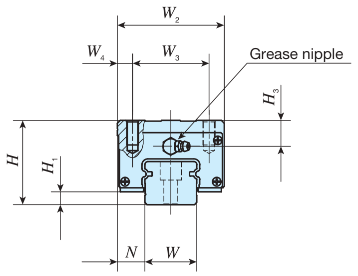
A, BS, D, E, F, Ⅰ, J, L, LF, MA
MN, N, PS, Q, RE, T, UR, V, W, Y, Z

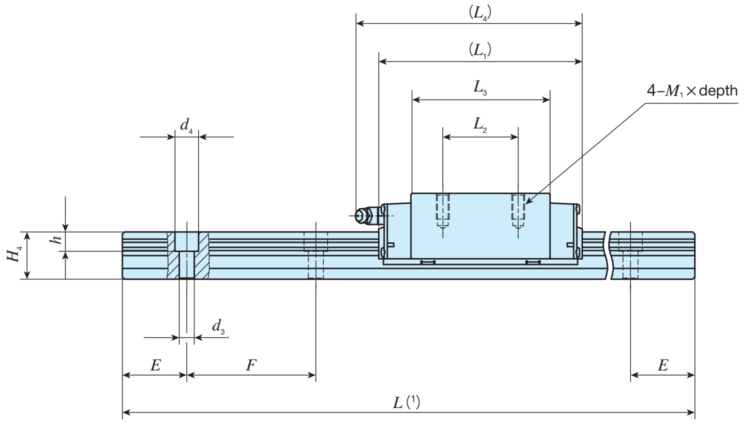
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

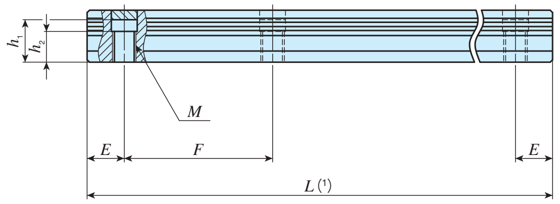
IKO C-Lube Linear Way MH

Block type mounting from top

	MHD ・ LWHD				
Shape					
Size	8	10	12	15	25
	30	35	45	55	65





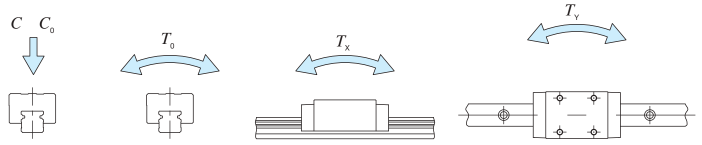


Ultra seal specification with track rail mounting from bottom

Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm									Dimensions of track rail mm											Appended mounting bolt for track rail (3) mm	Basic dynamic load rating (4)	Basic static load rating (4)	Static moment rating (4)		
MH series	LWH series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	M_1×depth	H_3	W	H_4	d_3	d_4	h	M	h_1(2)	h_2	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MHD 35		○	1.74	6.85	55	10	18	70	50	10	123	50	86.2	135	M 8×16	17	34	28	9	14	12	–	–	–	40	80	M 8×28	48 700	53 700	823	631 3 480	579 3 190
	LWHD 35…B	○				8																										
–	LWHD 35…M*	–																	–	–	–	M12	23	16			–					
–	LWHD 35…MU*	–																														
MHDG 35		○	2.26			10					151	72	114	163					9	14	12	–	–	–			M 8×28	59 500	71 600	1 100	1 090 5 570	1 000 5 110
	LWHDG35	○				8																										
MHD 45		○	3.30	10.7	70	13	20.5	86	60	13	147	60	103.4	158	M10×20	23	45	34	14	20	17	–	–	–	52.5	105	M12×35	74 600	80 200	1 610	1 150 6 190	1 060 5 690
	LWHD 45…B	○				14																										
–	LWHD 45…M*	–				10													–	–	–	M16	29	17			–					
–	LWHD 45…MU*	–																														
MHDG 45		○	4.57			13					190	80	146.6	201					14	20	17	–	–	–			M12×35	95 200	114 000	2 280	2 240 11 100	2 050 10 200
	LWHDG45	○				14																										
–	LWHD 55…B	○	5.36	15.5	80	17	23.5	100	75	12.5	183	75	132	194	M12×25	24	53	41	16	23	20	–	–	–	60	120	M14×45	113 000	121 000	2 870	2 210 11 600	2 030 10 600
–	LWHDG55	○	7.20								235	95	183.6	246														142 000	168 000	3 970	4 120 20 200	3 780 18 500
–	LWHD 65…B	○	9.80	22.2	90	18	31.5	126	76	25	229	70	164	239	M16×30	20	63	48	18	26	22	–	–	–	75	150	M16×50	176 000	184 000	5 180	4 130 22 000	3 790 20 200
–	LWHDG65	○	14.3								303	120	238.8	313														229 000	269 000	7 560	8 530 41 500	7 810 38 100

Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ－93 and Tables 2.3 and 2.4 on page Ⅱ－95.
(2) Choose bolts whose dimension allow fixing thread depth into track rail to be less than h_1.
(3) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176.
In an assembled set of MH series and LWHD…MU model, track rail mounting bolts are not appended.
(4) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

Remarks 1. The specifications of grease nipple are shown in Table 16 on page Ⅱ－104.
2. The identification numbers with * are our semi-standard items.



Example of identification number of assembled set

Model code	Dimensions	Dimensions	Part code	Part code	Model code	Dust protection code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MHD	G	45	C2	R1260			T1	P		/N
①	②	③	④	⑤	①	⑥	⑦	⑧	⑨	⑩

① Model	
MHD LWHD(…B)	Block type mounting from top

② Length of slide unit	
No symbol	Standard
G	Long

③ Size
35, 45, 55, 65

④ Number of slide unit (2)

⑤ Length of track rail (1,260 mm)

⑥ Dust protection code	
No symbol	Standard specification
M	Ultra seal specification
MU	Ultra seal specification with track rail mounting from bottom

⑦ Preload amount	
No symbol	Standard
T1	Light preload
T2	Medium preload
T3	Heavy preload

⑧ Accuracy class	
H	High
P	Precision
SP	Super precision

⑨ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

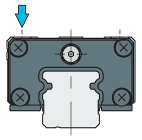
⑩ Special specification
A, D, E, F, Ⅰ, J, L, LF, MA MN, N, PS, Q, T, V, W, Y, Z

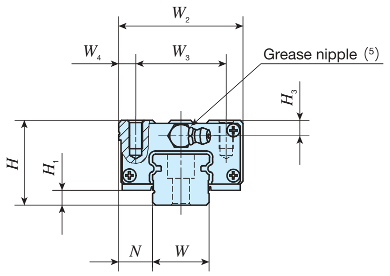
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

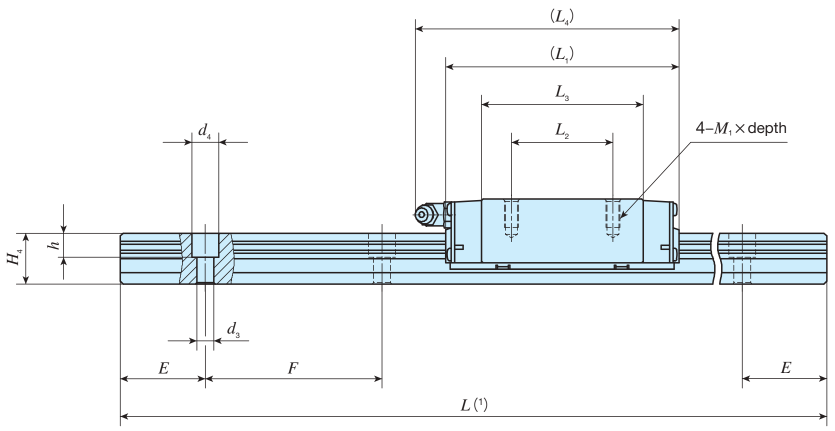
IKO C-Lube Linear Way MH

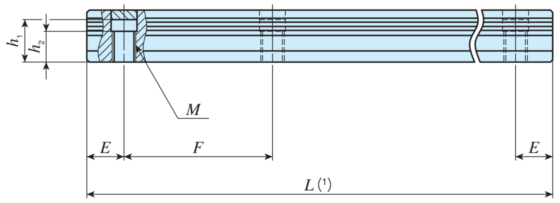
Compact block type mounting from top

Shape	**MHS** ・ **LWHS**			
Size	**15**	**20**	25	30









Ultra seal specification with track rail mounting from bottom

Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm									Dimensions of track rail mm											Appended mounting bolt for track rail (3) mm	Basic dynamic load rating (4)	Basic static load rating (4)	Static moment rating (4)		
MH series	LWH series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	M_1×depth	H_3	W	H_4	d_3	d_4	h	M	h_1 (2)	h_2	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MHS 15		○	0.18	1.47	24	4.5	9.5	34	26	4	66	26	44.2	69	M4× 8	4.5	15	15	4.5	8	6	–	–	–	30	60	M4×16	11 600	13 400	112	95.6 556	95.6 556
	LWHS 15···B	○											44.6																			
MHS 15···SL		○											44.2																			
	LWHS 15···SL	○											44.6																			
–	LWHS 15···M*	–																														
–	LWHS 15···MU*	–																	–	–	–	M6	12	9			–					
MHSG 15	–	○	0.25								82		60.1	85					4.5	8	6	–	–	–			M4×16	14 400	18 300	153	172 918	172 918
MHS 20		○	0.36	2.56	30	6	12	44	32	6	83	36	56	94	M5×10	5.5	20	18	6	9.5	8.5	–	–	–	30	60	M5×18	18 100	21 100	232	195 1 090	195 1 090
	LWHS 20···B	○											57.2																			
MHS 20···SL		○											56																			
	LWHS 20···SL	○											57.2																			
–	LWHS 20···M*	–				5																										
–	LWHS 20···MU*	–																	–	–	–	M8	13.5	9.5			–					
MHSG 20		○	0.53			6					112	50	84.8	122					6	9.5	8.5	–	–	–			M5×18	24 100	31 700	349	421 2 140	421 2 140
	LWHSG20	○											86																			

Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ−93, Table 2.2 on page Ⅱ−94, and Tables 2.3 and 2.4 on page Ⅱ−95.

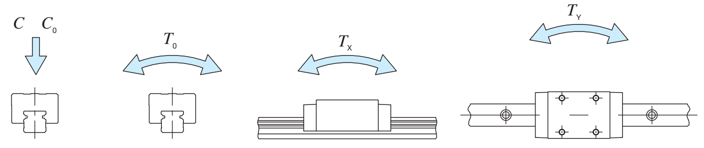
(2) Choose bolts whose dimension allow fixing thread depth into track rail to be less than h_1.

(3) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. For stainless steel model, stainless steel bolts are appended.
In an assembled set of MH series and LWHS···MU model, track rail mounting bolts are not appended.

(4) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

(5) The shapes of grease nipple vary by size. The specifications are shown in Table 16 on page Ⅱ−104.

Remark: The identification numbers with * are our semi-standard items.



Example of identification number of assembled set

Model code	Dimensions	Part code		Model code	Dust protection code	Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MHS	G	20	C2	R480			T1	P		/N
❶	❷	❸	❹	❺	❶	❻	❼	❽	❾	❿	⓫

① Model	
MHS LWHS(···B)	Compact block type mounting from top

② Length of slide unit	
No symbol	Standard
G	Long

③ Size
15, 20

④ Number of slide unit (2)

⑤ Length of track rail (480 mm)

⑥ Dust protection code	
No symbol	Standard specification
M	Ultra seal specification
MU	Ultra seal specification with track rail mounting from bottom

⑦ Material type	
No symbol	High carbon steel made
SL	Stainless steel made

⑧ Preload amount	
No symbol	Standard
T1	Light preload
T2	Medium preload
T3	Heavy preload

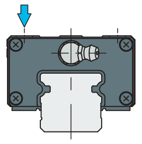
⑨ Accuracy class	
H	High
P	Precision
SP	Super precision

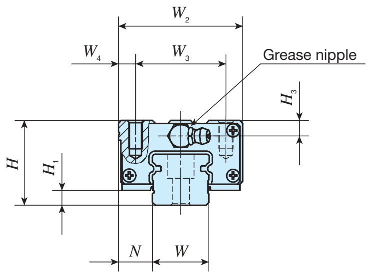
⑩ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

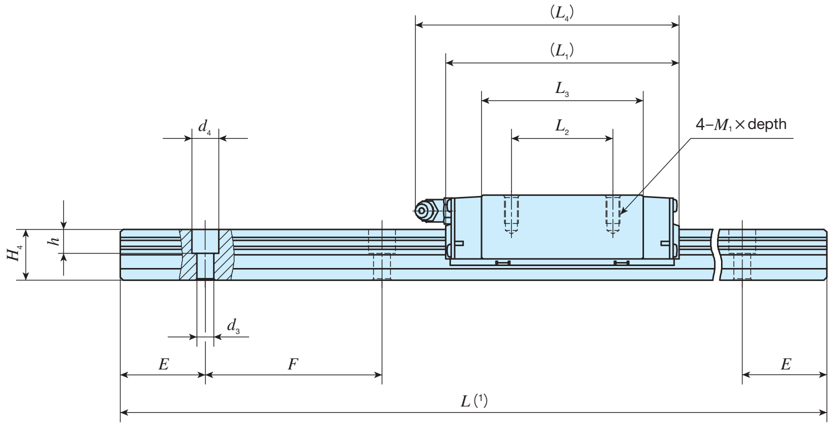
⑪ Special specification
A, BS, D, E, F, Ⅰ, J, L, LF, MA MN, N, Q, RE, T, V, W, Y, Z

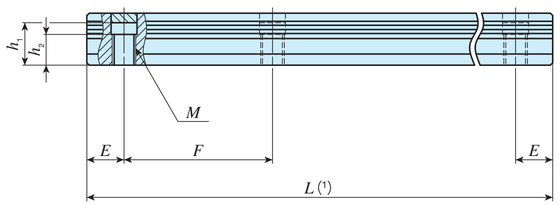
IKO C-Lube Linear Way MH

Compact block type mounting from top

Shape	MHS ・ LWHS			
				
Size	15	20	25	30







Ultra seal specification with track rail mounting from bottom

Identification number MH series	Identification number LWH series (No C-Lube)	Interchangeable	Mass (Ref.) Slide unit kg	Mass (Ref.) Track rail kg/m	Dimensions of assembly mm H	H_1	N	Dimensions of slide unit mm W_2	W_3	W_4	L_1	L_2	L_3	L_4	M_1×depth	H_3	Dimensions of track rail mm W	H_4	d_3	d_4	h	M	h_1(2)	h_2	E	F	Appended mounting bolt for track rail (3) mm Bolt size× ℓ	Basic dynamic load rating (4) C N	Basic static load rating (4) C_0 N	Static moment rating (4) T_0 N・m	T_X N・m	T_Y N・m
MHS 25		○	0.55	3.50	36	8	12.5	48	35	6.5	95	35	63.9	105	M6×12	6.5	23	22	7	11	9	–	–	–	30	60	M6×22	25 200	28 800	362	309 1 690	309 1 690
	LWHS 25…B	○				6.5							64.7																			
MHS 25…SL		○				8							63.9																			
	LWHS 25…SL	○				6.5							64.7																			
MHS 25…M*		–											63.9																			
	LWHS 25…M*	–											64.7																			
MHS 25…MU*		–											63.9						–	–	–	M10	18	13			–					
	LWHS 25…MU*	–											64.7																			
MHSG 25		○	0.67			8					118	50	86.6	128					7	11	9	–	–	–			M6×22	30 800	38 300	483	533 2 740	533 2 740
	LWHSG25	○				6.5							87.4																			
MHS 30		○	1.00	4.82	42	9	16	60	40	10	113	40	80.6	123	M8×16	8	28	25	9	14	12	–	–	–	40	80	M8×28	35 400	40 700	623	536 2 820	536 2 820
	LWHS 30…B	○				7																										
MHS 30…SL		○				9																										
	LWHS 30…SL	○				7																										
MHS 30…M*		–																														
	LWHS 30…M*	–																														
MHS 30…MU*		–																	–	–	–	M12	20	13			–					
	LWHS 30…MU*	–																														
MHSG 30		○	1.29			9					139	60	106.6	149					9	14	12	–	–	–			M8×28	42 700	53 200	814	894 4 460	894 4 460
	LWHSG30	○				7																										

Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ－93, Table 2.2 on page Ⅱ－94, and Tables 2.3 and 2.4 on page Ⅱ－95.

(2) Choose bolts whose dimension allow fixing thread depth into track rail to be less than h_1.

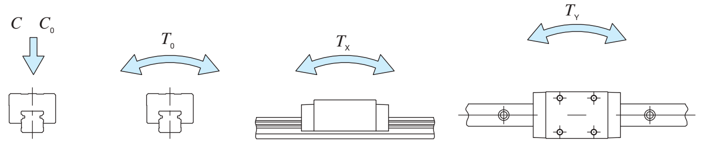
(3) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. For stainless steel model, stainless steel bolts are appended.

In an assembled set of MH series and LWHS…MU model, track rail mounting bolts are not appended.

(4) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

Remarks 1. The specifications of grease nipple are shown in Table 16 on page Ⅱ－104.

2. The identification numbers with * are our semi-standard items.



Example of identification number of assembled set

Model code	Dimensions	Part code			Model code	Dust protection code	Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MHS	G	30	C2	R480				T1	P		/N
1	2	3	4	5	1	6	7	8	9	10	11

① Model	
MHS LWHS(…B)	Compact block type mounting from top

② Length of slide unit	
No symbol	Standard
G	Long

③ Size
25, 30

④ Number of slide unit (2)

⑤ Length of track rail (480 mm)

⑥ Dust protection code	
No symbol	Standard specification
M	Ultra seal specification
MU	Ultra seal specification with track rail mounting from bottom

⑦ Material type	
No symbol	High carbon steel made
SL	Stainless steel made

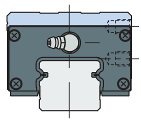
⑧ Preload amount	
No symbol	Standard
T1	Light preload
T2	Medium preload
T3	Heavy preload

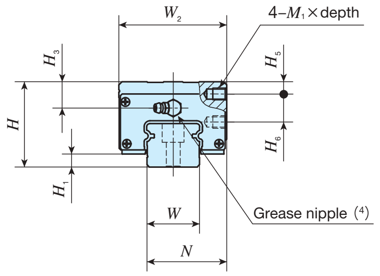
⑨ Accuracy class	
H	High
P	Precision
SP	Super precision

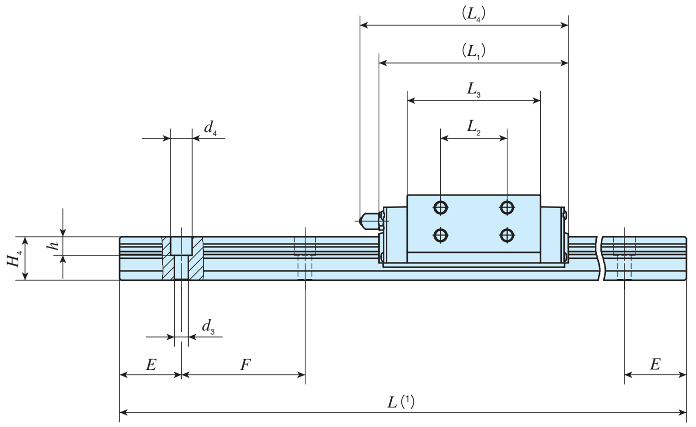
⑩ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

⑪ Special specification
A, BS, D, E, F, Ⅰ, J, L, LF, MA MN, N, PS, Q, RE, T, UR, V, W, Y, Z

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

	Side mounting type		
	LWHY		
Shape			
Size	15	20	25
	30	35	45





Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm									Dimensions of track rail mm							Appended mounting bolt for track rail (2) mm	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
MH series	LWH series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	L_1	L_2	L_3	L_4	M_1×depth	H_3	H_5	H_6	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
−	LWHY 15*	−	0.23	1.47	28	4.5	24.3	34	66	18	44.6	69	M 4× 4	8.5	4	9	15	15	4.5	8	6	30	60	M 4×16	11 600	13 400	112	95.6 556	95.6 556
−	LWHY 20*	−	0.36	2.56	30	6	31.5	43.7	83	25	57.2	94	M 5× 5	5.5	4	10	20	18	6	9.5	8.5	30	60	M 5×18	18 100	21 100	232	195 1 090	195 1 090
−	LWHY 25*	−	0.65	3.50	40	6.5	35	47.7	95	30	64.7	105	M 6× 6	10.5	6	12	23	22	7	11	9	30	60	M 6×22	25 200	28 800	362	309 1 690	309 1 690
−	LWHY 30*	−	1.12	4.82	45	7	43.5	59.7	113	40	80.6	123	M 6× 7	11	8	14	28	25	9	14	12	40	80	M 8×28	35 400	40 700	623	536 2 820	536 2 820
−	LWHY 35*	−	1.74	6.85	55	8	51.5	69.7	123	43	86.2	135	M 8× 9	17	8	18	34	28	9	14	12	40	80	M 8×28	38 000	41 900	823	631 3 480	579 3 190
−	LWHY 45*	−	3.30	10.7	70	14	65	85.7	147	55	103.4	158	M10×11	23	10	22	45	34	14	20	17	52.5	105	M12×35	58 300	62 600	1 610	1 150 6 190	1 060 5 690

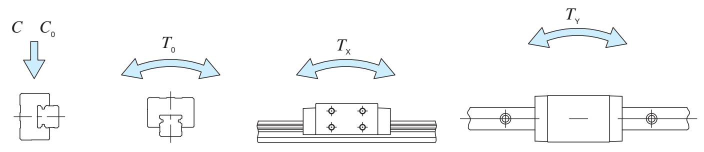
Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ−93.

(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176.

(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

(4) The shapes of grease nipple vary by size. The specifications are shown in Table 16 on page Ⅱ−104.

Remark: The identification numbers with * are our semi-standard items.



Example of identification number of assembled set

Model code	Dimensions	Part code		Preload symbol	Classification symbol	Supplemental code
LWHY	30	C2	R480	T1	P	/V
❶	❷	❸	❹	❺	❻	❼

① Model	
LWHY	Side mounting type

② Size
15, 20, 25, 30, 35, 45

③ Number of slide unit (2)

④ Length of track rail (480 mm)

⑤ Preload amount	
No symbol	Standard
T1	Light preload
T2	Medium preload
T3	Heavy preload

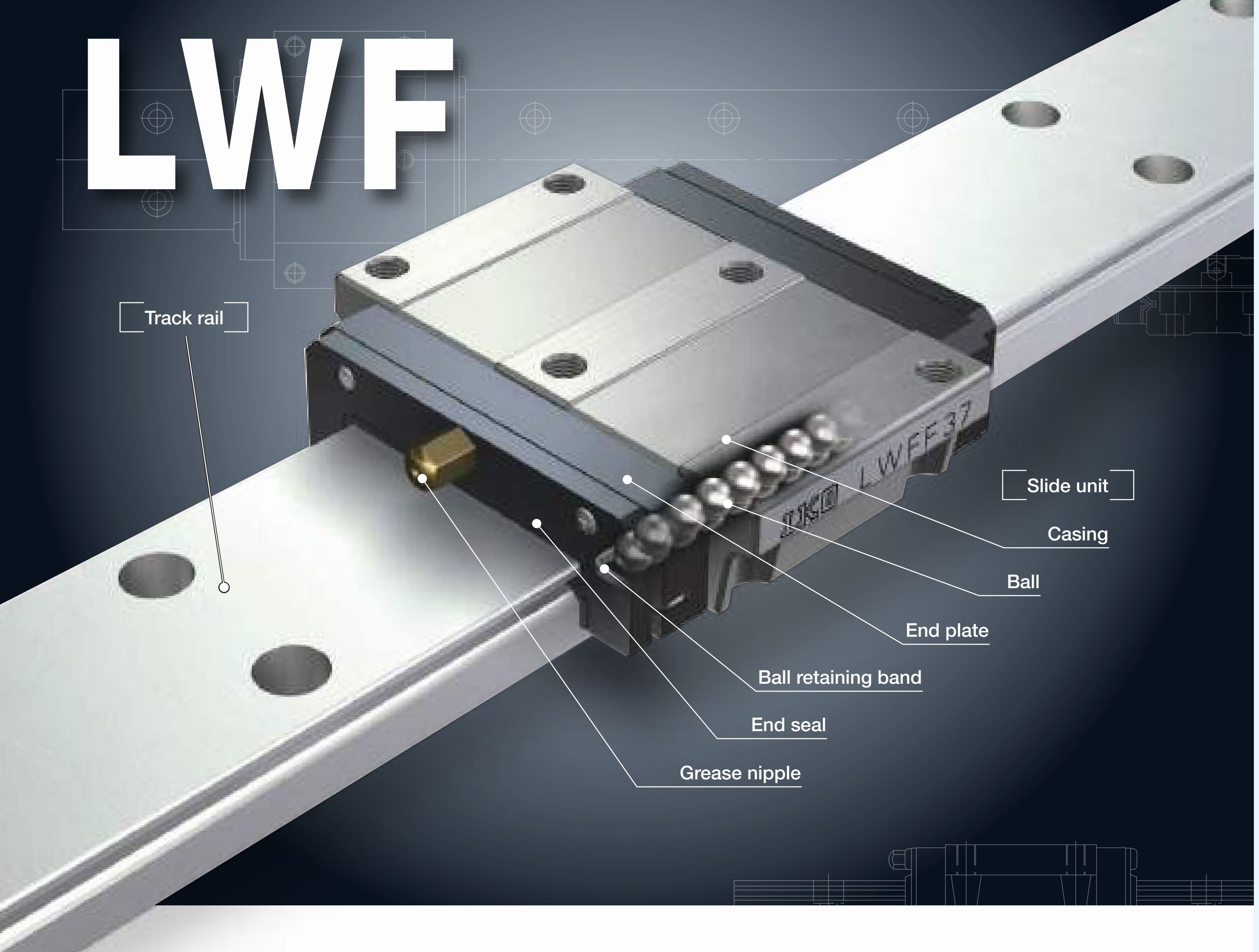
⑥ Accuracy class	
H	High
P	Precision
SP	Super precision

⑦ Special specification
A, E, F, Ⅰ, L, LF, MA, N, PS, RE, Y, Z

Linear Way F

Linear Way F

LWF



Points

● Wide rail type series resistant to moment load

1 As track rail width is wide and distance between moment load points is long, this is a linear motion rolling guide resistant to moment load and complex load and suitable for serial use.

● Slide unit shapes for various usage

2 As the lineup of three types of slide unit shape including two flange types with different dimensional series and block type with small width are available, you can select an optimal product for the specifications of your machine and device.

● Stainless steel selections superior in corrosion resistance are listed on lineup.

For details ➲ P.Ⅰ-41

3 Products made of stainless steel are highly resistant to corrosion, so that they are suitable for applications where rust prevention oil is not preferred, such as in a cleanroom environment.

Identification Number and Specification

Example of an identification number

The specification of LWF series is indicated by the identification number. Indicate the identification number, consisting of a model code, dimensions, a part code, a material code, a preload symbol, a classification symbol, an interchangeable code, and any supplemental codes for each specification to apply.

Non-interchangeable specification	1	2	3	4	5	6	7	8	9
Assembled set	LWFF	37	C1	R800		T_1	P		/FZ
Interchangeable specification									
Single slide unit	LWFS	37	C1		SL	T_1	P	S1	/Z
Single track rail(¹)	LWFF	37		R800	SL		P	S1	/F
Assembled set	LWFS	37	C1	R800	SL	T_1	P	S1	/FZ

1	**Model**	Model code	Page Ⅱ－137
2	**Size**	Dimensions	Page Ⅱ－137
3	**Number of slide units**	Part code	Page Ⅱ－137
4	**Length of track rail**		
5	**Material type**	Material code	Page Ⅱ－137
6	**Preload amount**	Preload symbol	Page Ⅱ－139
7	**Accuracy class**	Classification symbol	Page Ⅱ－140
8	**Interchangeable**	Interchangeable code	Page Ⅱ－141
9	**Special specification**	Supplemental code	Page Ⅱ－141

Note (¹) Indicate "LWFF" for the model code of the single track rail of block type LWFS mounting from top or stainless steel LWFS.

Identification Number and Specification —Model · Size · Number of Slide Unit ·

1 Model

Linear Way F (1)
(LWF series)

Flange type mounting from top / bottom : LWFH
: LWFF

Block type mounting from top : LWFS

For applicable models and sizes, see Table 1.
Indicate "LWFF" for the model code of the single track rail of block type LWFS mounting from top or stainless steel LWFS.

Note (1) This model has no built-in C-Lube.

2 Size

33,37,40,42,60,69,90 For applicable models and sizes, see Table 1.

3 Number of slide units

: C○ For an assembled set, indicates the number of slide units assembled on a track rail. For a single slide unit, only "C1" is specified.

4 Length of track rail

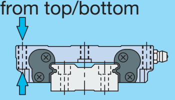
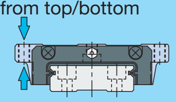
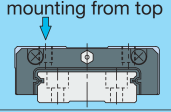
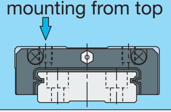
: R○ Indicate the length of track rail in mm. For standard and maximum length, see Table 2.1 and Table 2.2.

5 Material type

High carbon steel made : No symbol For applicable models and sizes, see Table 1.
Stainless steel made (2) : SL

Note (2) Mount a standard grease nipple (brass) on the stainless steel type, too. Stainless steel grease nipple is also available. If needed, please contact IKO.

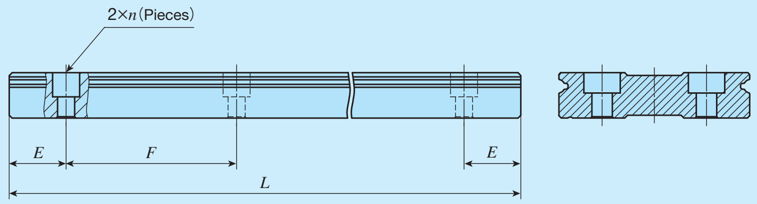
Table 1 Models and sizes of LWF series

Material	Shape	Model	Size						
			33	37	40	42	60	69	90
High carbon steel made	Flange type mounting from top/bottom 	LWFH	–	–	○	–	○	–	○
	Flange type mounting from top/bottom 	LWFF	○	○	–	○	–	○	–
	Block type mounting from top 	LWFS	○	○	–	–	–	–	–
Stainless steel made	Block type mounting from top 	LWFS···SL	○	○	–	○	–	–	–

Remark: For the models indicated in ▭, the interchangeable specification is available.

Length of Track Rail · Material Type—

Table 2.1 Standard and maximum length of high carbon steel track rail



unit: mm

Item \ Identification number		LWFH40	LWFH60	LWFH90	
Standard length L (n)		180 (3) 240 (4) 360 (6) 480 (8) 660 (11) 840 (14)	240 (3) 480 (5) 640 (8) 800 (10) 1 040 (13)	480 (6) 640 (8) 800 (10) 1 040 (13) 1 200 (15) 1 520 (19)	
Pitch of mounting holes F		60	80	80	
E		30	40	40	
Standard E dimensions (1)	or higher	8	10	10	
	below	38	50	50	
Maximum length (2)		1 500	1 520	1 520	
Item \ Identification number		LWFF33 LWFS33	LWFF37 LWFS37	LWFF42	LWFF69
Standard length L (n)		120 (3) 200 (5) 320 (8) 480 (12) 560 (14)	150 (3) 250 (5) 400 (8) 500 (10) 600 (12) 800 (16)	180 (3) 240 (4) 360 (6) 480 (8) 660 (11) 840 (14)	320 (4) 480 (6) 800 (10) 1 040 (13) 1 280 (16) 1 600 (20)
Pitch of mounting holes F		40	50	60	80
E		20	25	30	40
Standard E dimensions (1)	or higher	7	7	7	9
	below	27	32	37	49
Maximum length (2)		1 600	2 000	1 980	2 000

Notes (1) This does not apply to female threads for bellows (supplemental code "/J").
(2) We can produce products longer than the maximum length. If needed, please contact IKO.

Remarks 1. Indicate "LWFF" for the model code of the single track rail of block type LWFS mounting from top.
2. If not directed, E dimensions for both ends will be the same within the range of standard E dimensions. To change the dimensions, indicate the specified rail mounting hole positions "/E" of special specification. For more information, see page Ⅲ－30.

Table 2.2 Standard and maximum length of stainless steel track rail unit: mm

Item \ Identification number		LWFS33···SL	LWFS37···SL	LWFS42···SL
Standard length L (n)		120 (3) 200 (5) 320 (8) 480 (12) 560 (14)	150 (3) 250 (5) 400 (8) 500 (10) 600 (12) 800 (16)	180 (3) 240 (4) 360 (6) 480 (8) 660 (11) 840 (14)
Pitch of mounting holes F		40	50	60
E		20	25	30
Standard E dimensions (1)	or higher	7	7	7
	below	27	32	37
Maximum length (2)		1 200	1 200	1 200

Notes (1) This does not apply to female threads for bellows (supplemental code "/J").
(2) We can produce products longer than the maximum length. If needed, please contact IKO.

Remarks 1. Indicate "LWFF" for the model code of the single track rail.
2. If not directed, E dimensions for both ends will be the same within the range of standard E dimensions. To change the dimensions, indicate the specified rail mounting hole positions "/E" of special specification. For more information, see page Ⅲ－30.

6 Preload amount

Standard	: No symbol	Specify this item for an assembled set or a single slide unit.
Light preload	: T₁	For details of the preload amount, see Table 3.
Medium preload	: T₂	For applicable preload types, see Table 4.

Table 3 Preload amount

Preload type \ Item	Preload symbol	Preload amount N	Operational conditions
Standard	(No symbol)	0(1)	· Light and precise motion
Light preload	T₁	$0.02C_0$	· Almost no vibrations · Load is evenly balanced · Light and precise motion
Medium preload	T₂	$0.05C_0$	· Medium vibration · Medium overhung load

Note (1) Indicates zero or minimal amount of preload.
Remark: C_0 indicates the basic static load rating.

Table 4 Application of preload

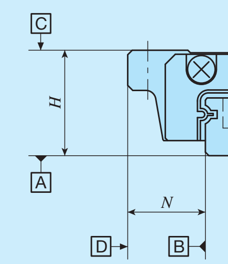
Size	Preload type (preload symbol)		
	Standard (No symbol)	Light preload (T₁)	Medium preload (T₂)
33	○	○	○
37	○	○	○
40	○	○	○
42	○	○	○
60	○	○	○
69	○	○	○
90	○	○	○

Remark: The mark 🟦 indicates that interchangeable specification products are available.

7 Accuracy class

High	: H	For interchangeable specification products, assemble a slide unit and a track rail of the same accuracy class.
Precision	: P	For details of accuracy class, see Table 5.
Super precision	: SP	For applicable accuracy class, see Table 6.

Table 5 Tolerance and allowance



unit: mm

Item \ Class (classification symbol)	High (H)	Precision (P)	Super precision (SP)
Dim. H tolerance	±0.040	±0.020	±0.010
Dim. N tolerance	±0.050	±0.025	±0.015
Dim. variation of H (1)	0.015	0.007	0.005
Dim. variation of N (1)	0.020	0.010	0.007
Dim. variation of H for multiple assembled sets (2)	0.035	0.025	–
Parallelism in operation of the slide unit C surface to A surface	See Fig. 1		
Parallelism in operation of the slide unit D surface to B surface	See Fig. 1		

Notes (1) It means the size variation between slide units mounted on the same track rail.
(2) Applicable to the interchangeable specifications.

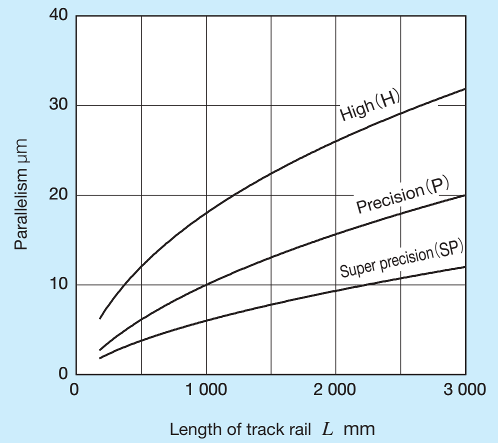


Fig. 1 Parallelism in operation

Table 6 Application of accuracy class

Size	Class (classification symbol)		
	High (H)	Precision (P)	Super precision (SP)
33	○	○	○
37	○	○	○
40	○	○	○
42	○	○	○
60	○	○	○
69	○	○	○
90	○	○	○

Remark: The mark 🟦 indicates that interchangeable specification products are available.

8 Interchangeable

S1 specification : S1
S2 specification : S2
Non-interchangeable specification : No symbol

This is specified for the interchangeable specifications. Assemble a track rail and a slide unit with the same interchangeable code. When using in combination with different interchangeable codes, please contact IKO. Note that the combination of interchangeable codes will not have any effect on accuracy.
For applicable models and sizes, see Table 1.
No symbol is indicated for non-interchangeable specification.

9 Special specification

/A, /C, /D, /E, /F, / I , /J○, /L○, /LF○, /MN, /N, /Q, /U, /V○, /W○, /Y○, /Z○

For applicable special specifications, see Tables 7.1, 7.2, 7.3, and 7.4.
For combination of multiple special specifications, see Table 8.
For details of special specifications, see page Ⅲ−29.

Table 7.1 Application of special specifications (Interchangeable specification, single slide unit)

Special specification	Supplemental code	Size						
		33	37	40	42	60	69	90
Female threads for bellows (1)	/J○	○	○	○	○	○	○	○
No end seal	/N	○	○	○	○	○	○	○
With C-Lube plate	/Q	○	○	○	○	○	○	○
Under seal	/U	○	○	○	○	○	○	○
Double end seals	/V○	○	○	×	○	×	○	×
Scrapers	/Z○	○	○	○	○	○	○	○

Note (1) Not applicable to stainless steel made products.

Table 7.2 Application of special specifications (Interchangeable specification, single track rail)

Special specification	Supplemental code	Size						
		33	37	40	42	60	69	90
Specified rail mounting hole positions	/E	○	○	○	○	○	○	○
Caps for rail mounting holes	/F	○	○	○	○	○	○	○
Female threads for bellows (1)	/J	○	○	○	○	○	○	○
Without track rail mounting bolt	/MN	○	○	○	○	○	○	○

Note (1) Not applicable to stainless steel made products.

Table 7.3 Application of special specifications (Interchangeable specification and assembled set)

Special specification	Supplemental code	Size						
		33	37	40	42	60	69	90
Opposite reference surfaces arrangement	/D	○	○	○	○	○	○	○
Specified rail mounting hole positions	/E	○	○	○	○	○	○	○
Caps for rail mounting holes	/F	○	○	○	○	○	○	○
Female threads for bellows (1)	/J○	○	○	○	○	○	○	○
Black chrome surface treatment	/L○	○	○	○	○	○	○	○
Fluorine black chrome surface treatment	/LF○	○	○	○	○	○	○	○
Without track rail mounting bolt	/MN	○	○	○	○	○	○	○
No end seal	/N	○	○	○	○	○	○	○
With C-Lube plate	/Q	○	○	○	○	○	○	○
Under seal	/U	○	○	○	○	○	○	○
Double end seals	/V○	○	○	×	○	×	○	×
Specified grease	/Y○	○	○	○	○	○	○	○
Scrapers	/Z○	○	○	○	○	○	○	○

Note (1) Not applicable to stainless steel made products.

Table 7.4 Application of special specifications (Non-interchangeable specification)

Special specification	Supplemental code	Size						
		33	37	40	42	60	69	90
Butt-jointing track rails	/A	○	○	○	○	○	○	○
Chamfered reference surface	/C○	×	×	○	×	○	×	○
Opposite reference surfaces arrangement	/D	○	○	○	○	○	○	○
Specified rail mounting hole positions	/E	○	○	○	○	○	○	○
Caps for rail mounting holes	/F	○	○	○	○	○	○	○
Inspection sheet	/I	○	○	○	○	○	○	○
Female threads for bellows	/J○	○	○	○	○	○	○	○
Black chrome surface treatment	/L○	○	○	○	○	○	○	○
Fluorine black chrome surface treatment	/LF○	○	○	○	○	○	○	○
Without track rail mounting bolt	/MN	○	○	○ (1)	○	○	○	○
No end seal	/N	○	○	○	○	○	○	○
With C-Lube plate	/Q	○	○	○	○	○	○	○
Under seal	/U	○	○	○	○	○	○	○
Double end seals	/V○	○	○	×	○	×	○	×
A group of multiple assembled sets	/W○	○	○	○	○	○	○	○
Specified grease	/Y○	○	○	○	○	○	○	○
Scrapers	/Z○	○	○	○	○	○	○	○

Note (1) Not applicable to LWFH size 40.

Table 8 Combination of supplemental codes

C	○															
D	○	○														
E	−	○	−													
F	○	○	○	○												
I	○	○	○	○	○											
J	○	○	○	○	○	○										
L	○	○	○	○	○	○	○									
LF	○	○	○	○	○	○	○	−								
MN	○	○	○	○	○	○	○	○	○							
N	○	○	○	○	−	○	−	○	○	○						
Q	○	○	○	○	○	○	−	○	○	○	○					
U	○	○	○	○	○	○	○	○	○	○	−	○				
V	○	−	○	○	○	○	●	○	○	○	−	−	○			
W	○	○	○	−	○	○	○	○	○	○	○	○	○	○		
Y	○	○	○	○	○	○	○	○	○	○	○	−	○	○	○	
Z	○	○	○	○	○	○	●(1)	○	○	○	−	−	○	●	○	○
	A	C	D	E	F	I	J	L	LF	MN	N	Q	U	V	W	Y

Note (1) Contact IKO for the case of LWFH.

Remarks 1. The combination of "−" shown in the table is not available.
2. Contact IKO for the combination of the interchangeable specification marked with ●.
3. When using multiple types for combination, please indicate by arranging the symbols in alphabetical order.

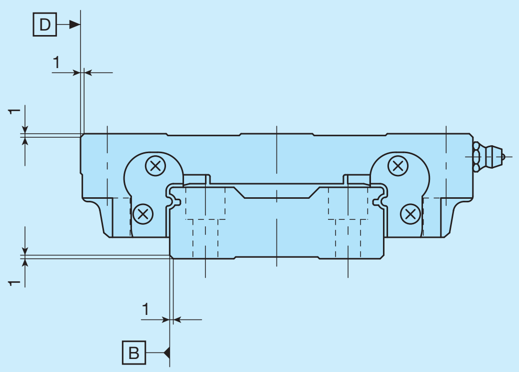
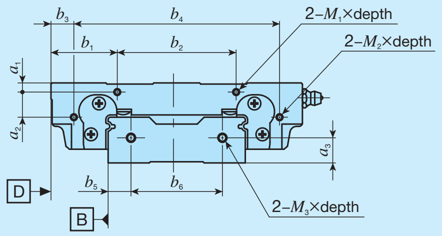


Fig. 2 Dimension of chamfered reference surface (Supplemental code /C /CC)

Remark: Add chamfer to the reference mounting surface of the slide unit and track rail.
For corner R of the mounting section, see Table 17.2 on page Ⅱ－148.

Table 9 Dimension of female threads for bellows (Supplemental code Single unit: /J Assembled set: /J /JJ)

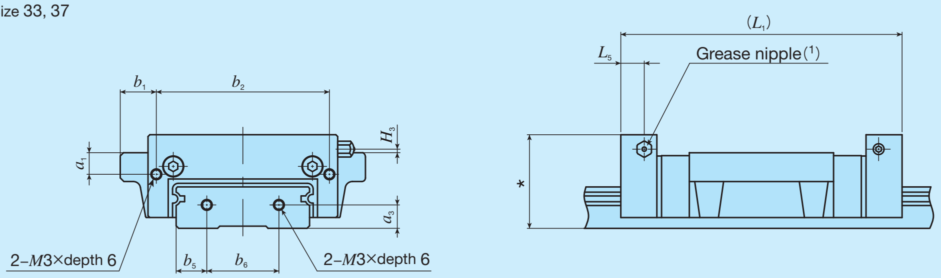


unit: mm

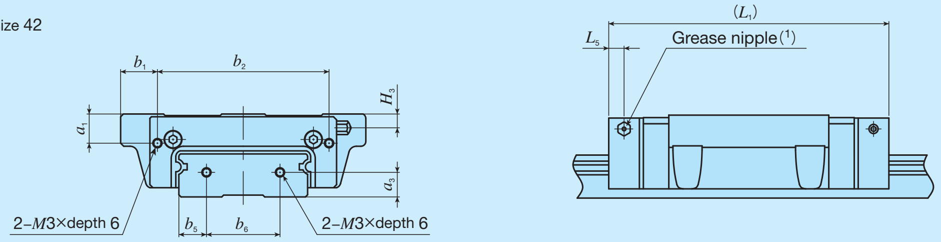
Identification number	Slide unit								Track rail			
	a_1	a_2	b_1	b_2	b_3	b_4	M_1×depth	M_2×depth	a_3	b_5	b_6	M_3×depth
LWFH 40	3	－	23.5	35	－	－	M3×6	－	9	8	24	M3×6
LWFH 60	4	11	29	52	10	90	M3×6	M3×3	11	10	40	M4×8
LWFH 90	6	17	41	80	13	136	M3×5	M3×5	13	15	60	M4×8

Table 10 Dimension of female threads for bellows (Supplemental code Single unit: /J Assembled set: /J /JJ)

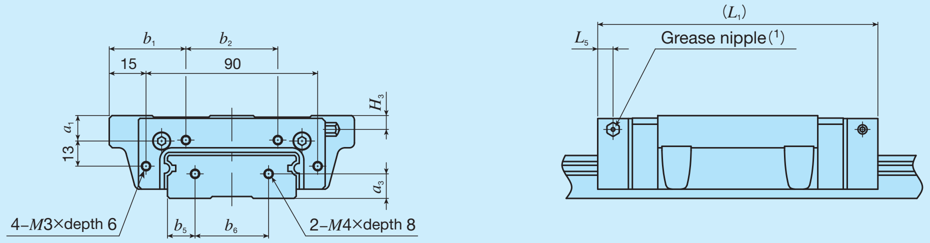
Size 33, 37



Size 42



Size 69



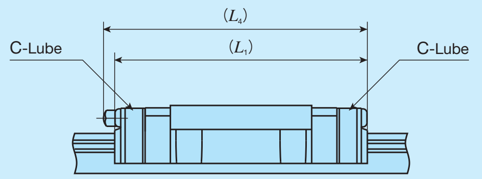
unit: mm

Identification number	Slide unit						Track rail		
	a_1	b_1	b_2	L_1(2)	L_5	H_3	a_3	b_5	b_6
LWFF 33	4	8.25	43.5	71	5	1	6	7.5	18
LWFS 33(…SL)		3.25							
LWFF 37	6	10	48	78	5	1	6.5	8.5	20
LWFS 37(…SL)		3							
LWFF 42	9.5	12	56	92	7	4.5	8	9	24
LWFS 42…SL		3							
LWFF 69	9	35	50	125	7	5	11	14.5	40

Notes (1) Grease nipple specifications and mounting position are different from standard specifications. Provided grease nipple is A-M3 for size 37 and 42 models, and A-M4 for size 69 model. For grease nipple specification, see Table 15 on page Ⅱ－146.
(2) Dimensions of the specification that female threads for bellows are fitted to both ends of the slide unit are indicated.

Remark: Dimensions indicated by * mark for series of size 33 and Size 37 is higher than the H dimension of Linear Way F. For details, contact IKO.

Table 11 Dimension of slide unit with C-Lube plate (Supplemental code /Q)

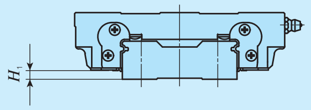


unit: mm

Size	L_1	L_4
33	64	66
37	73	75
40	78	–
42	86	98
60	98	–
69	121	132
90	131	–

Remark: The dimensions of the slide unit with C-Lube at both ends are indicated.

Table 12 H_1 dimension with under seal (Supplemental code /U)

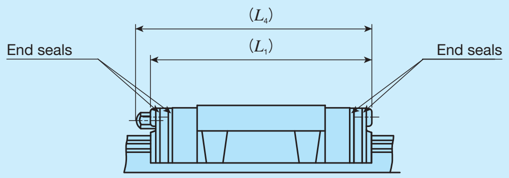


unit: mm

Size	H_1
40	3
60	4
90	5

Remark: H_1 dimensions of series of the Size 33, 37, 42, and 69 are the same as dimensions before mounting of under seal.

Table 13 Dimension of slide unit with double end seals (Supplemental code Single unit: /V Assembled set: /V /VV)

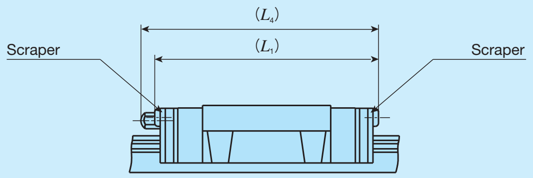


unit: mm

Size	L_1	L_4
33	61	64
37	70	74
42	82	96
69	117	130

Remark: The dimensions of the slide unit with double end seals at both ends are indicated.

Table 14 Dimension of slide unit with scrapers (Supplemental code Single unit: /Z Assembled set: /Z /ZZ)



unit: mm

Size	L_1	L_4
33	62	64
37	71	75
40	80	–
42	84	97
60	100	–
69	119	131
90	130	–

Remark: The dimensions of the slide unit with scraper at both ends are indicated.

Lubrication

Lithium-soap base grease with extreme-pressure additive (Alvania EP grease 2 [Shell Lubricants Japan K.K.]) is pre-packed in LWF series.
LWF series has grease nipple as indicated in Table 15. Supply nozzles fit to each shapes of grease nipple are also available. For order of these parts for lubrication, see Table 14.1 on page Ⅲ－23 and Table 15 on page Ⅲ－24.

Table 15 Parts for lubrication

Size	Grease nipple type (1)	Applicable supply nozzle type	Bolt size of female threads for piping
33	A-M3	A-5120V A-5240V B-5120V B-5240V	–
37	A-M4		M4
40	JIS type 1	Grease gun available on the market	M6
42	B-M6		
60	JIS type 1		
69	B-M6		
90	JIS type 1		

Note (1) For grease nipple specification, see Table 14.1 and Table 14.2 on page Ⅲ－23.
Remark: Stainless steel grease nipple is also available. If needed, please contact IKO.

Dust Protection

The slide units of LWF series are equipped with end seals as standard for dust protection. However, if large amount of contaminant or dust are floating, or if large particles of foreign substances such as chips or sand may adhere to the track rail, it is recommended to cover the whole unit with bellows or telescope type shield, etc.
LWF series is provided with specific bellows. The bellows are easy to mount and provide excellent dust protection. If needed, please refer to Ⅲ－26 for ordering.

Precaution for Use

❶ Mounting surface, reference mounting surface and typical mounting structure

When mounting the LWF series, properly align the reference mounting surface B and D of the track rail and slide unit with the reference mounting surface of the table and bed and fix them. (See Fig. 3.)

The reference mounting surfaces B and D and mounting surfaces A and C are precisely ground. Machining the mounting surface of the table and bed, such as machine or device, to high accuracy and mounting them properly will ensure stable linear motion with high accuracy.

Reference mounting surface of the slide unit is the opposite side of the IKO mark. The track rail reference mounting surface is identified by locating the IKO mark on the top surface of the track rail. It is the side surface above the mark (in the direction of the arrow). (See Fig. 4)

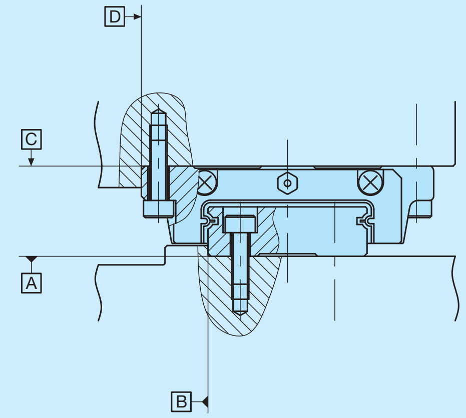


Fig. 3 Reference mounting surface and typical mounting structure

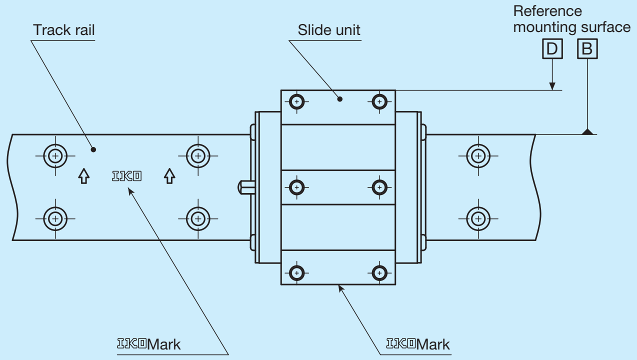


Fig. 4 Reference mounting surface

❷ Shoulder height and corner radius of the reference mounting surface

For the opposite corner of the mating reference mounting, it is recommended to have relieved fillet as indicated in Fig. 5. Recommended value for the shoulder height and corner radius on the mating side is indicated in Table 17.1 and Table 17.2.

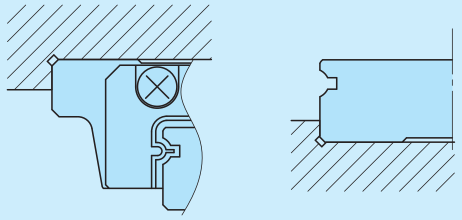


Fig. 5 Corner of the mating reference mounting

❸ Tightening torque for fixing screw

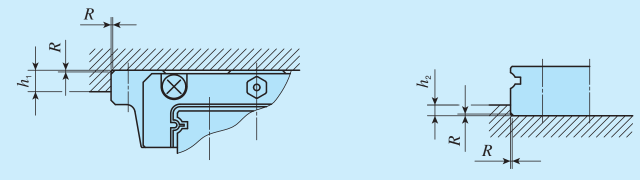
Typical tightening torque for mounting of the LWF series to the steel mating member material is indicated in Table 16. When vibration and shock of the machine or device are large, fluctuating load is large, or moment load is applied, fix it by using the torque 1.2 to 1.5 times larger than the value indicated in the table as necessary. If the mating member material is cast iron or aluminum alloy, reduce the tightening torque depending on the strength characteristics of the mating member material.

Table 16 Tightening torque for fixing screw

Bolt size	Tightening torque N・m	
	High carbon steel-made screw	Stainless steel-made screw
M 4×0.7	4.1	2.5
M 5×0.8	8.0	5.0
M 6×1	13.6	8.5
M 8×1.25	32.7	–
M10×1.5	63.9	–

Remark: The tightening torque is calculated based on strength division 12.9 and property division A2-70.

Table 17.1 Shoulder height and corner radius of the reference mounting surface

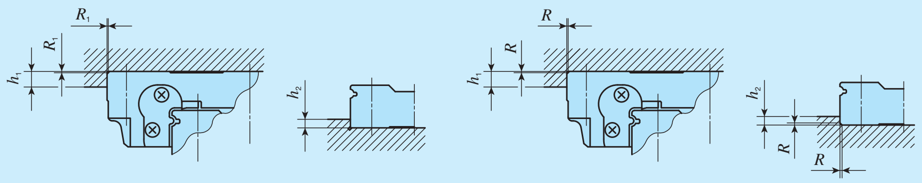


Mounting part of slide unit Mounting part of track rail

unit: mm

Size	Mounting part of slide unit		Mounting part of track rail	
	Shoulder height h_1	Corner radius R (Maximum)	Shoulder height h_2	Corner radius R (Maximum)
33	4	0.4	2	0.4
37	5	0.4	2.5	0.4
42	5	0.4	2.5	0.4
69	5	0.8	3.5	0.8

Table 17.2 Shoulder height and corner radius of the reference mounting surface



Mounting part of slide unit Mounting part of track rail

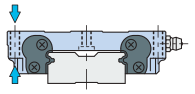
Mounting part of slide unit Mounting part of track rail
When supplemental code "/CC" is specified

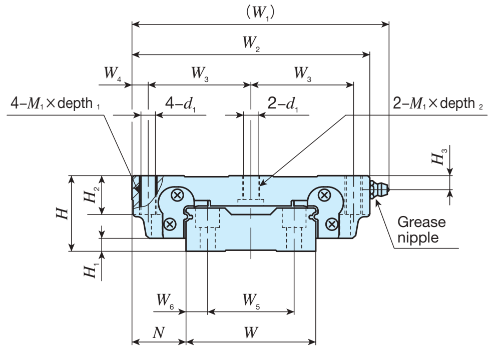
unit: mm

Size	Mounting part of slide unit		Mounting part of track rail Shoulder height h_2	Corner radius when supplemental code "/CC" is specified R (Maximum)
	Shoulder height h_1	Corner radius R (Maximum)		
40	4	0.3	3	1
60	6	0.5	4	1
90	8	0.5	6	1

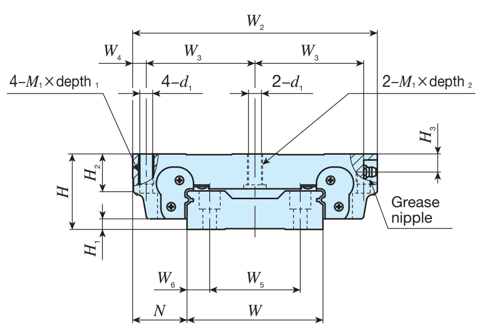
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Flange type mounting from top / bottom			
Shape	LWFH		
Size	40	60	90

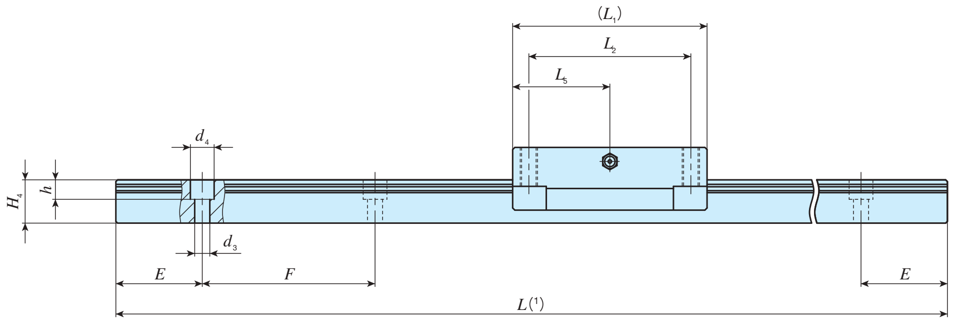




LWFH40, LWFH60



LWFH90



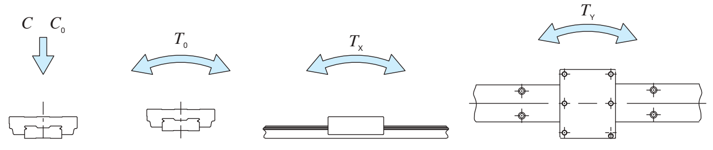
Identification number	Interchangeable	Mass(Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm												Dimensions of track rail mm										Appended mounting bolt for track rail (2) mm	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
LWF series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_1	W_2	W_3	W_4	L_1	L_2	L_5	d_1	M_1×depth 1	depth 2	H_2	H_3	W	H_4	W_5	W_6	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
LWFH 40	○	0.58	4.60	27	5	21	91	82	37	4	70	60	27.5	4.3	M 5×14	8	14	6.5	40	16	24	8	4.5	7.2	6	30	60	M4×16	12 600	16 600	280	108 612	99.3 563
LWFH 60	○	1.29	8.60	35	6	25	119	110	47.5	7.5	90	75	45	6.7	M 8×18	11	18	6.5	60	20	40	10	7	11	9	40	80	M6×22	16 100	23 500	600	210 1 090	193 998
LWFH 90	○	4.06	16.5	50	7	36	–	162	72	9	120	100	60	8.6	M10×20	20.5	26	12	90	25.5	60	15	9	14	12	40	80	M8×28	31 600	43 300	1 650	513 2 680	470 2 460

Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ－138.

(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. For size 40, small-head bolts are appended.

(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

Remark: The specifications of grease nipple are shown in Table 15 on page Ⅱ－146.



Example of identification number of assembled set

Model code	Dimensions	Part code		Preload symbol	Classification symbol	Interchangeable code	Supplemental code
LWFH	60	C2	R800	T1	P		/U
1	2	3	4	5	6	7	8

① Model	
LWFH	Flange type mounting from top / bottom

② Size
40, 60, 90

③ Number of slide unit (2)

④ Length of track rail (800 mm)

⑤ Preload amount	
No symbol	Standard
T1	Light preload
T2	Medium preload

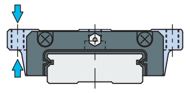
⑥ Accuracy class	
H	High
P	Precision
SP	Super precision

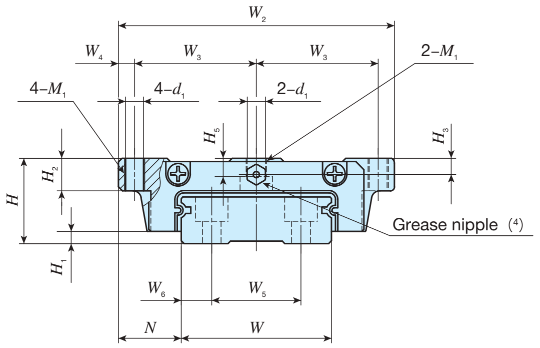
⑦ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

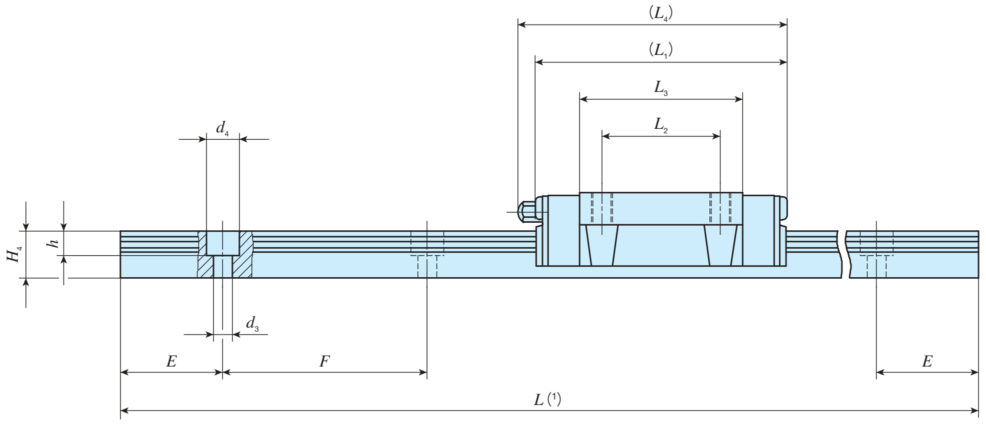
⑧ Special specification
A, C, D, E, F, Ⅰ, J, L, LF MN, N, Q, U, W, Y, Z

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Flange type mounting from top / bottom

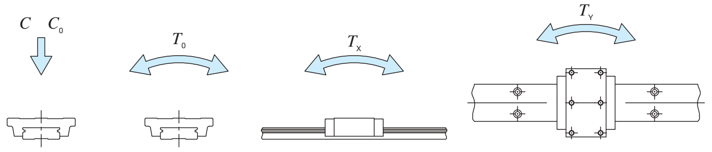
Shape	LWFF
	
Size	33 37 42 69





Identification number	Interchangeable	Mass(Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm													Dimensions of track rail mm									Appended mounting bolt for track rail (2) mm	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
LWF series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	d_1	M_1	H_2	H_3	H_5		W	H_4	W_5	W_6	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
LWFF 33	○	0.14	2.41	17	2.5	13.5	60	26.5	3.5	54	26	35.3	56	3.3	M4	6	3.2	3.7		33	10	18	7.5	4.6	8	6	20	40	M4×10	6 530	8 610	146	49.0 292	49.0 292
LWFF 37	○	0.23	3.05	21	3	15.5	68	30	4	62	29	40	66	4.4	M5	8	4	4.5		37	11.5	22	7.5	4.6	8	6	25	50	M4×12	9 840	12 200	235	80.0 480	80.0 480
LWFF 42	○	0.49	4.30	27	3	19	80	35	5	75	40	52.2	86	5.3	M6	10	6	7		42	14	24	9	4.6	8	6	30	60	M4×16	15 500	19 400	424	165 904	165 904
LWFF 69	○	1.40	9.51	35	4	25.5	120	53.5	6.5	109	60	79.5	120	7	M8	14	8	8		69	19.5	40	14.5	7	11	9	40	80	M6×22	34 900	44 100	1 560	581 2 940	488 2 460

Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ−138.
(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176.
(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.
(4) The shapes of grease nipple vary by size. The specifications are shown in Table 15 on page Ⅱ−146.



Example of identification number of assembled set

Model code	Dimensions	Part code		Preload symbol	Classification symbol	Interchangeable code	Supplemental code
LWFF	37	C2	R800	T1	P		/U
❶	❷	❸	❹	❺	❻	❼	❽

① Model

LWFF	Flange type mounting from top / bottom

② Size

33, 37, 42, 69

③ Number of slide unit (2)

④ Length of track rail (800 mm)

⑤ Preload amount

No symbol	Standard
T1	Light preload
T2	Medium preload

⑥ Accuracy class

H	High
P	Precision
SP	Super precision

⑦ Interchangeable

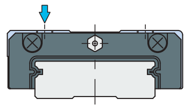
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

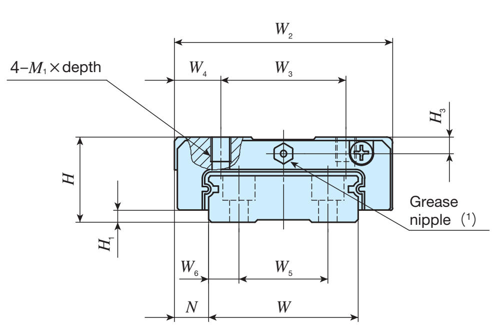
⑧ Special specification

A, D, E, F, Ⅰ, J, L, LF
MN, N, Q, U, V, W, Y, Z

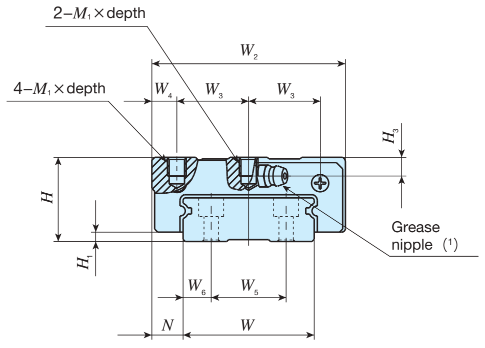
Block type mounting from top

Shape	LWFS
Size	33 / 37 / 42

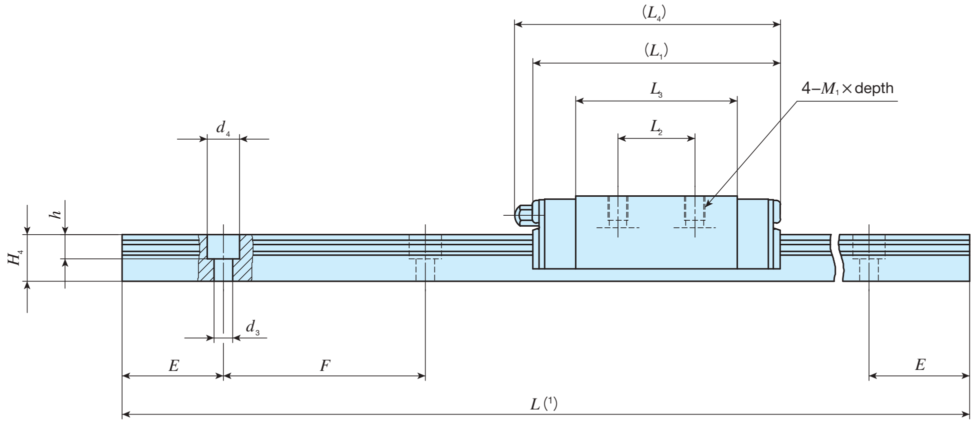




LWFS 33 (···SL)
LWFS 37 (···SL)



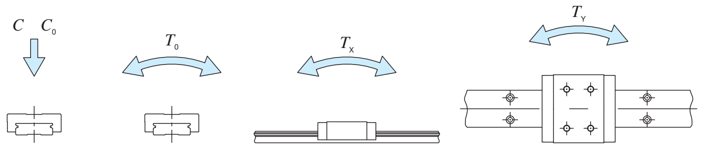
LWFS 42···SL



Identification number LWF series (No C-Lube)	Interchangeable	Mass(Ref.) Slide unit kg	Mass(Ref.) Track rail kg/m	Dimensions of assembly mm H	H_1	N	Dimensions of slide unit mm W_2	W_3	W_4	L_1	L_2	L_3	L_4	M_1×depth	H_3
LWFS 33	○	0.13	2.41	17	2.5	8.5	50	29	10.5	54	15	35.3	56	M4×5	3.2
LWFS 33···SL	○														
LWFS 37	○	0.20	3.05	21	3	8.5	54	31	11.5	62	19	40	66	M5×6	4
LWFS 37···SL	○														
LWFS 42···SL	○	0.40	4.30	27	3	10	62	23	8	75	32	52.2	86	M6×6	6

Identification number LWF series (No C-Lube)	Dimensions of track rail mm W	H_4	W_5	W_6	d_3	d_4	h	E	F	Appended mounting bolt for track rail (2) mm Bolt size× ℓ	Basic dynamic load rating (3) C N	Basic static load rating (3) C_0 N	Static moment rating (3) T_0 N・m	T_X N・m	T_Y N・m
LWFS 33	33	10	18	7.5	4.6	8	6	20	40	M4×10	6 530	8 610	146	49.0 292	49.0 292
LWFS 33···SL															
LWFS 37	37	11.5	22	7.5	4.6	8	6	25	50	M4×12	9 840	12 200	235	80.0 480	80.0 480
LWFS 37···SL															
LWFS 42···SL	42	14	24	9	4.6	8	6	30	60	M4×16	15 500	19 400	424	165 904	165 904

Notes (1) Track rail lengths L are shown in Tables 2.1 and 2.2 on page Ⅱ−138.
(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. For stainless steel model, stainless steel bolts are appended.
(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.
(4) The shapes of grease nipple vary by size. The specifications are shown in Table 15 on page Ⅱ−146.



Example of identification number of assembled set

Model code	Dimensions	Part code		Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
LWFS	37	C2	R800		T1	P		/U
❶	❷	❸	❹	❺	❻	❼	❽	❾

① Model

LWFS	Block type mounting from top

② Size

33, 37, 42

③ Number of slide unit (2)

④ Length of track rail (800 mm)

⑤ Material type

No symbol	High carbon steel made
SL	Stainless steel made

⑥ Preload amount

No symbol	Standard
T1	Light preload
T2	Medium preload

⑦ Accuracy class

H	High
P	Precision
SP	Super precision

⑧ Interchangeable

No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

⑨ Special specification

A, D, E, F, Ⅰ, J, L, LF
MN, N, Q, U, V, W, Y, Z

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

C-Lube Linear Way MUL
Linear Way U

C-Lube Linear Way MUL

MUL

The aquamarine end plate is the symbol of maintenance free.

Points

1 Original U-shaped track rail

MUL and LWU series are the linear motion rolling guides adopting the U-shaped track rail to greatly increase rigidity of track rail under moment load and torsion.

2 Expanded freedom of design for use as a structure beam

Because of the high rigidity of the track rail, the track rail can be used as a structure beam, such as a cantilever or both-end support in the machine and equipment. Therefore, freedom of design is expanded for user.

3 Additional machining available for corresponding to needs

High carbon steel track rail can be machined additionally to fix mechanical components such as a driving mechanism on the track rail directly at user.

4 Stainless steel selections superior in corrosion resistance are listed on lineup.

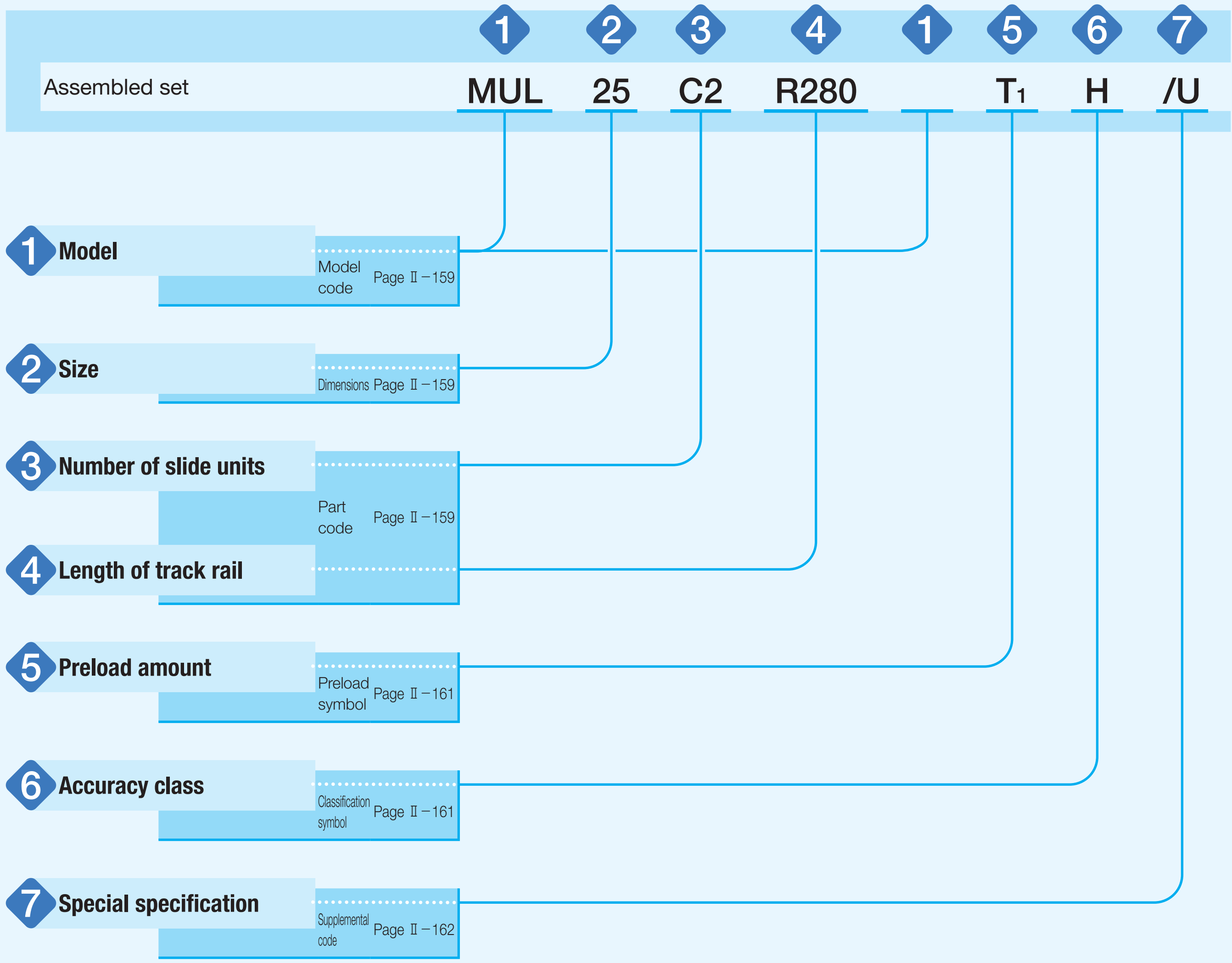
For details ➔ P.Ⅰ-41

The main metal components made of corrosion-resistant stainless steel are available for small size of 25 mm and 30 mm of track rail width. They are suitable for applications where rust prevention oil is not preferred, such as in a cleanroom environment.

Identification Number and Specification

Example of an identification number

The specifications of MUL and LWU series are indicated by the identification number. Indicate the identification number, consisting of a model code, dimensions, a part code, a preload symbol, a classification symbol, and any supplemental codes for each specification to apply.



1 Model
2 Size
3 Number of slide units
4 Length of track rail
5 Preload amount
6 Accuracy class
7 Special specification

Identification Number and Specification —Model · Structure · Size · Number of Slide unit ·

1 Model

C-Lube Linear Way MUL (MUL series) Small type : MUL

Linear Way U (1) (LWU series) Standard type : LWU

For applicable models and sizes, see Table 1.

Note (1) This model has no built-in C-Lube.

2 Size

25,30,40,50,60,86 For applicable models and sizes, see Table 1.

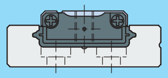
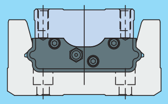
3 Number of slide units

: C○ Indicates the number of slide units assembled on a track rail.

4 Length of track rail

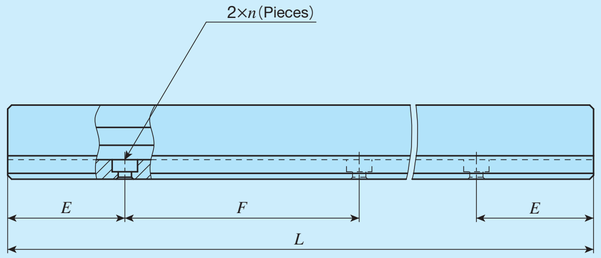
: R○ Indicate the length of track rail in mm.
For standard and maximum lengths, see Table 2.

Table 1 Models and sizes of MUL and LWU series

Shape	Material	Model	Size					
			25	30	40	50	60	86
Small type 	Stainless steel made	MUL	○	○	–	–	–	–
Standard type 	High carbon steel made	LWU···B	–	–	○	○	○	○

Length of Track Rail—

Table 2 Standard and maximum lengths of track rail



unit: mm

Item \ Identification number		MUL25	MUL30	LWU40···B	LWU50···B
Standard length L (n)		105 (3) 140 (4) 175 (5) 210 (6) 245 (7) 280 (8)	120 (3) 160 (4) 200 (5) 240 (6) 280 (7) 320 (8)	180 (3) 240 (4) 300 (5) 360 (6) 420 (7) 480 (8)	240 (3) 320 (4) 400 (5) 480 (6) 560 (7) 640 (8)
Pitch of mounting holes F		35	40	60	80
E		17.5	20	30	40
Standard E dimensions	or higher	4.5	4.5	–	–
	below	22	24.5	–	–
Maximum length (1)		420 (840)	480 (960)	720	800

Item \ Identification number	LWU60···B	LWU86···B
Standard length L (n)	300 (3) 400 (4) 500 (5) 600 (6) 700 (7) 800 (8)	300 (3) 400 (4) 500 (5) 600 (6) 700 (7) 800 (8)
Pitch of mounting holes F	100	100
E	50	50
Maximum length (1)	1 000	1 200

Note (1) Length up to the value in ( ) can be produced. If needed, please contact IKO.

Remarks 1. If not directed, E dimensions for both ends will be the same within the range of standard E dimensions. To change the dimensions, indicate the specified rail mounting hole positions "/E" of special specification. For more information, see page Ⅱ–30.

5 Preload amount

Standard : No symbol For details of the preload amount, see Table 3.
Light preload : T₁

Table 3 Preload amount

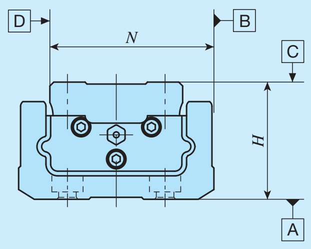
Item / Preload type	Preload symbol	Preload amount N	Operational conditions
Standard	(No symbol)	0 (1)	· Light and precise motion
Light preload	T₁	$0.02C_0$	· Almost no vibrations · Load is evenly balanced · Light and precise motion

Note (1) Indicates zero or minimal amount of preload.
Remark: C_0 indicates the basic static load rating.

6 Accuracy class

Ordinary : No symbol For details of accuracy class, see Table 4.
High : H

Table 4 Tolerance and allowance



unit: mm

Class (classification symbol) / Item	Ordinary (No symbol)	High (H)
Dim. H tolerance	±0.100	±0.050
Dim. N tolerance	±0.100	±0.050
Dim. variation of H (1)	0.050	0.040
Dim. variation of N (1)	0.050	0.040
Parallelism in operation of the slide unit C surface to A surface	See Fig. 1	
Parallelism in operation of the slide unit D surface to B surface	See Fig. 1	

Note (1) It means the size variation between slide units mounted on the same track rail.

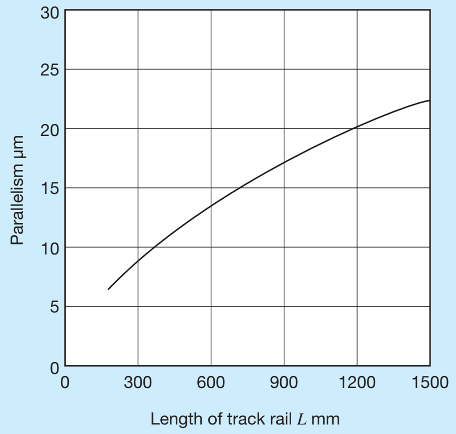


Fig. 1 Parallelism in operation

---

7 Special specification

/E, /L○, /MA, /Q, /U○, /W○

For applicable special specifications, see Table 5.
For combination of multiple special specifications, see Table 6.
For details of special specifications, see page Ⅲ—29.

Table 5 Application of special specifications

Special specification	Supplemental code	Size					
		25	30	40	50	60	86
Specified rail mounting hole positions	/E	○	○	×	×	×	×
Black chrome surface treatment	/L○	○(1)	○(1)	○	○	○	○
With track rail mounting bolt	/MA	○	○	○	○	○	○
With C-Lube plate	/Q	×	×	○	○	○	○
Upper seal	/U	○	○	×	×	×	×
A group of multiple assembled sets	/W○	○	○	○	○	○	○

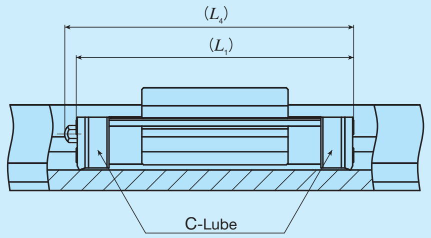
Notes (1) Applicable only to "/LR".

Table 6 Combination of supplemental codes

L	○				
MA	○	○			
Q	—	○	○		
U	○	○	○	—	
W	—	○	○	○	○
	E	L	MA	Q	U

Remarks 1. The combination of "—" shown in the table is not available.
2. When using multiple types for combination, please indicate by arranging the symbols in alphabetical order.

Table 7 Dimension of slide unit with C-Lube plate (Supplemental code /Q)

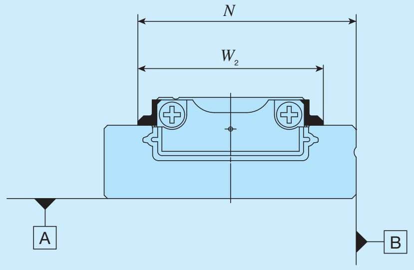


unit: mm

Size	L_1	L_4
40	67	68
50	82	83
60	95	100
86	142	146

Remark: The dimensions of the slide unit with C-Lube at both ends are indicated.

Table 8 Dimension of slide unit with upper seal (Supplemental code /U)



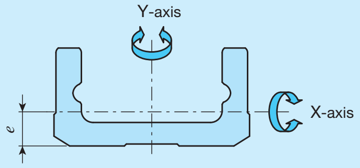
unit: mm

Size	N	W_2
25	21.4	18
30	25.9	22

Moment of Inertia of Sectional Area

High rigidity design of C-Lube Linear Way MUL and LWU are achieved by adopting a U-shaped track rail. The moment of inertia of sectional area of track rails are shown in Table 9.

Table 9 Moment of inertia of sectional area of track rails



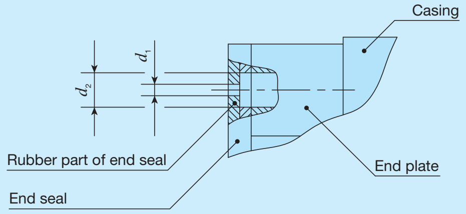
Identification number	Moment of inertia of sectional area mm^4		Center of gravity e mm
	I_X	I_Y	
MUL 25	3.7×10^{2}	7.5×10^{3}	2.6
MUL 30	9.3×10^{2}	1.7×10^{4}	3.3
LWU 40…B	1.0×10^{4}	6.8×10^{4}	6.6
		6.9×10^{4}	
LWU 50…B	2.8×10^{4}	1.7×10^{5}	8.7
LWU 60…B	6.3×10^{4}	3.9×10^{5}	10.7
			10.8
LWU 86…B	2.4×10^{5}	1.6×10^{6}	14.6

Lubrication

In the MUL series, lithium soap base grease (MULTEMP PS No.2, KYODO YUSHI) is prepacked, and in the LWU…B series, lithium soap base grease with extreme-pressure additive (Alvania EP grease 2 [Shell Lubricants Japan K.K.]) is prepacked. Additionally, MUL series has C-Lube placed in the recirculation part of balls, so that the interval for reapplicating lubricant can be extended and maintenance works such as grease job can be reduced significantly.

MUL series and LWU series have grease nipple or oil hole as indicated in Table 11. Supply nozzles fit to each shapes of grease nipple and dedicated supplying equipment (miniature greasers) fit to oil holes are also available. For order of these parts for lubrication, see Table 13 and Table 14.1 on page Ⅲ−23, and Table 15 on page Ⅲ−24.

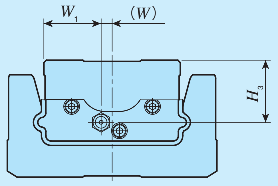
Table 10 Oil hole specifications



unit: mm

Size	d_1	d_2
25	0.5	1.2
30		1.5

Table 11 Lubrication parts and position of grease nipple



Size	Grease nipple type (1)	Applicable supply nozzle type	Bolt size of female threads for piping	Grease nipple position mm		
				W_1	W	H_3
25	Oil hole	Miniature greaser MG10B/MT2	−	7	0	2.9
30				9	0	3.75
40	A-M4	A-5120V A-5240V B-5120V B-5240V	M4	13	0	10.5
50				17	0	13.5
60	JIS type 1	Grease gun available on the market	M6	19	0	14.5
86				23.5	4.5	25.5

Note (1) For grease nipple specification, see Tables 14.1 and 14.2 on page Ⅲ−23.
Remark: Stainless steel grease nipple is also available. If needed, please contact IKO.

Dust Protection

The slide units of MUL series and LWU series are equiped with end seals and upper seals as standard for dust protection. However, if large amount of contaminant or dust are floating, or if large particles of foreign substances such as chips or sand may adhere to the track rail, it is recommended to attach a protective cover to the linear motion mechanism.

Precaution for Use

❶ Mounting surface, reference mounting surface and typical mounting structure

When mounting the MUL series and LWU series, properly align the reference mounting surfaces B and D of the track rail and slide unit with the reference mounting surface of the table and bed and fix them. (See Fig. 2)

The reference mounting surfaces B and D and mounting surfaces A and C are precisely ground. Machining the mounting surface of the table and bed, such as machine or device, to high accuracy and mounting them properly will ensure stable linear motion with high accuracy.

Reference mounting surfaces of slide unit and track rail of the MUL series and LWU series are the opposite side of the IKO mark. (See Fig. 3)

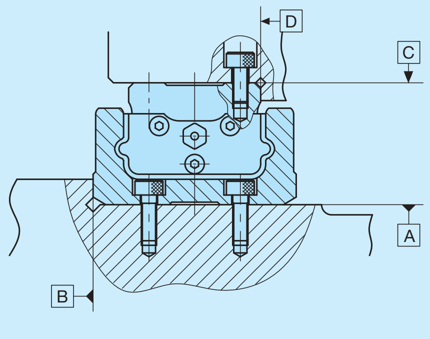


Fig. 2 Reference mounting surface and typical mounting structure

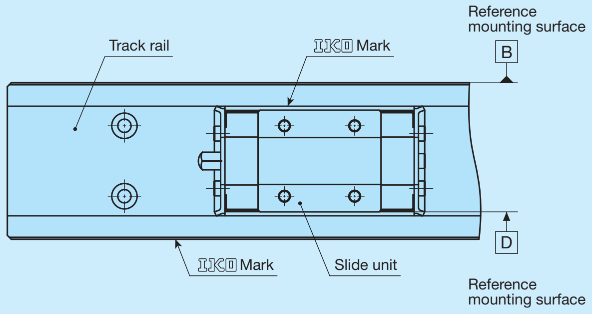


Fig. 3 Reference mounting surface

❷ Shoulder height and corner radius of the reference mounting surface

For the opposite corner of the mating reference mounting, it is recommended to have relieved fillet as indicated in Fig. 4.

Recommended value for the shoulder height and corner radius on the mating side is indicated in Table 13.

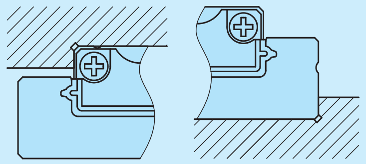


Fig. 4 Corner of the mating reference mounting

❸ Tightening torque for fixing screw

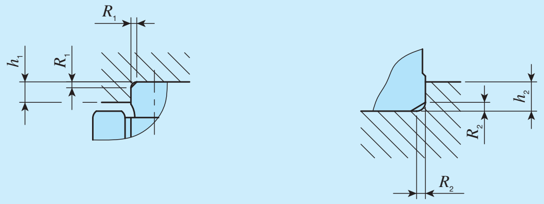
Typical tightening torque for mounting of the MUL series and LWU series to the steel mating member material is indicated in Table 12. When vibration and shock of the machine or device are large, fluctuating load is large, or moment load is applied, fix it by using the torque 1.2 to 1.5 times larger than the value indicated in the table as necessary. If the mating member material is cast iron or aluminum alloy, reduce the tightening torque depending on the strength characteristics of the mating member material.

Table 12 Tightening torque for fixing screw

Bolt size	Tightening torque N・m	
	Stainless steel-made screw	High carbon steel-made screw
M 2.5×0.45	0.62	–
M 3 ×0.5	–	1.8
M 4 ×0.7	–	4.1
M 5 ×0.8	–	8.0
M 6 ×1	–	13.6

Remark: The tightening torque is calculated based on strength division 12.9 and property division A2-70.

Table 13 Shoulder height and corner radius of the reference mounting surface



Mounting part of slide unit

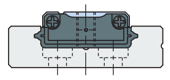
Mounting part of track rail

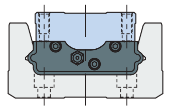
unit: mm

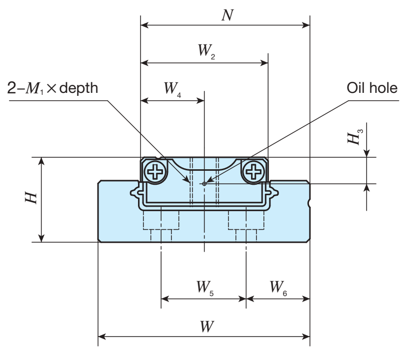
Size	Mounting part of slide unit		Mounting part of track rail	
	Shoulder height h_1	Corner radius R_1 (Maximum)	Shoulder height h_2	Corner radius R_2 (Maximum) (1)
25	1.5	0.2	2.5	–
30	2.5	0.2	3	–
40	3	0.5	5	1
50	3	0.5	7	2
60	3	0.5	9	2
86	4	0.5	11	2

Note (1) In sizes 25 and 30, provide a relieved fillet as shown in Fig. 4.

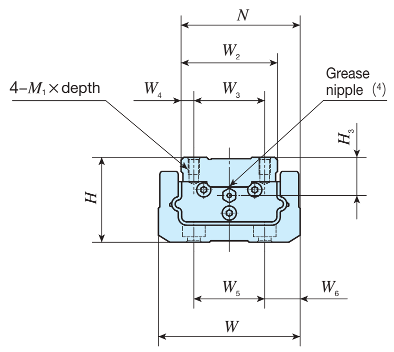
C-Lube Linear Way MUL

Small type		
Shape	**MUL** 	
Size	25	30

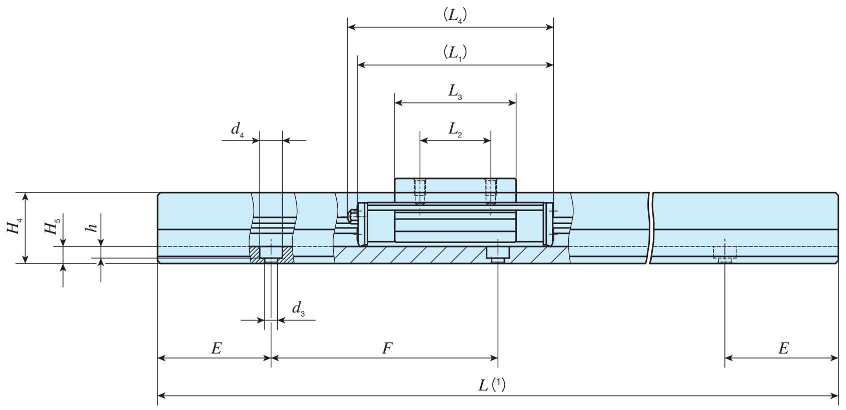
Standard type				
Shape	**LWU...B** 			
Size	40	50	60	86



MUL



LWU…B



Identification number		Interchangeable	Mass(Ref.)		Dimensions of assembly mm		Dimensions of slide unit mm									Dimensions of track rail mm										Appended mounting bolt for track rail (2) mm	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
MUL series	LWU series (No C-Lube)		Slide unit kg	Track rail kg/m	H	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	M_1× depth	H_3	W	H_4	H_5	W_5	W_6	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MUL 25	–	–	0.013	0.87	9	19.4	14	–	7	31	12	22	–	M 3× 5	2.9	24.9	6.7	3.2	9	8	2.9	4.8	1.6	17.5	35	Cross-recessed pan head screw for precision equipment M 2.5 × 6	1 770	2 840	20.3	10.1 53.7	8.4 45.0
MUL 30	–	– –	0.028 0.029	1.39	12	23.9	18	–	9	38	14	28.6	–	M 4× 7	3.75	29.9	8.7	4.5	12	9	2.9	5	2.7	20	40	M 2.5× 6	2 280	3 810	34.9	16.9 87.5	14.2 73.4
–	LWU 40…B	–	0.12	2.65 2.66	24	33	26	18	4	55	18	31.5	59	M 3× 5	10.5	40	19	5	18	11	3.4	6.5	3.1	30	60	M 3 × 8 (Not appended)	8 410	9 780	134	53.0 351	53.0 351
–	LWU 50…B	–	0.27	4.06 4.08	30	42	34	25	4.5	70	25	42.8	73	M 4× 6	13.5	50	25	6	25	12.5	4.5	8	4.1	40	80	M 4 ×10 (Not appended)	13 500	15 800	280	114 711	114 711
–	LWU 60…B	–	0.40	6.66 6.69	35	49	38	28	5	83	28	52.4	88	M 5× 8	14.5	60	30	8	28	16	5.5	9.5	5.4	50	100	M 5 ×12 (Not appended)	18 800	21 600	425	181 1 150	181 1 150
–	LWU 86…B	–	1.32	14.1	48	71	56	46	5	130	46	93	134	M 6×12	25.5	86	42	13	46	20	7	11	7	50	100	M 6 ×16 (Not appended)	41 400	51 500	1 470	764 4 120	764 4 120

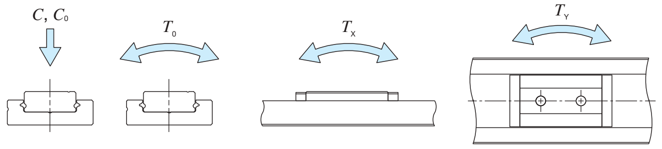
Notes (1) Track rail lengths L are shown in Table 2 on page Ⅱ−160.

(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176 or JCIS10-70 cross-recessed pan head screw for precision equipment. For the size 25 and 30 series, stainless steel bolts are appended. Track rail mounting bolts are not appended for MUL series.

(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

(4) The shapes of grease nipple vary by size. The specifications are shown in Table 11 on page Ⅱ−164.

Remark: The specification of oil hole is shown in Table 10 on page Ⅱ−164.



Example of identification number of assembled set

Model code	Dimensions	Part code		Model code	Preload symbol	Classification symbol	Supplemental code
MUL	25	C2	R280		T1	H	/LR
❶	❷	❸	❹	❶	❺	❻	❼

① Model	
MUL	Small type
LWU…B	Standard type

② Size
25, 30, 40, 50, 60, 86

③ Number of slide unit (2)

④ Length of track rail (280 mm)

⑤ Preload amount	
No symbol	Standard
T_1	Light preload

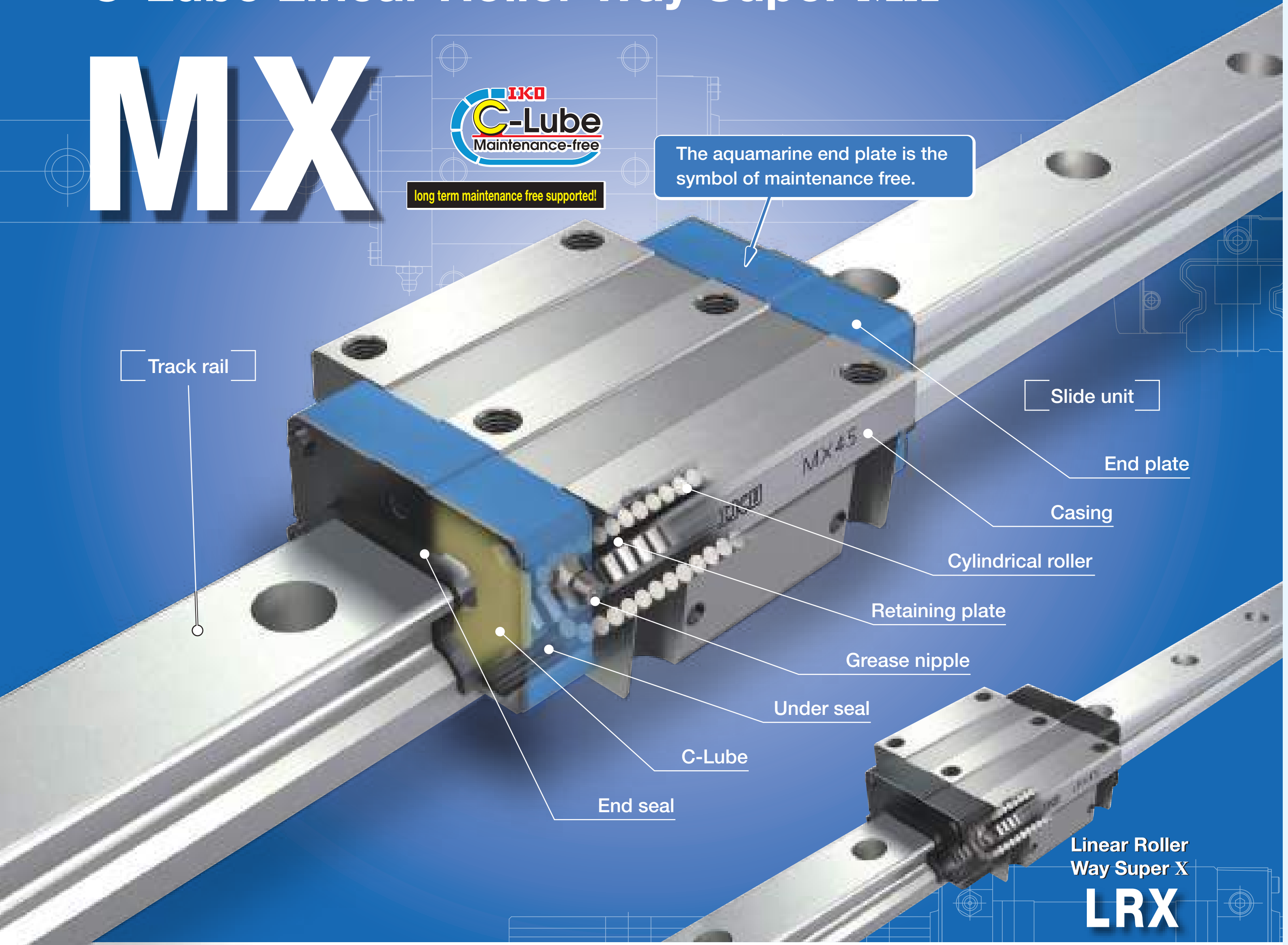
⑥ Accuracy class	
No symbol	Ordinary
H	High

⑦ Special specification
E, LR, MA, Q, U, W

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

C-Lube Linear Roller Way Super MX
Linear Roller Way Super X

C-Lube Linear Roller Way Super MX



The aquamarine end plate is the symbol of maintenance free.

Points

● Roller type linear motion rolling guides having the highest level of rolling guide performance

For details ➔ P.I-21

1 Linear motion rolling guide that has achieved the highest level of performance in all characteristics, including load capacity, rigidity, friction characteristics and accuracy, brought about by utilizing the roller's excellent characteristic.

● Wide range of variations for your needs

For details ➔ P.I-28

2 A wide variety of products, including five types of different slide unit shape such as the flange type, low profile flange type and low profile block type with low cross sectional height, etc., and four types of different slide unit length with varying lengths with same section are available. You can select an optimal product for the specifications of your machine and device.

● Extra long unit

For details ➔ P.I-29

3 Extra long slide unit series having the length 1.4 to 1.5 times of standard type is now available. With more rollers built into the slide units, the new series not only have the enhanced load capacity and rigidity but also exhibit super accuracy running performance.

● Stainless steels selections superior in corrosion resistance are listed on lineup.

For details ➔ P.I-41

4 A series of stainless steel products is available from the miniature size of track rail width 10 mm. They are highly corrosion-resistant and suitable for applications where rust prevention oil is not preferred, such as in cleanroom environment.

● Easy replacement from ball type

For details ➔ P.I-24

5 Mounting dimensions are compatible with MH / LWH series of ball type. Therefore, replacement to roller type is possible without major design changes of machine and device.

Identification Number and Specification

Example of an identification number

The specifications of MX and LRX series are indicated by the identification number. Indicate the identification number, consisting of a model code, dimensions, a part code, a material code, a preload symbol, a classification symbol, an interchangeable code, and any supplemental codes for each specification to apply.

		1	2	3	4	5	6	7	8	9	10
Non-interchangeable specification	Assembled set	MX	G	15	C2	R240		T_1	P		/Z
Interchangeable specification	Single slide unit	MX	G	15	C1			T_1	P	S1	/Z
	Single track rail (1)	LRX		15		R240			P	S1	
	Assembled set	MX	G	15	C2	R240		T_1	P	S1	/Z

1	Model	Model code	Page Ⅱ－173
2	Length of slide unit		
3	Size	Dimensions	Page Ⅱ－173
4	Number of slide units	Part code	Page Ⅱ－174
5	Length of track rail		
6	Material type	Material code	Page Ⅱ－174
7	Preload amount	Preload symbol	Page Ⅱ－177
8	Accuracy class	Classification symbol	Page Ⅱ－178
9	Interchangeable	Interchangeable code	Page Ⅱ－179
10	Special specification	Supplemental code	Page Ⅱ－179

Note (1) Indicate "LRX" for the model code of the single track rail regardless of the series and the combination of slide unit model.

Identification Number and Specification —Model · Length of Slide Unit · Size—

1 Model

C-Lube Linear Roller Way Super MX
(MX series)

Flange type mounting from top / bottom : MX (2)
Block type mounting from top : MXD
Compact block type mounting from top : MXS
Low profile flange type mounting from top : MXN
Low profile block type mounting from top : MXNS

Linear Roller Way Super X (1)
(LRX series)

Flange type mounting from top / bottom : LRX (2)
Block type mounting from top : LRXD
Compact block type mounting from top : LRXS

For applicable models and sizes, see Table 1.1 and Table 1.2.
Indicate "LRX" for the model code of the single track rail regardless of the series and the combination of slide unit models.

Notes (1) This model has no built-in C-Lube.
(2) Series of size 20 can only be mounted by the bolts from top. The models with the same dimensions allowing mounting from bottom are "MXH" and "LRXH."

2 Length of slide unit

Short : C
Standard : No symbol
Long : G
Extra long : L

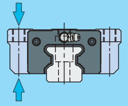
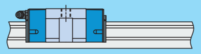
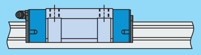
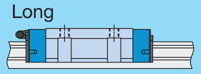
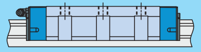
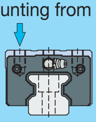
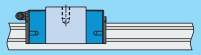
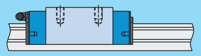
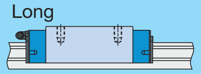
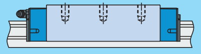
For applicable models and sizes, see Table 1.1 and Table 1.2.

3 Size

10, 12, 15, 20, 25, 30, 35, 45, 55, 65, 85, 100

For applicable models and sizes, see Table 1.1 and Table 1.2.

Table 1.1 Models and sizes of MX and LRX series

Material	Shape	Slide unit Length	Model	Size											
				10	12	15	20	25	30	35	45	55	65	85	100
High carbon steel made	Flange type mounting from top / bottom 	Short 	MXC	–	○	○	○(1)	○	○	○	○	○	○	–	–
			LRXC	–	○	○	○(1)	○	○	○	○	○	○	–	–
		Standard 	MX	–	○	○	○(1)	○	○	○	○	○	○	–	–
			LRX	–	○	○	○(1)	○	○	○	○	○	○	○	–
		Long 	MXG	–	○	○	○(1)	○	○	○	○	○	○	–	–
			LRXG	–	○	○	○(1)	○	○	○	○	○	○	○	○
		Extra long 	MXL	–	–	–	○(1)	○	○	○	○	○	○	–	–
			LRXL	–	–	–	–	–	–	–	–	–	–	○	–
	Block type mounting from top 	Short 	MXDC	–	○	○	○	○	○	○	○	○	○	–	–
			LRXDC	–	○	○	○	○	○	○	○	○	○	–	–
		Standard 	MXD	–	○	○	○	○	○	○	○	○	○	–	–
			LRXD	–	○	○	○	○	○	○	○	○	○	○	–
		Long 	MXDG	–	○	○	○	○	○	○	○	○	○	–	–
			LRXDG	–	○	○	○	○	○	○	○	○	○	○	–
		Extra long 	MXDL	–	–	–	○	○	○	○	○	○	○	–	–
			LRXDL	–	–	–	–	–	–	–	–	–	–	○	–

Note (1) MXC20, MX20, MXG20, MXL20, LRXC20, LRX20 and LRXG20 can only be mounted by the bolts from top.
The models with the same dimensions allowing mounting from bottom are MXHC20, MXH20, MXHG20, MXHL20, LRXHC20, LRXH20 and LRXHG20.

Remark: For the models indicated in ▭, the interchangeable specification is available.

—Number of Slide Unit · Length of Track Rail · Material Type—

4 Number of slide units

: C○

For an assembled set, indicates the number of slide units assembled on a track rail. For a single slide unit, only "C1" is specified.

5 Length of track rail

: R○

Indicate the length of track rail in mm.
For the standard and maximum lengths, see Table 2.1, Table 2.2, Table 2.3 and Table 2.4.

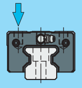
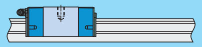
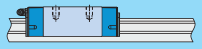
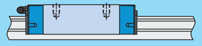
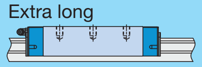
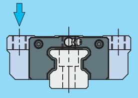
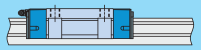
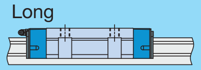
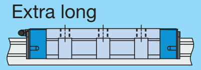
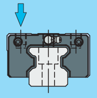
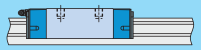
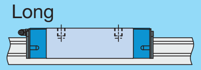
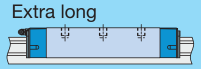
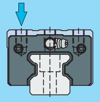
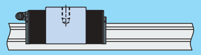
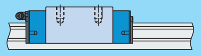
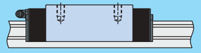
6 Material type

High carbon steel made : No symbol
Stainless steel made (1) : SL

For applicable models and sizes, see Table 1.1 and Table 1.2.

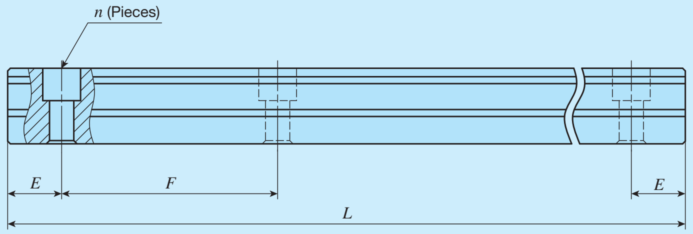
Note (1) Mount a standard grease nipple (brass) on the stainless steel type, too.
Stainless steel grease nipple is also available. If needed, please contact IKO.

Table 1.2 Models and sizes of MX and LRX series

Material	Shape	Slide unit Length	Model	Size											
				10	12	15	20	25	30	35	45	55	65	85	100
High carbon steel made	Compact block type mounting from top 	Short 	MXSC	–	–	○	○	○	○	–	–	–	–	–	–
			LRXSC	–	–	○	○	○	○	–	–	–	–	–	–
		Standard 	MXS	–	–	○	○	○	○	○	○	○	–	–	–
			LRXS	–	–	○	○	○	○	–	–	–	–	–	–
		Long 	MXSG	–	–	○	○	○	○	○	○	○	–	–	–
			LRXSG	–	–	○	○	○	○	–	–	–	–	–	–
		Extra long 	MXSL	–	–	–	○	○	○	–	–	–	–	–	–
	Low profile flange type mounting from top 	Standard 	MXN	–	–	–	–	–	○	○	○	○	–	–	–
		Long 	MXNG	–	–	–	–	–	○	○	○	○	–	–	–
		Extra long 	MXNL	–	–	–	–	–	○	○	○	○	–	–	–
	Low profile block type mounting from top 	Standard 	MXNS	–	–	–	–	–	○	○	○	○	–	–	–
		Long 	MXNSG	–	–	–	–	–	○	○	○	○	–	–	–
		Extra long 	MXNSL	–	–	–	–	–	○	○	○	○	–	–	–
Stainless steel made	Block type mounting from top 	Short 	LRXDC···SL	–	○	○	○	○	○	–	–	–	–	–	–
		Standard 	MXD···SL	○	○	○	○	○	○	–	–	–	–	–	–
			LRXD···SL	○	○	○	○	○	○	–	–	–	–	–	–
		Long 	LRXDG···SL	–	○	○	○	○	○	–	–	–	–	–	–

Remark: For the models indicated in ▭, the interchangeable specification is available.

Table 2.1 Standard and maximum length of high carbon steel track rail



unit: mm

Item (Identification number)		MX 12 LRX12	MX 15 LRX15	MX 20 LRX20	MX 25 LRX25	MX 30 LRX30	MX 35 LRX35
Standard length L (n)		80 (2) 160 (4) 240 (6) 320 (8) 400 (10) 480 (12) 560 (14) 640 (16) 720 (18)	180 (3) 240 (4) 360 (6) 480 (8) 660 (11)	240 (4) 480 (8) 660 (11) 840 (14) 1 020 (17) 1 200 (20) 1 500 (25)	240 (4) 480 (8) 660 (11) 840 (14) 1 020 (17) 1 200 (20) 1 500 (25)	480 (6) 640 (8) 800 (10) 1 040 (13) 1 200 (15) 1 520 (19)	480 (6) 640 (8) 800 (10) 1 040 (13) 1 200 (15) 1 520 (19)
Pitch of mounting holes F		40	60	60	60	80	80
E		20	30	30	30	40	40
Standard E dimensions (1)	or higher	5.5	7	8	9	10	10
	below	25.5	37	38	39	50	50
Maximum length (2)		1 480	1 500 (1 980)	1 980 (3 000)	3 000 (3 960)	2 960 (4 000)	2 960 (4 000)

Item (Identification number)		MX 45 LRX45	MX 55 LRX55	MX 65 LRX65	LRX85	LRXG100
Standard length L (n)		840 (8) 1 050 (10) 1 260 (12) 1 470 (14) 1 995 (19)	840 (7) 1 200 (10) 1 560 (13) 1 920 (16) 3 000 (25)	1 500 (10) 1 950 (13) 3 000 (20)	1 620 (9) 1 980 (11) 2 340 (13) 2 700 (15)	1 500 (10) 1 950 (13) 3 000 (20)
Pitch of mounting holes F		105	120	150	180	150
E		52.5	60	75	90	75
Standard E dimensions (1)	or higher	12.5	15	17	23	29
	below	65	75	92	113	104
Maximum length (2)		2 940 (3 990)	3 000 (3 960)	3 000 (3 900)	2 880	3 000

Notes (1) This does not apply to female threads for bellows (Supplemental code "/J").
(2) Length up to the value in ( ) can be produced. If needed, please contact IKO.

Remarks 1. A typical identification number is indicated, but is applied to all models of the same size.
2. Indicate "LRX" for the model code of the single track rail regardless of the series and the combination of slide unit models.
3. In the case where track rail mounting hole is half pitch specification (Supplemental code "/HP"), see Table 2.3.
4. If not directed, E dimensions for both ends will be the same within the range of standard E dimensions. To change the dimensions, indicate the specified rail mounting hole positions "/E" of special specification. For more information, see page Ⅲ−30.

Table 2.2 Standard and maximum length of stainless steel track rail

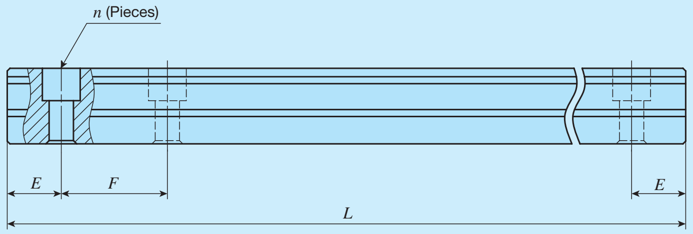
unit: mm

Item (Identification number)		MXD 10…SL LRXD10…SL	MX 12…SL LRX12…SL	MX 15…SL LRX15…SL	MX 20…SL LRX20…SL	MX 25…SL LRX25…SL	MX 30…SL LRX30…SL
Standard length L (n)		50 (2) 100 (4) 150 (6) 200 (8) 250 (10) 300 (12) 350 (14) 400 (16) 450 (18) 500 (20)	80 (2) 160 (4) 240 (6) 320 (8) 400 (10) 480 (12) 560 (14) 640 (16) 720 (18)	180 (3) 240 (4) 360 (6) 480 (8) 660 (11)	240 (4) 480 (8) 660 (11) 840 (14)	240 (4) 480 (8) 660 (11) 840 (14)	480 (6) 640 (8) 800 (10) 1 040 (13)
Pitch of mounting holes F		25	40	60	60	60	80
E		12.5	20	30	30	30	40
Standard E dimensions (1)	or higher	5	5.5	7	8	9	10
	below	17.5	25.5	37	38	39	50
Maximum length (2)		850 (1 000)	1 000 (1 480)	1 200 (1 980)	1 200 (1 980)	1 200 (1 980)	1 200 (2 000)

Notes (1) This does not apply to female threads for bellows (Supplemental code "/J").
(2) Length up to the value in ( ) can be produced. If needed, please contact IKO.

Remarks 1. A typical identification number is indicated, but is applied to all models of the same size.
2. Indicate "LRX" for the model code of the single track rail regardless of the series and the combination of slide unit models.
3. In the case where track rail mounting hole is half pitch specification (Supplemental code "/HP"), see Table 2.4.
4. If not directed, E dimensions for both ends will be the same within the range of standard E dimensions. To change the dimensions, indicate the specified rail mounting hole positions "/E" of special specification. For more information, see page Ⅲ−30.

Table 2.3 Standard and maximum length of high carbon steel track rail (Half pitch mounting holes specification supplemental code /HP)



unit: mm

Item (Identification number)		MX 12…/HP LRX12…/HP	MX 15…/HP LRX15…/HP	MX 20…/HP LRX20…/HP	MX 25…/HP LRX25…/HP	MX 30…/HP LRX30…/HP	MX 35…/HP LRX35…/HP
Standard length L (n)		80 (4) 160 (8) 240 (12) 320 (16) 400 (20) 480 (24) 560 (28) 640 (32) 720 (36)	180 (6) 240 (8) 360 (12) 480 (16) 660 (22)	240 (8) 480 (16) 660 (22) 840 (28) 1 020 (34) 1 200 (40) 1 500 (50)	480 (16) 660 (22) 840 (28) 1 020 (34) 1 200 (40) 1 500 (50)	480 (12) 640 (16) 800 (20) 1 040 (26) 1 200 (30) 1 520 (38)	480 (12) 640 (16) 800 (20) 1 040 (26) 1 200 (30) 1 520 (38)
Pitch of mounting holes F		20	30	30	30	40	40
E		10	15	15	15	20	20
Standard E dimensions (1)	or higher	5.5	7	8	9	10	10
	below	15.5	22	23	24	30	30
Maximum length (2)		1 480	1 500 (1 980)	1 980 (3 000)	3 000 (3 960)	2 960 (4 000)	2 960 (4 000)

Item (Identification number)		MX 45…/HP LRX45…/HP	MX 55…/HP LRX55…/HP	MX 65…/HP LRX65…/HP	LRX85…/HP
Standard length L (n)		840 (16) 1 050 (20) 1 260 (24) 1 470 (28) 1 995 (38)	840 (14) 1 200 (20) 1 560 (26) 1 920 (32) 3 000 (50)	1 500 (20) 1 950 (26) 3 000 (40)	1 620 (18) 1 980 (22) 2 340 (26) 2 700 (30)
Pitch of mounting holes F		52.5	60	75	90
E		26.25	30	37.5	45
Standard E dimensions (1)	or higher	12.5	15	17	23
	below	38.75	45	54.5	68
Maximum length (2)		2 940 (3 990)	3 000 (3 960)	3 000 (3 900)	2 970

Notes (1) This does not apply to female threads for bellows (Supplemental code "/J").
(2) Length up to the value in ( ) can be produced. If needed, please contact IKO.

Remarks 1. A typical identification number is indicated, but is applied to all models of the same size.
2. Indicate "LRX" for the model code of the single track rail regardless of the series and the combination of slide unit models.
3. If not directed, E dimensions for both ends will be the same within the range of standard E dimensions. To change the dimensions, indicate the specified rail mounting hole positions "/E" of special specification. For more information, see page Ⅲ−30.

Table 2.4 Standard and maximum length of stainless steel track rail (Half pitch mounting holes specification supplemental code /HP)

unit: mm

Item (Identification number)		MX 12…SL/HP LRX12…SL/HP	MX 15…SL/HP LRX15…SL/HP	MX 20…SL/HP LRX20…SL/HP	MX 25…SL/HP LRX25…SL/HP	MX 30…SL/HP LRX30…SL/HP
Standard length L (n)		80 (4) 160 (8) 240 (12) 320 (16) 400 (20) 480 (24) 560 (28) 640 (32) 720 (36)	180 (6) 240 (8) 360 (12) 480 (16) 660 (22)	240 (8) 480 (16) 660 (22) 840 (28)	480 (16) 660 (22) 840 (28)	480 (12) 640 (16) 800 (20) 1 040 (26)
Pitch of mounting holes F		20	30	30	30	40
E		10	15	15	15	20
Standard E dimensions (1)	or higher	5.5	7	8	9	10
	below	15.5	22	23	24	30
Maximum length (2)		1 000 (1 480)	1 200 (1 980)	1 200 (1 980)	1 200 (1 980)	1 200 (2 000)

Notes (1) This does not apply to female threads for bellows (Supplemental code "/J").
(2) Length up to the value in ( ) can be produced. If needed, please contact IKO.

Remarks 1. A typical identification number is indicated, but is applied to all models of the same size.
2. Indicate "LRX" for the model code of the single track rail regardless of the series and the combination of slide unit models.
3. If not directed, E dimensions for both ends will be the same within the range of standard E dimensions. To change the dimensions, indicate the specified rail mounting hole positions "/E" of special specification. For more information, see page Ⅲ−30.

7 Preload amount

Standard	: No symbol	Specify this item for an assembled set or a single slide unit. For details of the preload amount, see Table 3. For applicable preload types, see Table 4.
Light preload	: T₁	
Medium preload	: T₂	
Heavy preload	: T₃	

Table 3 Preload amount

Item Preload type	Preload symbol	Preload amount N	Operational conditions
Standard	(No symbol)	0 (1)	· Light and precise motion
Light preload	T₁	0.02 C_0	· Almost no vibrations · Load is evenly balanced · Light and precise motion
Medium preload	T₂	0.05 C_0	· Medium vibration · Medium overhung load
Heavy preload	T₃	0.08 C_0	· Operation with vibration and/or shock · Overhanging load applied · Heavy cutting

Note (1) Indicates zero or minimal amount of preload.
Remark: C_0 indicates the basic static load rating.

Table 4 Application of preload

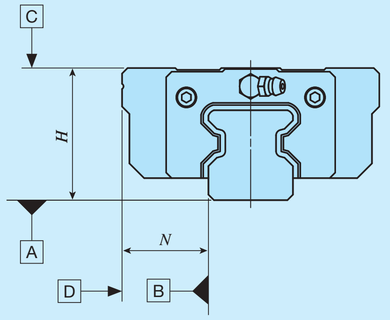
Size	Preload type (preload symbol)			
	Standard (No symbol)	Light preload (T₁)	Medium preload (T₂)	Heavy preload (T₃)
10	○	○	–	–
12	○	○	○	○
15	○	○	○	○
20	○	○	○	○
25	○	○	○	○
30	○	○	○	○
35	○	○	○	○
45	○	○	○	○
55	○	○	○	○
65	○	○	○	○
85	○	○	○	○
100	○	○	○	○

Remark: The mark ▨ indicates that interchangeable specification products are available.

8 Accuracy class

High	: H	For interchangeable specification products, assemble a slide unit and a track rail of the same accuracy class. For details of accuracy class, see Table 5. For applicable accuracy class, see Table 6.
Precision	: P	
Super precision	: SP	
Ultra precision	: UP	

Table 5 Tolerance and allowance



unit: mm

Class (classification symbol) Item	High (H)	Precision (P)	Super precision (SP)	Ultra precision (UP)
Dim. H tolerance	±0.040	±0.020	±0.010	±0.008
Dim. N tolerance	±0.050	±0.025	±0.015	±0.010
Dim. variation of H (1)	0.015	0.007	0.005	0.003
Dim. variation of N (1)	0.020	0.010	0.007	0.003
Dim. variation of H for multiple assembled sets (2)	0.035	0.025	–	–
Parallelism in operation of the slide unit C surface to A surface	See Fig. 1			
Parallelism in operation of the slide unit D surface to B surface	See Fig. 1			

Notes (1) It means the size variation between slide units mounted on the same track rail.
(2) Applicable to the interchangeable specification.

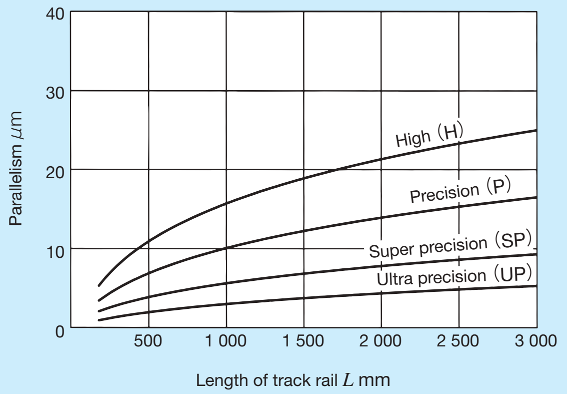


Fig. 1 Parallelism in operation

Table 6 Application of accuracy class

Size	Class (classification symbol)			
	High (H)	Precision (P)	Super precision (SP)	Ultra precision (UP)
10	○	○	○	○
12	○	○	○	○
15	○	○	○	○
20	○	○	○	○
25	○	○	○	○
30	○	○	○	○
35	○	○	○	○
45	○	○	○	○
55	○	○	○	○
65	○	○	○	○
85	○	○	○	○
100	○	○	○	○

Remark: The mark ▨ indicates that interchangeable specification products are available.

9 Interchangeable

S1 specification : S1
S2 specification : S2
Non-interchangeable specification : No symbol

This is specified for the interchangeable specifications. Assemble a track rail and a slide unit with the same interchangeable code. When using in combination with different interchangeable codes, please contact IKO. Note that the combination of interchangeable codes will not have any effect on accuracy.
For applicable models and sizes, see Table 1.1 and Table 1.2.
"No symbol" is indicated for non-interchangeable specification.

10 Special specification

/A, /D, /E, /F, /GE, /HP, /Ⅰ, /J○, /L○, /LF○, /MA, /MN, /N, /PS, /Q, /RC○, /T, /UR, /V○, /W○, /Y○, /Z○

For applicable special specifications, see Tables 7.1, 7.2, 7.3, and 7.4.
For combination of multiple special specifications, see Table 8.
For details of special specifications, see page Ⅲ－29.

Table 7.1 Application of special specifications (Interchangeable specification, single slide unit)

Special specification	Supplemental code	Size											
		10	12	15	20	25	30	35	45	55	65	85	100
Changed pitch of slide unit middle mounting holes (1)	/GE	−	×	○	○	○	○	○	○	○	○	−	−
Female threads for bellows (2)	/J○	−	×	○	○	○	○	○	○	○	○	−	−
No end seal (3)	/N	−	○	○	○	○	○	○	○	×	×	−	−
With C-Lube plate (4)	/Q	−	○	○	○	○	○	○	○	○	○	−	−
Double end seals	/V○	−	○	○	○	○	○	○	○	○	○	−	−
Scrapers	/Z○	−	○	○	○	○	○	○	○	○	○	−	−

Notes (1) Applicable to flange type (MX, MXG, MXH20, MXHG20, LRX, LRXG, LRXH20, LRXHG20).
(2) Not applicable to stainless steel made products.
(3) Not applicable to low profile flange type (MXN, MXNG, MXNL) and low profile block type (MXNS, MXNSG, MXNSL).
(4) Applicable to LRX series.

Table 7.2 Application of special specifications (Interchangeable specification, single track rail)

Special specification	Supplemental code	Size											
		10	12	15	20	25	30	35	45	55	65	85	100
Specified rail mounting hole positions	/E	−	○	○	○	○	○	○	○	○	○	−	−
Caps for rail mounting holes	/F	−	○	○	○	○	○	○	○	○	○	−	−
Half pitch mounting holes for track rail	/HP	−	○	○	○	○	○	○	○	○	○	−	−
Female threads for bellows (1)	/J	−	×	○	○	○	○	○	○	○	○	−	−
Black chrome surface treatment	/LR	−	○	○	○	○	○	○	○	○	○	−	−
Without track rail mounting bolt	/MN	−	○	○	○	○	○	○	○	○	○	−	−
Butt-jointing track rails	/T	−	○	○	○	○	○	○	○	○	○	−	−

Note (1) Not applicable to stainless steel made products.

Table 7.3 Application of special specifications (Interchangeable specification, assembled set)

Special specification	Supplemental code	Size											
		10	12	15	20	25	30	35	45	55	65	85	100
Opposite reference surfaces arrangement	/D	−	○	○	○	○	○	○	○	○	○	−	−
Specified rail mounting hole positions	/E	−	○	○	○	○	○	○	○	○	○	−	−
Caps for rail mounting holes	/F	−	○	○	○	○	○	○	○	○	○	−	−
Changed pitch of slide unit middle mounting holes (1)	/GE	−	×	○	○	○	○	○	○	○	○	−	−
Half pitch mounting holes for track rail	/HP	−	○	○	○	○	○	○	○	○	○	−	−
Female threads for bellows (2)	/J○	−	×	○	○	○	○	○	○	○	○	−	−
Black chrome surface treatment	/L○	−	○	○	○	○	○	○	○	○	○	−	−
Fluorine black chrome surface treatment	/LF○	−	○	○	○	○	○	○	○	○	○	−	−
With track rail mounting bolt (3)	/MA	−	○	○	○	○	○	○	○	○	○	−	−
Without track rail mounting bolt (4)	/MN	−	○	○	○	○	○	○	○	○	○	−	−
No end seal (5)	/N	−	○	○	○	○	○	○	○	×	×	−	−
With C-Lube plate (4)	/Q	−	○	○	○	○	○	○	○	○	○	−	−
Butt-jointing track rails	/T	−	○	○	○	○	○	○	○	○	○	−	−
Double end seals	/V○	−	○	○	○	○	○	○	○	○	○	−	−
Specified grease (6)	/Y○	−	○	○	○	○	○	○	○	○	○	−	−
Scrapers	/Z○	−	○	○	○	○	○	○	○	○	○	−	−

Notes (1) Applicable to flange type (MX, MXG, MXH20, MXHG20, LRX, LRXG, LRXH20, LRXHG20).
(2) Not applicable to stainless steel made products.
(3) Applicable to MX series.
(4) Applicable to LRX series.
(5) Not applicable to low profile flange type (MXN, MXNG, MXNL) and low profile block type (MXNS, MXNSG, MXNSL).
(6) MX series is applicable only to /YCG.

Table 7.4 Application of special specifications (Non-interchangeable specification)

Special specification	Supplemental code	Size											
		10	12	15	20	25	30	35	45	55	65	85	100
Butt-jointing track rails	/A	○	○	○	○	○	○	○	○	○	○	○	○
Opposite reference surfaces arrangement	/D	○	○	○	○	○	○	○	○	○	○	○	○
Specified rail mounting hole positions	/E	○	○	○	○	○	○	○	○	○	○	○	○
Caps for rail mounting holes	/F	×	○	○	○	○	○	○	○	○	○	○	○
Changed pitch of slide unit middle mounting holes (1)	/GE	×	×	○	○	○	○	○	○	○	○	×	○
Half pitch mounting holes for track rail	/HP	×	○	○	○	○	○	○	○	○	○	○	×
Inspection sheet	/Ⅰ	○	○	○	○	○	○	○	○	○	○	○	○
Female threads for bellows	/J○	×	×	○	○	○	○	○	○	○	○	○	×
Black chrome surface treatment	/L○	×	○	○	○	○	○	○	○	○	○	×	×
Fluorine black chrome surface treatment	/LF○	×	○	○	○	○	○	○	○	○	○	×	×
With track rail mounting bolt (2)	/MA	○	○	○	○	○	○	○	○	○	○	×	×
Without track rail mounting bolt (3)	/MN	○	○	○	○	○	○	○	○	○	○	○	○
No end seal (4)	/N	○	○	○	○	○	○	○	○	×	×	×	×
Rail cover plate for track rail (3)	/PS	×	×	×	×	×	×	○	○	○	×	×	×
With C-Lube plate (3)	/Q	○	○	○	○	○	○	○	○	○	○	○	×
C-Wiper (2) (5)	/RC○	×	×	×	○	○	○	○	○	○	○	×	×
Inner seal (2)	/UR	×	×	×	○	○	○	○	○	○	○	×	×
Double end seals	/V○	×	○	○	○	○	○	○	○	○	○	○	○
A group of multiple assembled sets (6)	/W○	○	○	○	○	○	○	○	○	○	○	○	×
Specified grease (7)	/Y○	○	○	○	○	○	○	○	○	○	○	○	○
Scrapers	/Z○	×	○	○	○	○	○	○	○	○	○	○	○

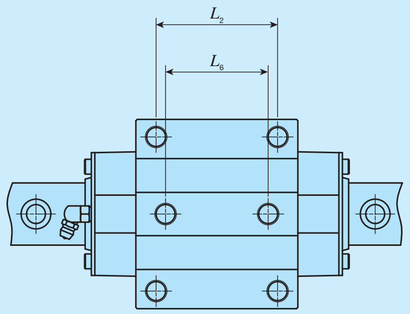
Notes (1) Applicable to flange type (MX, MXG, MXH20, MXHG20, LRX, LRXG, LRXH20, LRXHG20).
(2) Applicable to MX series.
(3) Applicable to LRX series.
(4) Not applicable to low profile flange type (MXN, MXNG, MXNL) and low profile block type (MXNS, MXNSG, MXNSL).
(5) Since inner seal and scraper are mounted simultaneously, indication of "/UR" or "/Z" is not necessary.
(6) LRX85, LRXG85, LRXL85, LRXD85, LRXDG85, LRXDL85 are applicable only to High (H) and Precision (P).
(7) MX series is applicable only to /YCG.

Table 8 Combination of supplemental codes

D	○																				
E	–	–																			
F	○	○	○																		
GE	○	○	○	○																	
HP	–	○	–	○	○																
I	○	○	○	○	○	○															
J	○	○	○	○	○	–	○														
L	○	○	○	○	○	○	○	○													
LF	○	○	○	○	○	○	○	○	–												
MA	○	○	○	○	○	○	○	○	○	○											
MN	○	○	○	○	○	○	○	○	○	○	–										
N	○	○	○	–	○	○	○	–	○	○	○	○									
PS	–	○	○	–	○	○	○	○	–	–	–	○	–								
Q	○	○	○	○	○	○	○	–	○	○	–	○	○	○							
RC	–	○	○	○	○	○	○	–	○	○	○	–	–	–	–						
T	–	○	○	○	○	○	–	–	○	○	○	○	○	–	○	–					
UR	–	○	○	○	○	○	○	○	○	○	○	–	–	–	–	–	–				
V	○	○	○	○	○	○	○	●	○	○	○	○	–	○	–	○	○	○			
W	○	○	–	○	○	○	○	○	○	○	○	○	○	○	○	○	–	○	○		
Y	○	○	○	○	○	○	○	○	○	○	○	○	○	○	–	–	○	–	○	○	
Z	○	○	○	○	○	○	○	●	○	○	○	○	–	–	–	–	○	○	●	○	○
	A	D	E	F	GE	HP	I	J	L	LF	MA	MN	N	PS	Q	RC	T	UR	V	W	Y

Remarks 1. The combination of "—" shown in the table is not available.
2. Contact IKO for the combination of the interchangeable specification marked with ●.
3. When using multiple types for combination, please indicate by arranging the symbols in alphabetical order.

Table 9 Pitch of slide unit middle mounting holes (Supplemental code /GE)

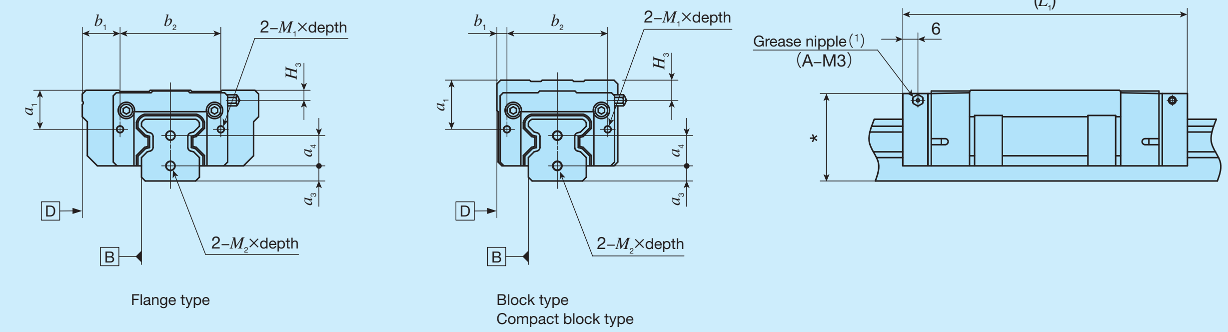


unit: mm

Size	L_2	L_6
15	30	26
20	40	35
25	45	40
30	52	44
35	62	52
45	80	60
55	95	70
65	110	82
100	200	150

Table 10.1 Dimension of female threads for bellows (Supplemental code Single unit: /J Assembled set: /J /JJ)

Size 15, 20, 25 and 30



unit: mm

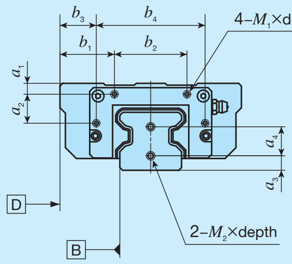
Identification number		Slide unit						Track rail		
		a_1	b_1	b_2	M_1×depth	L_1(2)	H_3	a_3	a_4	M_2×depth
MXC 15	LRXC 15	10.5	10.5	26	M3×6	67	1	4	8	M3×6
MX 15	LRX 15					83				
MXG 15	LRXG 15					99				
MXDC 15	LRXDC 15	14.5	4			67	5			
MXD 15	LRXD 15					83				
MXDG 15	LRXDG 15					99				
MXSC 15	LRXSC 15	10.5				67	1			
MXS 15	LRXS 15					83				
MXSG 15	LRXSG 15					99				
MXC 20(3)	LRXC 20(3)	12	13.5	36	M3×6	81	2	5	10	M4×8
MX 20(3)	LRX 20(3)					101				
MXG 20(3)	LRXG 20(3)					121				
MXL 20(3)	–					143				
MXDC 20	LRXDC 20	16	4			81	6			
MXD 20	LRXD 20					101				
MXDG 20	LRXDG 20					121				
MXDL 20	–					143				
MXSC 20	LRXSC 20	12				81	2			
MXS 20	LRXS 20					101				
MXSG 20	LRXSG 20					121				
MXSL 20	–					143				
MXC 25	LRXC 25	15.5	15	40	M3×6	89	4	6	12	M4×8
MX 25	LRX 25					113				
MXG 25	LRXG 25					128				
MXL 25	–					152				
MXDC 25	LRXDC 25	19.5	4			89	8			
MXD 25	LRXD 25					113				
MXDG 25	LRXDG 25					128				
MXDL 25	–					152				
MXSC 25	LRXSC 25	15.5				89	4			
MXS 25	LRXS 25					113				
MXSG 25	LRXSG 25					128				
MXSL 25	–					152				
MXC 30	LRXC 30	18.5	20	50	M3×6	100	4.8	7	14	M4×8
MX 30	LRX 30					128				
MXG 30	LRXG 30					149				
MXL 30	–					177				
MXDC 30	LRXDC 30	21.5	5			100	7.8			
MXD 30	LRXD 30					128				
MXDG 30	LRXDG 30					149				
MXDL 30	–					177				
MXSC 30	LRXSC 30	18.5				100	4.8			
MXS 30	LRXS 30					128				
MXSG 30	LRXSG 30					149				
MXSL 30	–					177				

Notes (1) The specification and mounting positions of grease nipple are different from those of the standard specification product. Note that grease nipple for size 30 models is A-M4 type. For grease nipple specification, see Table 14.1 on page Ⅲ－23.
(2) Dimensions of the specification that female threads for bellows are fitted to both ends of the slide unit are indicated.
(3) This is also applicable to the models allowing mounting from bottom (MXHC20, MXH20, MXHG20, MXHL20, LRXHC20, LRXH20 and LRXHG20).

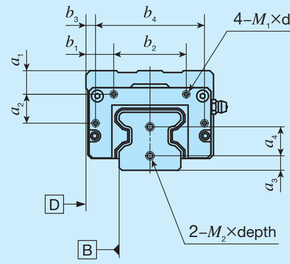
Remarks 1. Size 15 and 20 series of flange type and compact block type will have the dimension with * mark higher than the dimensions of assembly *H*. For details of dimensions, contact IKO.
2. This is also applicable to stainless steel type models of the same size.

Table 10.2 Dimension of female threads for bellows (Supplemental code Single unit: /J Assembled set: /J /JJ)

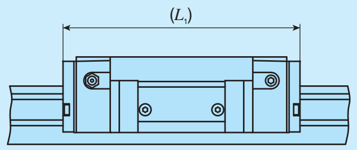
Size 35, 45, 55, 65 and 85



Flange type



Block type
Compact block type

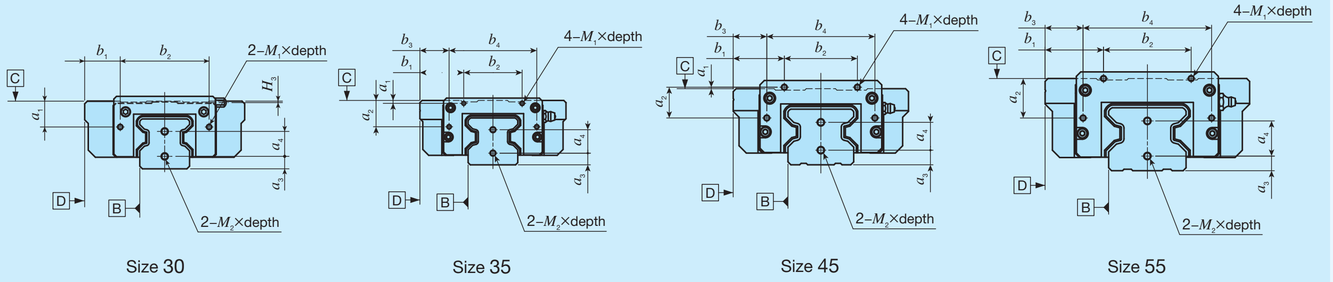


unit: mm

Identification number		Slide unit								Track rail		
		a_1	a_2	b_1	b_2	b_3	b_4	M_1×depth	L_1(1)	a_3	a_4	M_2×depth
MXC 35	LRXC 35	6	16	30	40	20	60	M3× 6	99	8	16	M4× 8
MX 35	LRX 35								131			
MXG 35	LRXG 35								159			
MXL 35	–								191			
MXDC 35	LRXDC 35	13		15		5			99			
MXD 35	LRXD 35								131			
MXDG 35	LRXDG 35								159			
MXDL 35	–								191			
MXS 35	–	6							131			
MXSG 35	–								159			
MXC 45	LRXC 45	7	21	35	50	23	74	M4× 8	123	10	19	M5×10
MX 45	LRX 45								163			
MXG 45	LRXG 45								203			
MXL 45	–								243			
MXDC 45	LRXDC 45	17		18		6			123			
MXD 45	LRXD 45								163			
MXDG 45	LRXDG 45								203			
MXDL 45	–								243			
MXS 45	–	7							163			
MXSG 45	–								203			
MXC 55	LRXC 55	7	27	40	60	26	88	M4× 8	145	10	24	M5×10
MX 55	LRX 55								193			
MXG 55	LRXG 55								247			
MXL 55	–								301			
MXDC 55	LRXDC 55	17		20		6			145			
MXD 55	LRXD 55								193			
MXDG 55	LRXDG 55								247			
MXDL 55	–								301			
MXS 55	–	7							193			
MXSG 55	–								247			
MXC 65	–	8.7	37	47.5	75	31	108	M5×10	191	14	28	M6×12
–	LRXC 65								192			
MX 65	–								255			
–	LRX 65								256			
MXG 65	–								319			
–	LRXG 65								320			
MXL 65	–								391			
MXDC 65	–			25.5		9			191			
–	LRXDC 65								192			
MXD 65	–								255			
–	LRXD 65								256			
MXDG 65	–								319			
–	LRXDG 65								320			
MXDL 65	–								391			
–	LRX 85	15	45	62.5	90	37.5	140	M6×10	334	14.5	38	M6×12
–	LRXG 85								406			
–	LRXL 85								505			
–	LRXD 85	15	45	38	90	13	140	M6×10	334	14.5	38	M6×12
–	LRXDG 85								406			
–	LRXDL 85								505			

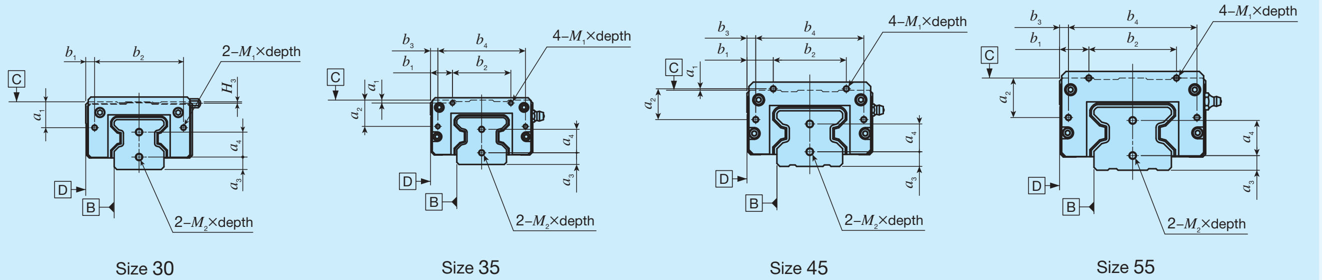
Note (1) Dimensions of the specification that female threads for bellows are fitted to both ends of the slide unit are indicated.

Table 10.3 Dimension of female threads for bellows (Supplemental code Single unit: /J Assembled set: /J /JJ)



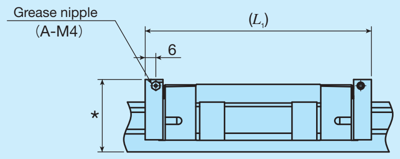
Size 30 Size 35 Size 45 Size 55

Low profile flange type

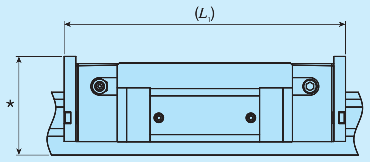


Size 30 Size 35 Size 45 Size 55

Low profile block type



Size 30



Size 35, 45, 55

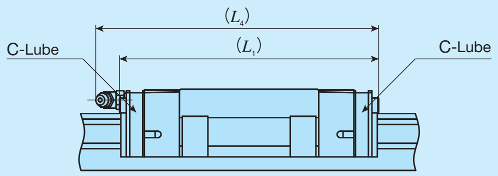
unit: mm

Identification number	Slide unit									Track rail		
	a_1(1)	a_2	b_1	b_2	b_3	b_4	M_1×depth	L_1(2)	H_3	a_3	a_4	M_2×depth
MXN 30	14.5	–	20	50	–	–	M3×6	128	0.8	7	14	M4× 8
MXNG 30								149				
MXNL 30								177				
MXNS 30			5					128				
MXNSG 30								149				
MXNSL 30								177				
MXN 35	2	16	30	40	20	60	M3×6	131	–	8	16	M4× 8
MXNG 35								159				
MXNL 35								191				
MXNS 35			15		5			131				
MXNSG 35								159				
MXNSL 35								191				
MXN 45	1	21	35	50	23	74	M4×8	163	–	10	19	M5×10
MXNG 45								203				
MXNL 45								243				
MXNS 45			18		6			163				
MXNSG 45								203				
MXNSL 45								243				
MXN 55	0	27	40	60	26	88	M4×8	193	–	10	24	M5×10
MXNG 55								247				
MXNL 55								301				
MXNS 55			20		6			193				
MXNSG 55								247				
MXNSL 55								301				

Notes (1) a_1 shows the dimension between mounting surface C and upper female thread.
(2) Dimensions of the specification that female threads for bellows are fitted to both ends of the slide unit are indicated.
Remark: The dimension of * is higher than the dimensions of assembly H. For details of dimensions, contact IKO.

Table 11.1 Dimension of slide unit with C-Lube plate (Supplemental code /Q)

Size: 10, 12, 15, 20, 25, 30



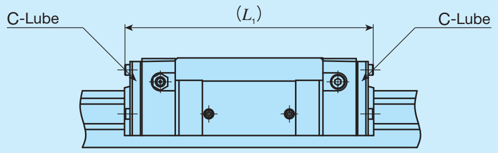
unit: mm

Identification number	L_1	L_4
LRXD 10…SL	44	–
LRXC 12	47	50
LRX 12	57	60
LRXG 12	68	71
LRXC 15	63	64
LRX 15	79	80
LRXG 15	95	96
LRXC 20	76	84
LRX 20	96	104
LRXG 20	116	124
LRXC 25	85	93
LRX 25	109	117
LRXG 25	124	132
LRXC 30	96	107
LRX 30	124	135
LRXG 30	145	156

Remarks 1. The dimensions of the slide unit with C-Lube at both ends are indicated.
2. A typical identification number is indicated, but is applied to all LRX series models of the same type.

Table 11.2 Dimension of slide unit with C-Lube plate (Supplemental code /Q)

Size: 35, 45, 55, 65, 85



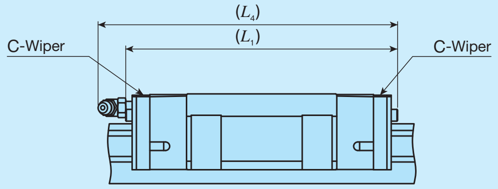
unit: mm

Identification number	L_1
LRXC 35	103
LRX 35	135
LRXG 35	163
LRXC 45	127
LRX 45	167
LRXG 45	207
LRXC 55	149
LRX 55	197
LRXG 55	251
LRXC 65	198
LRX 65	262
LRXG 65	326
LRX 85	341
LRXG 85	413
LRXL 85	512

Remarks 1. The dimensions of the slide unit with C-Lube at both ends are indicated.
2. A typical identification number is indicated, but is applied to all LRX series models of the same type.

Table 12.1 Dimension of slide unit with C-Wiper (Supplemental code Assembled set: /RC /RCC)

Size: 20, 25, 30



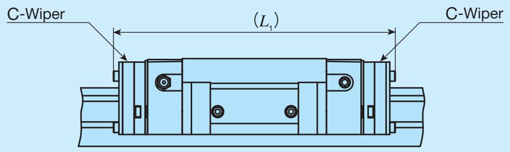
unit: mm

Identification number	L_1	L_4
MXC 20	80	90
MX 20	100	110
MXG 20	120	130
MXL 20	142	153
MXC 25	89	99
MX 25	113	123
MXG 25	128	138
MXL 25	152	162
MXC 30	100	113
MX 30	128	141
MXN 30		138
MXG 30	149	162
MXNG 30		159
MXL 30	177	190
MXNL 30		187

Remarks 1. The dimensions of the slide unit with C-Wiper at both ends are indicated.
2. A typical identification number is indicated, but is applied to all MX series models of the same size.

Table 12.2 Dimension of slide unit with C-Wiper (Supplemental code Assembled set: /RC /RCC)

Size: 35, 45, 55, 65



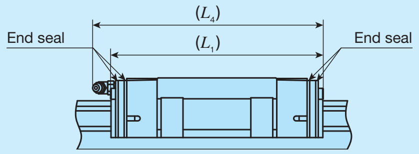
unit: mm

Identification number	L_1
MXC 35	123
MX 35	155
MXG 35	183
MXL 35	215
MXC 45	149
MX 45	189
MXG 45	229
MXL 45	269
MXC 55	172
MX 55	220
MXG 55	274
MXL 55	328
MXC 65	223
MX 65	287
MXG 65	351
MXL 65	423

Remarks 1. The dimensions of the slide unit with C-Wiper at both ends are indicated.
2. A typical identification number is indicated, but is applied to all MX series models of the same size.

Table 13.1 Dimension of slide unit with double end seals (Supplemental code Single unit: /V Assembled set: /V /VV)

Size: 12, 15, 20, 25, 30



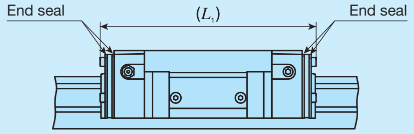
unit: mm

Identification number		L_1	L_4
MXC 12	–	49	52
–	LRXC 12	44	46
MX 12	–	58	61
–	LRX 12	54	57
MXG 12	–	70	72
–	LRXG 12	65	67
MXC 15	LRXC 15	58	59
MX 15	LRX 15	74	75
MXG 15	LRXG 15	90	91
MXC 20	LRXC 20	73	83
MX 20	LRX 20	93	103
MXG 20	LRXG 20	113	123
MXL 20	–	135	145
MXC 25	LRXC 25	83	92
MX 25	LRX 25	107	116
MXG 25	LRXG 25	122	131
MXL 25	–	146	155
MXC 30	LRXC 30	93	106
MX 30	LRX 30	121	134
MXN 30	–		131
MXG 30	LRXG 30	142	155
MXNG 30	–		152
MXL 30	–	170	183
MXNL 30	–		180

Remarks 1. The dimensions of the slide unit with double end seals at both ends are indicated.
2. A typical identification number is indicated, but is applied to all models of the same size.

Table 13.2 Dimension of slide unit with double end seals (Supplemental code Single unit: /V Assembled set: /V /VV)

Size: 35, 45, 55, 65, 85, 100



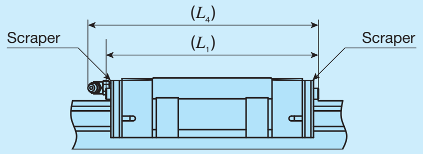
unit: mm

Identification number		L_1
MXC 35	LRXC 35	101
MX 35	LRX 35	133
MXG 35	LRXG 35	161
MXL 35	–	193
MXC 45	LRXC 45	127
MX 45	LRX 45	167
MXG 45	LRXG 45	207
MXL 45	–	247
MXC 55	LRXC 55	149
MX 55	LRX 55	197
MXG 55	LRXG 55	251
MXL 55	–	305
MXC 65	–	192
–	LRXC 65	193
MX 65	–	256
–	LRX 65	257
MXG 65	–	320
–	LRXG 65	321
MXL 65	–	392
–	LRX 85	338
–	LRXG 85	410
–	LRXL 85	509
–	LRXG 100	376

Remarks 1. The dimensions of the slide unit with double end seals at both ends are indicated.
2. A typical identification number is indicated, but is applied to all models of the same size.

Table 14.1 Dimension of slide unit with scrapers
(Supplemental code Single unit: /Z
Assembled set: /Z /ZZ)

Size: 12, 15, 20, 25, 30



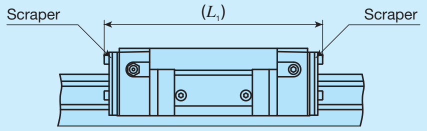
unit: mm

Identification number		L_1	L_4
MXC 12	–	50	53
–	LRXC 12	45	48
MX 12	–	60	63
–	LRX 12	56	58
MXG 12	–	71	74
–	LRXG 12	66	69
MXC 15	LRXC 15	60	61
MX 15	LRX 15	76	77
MXG 15	LRXG 15	92	93
MXC 20	LRXC 20	74	83
MX 20	LRX 20	94	103
MXG 20	LRXG 20	114	123
MXL 20	–	137	146
MXC 25	LRXC 25	85	93
MX 25	LRX 25	109	117
MXG 25	LRXG 25	124	132
MXL 25	–	148	156
MXC 30	LRXC 30	96	107
MX 30	LRX 30	124	135
MXN 30	–		132
MXG 30	LRXG 30	145	156
MXNG 30	–		153
MXL 30	–	173	184
MXNL 30	–		181

Remarks 1. The dimensions of the slide unit with scraper at both ends are indicated.
2. A typical identification number is indicated, but is applied to all models of the same size.

Table 14.2 Dimension of slide unit with scrapers
(Supplemental code Single unit: /Z
Assembled set: /Z /ZZ)

Size: 35, 45, 55, 65, 85, 100



unit: mm

Identification number		L_1
MXC 35	LRXC 35	103
MX 35	LRX 35	135
MXG 35	LRXG 35	163
MXL 35	–	195
MXC 45	LRXC 45	129
MX 45	LRX 45	169
MXG 45	LRXG 45	209
MXL 45	–	249
MXC 55	LRXC 55	151
MX 55	LRX 55	199
MXG 55	LRXG 55	253
MXL 55	–	307
MXC 65	LRXC 65	194
MX 65	LRX 65	258
MXG 65	LRXG 65	322
MXL 65	–	394
–	LRX 85	339
–	LRXG 85	411
–	LRXL 85	510
–	LRXG 100	378

Remarks 1. The dimensions of the slide unit with scraper at both ends are indicated.
2. A typical identification number is indicated, but is applied to all models of the same size.

Lubrication

Lithium-soap base grease with extreme-pressure additive (Alvania EP grease 2 [Shell Lubricants Japan K.K.]) is prepacked in MX series and LRX series. Additionally, MX series has C-Lube placed in the recirculation part of cylindrical roller, so that the interval for reapplicating lubricant can be extended and maintenance works such as grease job can be reduced significantly.

MX series and LRX series have grease nipple or oil hole as indicated in Table 15. Supply nozzles fit to each shapes of grease nipple and dedicated supplying equipment (miniature greasers) fit to oil holes are also available. For order of these parts for lubrication, see Table 13 and Table 14.1 on Page Ⅲ−23, and Table 15 on page Ⅲ−24.

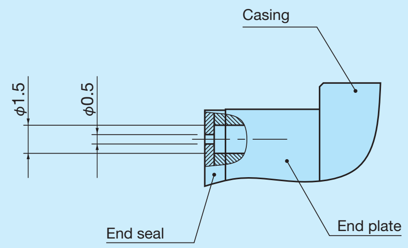


Fig. 2 Oil hole specification of MXD10···SL and LRXD10···SL

Table 15 Parts for lubrication

Size	Grease nipple type (1)	Applicable supply nozzle type	Bolt size of female threads for piping
10	Oil hole	Miniature greaser MG2.5B/EP2	–
12	A-M3	A-5120V A-5240V B-5120V B-5240V	–
15(2)	A-M4		M4
20(2)	B-M4	A-8120V B-8120V	
25(2)			
30(3) (4)	B-M6	Grease gun available on the market	M6
35(5)	JIS1 type		
45(6)	JIS2 type		PT1/8
55			
65			
85			
100	A-PT1/4		PT1/4

Notes (1) For grease nipple specification, see Table 14.1 and Table 14.2 in page Ⅲ−23.
(2) The grease nipple when female threads for bellows (supplemental code "/J") is specified is A-M3.
(3) The grease nipple when female threads for bellows (supplemental code "/J") is specified is A-M4.
(4) The grease nipple for MXN30 is B-M4. The grease nipple when female threads for bellows (supplemental code "/J") is specified is A-M4.
(5) The size of the grease nipple mounting thread hole for MXN35 in the slide unit travelling direction is smaller than that of the crosswise direction. When the grease nipple is mounted along the travelling direction, contact IKO.
(6) The grease nipple for MXN45 is JIS type1.

Remark: Stainless steel grease nipple is also available. If needed, please contact IKO.

Dust Protection

The slide units of MX series and LRX series are equipped with end seals and under seals as standard for dust protection. However, if large amount of contaminant or dust are floating, or if large particles of foreign substances such as chips or sand may adhere to the track rail, it is recommended to cover the whole unit with bellows or telescope type shield, etc.

MX series and LRX series are provided with specific bellows. The bellows are easy to mount and provide excellent dust protection. If needed, please refer to Ⅱ−26 for ordering.

Also the rail cover sheet to cover the mounting hole of track rail (Fig. 3) and track rail mounting from bottom with no mounting hole on the upper surface (Fig. 4) are available. If needed, please contact IKO.

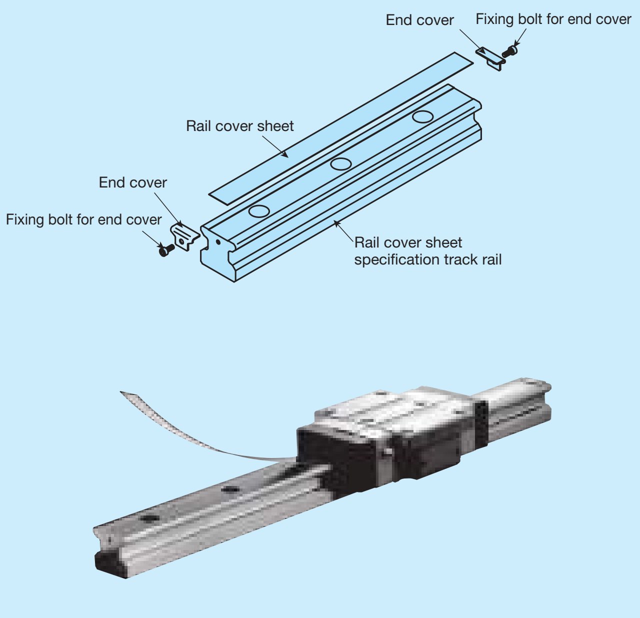


Fig. 3 Rail cover sheet

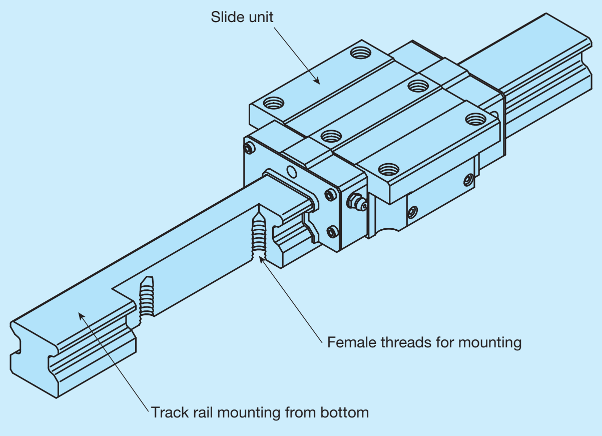


Fig. 4 Track rail mounting from bottom specification

Precaution for Use

❶ Mounting surface, reference mounting surface and typical mounting structure

When mounting the MX series and LRX series, properly align the reference mounting surfaces B and D of the track rail and slide unit with the reference mounting surface of the table anend bed and fix them. (See Fig. 5.)

The reference mounting surfaces B and D and mounting surfaces A and C are precisely ground. Machining the mounting surface of the table and bed, such as machine or device, to high accuracy and mounting them properly will ensure stable liar motion with high accuracy.

Reference mounting surface of the slide unit is the opposite side of the IKO mark. The track rail reference mounting surface is identified by locating the IKO mark on the top surface of the track rail. It is the side surface above the mark (in the direction of the arrow). (See Fig. 6.)

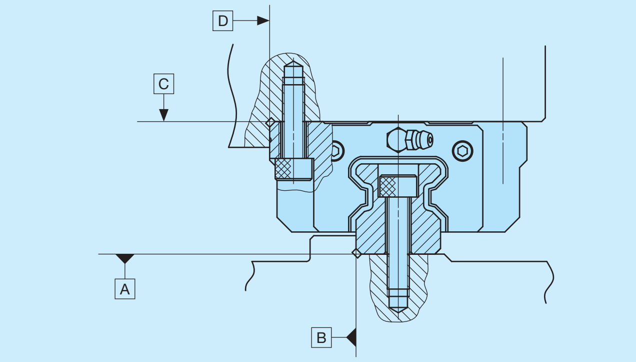


Fig. 5 Reference mounting surface and typical mounting structure

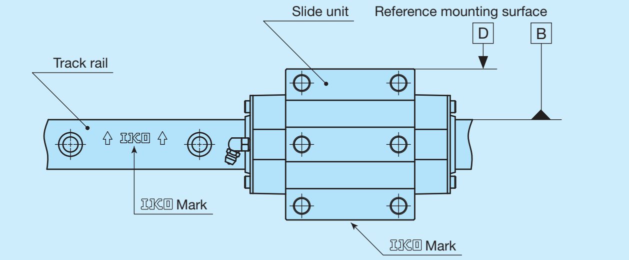


Fig. 6 Reference mounting surface

❷ Fixing the slide unit

Slide unit is also provided with mounting holes in the middle of width direction (see Fig. 7) and some products have the arrangement to receive the applied load in a good balance. When designing machines or equipment, consider the arrangement so that the mounting holes in the middle of slide unit can also be used to fix the units, to use the highest performance out of the product.

To fix the slide unit of compact block type or low profile block type, we recommend to secure the fixing thread depth of Table 16.1and Table 16.2. Also, with the low profile flange type and low profile block type, make sure that the fixing thread depth for the mounting screw in the middle of slide unit width direction should be less than the maximum fixing thread depth of the dimension table.

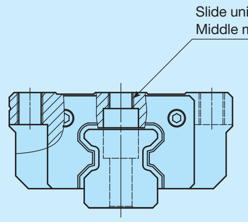


Fig. 7 Slide unit middle mounting hole

Table 16.1 Fixing thread depth for slide unit mounting hole of compact block type

unit: mm

Identification number		Recommended minimum fixing thread depth
MXS 15	LRXS 15	4.5
MXS 20	LRXS 20	5.5
MXS 25	LRXS 25	7
MXS 30	LRXS 30	9

Remark: A typical identification number is indicated, but is applied to all compact block types of the same size.

Table 16.2 Fixing thread depth for slide unit mounting hole of low profile block type

unit: mm

Identification number	Recommended minimum fixing thread depth
MXNS 30	8
MXNS 35	8.5
MXNS 45	10.5
MXNS 55	14

Remark: A typical identification number is indicated, but is applied to all low profile block types of the same size.

❸ Shoulder height and corner radius of the reference mounting surface

For the opposite corner of the mating reference mounting, it is recommended to have relieved fillet as indicated in Fig. 8, but you may also use it with providing corner radius R as shown in Table 17. Recommended value for the shoulder height and corner radius on the mating side is indicated in Table 17.

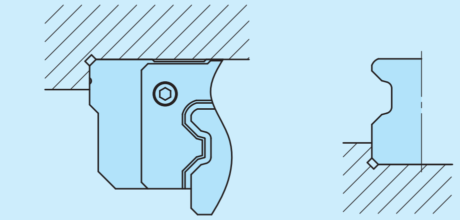
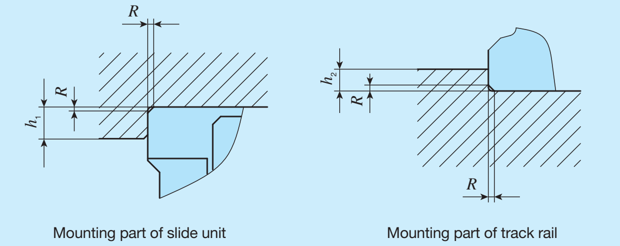


Fig. 8 Corner of the mating reference mounting

Table 17 Shoulder height and corner radius of the reference mounting surface



unit: mm

Size	Shoulder height of slide unit mounting part h_1	Shoulder height of track rail mounting part h_2	Corner radius R (Maximum)
10	4	1	0.3
12	4	2	0.5
15	4	3	0.5
20	5	4	0.5
25	6	5	1
30	8	5.5	1
35	8	5.5	1
45	8	7	1.5
55	10	8	1.5
65	10	10	1.5
85	14	14	2.5 (Slide unit) 1.5 (Track rail)
100	14	13	2.5

❹ Tightening torque for fixing screw

Typical tightening torque for mounting of the MX series and LRX series to the steel mating member material is indicated in Table 18. When vibration and shock of the machine or device are large, fluctuating load is large, or moment load is applied, fix it by using the torque 1.2 to 1.5 times larger than the value indicated in the table as necessary. If the mating member material is cast iron or aluminum alloy, reduce the tightening torque depending on the strength characteristics of the mating member material.

Table 18 Tightening torque for fixing screw

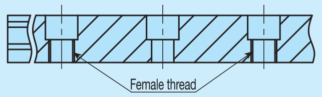
Bolt size	Tightening torque N・m		
	High carbon steel-made screw		Stainless steel-made screw
	Size 12 to 65	Size 85 and 100	
M 2.6×0.45	–	–	0.70
M 3 ×0.5	1.8	–	1.1
M 4 ×0.7	4.1	–	2.5
M 5 ×0.8	8.0	–	5.0
M 6 ×1	13.6	–	8.5
M 8 ×1.25	32.7	–	20.4
M10 ×1.5	63.9	–	–
M12 ×1.75	110	–	–
M14 ×2	175	–	–
M16 ×2	268	–	–
M20 ×2.5	522	–	–
M24 ×3	–	749	–
M30 ×3.5	–	1 490	–

Remarks 1. The tightening torque is calculated based on strength division 12.9 for product size 12 to 65, strength division 10.9 for product sizes 85 and 100, and property division A2-70 for stainless steel bolts.

2. It is recommended that the tightening torque of slide unit middle mounting holes for size 15, 20, 25, 30, 35 of flange type (MXC, MX, MXG, MXL, LRXC, LRX, LRXG) is to be 70 to 80% of the values in the table.

❺ Remarks

- As LRX(D)(G,L)85 and LRXG100 are heavyweight products, we recommend the use of eyebolts for transport and assembly. For eyebolt mounting, use the slide unit mounting holes and the track rail female threads for eyebolts (Fig. 9). For the LRXG100 track rail, also use the LRXG100 track rail dedicated eyebolt adapter (Fig. 10).
- LRX(D)(G,L)85 slide unit eyebolts (JIS B1168 M20) and LRX85 track rail dedicated eyebolts (Fig. 11) are not appended. If needed, please contact IKO.



Identification number	Bolt size
LRX85	M30
LRXG100	M36

Track rails of length 1000 mm or more have the female threads at two or more mounting hole positions.

Fig. 9 Track rail female threads for eyebolts

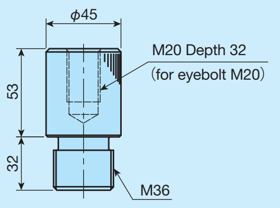


Fig. 10 LRXG100 track rail dedicated eyebolt adapter

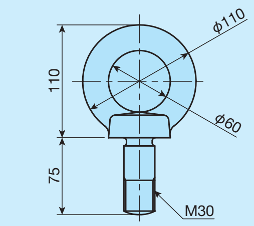
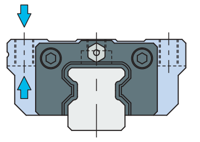
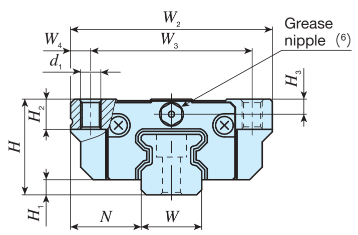


Fig. 11 LRX85 track rail dedicated eyebolt

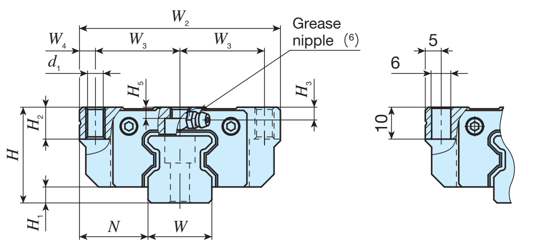
IKO C-Lube Linear Roller Way Super MX

Flange type mounting from top / bottom

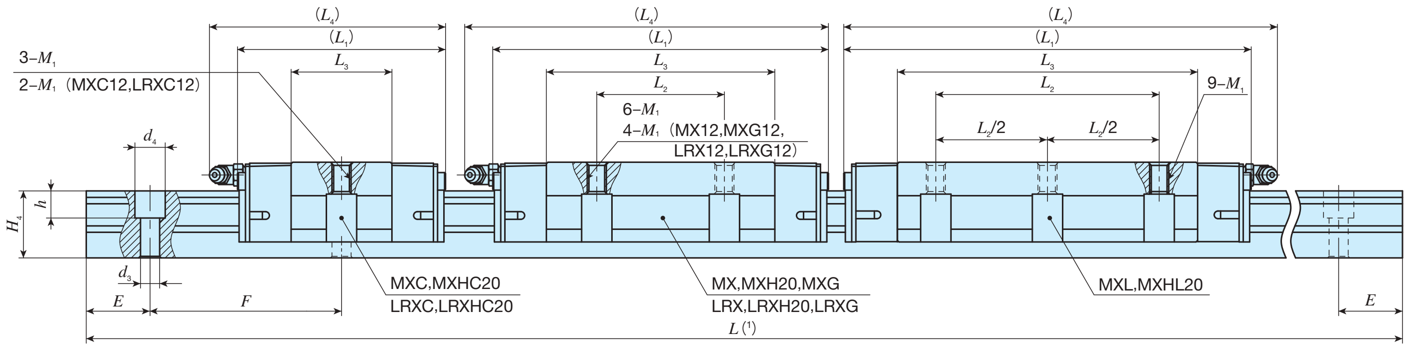
Shape	**MX** • **LRX** 					
Size	**12**	**15**	**20**	25	30	
	35	45	55	65	85	100



MXC12,LRXC12
MX 12,LRX 12
MXG12,LRXG12



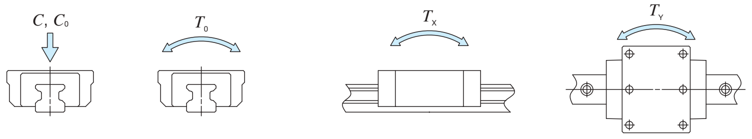
MXHC20,LRXHC 20
MXH 20,LRXH 20
MXHG20,LRXHG 20
MXHL 20
Mounting from bottom only (3)



Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm												Dimensions of track rail mm							Appended mounting bolt for track rail (4)	Basic dynamic load rating (5)	Basic static load rating (5)	Static moment rating (5)		
MX series	LRX series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	d_1	M_1	H_2	H_3	H_5	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MXC 12		○	0.058	0.92	19	3	14	40	32	4	40	–	15.8	44	3.4	M4	6	3	–	12	12	3.5	6	4.5	20	40	M3×12	4 250	6 500	49.4	18.6 196	18.6 196
	LRXC 12	○									37		14.8	40														3 900	6 090	46.3	16.3 170	16.3 170
MX 12		○	0.092								50	15	25.4	53														6 120	10 400	79.1	45.8 371	45.8 371
	LRX 12	○									47		25.3	50														5 890		78.7	45.2 343	45.2 343
MXG 12		○	0.13								61		36.6	64														8 120	15 000	114	92.7 628	92.7 628
	LRXG 12	○									58		35.8	61														7 710	14 600	111	88.6 581	88.6 581
MXC 15	LRXC 15	○	0.13	1.65	24	4	16	47	19	4.5	52	–	24	55	4.4	M5	7	3.5	3	15	16.5	4.5	8	6	30	60	M4×16	7 730	12 000	113	50.6 457	50.6 457
MX 15	LRX 15	○	0.20								68	30	40	71														11 500	20 000	188	136 942	136 942
MXG 15	LRXG 15	○	0.28								84		56	87														14 900	28 000	263	262 1 590	262 1 590
MXC 20(2)	LRXC 20(2)	○	0.29	2.73	30	5	21.5	63	26.5	5	66	–	31.6	74	–(2)	M6(2)	10	4	3.5	20	21	6	9.5	8.5	30	60	M5×20	16 100	26 400	341	150 1 260	150 1 260
MX 20(2)	LRX 20(2)	○	0.44								86	40	51.6	94														23 400	42 700	550	379 2 520	379 2 520
MXG 20(2)	LRXG 20(2)	○	0.61								106		71.6	114														30 100	58 900	760	713 4 200	713 4 200
MXL 20(2)	–	–	0.80								128	70	94.1	137														37 200	77 200	996	1 210 6 560	1 210 6 560
MXHC 20(3)	LRXHC 20(3)	○	0.29								66	–	31.6	74	–	–												16 100	26 400	341	150 1 260	150 1 260
MXH 20(3)	LRXH 20(3)	○	0.44								86	40	51.6	94														23 400	42 700	550	379 2 520	379 2 520
MXHG 20(3)	LRXHG 20(3)	○	0.61								106		71.6	114														30 100	58 900	760	713 4 200	713 4 200
MXHL 20(3)	–	–	0.80								128	70	94.1	137														37 200	77 200	996	1 210 6 560	1 210 6 560

Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ－175 and Table 2.3 on page Ⅱ－176 .
(2) The mounting bolt can be mounted only in downward direction.
(3) The mounting bolt can be mounted only in upward direction.
(4) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. In an assembled set of MX series, track rail mounting bolts are not appended.
(5) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.
(6) The shapes of grease nipple vary by size. The specifications are shown in Table 15 on page Ⅱ－188.

Remark: A grease nipple mounting thread hole is provided on the right and left end plates respectively.



Example of identification number of assembled set

Model code		Dimensions	Part code		Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MX	G	15	C2	R360	T1	P		/F
①	②	③	④	⑤	⑥	⑦	⑧	⑨

① Model	
MX LRX	Flange type mounting from top / bottom
MXH LRXH	Flange type mounting from bottom

② Length of slide unit	
C	Short
No symbol	Standard
G	Long
L	Extra long

③ Size

12, 15, 20

④ Number of slide unit (2)

⑤ Length of track rail (360 mm)

⑥ Preload amount	
No symbol	Standard
T1	Light preload
T2	Medium preload
T3	Heavy preload

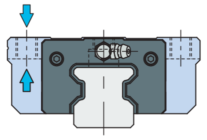
⑦ Accuracy class	
H	High
P	Precision
SP	Super precision
UP	Ultra precision

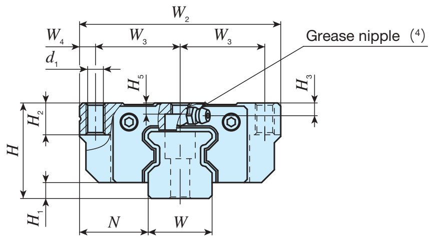
⑧ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

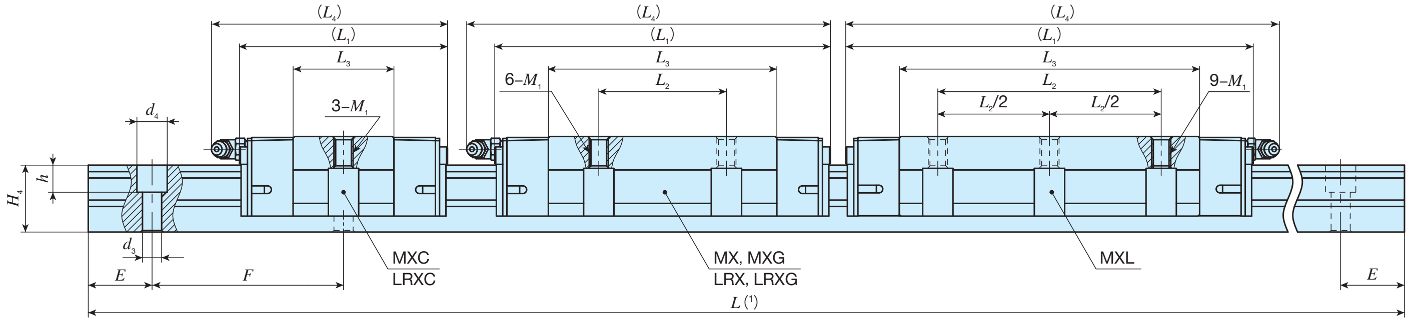
⑨ Special specification

A, D, E, F, GE, HP, Ⅰ, J, L
LF, MA, MN, N, Q, RC, T
UR, V, W, Y, Z

IKO C-Lube Linear Roller Way Super MX

Flange type mounting from top / bottom	
	MX • **LRX**
Shape	
Size	12 15 20 **25** **30** 35 45 55 65 85 100





Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm													Dimensions of track rail mm							Appended mounting bolt for track rail (2)	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
MX series	LRX series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	d_1	M_1	H_2	H_3	H_5	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MXC 25	LRXC 25	○	0.44	3.59	36	6	23.5	70	28.5	6.5	74	–	36	83	7	M 8	10	5	5	23	24.5	7	11	9	30	60	M6×25	21 600	33 800	500	213 1 810	213 1 810
MX 25	LRX 25	○	0.67								98	45	60	107														32 100	56 300	833	573 3 800	573 3 800
MXG 25	LRXG 25	○	0.84								113		75	122														38 200	70 300	1 040	885 5 380	885 5 380
MXL 25	–	–	1.08								137	70	99	146														47 400	92 800	1 370	1 530 8 480	1 530 8 480
MXC 30	LRXC 30	○	0.78	5.01	42	6.5	31	90	36	9	85	–	42.4	95	8.5	M10	10	6.5	5.5	28	28	9	14	12	40	80	M8×28	29 200	44 600	808	329 2 740	329 2 740
MX 30	LRX 30	○	1.20								113	52	70.4	123														43 400	74 400	1 350	883 5 780	883 5 780
MXG 30	LRXG 30	○	1.58								134		91.4	144														53 200	96 700	1 750	1 470 8 740	1 470 8 740
MXL 30	–	–	2.03								162	80	119.4	172														65 600	126 000	2 290	2 500 13 600	2 500 13 600

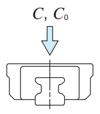
Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ－175 and Table 2.3 on page Ⅱ－176 .

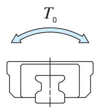
(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. In an assembled set of MX series, track rail mounting bolts are not appended.

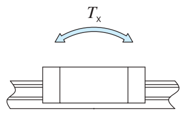
(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

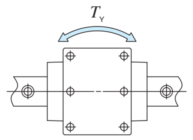
(4) The shapes of grease nipple vary by size. The specifications are shown in Table 15 on page Ⅱ－188.

Remark: A grease nipple mounting thread hole is provided on the right and left end plates respectively.









Example of identification number of assembled set

Model code		Dimensions	Part code		Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MX	G	25	C2	R840	T1	P		/F
❶	❷	❸	❹	❺	❻	❼	❽	❾

① Model	
MX LRX	Flange type mounting from top / bottom

② Length of slide unit	
C	Short
No symbol	Standard
G	Long
L	Extra long

③ Size
25, 30

④ Number of slide unit （2）

⑤ Length of track rail （840 mm）

⑥ Preload amount	
No symbol	Standard
T1	Light preload
T2	Medium preload
T3	Heavy preload

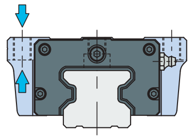
⑦ Accuracy class	
H	High
P	Precision
SP	Super precision
UP	Ultra precision

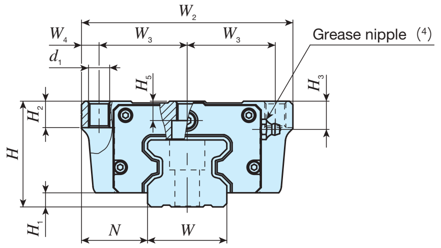
⑧ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

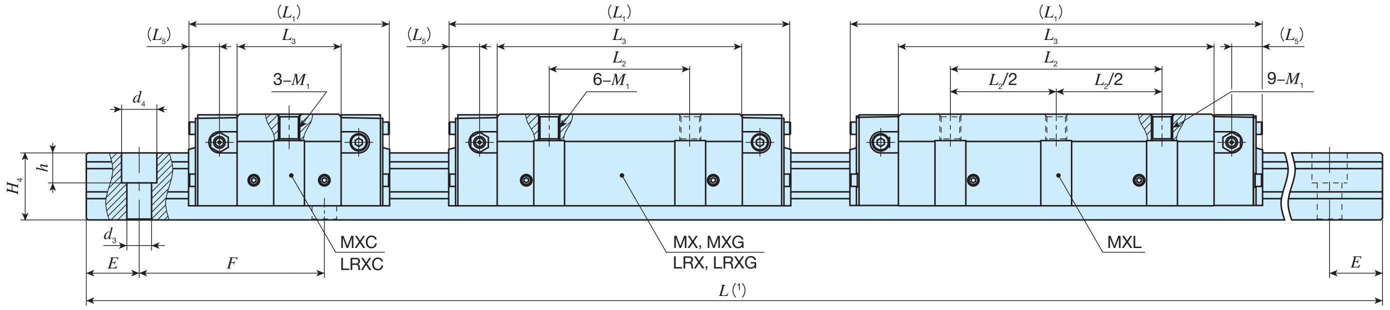
⑨ Special specification
A, D, E, F, GE, HP, Ⅰ, J, L LF, MA, MN, N, Q, RC, T UR, V, W, Y, Z

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO C-Lube Linear Roller Way Super MX

Flange type mounting from top / bottom						
	MX • **LRX**					
Shape						
Size	12	15	20	25	30	
	35	**45**	55	65	85	100





Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm												Dimensions of track rail mm							Appended mounting bolt for track rail (2)	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
MX series	LRX series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_5	d_1	M_1	H_2	H_3	H_5	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MXC 35		○	1.13	6.88	48	6.5	33	100	41	9	92	–	46.6	12.7	8.5	M10	13	13	7	34	32	9	14	12	40	80	M 8×35	39 500	60 000	1 300	506 3 950	506 3 950
	LRXC 35	○												12.5																		
MX 35		○	1.76								124	62	78.6	12.7														58 700	100 000	2 170	1 360 8 470	1 360 8 470
	LRX 35	○												12.5																		
MXG 35		○	2.41								152		106.6	12.7														74 200	135 000	2 930	2 440 13 800	2 440 13 800
	LRXG 35	○												12.5																		
MXL 35	–	–	3.00								184	100	138.6	12.7														90 800	175 000	3 800	4 060 21 300	4 060 21 300
MXC 45	LRXC 45	○	2.11	10.8	60	8	37.5	120	50	10	114	–	59	17.5	10.5	M12	15	16	11	45	38	14	20	17	52.5	105	M12×40	64 100	95 600	2 660	1 010 7 800	1 010 7 800
MX 45	LRX 45	○	3.26								154	80	99															95 400	159 000	4 430	2 700 16 800	2 700 16 800
MXG 45	LRXG 45	○	4.60								194		139															124 000	223 000	6 200	5 220 29 000	5 220 29 000
MXL 45	–	–	5.66								234	120	179															151 000	287 000	7 980	8 560 44 400	8 560 44 400

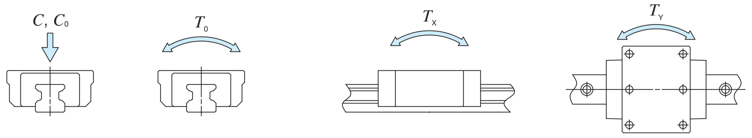
Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ－175 and Table 2.3 on page Ⅱ－176 .

(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. In an assembled set of MX series, track rail mounting bolts are not appended.

(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

(4) The shapes of grease nipple vary by size. The specifications are shown in Table 15 on page Ⅱ－188.

Remark: Three grease nipple mounting thread holes are provided on the right and left end plates respectively.



Example of identification number of assembled set

Model code		Dimensions	Part code		Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MX	G	35	C2	R1200	T_2	P		/F
1	2	3	4	5	6	7	8	9

① Model	
MX LRX	Flange type mounting from top / bottom

② Length of slide unit	
C	Short
No symbol	Standard
G	Long
L	Extra long

③ Size
35, 45

④ Number of slide unit (2)

⑤ Length of track rail (1,200 mm)

⑥ Preload amount	
No symbol	Standard
T_1	Light preload
T_2	Medium preload
T_3	Heavy preload

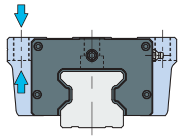
⑦ Accuracy class	
H	High
P	Precision
SP	Super precision
UP	Ultra precision

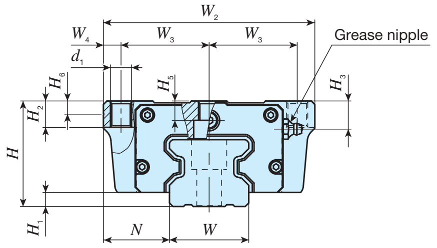
⑧ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

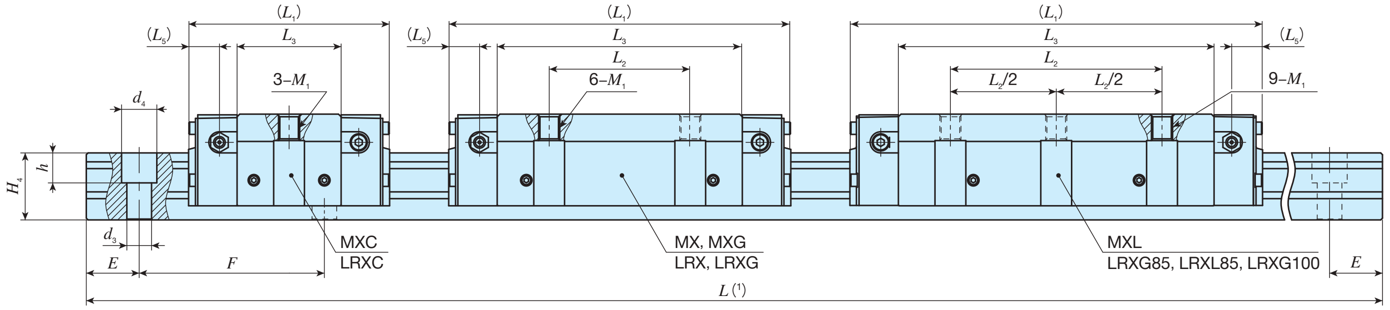
⑨ Special specification
A, D, E, F, GE, HP, Ⅰ, J, L LF, MA, MN, N, PS, Q RC, T, UR, V, W, Y, Z

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO C-Lube Linear Roller Way Super MX

Flange type mounting from top / bottom	
Shape	**MX** • **LRX** 
Size	12 15 20 25 30 35 45 **55** **65** **85** **100**





Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm														Dimensions of track rail mm							Appended mounting bolt for track rail (2)	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
MX series	LRX series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_5	d_1	M_1	H_2	H_3	H_5	H_6	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N · m	T_X N · m	T_Y N · m
MXC 55	LRXC 55	○	3.49	14.1	70	9	43.5	140	58	12	136	–	72	20	12.5	M14	17	16	14	–	53	43	16	23	20	60	120	M14×45	99 700	149 000	4 830	1 880 14 400	1 880 14 400
MX 55	LRX 55	○	5.42								184	95	120																148 000	248 000	8 040	5 040 31 100	5 040 31 100
MXG 55	LRXG 55	○	7.93								238		174																198 000	359 000	11 700	10 400 57 000	10 400 57 000
MXL 55	–	–	10.1								292	150	228																244 000	470 000	15 300	17 700 90 700	17 700 90 700
MXC 65		○	7.18	22.6	90	12	53.5	170	71	14	180	–	95	26.3	14.5	M16	23	18	18.5	–	63	56	18	26	22	75	150	M16×60	174 000	249 000	9 790	4 200 32 000	4 200 32 000
	LRXC 65	○									181			26.6																		4 200 32 200	4 200 32 200
MX 65		○	11.5								244	110	159	26.3															260 000	415 000	16 300	11 300 69 000	11 300 69 000
	LRX 65	○									245			26.6																		11 300 69 300	11 300 69 300
MXG 65		○	16.0								308		223	26.3															337 000	581 000	22 800	21 800 120 000	21 800 120 000
	LRXG 65	○									309			26.6																			
MXL 65	–	–	20.8								380	200	295	26.3															419 000	768 000	30 200	37 600 193 000	37 600 193 000
–	LRX 85	–	25.4	36.7	110	16	65	215	92.5	15	323	140	232	27.5	17.8	M20	35	22	25.5	20	85	67	26.5	39	30	90	180	M24×70	440 000	753 000	38 900	29 500 163 000	29 500 163 000
–	LRXG 85	–	32.7								395	200	304																542 000	985 000	50 800	50 000 257 000	50 000 257 000
–	LRXL 85	–	44.0								494	280	403																674 000	1 300 000	67 300	87 000 422 000	87 000 422 000
–	LRXG 100*	–	43.0	43.2	120	15	75	250	110	15	362	200	262	29.7	17.8	M20	35	30	30.5	–	100	70	33	48	36	75	150	M30×80	498 000	821 000	49 700	35 800 199 000	35 800 199 000

Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ－175 and Table 2.3 on page Ⅱ－176 .

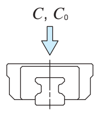
(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. In an assembled set of MX series, track rail mounting bolts are not appended.

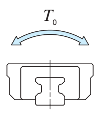
(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

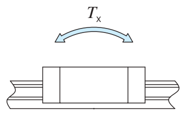
Remarks 1. The specifications of grease nipple are shown in Table 15 on page Ⅱ－188.

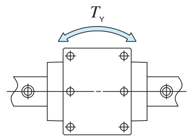
2. Three grease nipple mounting thread holes are provided on the right and left end plates respectively.

3. The identification numbers with * are our semi-standard items.









Example of identification number of assembled set

Model code		Dimensions	Part code		Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MX	G	55	C2	R3000	T2	P		/F
①	②	③	④	⑤	⑥	⑦	⑧	⑨

① Model	
MX LRX	Flange type mounting from top / bottom

② Length of slide unit	
C	Short
No symbol	Standard
G	Long
L	Extra long

③ Size
55, 65, 85, 100

④ Number of slide unit （2）

⑤ Length of track rail （3,000 mm）

⑥ Preload amount	
No symbol	Standard
T1	Light preload
T2	Medium preload
T3	Heavy preload

⑦ Accuracy class	
H	High
P	Precision
SP	Super precision
UP	Ultra precision

⑧ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

⑨ Special specification

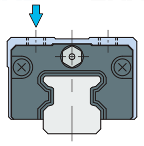
A, D, E, F, GE, HP, Ⅰ, J, L
LF, MA, MN, PS, Q, RC
T, UR, V, W, Y, Z

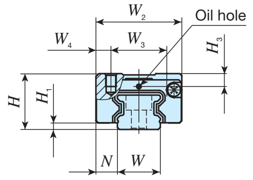
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO C-Lube Linear Roller Way Super MX

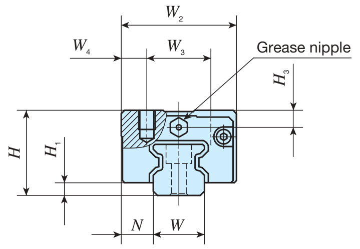
Block type mounting from top

Shape	**MXD** • **LRXD**
Size	10 12 15 20 25 30 35 45 55 65 85

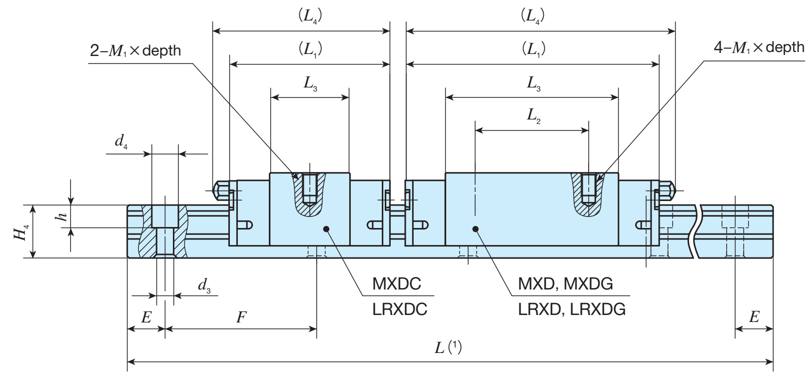




MXD 10
LRXD10



MXDC12, LRXDC12
MXD 12, LRXD 12
MXDG12, LRXDG12



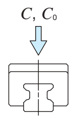
Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm									Dimensions of track rail mm								Appended mounting bolt for track rail (2)	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
MX series	LRX series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	M_1×depth	H_3	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MXD 10…SL		–	0.028	0.48	13	1.5	5	20	13	3.5	36	12	20.8	–	M2.6×3	3	10	8	3.5	6	3.5	12.5	25	M3×10	3 200	5 880	37.9	20.9 147	20.9 147
	LRXD 10…SL	–									35																	20.9 142	20.9 142
MXDC 12		○	0.045	0.92	20	3	7.5	27	15	6	40	–	15.8	44	M4 ×4.5	4	12	12	3.5	6	4.5	20	40	M3×12	4 250	6 500	49.4	18.6 196	18.6 196
	LRXDC 12	○									37		14.8	40											3 900	6 090	46.3	16.3 170	16.3 170
–	**LRXDC 12…SL**	○																											
MXD 12		○	0.072								50	15	25.4	53											6 120	10 400	79.1	45.8 371	45.8 371
	LRXD 12	○									47		25.3	50											5 890		78.7	45.2 343	45.2 343
MXD 12…SL		○									50		25.4	53											6 120		79.1	45.8 371	45.8 371
	LRXD 12…SL	○									47		25.3	50											5 890		78.7	45.2 343	45.2 343
MXDG 12		○	0.097								61		36.6	64											8 120	15 000	114	92.7 628	92.7 628
	LRXDG 12	○									58		35.8	61											7 710	14 600	111	88.6 581	88.6 581
–	**LRXDG 12…SL**	○																											

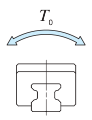
Notes (1) Track rail lengths L are shown in Tables 2.1 and 2.2 on page Ⅱ–175 and Tables 2.3 and 2.4 on page Ⅱ–176.

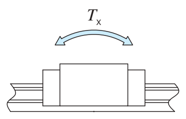
(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. For stainless steel model, stainless steel bolts are appended.
In an assembled set of MX series, track rail mounting bolts are not appended.

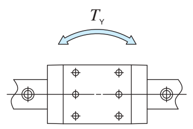
(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

Remarks 1. The specification of oil hole is shown in Fig. 2 on page Ⅱ–188.
2. The specifications of grease nipple are shown in Table 15 on page Ⅱ–188.
3. For size 12 series, a grease nipple mounting thread hole is provided on the right and left end plates respectively.









Example of identification number of assembled set

Model code	Dimensions	Part code		Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code	
MXD	G	12	C2	R560	___	T_1	P	___	/F
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩

① Model

MXD LRXD	Block type mounting from top

② Length of slide unit

C	Short
No symbol	Standard
G	Long

③ Size

10, 12

④ Number of slide unit (2)

⑤ Length of track rail (560 mm)

⑥ Material type

No symbol	High carbon steel made
SL	Stainless steel made

⑦ Preload amount

No symbol	Standard
T_1	Light preload
T_2	Medium preload
T_3	Heavy preload

⑧ Accuracy class

H	High
P	Precision
SP	Super precision
UP	Ultra precision

⑨ Interchangeable

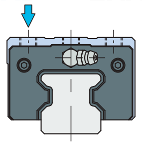
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

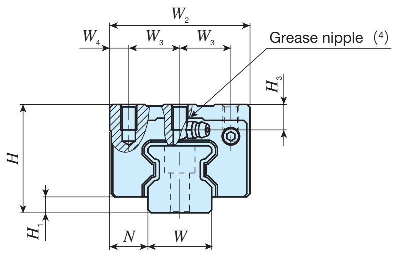
⑩ Special specification

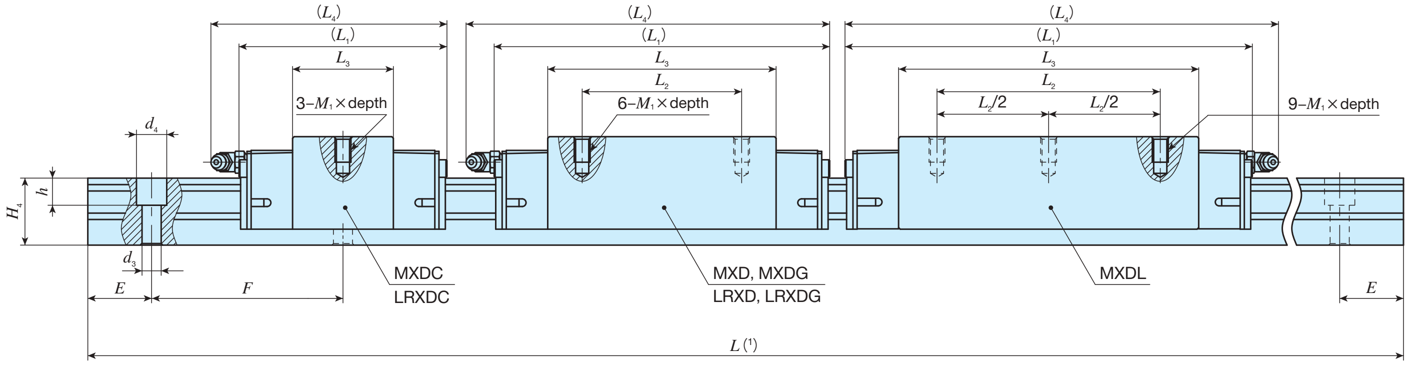
A, D, E, F, HP, Ⅰ, L, LF
MA, MN, N, Q, T, V, W
Y, Z

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Block type mounting from top

Shape	**MXD** • **LRXD** 
Size	10 12 **15** **20** 25 30 35 45 55 65 85





Identification number MX series	LRX series (No C-Lube)	Interchangeable	Mass (Ref.) Slide unit kg	Track rail kg/m	Dimensions of assembly mm H	H_1	N	Dimensions of slide unit mm W_2	W_3	W_4	L_1	L_2	L_3	L_4	M_1×depth
MXDC 15	LRXDC 15	○	0.13	1.65	28	4	9.5	34	13	4	52	–	24	55	M4×8
–	LRXDC 15…SL	○													
MXD 15	LRXD 15	○	0.19								68	26	40	71	
MXD 15…SL	LRXD 15…SL	○													
MXDG 15	LRXDG 15	○	0.26								84		56	87	
–	LRXDG 15…SL	○													
MXDC 20	LRXDC 20	○	0.25	2.73	34	5	12	44	16	6	66	–	31.6	74	M5×8
–	LRXDC 20…SL	○													
MXD 20	LRXD 20	○	0.38								86	36	51.6	94	
MXD 20…SL	LRXD 20…SL	○													
MXDG 20	LRXDG 20	○	0.52								106	50	71.6	114	
–	LRXDG 20…SL	○													
MXDL 20	–	–	0.67								128	70	94.1	137	

Identification number MX series	LRX series (No C-Lube)	H_3	Dimensions of track rail mm W	H_4	d_3	d_4	h	E	F	Appended mounting bolt for track rail (2) Bolt size× ℓ	Basic dynamic load rating (3) C N	Basic static load rating (3) C_0 N	Static moment rating (3) T_0 N · m	T_X N · m	T_Y N · m
MXDC 15	LRXDC 15	7.5	15	16.5	4.5	8	6	30	60	M4×16	7 730	12 000	113	50.6 457	50.6 457
–	LRXDC 15…SL														
MXD 15	LRXD 15										11 500	20 000	188	136 942	136 942
MXD 15…SL	LRXD 15…SL														
MXDG 15	LRXDG 15										14 900	28 000	263	262 1 590	262 1 590
–	LRXDG 15…SL														
MXDC 20	LRXDC 20	8	20	21	6	9.5	8.5	30	60	M5×20	16 100	26 400	341	150 1 260	150 1 260
–	LRXDC 20…SL														
MXD 20	LRXD 20										23 400	42 700	550	379 2 520	379 2 520
MXD 20…SL	LRXD 20…SL														
MXDG 20	LRXDG 20										30 100	58 900	760	713 4 200	713 4 200
–	LRXDG 20…SL														
MXDL 20	–										37 200	77 200	996	1 210 6 560	1 210 6 560

Notes (1) Track rail lengths L are shown in Tables 2.1 and 2.2 on page Ⅱ－175 and Tables 2.3 and 2.4 on page Ⅱ－176.

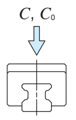
(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. For stainless steel model, stainless steel bolts are appended.

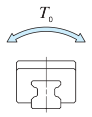
In an assembled set of MX series, track rail mounting bolts are not appended.

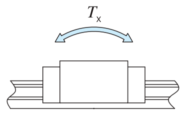
(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

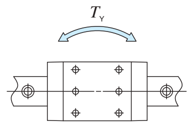
(4) The shapes of grease nipple vary by size. The specifications are shown in Table 15 on page Ⅱ－188.

Remark: A grease nipple mounting thread hole is provided on the right and left end plates respectively.









Example of identification number of assembled set

Model code		Dimensions	Part code		Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MXD	G	20	C2	R840	＿	T1	P	＿	/F
1	2	3	4	5	6	7	8	9	10

① Model	
MXD LRXD	Block type mounting from top

② Length of slide unit	
C	Short
No symbol	Standard
G	Long
L	Extra long

③ Size

15, 20

④ Number of slide unit (2)

⑤ Length of track rail (840 mm)

⑥ Material type	
No symbol	High carbon steel made
SL	Stainless steel made

⑦ Preload amount	
No symbol	Standard
T1	Light preload
T2	Medium preload
T3	Heavy preload

⑧ Accuracy class	
H	High
P	Precision
SP	Super precision
UP	Ultra precision

⑨ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

⑩ Special specification

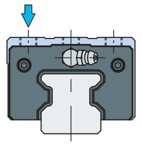
A, D, E, F, HP, Ⅰ, J, L, LF
MA, MN, N, Q, RC, T, UR
V, W, Y, Z

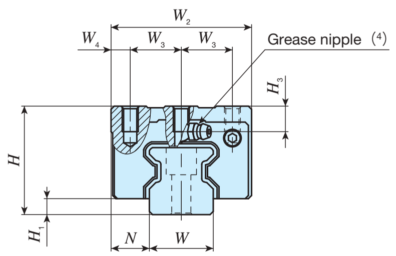
IKO C-Lube Linear Roller Way Super MX

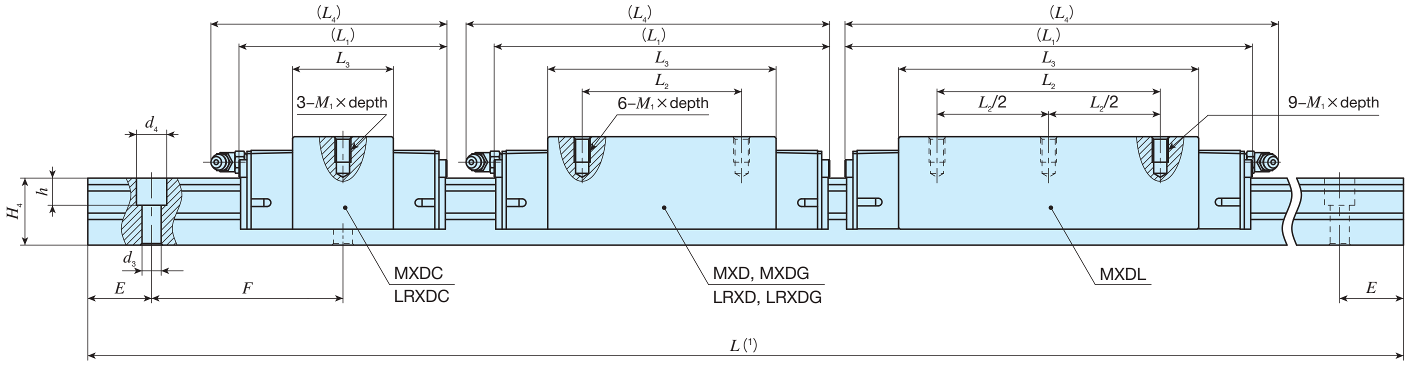
Block type mounting from top

MXD ・ LRXD

Shape						
Size	10	12	15	20	25	30
	35	45	55	65	85	







Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm									Dimensions of track rail mm							Appended mounting bolt for track rail (2)	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
MX series	LRX series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	M_1×depth	H_3	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MXDC 25	LRXDC 25	○	0.36	3.59	40	6	12.5	48	17.5	6.5	74	–	36	83	M6×12	9	23	24.5	7	11	9	30	60	M6×25	21 600	33 800	500	213 1 810	213 1 810
–	LRXDC 25…SL	○																											
MXD 25	LRXD 25	○	0.55								98	35	60	107											32 100	56 300	833	573 3 800	573 3 800
MXD 25…SL	LRXD 25…SL	○																											
MXDG 25	LRXDG 25	○	0.68								113	50	75	122											38 200	70 300	1 040	885 5 380	885 5 380
–	LRXDG 25…SL	○																											
MXDL 25	–	–	0.88								137	70	99	146											47 400	92 800	1 370	1 530 8 480	1 530 8 480
MXDC 30	LRXDC 30	○	0.60	5.01	45	6.5	16	60	20	10	85	–	42.4	95	M8×12	9.5	28	28	9	14	12	40	80	M8×28	29 200	44 600	808	329 2 740	329 2 740
–	LRXDC 30…SL	○																											
MXD 30	LRXD 30	○	0.92								113	40	70.4	123											43 400	74 400	1 350	883 5 780	883 5 780
MXD 30…SL	LRXD 30…SL	○																											
MXDG 30	LRXDG 30	○	1.18								134	60	91.4	144											53 200	96 700	1 750	1 470 8 740	1 470 8 740
–	LRXDG 30…SL	○																											
MXDL 30	–	–	1.52								162	80	119.4	172											65 600	126 000	2 290	2 500 13 600	2 500 13 600

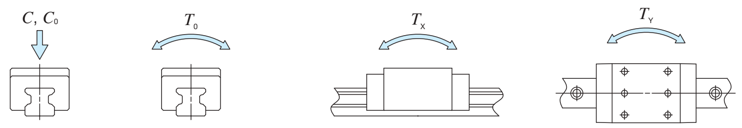
Notes (1) Track rail lengths L are shown in Tables 2.1 and 2.2 on page Ⅱ−175 and Tables 2.3 and 2.4 on page Ⅱ−176.

(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. For stainless steel model, stainless steel bolts are appended.
In an assembled set of MX series, track rail mounting bolts are not appended.

(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

(4) The shapes of grease nipple vary by size. The specifications are shown in Table 15 on page Ⅱ−188.

Remark: A grease nipple mounting thread hole is provided on the right and left end plates respectively.



Example of identification number of assembled set

Model code		Dimensions	Part code		Material code	Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MXD	G	25	C2	R840	__	T1	P	__	/F
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩

① Model	
MXD LRXD	Block type mounting from top

② Length of slide unit	
C	Short
No symbol	Standard
G	Long
L	Extra long

③ Size
25, 30

④ Number of slide unit (2)

⑤ Length of track rail (840 mm)

⑥ Material type	
No symbol	High carbon steel made
SL	Stainless steel made

⑦ Preload amount	
No symbol	Standard
T1	Light preload
T2	Medium preload
T3	Heavy preload

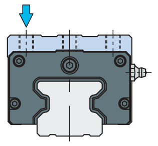
⑧ Accuracy class	
H	High
P	Precision
SP	Super precision
UP	Ultra precision

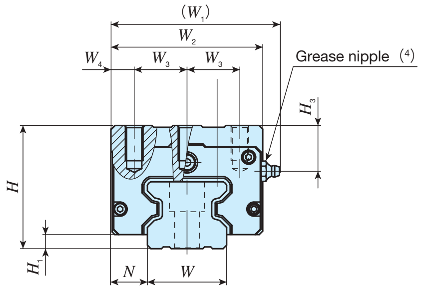
⑨ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

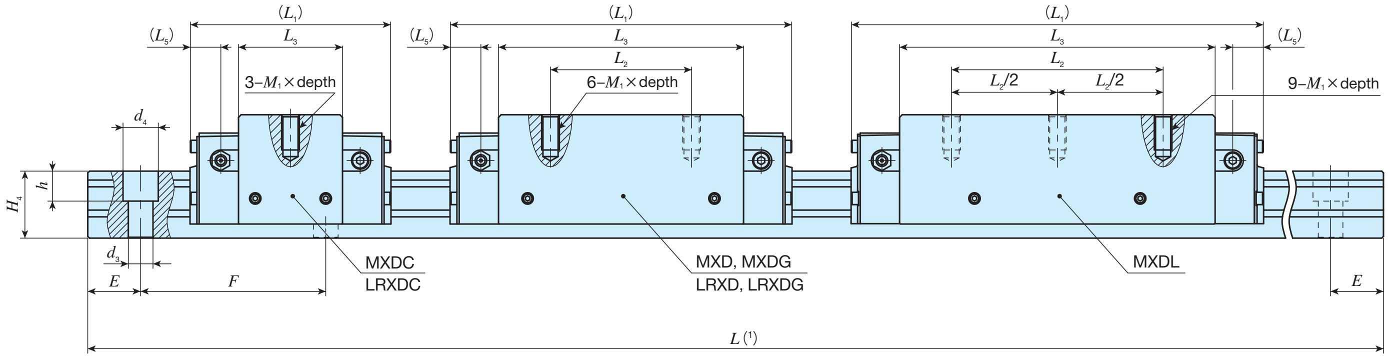
⑩ Special specification
A, D, E, F, HP, Ⅰ, J, L, LF
MA, MN, N, Q, RC, T, UR
V, W, Y, Z

IKO C-Lube Linear Roller Way Super MX

Block type mounting from top

Shape	**MXD** • **LRXD** 					
Size	10	12	15	20	25	30
	35	**45**	55	65	85	





Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm										Dimensions of track rail mm							Appended mounting bolt for track rail (2)	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
MX series	LRX series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_1	W_2	W_3	W_4	L_1	L_2	L_3	L_5	M_1×depth	H_3	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MXDC 35		○	0.97	6.88	55	6.5	18	78	70	25	10	92	–	46.6	12.7	M 8×16	20	34	32	9	14	12	40	80	M 8×35	39 500	60 000	1 300	506 3 950	506 3 950
	LRXDC 35	○													12.5															
MXD 35		○	1.52									124	50	78.6	12.7											58 700	100 000	2 170	1 360 8 470	1 360 8 470
	LRXD 35	○													12.5															
MXDG 35		○	2.02									152	72	106.6	12.7											74 200	135 000	2 930	2 440 13 800	2 440 13 800
	LRXDG 35	○													12.5															
MXDL 35	–	–	2.55									184	100	138.6	12.7											90 800	175 000	3 800	4 060 21 300	4 060 21 300
MXDC 45	LRXDC 45	○	2.01	10.8	70	8	20.5	96	86	30	13	114	–	59	17.5	M10×20	26	45	38	14	20	17	52.5	105	M12×40	64 100	95 600	2 660	1 010 7 800	1 010 7 800
MXD 45	LRXD 45	○	3.13									154	60	99												95 400	159 000	4 430	2 700 16 800	2 700 16 800
MXDG 45	LRXDG 45	○	4.29									194	80	139												124 000	223 000	6 200	5 220 29 000	5 220 29 000
MXDL 45	–	–	5.36									234	120	179												151 000	287 000	7 980	8 560 44 400	8 560 44 400

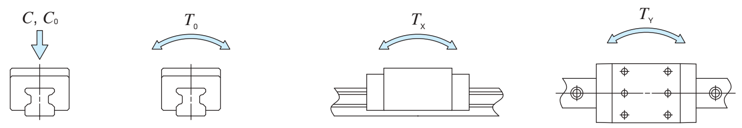
Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ－175 and Table 2.3 on page Ⅱ－176 .

(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. In an assembled set of MX series, track rail mounting bolts are not appended.

(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

(4) The shapes of grease nipple vary by size. The specifications are shown in Table 15 on page Ⅱ－188.

Remark: Three grease nipple mounting thread holes are provided on the right and left end plates respectively.



Example of identification number of assembled set

Model code		Dimensions	Part code		Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MXD	G	35	C2	R1200	T2	P		/F
❶	❷	❸	❹	❺	❻	❼	❽	❾

① Model

MXD LRXD	Block type mounting from top

② Length of slide unit

C	Short
No symbol	Standard
G	Long
L	Extra long

③ Size

35, 45

④ Number of slide unit (2)

⑤ Length of track rail (1,200 mm)

⑥ Preload amount

No symbol	Standard
T1	Light preload
T2	Medium preload
T3	Heavy preload

⑦ Accuracy class

H	High
P	Precision
SP	Super precision
UP	Ultra precision

⑧ Interchangeable

No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

⑨ Special specification

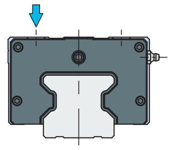
A, D, E, F, HP, Ⅰ, J, L, LF
MA, MN, N, PS, Q, RC, T
UR, V, W, Y, Z

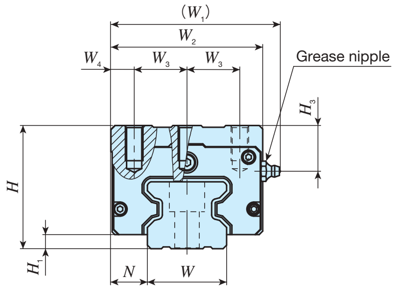
MX・LRX

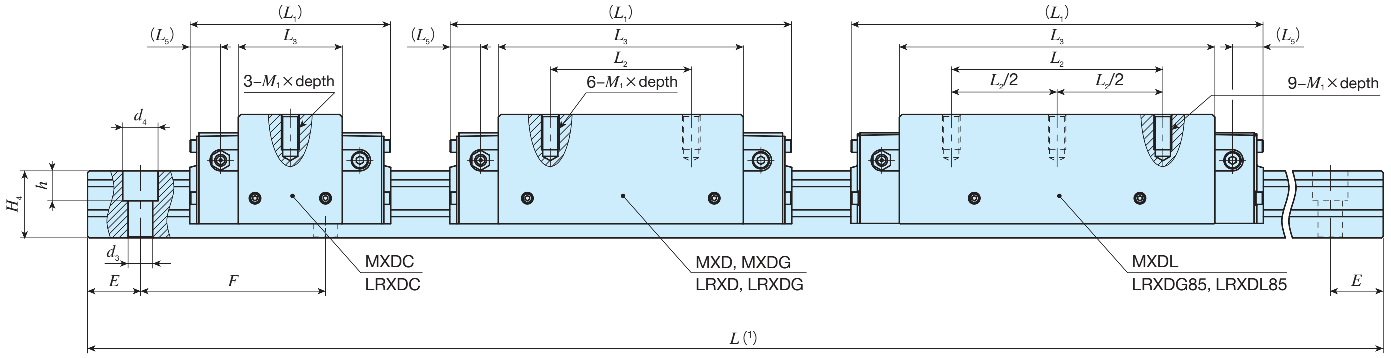
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO C-Lube Linear Roller Way Super MX

Block type mounting from top

Shape	**MXD** ・ **LRXD** 
Size	10 12 15 20 25 30 35 45 **55** **65** **85**





Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm										Dimensions of track rail mm							Appended mounting bolt for track rail (2)	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
MX series	LRX series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_1	W_2	W_3	W_4	L_1	L_2	L_3	L_5	M_1×depth	H_3	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MXDC 55	LRXDC 55	○	3.17	14.1	80	9	23.5	110	100	37.5	12.5	136	–	72	20	M12×25	26	53	43	16	23	20	60	120	M14×45	99 700	149 000	4 830	1 880 14 400	1 880 14 400
MXD 55	LRXD 55	○	4.97									184	75	120												148 000	248 000	8 040	5 040 31 100	5 040 31 100
MXDG 55	LRXDG 55	○	7.06									238	95	174												198 000	359 000	11 700	10 400 57 000	10 400 57 000
MXDL 55	–	–	9.08									292	150	228												244 000	470 000	15 300	17 700 90 700	17 700 90 700
MXDC 65		○	5.52	22.6	90	12	31.5	135	126	38	25	180	–	95	26.3	M16×25	18	63	56	18	26	22	75	150	M16×60	174 000	249 000	9 790	4 200 32 000	4 200 32 000
	LRXDC 65	○										181			26.6														4 200 32 200	4 200 32 200
MXD 65		○	8.70									244	70	159	26.3											260 000	415 000	16 300	11 300 69 000	11 300 69 000
	LRXD 65	○										245			26.6														11 300 69 300	11 300 69 300
MXDG 65		○	12.1									308	120	223	26.3											337 000	581 000	22 800	21 800 120 000	21 800 120 000
	LRXDG 65	○										309			26.6															
MXDL 65	–	–	15.5									380	200	295	26.3											419 000	768 000	30 200	37 600 193 000	37 600 193 000
	LRXD 85	–	19.9	36.7	110	16	40.5	175	166	60	23	323	140	232	27.5	M20×30	22	85	67	26.5	39	30	90	180	M24×70	440 000	753 000	38 900	29 500 163 000	29 500 163 000
	LRXDG 85	–	25.5									395	200	304												542 000	985 000	50 800	50 000 257 000	50 000 257 000
	LRXDL 85	–	34.1									494	280	403												674 000	1 300 000	67 300	87 000 422 000	87 000 422 000

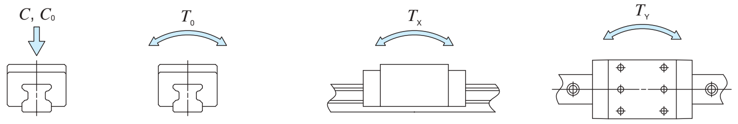
Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ－175 and Table 2.3 on page Ⅱ－176 .

(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. In an assembled set of MX series, track rail mounting bolts are not appended.

(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

Remarks 1. The specifications of grease nipple are shown in Table 15 on page Ⅱ－188.

2. Three grease nipple mounting thread holes are provided on the right and left end plates respectively.



Example of identification number of assembled set

Model code		Dimensions	Part code		Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MXD	G	55	C2	R3000	T_2	P	＿	/F
①	②	③	④	⑤	⑥	⑦	⑧	⑨

① Model

MXD LRXD	Block type mounting from top

② Length of slide unit

C	Short
No symbol	Standard
G	Long
L	Extra long

③ Size

55, 65, 85

④ Number of slide unit (2)

⑤ Length of track rail (3,000 mm)

⑥ Preload amount

No symbol	Standard
T_1	Light preload
T_2	Medium preload
T_3	Heavy preload

⑦ Accuracy class

H	High
P	Precision
SP	Super precision
UP	Ultra precision

⑧ Interchangeable

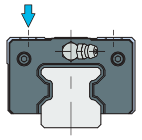
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

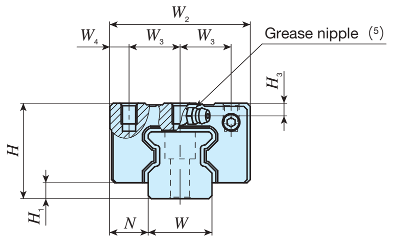
⑨ Special specification

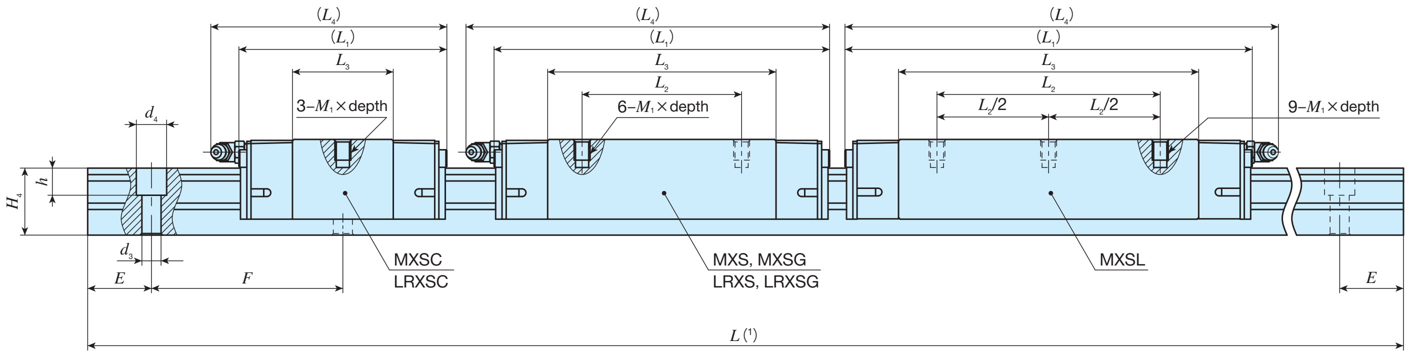
A, D, E, F, HP, Ⅰ, J, L, LF
MA, MN, PS, Q, RC, T
UR, V, W, Y, Z

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Compact block type mounting from top

Shape	**MXS** • **LRXS** 
Size	15 · 20 · 25 · 30 35 · 45 · 55

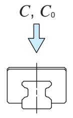


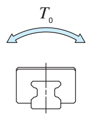


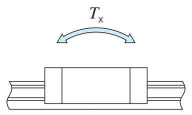
Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm										Dimensions of track rail mm							Appended mounting bolt for track rail (3)	Basic dynamic load rating (4)	Basic static load rating (4)	Static moment rating (4)		
MX series	LRX series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	M_1×depth (2)	H_3	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MXSC 15	LRXSC 15	○	0.099	1.65	24	4	9.5	34	13	4	52	–	24	55	M4× 5.5	3.5	15	16.5	4.5	8	6	30	60	M4×16	7 730	12 000	113	50.6 457	50.6 457
MXS 15	LRXS 15	○	0.15								68	26	40	71											11 500	20 000	188	136 942	136 942
MXSG 15	LRXSG 15	○	0.21								84		56	87											14 900	28 000	263	262 1 590	262 1 590
MXSC 20	LRXSC 20	○	0.21	2.73	30	5	12	44	16	6	66	–	31.6	74	M5× 6.5	4	20	21	6	9.5	8.5	30	60	M5×20	16 100	26 400	341	150 1 260	150 1 260
MXS 20	LRXS 20	○	0.31								86	36	51.6	94											23 400	42 700	550	379 2 520	379 2 520
MXSG 20	LRXSG 20	○	0.42								106	50	71.6	114											30 100	58 900	760	713 4 200	713 4 200
MXSL 20	–	–	0.55								128	70	94.1	137											37 200	77 200	996	1 210 6 560	1 210 6 560
MXSC 25	LRXSC 25	○	0.30	3.59	36	6	12.5	48	17.5	6.5	74	–	36	83	M6× 9	5	23	24.5	7	11	9	30	60	M6×25	21 600	33 800	500	213 1 810	213 1 810
MXS 25	LRXS 25	○	0.47								98	35	60	107											32 100	56 300	833	573 3 800	573 3 800
MXSG 25	LRXSG 25	○	0.57								113	50	75	122											38 200	70 300	1 040	885 5 380	885 5 380
MXSL 25	–	–	0.74								137	70	99	146											47 400	92 800	1 370	1 530 8 480	1 530 8 480
MXSC 30	LRXSC 30	○	0.54	5.01	42	6.5	16	60	20	10	85	–	42.4	95	M8×11	6.5	28	28	9	14	12	40	80	M8×28	29 200	44 600	808	329 2 740	329 2 740
MXS 30	LRXS 30	○	0.83								113	40	70.4	123											43 400	74 400	1 350	883 5 780	883 5 780
MXSG 30	LRXSG 30	○	1.05								134	60	91.4	144											53 200	96 700	1 750	1 470 8 740	1 470 8 740
MXSL 30	–	–	1.37								162	80	119.4	172											65 600	126 000	2 290	2 500 13 600	2 500 13 600

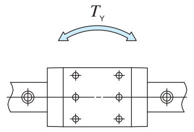
Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ－175 and Table 2.3 on page Ⅱ－176 .
(2) For the fixing thread depth of the slide unit mounting hole, the value indicated in Table 16.1 on page Ⅱ－190 is recommended.
(3) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176. In an assembled set of MX series, track rail mounting bolts are not appended.
(4) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.
(5) The shapes of grease nipple vary by size. The specifications are shown in Table 15 on page Ⅱ－188.

Remark: A grease nipple mounting thread hole is provided on the right and left end plates respectively.









Example of identification number of assembled set

Model code		Dimensions	Part code		Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MXS	G	25	C2	R840	T_1	P		/F
❶	❷	❸	❹	❺	❻	❼	❽	❾

① Model

MXS LRXS	Compact block type mounting from top

② Length of slide unit

C	Short
No symbol	Standard
G	Long
L	Extra long

③ Size
15, 20, 25, 30

④ Number of slide unit (2)

⑤ Length of track rail (840 mm)

⑥ Preload amount

No symbol	Standard
T_1	Light preload
T_2	Medium preload
T_3	Heavy preload

⑦ Accuracy class

H	High
P	Precision
SP	Super precision
UP	Ultra precision

⑧ Interchangeable

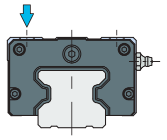
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

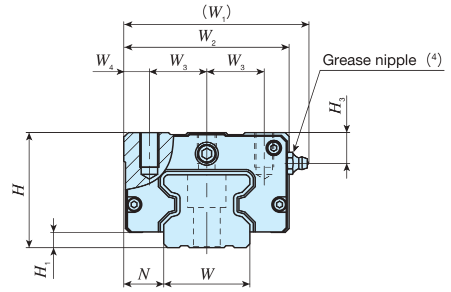
⑨ Special specification
A, D, E, F, HP, Ⅰ, J, L, LF
MA, MN, N, Q, RC, T, UR
V, W, Y, Z

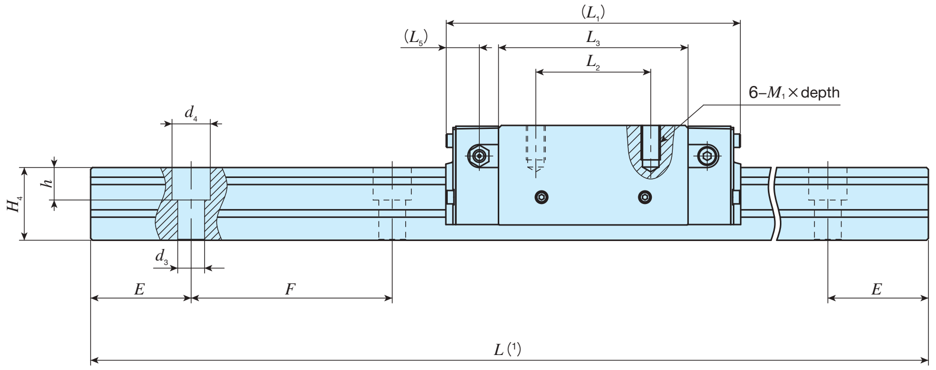
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Compact block type mounting from top

Shape	MXS			
Size	15	20	25	30
	35	45	55	



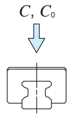


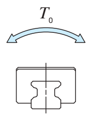


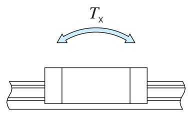
Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm										Dimensions of track rail mm							Mounting bolt for track rail (2)	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
MX series	LRX series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_1	W_2	W_3	W_4	L_1	L_2	L_3	L_5	M_1× depth	H_3	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MXS 35	−	○	1.22	6.88	48	6.5	18	78	70	25	10	124	50	78.6	12.7	M 8×12	13	34	32	9	14	12	40	80	M 8×35	58 700	100 000	2 170	1 360 8 470	1 360 8 470
MXSG 35	−	○	1.61									152	72	106.6												74 200	135 000	2 930	2 440 13 800	2 440 13 800
MXS 45	−	○	2.37	10.8	60	8	20.5	96	86	30	13	154	60	99	17.5	M10×18	16	45	38	14	20	17	52.5	105	M12×40	95 400	159 000	4 430	2 700 16 800	2 700 16 800
MXSG 45	−	○	3.27									194	80	139												124 000	223 000	6 200	5 220 29 000	5 220 29 000
MXS 55	−	○	3.96	14.1	70	9	23.5	110	100	37.5	12.5	184	75	120	20	M12×20	16	53	43	16	23	20	60	120	M14×45	148 000	248 000	8 040	5 040 31 100	5 040 31 100
MXSG 55	−	○	5.63									238	95	174												198 000	359 000	11 700	10 400 57 000	10 400 57 000

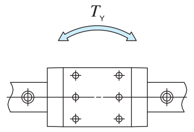
Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ−175 and Table 2.3 on page Ⅱ−176 .
(2) Track rail mounting bolts are not appended.
(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.
(4) The shapes of grease nipple vary by size. The specifications are shown in Table 15 on page Ⅱ−188.

Remark: Three grease nipple mounting thread holes are provided on the right and left end plates respectively.









Example of identification number of assembled set

Model code		Dimensions	Part code		Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MXS	G	45	C2	R1470	T1	P		/F
❶	❷	❸	❹	❺	❻	❼	❽	❾

① Model

MXS	Compact block type mounting from top

② Length of slide unit

No symbol	Standard
G	Long

③ Size

35, 45, 55

④ Number of slide unit (2)

⑤ Length of track rail (1,470 mm)

⑥ Preload amount

No symbol	Standard
T1	Light preload
T2	Medium preload
T3	Heavy preload

⑦ Accuracy class

H	High
P	Precision
SP	Super precision
UP	Ultra precision

⑧ Interchangeable

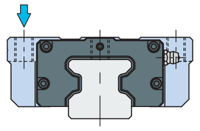
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

⑨ Special specification

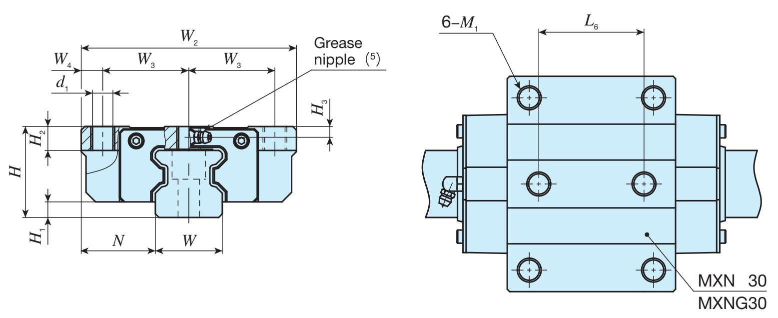
A, D, E, F, HP, Ⅰ, J, L, LF
MA, N, RC, T, UR, V, W, Z

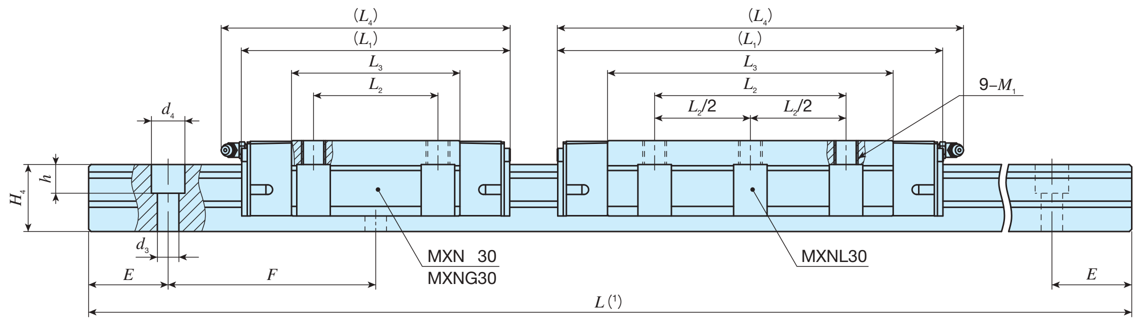
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Low profile flange type mounting from top

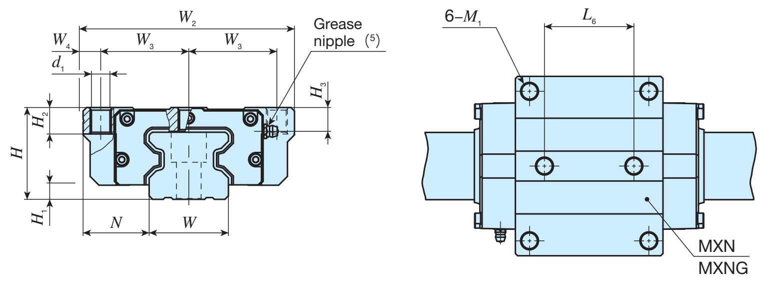
Shape	**MXN** 
Size	30 35 45 55

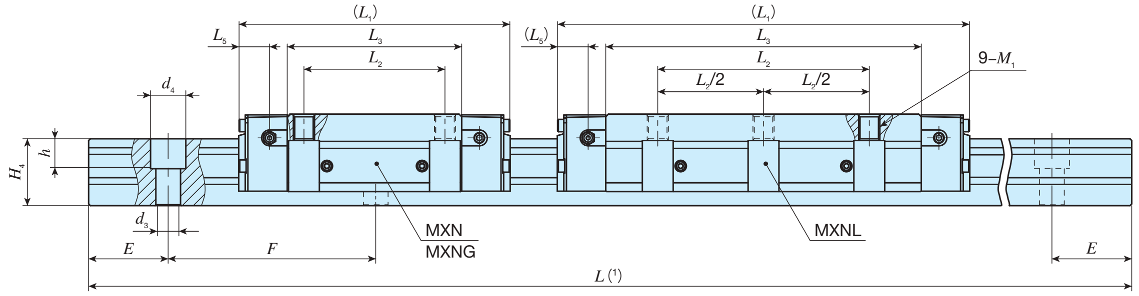
MXN 30
MXNG 30
MXNL 30





MXN
MXNG
MXNL

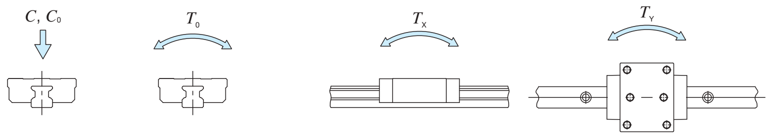




Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm												Dimensions of track rail mm							Mounting bolt for track rail (3)	Basic dynamic load rating (4)	Basic static load rating (4)	Static moment rating (4)		
MX series	LRX series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_2	W_3	W_4	L_1	L_2	L_3	L_4	L_5	L_6	d_1	M_1	Maximum fixing thread depth (2)	H_2	H_3	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MXN 30	–	○	1.05	5.01	38	6.5	31	90	36	9	113	52	70.4	121	–	44	8.5	M10	9	10	4.5	28	28	9	14	12	40	80	M 8×28	43 400	74 400	1 350	883 5 780	883 5 780
MXNG 30	–	○	1.38								134		91.4	142																53 200	96 700	1 750	1 470 8 740	1 470 8 740
MXNL 30	–	–	1.75								162	80	119.4	170		80														65 600	126 000	2 290	2 500 13 600	2 500 13 600
MXN 35	–	○	1.55	6.88	44	6.5	33	100	41	9	124	62	78.6	–	12.7	52	8.5	M10	11	13	11	34	32	9	14	12	40	80	M 8×35	58 700	100 000	2 170	1 360 8 470	1 360 8 470
MXNG 35	–	○	2.13								152		106.6																	74 200	135 000	2 930	2 440 13 800	2 440 13 800
MXNL 35	–	–	2.71								184	100	138.6			100														90 800	175 000	3 800	4 060 21 300	4 060 21 300
MXN 45	–	○	2.58	10.8	52	8	37.5	120	50	10	154	80	99	–	17.5	60	10.5	M12	13	15	13.5	45	38	14	20	17	52.5	105	M12×40	95 400	159 000	4 430	2 700 16 800	2 700 16 800
MXNG 45	–	○	3.73								194		139																	124 000	223 000	6 200	5 220 29 000	5 220 29 000
MXNL 45	–	–	4.72								234	120	179			120														151 000	287 000	7 980	8 560 44 400	8 560 44 400
MXN 55	–	○	4.61	14.1	63	9	43.5	140	58	12	184	95	120	–	20	70	12.5	M14	19	17	16	53	43	16	23	20	60	120	M14×45	148 000	248 000	8 040	5 040 31 100	5 040 31 100
MXNG 55	–	○	6.94								238		174																	198 000	359 000	11 700	10 400 57 000	10 400 57 000
MXNL 55	–	–	8.87								292	150	228			150														244 000	470 000	15 300	17 700 90 700	17 700 90 700

Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ－175 and Table 2.3 on page Ⅱ－176 .
(2) The fixing thread depth of mounting screw in the middle of the way in the slide unit width direction should be less than the maximum fixing thread depth.
(3) Track rail mounting bolts are not appended.
(4) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.
(5) The shapes of grease nipple vary by size. The specifications are shown in Table 15 on page Ⅱ－188.

Remarks 1. For size 30 series, a grease nipple mounting thread hole is provided on the right and left end plates respectively.
2. For size 35, 45, and 55 series, three grease nipple mounting thread holes are provided on the right and left end plates respectively. However, the size of thread hole for size 35 in the slide unit travelling direction is smaller than that of the crosswise direction. When the grease nipple is mounted along the travelling direction, contact IKO.



Example of identification number of assembled set

Model code		Dimensions	Part code		Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MXN	G	55	C2	R3000	T2	P		/F
1	2	3	4	5	6	7	8	9

① Model	
MXN	Low profile flange type mounting from top

② Length of slide unit	
No symbol	Standard
G	Long
L	Extra long

③ Size
30, 35, 45, 55

④ Number of slide unit (2)

⑤ Length of track rail (3,000 mm)

⑥ Preload amount	
No symbol	Standard
T1	Light preload
T2	Medium preload
T3	Heavy preload

⑦ Accuracy class	
H	High
P	Precision
SP	Super precision
UP	Ultra precision

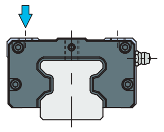
⑧ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

⑨ Special specification
A, D, E, F, HP, Ⅰ, J, L, LF
MA, RC, T, UR, V, W, Z

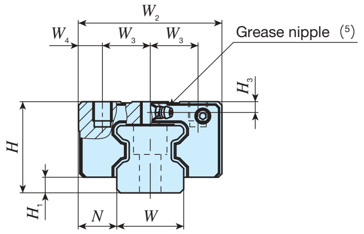
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO C-Lube Linear Roller Way Super MX

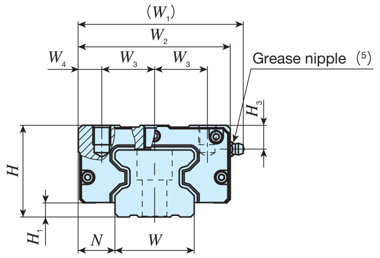
Low profile block type mounting from top	
Shape	**MXNS**
Size	30 / 35 / 45 / 55

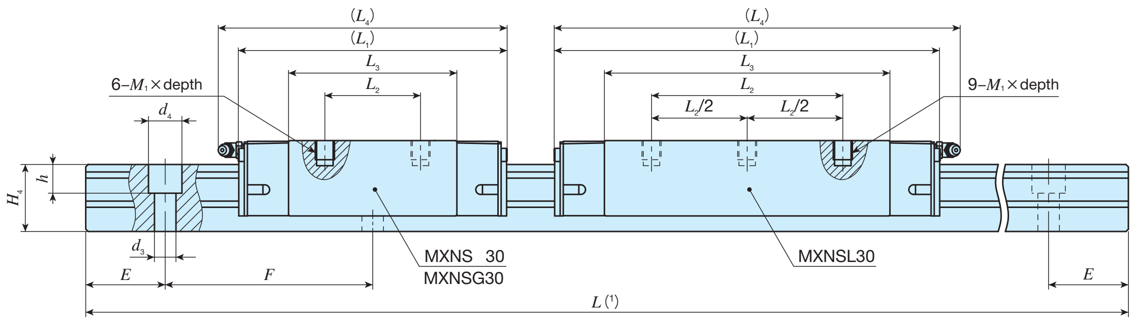


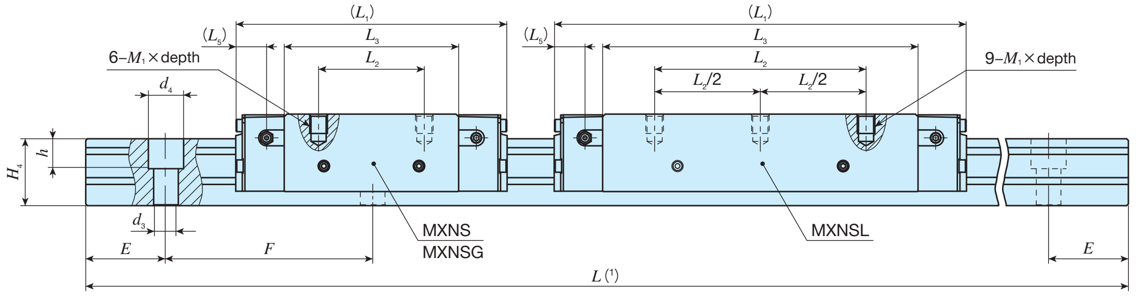
MXNS 30
MXNSG 30
MXNSL 30



MXNS
MXNSG
MXNSL







Identification number		Interchangeable	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm											Dimensions of track rail mm								Mounting bolt for track rail (3)	Basic dynamic load rating (4)	Basic static load rating (4)	Static moment rating (4)		
MX series	LRX series (No C-Lube)		Slide unit kg	Track rail kg/m	H	H_1	N	W_1	W_2	W_3	W_4	L_1	L_2	L_3	L_4	L_5	M_1×depth (2)	Maximum fixing thread depth (2)	H_3	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
MXNS 30	–	○	0.70	5.01	38	6.5	16	–	60	20	10	113	40	70.4	121	–	M 8× 8	9	4.5	28	28	9	14	12	40	80	M 8×28	43 400	74 400	1 350	883 5 780	883 5 780
MXNSG 30	–	○	0.90									134	60	91.4	142													53 200	96 700	1 750	1 470 8 740	1 470 8 740
MXNSL 30	–	–	1.14									162	80	119.4	170													65 600	126 000	2 290	2 500 13 600	2 500 136 000
MXNS 35	–	○	1.08	6.88	44	6.5	18	78	70	25	10	124	50	78.6	–	12.7	M 8× 9	11	11	34	32	9	14	12	40	80	M 8×35	58 700	100 000	2 170	1 360 8 470	1 360 8 470
MXNSG 35	–	○	1.42									152	72	106.6														74 200	135 000	2 930	2 440 13 800	2 440 13 800
MXNSL 35	–	–	1.81									184	100	138.6														90 800	175 000	3 800	4 060 21 300	4 060 21 300
MXNS 45	–	○	1.84	10.8	52	8	20.5	94	86	30	13	154	60	99	–	17.5	M10×11	13	13.5	45	38	14	20	17	52.5	105	M12×40	95 400	159 000	4 430	2 700 16 800	2 700 16 800
MXNSG 45	–	○	2.58									194	80	139														124 000	223 000	6 200	5 220 29 000	5 220 29 000
MXNSL 45	–	–	3.29									234	120	179														151 000	287 000	7 980	8 560 44 400	8 560 44 400
MXNS 55	–	○	3.31	14.1	63	9	23.5	110	100	37.5	12.5	184	75	120	–	20	M12×15	19	16	53	43	16	23	20	60	120	M14×45	148 000	248 000	8 040	5 040 31 100	5 040 31 100
MXNSG 55	–	○	4.83									238	95	174														198 000	359 000	11 700	10 400 57 000	10 400 57 000
MXNSL 55	–	–	6.28									292	150	228														244 000	470 000	15 300	17 700 90 700	17 700 90 700

Notes (1) Track rail lengths L are shown in Table 2.1 on page Ⅱ−175 and Table 2.3 on page Ⅱ−176 .

(2) For the fixing thread depth of the slide unit mounting hole, the value indicated in Table 16.2 on page Ⅱ−190 is recommended. The fixing thread depth of mounting screw in the middle of the way in the slide unit width direction should be less than the maximum fixing thread depth.

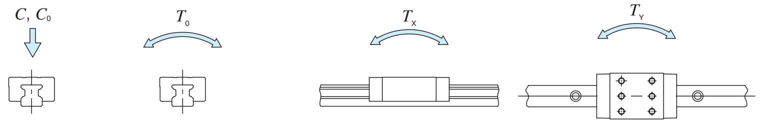
(3) Track rail mounting bolts are not appended.

(4) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

(5) The shapes of grease nipple vary by size. The specifications are shown in Table 15 on page Ⅱ−188.

Remarks 1. For size 30 series, a grease nipple mounting thread hole is provided on the right and left end plates respectively.

2. For size 35, 45, and 55 series, three grease nipple mounting thread holes are provided on the right and left end plates respectively. However, the size of thread hole for size 35 in the slide unit travelling direction is smaller than that of the crosswise direction. When the grease nipple is mounted along the travelling direction, contact IKO.



Example of identification number of assembled set

Model code		Dimensions	Part code		Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MXNS	G	55	C2	R3000	T2	P		/F
❶	❷	❸	❹	❺	❻	❼	❽	❾

① Model	
MXNS	Low profile block type mounting from top

② Length of slide unit	
No symbol	Standard
G	Long
L	Extra long

③ Size
30, 35, 45, 55

④ Number of slide unit (2)

⑤ Length of track rail (3,000 mm)

⑥ Preload amount	
No symbol	Standard
T1	Light preload
T2	Medium preload
T3	Heavy preload

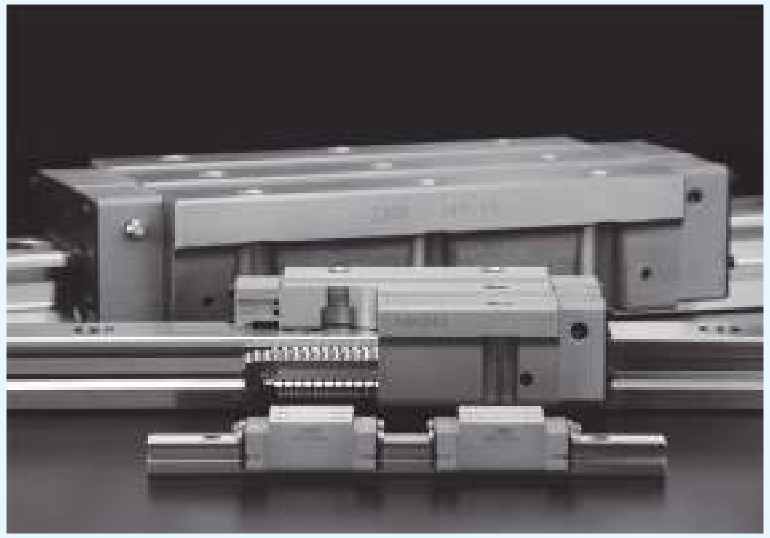
⑦ Accuracy class	
H	High
P	Precision
SP	Super precision
UP	Ultra precision

⑧ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

⑨ Special specification
A, D, E, F, HP, Ⅰ, J, L, LF
MA, RC, T, UR, V, W, Z

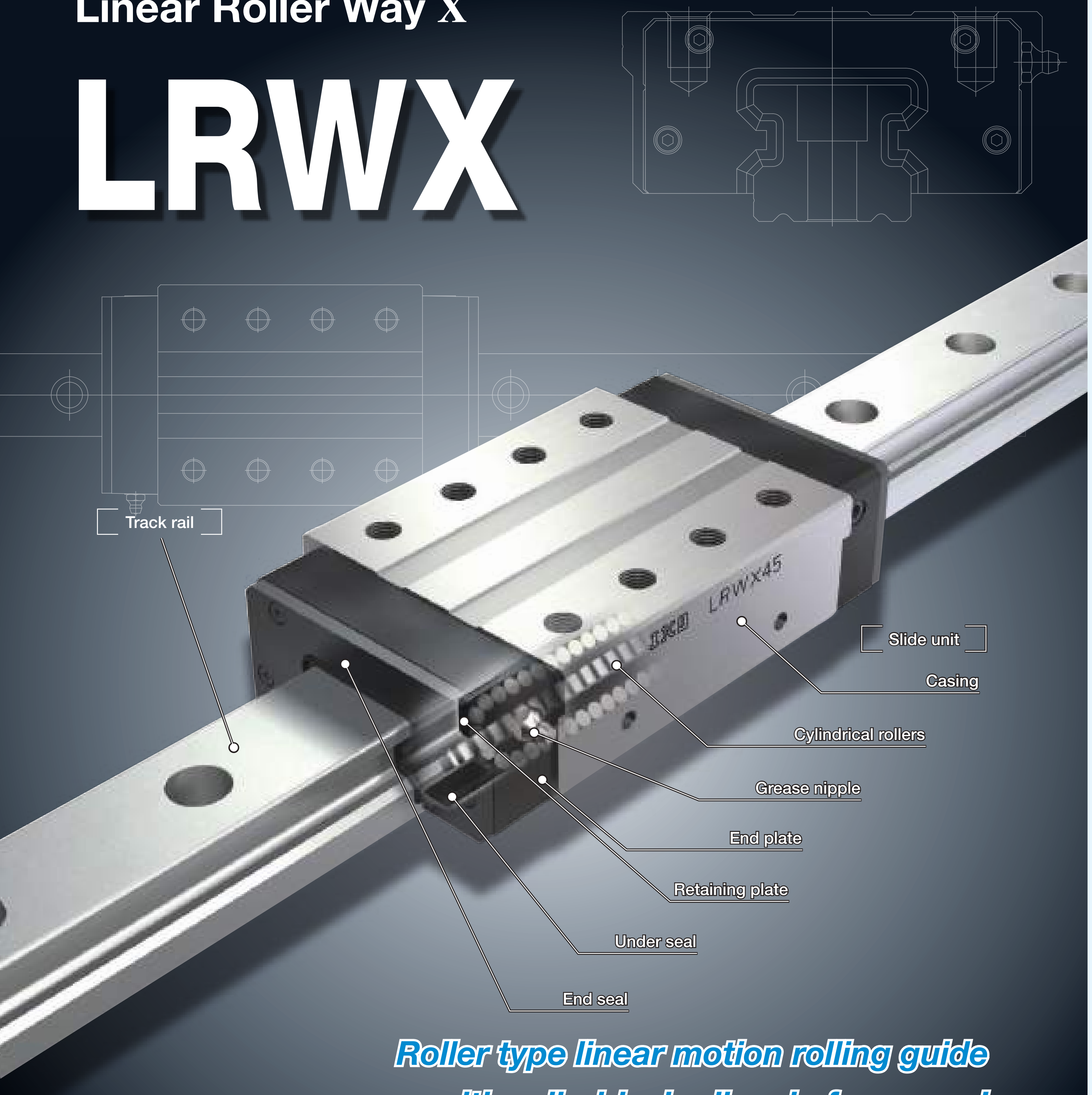
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Linear Roller Way X



Linear Roller Way X

LRWX



Roller type linear motion rolling guide with cylindrical rollers in four-rows!

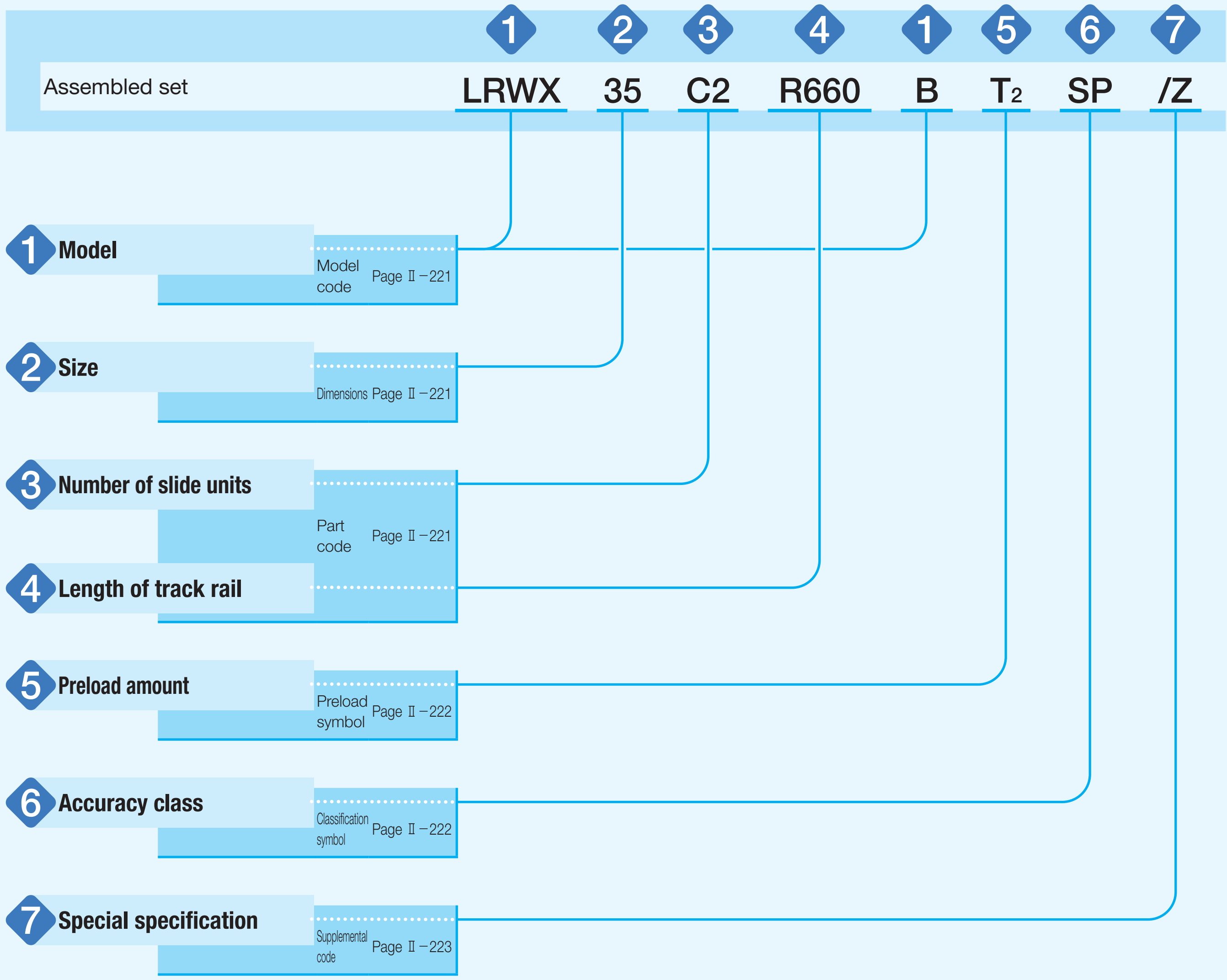
Well-balanced roller arrangement enabling equal resistance to all direction loads!

Slide unit shape block type and flange type are available and can be selected according to the application!

Identification Number and Specification

Example of an identification number

The specification of LRWX series is indicated by the identification number. Indicate the identification number, consisting of a model code, dimensions, a part code, a preload symbol, a classification symbol, and any supplemental codes for each specification to apply.



	1	2	3	4	1	5	6	7
Assembled set	LRWX	35	C2	R660	B	T_2	SP	/Z

	Item	Code	Reference
1	**Model**	Model code	Page Ⅱ−221
2	**Size**	Dimensions	Page Ⅱ−221
3	**Number of slide units**	Part code	Page Ⅱ−221
4	**Length of track rail**	Part code	Page Ⅱ−221
5	**Preload amount**	Preload symbol	Page Ⅱ−222
6	**Accuracy class**	Classification symbol	Page Ⅱ−222
7	**Special specification**	Supplemental code	Page Ⅱ−223

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Identification Number and Specification —Model · Size · Number of Slide Unit · Length of Track Rail—

1 Model

Linear Roller Way X (1) (LRWX series)

Block type mounting from top : LRWX···B
Flange type mounting from bottom : LRWXH

For applicable models and sizes, see Table 1.

Note (1) This model has no built-in C-Lube.

2 Size

25,35,45,55,75 For applicable models and sizes, see Table 1.

3 Number of slide units

: C○ Indicates the number of slide units assembled on a track rail.

4 Length of track rail

: R○ Indicate the length of track rail in mm. For standard and maximum lengths, see Table 2.

Table 1 Models and sizes of LRWX series

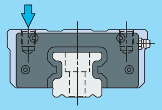
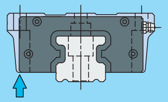
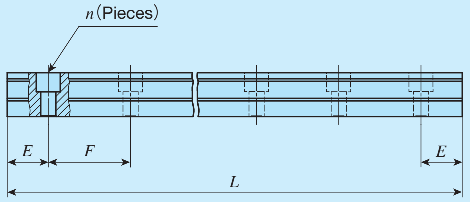
Shape	Model	Size				
		25	35	45	55	75
Block type mounting from top 	LRWX···B	○	○	○	○	○
Flange type mounting from bottom 	LRWXH	–	○	○	○	○

Table 2 Standard and maximum lengths of track rail



unit: mm

Identification number / Item		LRWX25···B	LRWX25···B/HP(3)	LRWX 35···B LRWXH35	LRWX 45···B LRWXH45	LRWX 55···B LRWXH55	LRWX 75···B LRWXH75
Standard length $L(n)$		480 (8) 660 (11) 840 (14) 1 020 (17) 1 200 (20) 1 500 (25)	480 (16) 660 (22) 840 (28) 1 020 (34) 1 200 (40) 1 500 (50)	480 (8) 660 (11) 840 (14) 1 020 (17) 1 200 (20) 1 500 (25)	800 (10) 1 040 (13) 1 200 (15) 1 520 (19) 1 920 (24)	800 (8) 1 000 (10) 1 200 (12) 1 500 (15) 2 000 (20) 3 000 (30)	840 (7) 1 200 (10) 1 560 (13) 1 920 (16) 3 000 (25)
Pitch of mounting holes F		60	30	60	80	100	120
E		30	15	30	40	50	60
Standard E dimensions (1)	or higher	9	9	12	15	18	23
	below	39	24	42	55	68	83
Maximum length (2)		1 980 (3 000)	1 980 (3 000)	3 000 (3 960)	2 960 (4 000)	3 000 (4 000)	3 000 (3 960)

Notes (1) Not applicable to female threads for bellows (supplemental code "/J").
(2) Length up to the value in ( ) can be produced. If needed, please contact IKO.
(3) This indicates the dimension for the half pitch mounting holes specification of track rail.

Remark: If not directed, E dimensions for both ends will be the same within the range of standard E dimensions. To change the dimensions, indicate the specified rail mounting hole positions "/E" of special specification. For more information, see page Ⅲ−30.

—Preload Amount · Accuracy Class—

5 Preload amount

Standard : No symbol For details of the preload amount, see Table 3.
Light preload : T_1
Medium preload : T_2
Heavy preload : T_3

6 Accuracy class

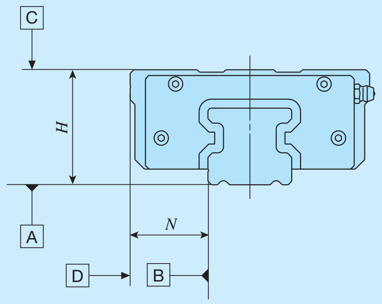
High : H For details of accuracy class, see Table 4.
Precision : P
Super precision : SP
Ultra precision : UP

Table 3 Preload amount

Item / Preload type	Preload symbol	Preload amount N	Operational conditions
Standard	(No symbol)	0(1)	· Light and precise motion
Light preload	T_1	0.02 C_0	· Almost no vibrations · Load is evenly balanced · Light and precise motion
Medium preload	T_2	0.05 C_0	· Medium vibration · Medium overhung load
Heavy preload	T_3	0.08 C_0	· Operation with vibration and / or shock · Overhanging load applied · Heavy cutting

Note (1) Indicates zero or minimal amount of preload.
Remark: C_0 indicates the basic static load rating.

Table 4 Tolerance and allowance



unit: mm

Class (classification symbol) / Item	High (H)	Precision (P)	Super precision (SP)	Ultra precision (UP)
Dim. H tolerance	±0.040	±0.020	±0.010	±0.008
Dim. N tolerance	±0.050	±0.025	±0.015	±0.010
Dim. variation of H(1)	0.015	0.007	0.005	0.003
Dim. variation of N(1)	0.020	0.010	0.007	0.003
Dim. variation of H for multiple assembled sets	0.035	0.025	–	–
Parallelism in operation of the slide unit C surface to A surface	See Fig. 1			
Parallelism in operation of the slide unit D surface to B surface	See Fig. 1			

Note (1) It means the size variation between slide units mounted on the same track rail.

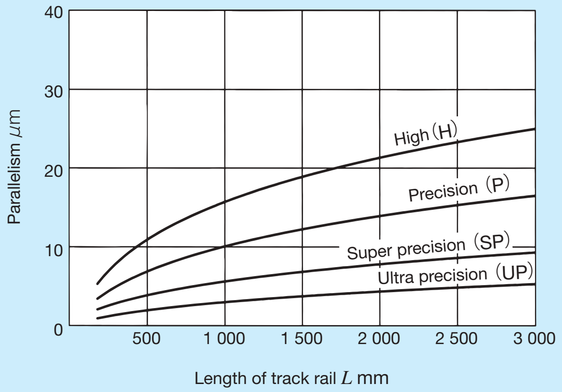


Fig. 1 Parallelism in operation

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

7 Special specification

/A, /D, /E, /F, /HP, / I ,
/J○, /L○, /LF○, /Q,
/V○, /W○, /Y○, /Z○

For applicable special specifications, see Table 5.
For combination of multiple special specifications, see Table 6.
For details of special specifications, see page Ⅲ−29.

Table 5 Application of special specifications

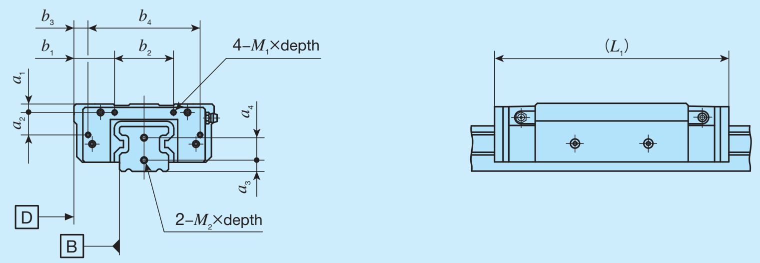
Special specification	Supplemental code	Size 25	35	45	55	75
Butt-jointing track rails	/A	○	○	○	○	○
Opposite reference surfaces arrangement	/D	○	○	○	○	○
Specified rail mounting hole positions	/E	○	○	○	○	○
Caps for rail mounting holes	/F	○	○	○	○	○
Half pitch mounting holes for track rail	/HP	○	×	×	×	×
Inspection sheet	/I	○	○	○	○	○
Female threads for bellows	/J○	○	○	○	○	○
Black chrome surface treatment	/L○	○	○	○	○	○
Fluorine black chrome surface treatment	/LF○	○	○	○	○	○
With C-Lube plate	/Q	○	○	○	○	○
Double seals	/V○	○	×	×	×	×
A group of multiple assembled sets	/W○	○	○	○	○	○
Specified grease	/Y○	○	○	○	○	○
Scrapers	/Z○	○	○	○	○	○

Table 6 Combination of supplemental codes

D	○												
E	−	−											
F	○	○	○										
HP	−	○	−	○									
I	○	○	○	○	○								
J	○	○	○	○	−	○							
L	○	○	○	○	○	○	○						
LF	○	○	○	○	○	○	○	−					
Q	○	○	○	○	○	○	−	○	○				
V	○	○	○	○	○	○	○	○	○	−			
W	○	○	−	○	○	○	○	○	○	○	○		
Y	○	○	○	○	○	○	○	○	○	−	○	○	
Z	○	○	○	○	○	○	−	○	○	−	○	○	○
	A	D	E	F	HP	I	J	L	LF	Q	V	W	Y

Remarks 1. The combination of "−" shown in the table is not available.
2. When using multiple types for combination, please indicate by arranging the symbols in alphabetical order.

Table 7 Dimension of female threads for bellows (Supplemental code: /J /JJ)

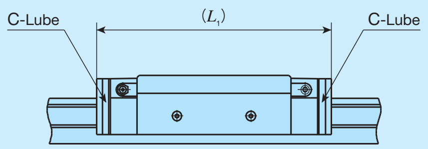


unit: mm

Identification number	Slide unit a_1	a_2	b_1	b_2	b_3	b_4	M_1×depth	L_1 (1)	Track rail a_3	a_4	M_2×depth
LRWX 25…B	5	12	15	33	7	49	M3× 6	116	7	12	M4× 8
LRWX 35…B	6	16	29	42	10	80	M3× 6	166	8	16	M4× 8
LRWXH 35			31		12						
LRWX 45…B	8	20	34	52	12	96	M4× 8	221	10	19	M5×10
LRWXH 45			38		16						
LRWX 55…B	9	24	36	68	15	110	M5×10	282	12	23	M6×12
LRWXH 55			43		22						
LRWX 75…B	10	35	35	110	15.5	149	M5×10	366	15	30	M6×12
LRWXH 75			42		22.5						

Note (1) Dimensions of the specification that female threads for bellows are fitted to both ends of the slide unit are indicated.

Table 8 Dimension of slide unit with C-Lube plate (Supplemental code /Q)

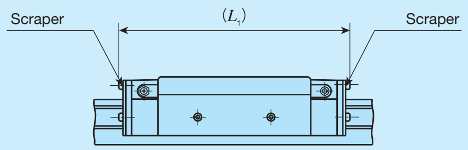


unit: mm

Size	L_1
25	120
35	166
45	218
55	275
75	364

Remark: The dimensions of the slide unit with C-Lube at both ends are indicated.

Table 9 Dimension of slide unit with scrapers (Supplemental code: /Z /ZZ)



unit: mm

Size	L_1
25	120
35	164
45	217
55	275
75	361

Remark: The dimensions of the slide unit with scraper at both ends are indicated.

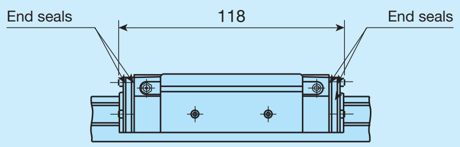


Fig. 2 Dimensions of slide unit with double seals (Size 25) (Supplemental code: /V /VV)

Remark: The dimensions of the slide unit with double end seals at both ends are indicated.

Lubrication

Lithium-soap base grease with extreme-pressure additive (Alvania EP Grease 2 [Shell Lubricants Japan K.K.]) is pre-packed in LRWX series.

LRWX series has grease nipple as indicated in Table 10.

Table 10 Parts for lubrication

Size	Grease nipple type (1)	Applicable supply nozzle type	Bolt size of female threads for piping
25	JIS type 1	Grease gun available on the market	M6
35			
45	JIS type 2		PT1/8
55			
75			

Note (1) For grease nipple specification, see Table 14.2 on page Ⅲ－23.
Remark: Stainless steel grease nipple is also available. If needed, please contact IKO.

Dust Protection

The slide units of LRWX series are equipped with end seals and under seals as standard for dust protection. However, if large amount of contaminant or dust are floating, or if large particles of foreign substances such as chips or sand may adhere to the track rail, it is recommended to cover the whole unit with bellows or telescope type shield, etc.
LRWX series is provided with specific bellows. The bellows are easy to mount and provide excellent dust protection. If needed, please refer to Ⅲ－26 for ordering.

Precaution for Use

❶Mounting surface, reference mounting surface and typical mounting structure

When mounting the LRWX series, properly align the reference mounting surfaces B and D of the track rail and slide unit with the reference mounting surface of the table and bed and fix them. (See Fig. 3)
Reference mounting surfaces B and D and mounting surfaces A and C are ground precisely. Machining the mounting surface of the table and bed, such as machine or device, to high accuracy and mounting them properly will ensure stable linear motion with high accuracy.
Reference mounting surface of the slide unit is the opposite side of the IKO mark. The track rail reference mounting surface is identified by locating the IKO mark on the top surface of the track rail. It is the side surface above the mark (in the direction of the arrow). (See Fig. 4)

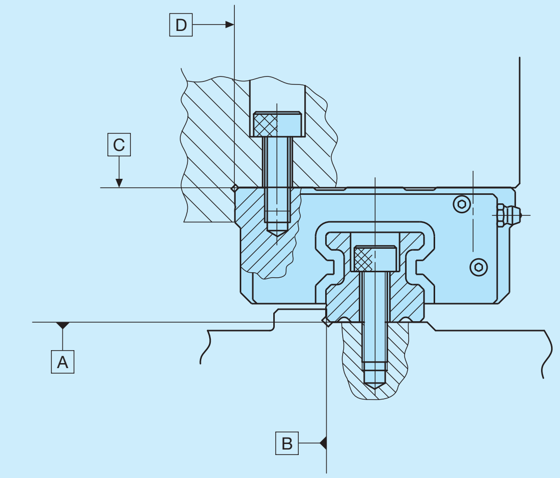


Fig. 3 Reference mounting surface and typical mounting structure

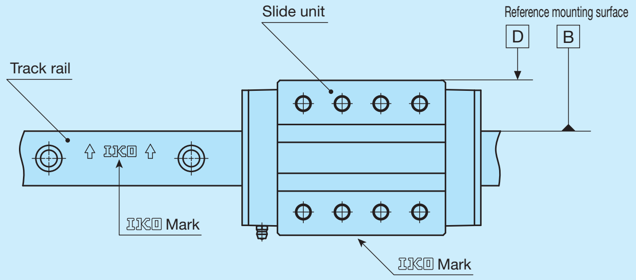


Fig. 4 Reference mounting surface

❷Fixing the slide unit

Slide unit of LRWX25··· B and LRWXH is also provided with mounting holes in the middle of width direction (see Fig. 5) and has the arrangement to receive the applied load in a good balance. When designing machines or equipment, consider the arrangement so that the mounting holes in the middle of slide unit can also be used to fix the units, to use the highest performance out of the product.

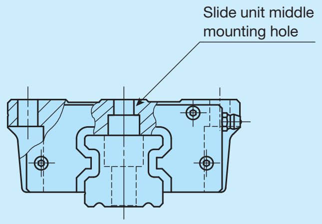


Fig. 5 Slide unit middle mounting hole

❸Shoulder height and corner radius of the reference mounting surface

For the opposite corner of the mating reference mounting, it is recommended to have relieved fillet as indicated in Fig. 6, but you may also use it with providing corner radius R as shown in Table 11. Recommended value for the shoulder height and corner radius on the mating side is indicated in Table 11.

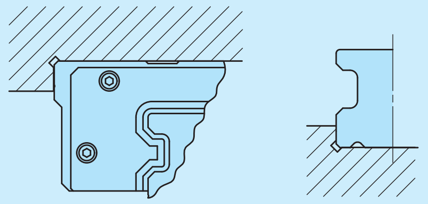
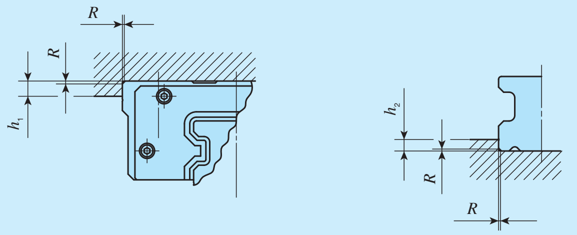


Fig. 6 Corner of the mating reference mounting

Table 11 Shoulder height and corner radius of the reference mounting surface



Mounting part of slide unit

Mounting part of track rail

unit: mm

Size	Shoulder height of slide unit mounting part h_1	Shoulder height of track rail mounting part h_2	Corner radius R (Maximum)
25	6	4	1
35	8	5.5	1
45	8	6	1
55	10	8	1.5
75	10	8	1.5

❹Tightening torque for fixing screw

Typical tightening torque for mounting of the LRWX series to the steel mating member material is indicated in Table 12. When vibration and shock of the machine or device are large, fluctuating load is large, or moment load is applied, fix it by using the torque 1.2 to 1.5 times larger than the value indicated in the table as necessary. If the mating member material is cast iron or aluminum alloy, reduce the tightening torque depending on the strength characteristics of the mating member material.

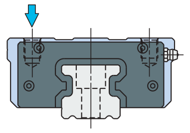
Table 12 Tightening torque for fixing screw

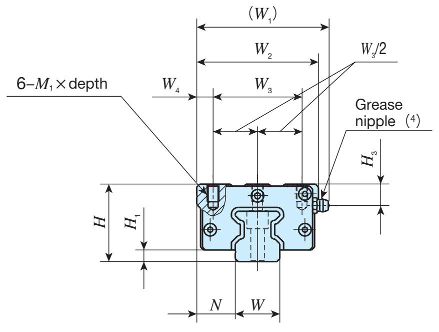
Bolt size	Tightening torque N・m
	High carbon steel-made screw
M 6×1	13.6
M 8×1.25	32.7
M10×1.5	63.9
M12×1.75	110
M16×2	268
M24×3	749

Remark: The tightening torque is calculated based on strength division 12.9 for product size up to 55, and strength division 10.9 for product size 75.

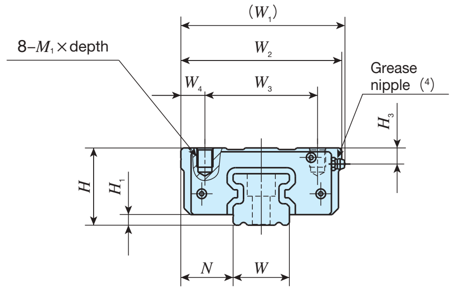
Block type mounting from top

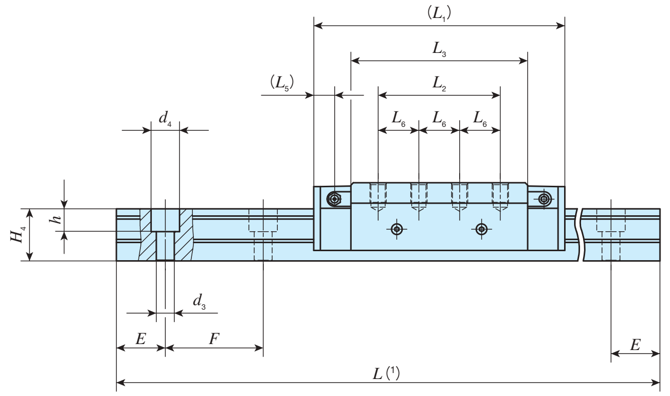
Shape	**LRWX⋯B**
Size	25 35 45 55 75





LRWX 25⋯B





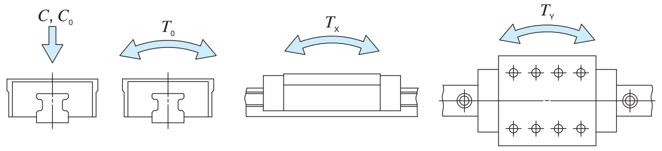
Identification number	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm											Dimensions of track rail mm							Appended mounting bolt for track rail (2)	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
LRWX series (No C-Lube)	Slide unit kg	Track rail kg/m	H	H_1	N	W_1	W_2	W_3	W_4	L_1	L_2	L_3	L_5	L_6	M_1× depth	H_3	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N・m	T_X N・m	T_Y N・m
LRWX 25⋯B	0.93	3.70	40	6	20	69	63	46	8.5	109	45	74.4	11	–	M 6× 9	11	23	26	7	11	9	30	60	M 6×28	32 700	70 300	1 110	885 5 170	885 5 170
LRWX 35⋯B	2.65	6.66	48	6.5	32.5	103	100	70	15	154	75	108.4	12.8	25	M10×12	10	35	32	11	17.5	14	30	60	M10×35	49 900	91 100	2 150	1 660 9 450	1 660 9 450
LRWX 45⋯B	5.32	10.3	60	8	37.5	125	120	82	19	205	105	144	18.5	35	M12×16	14.5	45	39	14	20	16	40	80	M12×40	93 300	167 000	5 000	4 030 23 000	4 030 23 000
LRWX 55⋯B	9.09	15.3	70	9	42.5	142	140	95	22.5	262	135	189	24.5	45	M16×18	16	55	47	18	26	21	50	100	M16×50	186 000	330 000	12 200	10 700 57 900	10 700 57 900
LRWX 75⋯B	19.0	25.1	90	10	52.5	190	180	123	28.5	346	180	240	45	60	M16×25	20	75	57	26	39	30	60	120	M24×60	298 000	518 000	25 200	20 900 121 000	20 900 121 000

Notes (1) Track rail lengths L are shown in Table 2 on page Ⅱ−221.

(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176.

(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.

(4) The shapes of grease nipple vary by size. The specifications are shown in Table 10 on page Ⅱ−225.



Example of identification number of assembled set

Model code	Dimensions	Part code		Model code	Preload symbol	Classification symbol	Supplemental code
LRWX	35	C2	R840	B	T1	P	/W2
①	②	③	④	①	⑤	⑥	⑦

① Model

LRWX⋯B	Block type mounting from top

② Size

25, 35, 45, 55, 75

③ Number of slide unit (2)

④ Length of track rail (840 mm)

⑤ Preload amount

No symbol	Standard
T1	Light preload
T2	Medium preload
T3	Heavy preload

⑥ Accuracy class

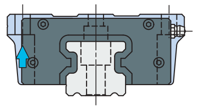
H	High
P	Precision
SP	Super precision
UP	Ultra precision

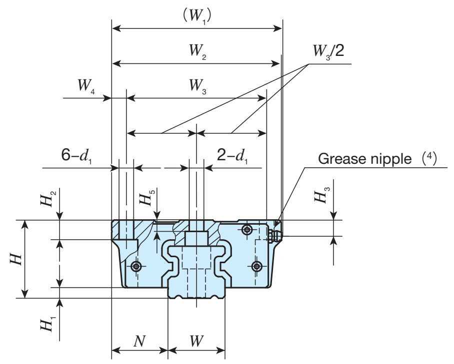
⑦ Special specification

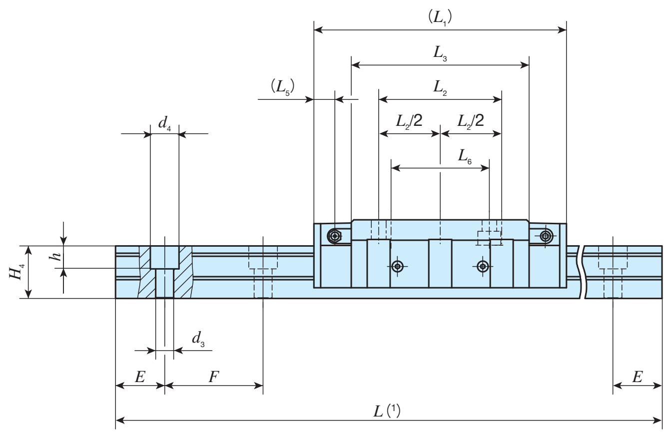
A, D, E, F, HP, Ⅰ, J
L, LF, Q, V, W, Y, Z

Flange type mounting from bottom

Shape	LRWXH
Size	35 | 45 | 55 | 75

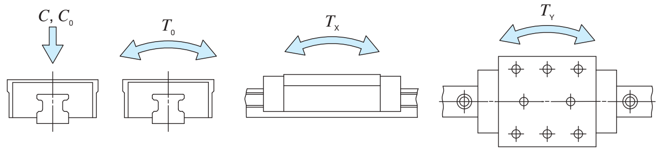






Identification number	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide unit mm													Dimensions of track rail mm							Appended mounting bolt for track rail (2)	Basic dynamic load rating (3)	Basic static load rating (3)	Static moment rating (3)		
LRWX series (No C-Lube)	Slide unit kg	Track rail kg/m	H	H_1	N	W_1	W_2	W_3	W_4	L_1	L_2	L_3	L_5	L_6	d_1	H_2	H_3	H_5	W	H_4	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N	T_0 N·m	T_X N·m	T_Y N·m
LRWXH 35	2.51	6.66	48	6.5	34.5	105	104	86	9	154	75	108.4	12.8	60	9	12	10	7	35	32	11	17.5	14	30	60	M10×35	49 900	91 100	2 150	1 660 9 450	1 660 9 450
LRWXH 45	5.18	10.3	60	8	41.5	129	128	108	10	205	105	144	18.5	80	11	15	14.5	10	45	39	14	20	16	40	80	M12×40	93 300	167 000	5 000	4 030 23 000	4 030 23 000
LRWXH 55	9.08	15.3	70	9	49.5	−	154	130	12	262	135	189	24.5	106	14	18	16	10	55	47	18	26	21	50	100	M16×50	186 000	330 000	12 200	10 700 57 900	10 700 57 900
LRWXH 75	19.7	25.1	90	10	59.5	197	194	164	15	346	180	240	45	134	18	24	20	16	75	57	26	39	30	60	120	M24×60	298 000	518 000	25 200	20 900 121 000	20 900 121 000

Notes (1) Track rail lengths L are shown in Table 2 on page Ⅱ−221.
(2) The appended track rail mounting bolts are hexagon socket head bolts equivalent to JIS B 1176.
(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), and static moment rating (T_0, T_X, T_Y) are shown in the sketches below. The upper values of T_X and T_Y are for one slide unit and the lower values are for two slide units in close contact.
(4) The shapes of grease nipple vary by size. The specifications are shown in Table 10 on page Ⅱ−225.



Example of identification number of assembled set

Model code	Dimensions	Part code		Preload symbol	Classification symbol	Supplemental code
LRWXH	35	C2	R840	T1	P	/W2
1	2	3	4	5	6	7

① Model

LRWXH	Flange type mounting from bottom

② Size

35, 45, 55, 75

③ Number of slide unit (2)

④ Length of track rail (840 mm)

⑤ Preload amount

No symbol	Standard
T1	Light preload
T2	Medium preload
T3	Heavy preload

⑥ Accuracy class

H	High
P	Precision
SP	Super precision
UP	Ultra precision

⑦ Special specification

A, D, E, F, HP, Ⅰ, J
L, LF, Q, V, W, Y, Z

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Linear Way Module

Linear Way Module

LWLM

LRWM

Points

1 Compact module type

Compact linear motion rolling guides consisting of a set of track rail and slide member which forms the smallest unit of linear motion mechanism.

2 Available Models

Two models are available: LWLM which uses balls for the rolling elements; and LRWM which uses rollers.

3 Stainless steel selections for excellent corrosion resistance

LWLM is made of stainless steel of excellent corrosion resistance. They are suitable for applications where rust prevention oil is not preferred, such as in cleanroom environment.

Identification Number and Specification

Example of an identification number

The specification of Linear Way Module series is indicated by the identification number. Indicate the identification number, consisting of a model code, dimensions, a part code, a classification symbol, and any supplemental codes for each specification to apply.

	1	2	3	4	5	6
Assembled set	LRWM	3	M2	R660	SP	/W2

No.	Item	Code	Page
1	**Model**	Model code	Page Ⅱ－235
2	**Size**	Dimensions	Page Ⅱ－235
3	**Number of slide members**	Part code	Page Ⅱ－235
4	**Length of track rail**	Part code	Page Ⅱ－236
5	**Accuracy class**	Classification symbol	Page Ⅱ－237
6	**Special specification**	Supplemental Code	Page Ⅱ－238

Identification Number and Specification

—Model・Size・Number of Slide Member—

1 Model

Linear Way Module

Linear Way LM (1) : LWLM
Linear Roller Way M (1) : LRWM

For applicable models and sizes, see Table 1.1 and 1.2.

Note (1) This model has no built-in C-Lube.

2 Size

7, 9, 11
2, 3, 4, 5, 6

For applicable models and sizes, see Table 1.1 and 1.2.

3 Number of slide members

: M○

Indicates the number of slide members assembled on a track rail.

Table 1.1 Model and sizes of LWLM series

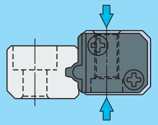
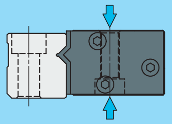
Shape	Model	Size		
		7	9	11
	LWLM	○	○	○

Table 1.2 Model and sizes of LRWM series

Shape	Model	Size				
		2	3	4	5	6
	LRWM	○	○	○	○	○

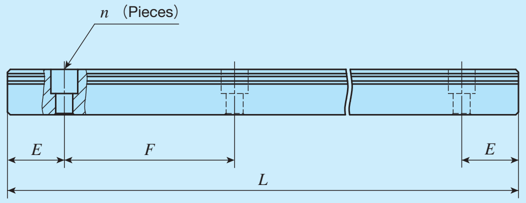
—Length of Track Rail—

4 Length of track rail

: R○

Indicate the length of track rail in mm.
For standard and maximum lengths, see Table 2.

Table 2 Standard and maximum lengths of track rail



unit: mm

Identification number / Item		LWLM7	LWLM9	LWLM11
Standard length L (n)		60 (3) 80 (4) 120 (6) 160 (8)	100 (4) 150 (6) 200 (8) 275 (11)	160 (4) 240 (6) 320 (8) 440 (11)
Pitch of mounting holes F		20	25	40
E		10	12.5	20
Standard E dimensions	or higher	4.5	5	5.5
	below	14.5	17.5	25.5
Maximum length (1)		240 (500)	350 (900)	520 (1 000)

Identification number / Item		LRWM2	LRWM3	LRWM4	LRWM5	LRWM6
Standard length L (n)		480 (8) 660 (11) 840 (14)	480 (8) 660 (11) 840 (14)	800 (10) 1 040 (13) 1 200 (15)	800 (8) 1 200 (12) 1 500 (15)	1 200 (10)
Pitch of mounting holes F		60	60	80	100	120
E		30	30	40	50	60
Standard E dimensions	or higher	8	9	10	12	13
	below	38	39	50	62	73
Maximum length		1 800	1 860	1 920	1 600	1 200

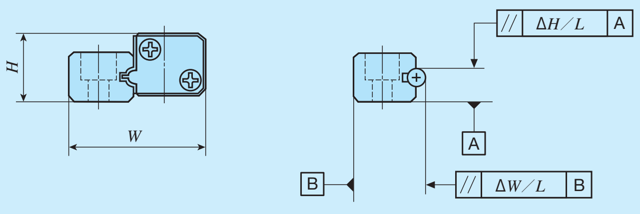
Note (1) Length up to the value in ( ) can be produced. If needed, please contact IKO.
Remark: If not directed, E dimensions for both ends will be the same within the range of standard E dimensions. To change the dimensions, indicate the specified rail mounting hole positions "/E" of special specification. For more information, see page Ⅲ−30.

5 Accuracy class

High : H
Precision : P
Super precision : SP

For details of accuracy class, see Table 3.

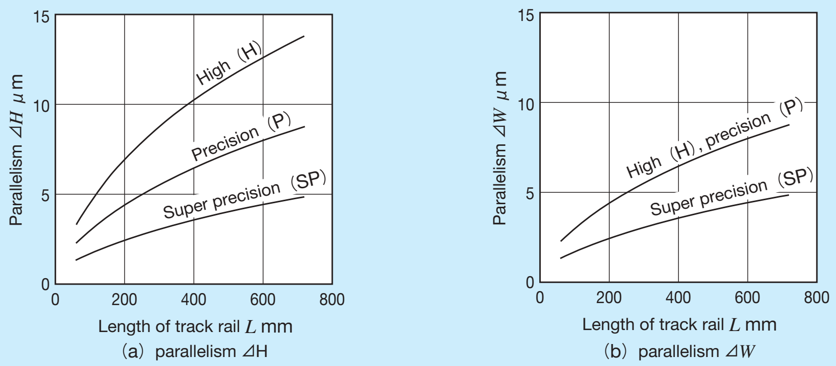
Table 3 Tolerance and allowance



unit: mm

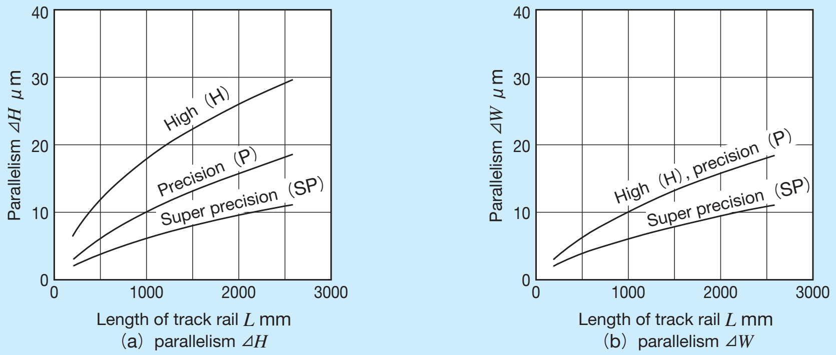
Class (classification symbol) / Item	High (H)	Precision (P)	Super precision (SP)
Dim. H tolerance	±0.040	±0.020	±0.010
Dim. W tolerance	±0.050	±0.025	±0.015
Dim. variation of H(1)	0.015	0.007	0.005
Dim. variation of W(1)	0.020	0.010	0.007
Track rail parallelism $\varDelta H$	See Fig. 1.1 and Fig. 1.2		
Track rail parallelism $\varDelta W$	See Fig. 1.1 and Fig. 1.2		

Note (1) It means the size variation between slide members mounted on the same track rail.



(a) parallelism ⊿H (b) parallelism ⊿W

Fig.1.1 Track rail parallelism for LWLM



(a) parallelism ⊿H (b) parallelism ⊿W

Fig.1.2 Track rail parallelism for LRWM

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6 Special specification

/A, /E, /F, /I, /LR,
/LFR, /MN, /W○, /Y○

For applicable special specifications, see Table 4.
For combination of multiple special specifications, see Table 5.
For details of special specifications, see page Ⅲ－29.

Table 4 Application of special specifications

Special specification	Supplemental code	Model and size							
		LWLM			LRWM				
		7	9	11	2	3	4	5	6
Butt-jointing track rails	/A	×	×	×	○	○	○	○	○
Specified rail mounting hole positions	/E	○	○	○	○	○	○	○	○
Caps for rail mounting holes	/F	×	×	×	○	○	○	○	○
Inspection sheet	/I	○	○	○	○	○	○	○	○
Black chrome surface treatment	/LR	×	×	×	○	○	○	○	○
Fluorine black chrome surface treatment	/LFR	×	×	×	○	○	○	○	○
Without track rail mounting bolt	/MN	○	○	○	○(1)	○(1)	○(1)	○(1)	○(1)
A group of multiple assembled sets	/W○	○	○	○	○	○	○	○	○
Specified grease	/Y○	○	○	○	○	○	○	○	○

Note (1) None of mounting bolts for slide member and track rail are appended.

Table 5 Combination of supplemental codes

	A	E	F	I	LR	LFR	MN	W
E	—							
F	○	○						
I	○	○	○					
LR	○	○	○	○				
LFR	○	○	○	○	—			
MN	○	○	○	○	○	○		
W	○	—	○	○	○	○	○	
Y	○	○	○	○	○	○	○	○

Remarks 1. The combination of "—" shown in the table is not available.
2. When using multiple types for combination, please indicate by arranging the symbols in alphabetical order.

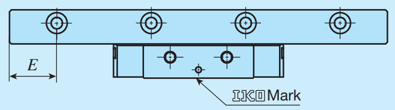


Fig.2 Specified rail mounting hole positions (Supplemental code /E)

Remark: For details of specified rail mounting hole positions (supplemental code /E), see page Ⅲ－30.

Lubrication

Lithium-soap base grease with extreme-pressure additive (Alvania EP Grease 2 [Shell Lubricants Japan K.K.]) is pre-packed in Linear Way Module series.
Though grease nipples are not appended to Linear Way Module series, oil holes are provided to slide member so that the grease or lubrication oil supplied from machines / devices is directly guided to the rolling elements recirculation route. Lubrication is easily conducted by providing the supply route in the machines / devices as shown in Fig. 3.

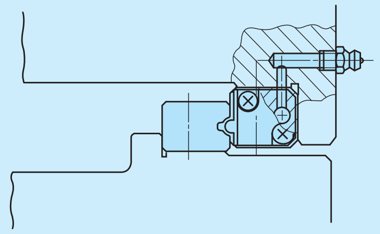


Fig. 3 Example of lubrication method

Dust Protection

The slide members of Linear Way Module series are equipped with end seals as standard for dust protection. However, if large amount of contaminant or dust are floating, or if large particles of foreign substances such as chips or sand may adhere to the track rail, it is recommended to cover the whole unit with bellows or telescope type shield, etc.

Precaution for Use

❶ Mounting surface, reference mounting surface and typical mounting structure

When mounting the Linear Way Module series, properly align the reference mounting surfaces B and D of the track rail and slide member with the reference mounting surface of the table and bed and fix them. (See Fig. 4)
The reference mounting surfaces B and D and mounting surfaces A and C are precisely ground. Machining the mounting surface of the table and bed, such as machine or device, to high accuracy and mounting them properly will ensure stable linear motion with high accuracy.

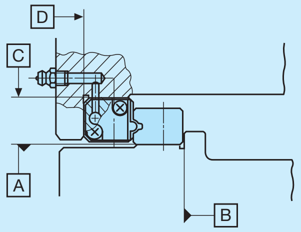


Fig. 4 Reference mounting surface and typical mounting structure

❷ Fixing the slide member

Typical mounting structure of Linear Way Module series is shown in Fig. 5. As a convenient means to eliminate play or to give preload in linear motion rolling mechanism, preload adjusting screws are often used.
Set the preload adjusting screws at the positions of fixing bolts of slide member and in the middle of the height of slide member, and then press the slide member by tightening the screw.
For mounting the slide member of Linear Way Module LWLM, it is recommended to fix the slide member from the table side, because the allowance for the preload adjustment in the bolt hole of slide member is small. In this case, the bolt hole and the counterbore in the table should be made larger to give the adjustment allowance.

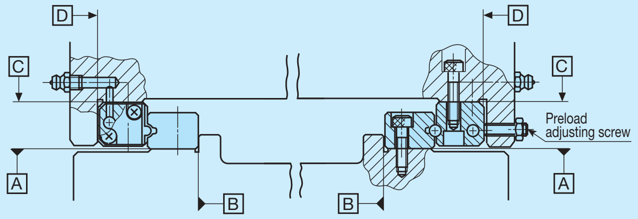


Fig.5 Mounting by preload adjusting screws

Preload amount varies depending on operational conditions of your machine and device. However, as excessive preload may lead to short life and damage on the raceway, it is typically ideal to adjust to zero clearance or slight preload state.

❸ Shoulder height and corner radius of the reference mounting surface

For the opposite corner of the mating reference mounting, it is recommended to have relieved fillet as indicated in Fig. 6. Recommended value for the shoulder height and corner radius on the mating side is indicated in Table 7.1, Table 7.2 and Table 7.3.

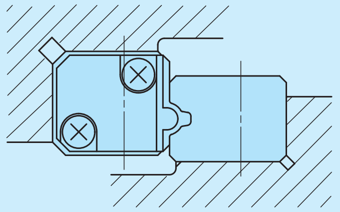


Fig. 6 Corner of the mating reference mounting

❹ Tightening torque for fixing screw

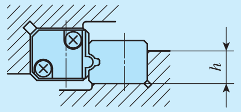
Typical tightening torque for mounting of Linear Way Module series to the steel mating member material is indicated in Table 6. When vibration and shock of the machine or device are large, fluctuating load is large, or moment load is applied, fix it by using the torque 1.2 to 1.5 times larger than the value indicated in the table as necessary. If the mating member material is cast iron or aluminum alloy, reduce the tightening torque depending on the strength characteristics of the mating member material.

Table 6 Tightening torque for fixing screw

Bolt size	Tightening torque N・m	
	High carbon steel-made screw	Stainless steel-made screw
M 2.6×0.45	–	0.7
M 3 ×0.5	1.8	1.1
M 4 ×0.7	4.1	–
M 5 ×0.8	8.0	–
M 6 ×1	13.6	–
M 8 ×1.25	32.7	–
M10 ×1.5	63.9	–
M12 ×1.75	110	–

Remark: The tightening torque is calculated based on strength division 12.9 and property division A2-70.

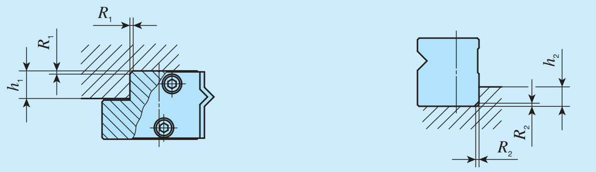
Table 7.1 Shoulder height of the reference mounting surface for LWLM



unit: mm

Size	Mounting part of track rail shoulder height h
7	4
9	5
11	6

Table 7.2 Shoulder height and corner radius of the reference mounting surface for LRWM



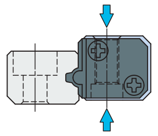
Mounting part of slide member

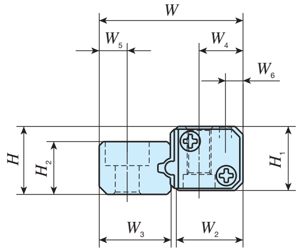
Mounting part of track rail

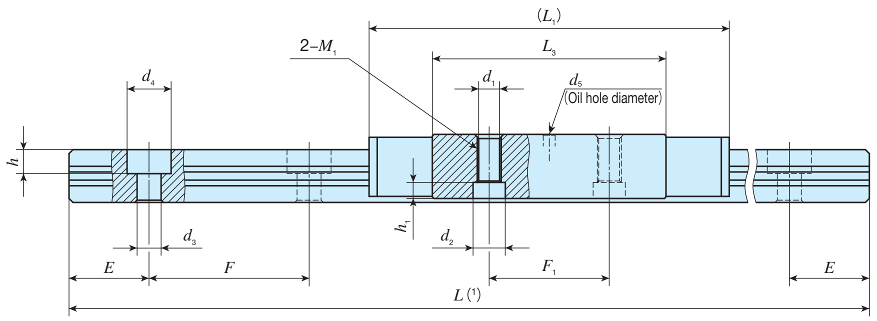
unit: mm

Size	Mounting part of slide member		Mounting part of track rail	
	Shoulder height h_1	Corner radius R_1 (Maximum)	Shoulder height h_2	Corner radius R_2 (Maximum)
2	7	1	5	1
3	8.5	1	6	1
4	10.5	1.5	6	1
5	12.5	1.5	8	1
6	14.5	2	8	1.5

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Linear Way LM	
	LWLM
Shape	
Size	**7** | **9** | **11**

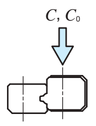




Identification number	Mass (Ref.)		Dimensions of assembly mm		Dimensions of slide member mm												Dimensions of track rail mm								Appended mounting bolt for track rail (2)	Basic dynamic load rating (3)	Basic static load rating (3)
Linear Way Module series (No C-Lube)	Slide member g	Track rail g/m	H	W	H_1	W_2	W_4	W_6	L_1	L_3	F_1	d_1	d_2	h_1	M_1	d_5	H_2	W_3	W_5	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N
LWLM 7*	10	210	7	15	6.6	7.8	5	2.5	38	24	12	–	–	–	M2.6	1	4.8	6.8	3.3	3(4)	–(4)	–(4)	10	20	M2.6×8(4)	1 730	2 020
LWLM 9*	16	390	8.5	18	8	8.6	5.5	2.2	45	29.2	15	–	–	–	M3	1.5	6.6	9	3.5	3	5.5	3	12.5	25	M2.6×8	2 780	3 150
LWLM 11*	32	590	11	23	10	11.8	7	3	52	32.8	15	2.55	5	3	M3	2	8	10.8	5	3.5	6	4.5	20	40	M3×8	4 080	4 240

Notes (1) Track rail lengths L are shown in Table 2 on page Ⅱ−236.
(2) The appended mounting bolts are stainless steel hexagon socket head bolts equivalent to JIS B 1176.
(3) The direction of basic dynamic load rating (C) and basic static load rating (C_0) are shown in the sketch below.
(4) Track rail mounting holes have no counterbore.
When the appended track rail mounting bolts are used, the height from track rail bottom surface to bolt head is 7.4 mm.

Remarks 1. Slide member mounting bolts are not appended.
2. The identification numbers with * are our semi-standard items.



Example of identification number of assembled set

Model code	Dimensions	Part code		Classification symbol	Supplemental code
LWLM	**9**	**M2**	**R200**	**P**	**/W2**
①	②	③	④	⑤	⑥

① Model

LWLM	Linear Way LM

② Size

7, 9, 11

③ Number of slide member (2)

④ Length of track rail (200 mm)

⑤ Accuracy class

H	High
P	Precision
SP	Super precision

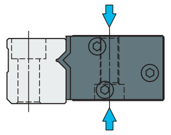
⑥ Special specification

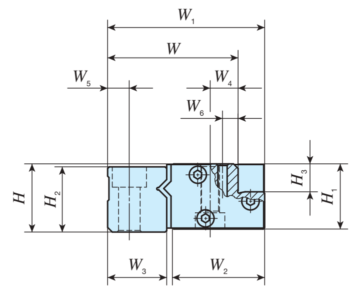
E, Ⅰ, MN, W, Y

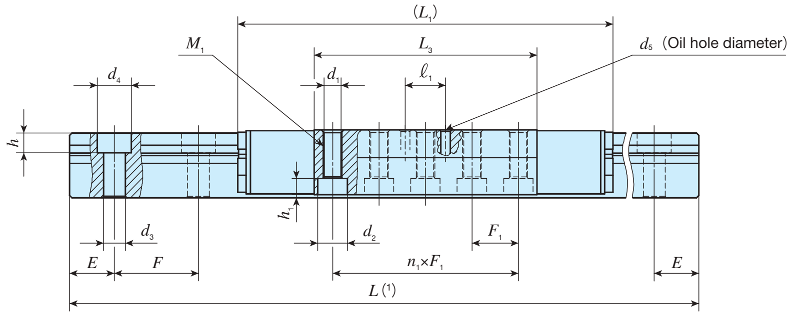
LWLM・LRWM

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Linear Roller Way M

Shape	LRWM 				
Size	2	3	4	5	6





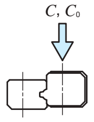
Identification number	Mass (Ref.)		Dimensions of assembly mm			Dimensions of slide member mm														Appended mounting bolt for slide member (2)	Dimensions of track rail mm								Appended mounting bolt for track rail (2)	Basic dynamic load rating (3)	Basic static load rating (3)
Linear Way Module series (No C-Lube)	Slide member kg	Track rail kg/m	H	W	W_1	H_1	H_3	W_2	W_4	L_1	L_3	$n_1 \times F_1$	M_1	d_1	d_2	h_1	W_6	ℓ_1	d_5	Bolt size× ℓ	H_2	W_3	W_5	d_3	d_4	h	E	F	Bolt size× ℓ	C N	C_0 N
LRWM 2*	0.26	1.98	19	33	39.6	18	7.5	22.9	8	105	63	4×12	M 5	4.4	8	4.1	4	10	3	M4×20	18	15	6	6	9.5	5.4	30	60	M 5×20	9 700	10 800
LRWM 3*	0.46	2.92	22	42	50.6	21	9	29.8	9	122	72	4×15	M 6	5.4	9.5	5.2	5	13	3	M5×25	21	19	7	7	11	6.5	30	60	M 6×25	18 500	20 300
LRWM 4*	0.98	4.64	28	56	65.6	27	11	39.4	13	157	96	5×16	M 8	6.8	11	6.2	6	–	3	M6×32	27	24	9	9	14	8.6	40	80	M 8×32	36 500	39 800
LRWM 5*	2.03	6.85	33	70	81.6	32	13	49.1	16	212	140	5×24	M10	8.6	14	8.2	7	–	3	M8×35	32	30	12	11	17.5	10.8	50	100	M10×35	67 900	75 500
LRWM 6*	3.42	9.25	38	83	96.6	37	15	58.6	21	256	168	6×25	M10	8.6	14	8.2	8	28	3	M8×40	37	35	14	14	20	13	60	120	M12×40	99 800	109 000

Notes (1) Track rail lengths L are shown in Table 2 on page Ⅱ－236.

(2) The appended mounting bolts are hexagon socket head bolts equivalent to JIS B 1176.

(3) The direction of basic dynamic load rating (C) and basic static load rating (C_0) are shown in the sketch below.

Remark: The identification numbers with * are our semi-standard items.



Example of identification number of assembled set

Model code	Dimensions		Part code	Classification symbol	Supplemental code
LRWM	3	M2	R660	P	/W2
❶	❷	❸	❹	❺	❻

① Model	
LRWM	Linear Roller Way M

② Size
2, 3, 4, 5, 6

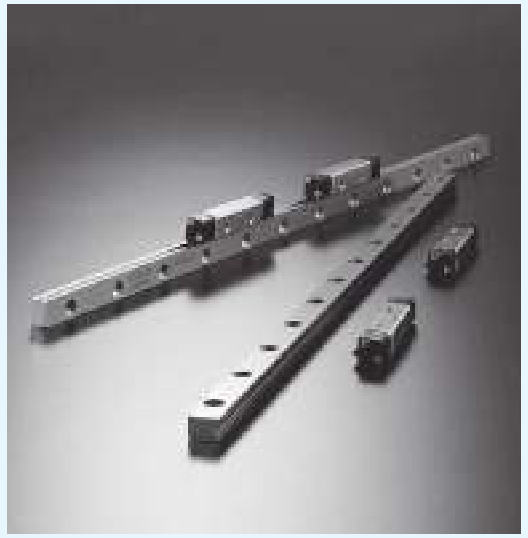
③ Number of slide member (2)

④ Length of track rail (660 mm)

⑤ Accuracy class	
H	High
P	Precision
SP	Super precision

⑥ Special specification
A, E, F, Ⅰ, LR, LFR MN, W, Y

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

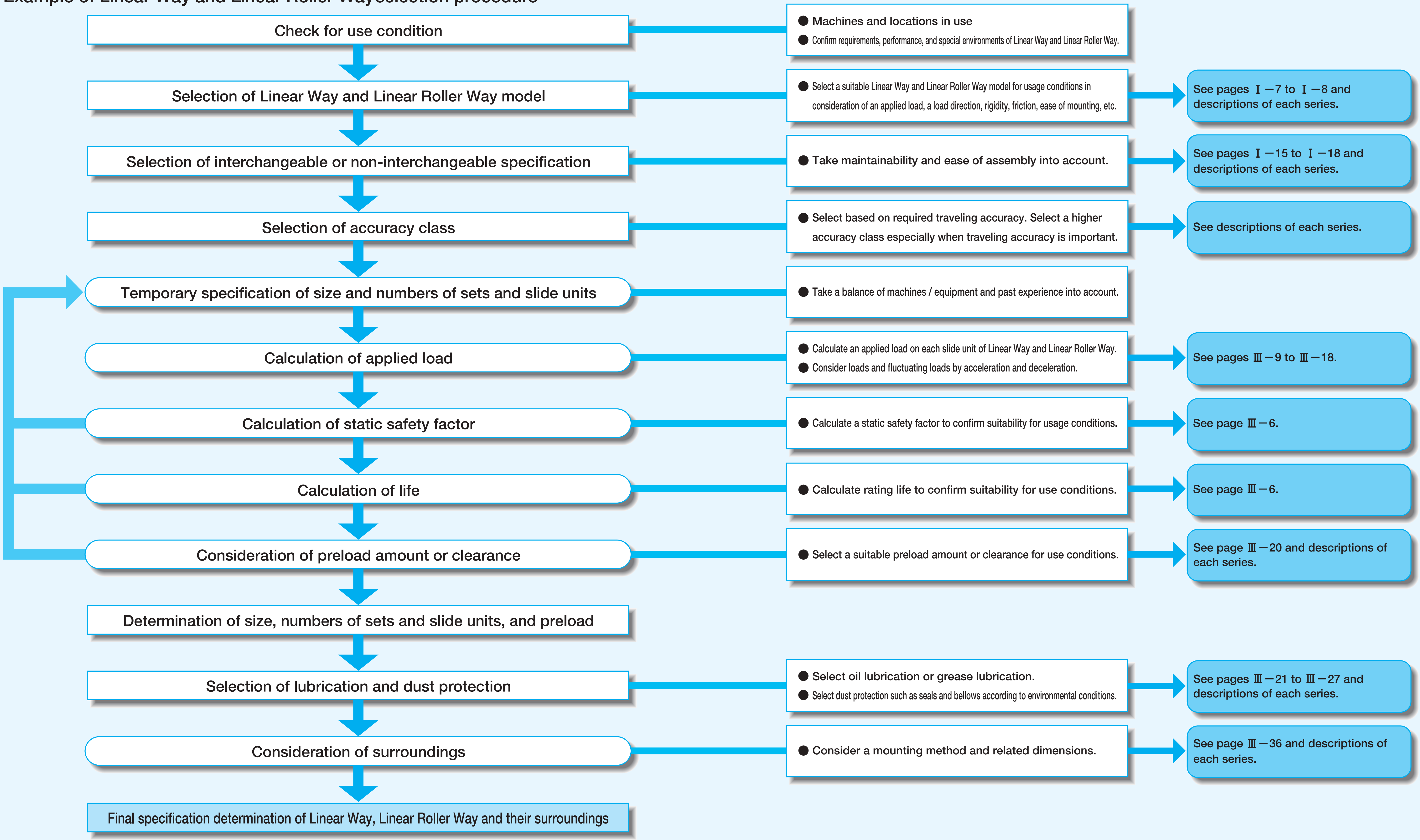


General Explanation

Selection Procedure

Selection of Linear Way and Linear Roller Way should be considered from the most important required matter to details in order.
Typical procedure is shown below.

Example of Linear Way and Linear Roller Way selection procedure



Check for use condition	● Machines and locations in use ● Confirm requirements, performance, and special environments of Linear Way and Linear Roller Way.	
Selection of Linear Way and Linear Roller Way model	● Select a suitable Linear Way and Linear Roller Way model for usage conditions in consideration of an applied load, a load direction, rigidity, friction, ease of mounting, etc.	See pages Ⅰ−7 to Ⅰ−8 and descriptions of each series.
Selection of interchangeable or non-interchangeable specification	● Take maintainability and ease of assembly into account.	See pages Ⅰ−15 to Ⅰ−18 and descriptions of each series.
Selection of accuracy class	● Select based on required traveling accuracy. Select a higher accuracy class especially when traveling accuracy is important.	See descriptions of each series.
Temporary specification of size and numbers of sets and slide units	● Take a balance of machines / equipment and past experience into account.	
Calculation of applied load	● Calculate an applied load on each slide unit of Linear Way and Linear Roller Way. ● Consider loads and fluctuating loads by acceleration and deceleration.	See pages Ⅲ−9 to Ⅲ−18.
Calculation of static safety factor	● Calculate a static safety factor to confirm suitability for usage conditions.	See page Ⅲ−6.
Calculation of life	● Calculate rating life to confirm suitability for use conditions.	See page Ⅲ−6.
Consideration of preload amount or clearance	● Select a suitable preload amount or clearance for use conditions.	See page Ⅲ−20 and descriptions of each series.
Determination of size, numbers of sets and slide units, and preload		
Selection of lubrication and dust protection	● Select oil lubrication or grease lubrication. ● Select dust protection such as seals and bellows according to environmental conditions.	See pages Ⅲ−21 to Ⅲ−27 and descriptions of each series.
Consideration of surroundings	● Consider a mounting method and related dimensions.	See page Ⅲ−36 and descriptions of each series.
Final specification determination of Linear Way, Linear Roller Way and their surroundings		

Load Rating and Life

Life of linear motion rolling guides

Even in normal operational status, a linear motion rolling guide will reach the end of its life after a certain period of operations. As repeated load is constantly applied onto a raceway and rolling elements of the linear motion rolling guide, this leads to leprous damage (scale-like wear fragments) called fatigue flaking due to rolling contact fatigue of materials, it will be unusable at the end. Total traveling distance before occurrence of this fatigue flaking on a raceway or rolling elements is called the life of linear motion rolling guide.
As the life of linear motion rolling guide may vary depending on material fatigue phenomenon, rating life based on statistic calculation is used.

Rating life

Rating life of linear motion rolling guide refers to the total traveling distance 90% of a group of the same linear motion rolling guide can operate without linear motion rolling guide material damages due to rolling contact fatigue when they are operated individually under the same conditions.

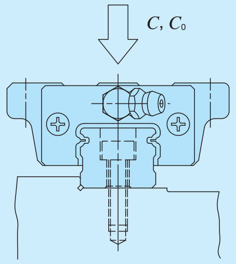


Fig. 1 Direction of load rating

Basic dynamic load rating C

Complying with ISO 14728-1

Basic dynamic load rating refers to load with certain direction and size that is logically endurable for rating life of 50×10^3 m when a group of the same linear motion rolling guides is operated individually under the same conditions.

Basic static load rating C_0

Complying with ISO 14728-2

Basic static load rating refers to static load generating a certain contact stress at the center of contact part of the rolling elements and a raceway under maximum load, which is the load at the allowable limit for normal rolling motion. Generally, it is used considering static safety factor.

Static moment rating T_0, T_X, T_Y

Static moment rating refers to static moment load generating a certain contact stress at the center of contact parts of rolling elements and a raceway under the maximum load when the moment load shown in Fig. 2 is loaded, which is the moment load at the allowable limit for normal rolling motion. Generally, it is used considering static safety factor.

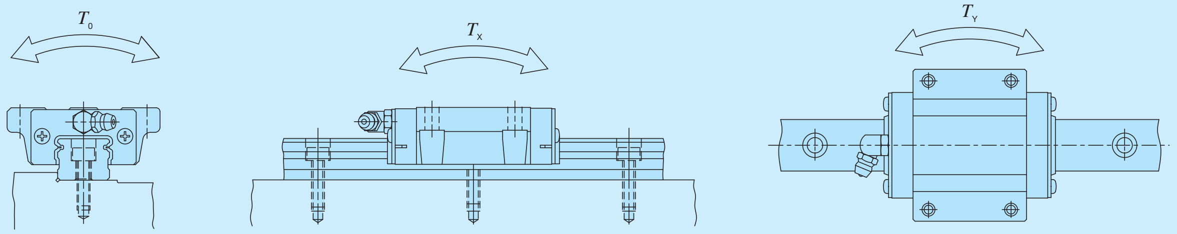


Fig. 2 Direction of static moment rating

Calculating formula of life

The rating life calculation formulas are shown below.

Linear Way

$$L=50\left(\frac{C}{P}\right)^3 \cdots\cdots(1)$$

Linear Roller Way

$$L=50\left(\frac{C}{P}\right)^{10/3} \cdots\cdots(2)$$

where, L: Rating life, 10^3 m
C: Basic dynamic load rating, N
P: Dynamic equivalent load, N

Life time can be calculated by applying a stroke length and a number of strokes per minute to the formula below.

$$L_h=\frac{10^6L}{2Sn_1\times60} \cdots\cdots(3)$$

where, L_h : Rating life in hours, h
S : Stroke length, mm
n_1 : Number of strokes per minute, min^{-1}

Load factor

Load applied to a linear motion rolling guide can be larger than theoretical load due to machine vibration or shock. Generally, the applied load is obtained by multiplying it by the load factor indicated in Table 1.

Table 1 Load factor

Operating conditions	f_W
Smooth operation free from shock	1 ～ 1.2
Normal operation	1.2 ～ 1.5
Operation with shock load	1.5 ～ 3

Static safety factor

Generally, basic static load rating and static moment rating is considered as load at the allowable limit for normal rolling motion. However, static safety factor must be considered according to operating conditions and required performance of the linear motion rolling guide.
Static safety factor can be obtained by the following equation and typical values are indicated in Tables 2.1 and 2.2.
Equation (5) is a representative equation for a moment load. Moment load and static moment rating in each direction is applied for the calculation.

$$f_S=\frac{C_0}{P_0} \cdots\cdots(4)$$

$$f_S=\frac{T_0}{M_0} \cdots\cdots(5)$$

where, f_S : Static safety factor
C_0 : Basic static load rating, N
P_0 : Static equivalent load, N
T_0 : Static moment rating, N・m
M_0 : Moment load in each direction, N・m (maximum moment load)

Table 2.1 Static safety factor for Linear Way

Operational conditions	f_S
Operation with vibration and / or shock	3 ～ 5
High operating performance	2 ～ 4
Normal operating conditions	1 ～ 3

Table 2.2 Static safety factor for Linear Roller Way

Operational conditions	f_S
Operation with vibration and / or shock	4 ～ 6
High operating performance	3 ～ 5
Normal operating conditions	2.5 ～ 3

Dynamic equivalent load

When a load is applied in a direction other than that of the basic dynamic load rating or a complex load is applied, the dynamic equivalent load must be calculated to obtain the basic rating life.

Obtain the downward and lateral conversion loads from the loads and moments in various directions.

$$F_{\mathrm{re}}=k_{\mathrm{r}}\left|F_{\mathrm{r}}\right|+\frac{C_0}{T_0}\left|M_0\right|+\frac{C_0}{T_{\mathrm{X}}}\left|M_{\mathrm{X}}\right| \quad \cdots\cdots (6)$$

$$F_{\mathrm{ae}}=k_{\mathrm{a}}\left|F_{\mathrm{a}}\right|+\frac{C_0}{T_{\mathrm{Y}}}\left|M_{\mathrm{Y}}\right| \quad \cdots\cdots (7)$$

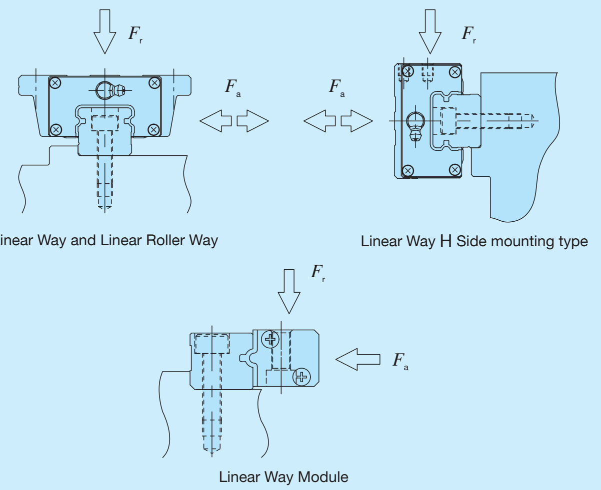
[For Linear Way H Side mounting type (LWHY)]

$$F_{\mathrm{ae}}=k_{\mathrm{a}}\left|F_{\mathrm{a}}\right|+\frac{C_0}{T_0}\left|M_0\right|+\frac{C_0}{T_{\mathrm{X}}}\left|M_{\mathrm{x}}\right| \quad \cdots\cdots (8)$$

$$F_{\mathrm{re}}=k_{\mathrm{r}}\left|F_{\mathrm{r}}\right|+\frac{C_0}{T_{\mathrm{Y}}}\left|M_{\mathrm{Y}}\right| \quad \cdots\cdots (9)$$

where, F_{re} : Downward conversion load, N
F_{ae} : Lateral conversion load, N
F_{r} : Downward load, N
F_{a} : Lateral load, N
M_0 : Moment load in the $\mathrm{T_0}$ direction, N · m
M_{X} : Moment load in the $\mathrm{T_X}$ direction, N · m
M_{Y} : Moment load in the $\mathrm{T_Y}$ direction, N · m
k_{r}, k_{a} : Conversion factors for load direction (See Table 3)
C_0 : Basic static load rating, N
T_0 : Static moment rating in the $\mathrm{T_0}$ direction, N · m
T_{X} : Static moment rating in the $\mathrm{T_X}$ direction, N · m
T_{Y} : Static moment rating in the $\mathrm{T_Y}$ direction, N · m

Table 3 Conversion factor for load direction



Linear Way and Linear Roller Way

Linear Way H Side mounting type

Linear Way Module

Series name and size		Conversion factor		
		k_{r}		k_{a}
		$F_{\mathrm{r}} \geqq 0$	$F_{\mathrm{r}} < 0$	
C-Lube Linear Way ML Linear Way L	Ball retained type	1	1	1.19
	Ball non-retained type	1	1	0.84
C-Lube Linear Way MLV		1	1	1.19
C-Lube Linear Way MV		1	1.23	1.35
C-Lube Linear Way ME Linear Way E	15～30	1	1	1
	35～45	1	1.19	1.28
Low Decibel Linear Way E		1	1	1
C-Lube Linear Way MH Linear Way H	8～12	1	1	1.19
	15～30	1	1	1
	35～65	1	1.19	1.28
Linear Way H Horizontal mounting type	15～30	1	1	1
	35～45 (1)	1	1	0.84 0.95
Linear Way F	33～42	1	1	1
	69	1	1	1.19
	LWFH	1	1.19	1.28
C-Lube Linear Way MUL Linear Way U	25, 30	1	1	1.19
	40～86	1	1	1
C-Lube Linear Roller Way Super MX Linear Roller Way Super X		1	1	1
Linear Roller Way X		1	1	1
Linear Way Module	LWLM	1	1	0.73
	LRWM	1	1	0.58

Note (1) The upper value of k_{a} columns represents the right direction and the lower value represents the left direction.

Obtain the dynamic equivalent load from the downward and lateral conversion loads.

$$P=XF_{\mathrm{re}}+YF_{\mathrm{ae}} \quad \cdots\cdots (10)$$

where, P : Dynamic equivalent load, N
X, Y : Dynamic equivalent load factor (See Table 4)
F_{re} : Downward conversion load, N
F_{ae} : Lateral conversion load, N

Table 4 Dynamic equivalent load factor

Class	X	Y
$\left|F_{\mathrm{re}}\right| \geqq \left|F_{\mathrm{ae}}\right|$	1	0.6
$\left|F_{\mathrm{re}}\right| < \left|F_{\mathrm{ae}}\right|$	0.6	1

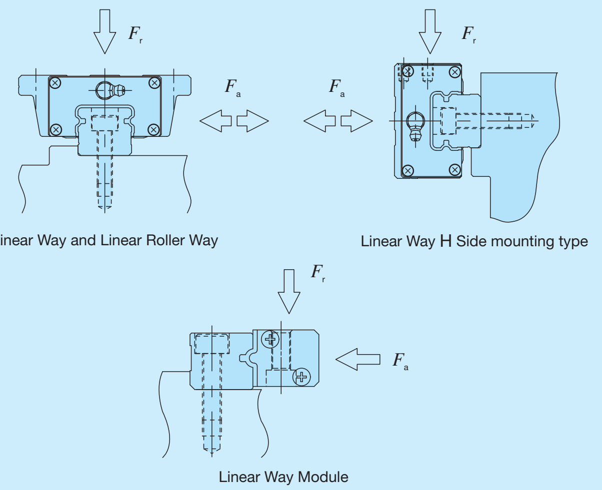
Static equivalent load

When a load is applied in a direction other than that of the basic static load rating or a complex load is applied, the static equivalent load must be calculated to obtain the static safety factor.

$$P_0=k_{0\mathrm{r}}\left|F_{\mathrm{r}}\right|+k_{0\mathrm{a}}\left|F_{\mathrm{a}}\right|+\frac{C_0}{T_0}\left|M_0\right|+\frac{C_0}{T_{\mathrm{X}}}\left|M_{\mathrm{X}}\right|+\frac{C_0}{T_{\mathrm{Y}}}\left|M_{\mathrm{Y}}\right| \quad \cdots\cdots (11)$$

where, P_0 : Static equivalent load, N
F_{r} : Downward load, N
F_{a} : Lateral load, N
M_0 : Moment load in the $\mathrm{T_0}$ direction, N · m
M_{X} : Moment load in the $\mathrm{T_X}$ direction, N · m
M_{Y} : Moment load in the $\mathrm{T_Y}$ direction, N · m
$k_{0\mathrm{r}}$, $k_{0\mathrm{a}}$: Conversion factors for load direction (See Table 5)
C_0 : Basic static load rating, N
T_0 : Static moment rating in the $\mathrm{T_0}$ direction, N · m
T_{X} : Static moment rating in the $\mathrm{T_X}$ direction, N · m
T_{Y} : Static moment rating in the $\mathrm{T_Y}$ direction, N · m

Table 5 Conversion factor for load direction



Linear Way and Linear Roller Way

Linear Way H Side mounting type

Linear Way Module

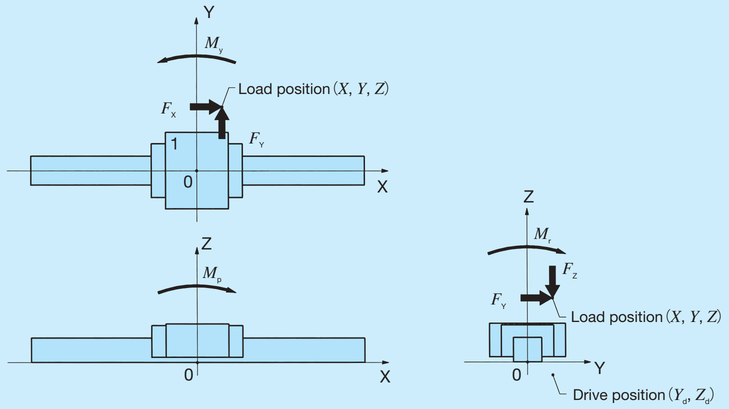
Series name and size		Conversion factor		
		$k_{0\mathrm{r}}$		$k_{0\mathrm{a}}$
		$F_{\mathrm{r}} \geqq 0$	$F_{\mathrm{r}} < 0$	
C-Lube Linear Way ML Linear Way L	Ball retained type	1	1	1.19
	Ball non-retained type	1	1	0.84
C-Lube Linear Way MLV		1	1	1.19
C-Lube Linear Way MV		1	1.88	2.08
C-Lube Linear Way ME Linear Way E	15～30	1	1	1
	35～45	1	1.19	1.28
Low Decibel Linear Way E		1	1	1
C-Lube Linear Way MH Linear Way H	8～12	1	1	1.19
	15～30	1	1	1
	35～65	1	1.19	1.28
Linear Way H Horizontal mounting type	15～30	1	1	1
	35～45 (1)	1	1	0.78 0.93
Linear Way F	33～42	1	1	1
	69	1	1	1.19
	LWFH	1	1.19	1.28
C-Lube Linear Way MUL Linear Way U	25, 30	1	1	1.19
	40～86	1	1	1
C-Lube Linear Roller Way Super MX Linear Roller Way Super X		1	1	1
Linear Roller Way X		1	1	1
Linear Way Module	LWLM	1	1	0.60
	LRWM	1	1	0.50

Note (1) The upper value of $k_{0\mathrm{a}}$ columns represents the right direction and the lower value represents the left direction.

Calculated Load

Examples of calculation for the loads applied to Linear Way and Linear Roller Way that is incorporated in machine / equipment is shown in Table 6.1 to Table 6.6.

Table 6.1 One track rail and one slide unit

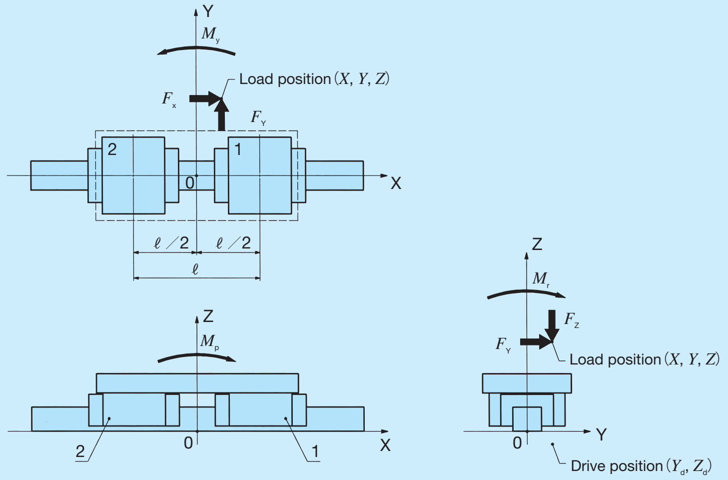


Slide unit No.	Load applied on the slide unit				
	Downward load F_r	Lateral load F_a	Moment load in the T_0 direction M_0	Moment load in the T_X direction M_X	Moment load in the T_Y direction M_Y
1	F_Z	F_Y	M_r	M_p	M_y

Remark: The moment loads in each direction M_r, M_p, M_y can be obtained by the following equation.

$$M_r = F_Y Z + F_Z Y$$
$$M_p = F_X\ (Z - Z_d) + F_Z X$$
$$M_y = -F_X\ (Y - Y_d) + F_Y X$$

Table 6.2 One track rail and two slide units

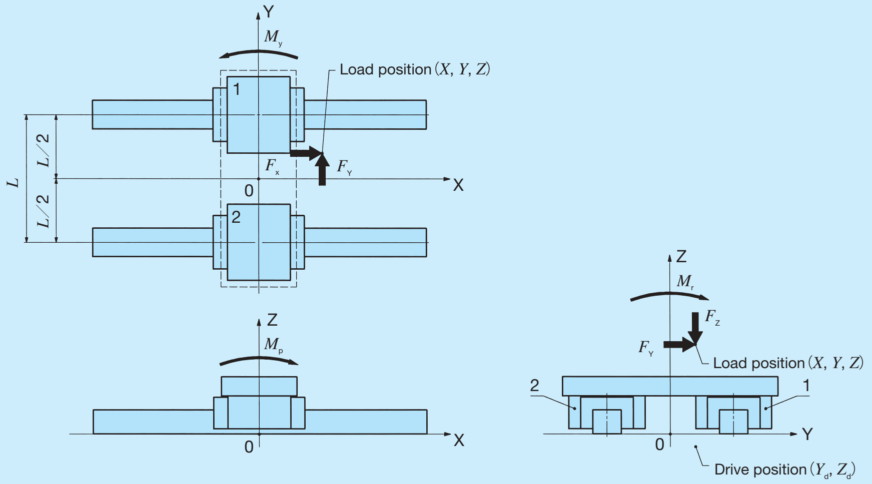


Slide unit No.	Load applied on the slide unit		
	Downward load F_r	Lateral load F_a	Moment load in the T_0 direction M_0
1	$\frac{F_Z}{2}+\frac{M_p}{\ell}$	$\frac{F_Y}{2}+\frac{M_y}{\ell}$	$\frac{M_r}{2}$
2	$\frac{F_Z}{2}-\frac{M_p}{\ell}$	$\frac{F_Y}{2}-\frac{M_y}{\ell}$	$\frac{M_r}{2}$

Remark: The moment loads in each direction M_r, M_p, M_y can be obtained by the following equation.

$$M_r = F_Y Z + F_Z Y$$
$$M_p = F_X\ (Z - Z_d) + F_Z X$$
$$M_y = -F_X\ (Y - Y_d) + F_Y X$$

Table 6.3 Two track rails and one slide unit

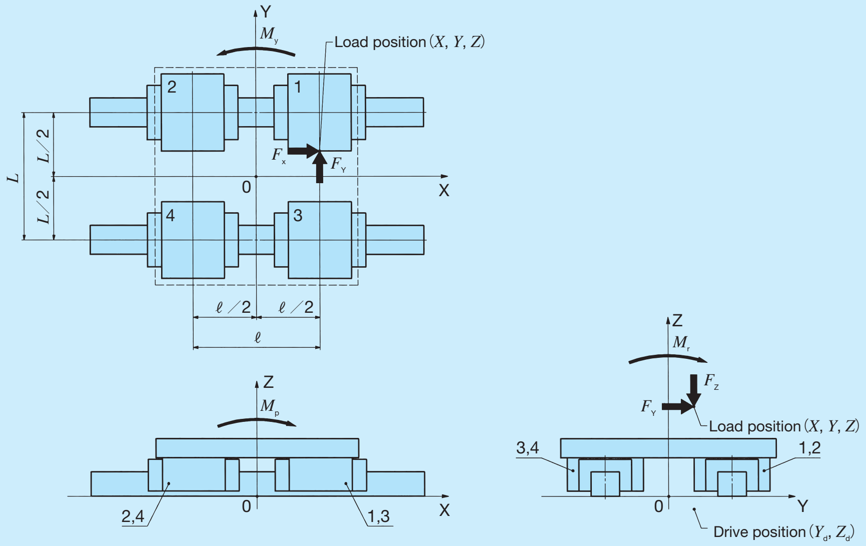


Slide unit No.	Load applied on the slide unit			
	Downward load F_r	Lateral load F_a	Moment load in the T_X direction M_X	Moment load in the T_Y direction M_Y
1	$\frac{F_Z}{2}+\frac{M_r}{L}$	$\frac{F_Y}{2}$	$\frac{M_p}{2}$	$\frac{M_y}{2}$
2	$\frac{F_Z}{2}-\frac{M_r}{L}$	$\frac{F_Y}{2}$	$\frac{M_p}{2}$	$\frac{M_y}{2}$

Remark: The moment loads in each direction M_r, M_p, M_y can be obtained by the following equation.

$$M_r = F_Y Z + F_Z Y$$
$$M_p = F_X\ (Z - Z_d) + F_Z X$$
$$M_y = -F_X\ (Y - Y_d) + F_Y X$$

Table 6.4 Two track rails and two slide units

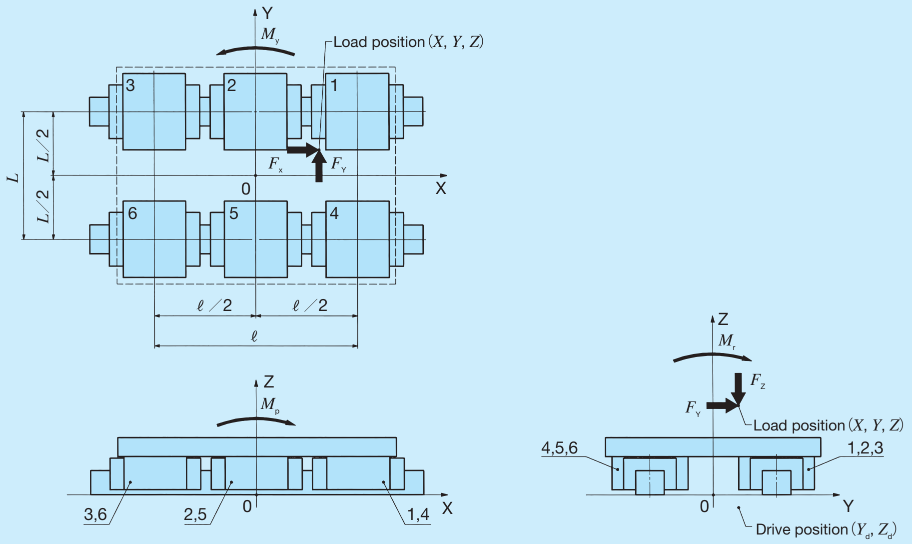


Slide unit No.	Load applied on the slide unit	
	Downward load F_r	Lateral load F_a
1	$\frac{F_z}{4}+\frac{M_r}{2L}+\frac{M_p}{2\ell}$	$\frac{F_Y}{4}+\frac{M_y}{2\ell}$
2	$\frac{F_z}{4}+\frac{M_r}{2L}-\frac{M_p}{2\ell}$	$\frac{F_Y}{4}-\frac{M_y}{2\ell}$
3	$\frac{F_z}{4}-\frac{M_r}{2L}+\frac{M_p}{2\ell}$	$\frac{F_Y}{4}+\frac{M_y}{2\ell}$
4	$\frac{F_z}{4}-\frac{M_r}{2L}-\frac{M_p}{2\ell}$	$\frac{F_Y}{4}-\frac{M_y}{2\ell}$

Remark: The moment loads in each direction M_r, M_p, M_y can be obtained by the following equation.

$$M_r=F_Y Z+F_Z Y$$
$$M_p=F_X\ (Z-Z_d)+F_Z X$$
$$M_y=-F_X\ (Y-Y_d)+F_Y X$$

Table 6.5 Two track rails and three slide units

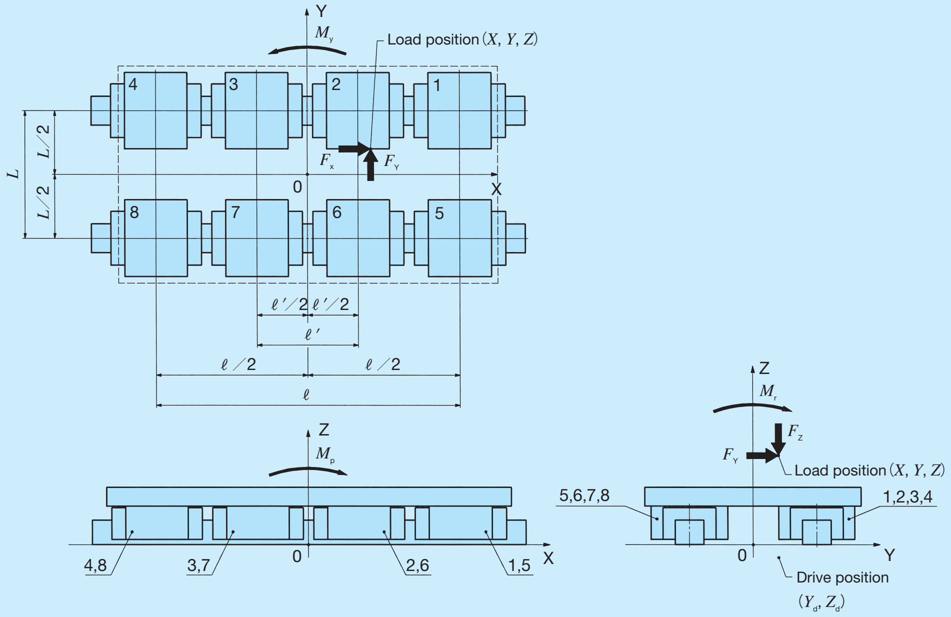


Slide unit No.	Load applied on the slide unit	
	Downward load F_r	Lateral load F_a
1	$\frac{F_z}{6}+\frac{M_r}{3L}+\frac{M_p}{2\ell}$	$\frac{F_Y}{6}+\frac{M_y}{2\ell}$
2	$\frac{F_z}{6}+\frac{M_r}{3L}$	$\frac{F_Y}{6}$
3	$\frac{F_z}{6}+\frac{M_r}{3L}-\frac{M_p}{2\ell}$	$\frac{F_Y}{6}-\frac{M_y}{2\ell}$
4	$\frac{F_z}{6}-\frac{M_r}{3L}+\frac{M_p}{2\ell}$	$\frac{F_Y}{6}+\frac{M_y}{2\ell}$
5	$\frac{F_z}{6}-\frac{M_r}{3L}$	$\frac{F_Y}{6}$
6	$\frac{F_z}{6}-\frac{M_r}{3L}-\frac{M_p}{2\ell}$	$\frac{F_Y}{6}-\frac{M_y}{2\ell}$

Remark: The moment loads in each direction M_r, M_p, M_y can be obtained by the following equation.

$$M_r=F_Y Z+F_Z Y$$
$$M_p=F_X\ (Z-Z_d)+F_Z X$$
$$M_y=-F_X\ (Y-Y_d)+F_Y X$$

Table 6.6 Two track rails and four slide units



Slide unit No.	Load applied on the slide unit	
	Downward load F_r	Lateral load F_a
1	$\frac{F_z}{8}+\frac{M_r}{4L}+\frac{M_p}{2}\frac{\ell}{\ell^2+\ell'^2}$	$\frac{F_Y}{8}+\frac{M_y}{2}\frac{\ell}{\ell^2+\ell'^2}$
2	$\frac{F_z}{8}+\frac{M_r}{4L}+\frac{M_p}{2}\frac{\ell'}{\ell^2+\ell'^2}$	$\frac{F_Y}{8}+\frac{M_y}{2}\frac{\ell'}{\ell^2+\ell'^2}$
3	$\frac{F_z}{8}+\frac{M_r}{4L}-\frac{M_p}{2}\frac{\ell'}{\ell^2+\ell'^2}$	$\frac{F_Y}{8}-\frac{M_y}{2}\frac{\ell'}{\ell^2+\ell'^2}$
4	$\frac{F_z}{8}+\frac{M_r}{4L}-\frac{M_p}{2}\frac{\ell}{\ell^2+\ell'^2}$	$\frac{F_Y}{8}-\frac{M_y}{2}\frac{\ell}{\ell^2+\ell'^2}$
5	$\frac{F_z}{8}-\frac{M_r}{4L}+\frac{M_p}{2}\frac{\ell}{\ell^2+\ell'^2}$	$\frac{F_Y}{8}+\frac{M_y}{2}\frac{\ell}{\ell^2+\ell'^2}$
6	$\frac{F_z}{8}-\frac{M_r}{4L}+\frac{M_p}{2}\frac{\ell'}{\ell^2+\ell'^2}$	$\frac{F_Y}{8}+\frac{M_y}{2}\frac{\ell'}{\ell^2+\ell'^2}$
7	$\frac{F_z}{8}-\frac{M_r}{4L}-\frac{M_p}{2}\frac{\ell'}{\ell^2+\ell'^2}$	$\frac{F_Y}{8}-\frac{M_y}{2}\frac{\ell'}{\ell^2+\ell'^2}$
8	$\frac{F_z}{8}-\frac{M_r}{4L}-\frac{M_p}{2}\frac{\ell}{\ell^2+\ell'^2}$	$\frac{F_Y}{8}-\frac{M_y}{2}\frac{\ell}{\ell^2+\ell'^2}$

Remark: The moment loads in each direction M_r, M_p, M_y can be obtained by the following equation.

$M_r=F_YZ+F_ZY$
$M_p=F_X\ (Z-Z_d)+F_ZX$
$M_y=-F_X\ (Y-Y_d)+F_YX$

Mean Equivalent Load for Fluctuating Load

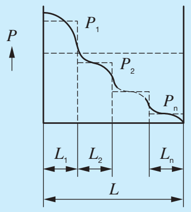
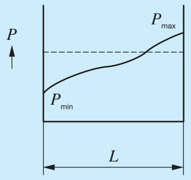
When the load on the Linear Way and Linear Roller Way varies, instead of dynamic equivalent load P, the mean equivalent load P_m is used for calculating formula of life.
The mean equivalent load is a load converted to give life equal to that for fluctuating load. It is obtained by the following formula:

$$P_m=\sqrt[p]{\frac{1}{L}\int_0^L P_n^{\,p}\,dL}\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots(12)$$

where, P_m : Mean equivalent load, N
L : Total traveling distance, m
P_n : Fluctuating load, N
p : Exponent (ball type: 3, roller type: 10/3)

Table 7 gives calculation examples of the mean equivalent load for typical fluctuating loads.

Table 7 Mean equivalent load for fluctuating load

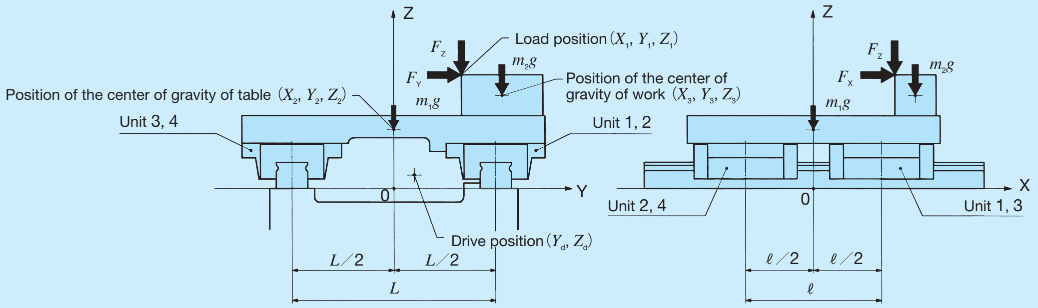
Example		Mean equivalent load
① Stepwise changing load		$P_m=\sqrt[p]{\frac{1}{L}(P_1{}^p L_1+P_2{}^p L_2+\ldots+P_n{}^p L_n)}$ where, L_1 : Total traveling distance receiving the load P_1, m L_2 : Total traveling distance receiving the load P_2, m L_n : Total traveling distance receiving the load P_n, m
② Monotonously changing load		$P_m\fallingdotseq\frac{1}{3}(2P_{max}+P_{min})$ where, P_{max} : Maximum value of fluctuating load, N P_{min} : Minimum value of fluctuating load, N

Examples of Load and Life Calculation

Example 1

Linear Way Model		ME 25 C2 R640 H
Basic dynamic load rating	C	18100 N
Basic static load rating	C_0	21100 N
Applied load	F_{X1}	1000 N
	F_{Y1}	2000 N
	F_{Z1}	1000 N
Load position	X_1	60 mm
	Y_1	50 mm
	Z_1	83 mm
Table mass	m_1	10 kg
Position of the center of gravity of table	X_2	0 mm
	Y_2	0 mm
	Z_2	43 mm

Work mass	m_2	10 kg
Position of center of gravity of work	X_3	75 mm
	Y_3	80 mm
	Z_3	68 mm
Number of strokes per minute	n_1	5 min^{-1}
Stroke length	S	100 mm
Distance between slide units	ℓ	100 mm
Distance between the track rails	L	150 mm
Drive position	Y_d	150 mm
	Z_d	10 mm



The life and static safety factor in the case of Example 1 is calculated. Load factor f_W is assumed to be 1.5.

❶Calculation of load on the slide unit

Due to the applied load and the table weight, moment load occurs around each coordinate axis of the Linear Way as shown below.

$$M_r=\Sigma(F_YZ)+\Sigma(F_ZY)=F_{Y1}Z_1+F_{Z1}Y_1+m_1gY_2+m_2gY_3$$
$$=2000\times83+1000\times50+10\times9.8\times0+10\times9.8\times80$$
$$\fallingdotseq224000$$

$$M_p=\Sigma\{F_X(Z-Z_d)\}+\Sigma(F_ZX)=F_{X1}(Z_1-Z_d)+F_{Z1}X_1+m_1gX_2+m_2gX_3$$
$$=1000\times(83-10)+1000\times60+10\times9.8\times0+10\times9.8\times75\fallingdotseq140000$$

$$M_y=-\Sigma\{F_X(Y-Y_d)\}+\Sigma(F_YX)=-F_{X1}(Y_1-Y_d)+F_{Y1}X_1$$
$$=-1000\times(50-150)+2000\times60=220000$$

where, M_r : Moment load in the rolling direction, N · mm
M_p : Moment load in the pitching direction, N · mm
M_y : Moment load in the yawing direction, N · mm

The loads applied on each slide unit are calculated according to Table 6.4 on page Ⅲ−11.

$$F_{r1}=\frac{\Sigma F_Z}{4}+\frac{M_r}{2L}+\frac{M_p}{2\ell}=\frac{F_{Z1}+m_1g+m_2g}{4}+\frac{M_r}{2L}+\frac{M_p}{2\ell}$$
$$=\frac{1000+10\times9.8+10\times9.8}{4}+\frac{224000}{2\times150}+\frac{140000}{2\times100}$$
$$\fallingdotseq1750$$

$$F_{r2}=\frac{\Sigma F_Z}{4}+\frac{M_r}{2L}-\frac{M_p}{2\ell}=\frac{F_{Z1}+m_1g+m_2g}{4}+\frac{M_r}{2L}-\frac{M_p}{2\ell}\fallingdotseq346$$

$$F_{r3}=\frac{\Sigma F_Z}{4}-\frac{M_r}{2L}+\frac{M_p}{2\ell}=\frac{F_{Z1}+m_1g+m_2g}{4}-\frac{M_r}{2L}+\frac{M_p}{2\ell}\fallingdotseq252$$

$$F_{r4}=\frac{\Sigma F_Z}{4}-\frac{M_r}{2L}-\frac{M_p}{2\ell}=\frac{F_{Z1}+m_1g+m_2g}{4}-\frac{M_r}{2L}-\frac{M_p}{2\ell}$$
$$\fallingdotseq-1150$$

$$F_{a1}=F_{a3}=\frac{\Sigma F_Y}{4}+\frac{M_y}{2\ell}=\frac{F_{Y1}}{4}+\frac{M_y}{2\ell}$$
$$=\frac{2000}{4}+\frac{220000}{2\times100}=1600$$

$$F_{a2}=F_{a4}=\frac{\Sigma F_Y}{4}-\frac{M_y}{2\ell}=\frac{F_{Y1}}{4}-\frac{M_y}{2\ell}=-600$$

❷Calculating of rating life

The upward / downward load and lateral load are converted by formula (6) and (7) on page Ⅲ−7.

$$F_{re1}=k_r|F_{r1}|=1\times1750=1750$$
$$F_{re2}=k_r|F_{r2}|=1\times346=346$$
$$F_{re3}=k_r|F_{r3}|=1\times252=252$$
$$F_{re4}=k_r|F_{r4}|=1\times1150=1150$$
$$F_{ae1}=k_a|F_{a1}|=1\times1600=1600$$
$$F_{ae2}=k_a|F_{a2}|=1\times600=600$$
$$F_{ae3}=k_a|F_{a3}|=1\times1600=1600$$
$$F_{ae4}=k_a|F_{a4}|=1\times600=600$$

where, k_r, k_a: Conversion factors for load direction (See Table 3 on page Ⅲ−7.)

The dynamic equivalent load is calculated by formula (10) on page Ⅲ−7.

$$P_1=X|F_{re1}|+Y|F_{ae1}|=1\times1750+0.6\times1600=2710$$
$$P_2=X|F_{re2}|+Y|F_{ae2}|=0.6\times346+1\times600\fallingdotseq808$$
$$P_3=X|F_{re3}|+Y|F_{ae3}|=0.6\times252+1\times1600\fallingdotseq1750$$
$$P_4=X|F_{re4}|+Y|F_{ae4}|=1\times1150+0.6\times600=1510$$

The basic rating life of slide unit 1 receiving the largest dynamic equivalent load is calculated. The basic rating life is obtained by the formula (1) given on the page Ⅲ−6 considering the load factor f_w (see Table 1 on page Ⅲ−6).

$$L_1=50\left(\frac{C}{f_WP_1}\right)^3=50\times\left(\frac{18100}{1.5\times2710}\right)^3\fallingdotseq4410$$

$$L_{h1}=\frac{10^6L_1}{2Sn_1\times60}=\frac{10^6\times4410}{2\times100\times5\times60}\fallingdotseq73500$$

As the result of calculation above, the basic rating life is about 73,500 hours.

❸Calculating of static safety factor

The static equivalent load is calculated from the upward / downward load and lateral load by formula (11) on page Ⅲ−8.

$$P_{01}=k_{0r}|F_{r1}|+k_{0a}|F_{a1}|=1\times1750+1\times1600=3350$$
$$P_{02}=k_{0r}|F_{r2}|+k_{0a}|F_{a2}|=1\times346+1\times600=946$$
$$P_{03}=k_{0r}|F_{r3}|+k_{0a}|F_{a3}|=1\times252+1\times1600=1852$$
$$P_{04}=k_{0r}|F_{r4}|+k_{0a}|F_{a4}|=1\times1150+1\times600=1750$$

where, k_{0r}, k_{0a}: Conversion factors for load direction (See Table 5 on page Ⅲ−8.)

The static safety factor of slide unit 1 receiving the largest static equivalent load is calculated. The static safety factor is calculated by formula (4) on page Ⅲ−6.

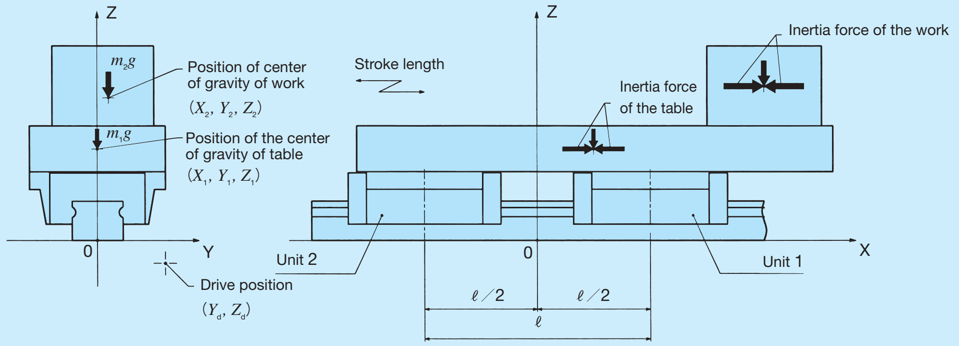
$$f_{s1}=\frac{C_0}{P_{01}}=\frac{21100}{3350}\fallingdotseq6.3$$

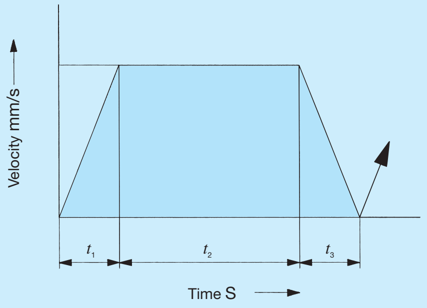
As the result of calculation above, the static safety factor is about 6.3.

Example 2

Linear Way Model··················MH 45 C2 R1050 H
Basic dynamic load rating······ C = 74600 N
Basic static load rating········· C_0 = 80200 N
Static moment rating in the T_0 direction···· T_0 = 1610 N · m
Table mass································ m_1 = 100 kg
Position of the center of gravity of table··· X_1 = 50 mm
··· Y_1 = 0 mm
··· Z_1 = 80 mm
Work mass································ m_2 = 1000 kg
Position of center of gravity of work···· X_2 = 200 mm
···· Y_2 = 10 mm
···· Z_2 = 130 mm

Distance between slide units··· ℓ = 200 mm
Stroke length························· S = 500 mm
Number of strokes per minute··· n_1 = 6 min^{-1}
Maximum traveling velocity···· V = 100 mm/s
Time spent for acceleration ··· t_1 = 0.1 s
Time spent during constant speed motion··· t_2 = 4.9 s
Time spent for deceleration···· t_3 = 0.1 s
Drive position························ Y_d = 60 mm
························ Z_d = −20 mm





The life and static safety factor in the case of Example 2 is calculated. Load factor f_W is assumed to be 1.5.

❶Calculation of load on the slide unit

Due to the applied load and the table mass and inertia force, moment load occurs around each coordinate axis of the Linear Way as shown below.

〔During acceleration at the start of motion〕

$$M_r=\Sigma\ (F_YZ)+\Sigma\ (F_ZY)=m_1gY_1+m_2gY_2=100\times9.8\times0+1000\times9.8\times10\fallingdotseq98000$$

$$\begin{aligned}M_p&=\Sigma\ \{F_X\ (Z-Z_d)\}+\Sigma\ (F_ZX)\\&=m_1\frac{V_{max}}{1000\times t_1}\ (Z_1-Z_d)+m_2\frac{V_{max}}{1000\times t_1}\ (Z_2-Z_d)+m_1gX_1+m_2gX_2\\&=100\times\frac{100}{1000\times0.1}\times\ (80+20)+1000\times\frac{100}{1000\times0.1}\times\ (130+20)+100\times9.8\times50+1000\times9.8\times200\\&\fallingdotseq2169000\end{aligned}$$

$$\begin{aligned}M_y&=-\Sigma\ \{F_X\ (Y-Y_d)\}+\Sigma\ (F_YX)\\&=-m_1\frac{V_{max}}{1000\times t_1}\ (Y_1-Y_d)-m_2\frac{V_{max}}{1000\times t_1}\ (Y_2-Y_d)\\&=-100\times\frac{100}{1000\times0.1}\times\ (0-60)-1000\times\frac{100}{1000\times0.1}\times\ (10-60)\ \fallingdotseq56000\end{aligned}$$

〔During constant speed motion〕

$$M_r=m_1gY_1+m_2gY_2\fallingdotseq98000$$

$$M_p=m_1gX_1+m_2gX_2\fallingdotseq2010000$$

$$M_y=0$$

〔During deceleration at the end of motion〕

$$M_r=m_1gY_1+m_2gY_2\fallingdotseq98000$$

$$M_p=-m_1\frac{V_{max}}{1000\times t_3}(Z_1-Z_d)-m_2\frac{V_{max}}{1000\times t_3}(Z_2-Z_d)+m_1gX_1+m_2gX_2\fallingdotseq1850000$$

$$M_y=m_1\frac{V_{max}}{1000\times t_3}(Y_1-Y_d)+m_2\frac{V_{max}}{1000\times t_3}(Y_2-Y_d)\fallingdotseq-56000$$

where, M_r: Moment load in the rolling direction, N · mm
M_p: Moment load in the pitching direction, N · mm
M_y: Moment load in the yawing direction, N · mm

The loads applied on each slide unit are calculated according to Table 6.2 on page Ⅲ−9.

〔During acceleration at the start of motion〕

$$\begin{aligned}F_{r1}&=\frac{\Sigma F_Z}{2}+\frac{M_p}{\ell}=\frac{m_1g+m_2g}{2}+\frac{M_p}{\ell}\\&=\frac{100\times9.8+1000\times9.8}{2}+\frac{2169000}{200}\fallingdotseq16200\end{aligned}$$

$$F_{r2}=\frac{\Sigma F_Z}{2}+\frac{M_p}{\ell}=\frac{m_1g+m_2g}{2}-\frac{M_p}{\ell}\fallingdotseq-5460$$

$$F_{a1}=\frac{\Sigma F_Y}{2}+\frac{M_y}{\ell}=280$$

$$F_{a2}=\frac{\Sigma F_Y}{2}-\frac{M_y}{\ell}=-280$$

$$M_{01}=M_{02}=\frac{M_r}{2}=49000$$

〔During constant speed motion〕

$$F_{r1}=\frac{100\times9.8+1000\times9.8}{2}+\frac{2010000}{200}\fallingdotseq15400$$

$$F_{r2}\fallingdotseq-4660$$

$$F_{a1}=F_{a2}=0$$

$$M_{01}=M_{02}=49000$$

〔During deceleration at the end of motion〕

$$F_{r1}=\frac{100\times9.8+1000\times9.8}{2}+\frac{1850000}{200}\fallingdotseq14600$$

$$F_{r2}\fallingdotseq-3860$$

$$F_{a1}\fallingdotseq-280$$

$$F_{a2}\fallingdotseq280$$

$$M_{01}=M_{02}=49000$$

❷Calculating of rating life

The upward / downward load, lateral load and the moment load along T_0 direction are calculated by the formula (6) and (7) on page Ⅲ−7, and the dynamic equivalent load is calculated by formula (10).

〔During acceleration at the start of motion〕

$$F_{re1}=k_r\,|\,F_{r1}\,|\,+\frac{C_0}{T_0}|M_{01}\,|\,=1\times16200+\frac{80200}{1610}\times\frac{49000}{1000}\fallingdotseq18600$$

$$F_{re2}=1\times5460+\frac{80200}{1610}\times\frac{49000}{1000}\fallingdotseq7900$$

$$F_{ae1}=k_a\,|\,F_{a1}\,|\,=1.28\times280\fallingdotseq358$$

$$F_{ae2}=1.28\times280\fallingdotseq358$$

$$P_{1a}=X\,F_{re1}+Y\,F_{ae1}=1\times18600+0.6\times358\fallingdotseq18800$$

$$P_{2a}=X\,F_{re2}+Y\,F_{ae2}=1\times7900+0.6\times358\fallingdotseq8110$$

〔During constant speed motion〕

$$F_{re1}=1\times15400+\frac{80200}{1610}\times\frac{49000}{1000}\fallingdotseq17800$$

$$F_{re2}=1\times4660+\frac{80200}{1610}\times\frac{49000}{1000}\fallingdotseq7100$$

$$F_{ae1}=0$$

$$F_{ae2}=0$$

$$P_{1b}=17800$$

$$P_{2b}=7100$$

〔During deceleration at the end of motion〕

$$F_{re1}=1\times14600+\frac{80200}{1610}\times\frac{49000}{1000}\fallingdotseq17000$$

$$F_{re2}=1\times3860+\frac{80200}{1610}\times\frac{49000}{1000}\fallingdotseq6300$$

$$F_{ae1}=1.28\times280\fallingdotseq358$$

$$F_{ae2}=1.28\times280\fallingdotseq358$$

$$P_{1c}=1\times17000+0.6\times358\fallingdotseq17200$$

$$P_{2c}=1\times6300+0.6\times358\fallingdotseq6510$$

Because the dynamic equivalent load changes stepwise along the traveling distance, the mean equivalent load is calculated from ① in Table 7 on page Ⅲ−14.

$$\begin{aligned}P_{m1}&=\sqrt[3]{\frac{1}{S}\left(P_{1a}{}^3\frac{V_{max}\,t_1}{2}+P_{1b}{}^3V_{max}t_2+P_{1c}{}^3\frac{V_{max}\,t_3}{2}\right)}\\&=\left\{\frac{1}{500}\times\left(18800^3\times\frac{100\times0.1}{2}+17800^3\times100\times4.9+17200^3\times\frac{100\times0.1}{2}\right)\right\}^{1/3}\fallingdotseq17800\end{aligned}$$

$$P_{m2}=\left\{\frac{1}{500}\times\left(8110^3\times\frac{100\times0.1}{2}+7100^3\times100\times4.9+6510^3\times\frac{100\times0.1}{2}\right)\right\}^{1/3}\fallingdotseq7110$$

The basic rating life of slide unit 1 receiving the largest dynamic equivalent load is calculated. The basic rating life is obtained by the formula (1) given on the page Ⅲ−6 considering the load factor f_w (see Table 1 on page Ⅲ−6).

$$L_1=50\left(\frac{C}{f_WP_{m1}}\right)^3=50\left(\frac{74600}{1.5\times17800}\right)^3\fallingdotseq1090$$

$$L_{h1}=\frac{10^6L_1}{2Sn_1\times60}=\frac{10^6\times1090}{2\times500\times6\times60}\fallingdotseq3030$$

As the result of calculation above, the basic rating life is about 3,030 hours.

❸Calculating of static safety factor

The static equivalent load is calculated from the upward / downward load and lateral load by formula (11) on page Ⅲ−8.

〔During acceleration at the start of motion〕

$$P_{01a}=k_{0r}\,|\,F_{r1}\,|\,+k_{0a}\,|\,F_{a1}\,|\,+\frac{C_0}{T_0}|M_{01}\,|\,=1\times16200+1.28\times280+\frac{80200}{1610}\times\frac{49000}{1000}\fallingdotseq19000$$

$$P_{02a}=k_{0r}\,|\,F_{r2}\,|\,+k_{0a}\,|\,F_{a2}\,|\,+\frac{C_0}{T_0}|M_{02}\,|\,=1.19\times5460+1.28\times280+\frac{80200}{1610}\times\frac{49000}{1000}\fallingdotseq9300$$

〔During constant speed motion〕

$$P_{01b}=1\times15400+1.28\times0+\frac{80200}{1610}\times\frac{49000}{1000}\fallingdotseq19000$$

$$P_{02b}=1.19\times4660+1.28\times0+\frac{80200}{1610}\times\frac{49000}{1000}\fallingdotseq7990$$

〔During deceleration at the end of motion〕

$$P_{01c}=1\times14600+1.28\times280+\frac{80200}{1610}\times\frac{49000}{1000}\fallingdotseq17400$$

$$P_{02c}=1.19\times3860+1.28\times280+\frac{80200}{1610}\times\frac{49000}{1000}\fallingdotseq7390$$

The static safety factor of slide unit 1 during acceleration at the start of motion receiving the largest static equivalent load is calculated. The static safety factor is calculated by formula (4) on page Ⅲ−6.

$$f_s=\frac{C_0}{P_{01a}}=\frac{80200}{19000}\fallingdotseq4.2$$

As the result of calculation above, the static safety factor is about 4.2.

Accuracy

Five classes of accuracy, ordinary, high, precision, super precision, and ultra precision are specified for Linear Way and Linear Roller Way.

The outline of applicable accuracy classes is shown in Table 8. For details, see an explanation of each series.

Table 8 Accuracy classes and series

Class (classification symbol) / Series name	Ordinary (No symbol)	High (H)	Precision (P)	Super precision (SP)	Ultra precision (UP)
C-Lube Linear Way ML Linear Way L	–	○	○	–	–
C-Lube Linear Way MLV	–	○	–	–	–
C-Lube Linear Way MV	○	○	○	○	–
C-Lube Linear Way ME Linear Way E	○	○	○	○	–
C-Lube Linear Way MH Linear Way H	–	○	○	○	–
Linear Way F	–	○	○	○	–
C-Lube Linear Way MUL Linear Way U	○	○	–	–	–
C-Lube Linear Roller Way Super MX Linear Roller Way Super X	–	○	○	○	○
Linear Roller Way X	–	○	○	○	○
Linear Way Module	–	○	○	○	–

Preload

Objectives of preload

In some cases, the linear motion rolling guide is used with clearance given to the linear motion rolling guide when light motion with small load is required. However, for some applications, it may be used with play in the guiding mechanism removed or with preload to increase rigidity.

Preload is applied to the contact parts of a raceway and rolling elements with internal stress generated in advance. When a external load is applied on the preloaded linear motion rolling guide, shock absorbing with this internal stress makes elastic deformation smaller, and its rigidity is increased. (See Fig. 3)

Preload setting

Preload amount is determined by considering the characteristics of the machines or equipments on which the linear motion rolling guide is mounted and the nature of load acting on the linear motion rolling guide. The standard amount of preload for linear motion rolling guides is, in general, approx. 1/3 of load when the rolling elements are balls (steel balls) and approx. 1/2 of load when they are rollers (cylindrical rollers). If the linear motion rolling guides are required to have very high rigidity to withstand vibration or fluctuating load, a larger preload may be applied. For applicable preload amount, see Table 9. For details, see an explanation of each series.

Precaution for preload selection

Even when high rigidity must be required, excessive preload should be avoided, because it will produce an excessive stress between rolling elements and raceways, and eventually result in short life of linear motion rolling guides. It is important to apply a proper amount of preload, considering the operational conditions. When using with a large preload, contact IKO.

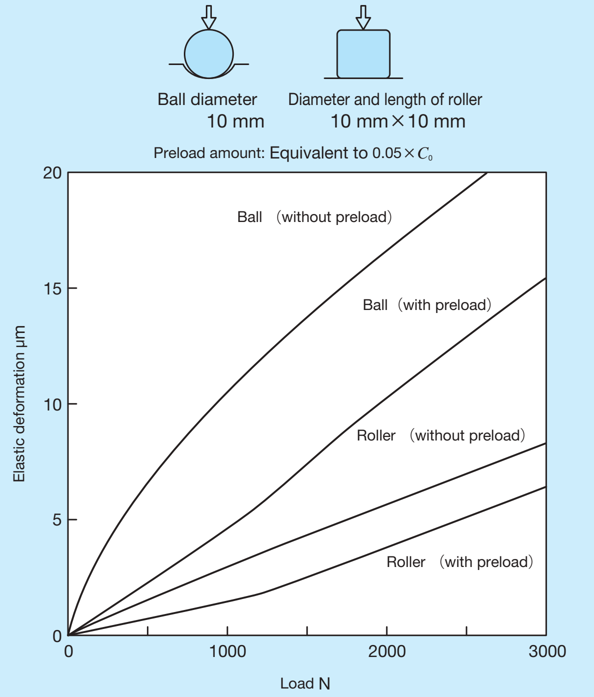


Fig. 3 Preload and elastic deformation behavior

Table 9 Series and preload amount

Preload (preload symbol) / Series name	Clearance (Tc)	Clearance (T_0)	Standard (No symbol)	Light preload (T_1)	Medium preload (T_2)	Heavy preload (T_3)
C-Lube Linear Way ML Linear Way L	–	○	○	○	–	–
C-Lube Linear Way MLV (1)	–	–	–	–	–	–
C-Lube Linear Way MV	○	–	○	○	–	–
C-Lube Linear Way ME Linear Way E	○	–	○	○	○	–
C-Lube Linear Way MH Linear Way H	–	○	○	○	○	○
Linear Way F	–	–	○	○	○	–
C-Lube Linear Way MUL Linear Way U	–	–	○	○	–	–
C-Lube Linear Roller Way Super MX Linear Roller Way Super X	–	–	○	○	○	○
Linear Roller Way X	–	–	○	○	○	○

Note (1) Preload is adjusted to have subtle clearance or minimal amount of preload.

Friction

Friction of linear motion rolling guide

The static friction (start-up friction) of linear motion rolling guides is much lower than that of conventional plain guides. Also, the difference between static friction and dynamic friction is small, and frictional resistance varies little when velocity changes. These are excellent features of linear motion rolling guides, and account for their ability to reduce power consumption, suppress operating temperature rise, and increase traveling speed.

Since frictional resistance and variation are small, high-speed response characteristics to motion commands and high accuracy positioning can be achieved.

Friction coefficient

The frictional resistance of linear motion rolling guides varies with their model, applied load, velocity and characteristics of lubricant. Generally, lubricant or seals are major factors in determining the frictional resistance in light load or high-speed operation, while the amount of load is the major factor in heavy load or low speed operation. The frictional resistance of linear motion rolling guides depends on various factors, but generally the following formula is used.

$$F=\mu P \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (13)$$

where, F : Frictional resistance, N

μ : Dynamic friction coefficient

P : Applied load, N

For sealed guides, seal resistance is added to the above value, but this resistance varies greatly depending on the interference amount of seal lip and lubrication conditions.

Where the lubrication and mounting condition are correct and the load is moderate, the friction coefficients of Linear Way and Linear Roller Way in operation are within the range shown in Table 10. Generally, friction coefficient is large under small load.

Table 10 Friction coefficient

Series name	Dynamic friction coefficient μ (1)
Linear Way	0.0040～0.0060
Linear Roller Way	0.0020～0.0040

Note (1) These friction coefficients do not include seal.

Lubrication

Objectives of lubrication

The objectives of applying lubricant for linear motion rolling guides is to keep raceways, rolling elements, etc. in a linear motion rolling guide from metal contact, and thereby reduce friction and wear preventing heat generation and seizure. When an adequate oil film is formed at the rolling contact area between the raceways and rolling elements, the contact stress due to load can be reduced. To manage the formation of adequate oil film is important for ensuring the reliability of linear motion rolling mechanism.

Selection of lubricant

To obtain the full performance of linear motion rolling guides, it is necessary to select an appropriate lubricant and lubrication method by considering the model, load and velocity of each linear motion rolling guide. However, as compared with plain guides, lubrication of linear motion rolling guides is much simpler. Only a small amount of lubrication oil is needed and replenishment interval is longer, so maintenance can be greatly reduced. Grease and oil are the two most commonly used lubricants for linear motion rolling guides.

Grease lubrication

For linear motion rolling guides, lithium-soap base grease (Consistency No.2 of JIS) is commonly used. For rolling guides operating under heavy load conditions, grease containing extreme pressure additives is recommended.

In clean and high-vacuum environments, where low dust generating performance and low vaporization characteristics are required, greases containing a synthetic-base oil or a soap other than the lithium-soap base are used. For applications in these environments, due consideration is necessary to select a grease that is suitable for the operating conditions of linear motion rolling guide and achieves satisfactory lubrication performance at the same time.

Table 11 Pre-packed grease list

Series name	Pre-packed grease
C-Lube Linear Way ML Linear Way L	MULTEMP PS No.2 [KYODO YUSHI CO., LTD.]
C-Lube Linear Way MLV	
C-Lube Linear Way MV	Alvania EP Grease 2 [Shell Lubricants Japan K.K.]
C-Lube Linear Way ME Linear Way E	
C-Lube Linear Way MH (1) Linear Way H (1)	
Linear Way F	
C-Lube Linear Way MUL Linear Way U (2)	MULTEMP PS No.2 [KYODO YUSHI CO., LTD.]
C-Lube Linear Roller Way Super MX Linear Roller Way Super X	Alvania EP Grease 2 [Shell Lubricants Japan K.K.]
Linear Roller Way X	
Linear Way Module	

Notes (1) MULTEMP PS No.2 is pre-packed in size 8 to 12 series.
(2) Alvania EP Grease 2 is pre-packed in size 40 to 86 series.

Grease replenishment interval

The quality of any grease will gradually deteriorate as operating time passes. Therefore, periodic replenishment is necessary. Grease replenishment interval varies depending on the operating conditions. A six month interval is generally recommended, and if the machine operation consists of reciprocating motions with many cycles and long strokes, replenishment every three month is recommended.

In addition, linear motion rolling guides in which the lubrication part "C-Lube" is built deliver long-term maintenance free performance. This eliminates the need for lubrication mechanism and workload which used to be necessary for linear motion rolling guides and significantly reduces maintenance cost.

Grease replenishment method

New grease must be supplied through a grease feed device such as a grease nipple until old grease is discharged. After grease is replenished, running-in is performed and excess grease will be discharged to outside of the linear motion rolling guide. Discharged grease must then be removed before starting the operation.

The amount of grease required for standard replenishment is about 1/3 to 1/2 of the free space inside the linear motion rolling guide. When grease is supplied from a grease nipple for the first time, there will be grease lost in the replenishment path. The amount lost should be taken into consideration.

Generally, immediately after grease is replenished, frictional resistance tends to increase. If additional running-in is performed for 10 to 20 reciprocating cycles after excess grease is discharged, frictional resistance becomes small and stable.

For applications where low frictional resistance is required, the replenishment amount of grease may be reduced, but it must be kept to an appropriate level so as not to give a bad influence on the lubrication performance.

Mixing of different type of grease

Mixing different types of grease may result in changing the properties of base oil, soap base, or additives used, and, in some cases, severely deteriorate the lubrication performance or cause trouble due to chemical changes of additives. Old grease should therefore be removed thoroughly before filling with new grease.

Lubrication part "C-Lube"

C-Lube is a porous resin with molding formed fine resin powder. It is a lubrication part impregnated with a large amount of lubrication oil in its open pores by capillary inside.

Lubrication oil is supplied directly to balls (steel balls) or rollers (cylindrical rollers), not to the track rail. When the balls or rollers have contact with C-Lube built in the slide unit, lubrication oil is supplied to the surface of the balls or rollers. As the balls or rollers circulate, the lubricant is distributed to the loading area along the track rail. This results in adequate lubrication oil being properly maintained in the loading area and lubrication performance will last for a long time.

The surface of C-Lube is always covered with the lubrication oil. Lubrication oil is continuously supplied to the surface of balls or rollers by surface tension in the contact of C-Lube surface and balls or rollers.

Oil lubrication

For oil lubrication, heavy load requires high oil viscosity and high velocity requires low oil viscosity. Generally, for linear motion rolling guides operating under heavy load, lubrication oil with a viscosity of about 68 mm^2/s is used. For linear motion rolling guides under light load at high-speed operation, lubrication oil with a viscosity of about 13 mm^2/s is used.

Table 12 Grease brands used in linear motion rolling guide

Brand		Base oil	Thickener	Consistency	Range of operating temperature (2) ℃	Usage
Alvania EP Grease 2	[Shell Lubricants Japan K.K.]	Mineral oil	Lithium	284	-20～110	General application with extreme-pressure additive
Alvania Grease S2	[Shell Lubricants Japan K.K.]	Mineral oil	Lithium	283	-25～120	General application
MULTEMP PS No.2	[KYODO YUSHI CO., LTD.]	Synthetic oil, Mineral oil	Lithium	275	-50～130	General application
IKO Low Dust-Generation Grease for Clean Environment CG2	[NIPPON THOMPSON CO., LTD.]	Synthetic oil	Urea	280	-40～200	For clean environment Long life
IKO Low Dust-Generation Grease for Clean Environment CGL	[NIPPON THOMPSON CO., LTD.]	Synthetic oil, Mineral oil	Lithium / Calcium	225	-30～120	For clean environment Low sliding
Klüberalfa GR Y-VAC3 (1)	[NOK KLUEBER]	Synthetic oil	Ethylene tetra-fluoride	No.3	-20～250	For vacuum
IKO Anti-Fretting Corrosion Grease AF2	[NIPPON THOMPSON CO., LTD.]	Synthetic oil	Urea	285	-50～170	Fretting-proof
6459 Grease N	[Shell Lubricants Japan K.K.]	Mineral oil	Poly-urea	305	–	Fretting-proof

Notes (1) Set replenishment intervals to short.
(2) The ranges of operating temperature are quoted from the grease manufacturer's cataloged values, but do not guarantee regular use under high temperature environment.

Remarks Check with the chosen grease manufacturer's catalog before use.
For grease for applications other than those listed, please contact IKO.

Miniature greaser

The miniature greaser is specially prepared for grease replenishment for Linear Way and Linear Roller Way with an oil hole. Table 13 shows types of grease and specifications of miniature greasers.

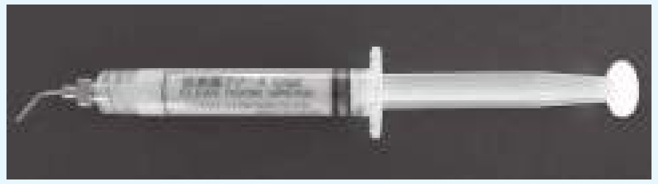


Table 13 Grease type and miniature greaser

Identification number	Grease name	Amount	Outer diameter of grease feed needle
MG10B/MT2	Lithium-Based Grease MT2	10 ml	ϕ1 mm
MG10B/CG2	IKO Low Dust-Generation Grease for Clean Environment CG2		
MG2.5B/EP2	Lithium-Based Grease EP2	2.5 ml	
MG2.5B/CG2	IKO Low Dust-Generation Grease for Clean Environment CG2		
MG2.5B/CGL	IKO Low Dust-Generation Grease for Clean Environment CGL		
MG2.5B/AF2	IKO Anti-Fretting Corrosion Grease AF2		

Grease nipple and supply nozzle

Tables 14.1 and 14.2 show the specifications of grease nipples and applicable types of supply nozzles, and Table 15 shows the specifications of supply nozzles.

Table 14.1 Grease nipple and applicable supply nozzle type

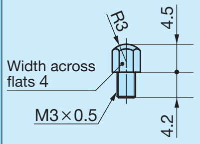
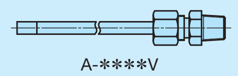
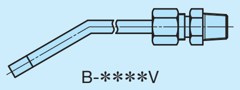
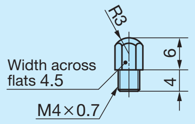
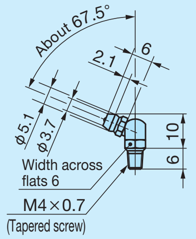
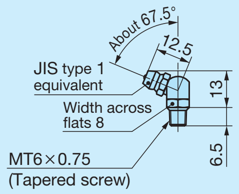
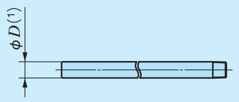
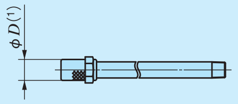
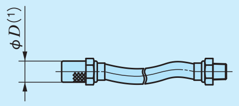
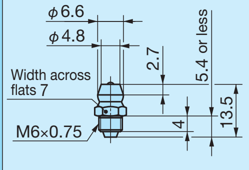
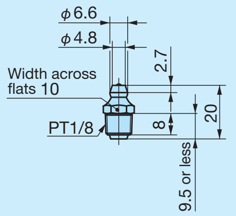
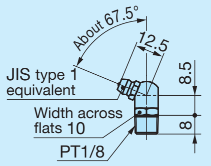
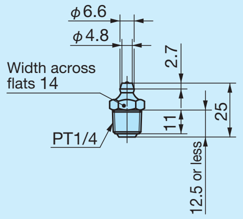
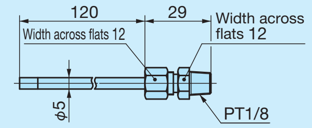
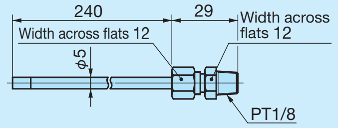
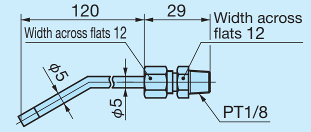
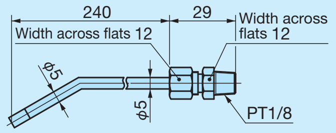
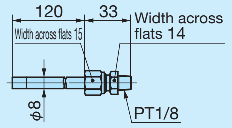
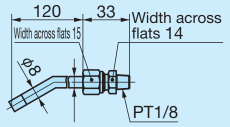
Grease nipple		Applicable supply nozzle type	
Type	Dimensions and shape	Type	Shape
A-M3	 	A-5120V A-5240V B-5120V B-5240V	 
A-M4	 		
B-M4	 	A-8120V B-8120V	

Table 14.2 Grease nipple and applicable supply nozzle type

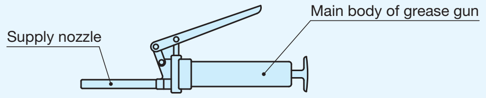
Grease nipple		Applicable supply nozzle type	
Type	Dimensions and shape	Type	Shape
B-M6	 	Products available on the market	  
JIS type 1	 		
JIS type 2	 		
JIS type 4	 		
A-PT 1/4	 		

Note (1) For straight type, chuck type and hose type supply nozzles available on the market, it is recommended to use one with an outer diameter D of 13 mm or less.

Table 15 Types and dimensions of supply nozzle

Type	Dimensions and shape
A-5120V	
A-5240V	
B-5120V	
B-5240V	
A-8120V	
B-8120V	

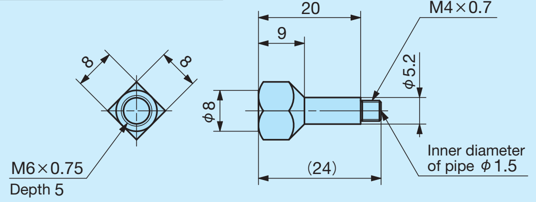
Remark: The supply nozzles shown in the table can be mounted on the main body of a common grease gun available on the market shown below. If needed, specify the supply nozzle type and place an order to IKO.



Piping joint

When applying centralized grease or oil lubrication, detach the grease nipple or plug from the slide unit, and replace them with piping joints, which are prepared for various female threads for piping. Use them after confirming the dimensions of the piping joints and H_3 dimensions in the dimensions table of each models, because the top face of some piping joints is at the same or higher level than the top face of slide unit. Fig. 4.1 and 4.2 and Tables 16.1, 16.2, 16.3, and 16.4 show identification number and dimensions of piping joints. Note that some of them are not applicable for the slide units of special specifications. Piping joints can be mounted on Linear Way and Linear Roller Way prior to delivery upon request. If needed, please contact IKO.

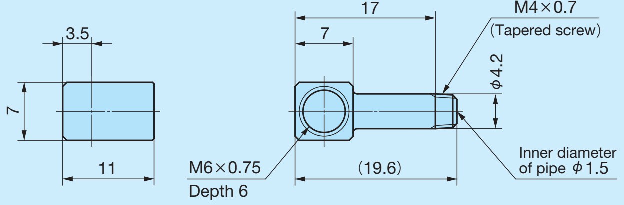
Identification number	SC4-20S



Remark: Not applicable to MX, LRX series.

Fig. 4.1 Piping joint for M4×0.7 (Straight type)

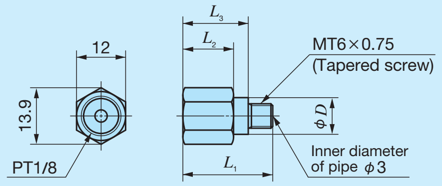
Identification number	LC4-17



Remark: It is recommended to mount the straight type piping joint in Table 16.1 for female threads (M6×0.75).

Fig. 4.2 Piping joint for M4×0.7 (L type)

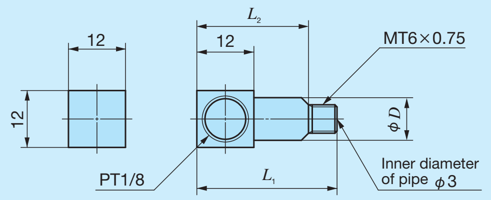
Table 16.1 Piping joint for M6×0.75 (Straight type)



unit: mm

Identification number	L_1	L_2	L_3	D
SC6-16	22	12.4	16	9
SC6-22S	28	12	22	6
SC6-25S	31	12	25	6

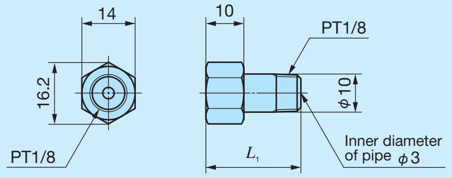
Table 16.2 Piping joint for M6×0.75 (L type)



unit: mm

Identification number	L_1	L_2	D
LC6-18	25	18	9
LC6-22S	28	–	6
LC6-24	30.5	23.5	9
LC6-25S	31	–	6

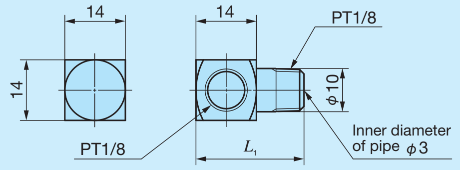
Table 16.3 Piping joint for PT1/8 (Straight type)



unit: mm

Identification number	L_1
SC1/8-19S	25
SC1/8-34S	40

Table 16.4 Piping joint for PT1/8 (L type)



unit: mm

Identification number	L_1
LC1/8-19S	25
LC1/8-34S	40

Dust Protection

Purpose of dust protection

To obtain the full performance of linear motion rolling guides, it is important to protect them from the intrusion of dust and other harmful foreign substances. Select an effective sealing or dust-protection device to withstand any operating conditions that might be imposed.

Method of dust protection

Linear Way and Linear Roller Way have end seals as a standard specification. In addition, double seals or scrapers are provided as special specifications for improvement in dust protection performance. Also caps and a rail cover sheet to cover the mounting hole of track rail (Fig. 5) and track rail mounting from bottom with no mounting hole on the upper surface (Fig. 6) will further increase the reliability of dust protection.

However, if large amount of contaminant or dust are floating, or if large particles of foreign substances such as chips or sand may adhere to the raceway, complete dust protection becomes difficult. In this case, it is recommended to cover the whole unit with bellows (Fig. 7), telescope type shield, etc.

When rail cover sheet or track rails mounting from bottom specification is needed, please contact IKO.

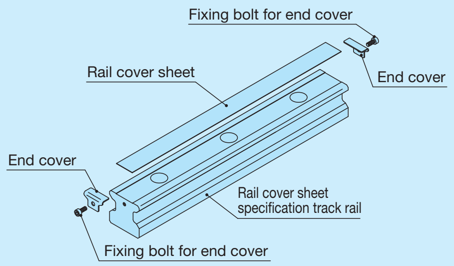


Fig. 5 Rail cover sheet

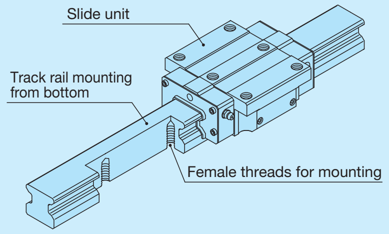


Fig. 6 Track rail mounting from bottom

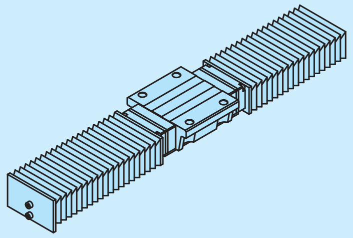


Fig. 7 Bellows

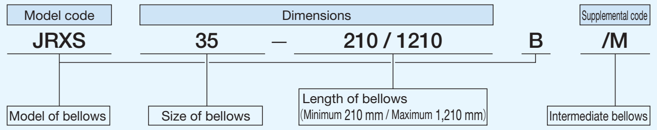
Specific bellows

The specific bellows are manufactured to match the dimensions of Linear Way and Linear Roller Way for easy mounting and excellent dust protection.

If special bellows to be used in an upside-down position or those made of heat-resistant material are needed, please contact IKO.

Identification number of bellows

The identification number of bellows consists of a model code, dimensions, and any supplemental codes. Its standard arrangement is shown below.



Calculation of minimum length of bellows

The minimum necessary length of specific bellows is determined, by first calculating the necessary number of accordion pleats as follows.

$$ns=\frac{S}{\ell s_{\max}-\ell s_{\min}}$$

where,
ns : Number of pleats (Raise decimal fractions)
S : Stroke length, mm
$\ell s_{\max}$: Maximum length of one pleat (See Tables 18.1 and 18.2)
$\ell s_{\min}$: Minimum length of one pleat (See Tables 18.1 and 18.2)

$$L_{\min}=ns\times\ell s_{\min}+m\times5+10$$
$$L_{\max}=S+L_{\min}$$

where,
$L_{\min}$: Minimum length of bellows, mm
$L_{\max}$: Maximum length of bellows, mm
m : Number of internal guide plates (See Table 17)

Table 17 Number of internal guide plates for bellows

Model	P dimensions of specific bellows (1) mm		Number of internal guide plates m
	Above	Below	
JEF **JRES**	—	35	$m=\frac{ns}{7}-1$
JES **JHS** **JFS** **JRXS…B** **JFFS**	—	22	$m=\frac{ns}{16}$ when $ns≦20$, then $m=0$
	22	25	$m=\frac{ns}{12}$ when $ns≦18$, then $m=0$
	25	35	$m=\frac{ns}{8}$

Note (1) For P dimensions, see Table 18.1 and Table 18.2.

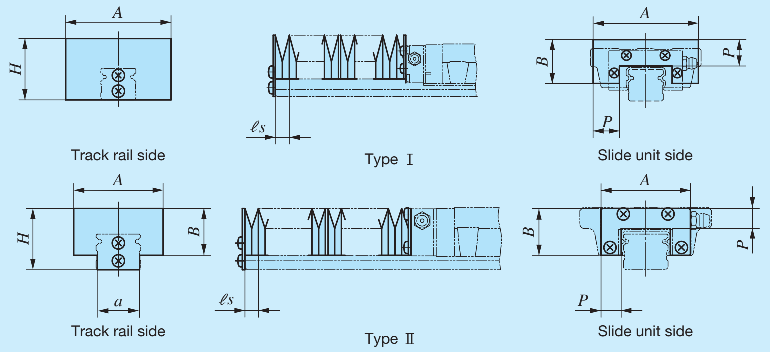
Remark: In calculating the number of internal guide plates m, raise the decimal fractions for JEF and JRES and omit the decimal fractions for others.

Intermediate bellows

Since different type of mounting plate is used for mounting bellows between slide units. add supplemental code "/M" onto the identification number when ordering.

Reinforced bellows are also available, which are specially designed for use on long track rails or for lateral mounting. The width A of reinforced bellows is greater than that of standard type bellows. If needed, please contact IKO.

Table 18.1 Dimensions of bellows and applicable models

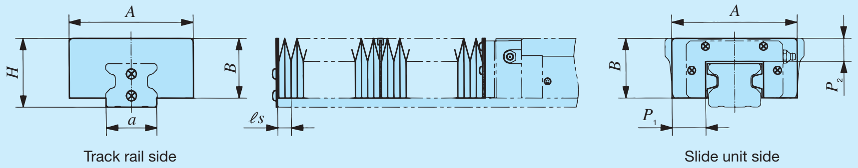


unit: mm

Series name	Size	Bellows model code	Type	H	A	a	B	P	ℓs_{min}	ℓs_{max}
C-Lube Linear Way ME Linear Way E	15	JEF 15	Ⅱ	23.5	34	14	17	8	2	9
	20	JEF 20		27.5	40	19	21	9	2	10
	25	JEF 25		32	46	22	24	10	2	11
	30	JES 30		42	70	27	35	15	2	14
	35	JES 35		48	85	33	40	18	2	18.5
	45	JES 45		60	105	44	50	22	2	23.5
C-Lube Linear Way MH Linear Way H(1)	15	JHS 15	Ⅰ	31(2)	55	–	19.5	15	2	14
	20	JHS 20		35(2)	60	–	25	15	2	14
	25	JHS 25		39(2)	64	–	29.5	15	2	14
	30	JHS 30		42	70	–	35	15	2	14
	35	JHS 35		48	85	–	40	18	2	18.5
	45	JHS 45		60	105	–	50	22	2	23.5
	55	JHS 55		70	120	–	57	25	2	28
	65	JHS 65		90	158	–	76	35	2	42
Linear Way F	33	JFFS 33	Ⅱ	26(2)	66(3)	–	23	15	2	15
	37	JFFS 37	Ⅱ	27.5(2)	70(3)	–	24	15	2	15
	40	JFS 40	Ⅰ	32(2)	80	–	27	15	2	14
	42	JFFS 42	Ⅱ	30.5(2)	76(3)	–	27.5	15	2	15
	60	JFS 60	Ⅰ	36(2)	100	–	30	15	2	14
	69	JFFS 69	Ⅱ	36(2)	106	–	31.5	15	2	15
	90	JFS 90	Ⅰ	50	150	–	43	22	2	23.5

Notes (1) Not applicable to horizontal mounting type LWHY.
(2) The height of bellows may become higher than the height H of dimensions of assembly of slide units. Check H dimensions of each series in dimension table.
(3) The width of bellows may become larger than the W_2 dimensions of slide units. Check with W_2 dimensions of each series in dimension table.

Table 18.2 Dimensions of bellows and applicable models



unit: mm

Series name	Size	Bellows model code	H	A	a	B	P_1	P_2	ℓs_{min}	ℓs_{max}
C-Lube Linear Roller Way Super MX Linear Roller Way Super X	15	JRES 15	34(1)	55(2)	14	30	17.5	15	2	15
	20	JRES 20	39(1)	60(2)	19	34	15	15	2	15
	25	JRES 25	42(1)	65(2)	22	36	16.5	15	2	15
	30	JRES 30	46(1)	70(2)	27	39.5	15	15	2	15
	35	JRES 35	48	88(2)	33	41.5	24	15	2	15
	45	JRES 45	60	108(2)	44	52	29	20	2	21
	55	JRES 55	70	122(2)	52	61	31	22	2	23.5
	65	JRES 65	88	140(2)	61	76	25	25	2	30
	85	JRES 85	107	180	82	89	30	30	2	36
Linear Roller Way X	25	JRXS 25…B	40	60	22	34	15	12	2	10
	35	JRXS 35…B	48	88	34	41.5	24	15	2	14
	45	JRXS 45…B	60	108	44	52	29	20	2	21
	55	JRXS 55…B	70	122	54	61	31	22	2	23.5
	75	JRXS 75…B	90	160	74	80	40	30	2	36

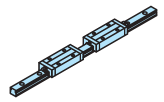
Notes (1) The height of bellows may become higher than the height H of dimensions of assembly of slide units. Check H dimensions of each series in dimension table.
(2) The width of bellows may become larger than the W_2 dimensions of slide units. Check W_2 dimensions of each series in dimension table.

Identification number and quantity for ordering

To order a set of Linear Way and Linear Roller Way, please specify the number of sets based on the number of track rails. For slide units of the interchangeable specification or single track rails, please specify the number of units.

Non-interchangeable specification

Assembled set



(When 1 set is needed)

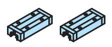
Example of identification number indication

LWESG 25 C2 R640 SL T1 P /FU

Order quantity
1 set

Interchangeable specification

Single slide unit



(When 2 pieces are needed)

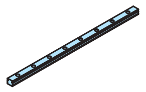
Example of identification number indication

LWESG 25 C1 SL T1 P SO /U

Only C1 is specified.
Please specify S1 or S2.

Order quantity
2 pieces

Single track rail



(When 1 unit is needed)

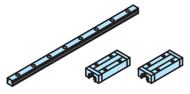
Example of identification number indication

LWE 25 R640 SL P SO /F

Please specify S1 or S2.

Order quantity
1 unit

Assembled set



(When 1 set is needed)

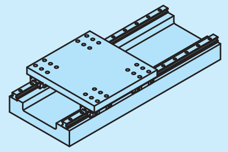
Example of identification number indication

LWESG 25 C2 R640 SL T1 P SO /FU

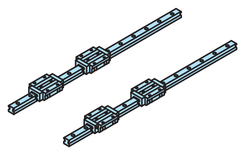
Please specify S1 or S2.

Order quantity
1 set

Specification with 1 multiple assembled sets as 1 assembled group (Special specification /W)



Linear Way and Linear Roller Way



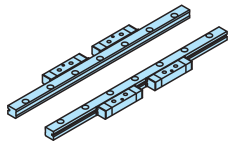
(When 2 sets as 1 assembled group is needed)

Example of identification number indication

LRX 45 C2 R1260 T3 SP /W2

Order quantity
2 sets

Linear Way Module



(When 2 sets as 1 assembled group is needed)

Example of identification number indication

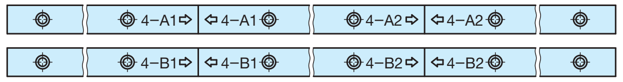
LWLM 9 M2 R360 P /W2

Order quantity
2 set

Special Specification

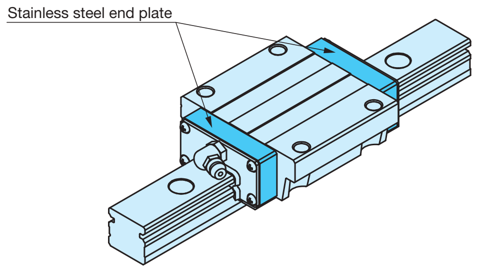
For Linear Way and Linear Roller Way, special specification described in pages Ⅲ−29 through Ⅲ−35 is available. There is limitation on applicable special specification. For details, see an explanation of each series.

Butt-jointing track rails /A



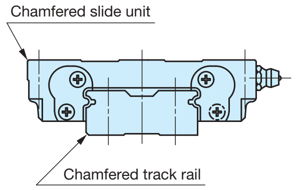
When the track rail of non-interchangeable specification is longer than the maximum length, two or more track rails should be butted in a linear motion direction. For length and number of track rails to butt, please contact IKO.

Stainless steel end plate /BS



The standard synthetic resin end plates are replaced with stainless steel end plates. The total length of the slide unit remains unchanged.
In addition, for improvement of heat resistance, it is recommended to use "No end seal (supplemental code /N)" together.

Chamfered reference surface /C /CC

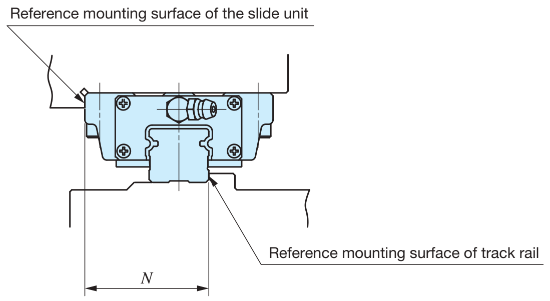


Add chamfer to the reference mounting surface of the slide unit and track rail.

① /C Add chamfer to the reference mounting surface of the track rail.

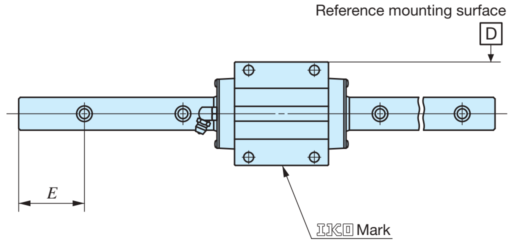
② /CC Add chamfer to the reference mounting surface of the slide unit and track rail.

Opposite reference surfaces arrangement /D



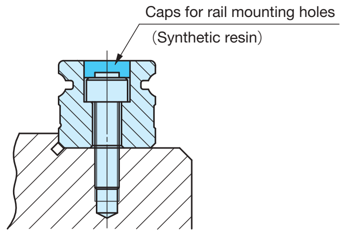
Reference mounting surface of the track rail should be the opposite of the standard position. Accuracy of N dimensions and parallelism during operation remain unchanged.

Specified rail mounting hole positions /E



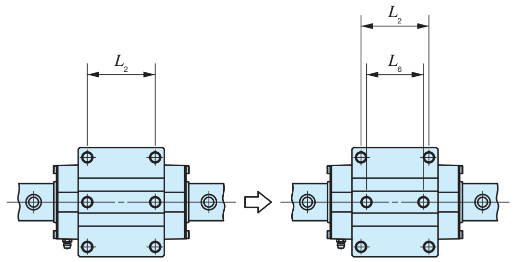
By specifying E dimensions from the mounting hole at the track rail left end to the left end surface when seen from IKO mark of the slide unit, specify the position of track rail mounting hole.
Specify the dimensions (in mm) after "/E".
In addition, E dimension range is limited. For details, please contact IKO.
For Linear Way H horizontal mounting type and Linear Way Module series, see an explanation of each series.

Caps for rail mounting holes /F



Dedicated caps for rail mounting holes are included. They close track rail mounting holes to improve sealing property in a motion direction. Contact IKO for aluminum alloy caps for rail mounting holes.

Changed pitch of slide unit middle mounting holes /GE

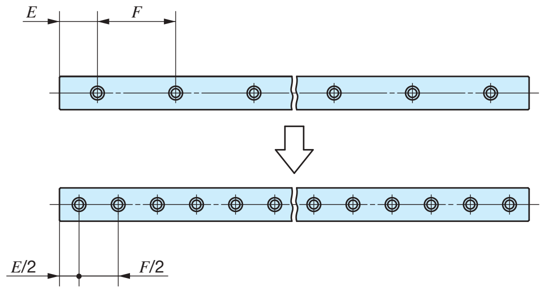


Change the dimension between mounting holes at the slide unit center.

Hybrid C-Lube Linear Way /HB

Change the material of rolling elements built into the slide unit to silicon nitride ceramics.

Half pitch mounting holes for track rail /HP

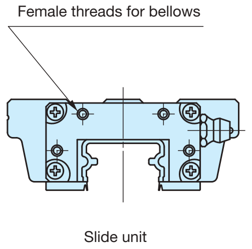


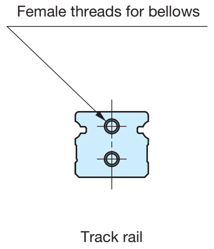
Set the pitch of track rail mounting holes to a half of the standard F dimension. The specification with bolts for track rail mounting holes are supplied with the required number of bolts.

Inspection sheet /I

Inspection sheet of *H* dimension, *N* dimension and parallelism during slide unit operation are appended in each set.

Female threads for bellows (Single unit) /J /JR /JL

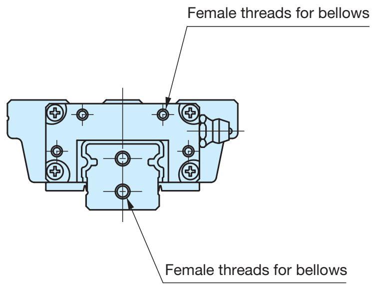




For single slide unit or single track rail of the interchangeable specification, fit female threads for bellows.

① /J Fit female threads to both ends of the slide unit or track rail.
② /JR Fit female threads to a right end surface of the slide unit seen from IKO mark of the slide unit.
③ /JL Fit female threads to a left end surface of the slide unit seen from IKO mark of the slide unit.

Female threads for bellows (Assembled set) /J /JJ /JR /JS /JJS



For assembled set of the interchangeable specification or a non-interchangeable specification product, fit female threads for bellows to the slide unit and track rail.

① /J Fit female threads to both ends of the track rail and to slide unit end nearest to both ends of the track rail. (When only one slide unit is used, fit them to both ends of the track rail)
② /JJ When two or more slide units are used, fit female threads to both ends of the track rail and to both ends of each slide unit. (When only one slide unit is used, specify "/J")
③ /JR Fit female threads to both ends of the track rail.
④ /JS Fit female threads to slide unit end nearest to both ends of the track rail. (When only one slide unit is used, they are fitted to both ends of the track rail)
⑤ /JJS When two or more slide units are used, fit female threads to both ends of each slide unit. (When only one slide unit is used, specify "/JS")

Black chrome surface treatment /LC /LR /LCR

Acrylate resin coating is applied to improve the rust prevention property after black impregnated chrome surface treatment.

① /LC Perform casing treatment.
② /LR Perform track rail treatment.
③ /LCR Perform casing and track rail treatment.

Fluorine black chrome surface treatment /LFC /LFR /LFCR

Fluorinated resin coating is applied to improve the rust prevention property after black impregnated chrome surface treatment. In addition, this prevent foreign substances from sticking to the surface.

① /LFC Perform casing treatment.
② /LFR Perform track rail treatment.
③ /LFCR Perform casing and track rail treatment.

With track rail mounting bolt /MA

Recommended track rail mounting bolt is included. For bolt size, see the dimension table.

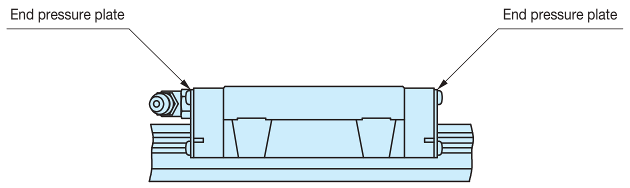
Without track rail mounting bolt /MN

Track rail mounting bolt is not included.

Changed size of mounting holes /M4

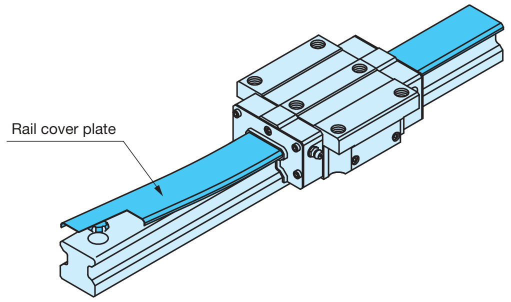
Set the M3 track rail mounting hole for ME15 to M4 track rail mounting holes. For combination with track rail mounting bolt (supplemental code "/MA"), specify "/MA4".

No end seal /N



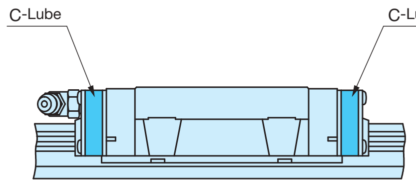
End seals at both ends of the slide unit can be replaced with end pressure plates, which do not come in contact with the track rail, to reduce frictional resistance. No under seal is attached.
This specification is not effective for dust protection.

Rail cover plate for track rail /PS



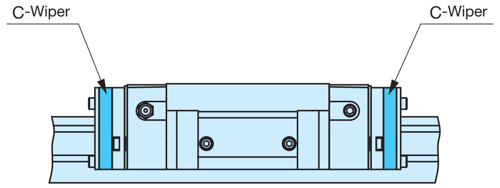
Deliver with the track rail cover plate mounted. Covering the upper surface with U-shape stainless steel thin plate after assembly of the track rail improves the sealing property further. Change the end seal to dedicated one.
In addition, see the supplied rail cover plate instruction manual for mounting of rail cover plate.

With C-Lube plate /Q



The C-Lube impregnated with lubricant is attached inside the end seal of the slide unit, so that the interval for reapplicating lubricant can be extended.

C-Wiper /RC /RCC



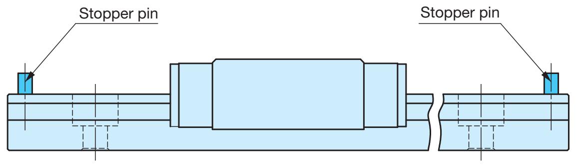
C-Wiper is mounted on the slide unit end to improve dust protection property.
In addition, the slide unit with C-Wiper is equipped with inner seal (/UR) and scraper (/Z) together.

① /RC Fit C-Wiper to slide unit end nearest to both ends of the track rail. When only one slide unit is used, fit them to both ends of the track rail.
② /RCC When two or more slide units are used, fit C-Wiper to both ends of each slide unit.

Special environment seal /RE

The standard end seal and under seal are replaced with seals for special environment that can be used at high temperatures.

Track rail with stopper pins /S

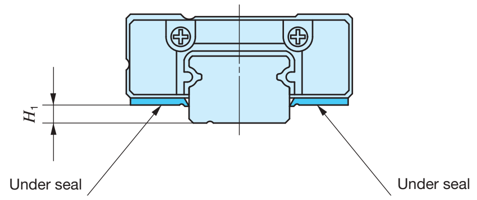


Mount stopper pins to both ends of the track rail as slide unit retainers.

Butt-jointing track rails (Interchangeable specification) /T

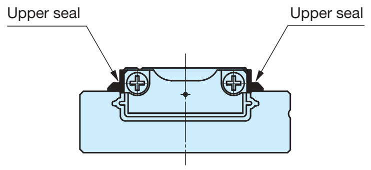
Finish the butted parts at both ends so as to set the interchangeable specification track rail in a linear motion direction. Butt the same interchangeable code for track rails. For non-interchangeable specification, specify butt-jointing track rails "/A".

Under seal (1) /U

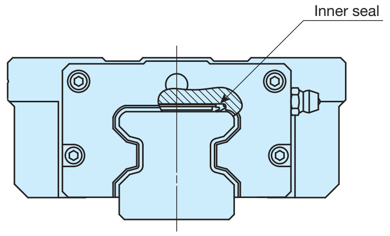


The seal is attached to the bottom of the slide unit to prevent foreign substances from entering from underneath.

Note (1) For C-Lube Linear Way MUL and Linear Way U, attach "upper seal".
The seal is attached to the upper end of the slide unit to prevent foreign substances from entering from above.

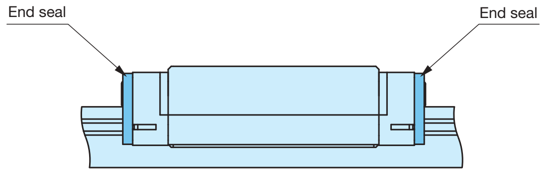


Inner seal /UR



Attach the inner seal to the inside of the slide unit.
Inner seal improves dust protection property of the cylindrical roller circulation part against foreign substances from the upper surface of the track rail.

End seal /US



Attach end seals instead of scrapers on both sides of the slide unit in order to improve the dust protection performance.

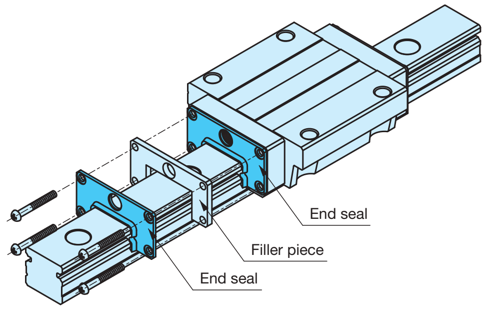
Double seals (Single unit) /V /VR /VL

Double end seals are mounted to the interchangeable specification slide unit to improve the dust protection property.

① /V Apply double seals to both ends of the slide unit.
② /VR Apply double seals to a right end surface of the slide unit seen from the IKO mark of the slide unit.
③ /VL Apply double seals to a left end surface of the slide unit seen from the IKO mark of the slide unit.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

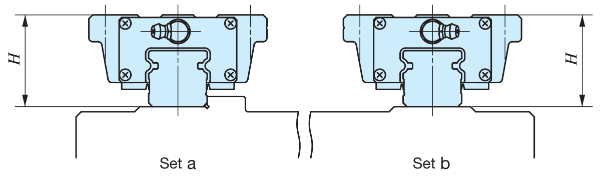
Double seals (Assembled set) /V /VV



Double end seals are mounted to the interchangeable specification assembled set or non-interchangeable specification product's slide unit to improve the dust protection property.

① /V Apply double seals to slide unit end nearest to both ends of the track rail. When only one slide unit is used, fit them to both ends of the track rail.
② /VV When two or more slide units are used, apply double seals to both ends of each slide unit.

A group of multiple assembled sets /W



Set the variation of H dimensions of the Linear Way and Linear Roller Way of multiple assembled sets on the same flat surface in the standard range.
The variation of H dimensions of the multiple assembled sets is the same as the accuracy of one set.
Indicate the number of sets after "/W" based on the number of units when specify.

Specified grease /YCG /YCL /YAF /YBR /YNG

The type of pre-packed grease can be changed by the supplemental code.

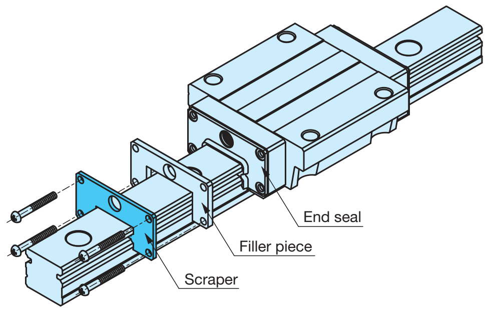
① /YCG Low Dust-Generation Grease for Clean Environment CG2 is pre-packed.
② /YCL Low Dust-Generation Grease for Clean Environment CGL is pre-packed.
③ /YAF Anti-Fretting Corrosion Grease AF2 is pre-packed.
④ /YBR MOLYCOTE BR2- Plus Grease [Dow Corning] is pre-packed.
⑤ /YNG No grease is pre-packed.

Scraper (Single unit) /Z /ZR /ZL

Mount a metal scraper to the interchangeable specification slide unit.
The scraper is non-contact type and effectively eliminate large foreign substances adhering to the track rail.

① /Z Mount scrapers to both ends of the slide unit.
② /ZR Fit a scraper to a right end surface of the slide unit seen from IKO mark of the slide unit.
③ /ZL Fit a scraper to a left end surface of the slide unit seen from IKO mark of the slide unit.

Scraper (Assembled set) /Z /ZZ



Mount a metal scraper to the interchangeable specification assembled set or non-interchangeable specification product's slide unit.
The scraper is non-contact type and effectively eliminate large foreign substances adhering to the track rail.

① /Z Fit a scraper to slide unit end nearest to both ends of the track rail. When only one slide unit is used, fit them to both ends of the track rail.
② /ZZ When two or more slide units are used, fit scrapers to both ends of each slide unit.

Precaution for Use

Operating temperature

The maximum operating temperature for linear motion rolling guide with integrated C-Lube is 80℃. The maximum operating temperature for linear motion rolling guide without integrated C-Lube is 120℃ and temperature up to 100 ˚C is allowed for continuous operation. When the temperature exceeds 100℃, please contact IKO.
When specifying special specification with C-Lube plate (supplemental code "/Q"), utilize it below 80℃.

Multiple slide units used in close proximity

When using multiple slide units in close proximity, greater load may be applied than the calculated value depending on the deviation of slide unit mounting accuracy for the machine or device. In such cases, allowance for greater applied load than the calculated value should be made.

Lateral or upside-down mounting

For lateral or upside-down mounting of the Linear Way E and Linear Way F, specify the special specification (supplemental code "/U") with under seal as necessary to prevent foreign substances from entering into the slide unit.

Operation velocity

Operation velocity limit value of the Linear Way and Linear Roller Way depends on operation conditions such as motion characteristics, applied load, lubrication status, mounting accuracy and environment temperature. Reference values based on actual performance and experienced values as a reference of maximum velocity under typical operating conditions are indicated in Table 19.

Table 19 Reference maximum velocity

Size	Maximum velocity m/min
35	180
45	120
55	100
65	75

Cleaning and removing fat

Never clean a linear motion rolling guide that has integrated C-lube with organic solvents or white kerosene with fat removing properties.

Lubrication oil supply point for oil lubrication

If the lubrication oil is supplied by a gravity drip system, enough lubrication oil may not be supplied to ways above the supply point, so lubrication path and supply point must be considered. For such applications, please contact IKO.

Precautions regarding oil components

Rust prevention oil or grease is used for the linear motion rolling guide. Therefore, oil may drip or spatter depending on the operating conditions. Consider installing a shielding plate if necessary.

Storage

Store the Linear Way/Linear Roller Way horizontally indoors in the IKO packing and packaging provided. Avoid high temperature, low temperature and high humidity. Lubricant will deteriorate over time in products stored for a long time. Be sure to reapply lubricant prior to use.

Precaution for Mounting

When mounting multiple assembled sets at the same time

● Interchangeable specification products
For interchangeable specification products, assemble a slide unit and a track rail with the same interchangeable code ("S1" or "S2").
● Non-interchangeable specification products
Do not change the combination of delivered slide unit and track rail.
● Product including multiple assembled sets
For special specification (supplemental code "/W") products with multiple assembled sets, the delivered combination is managed as a group for variation. So do not mix with different group for mounting.

Assembling of slide unit and track rail

When assembling the slide unit on the track rail, correctly fit the grooves of the slide unit and the track rail and move the slide unit softly in parallel direction. Rough handling may result in damaging of seals or dropping of steel balls and cylindrical roller.
For product including a dummy rail as a standard accessory, operation of the slide unit to the track rail can be made easier by using the dummy rail.
Though the dummy rail is included as an accessory of products indicated in Table 21.1 and Table 21.2, it is also available for other products. If these parts are necessary, please contact IKO.

Mounting accuracy

Deviation of accuracy of Linear Way and Linear Roller Way mounting surface or deviation of accuracy in mounting may generate large load over the calculated value. Note that such load could affect the life adversely. It enhances the reliability of Linear Way and Linear Roller Way to ensure high machining accuracy and assembly accuracy depending on operational conditions of the track rail and slide unit such as required motion accuracy and rigidity and to consider mounting structure that can maintain the accuracy and performance. Typical reference values for mounting parallelism between multiple assembled sets used are shown in Table 20.

Table 20 Parallelism between two mounting surfaces unit: μm

Classification	Ordinary (No symbol)	High (H)	Precision (P)	Super precision (SP)	Ultra precision (UP)
Parallelism	30		20	10	6

Shoulder height and corner radius of the reference mounting surface

For the shape of opposite corner of the reference surface, it is recommended to have relieved fillet as indicated in Fig. 8, but you may also use it with providing radius at the corner. For recommended values for the shoulder height and corner radius of the reference mounting surface, see an explanation of each series.

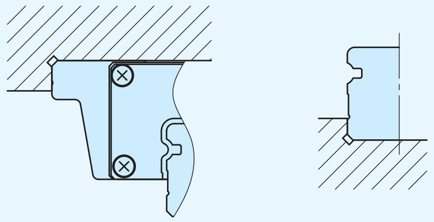


Fig. 8 Corner of the mating reference mounting

Table 21.1 Products appended with dummy rail ○: Appended

Series name and size		Interchangeable		Non-interchangeable specification
		Single unit	Assembled set	Assembled set
C-Lube Linear Way ML Linear Way L		○	See Table 21.2	See Table 21.2
C-Lube Linear Way MLV		–	–	
C-Lube Linear Way MV		–	–	–
C-Lube Linear Way ME Linear Way E		○	–	–
C-Lube Linear Way MH Linear Way H	8～12	○	○	○
	15～65	○	–	–
Linear Way F		○	–	–
C-Lube Linear Way MUL Linear Way U	25, 30	–	–	○
	40～86	–	–	–
C-Lube Linear Roller Way Super MX Linear Roller Way Super X	10～30	○	○	○
	35～65	○	–	–
	Extra long	○	○	○
	85, 100	–	–	–
Linear Roller Way X		–	–	–

Table 21.2 Appended dummy rail model number for C-Lube Linear Way ML, C-Lube Linear Way MLV and Linear Way L

C-Lube Linear Way ML		C-Lube Linear Way MLV	Linear Way L	
Standard type	Wide type	Standard type	Standard type	Wide type
–	–	–	LWL 2	LWLF 4
MLC 3	MLFC 6	–	LWLC 3	LWLFC 6
ML 3	MLF 6	–	LWL 3	LWLF 6
MLC 5	MLFC 10	–	LWLC 5…B	LWLFC 10…B
ML 5	MLF 10	–	LWL 5…B	LWLF 10…B
MLC 7	MLFC 14	MLV 7	LWLC 7…B	LWLFC 14…B
ML 7	MLF 14	–	LWL 7…B	LWLF 14…B
MLG 7	MLFG 14	–	LWLG 7…B	LWLFG 14…B
MLC 9	MLFC 18	MLV 9	LWLC 9…B	LWLFC 18…B
ML 9	MLF 18	–	LWL 9…B	LWLF 18…B
MLG 9	MLFG 18	–	LWLG 9…B	LWLFG 18…B
MLL 9	–	–	–	–
MLG 12	MLFG 24	–	LWLG 12…B	LWLFG 24…B
MLL 12	–	–	–	–
MLG 15	MLFG 30	–	LWLG 15…B	LWLFG 30…B
MLL 15	–	–	–	–
MLG 20	MLFG 42	–	LWLG 20…B	LWLFG 42…B
MLG 25	–	–	LWLG 25…B	–

Cleanup of mounting surface

Remove burrs and blemishes by using oil-stone, etc. and wipe off rust prevention oil and dust with clean cloth from mounting surface and reference mounting surface of the machine or device to which the Linear Way or Linear Roller Way are mounted.

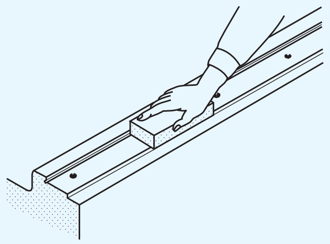


Fig. 9 Cleanup of mounting surface

Mounting of caps for rail mounting holes

When mounting the special specification caps for rail mounting holes (supplemental code "/F") on the track rail, use a flat applicator and stamp it by bits until it becomes plane with the track rail upper surface.

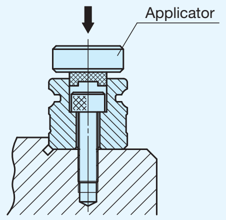


Fig. 10 Mounting of caps for rail mounting holes

Tightening torque for fixing screw

Typical fixing screw tightening torque to mount the Linear Way and Linear Roller Way is indicated in Table 22. When vibration and shock of the machine or device are large, fluctuating load is large, or moment load is applied, fix it by using the torque 1.2 to 1.5 times larger than the value indicated as necessary.

If the mating member material is cast iron or aluminum alloy, reduce the tightening torque depending on the strength characteristics of the mating member material.

For details, see an explanation of each series.

Though the track rail mounting bolts are appended as an accessory of products indicated in Table 23, it is also available for other products. If these parts are necessary, please contact IKO.

Table 22 Tightening torque for fixing screw

Bolt size	Tightening torque N・m			
	High carbon steel-made screw (Strength division 8.8)	High carbon steel-made screw (Strength division 10.9)	High carbon steel-made screw (Strength division 12.9)	Stainless steel-made screw (Property division A2-70)
M 1 ×0.25	–	–	–	0.04
M 1.4×0.3	–	–	–	0.10
M 1.6×0.35	–	–	–	0.15
M 2 ×0.4	–	–	–	0.31
M 2.3×0.4	–	–	–	0.49
M 2.5×0.45	–	–	–	0.62
M 2.6×0.45	–	–	–	0.70
M 3 ×0.5	1.3	–	1.8	1.1
M 4 ×0.7	2.9	–	4.1	2.5
M 5 ×0.8	5.7	–	8.0	5.0
M 6 ×1	–	–	13.6	8.5
M 8 ×1.25	–	–	32.7	20.4
M10 ×1.5	–	–	63.9	–
M12 ×1.75	–	–	110	–
M14 ×2	–	–	175	–
M16 ×2	–	–	268	–
M20 ×2.5	–	–	522	–
M24 ×3	–	749	–	–
M30 ×3.5	–	1 490	–	–

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Table 23 Specifications of appended track rail mounting bolts

Series			Specifications of appended bolts		
	Size	Material type	Type	Material	Class
C-Lube Linear Way ML Standard type(1) Linear Way L Standard type(1)	1～ 3(2)	Stainless steel made	JCIS 10-70 Cross-recessed pan head screw for precision equipment	Stainless steel made	–
	5	Stainless steel made	JCIS 10-70 Cross-recessed pan head screw for precision equipment	Stainless steel made	–
	7～ 25	Stainless steel made	JIS B 1176 Hexagon socket head bolt	Stainless steel made	Property division A2-70
	9～ 20	High carbon steel made	JIS B 1176 Hexagon socket head bolt	High carbon steel made	Strength division 8.8
C-Lube Linear Way ML Wide type(1) Linear Way L Wide type(1)	4～ 10	Stainless steel made	JCIS 10-70 Cross-recessed pan head screw for precision equipment	Stainless steel made	–
	14～ 42	Stainless steel made	JIS B 1176 Hexagon socket head bolt	Stainless steel made	Property division A2-70
	18～ 42	High carbon steel made	JIS B 1176 Hexagon socket head bolt	High carbon steel made	Strength division 8.8
C-Lube Linear Way MLV		Stainless steel made	JIS B 1176 Hexagon socket head bolt	Stainless steel made	Property division A2-70
C-Lube Linear Way MV(3)		High carbon steel made	JIS B 1176 Hexagon socket head bolt	High carbon steel made	Strength division 12.9
C-Lube Linear Way ME(3) Linear Way E(3)		Stainless steel made	JIS B 1176 Hexagon socket head bolt	Stainless steel made	Property division A2-70
		High carbon steel made	JIS B 1176 Hexagon socket head bolt	High carbon steel made	Strength division 12.9
C-Lube Linear Way MH(4) Linear Way H(5)	8～ 30	Stainless steel made	JIS B 1176 Hexagon socket head bolt	Stainless steel made	Property division A2-70
	12	High carbon steel made	JIS B 1176 Hexagon socket head bolt	High carbon steel made	Strength division 8.8
	15～ 65	High carbon steel made	JIS B 1176 Hexagon socket head bolt	High carbon steel made	Strength division 12.9
Linear Way F		Stainless steel made	JIS B 1176 Hexagon socket head bolt	Stainless steel made	Property division A2-70
		High carbon steel made	JIS B 1176 Hexagon socket head bolt	High carbon steel made	Strength division 12.9
C-Lube Linear Way MUL(3)	25	Stainless steel made	JCIS 10-70 Cross-recessed pan head screw for precision equipment	Stainless steel made	–
	30	Stainless steel made	JIS B 1176 Hexagon socket head bolt	Stainless steel made	Property division A2-70
Linear Way U(3)	40～ 86	High carbon steel made	JIS B 1176 Hexagon socket head bolt	High carbon steel made	Strength division 12.9
C-Lube Linear Roller Way Super MX(4) Linear Roller Way Super X	10～ 65	Stainless steel made	JIS B 1176 Hexagon socket head bolt	Stainless steel made	Property division A2-70
		High carbon steel made	JIS B 1176 Hexagon socket head bolt	High carbon steel made	Strength division 12.9
	85～100	High carbon steel made	JIS B 1176 Hexagon socket head bolt	High carbon steel made	Strength division 10.9
Linear Roller Way X	25～ 55	High carbon steel made	JIS B 1176 Hexagon socket head bolt	High carbon steel made	Strength division 12.9
	75	High carbon steel made	JIS B 1176 Hexagon socket head bolt	High carbon steel made	Strength division 10.9
Linear Way LM(6)		Stainless steel made	JIS B 1176 Hexagon socket head bolt	Stainless steel made	Property division A2-70
Linear Roller Way M(7)		High carbon steel made	JIS B 1176 Hexagon socket head bolt	High carbon steel made	Strength division 12.9

Notes (1) The bolts are not appended for tapped rail specification.
(2) The bolts are not appended. Specifications in the table are the ones prepared by IKO.
(3) The bolts are not appended. Specifications in the table are the ones when special specification "/MA" (with track rail mounting bolts) is specified.
(4) The bolts are not appended in an assembled set. Specifications in the table are the ones when special specification "/MA" (with track rail mounting bolts) is specified.
(5) The bolts are not appended in LWH···MU.
(6) Slide member mounting bolts are not appended.
(7) Slide member mounting bolts are also appended.

Mounting surface, reference mounting surface and typical mounting structure

When mounting Linear Way and Linear Roller Way, properly align the reference mounting surface B and D of the track rail and slide unit with the reference mounting surface of the table and bed and fix them. (See Fig. 11)

The reference mounting surfaces B and D and mounting surfaces A and C are precisely ground. Machining the mounting surface of the table and bed, such as machine or device, to high accuracy and mounting them properly will ensure stable linear motion with high accuracy.

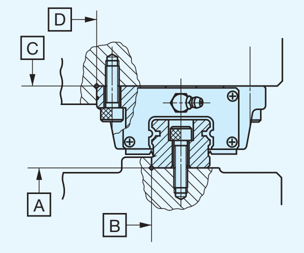


Fig. 11 Reference mounting surface and typical mounting structure of Linear Way and Linear Roller Way

Reference mounting surface of the slide unit is the opposite side of the IKO mark. The track rail reference mounting surface is identified by locating the IKO mark on the top surface of the track rail. It is the side surface above the mark (in the direction of the arrow). (See Fig. 12.)

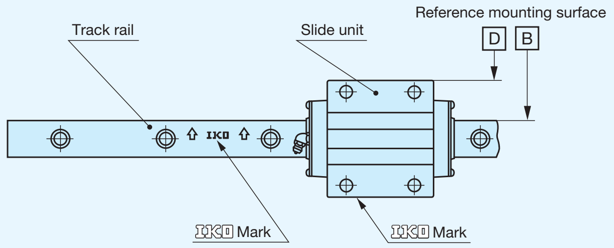


Fig. 12 Position of reference mounting surface of Linear Way and Linear Roller Way (Representative example)

Load direction and mounting structure

When lateral load, alternate load, or fluctuating load is applied onto the Linear Way or Linear Roller Way, securely fix the ends of slide unit and track rail as indicated in the Fig. 13 and Fig. 14.

When the load is small or operational conditions are not harsh, mounting methods indicated in Fig. 15 and Fig. 16 may be used.

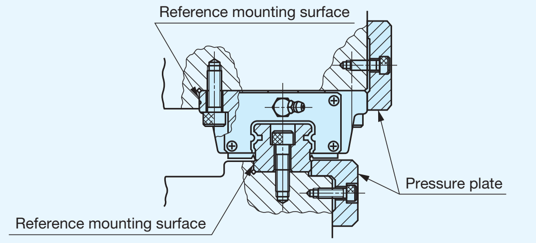


Fig. 13 Mounting example with pressure plate

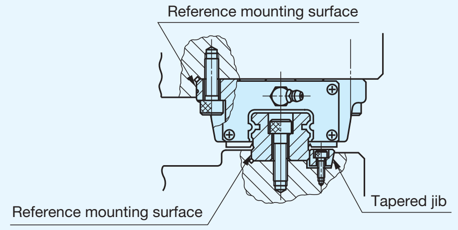


Fig. 14 Mounting example with tapered jib

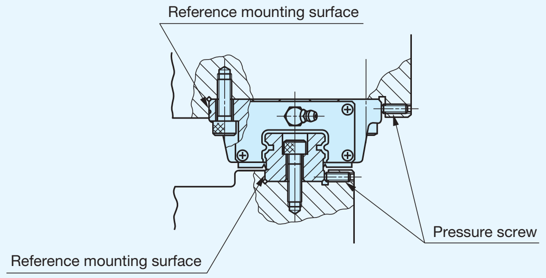


Fig. 15 Mounting example with pressure screw

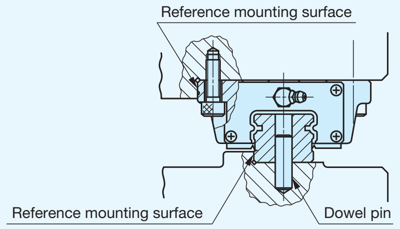


Fig. 16 Mounting example with dowel pin

Mounting Examples

Typical procedures to mount Linear Way and Linear Roller Way are described in Examples 1 to 4 using a Linear Way as a representative case.

Example 1. Typical operation

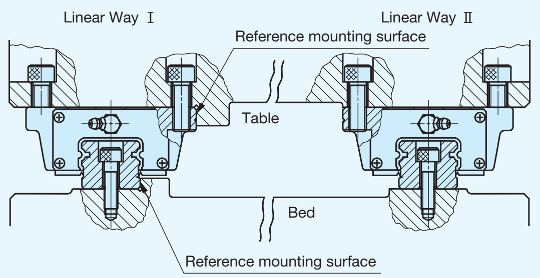


Fig. 17 Mounting example 1

For typical application without shock, reference mounting surface is prepared on each bed and table on the reference side. The mounting procedures are as follows. (See Fig. 17)

❶ Cleanup of mounting surface and reference mounting surface

- Remove burrs and blemishes by using oil-stone, etc. from reference mounting surface and mounting surface of the machine or the device to which Linear Way is mounted and wipe off with clean cloth. (see Fig. 18)
- Wipe off rust prevention oil and dust on the reference mounting surface and the mounting surface of the Linear Way with clean cloth.

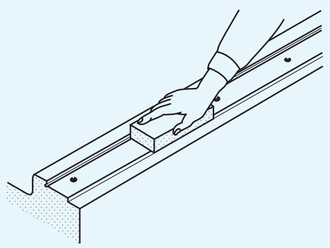


Fig. 18 Cleanup of mounting surface

❷ Temporary fixing of Linear Way Ⅰ and Ⅱ track rails

- Align and temporarily fix them with reference mounting surface of each Linear Way track rail. (See Fig. 19)
  At this point, ensure that the fixing bolt does not interfere with the mounting hole.
- Fix the Linear Way Ⅱ track rail to the bed.

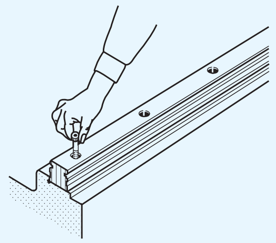


Fig. 19 Temporary fixing of track rail

❸ Fixing of Linear Way Ⅰ track rail

- Use small type vise or the like to stick track rail reference mounting surface to the reference mounting surface of the bed and tighten the fixing bolt at the same position. Repeat this method from one end to fix the track rail in order. (See Fig. 20)
- Linear Way Ⅱ track rail should be left temporarily fixed.

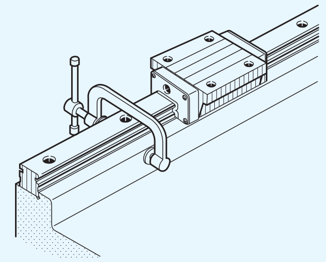


Fig. 20 Fixing of reference side track rail

❹ Temporary fixing of Linear Way Ⅰ and Ⅱ slide units

- Align the Linear Way with the mounting position of the table and load the table gently.
- Temporarily fix the Linear Way Ⅰ and Ⅱ slide units to the table.

❺ Fixing of Linear Way Ⅰ slide unit

- Align the reference mounting surface of the Linear Way Ⅰ slide unit with the reference mounting surface of the table correctly and fix them.

❻ Fixing of Linear Way Ⅱ slide unit

- Fix one of the Linear Way Ⅱ slide units in a motion direction correctly and leave the other slide units temporarily fixed. (See Fig. 21)

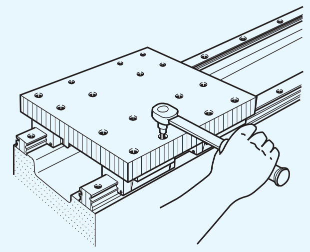


Fig. 21 Fixing of slide unit

❼ Fixing of Linear Way Ⅱ track rail

- Move the table and fix the Linear Way Ⅱ track rail ensuring smooth motion status. At this point, tighten each fixing bolt immediately after the fixed slide unit of the Linear Way Ⅱ passes on each of it. Repeat this method from one end to fix the track rail in order. (See Fig. 22)

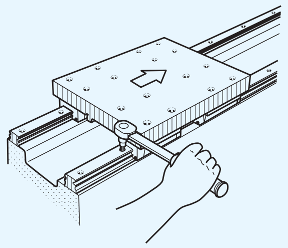


Fig. 22 Fixing of driven side track rail

❽ Fixing of Linear Way Ⅱ slide unit

- Fix the rest of the Linear Way II slide units.

Example 2. Operation for linear motion with accuracy and rigidity

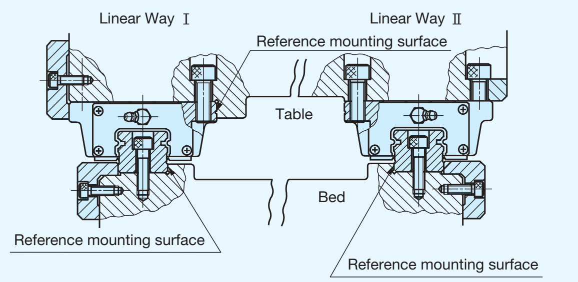


Fig. 23 Mounting example 2

If accuracy and rigidity of linear motion are required, prepare two reference mounting surfaces on the bed and one reference mounting surface on the table. The mounting procedures are as follows. (See Fig. 23)

❶ Cleanup of mounting surface and reference mounting surface

- Remove burrs and blemishes by using oil-stone, etc. from reference mounting surface and mounting surface of the machine or the device to which Linear Way is mounted and wipe off with clean cloth. (see Fig. 24)
- Wipe off rust prevention oil and dust on the reference mounting surface and the mounting surface of the Linear Way with clean cloth.

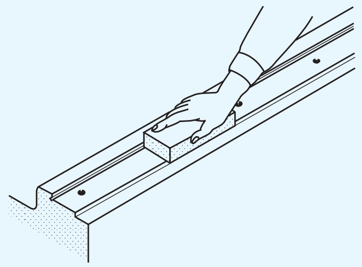


Fig. 24 Cleanup of mounting surface

❷ Temporary fixing of Linear Way Ⅰ and Ⅱ track rails

- Align and temporarily fix them with reference mounting surface of each Linear Way track rail. (See Fig. 25)
  At this point, ensure that the fixing bolt does not interfere with the mounting hole.

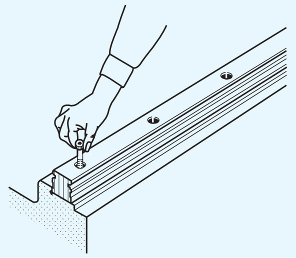


Fig. 25 Temporary fixing of track rail

❸ Fixing of Linear Way Ⅰ and Ⅱ track rails

- Stick the track rail reference mounting surface of the Linear Way Ⅰ to the reference mounting surface of the bed with pressure plate or pressure screws and tighten the track rail fixing bolt at the same position. Repeat this method from one end to fix the track rail in order. (See Fig. 26)

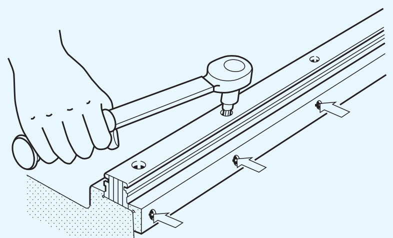


Fig. 26 Fixing of track rail

❹ Temporary fixing of Linear Way Ⅰ and Ⅱ slide units

- Align the slide unit with the mounting position of the table and load the table gently. Temporarily fix the Linear Way Ⅰ and Ⅱ slide units to the table.

❺ Fixing of Linear Way Ⅰ slide unit

- Align the reference mounting surface of the Linear Way Ⅰ slide unit with the reference mounting surface of the table correctly and fix them with pressure plate or pressure screws.

❻ Fixing of Linear Way Ⅱ slide unit

- Move the table ensuring smooth motion status, and fix the Linear Way Ⅱ slide unit. (See Fig. 27)

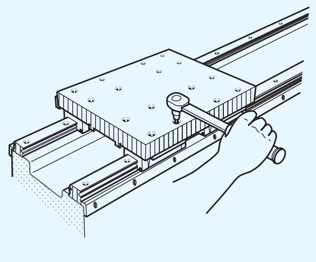


Fig. 27 Fixing of slide unit

Example 3 Operation in case the slide unit is fixed separated from the track rail

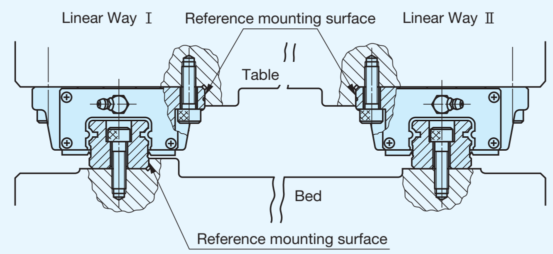


Fig. 28 Mounting example 3

If it cannot be fixed securely with the table loaded, prepare one reference mounting surface on the bed and two reference mounting surfaces on the table. The mounting procedures are as follows. (See Fig. 28)

❶ Cleanup of mounting surface and reference mounting surface

- Remove burrs and blemishes by using oil-stone, etc. from reference mounting surface and mounting surface of the machine or the device to which Linear Way is mounted and wipe off with clean cloth. (see Fig. 29)
- Wipe off rust prevention oil and dust on the reference mounting surface and the mounting surface of the Linear Way with clean cloth.

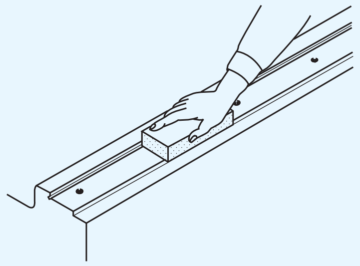


Fig. 29 Cleanup of mounting surface

❷ Temporary fixing of Linear Way Ⅰ and Ⅱ track rails

- Align and temporarily fix them with reference mounting surface of each Linear Way track rail. (See Fig. 30)
  At this point, ensure that the fixing bolt does not interfere with the mounting hole.

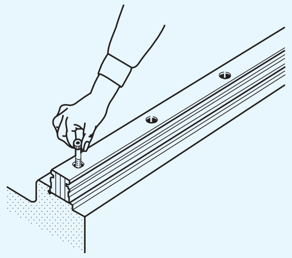


Fig. 30 Temporary fixing of track rail

❸ Fixing of Linear Way Ⅰ track rail

- Use small type vise or the like to stick track rail reference mounting surface to the reference mounting surface of the bed and tighten the fixing bolt at the same position. Repeat this method from one end to fix the track rail in order. (See Fig. 31)
- Linear Way Ⅱ track rail should be left temporarily fixed.

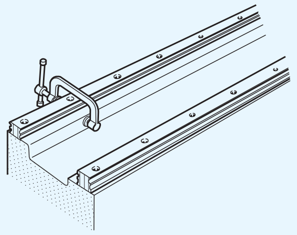


Fig. 31 Fixing of track rail

❹ Separation of track rail and slide unit

- After checking the combination and positions of Linear Way Ⅰ and Ⅱ track rails and slide units, separate each slide unit from the track rail.

❺ Fixing of Linear Way Ⅰ and Ⅱ slide units

- Align with the reference mounting surface of the Linear Way Ⅰ and Ⅱ slide units correctly, and fix them. (See Fig. 32)

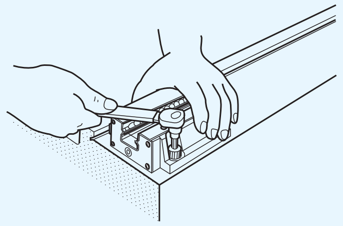


Fig. 32 Fixing of slide unit

❻ Setting of track rail and slide unit

- Insert and assemble the slide unit fixed to the table slowly with care while aligning it with the track rail fixed and temporarily fixed to the bed to maintain parallelism.

❼ Fixing of Linear Way Ⅱ track rail

- Move the table and fix the Linear Way Ⅱ track rail ensuring smooth motion status. At this point, tighten each fixing bolt immediately after the fixed slide unit of the Linear Way Ⅱ passes on each of it. Repeat this method from one end to fix the track rail in order.

Example 4. Operation of Linear Way Module

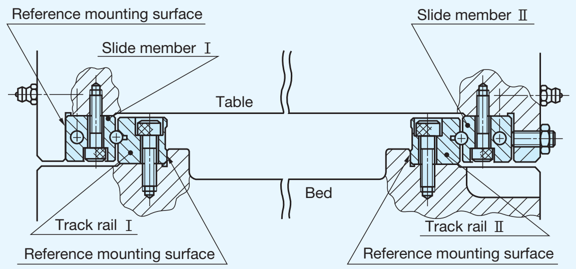


Fig. 33 Mounting example 4

For the Linear Way Module, normally 2 sets are used in parallel as indicated in Fig. 33. For the mounting, typically follow the procedure below (see Fig. 33).

❶ Cleanup of mounting surface and reference mounting surface

- Remove burrs and blemishes by using oil-stone, etc. from reference mounting surface and mounting surface of the machine or the device to which Linear Way Module is mounted and wipe off with clean cloth (see Fig. 34).
- Wipe off rust prevention oil and dust on the reference mounting surface and the mounting surface of the Linear Way Module with clean cloth.

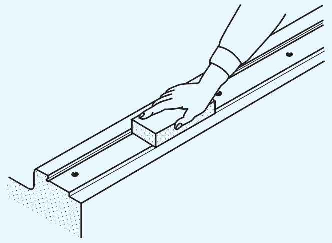


Fig. 34 Cleanup of mounting surface

❷ Fixing of track rail

- Align the reference mounting surfaces of track rails Ⅰ and Ⅱ with the reference mounting surfaces of the bed correctly, stick them by using small type vise, and tighten the fixing bolts at the same position (see Fig. 35).

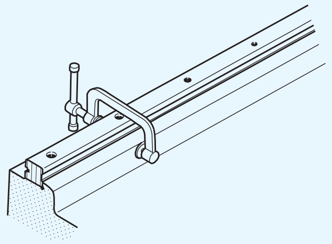


Fig. 35 Fixing of track rail

❸ Fixing the slide member

- Align the reference mounting surface of the slide member Ⅰ with the reference mounting surface of the table correctly, tighten the fixing bolt to fix them, and temporarily fix the slide member Ⅱ (see Fig. 36).

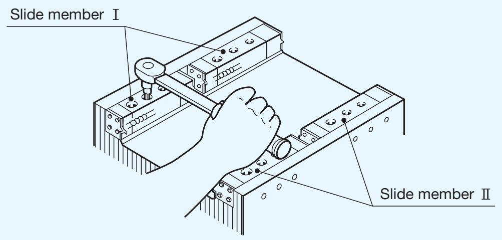


Fig. 36 Fixing of slide member

❹ Setting of table and bed

- Insert and assemble the slide member fixed to the table slowly with care while aligning it with the track rail fixed to the bed to maintain parallelism.

❺ Fixing the slide member Ⅱ

- As indicated in Fig. 37, tighten the preload adjusting screw at the center first and then all the rest preload adjusting screws in order while measuring the clearance by using the dial gauge.
- The position where the dial gauge deflection stops after moving the table to right and left indicates zero preload or slight preload state.
- After preload adjustment, tighten the fixing bolt to fix them.

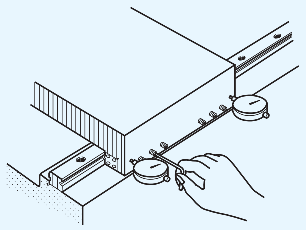


Fig. 37 Preload adjustment

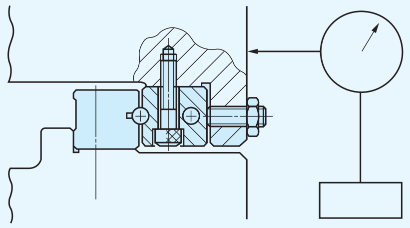


Fig. 38 Example of preload adjustment check method

Mounting of reference side track rail

Mounting methods of reference side track rail are indicated below. Select a method suitable for the specifications of your machine or device.

❶ Method to use reference mounting surface

- Stick track rail reference mounting surface to the reference mounting surface of the bed by using a pressure plate or small type vise, and tighten the fixing bolt at the same position. Repeat this method from one end to fix the track rail in order.

❷ Method to use temporary reference surface

- Prepare temporary reference surface around the mounting surface of the bed, temporarily fix the track rail, fix the measurement stand on the upper surface of the slide unit as indicated in Fig. 39, place an indicator onto the temporary reference surface, and fix them from one end of the track rail in order while maintaining straightness.

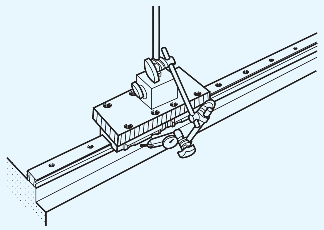


Fig. 39 Method to use temporary reference surface

❸ Method with straight-edge

- After temporary fixing of the track rail, apply an indicator to the reference mounting surface of the track rail as indicated in Fig. 40 and fix them from one end of the track rail in order referring to the straight-edge while maintaining straightness.

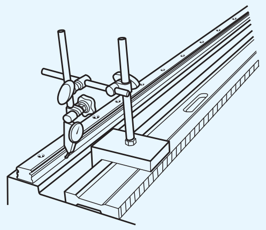


Fig. 40 Method with straight-edge

Mounting of driven side track rail

Mounting methods of driven side track rail are indicated below. Select a method suitable for the specifications of your machine or device.

❶ Method to use reference mounting surface

- Stick track rail reference mounting surface to the reference mounting surface of the bed by using a pressure plate or small type vise, and tighten the fixing bolt at the same position. Repeat this method from one end to fix the track rail in order.

❷ Method to follow the reference side track rail

- Correctly mount the reference side track rail and one of the driven slide units in motion direction, temporarily fix the rest of slide units and track rails, and fix them from one end of the driven side track rail in order ensuring smooth motion status.

❸ Method with straight-edge

- After temporary fixing of the track rail, apply an indicator to the reference mounting surface of the track rail as indicated in Fig. 40 and fix them from one end of the track rail in order referring to the straight-edge while maintaining straightness.

❹ Method to use reference side Linear Way

- Fix a measurement stand onto the upper surface of the reference side slide unit as indicated in Fig. 41, place an indicator onto the reference mounting surface of the driven side track rail, and fix them from one end in order while maintaining parallelism.

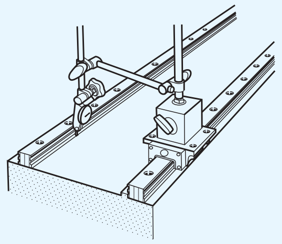


Fig. 41 Method to use reference side Linear Way

Mounting procedures when track rails are butt-jointed

When multiple track rails are butt-jointed, it is necessary to specify special specification butted track rails (non-interchangeable specification, supplemental code "/A") or butt-jointing track rails (interchangeable specification, supplemental code "/T").
Butt-jointing track rails have a butt-jointing mark on the track rail end surface as indicated in Fig. 42. Typical method to butt-joint the track rails is as follows.

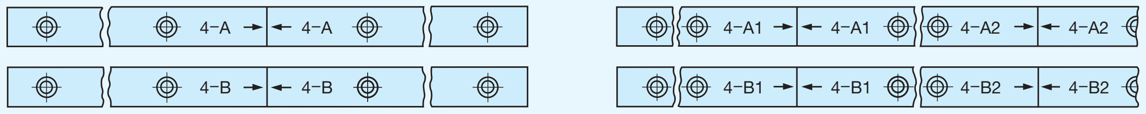


Fig. 42 Butt-jointing mark

❶ Align the butt-jointing mark on the track rail end surface and temporarily fix it. Since butt-jointing track rails are interchangeable, no butt-jointing position is specified.

❷ Correctly align the reference mounting surface of the track rail with that of the bed in order. At this point, use a small type vise or the like to stick the reference mounting surfaces of the bed and track rail together so as to eliminate any step at the joint part of the track rail. (See Fig. 43)

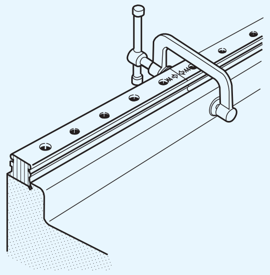


Fig. 43 Method to butt-joint track rails

Guide to Mounting Videos

Instructional videos about the mounting methods for linear motion rolling guides are available on the IKO website. Please utilize them when necessary.

https://www.ikont.co.jp/eg/

Reference tables

Unit Conversion Rate Table

SI, CGS series and gravity system unit cross-reference table

Unit system \ Amount	Length	Mass	Time	Acceleration	Force	Stress and pressure	Energy	Power	Temperature	Viscosity	Kinetic viscosity	Flux	Flux density	Magnetic field intensity
SI	m	kg	s	m/s^{2}	N	Pa	J	W	K	Pa·s	m^{2}/s	Wb	T	A/m
CGS series	cm	g	s	Gal	dyn	dyn/cm^{2}	erg	erg/s	℃	P	St	Mx	Gs	Oe
Gravity system	m	kgf·s^{2}/m	s	m/s^{2}	kgf	kgf/m^{2}	kgf·m	kgf·m/s	℃	kgf·s/m^{2}	m^{2}/s	—	—	—

SI unit conversion

Amount	Unit name	Code	SI conversion rate	SI unit name	Code
Angle	D	°	$\pi/180$	Radian	rad
	Min	′	$\pi/10\,800$		
	Sec	″	$\pi/648\,000$		
Length	Meter	m	1	Meter	m
	Micron	μ	10^{-6}		
	Angstrom	Å	10^{-10}		
	X ray unit		$\approx 1.002\,08\times10^{-13}$		
	Nautical mile	n mile	1852		
Area	Square meter	m^{2}	1	Square meter	m^{2}
	Are	a	10^{2}		
	Hectare	ha	10^{4}		
Volume	Cubic meter	m^{3}	1	Cubic meter	m^{3}
	Liter	l, L	10^{-3}		
Mass	Kilogram	kg	1	Kilogram	kg
	Ton	t	10^{3}		
	Atomic mass unit	u	$\approx 1.660\,57\times10^{-27}$		
Time	Sec	s	1	Sec	s
	Min	min	60		
	Hr	h	3 600		
	Day	d	86 400		
Velocity	Meter per second	m/s	1	Meter per second	m/s
	Knot	kn	1 852/3 600		
Frequency and vibration	Number of cycle	s^{-1}	1	Hertz	Hz
Number of rotations	Rotation per minute	min^{-1}	1/60	Per second	s^{-1}
Angular velocity	Radian per second	rad/s	1	Radian per second	rad/s
Acceleration	Meter per second	m/s^{2}	1	Meter per second	m/s^{2}
	G	G	9.806 65		
Force	Weight in kg	kgf	9.806 65	Newton	N
	Weight in ton	tf	9 806.65		
	Dyne	dyn	10^{-5}		
Force moment load	Weight in kg meter	kgf·m	9.806 65	Newton meter	N · m
Stress and pressure	Weight in kg per square meter	kgf/m^{2}	9.806 65	Pascal	Pa
	Weight in kg per square cm	kgf/cm^{2}	$9.806\,65\times10^{4}$		
	Weight in kg per square mm	kgf/mm^{2}	$9.806\,65\times10^{6}$		
Pressure	Meter water column	mH$_{2}$O	9 806.65	Pascal	Pa
	millimeter of mercury column	mmHg	101 325/760		
	Torr	Torr	101 325/760		
	Air pressure	atm	101 325		
	Bar	bar	10^{5}		
Energy	Erg	erg	10^{-7}	Joule	J
	IT calorie	cal$_{\mathrm{IT}}$	4.186 8		
	Weight in kg meter	kgf·m	9.806 65		
	Kilowatt per hour	kW·h	3.600×10^{6}		
	French horse-power per hour	PS·h	$\approx 2.647\,79\times10^{6}$		
	Electron volt	eV	$\approx 1.602\,19\times10^{-19}$		
Power and motivity	Watt	W	1	Watt	W
	French horse-power	PS	≈735.5		
	Weight in kg meter per second	kgf·m/s	9.806 65		
Viscosity	Poise	P	10^{-1}	Pascal second	Pa·s
	Centipoise	cP	10^{-3}		
	Weight in kg second per square meter	kgf·s/m^{2}	9.806 65		
Kinetic viscosity	Stokes	St	10^{-4}	Square meter per second	m^{2}/s
	Centistokes	cSt	10^{-6}		
Temperature	D	℃	+273.15	Kelvin	K
Radioactivity	Curie	Ci	3.7×10^{10}	Becquerel	Bq
Exposure radiation dose	Roentgen	R	2.58×10^{-4}	Coulomb per kg	C/kg
Absorbed dose	Rad	rad	10^{-2}	Gray	Gy
Dose equivalent	Rem	rem	10^{-2}	Sievert	Sv
Flux	Maxwell	Mx	10^{-8}	Weber	Wb
Flux density	Gamma	γ	10^{-9}	Tesla	T
	Gauss	Gs	10^{-4}		
Magnetic field intensity	Oersted	Oe	$10^{3}/4\pi$	Ampere per meter	A/m
Electric charge	Coulomb	C	1	Coulomb	C
Electric potential difference	Volt	V	1	Volt	V
Capacitance	Farad	F	1	Farad	F
(Electric) Resistance	Ohm	Ω	1	Ohm	Ω
(Electric) Conductance	Siemens	S	1	Siemens	S
Inductance	Henry	H	1	Henry	H
Current	Ampere	A	1	Ampere	A

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Inch-mm Conversion Table

1 inch=25.4mm

inch		0″	1″	2″	3″	4″	5″	6″	7″	8″
Fractional number	Decimal number									
	0		25.400	50.800	76.200	101.600	127.000	152.400	177.800	203.200
1 / 64″	0.015625	0.397	25.797	51.197	76.597	101.997	127.397	152.797	178.197	203.597
1 / 32″	0.031250	0.794	26.194	51.594	76.994	102.394	127.794	153.194	178.594	203.994
3 / 64″	0.046875	1.191	26.591	51.991	77.391	102.791	128.191	153.591	178.991	204.391
1 / 16″	0.062500	1.588	26.988	52.388	77.788	103.188	128.588	153.988	179.388	204.788
5 / 64″	0.078125	1.984	27.384	52.784	78.184	103.584	128.984	154.384	179.784	205.184
3 / 32″	0.093750	2.381	27.781	53.181	78.581	103.981	129.381	154.781	180.181	205.581
7 / 64″	0.109375	2.778	28.178	53.578	78.978	104.378	129.778	155.178	180.578	205.978
1 / 8″	0.125000	3.175	28.575	53.975	79.375	104.775	130.175	155.575	180.975	206.375
9 / 64″	0.140625	3.572	28.972	54.372	79.772	105.172	130.572	155.972	181.372	206.772
5 / 32″	0.156250	3.969	29.369	54.769	80.169	105.569	130.969	156.369	181.769	207.169
11 / 64″	0.171875	4.366	29.766	55.166	80.566	105.966	131.366	156.766	182.166	207.566
3 / 16″	0.187500	4.762	30.162	55.562	80.962	106.362	131.762	157.162	182.562	207.962
13 / 64″	0.203125	5.159	30.559	55.959	81.359	106.759	132.159	157.559	182.959	208.359
7 / 32″	0.218750	5.556	30.956	56.356	81.756	107.156	132.556	157.956	183.356	208.756
15 / 64″	0.234375	5.953	31.353	56.753	82.153	107.553	132.953	158.353	183.753	209.153
1 / 4″	0.250000	6.350	31.750	57.150	82.550	107.950	133.350	158.750	184.150	209.550
17 / 64″	0.265625	6.747	32.147	57.547	82.947	108.347	133.747	159.147	184.547	209.947
9 / 32″	0.281250	7.144	32.544	57.944	83.344	108.744	134.144	159.544	184.944	210.344
19 / 64″	0.296875	7.541	32.941	58.341	83.741	109.141	134.541	159.941	185.341	210.741
5 / 16″	0.312500	7.938	33.338	58.738	84.138	109.538	134.938	160.338	185.738	211.138
21 / 64″	0.328125	8.334	33.734	59.134	84.534	109.934	135.334	160.734	186.134	211.534
11 / 32″	0.343750	8.731	34.131	59.531	84.931	110.331	135.731	161.131	186.531	211.931
23 / 64″	0.359375	9.128	34.528	59.928	85.328	110.728	136.128	161.528	186.928	212.328
3 / 8″	0.375000	9.525	34.925	60.325	85.725	111.125	136.525	161.925	187.325	212.725
25 / 64″	0.390625	9.922	35.322	60.722	86.122	111.522	136.922	162.322	187.722	213.122
13 / 32″	0.406250	10.319	35.719	61.119	86.519	111.919	137.319	162.719	188.119	213.519
27 / 64″	0.421875	10.716	36.116	61.516	86.916	112.316	137.716	163.116	188.516	213.916
7 / 16″	0.437500	11.112	36.512	61.912	87.312	112.712	138.112	163.512	188.912	214.312
29 / 64″	0.453125	11.509	36.909	62.309	87.709	113.109	138.509	163.909	189.309	214.709
15 / 32″	0.468750	11.906	37.306	62.706	88.106	113.506	138.906	164.306	189.706	215.106
31 / 64″	0.484375	12.303	37.703	63.103	88.503	113.903	139.303	164.703	190.103	215.503
1 / 2″	0.500000	12.700	38.100	63.500	88.900	114.300	139.700	165.100	190.500	215.900
33 / 64″	0.515625	13.097	38.497	63.897	89.297	114.697	140.097	165.497	190.897	216.297
17 / 32″	0.531250	13.494	38.894	64.294	89.694	115.094	140.494	165.894	191.294	216.694
35 / 64″	0.546875	13.891	39.291	64.691	90.091	115.491	140.891	166.291	191.691	217.091
9 / 16″	0.562500	14.288	39.688	65.088	90.488	115.888	141.288	166.688	192.088	217.488
37 / 64″	0.578125	14.684	40.084	65.484	90.884	116.284	141.684	167.084	192.484	217.884
19 / 32″	0.593750	15.081	40.481	65.881	91.281	116.681	142.081	167.481	192.881	218.281
39 / 64″	0.609375	15.478	40.878	66.278	91.678	117.078	142.478	167.878	193.278	218.678
5 / 8″	0.625000	15.875	41.275	66.675	92.075	117.475	142.875	168.275	193.675	219.075
41 / 64″	0.640625	16.272	41.672	67.072	92.472	117.872	143.272	168.672	194.072	219.472
21 / 32″	0.656250	16.669	42.069	67.469	92.869	118.269	143.669	169.069	194.469	219.869
43 / 64″	0.671875	17.066	42.466	67.866	93.266	118.666	144.066	169.466	194.866	220.266
11 / 16″	0.687500	17.462	42.862	68.262	93.662	119.062	144.462	169.862	195.262	220.662
45 / 64″	0.703125	17.859	43.259	68.659	94.059	119.459	144.859	170.259	195.659	221.059
23 / 32″	0.718750	18.256	43.656	69.056	94.456	119.856	145.256	170.656	196.056	221.456
47 / 64″	0.734375	18.653	44.053	69.453	94.853	120.253	145.653	171.053	196.453	221.853
3 / 4″	0.750000	19.050	44.450	69.850	95.250	120.650	146.050	171.450	196.850	222.250
49 / 64″	0.765625	19.447	44.847	70.247	95.647	121.047	146.447	171.847	197.247	222.647
25 / 32″	0.781250	19.844	45.244	70.644	96.044	121.444	146.844	172.244	197.644	223.044
51 / 64″	0.796875	20.241	45.641	71.041	96.441	121.841	147.241	172.641	198.041	223.441
13 / 16″	0.812500	20.638	46.038	71.438	96.838	122.238	147.638	173.038	198.438	223.838
53 / 64″	0.828125	21.034	46.434	71.834	97.234	122.634	148.034	173.434	198.834	224.234
27 / 32″	0.843750	21.431	46.831	72.231	97.631	123.031	148.431	173.831	199.231	224.631
55 / 64″	0.859375	21.828	47.228	72.628	98.028	123.428	148.828	174.228	199.628	225.028
7 / 8″	0.875000	22.225	47.625	73.025	98.425	123.825	149.225	174.625	200.025	225.425
57 / 64″	0.890625	22.622	48.022	73.422	98.822	124.222	149.622	175.022	200.422	225.822
29 / 32″	0.906250	23.019	48.419	73.819	99.219	124.619	150.019	175.419	200.819	226.219
59 / 64″	0.921875	23.416	48.816	74.216	99.616	125.016	150.416	175.816	201.216	226.616
15 / 16″	0.937500	23.812	49.212	74.612	100.012	125.412	150.812	176.212	201.612	227.012
61 / 64″	0.953125	24.209	49.609	75.009	100.409	125.809	151.209	176.609	202.009	227.409
31 / 32″	0.968750	24.606	50.006	75.406	100.806	126.206	151.606	177.006	202.406	227.806
63 / 64″	0.984375	25.003	50.403	75.803	101.203	126.603	152.003	177.403	202.803	228.203

1 inch=25.4mm

Hardness Conversion Table (Reference)

Rockwell C scale hardness Load 1471N HRC	Vickers hardness HV	Brinell hardness		Rockwell hardness		Shore hardness HS
		Standard ball	Tungsten Carbide ball	A scale Load 588.4N Diamond circular cone	B scale Load 980.7N Diameter $^1/_{16}$in ball	
68	940	—	—	85.6	—	97
67	900	—	—	85.0	—	95
66	865	—	—	84.5	—	92
65	832	—	(739)	83.9	—	91
64	800	—	(722)	83.4	—	88
63	772	—	(705)	82.8	—	87
62	746	—	(688)	82.3	—	85
61	720	—	(670)	81.8	—	83
60	697	—	(654)	81.2	—	81
59	674	—	(634)	80.7	—	80
58	653	—	615	80.1	—	78
57	633	—	595	79.6	—	76
56	613	—	577	79.0	—	75
55	595	—	560	78.5	—	74
54	577	—	543	78.0	—	72
53	560	—	525	77.4	—	71
52	544	(500)	512	76.8	—	69
51	528	(487)	496	76.3	—	68
50	513	(475)	481	75.9	—	67
49	498	(464)	469	75.2	—	66
48	484	451	455	74.7	—	64
47	471	442	443	74.1	—	63
46	458	432	432	73.6	—	62
45	446	421	421	73.1	—	60
44	434	409	409	72.5	—	58
43	423	400	400	72.0	—	57
42	412	390	390	71.5	—	56
41	402	381	381	70.9	—	55
40	392	371	371	70.4	—	54
39	382	362	362	69.9	—	52
38	372	353	353	69.4	—	51
37	363	344	344	68.9	—	50
36	354	336	336	68.4	(109.0)	49
35	345	327	327	67.9	(108.5)	48
34	336	319	319	67.4	(108.0)	47
33	327	311	311	66.8	(107.5)	46
32	318	301	301	66.3	(107.0)	44
31	310	294	294	65.8	(106.0)	43
30	302	286	286	65.3	(105.5)	42
29	294	279	279	64.7	(104.5)	41
28	286	271	271	64.3	(104.0)	41
27	279	264	264	63.8	(103.0)	40
26	272	258	258	63.3	(102.5)	38
25	266	253	253	62.8	(101.5)	38
24	260	247	247	62.4	(101.0)	37
23	254	243	243	62.0	100.0	36
22	248	237	237	61.5	99.0	35
21	243	231	231	61.0	98.5	35
20	238	226	226	60.5	97.8	34
(18)	230	219	219	—	96.7	33
(16)	222	212	212	—	95.5	32
(14)	213	203	203	—	93.9	31
(12)	204	194	194	—	92.3	29
(10)	196	187	187	—	90.7	28
(8)	188	179	179	—	89.5	27
(6)	180	171	171	—	87.1	26
(4)	173	165	165	—	85.5	25
(2)	166	158	158	—	83.5	24
(0)	160	152	152	—	81.7	24

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Tolerances of Shaft Dimensions

unit: μm

Classification of diameter mm		b12		c12		d6		e6		e12		f5		f6		g5	
Above	Below	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L
—	3	−140	−240	−60	−160	−20	−26	−14	−20	−14	−114	−6	−10	−6	−12	−2	−6
3	6	−140	−260	−70	−190	−30	−38	−20	−28	−20	−140	−10	−15	−10	−18	−4	−9
6	10	−150	−300	−80	−230	−40	−49	−25	−34	−25	−175	−13	−19	−13	−22	−5	−11
10	18	−150	−330	−95	−275	−50	−61	−32	−43	−32	−212	−16	−24	−16	−27	−6	−14
18	30	−160	−370	−110	−320	−65	−78	−40	−53	−40	−250	−20	−29	−20	−33	−7	−16
30	40	−170	−420	−120	−370	−80	−96	−50	−66	−50	−300	−25	−36	−25	−41	−9	−20
40	50	−180	−430	−130	−380												
50	65	−190	−490	−140	−440	−100	−119	−60	−79	−60	−360	−30	−43	−30	−49	−10	−23
65	80	−200	−500	−150	−450												
80	100	−220	−570	−170	−520	−120	−142	−72	−94	−72	−422	−36	−51	−36	−58	−12	−27
100	120	−240	−590	−180	−530												
120	140	−260	−660	−200	−600	−145	−170	−85	−110	−85	−485	−43	−61	−43	−68	−14	−32
140	160	−280	−680	−210	−610												
160	180	−310	−710	−230	−630												
180	200	−340	−800	−240	−700	−170	−199	−100	−129	−100	−560	−50	−70	−50	−79	−15	−35
200	225	−380	−840	−260	−720												
225	250	−420	−880	−280	−740												
250	280	−480	−1000	−300	−820	−190	−222	−110	−142	−110	−630	−56	−79	−56	−88	−17	−40
280	315	−540	−1060	−330	−850												
315	355	−600	−1170	−360	−930	−210	−246	−125	−161	−125	−695	−62	−87	−62	−98	−18	−43
355	400	−680	−1250	−400	−970												
400	450	−760	−1390	−440	−1070	−230	−270	−135	−175	−135	−765	−68	−95	−68	−108	−20	−47
450	500	−840	−1470	−480	−1110												

g6		h5		h6		h7		h8		h9		h10		h11		Classification of diameter mm	
H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	Above	Below
−2	−8	0	−4	0	−6	0	−10	0	−14	0	−25	0	−40	0	−60	—	3
−4	−12	0	−5	0	−8	0	−12	0	−18	0	−30	0	−48	0	−75	3	6
−5	−14	0	−6	0	−9	0	−15	0	−22	0	−36	0	−58	0	−90	6	10
−6	−17	0	−8	0	−11	0	−18	0	−27	0	−43	0	−70	0	−110	10	18
−7	−20	0	−9	0	−13	0	−21	0	−33	0	−52	0	−84	0	−130	18	30
−9	−25	0	−11	0	−16	0	−25	0	−39	0	−62	0	−100	0	−160	30	40
																40	50
−10	−29	0	−13	0	−19	0	−30	0	−46	0	−74	0	−120	0	−190	50	65
																65	80
−12	−34	0	−15	0	−22	0	−35	0	−54	0	−87	0	−140	0	−220	80	100
																100	120
−14	−39	0	−18	0	−25	0	−40	0	−63	0	−100	0	−160	0	−250	120	140
																140	160
																160	180
−15	−44	0	−20	0	−29	0	−46	0	−72	0	−115	0	−185	0	−290	180	200
																200	225
																225	250
−17	−49	0	−23	0	−32	0	−52	0	−81	0	−130	0	−210	0	−320	250	280
																280	315
−18	−54	0	−25	0	−36	0	−57	0	−89	0	−140	0	−230	0	−360	315	355
																355	400
−20	−60	0	−27	0	−40	0	−63	0	−97	0	−155	0	−250	0	−400	400	450
																450	500

Classification of diameter mm		h12		js5		j5		js6		j6		j7		k5		k6	
Above	Below	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L
—	3	0	−100	+2	−2	+2	−2	+3	−3	+4	−2	+6	−4	+4	0	+6	0
3	6	0	−120	+2.5	−2.5	+3	−2	+4	−4	+6	−2	+8	−4	+6	+1	+9	+1
6	10	0	−150	+3	−3	+4	−2	+4.5	−4.5	+7	−2	+10	−5	+7	+1	+10	+1
10	18	0	−180	+4	−4	+5	−3	+5.5	−5.5	+8	−3	+12	−6	+9	+1	+12	+1
18	30	0	−210	+4.5	−4.5	+5	−4	+6.5	−6.5	+9	−4	+13	−8	+11	+2	+15	+2
30	40	0	−250	+5.5	−5.5	+6	−5	+8	−8	+11	−5	+15	−10	+13	+2	+18	+2
40	50																
50	65	0	−300	+6.5	−6.5	+6	−7	+9.5	−9.5	+12	−7	+18	−12	+15	+2	+21	+2
65	80																
80	100	0	−350	+7.5	−7.5	+6	−9	+11	−11	+13	−9	+20	−15	+18	+3	+25	+3
100	120																
120	140	0	−400	+9	−9	+7	−11	+12.5	−12.5	+14	−11	+22	−18	+21	+3	+28	+3
140	160																
160	180																
180	200	0	−460	+10	−10	+7	−13	+14.5	−14.5	+16	−13	+25	−21	+24	+4	+33	+4
200	225																
225	250																
250	280	0	−520	+11.5	−11.5	+7	−16	+16	−16	+16	−16	+26	−26	+27	+4	+36	+4
280	315																
315	355	0	−570	+12.5	−12.5	+7	−18	+18	−18	+18	−18	+29	−28	+29	+4	+40	+4
355	400																
400	450	0	−630	+13.5	−13.5	+7	−20	+20	−20	+20	−20	+31	−32	+32	+5	+45	+5
450	500																

unit: μm

m5		m6		n5		n6		p6		Classification of diameter mm	
H	L	H	L	H	L	H	L	H	L	Above	Below
+6	+2	+8	+2	+8	+4	+10	+4	+12	+6	—	3
+9	+4	+12	+4	+13	+8	+16	+8	+20	+12	3	6
+12	+6	+15	+6	+16	+10	+19	+10	+24	+15	6	10
+15	+7	+18	+7	+20	+12	+23	+12	+29	+18	10	18
+17	+8	+21	+8	+24	+15	+28	+15	+35	+22	18	30
+20	+9	+25	+9	+28	+17	+33	+17	+42	+26	30	40
										40	50
+24	+11	+30	+11	+33	+20	+39	+20	+51	+32	50	65
										65	80
+28	+13	+35	+13	+38	+23	+45	+23	+59	+37	80	100
										100	120
+33	+15	+40	+15	+45	+27	+52	+27	+68	+43	120	140
										140	160
										160	180
+37	+17	+46	+17	+51	+31	+60	+31	+79	+50	180	200
										200	225
										225	250
+43	+20	+52	+20	+57	+34	+66	+34	+88	+56	250	280
										280	315
+46	+21	+57	+21	+62	+37	+73	+37	+98	+62	315	355
										355	400
+50	+23	+63	+23	+67	+40	+80	+40	+108	+68	400	450
										450	500

Tolerances of Housing Hole Dimensions

unit: μm

Classification of diameter mm		B12		E7		E11		E12		F6		F7		G6		G7		H6		H7		H8		H9		H10		H11		JS6		J6		Classification of diameter mm	
Above	Below	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	Above	Below
—	3	+240	+140	+24	+14	+74	+14	+114	+14	+12	+6	+16	+6	+8	+2	+12	+2	+6	0	+10	0	+14	0	+25	0	+40	0	+60	0	+3	−3	+2	−4	—	3
3	6	+260	+140	+32	+20	+95	+20	+140	+20	+18	+10	+22	+10	+12	+4	+16	+4	+8	0	+12	0	+18	0	+30	0	+48	0	+75	0	+4	−4	+5	−3	3	6
6	10	+300	+150	+40	+25	+115	+25	+175	+25	+22	+13	+28	+13	+14	+5	+20	+5	+9	0	+15	0	+22	0	+36	0	+58	0	+90	0	+4.5	−4.5	+5	−4	6	10
10	18	+330	+150	+50	+32	+142	+32	+212	+32	+27	+16	+34	+16	+17	+6	+24	+6	+11	0	+18	0	+27	0	+43	0	+70	0	+110	0	+5.5	−5.5	+6	−5	10	18
18	30	+370	+160	+61	+40	+170	+40	+250	+40	+33	+20	+41	+20	+20	+7	+28	+7	+13	0	+21	0	+33	0	+52	0	+84	0	+130	0	+6.5	−6.5	+8	−5	18	30
30	40	+420	+170	+75	+50	+210	+50	+300	+50	+41	+25	+50	+25	+25	+9	+34	+9	+16	0	+25	0	+39	0	+62	0	+100	0	+160	0	+8	−8	+10	−6	30	40
40	50	+430	+180																															40	50
50	65	+490	+190	+90	+60	+250	+60	+360	+60	+49	+30	+60	+30	+29	+10	+40	+10	+19	0	+30	0	+46	0	+74	0	+120	0	+190	0	+9.5	−9.5	+13	−6	50	65
65	80	+500	+200																															65	80
80	100	+570	+220	+107	+72	+292	+72	+422	+72	+58	+36	+71	+36	+34	+12	+47	+12	+22	0	+35	0	+54	0	+87	0	+140	0	+220	0	+11	−11	+16	−6	80	100
100	120	+590	+240																															100	120
120	140	+660	+260	+125	+85	+335	+85	+485	+85	+68	+43	+83	+43	+39	+14	+54	+14	+25	0	+40	0	+63	0	+100	0	+160	0	+250	0	+12.5	−12.5	+18	−7	120	140
140	160	+680	+280																															140	160
160	180	+710	+310																															160	180
180	200	+800	+340	+146	+100	+390	+100	+560	+100	+79	+50	+96	+50	+44	+15	+61	+15	+29	0	+46	0	+72	0	+115	0	+185	0	+290	0	+14.5	−14.5	+22	−7	180	200
200	225	+840	+380																															200	225
225	250	+880	+420																															225	250
250	280	+1000	+480	+162	+110	+430	+110	+630	+110	+88	+56	+108	+56	+49	+17	+69	+17	+32	0	+52	0	+81	0	+130	0	+210	0	+320	0	+16	−16	+25	−7	250	280
280	315	+1060	+540																															280	315
315	355	+1170	+600	+182	+125	+485	+125	+695	+125	+98	+62	+119	+62	+54	+18	+75	+18	+36	0	+57	0	+89	0	+140	0	+230	0	+360	0	+18	−18	+29	−7	315	355
355	400	+1250	+680																															355	400
400	450	+1390	+760	+198	+135	+535	+135	+765	+135	+108	+68	+131	+68	+60	+20	+83	+20	+40	0	+63	0	+97	0	+155	0	+250	0	+400	0	+20	−20	+33	−7	400	450
450	500	+1470	+840																															450	500

unit: μm

Classification of diameter mm		JS7		J7		K5		K6		K7		M6		M7		N6		N7		P6		P7		R7		S7		Classification of diameter mm	
Above	Below	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	Above	Below
—	3	+5	−5	+4	−6	0	−4	0	−6	0	−10	−2	−8	−2	−12	−4	−10	−4	−14	−6	−12	−6	−16	−10	−20	−14	−24	—	3
3	6	+6	−6	+6	−6	0	−5	+2	−6	+3	−9	−1	−9	0	−12	−5	−13	−4	−16	−9	−17	−8	−20	−11	−23	−15	−27	3	6
6	10	+7	−7	+8	−7	+1	−5	+2	−7	+5	−10	−3	−12	0	−15	−7	−16	−4	−19	−12	−21	−9	−24	−13	−28	−17	−32	6	10
10	18	+9	−9	+10	−8	+2	−6	+2	−9	+6	−12	−4	−15	0	−18	−9	−20	−5	−23	−15	−26	−11	−29	−16	−34	−21	−39	10	18
18	30	+10	−10	+12	−9	+1	−8	+2	−11	+6	−15	−4	−17	0	−21	−11	−24	−7	−28	−18	−31	−14	−35	−20	−41	−27	−48	18	30
30	40	+12	−12	+14	−11	+2	−9	+3	−13	+7	−18	−4	−20	0	−25	−12	−28	−8	−33	−21	−37	−17	−42	−25	−50	−34	−59	30	40
40	50																											40	50
50	65	+15	−15	+18	−12	+3	−10	+4	−15	+9	−21	−5	−24	0	−30	−14	−33	−9	−39	−26	−45	−21	−51	−30	−60	−42	−72	50	65
65	80																							−32	−62	−48	−78	65	80
80	100	+17	−17	+22	−13	+2	−13	+4	−18	+10	−25	−6	−28	0	−35	−16	−38	−10	−45	−30	−52	−24	−59	−38	−73	−58	−93	80	100
100	120																							−41	−76	−66	−101	100	120
120	140	+20	−20	+26	−14	+3	−15	+4	−21	+12	−28	−8	−33	0	−40	−20	−45	−12	−52	−36	−61	−28	−68	−48	−88	−77	−117	120	140
140	160																							−50	−90	−85	−125	140	160
160	180																							−53	−93	−93	−133	160	180
180	200	+23	−23	+30	−16	+2	−18	+5	−24	+13	−33	−8	−37	0	−46	−22	−51	−14	−60	−41	−70	−33	−79	−60	−106	−105	−151	180	200
200	225																							−63	−109	−113	−159	200	225
225	250																							−67	−113	−123	−169	225	250
250	280	+26	−26	+36	−16	+3	−20	+5	−27	+16	−36	−9	−41	0	−52	−25	−57	−14	−66	−47	−79	−36	−88	−74	−126	−138	−190	250	280
280	315																							−78	−130	−150	−202	280	315
315	355	+28	−28	+39	−18	+3	−22	+7	−29	+17	−40	−10	−46	0	−57	−26	−62	−16	−73	−51	−87	−41	−98	−87	−144	−169	−226	315	355
355	400																							−93	−150	−187	−244	355	400
400	450	+31	−31	+43	−20	+2	−25	+8	−32	+18	−45	−10	−50	0	−63	−27	−67	−17	−80	−55	−95	−45	−108	−103	−166	−209	−272	400	450
450	500																							−109	−172	−229	−292	450	500

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Model Code Index

Model code	Series name	Catalog name	Page
B			
BG	Stroke Rotary Cage	RED	Ⅱ-192
BK…A	Miniature Stroke Rotary Bushing	RED	Ⅱ-187
BSP…SL	Precision Linear Slide Unit	RED	Ⅱ-89
BSPG…SL	Precision Linear Slide Unit	RED	Ⅱ-91
BSR…SL	Precision Linear Slide Unit	RED	Ⅱ-93
BSU…A	Linear Slide Unit	RED	Ⅱ-99
BWU	High Rigidity Precision Linear Slide Unit	RED	Ⅱ-81
C			
CRW	Crossed Roller Way	RED	Ⅱ-33
CRW…SL	Crossed Roller Way	RED	Ⅱ-33
CRWG	Anti-Creep Cage Crossed Roller Way	RED	Ⅱ-27
CRWG…H	Anti-Creep Cage Crossed Roller Way H	RED	Ⅱ-31
CRWM	Crossed Roller Way	RED	Ⅱ-49
CRWU	Crossed Roller Way Unit	RED	Ⅱ-63
CRWU…R	Crossed Roller Way Unit	RED	Ⅱ-67
CRWU…RS	Crossed Roller Way Unit	RED	Ⅱ-71
CRWUG	Anti-Creep Cage Crossed Roller Way Unit	RED	Ⅱ-61
F			
FT	Flat Roller Cage	RED	Ⅱ-211
FT…N	Flat Roller Cage	RED	Ⅱ-211
FT…V	Flat Roller Cage	RED	Ⅱ-211
FTW…A	Flat Roller Cage	RED	Ⅱ-212
FTW…VA	Flat Roller Cage	RED	Ⅱ-212
G			
GSN	Roller Way	RED	Ⅱ-204
L			
LM	Linear Bushing	RED	Ⅱ-147
LM…AJ	Linear Bushing	RED	Ⅱ-147
LM…F	Linear Bushing	RED	Ⅱ-161

Model code	Series name	Catalog name	Page
LM…F AJ	Linear Bushing	RED	Ⅱ-161
LM…F OP	Linear Bushing	RED	Ⅱ-161
LM…F UU	Linear Bushing	RED	Ⅱ-163
LM…F UU AJ	Linear Bushing	RED	Ⅱ-163
LM…F UU OP	Linear Bushing	RED	Ⅱ-163
LM…N	Linear Bushing	RED	Ⅱ-147
LM…N AJ	Linear Bushing	RED	Ⅱ-147
LM…N F	Linear Bushing	RED	Ⅱ-161
LM…N F AJ	Linear Bushing	RED	Ⅱ-161
LM…N F OP	Linear Bushing	RED	Ⅱ-161
LM…N F UU	Linear Bushing	RED	Ⅱ-163
LM…N F UU AJ	Linear Bushing	RED	Ⅱ-163
LM…N F UU OP	Linear Bushing	RED	Ⅱ-163
LM…N OP	Linear Bushing	RED	Ⅱ-147
LM…N UU	Linear Bushing	RED	Ⅱ-151
LM…N UU AJ	Linear Bushing	RED	Ⅱ-151
LM…N UU OP	Linear Bushing	RED	Ⅱ-151
LM…OP	Linear Bushing	RED	Ⅱ-147
LM…UU	Linear Bushing	RED	Ⅱ-151
LM…UU AJ	Linear Bushing	RED	Ⅱ-151
LM…UU OP	Linear Bushing	RED	Ⅱ-151
LMB	Linear Bushing	RED	Ⅱ-159
LMB…AJ	Linear Bushing	RED	Ⅱ-159
LMB…N	Linear Bushing	RED	Ⅱ-159
LMB…N AJ	Linear Bushing	RED	Ⅱ-159
LMB…N OP	Linear Bushing	RED	Ⅱ-159
LMB…OP	Linear Bushing	RED	Ⅱ-159
LME	Linear Bushing	RED	Ⅱ-155
LME…AJ	Linear Bushing	RED	Ⅱ-155
LME…F	Linear Bushing	RED	Ⅱ-165
LME…F AJ	Linear Bushing	RED	Ⅱ-165
LME…F OP	Linear Bushing	RED	Ⅱ-165
LME…F UU	Linear Bushing	RED	Ⅱ-167
LME…F UU AJ	Linear Bushing	RED	Ⅱ-167
LME…F UU OP	Linear Bushing	RED	Ⅱ-167
LME…N	Linear Bushing	RED	Ⅱ-155
LME…N AJ	Linear Bushing	RED	Ⅱ-155
LME…N F	Linear Bushing	RED	Ⅱ-165
LME…N F AJ	Linear Bushing	RED	Ⅱ-165

Note: BLUE denotes CAT-1591E, while RED denotes CAT-1592E

Model Code Index

Model code	Series name	Catalog name	Page
LME…N F OP	Linear Bushing	RED	Ⅱ-165
LME…N F UU	Linear Bushing	RED	Ⅱ-167
LME…N F UU AJ	Linear Bushing	RED	Ⅱ-167
LME…N F UU OP	Linear Bushing	RED	Ⅱ-167
LME…N OP	Linear Bushing	RED	Ⅱ-155
LME…N UU	Linear Bushing	RED	Ⅱ-157
LME…N UU AJ	Linear Bushing	RED	Ⅱ-157
LME…N UU OP	Linear Bushing	RED	Ⅱ-157
LME…OP	Linear Bushing	RED	Ⅱ-155
LME…UU	Linear Bushing	RED	Ⅱ-157
LME…UU AJ	Linear Bushing	RED	Ⅱ-157
LME…UU OP	Linear Bushing	RED	Ⅱ-157
LMG	Linear Bushing G	RED	Ⅱ-139
LMGT	Linear Bushing G	RED	Ⅱ-139
LMS	Miniature Linear Bushing	RED	Ⅱ-172
LMS…F	Miniature Linear Bushing	RED	Ⅱ-172
LMS…F UU	Miniature Linear Bushing	RED	Ⅱ-172
LMS…UU	Miniature Linear Bushing	RED	Ⅱ-172
LMSL	Miniature Linear Bushing	RED	Ⅱ-172
LMSL…F	Miniature Linear Bushing	RED	Ⅱ-172
LMSL…F UU	Miniature Linear Bushing	RED	Ⅱ-172
LMSL…UU	Miniature Linear Bushing	RED	Ⅱ-172
LRWM	Linear Way Module	BLUE	Ⅱ-243
LRWX…B	Linear Roller Way X	BLUE	Ⅱ-227
LRWXH	Linear Roller Way X	BLUE	Ⅱ-229
LRX	Linear Roller Way Super X	BLUE	Ⅱ-191
LRXC	Linear Roller Way Super X	BLUE	Ⅱ-191
LRXD	Linear Roller Way Super X	BLUE	Ⅱ-199
LRXD…SL	Linear Roller Way Super X	BLUE	Ⅱ-199
LRXDC	Linear Roller Way Super X	BLUE	Ⅱ-199
LRXDC…SL	Linear Roller Way Super X	BLUE	Ⅱ-199
LRXDG	Linear Roller Way Super X	BLUE	Ⅱ-199
LRXDG…SL	Linear Roller Way Super X	BLUE	Ⅱ-199
LRXDL	Linear Roller Way Super X	BLUE	Ⅱ-207
LRXG	Linear Roller Way Super X	BLUE	Ⅱ-191
LRXH	Linear Roller Way Super X	BLUE	Ⅱ-191
LRXHC	Linear Roller Way Super X	BLUE	Ⅱ-191
LRXHG	Linear Roller Way Super X	BLUE	Ⅱ-191
LRXL	Linear Roller Way Super X	BLUE	Ⅱ-197

Model code	Series name	Catalog name	Page
LRXS	Linear Roller Way Super X	BLUE	Ⅱ-209
LRXSC	Linear Roller Way Super X	BLUE	Ⅱ-209
LRXSG	Linear Roller Way Super X	BLUE	Ⅱ-209
LSAG	Linear Ball Spline G	RED	Ⅱ-123
LSAGF	Linear Ball Spline G	RED	Ⅱ-127
LSAGFL	Linear Ball Spline G	RED	Ⅱ-127
LSAGFLT	Linear Ball Spline G	RED	Ⅱ-127
LSAGFT	Linear Ball Spline G	RED	Ⅱ-127
LSAGL	Linear Ball Spline G	RED	Ⅱ-123
LSAGLT	Linear Ball Spline G	RED	Ⅱ-123
LSAGT	Linear Ball Spline G	RED	Ⅱ-123
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LWE…SL	Linear Way E	BLUE	Ⅱ-75
LWEC	Linear Way E	BLUE	Ⅱ-75
LWEC…SL	Linear Way E	BLUE	Ⅱ-75
LWEG	Linear Way E	BLUE	Ⅱ-75
LWEG…SL	Linear Way E	BLUE	Ⅱ-75
LWES	Linear Way E	BLUE	Ⅱ-83
LWES…Q	Low Decibel Linear Way E	BLUE	Ⅱ-83
LWES…SL	Linear Way E	BLUE	Ⅱ-83
LWESC	Linear Way E	BLUE	Ⅱ-83
LWESC…SL	Linear Way E	BLUE	Ⅱ-83
LWESG	Linear Way E	BLUE	Ⅱ-83
LWESG…SL	Linear Way E	BLUE	Ⅱ-83
LWET	Linear Way E	BLUE	Ⅱ-79
LWET…Q	Low Decibel Linear Way E	BLUE	Ⅱ-79
LWET…SL	Linear Way E	BLUE	Ⅱ-79
LWETC	Linear Way E	BLUE	Ⅱ-79
LWETC…SL	Linear Way E	BLUE	Ⅱ-79
LWETG	Linear Way E	BLUE	Ⅱ-79
LWETG…SL	Linear Way E	BLUE	Ⅱ-79
LWFF	Linear Way F	BLUE	Ⅱ-151
LWFH	Linear Way F	BLUE	Ⅱ-149
LWFS	Linear Way F	BLUE	Ⅱ-153
LWFS…SL	Linear Way F	BLUE	Ⅱ-153
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Note: BLUE denotes CAT-1591E, while RED denotes CAT-1592E

Model Code Index

L

Model code	Series name	Catalog name	Page
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LWHD	Linear Way H	BLUE	Ⅱ-121
LWHD…B	Linear Way H	BLUE	Ⅱ-123
LWHD…M	Linear Way H	BLUE	Ⅱ-123
LWHD…MU	Linear Way H	BLUE	Ⅱ-123
LWHD…SL	Linear Way H	BLUE	Ⅱ-121
LWHDC…SL	Linear Way H	BLUE	Ⅱ-121
LWHDG	Linear Way H	BLUE	Ⅱ-123
LWHDG…SL	Linear Way H	BLUE	Ⅱ-121
LWHG	Linear Way H	BLUE	Ⅱ-107
LWHS…B	Linear Way H	BLUE	Ⅱ-127
LWHS…M	Linear Way H	BLUE	Ⅱ-127
LWHS…MU	Linear Way H	BLUE	Ⅱ-127
LWHS…SL	Linear Way H	BLUE	Ⅱ-127
LWHSG	Linear Way H	BLUE	Ⅱ-127
LWHT	Linear Way H	BLUE	Ⅱ-113
LWHT…B	Linear Way H	BLUE	Ⅱ-113
LWHT…M	Linear Way H	BLUE	Ⅱ-113
LWHT…MU	Linear Way H	BLUE	Ⅱ-113
LWHT…SL	Linear Way H	BLUE	Ⅱ-113
LWHTG	Linear Way H	BLUE	Ⅱ-115
LWHY	Linear Way H	BLUE	Ⅱ-131
LWL	Linear Way L	BLUE	Ⅱ-23
LWL…B	Linear Way L	BLUE	Ⅱ-25
LWL…B CS	Linear Way L	BLUE	Ⅱ-27
LWL…N	Linear Way L	BLUE	Ⅱ-25
LWL…Y	Linear Way L	BLUE	Ⅱ-23
LWLC	Linear Way L	BLUE	Ⅱ-23
LWLC…B	Linear Way L	BLUE	Ⅱ-25
LWLC…N	Linear Way L	BLUE	Ⅱ-25
LWLF	Linear Way L	BLUE	Ⅱ-31
LWLF…B	Linear Way L	BLUE	Ⅱ-31
LWLF…BCS	Linear Way L	BLUE	Ⅱ-35
LWLF…N	Linear Way L	BLUE	Ⅱ-31
LWLFC	Linear Way L	BLUE	Ⅱ-31
LWLFC…B	Linear Way L	BLUE	Ⅱ-31
LWLFC…N	Linear Way L	BLUE	Ⅱ-31
LWLFG…B	Linear Way L	BLUE	Ⅱ-33
LWLFG…N	Linear Way L	BLUE	Ⅱ-33
LWLG…B	Linear Way L	BLUE	Ⅱ-25
LWLG…N	Linear Way L	BLUE	Ⅱ-25
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M

Model code	Series name	Catalog name	Page
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MAGF	C-Lube Linear Ball Spline MAG	RED	Ⅱ-127
MAGFT	C-Lube Linear Ball Spline MAG	RED	Ⅱ-127
MAGL	C-Lube Linear Ball Spline MAG	RED	Ⅱ-123
MAGLT	C-Lube Linear Ball Spline MAG	RED	Ⅱ-123
MAGT	C-Lube Linear Ball Spline MAG	RED	Ⅱ-123
ME	C-Lube Linear Way ME	BLUE	Ⅱ-75
ME…SL	C-Lube Linear Way ME	BLUE	Ⅱ-75
MEC	C-Lube Linear Way ME	BLUE	Ⅱ-75
MEC…SL	C-Lube Linear Way ME	BLUE	Ⅱ-75
MEG	C-Lube Linear Way ME	BLUE	Ⅱ-75
MEG…SL	C-Lube Linear Way ME	BLUE	Ⅱ-75
MES	C-Lube Linear Way ME	BLUE	Ⅱ-83
MES…SL	C-Lube Linear Way ME	BLUE	Ⅱ-83
MESC	C-Lube Linear Way ME	BLUE	Ⅱ-83
MESC…SL	C-Lube Linear Way ME	BLUE	Ⅱ-83
MESG	C-Lube Linear Way ME	BLUE	Ⅱ-83
MESG…SL	C-Lube Linear Way ME	BLUE	Ⅱ-83
MET	C-Lube Linear Way ME	BLUE	Ⅱ-79
MET…SL	C-Lube Linear Way ME	BLUE	Ⅱ-79
METC	C-Lube Linear Way ME	BLUE	Ⅱ-79
METC…SL	C-Lube Linear Way ME	BLUE	Ⅱ-79
METG	C-Lube Linear Way ME	BLUE	Ⅱ-79
METG…SL	C-Lube Linear Way ME	BLUE	Ⅱ-79
MH	C-Lube Linear Way MH	BLUE	Ⅱ-107
MH…M	C-Lube Linear Way MH	BLUE	Ⅱ-107
MH…MU	C-Lube Linear Way MH	BLUE	Ⅱ-107
MHD	C-Lube Linear Way MH	BLUE	Ⅱ-121
MHD…M	C-Lube Linear Way MH	BLUE	Ⅱ-123
MHD…MU	C-Lube Linear Way MH	BLUE	Ⅱ-123

Note: BLUE denotes CAT-1591E, while RED denotes CAT-1592E

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MHDG	C-Lube Linear Way MH	BLUE	Ⅱ-123
MHDG…SL	C-Lube Linear Way MH	BLUE	Ⅱ-121
MHG	C-Lube Linear Way MH	BLUE	Ⅱ-107
MHS	C-Lube Linear Way MH	BLUE	Ⅱ-127
MHS…M	C-Lube Linear Way MH	BLUE	Ⅱ-129
MHS…MU	C-Lube Linear Way MH	BLUE	Ⅱ-129
MHS…SL	C-Lube Linear Way MH	BLUE	Ⅱ-127
MHSG	C-Lube Linear Way MH	BLUE	Ⅱ-127
MHT	C-Lube Linear Way MH	BLUE	Ⅱ-113
MHT…M	C-Lube Linear Way MH	BLUE	Ⅱ-115
MHT…MU	C-Lube Linear Way MH	BLUE	Ⅱ-115
MHT…SL	C-Lube Linear Way MH	BLUE	Ⅱ-113
MHTG	C-Lube Linear Way MH	BLUE	Ⅱ-113
ML	C-Lube Linear Way ML	BLUE	Ⅱ-25
MLC	C-Lube Linear Way ML	BLUE	Ⅱ-25
MLF	C-Lube Linear Way ML	BLUE	Ⅱ-31
MLFC	C-Lube Linear Way ML	BLUE	Ⅱ-31
MLFG	C-Lube Linear Way ML	BLUE	Ⅱ-33
MLG	C-Lube Linear Way ML	BLUE	Ⅱ-25
MLL	C-Lube Linear Way ML	BLUE	Ⅱ-27
MLV	C-Lube Linear Way MLV	BLUE	Ⅱ-47
MUL	C-Lube Linear Way MUL	BLUE	Ⅱ-167
MV	C-Lube Linear Way MV	BLUE	Ⅱ-59
MX	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-191
MXC	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-191
MXD	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-199
MXD…SL	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-199
MXDC	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-199
MXDG	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-199
MXDL	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-201
MXG	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-191
MXH	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-191
MXHC	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-191
MXHG	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-191
MXHL	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-191
MXL	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-191
MXN	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-213
MXNG	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-213
MXNL	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-213
MXNS	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-215
MXNSG	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-215
MXNSL	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-215
MXS	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-209
MXSC	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-209
MXSG	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-209
MXSL	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-209

O

Model code	Series name	Catalog name	Page
OR…A	Miniature Stroke Rotary Bushing	RED	Ⅱ-187

R

Model code	Series name	Catalog name	Page
RW	Roller Way	RED	Ⅱ-201
RWB	Roller Way	RED	Ⅱ-202

S

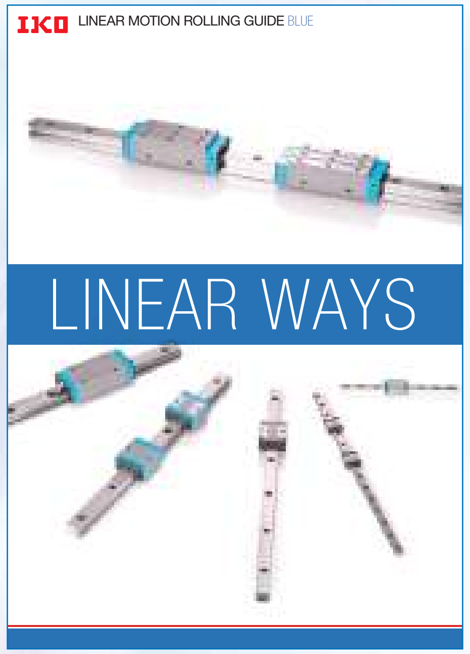
Model code	Series name	Catalog name	Page
SF…A	Miniature Stroke Rotary Bushing	RED	Ⅱ-187
SR	Roller Way	RED	Ⅱ-203
ST	Stroke Rotary Bushing	RED	Ⅱ-179
ST…B	Stroke Rotary Bushing	RED	Ⅱ-179
ST…UU	Stroke Rotary Bushing	RED	Ⅱ-181
ST…UU B	Stroke Rotary Bushing	RED	Ⅱ-181
STS	Miniature Stroke Rotary Bushing	RED	Ⅱ-187
STSI	Miniature Stroke Rotary Bushing	RED	Ⅱ-187

Note: BLUE denotes CAT-1591E, while RED denotes CAT-1592E

IKO Linear Motion Rolling Guide Series, Configuration of General Catalog

IKO Linear Motion Rolling Guide Series General Catalog Consists of **BLUE** (CAT-1591E) and **RED** (CAT-1592E), the two volumes.

BLUE


IKO LINEAR MOTION ROLLING GUIDE BLUE

LINEAR WAYS

CAT-1591E

【Models】

- Rail Guide Type
  - Endless Linear Motion Type

C-Lube Linear Way ML
Linear Way L
ML・LWL

C-Lube Linear Way MLV
MLV

C-Lube Linear Way MV
MV

C-Lube Linear Way ME
Linear Way E
ME・LWE

C-Lube Linear Way MH
Linear Way H
MH・LWH

Linear Way F
LWF

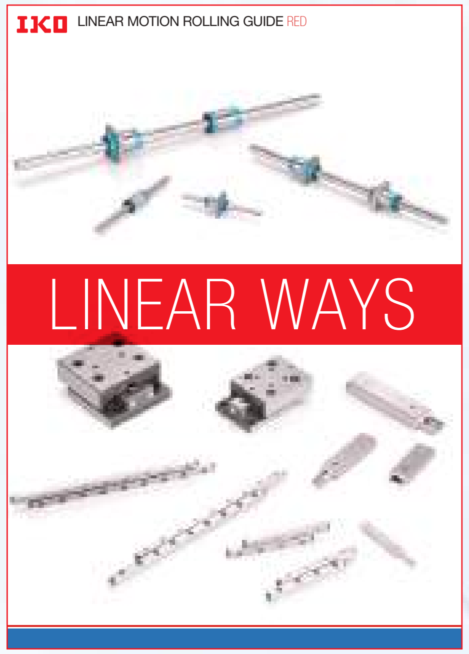
C-Lube Linear Way MUL
Linear Way U
MUL・LWU

C-Lube
Linear Roller Way Super MX
Linear Roller Way Super X
MX・LRX

Linear Roller Way X
LRWX

Linear Way Module
LWLM・LRWM

RED


IKO LINEAR MOTION ROLLING GUIDE RED

LINEAR WAYS

CAT-1592E

【Models】

- Rail Guide Type
  - Limited Linear Motion Type
- Shaft Guide Type
  - Endless Linear Motion Type
  - Limited Linear Motion Type + Rolling Motion Type
- Flat Guide Type
  - Endless Linear Motion Type
  - Limited Linear Motion Type

Rail Guide Type
Crossed Roller Way
CRW(G)(…H)
CRWU(G)

Rail Guide Type
Linear Slide Unit
BWU・BSP(G)
BSU…A

Shaft Guide Type
Linear Ball Spline
MAG・LSAG

Shaft Guide Type
Linear Bushing
LMG・LM・LMS

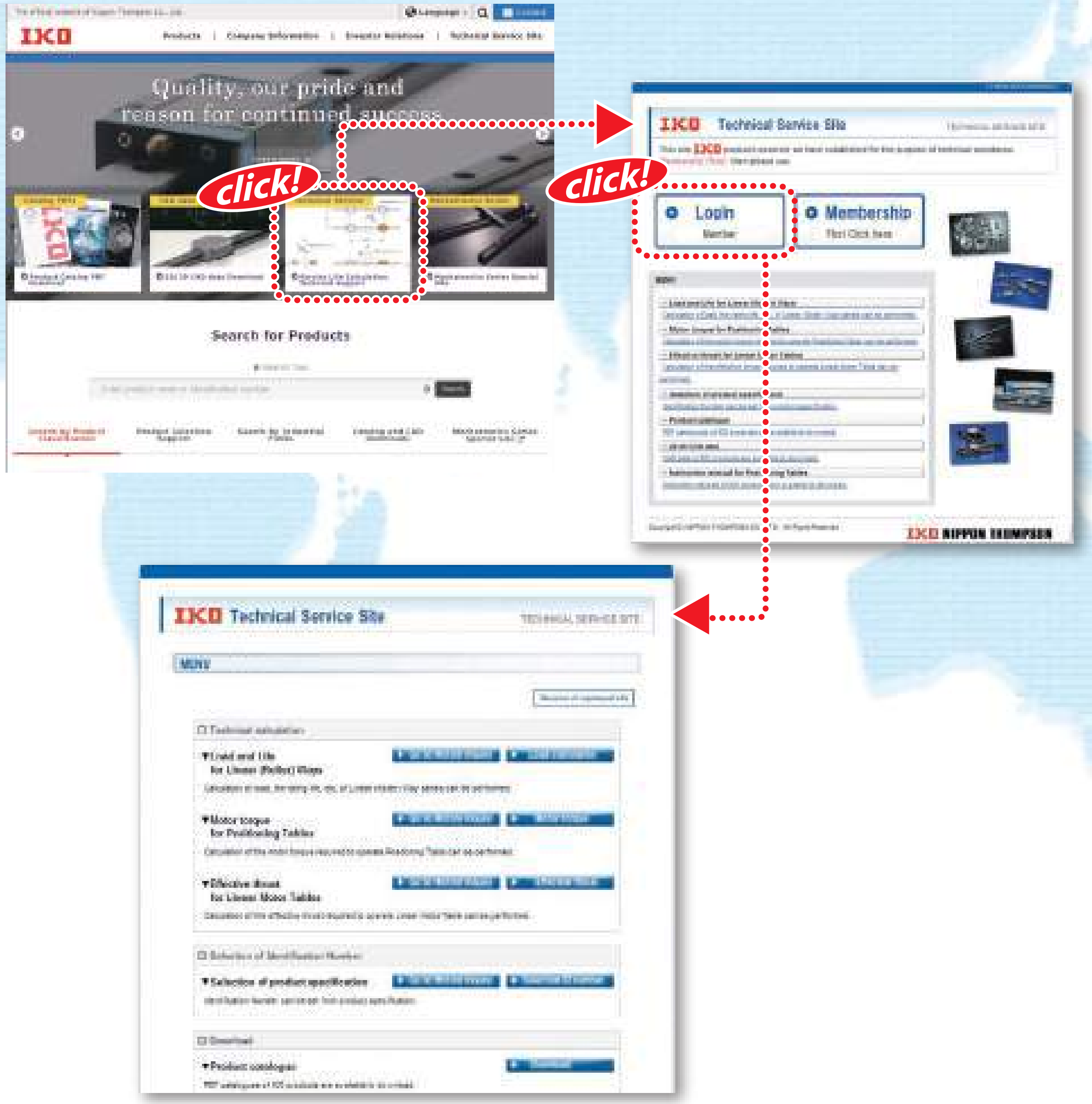
Shaft Guide Type
Stroke Rotary Bushing
ST・STSI・BG

Flat Guide Type
Roller Way & Flat Roller Cage
RW・SR・GSN
FT・FTW…A

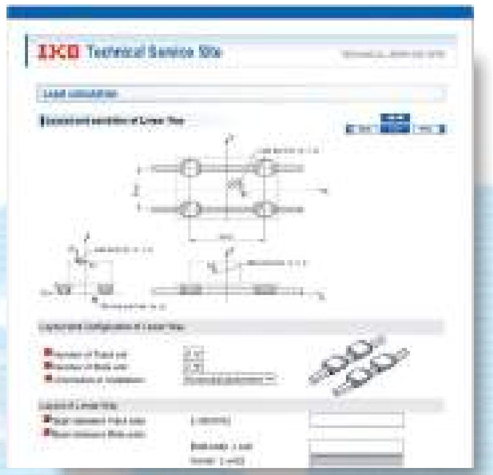
IKO Introduction of Technical Service Site

"IKO Technical Service Site" can be accessed from our home page. The site provides various tools for selecting Linear Ways and Linear Roller Ways. Please utilize these tools for assistance when selecting products. Additionally the site also provides CAD data and product catalogs for the Needle Series, Linear Motion Rolling Guide Series, and Mechatronics Series for download. Please utilize them to improve your design efficiency.

https://www.ikont.co.jp/eg/



1. Technical calculations



For Linear Way/Linear Roller Way load and life calculation, you can obtain the calculated load and the rating life by entering the operating conditions.

Also you can derive the motor torque required for operation and the effective propulsion force during operation in the sections of motor torque calculation and calculation of effective propulsion force of linear motor tables respectively, and output the calculation results in PDF format, as well as save the histories.

2. Selection of Identification Number

By selecting such specification as model code, dimensions, part code, material code, preload symbol, classification symbol, interchangeable code and supplemental code of Linear ways/Linear roller ways, you can easily specify the identification number used for ordering.

Also you can browse the CAD data of the selected products, calculate the load, and output the selection results in PDF format, as well as save the histories.

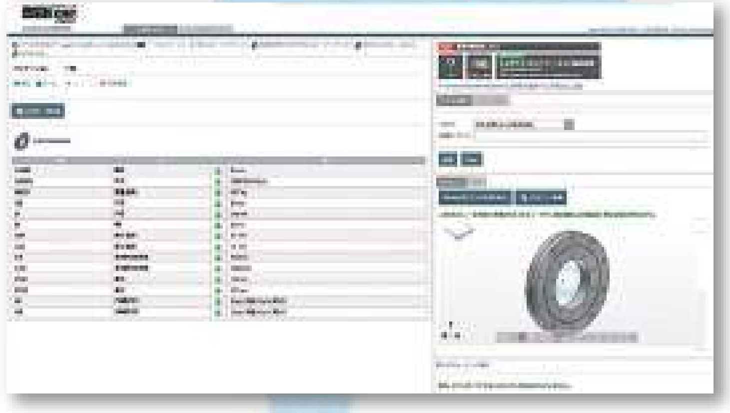
3. Downloading CAD data

2-dimensional CAD data (DXF file)

There are two types of figures, brief figure and detailed figure. The brief figure shows only the external view lines, and the detailed figure shows the detailed lines. The drawing consists of three drawings: front view, side view and plain view. The scale shows only the original size (1:1), and it does not show dimension lines.

3-dimensional CAD data

It is linked to the mechanical parts CAD library "PART community". Entering the rail dimension and option contents to the detail, you can view the 2D/3D CAD data suitable for the specification for free of charge.



4. Downloading Catalog and Operation Manual

You can download product catalogs of needle series, linear motion rolling guide series and mechatronics series, operation manuals of precision positioning tables and various electrical components in PDF format, as well as support software for precision positioning tables. If you would like a copy of our catalog, please visit the IKO official website and apply for the catalog, or contact our regional office or sales office nearby.

Oil Minimum

IKO Gentle to The Earth

Nippon Thompson Co., Ltd. is working to develop global environment-friendly products.
It is committed to developing products that make its customers' machinery and
equipment more reliable, thereby contributing to preserving the global environment.
This development stance manifests well in the keyword "**Oil Minimum.**"
Our pursuit of Oil Minimum has led to the creation of
IKO's proprietary family of lubricating parts as "C-Lube."

- IKO Linear Motion Rolling Guides are manufactured through a control system that alleviates their impact on the global environment to meet the quality requirements of ISO 14001 in compliance with the quality requirements level of ISO 9001 for quality improvement.
- The standard products listed in this catalog comply with the specifications of the ten hazardous materials cited in the European RoHS Directive.

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ISO 9001 & 14001 Quality system registration certificate

ISO 9001 Certified ISO 14001 Certified

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IKO LINEAR MOTION ROLLING GUIDE RED

CAT-1592E

LINEAR WAYS

Good Environment and Good Quality

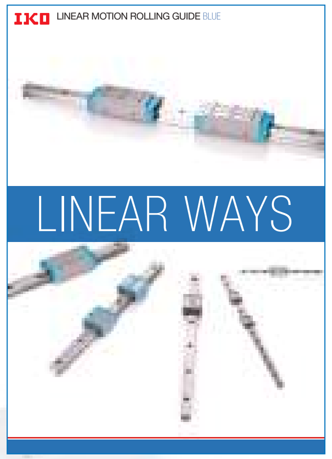
IKO Linear Motion Rolling Guides are used with satisfactory results for various applications requiring precision positioning such as semi-conductor manufacturing equipment, large sized machine tools, industrial robots, and precision equipment.

In contrast to conventional rolling bearings used in rotating parts, Linear Motion Rolling Guides are the products applicable to plane sliding surfaces, and meet the increasing needs for linear motion and precision positioning in machines and equipment.

Linear Way and Linear Roller Way of Rail Guide Type, Linear Ball Spline of Shaft Guide Type, and other products, recognized for their high quality and excellent features, are available.

IKO LINEAR MOTION ROLLING GUIDE SERIES Full Lineup

Linear Motion Rolling Guide Series General Catalog BLUE


IKO LINEAR MOTION ROLLING GUIDE BLUE
LINEAR WAYS

Recorded in CAT-1591E

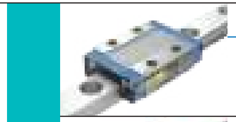
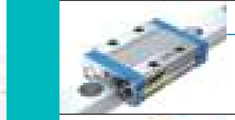
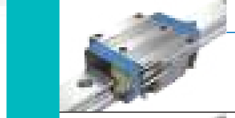
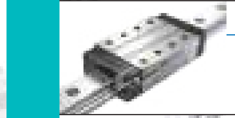
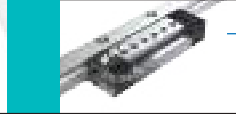
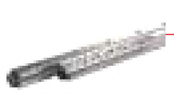
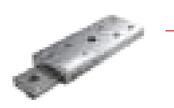
Linear Way
Linear Roller Way

Linear Motion Rolling Guide Series General Catalog RED


IKO LINEAR MOTION ROLLING GUIDE RED
LINEAR WAYS

Recorded in CAT-1592E

Crossed Roller Way
Linear Slide Unit
Linear Ball Spline
Linear Bushing
Stroke Rotary Bushing
Roller Way & Flat Roller Cage

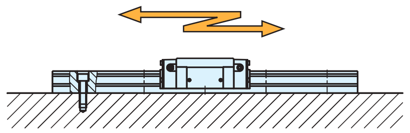
				C-Lube Maintenance Free Series			
Rail Guide Type		**Ball Type Miniature Series**	Super small-size linear motion rolling guide produced by original small sizing technology	**C-Lube Linear Way ML** ML : Standard type MLF : Wide type	**Linear Way L** LWL : Standard type LWLF : Wide type		
Rail Guide Type		**Ball Type Miniature Value Series**	Economical linear motion rolling guides without changing the superior performance of Ball Type Miniature Series	**C-Lube Linear Way MLV** MLV			
Rail Guide Type		**Ball Type Low Profile/Light Weight Series**	Super low profile and super light weight linear motion rolling guides with high load capacity	**C-Lube Linear Way MV** MV			
Rail Guide Type		**Ball Type Compact Series**	Versatile linear motion rolling guides pursuing compactness in every aspect	**C-Lube Linear Way ME** ME : Flange type mounting from bottom MET : Flange type mounting from top MES : Block type mounting from top	**Linear Way E** LWE : Flange type mounting from bottom LWET : Flange type mounting from top LWES : Block type mounting from top	**Low Decibel Linear Way E** LWE ···Q : Flange type mounting from bottom LWET···Q : Flange type mounting from top LWES···Q : Block type mounting from top	
Rail Guide Type		**Ball Type High Rigidity Series**	High rigidity linear motion rolling guides designed to evenly support high load capacity by incorporating large-diameter balls	**C-Lube Linear Way MH** MH : Flange type mounting from bottom MHT : Flange type mounting from top MHD : Block type mounting from top MHS : Compact block type mounting from top	**Linear Way H** LWH : Flange type mounting from bottom LWHT : Flange type mounting from top LWHD : Block type mounting from top LWHS : Compact block type mounting from top LWHY : Horizontal mounting type		
Rail Guide Type		**Ball Type Wide Rail Type Series**	Linear motion rolling guide suitable to single-row use due to having resistance to across-the-width moment load by using a wide track rail		**Linear Way F** LWFH : Flange type mounting from top / bottom LWFF : Flange type mounting from top / bottom LWFS : Block type mounting from top		
Rail Guide Type		**Ball Type U-Shaped Track Rail Series**	Linear motion rolling guide of high track rail rigidity with U-shaped track rail	**C-Lube Linear Way MUL** MUL : Small type	**Linear Way U** LWU ···B : Standard ball-retained type		
Rail Guide Type		**Roller Type**	Linear motion rolling guide that has achieved the highest level of performance in all characteristics utilizing the roller's superior characteristic	**C-Lube Linear Roller Way Super MX** MX : Flange type mounting from top / bottom MXD : Block type mounting from top MXS : Compact block type mounting from top MXN : Low profile flange type mounting from top / bottom MXNS : Low profile block type mounting from top	**Linear Roller Way Super X** LRX : Flange type mounting from top / bottom LRXD : Block type mounting from top LRXS : Compact block type mounting from top		
Rail Guide Type		**Roller Type**	Roller type linear motion rolling guide with cylindrical rollers in four-rows		**Linear Roller Way X** LRWX : Block type mounting from top LRWXH : Flange type mounting from bottom		
Rail Guide Type		**Module Type**	Minimum compact linear motion rolling guide with both a track rail and slide member provided		**Linear Way Module** LWLM : Ball type small type LRWM: Roller type		
Rail Guide Type		**Crossed Roller Way**	Linear motion rolling guide incorporating a roller cage between two ways whose two V-shaped surfaces are used as track groove		**Anti-Creep Cage Crossed Roller Way** CRWG **Anti-Creep Cage Crossed Roller Way Unit** CRWUG	**Anti-Creep Cage Crossed Roller Way H** CRWG···H **Crossed Roller Way Unit** CRWU / CRWU···R / CRWU···RS	**Crossed Roller Way** CRW : Standard type CRWM : Module type
Rail Guide Type		**Linear Slide Unit**	Light weight, small, and compact linear motion rolling guide that has achieved light and smooth motion		**High Rigidity Precision Linear Slide Unit** BWU	**Precision Linear Slide Unit** BSP : Limited linear motion type BSPG : Built-in rack & pinion type BSR : Endless linear motion type	**Linear Slide Unit** BSU···A
Shaft Guide Type		**Linear Ball Spline**	Linear motion rolling guide capable of performing linear motion and torque transmission using an external cylinder along the spline shaft.	**C-Lube Linear Ball Spline MAG** MAG : Standard type MAGF : Flange type	**Linear Ball Spline G** LSAG : Standard type LSAGF : Flange type		
Shaft Guide Type		**Linear Bushing**	A wide variety of linear motion rolling guides facilitating the rolling motion in bush guide portion		**Linear Bushing G** LMG	**Linear Bushing** LM/LME/LMB	**Miniature Linear Bushing** LMS
Shaft Guide Type		**Stroke Rotary Bushing**	Linear motion rolling guide enabling the rolling motion and rotary and linear motion in axial direction		**Stroke Rotary Bushing** ST : Ordinary type ST···B : For heavy load	**Miniature Stroke Rotary Bushing** STSI : Assembled set with a shaft STS : Assembled set without a shaft	**Stroke Rotary Cage** BG
Flat Guide Type		**Roller Way & Flat Roller Cage**	High accuracy linear motion rolling guide providing high rigidity in load direction		**Roller Way** RW/SR/GSN	**Flat Roller Cage** FT : Single row type FTW···A : Double row angle type	

Types of Linear Motion Rolling Guides

Guide Type

Rail Guide Type

The Rail Guide Type achieves linear motion along a rail. This product can receive a complex load and features high performance, excellent total balance and easy handling.



Endless linear motion

Linear Way

Linear Roller Way

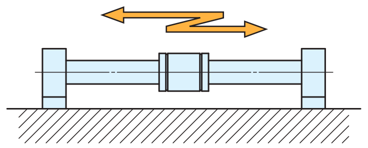
Limited linear motion

Crossed Roller Way

Linear Slide Unit

Shaft Guide Type

The Shaft Guide Type achieves linear motion along a shaft. This product is easy to handle and suitable for relatively low load conditions. Some shaft guide products can achieve both rotation and reciprocating linear motion.



Endless linear motion

Linear Ball Spline

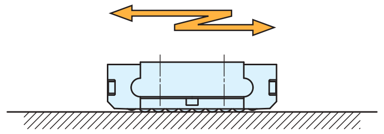
Linear Bushing

Limited linear motion + rotation

Stroke Rotary Bushing

Flat Guide Type

The Flat Guide Type achieves linear motion on a surface. This product can receive only a unidirectional load but feature high rigidity in the load direction.



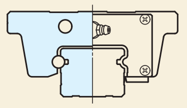
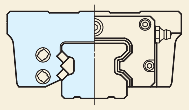
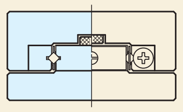
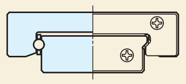
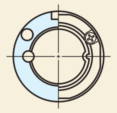
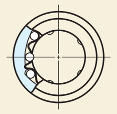
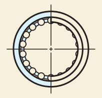
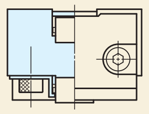
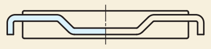
Endless linear motion

Roller Way

Limited linear motion

Flat Roller Cage

Specifications of Linear Motion Rolling Guides

			Type of rolling element	Type of motion	Load direction and load carrying capacity	Rigidity	Frictional characteristic	Ease of mounting	General applications	Item-listed catalog
Rail Guide Type	Endless linear motion	Linear Way 	Ball	Endless linear motion	Complex load, medium to heavy load	○	○	◎	• NC machine tool • Precision working machine • Robot • Transfer machine	BLUE
		Linear Roller Way 	Roller	Endless linear motion	Complex load, heavy to extra-heavy load	◎	○	◎	• Heavy duty machine tool • Large working machine • High-rigidity robot	BLUE
	Limited linear motion	Crossed Roller Way 	Roller	Limited linear motion	Complex load, medium load	○	◎	◎	• Precision working machine • Electronic parts assembling machine • Precision measuring instrument	RED
		Linear Slide Unit 	Ball	Limited linear motion	Complex load, light to medium load	△	◎	◎	• Electronic parts assembling machine	RED
Shaft Guide Type	Endless linear motion	Linear Ball Spline 	Ball	Endless linear motion	Complex load, medium to heavy load	○	○	○	• Robot • Testing and inspection equipment • Transfer machine	RED
		Linear Bushing 	Ball	Endless linear motion	Radial load, light load	△	○	○	• Packaging machine • Measuring instrument • Medical instrument	RED
	Limited linear motion + rotation	Stroke Rotary Bushing 	Ball	Limited linear motion + rotation	Radial load, light load	△	◎	○	• Printing press • Press die set • Precision measuring instrument	RED
Flat Guide Type	Endless linear motion	Roller Way 	Roller	Endless linear motion	Unidirectional load, extra-heavy load	◎	○	△	• NC machine tool • Precision working machine	RED
	Limited linear motion	Flat Roller Cage 	Roller	Limited linear motion	Unidirectional load, extra-heavy load	◎	◎	○	• Precision working machine • Optical measuring instrument	RED

Code description ◎Excellent ○Good △Fair

LINEAR MOTION ROLLING GUIDE SERIES RED INDEX

Crossed Roller Way

CRWG CRWG…H CRW CRWM

Linear motion rolling guide incorporating a roller cage between two ways whose two V-shaped surfaces are used as track groove

Ⅱ-7

Crossed Roller Way Unit

CRWUG CRWU

A linear motion rolling guide with high rigidity table and bed incorporating CRWG and CRW guides for excellent load balance.

Ⅱ-55

High Rigidity Precision Linear Slide Unit

BWU

Light weight, small, and compact linear motion rolling guide that has achieved light and smooth motion

Ⅱ-75

Precision Linear Slide Unit

BSP BSPG BSR BSU

Light weight, small, and compact linear motion rolling guide that has achieved light and smooth motion

Ⅱ-83

Linear Ball Spline

MAG LSAG

Linear motion rolling guide capable of performing linear motion and torque transmission using an external cylinder along the spline shaft.

Ⅱ-107

Linear Bushing

LMG LM LMS

A wide variety of linear motion rolling guides facilitating the rolling motion in bush guide portion

Ⅱ-133

Stroke Rotary Bushing

ST STSI BG

Linear motion rolling guide enabling the rolling motion and rotary and linear motion in axial direction

Ⅱ-175

Roller Way

RW SR GSN

High accuracy linear motion rolling guide providing high rigidity in load direction

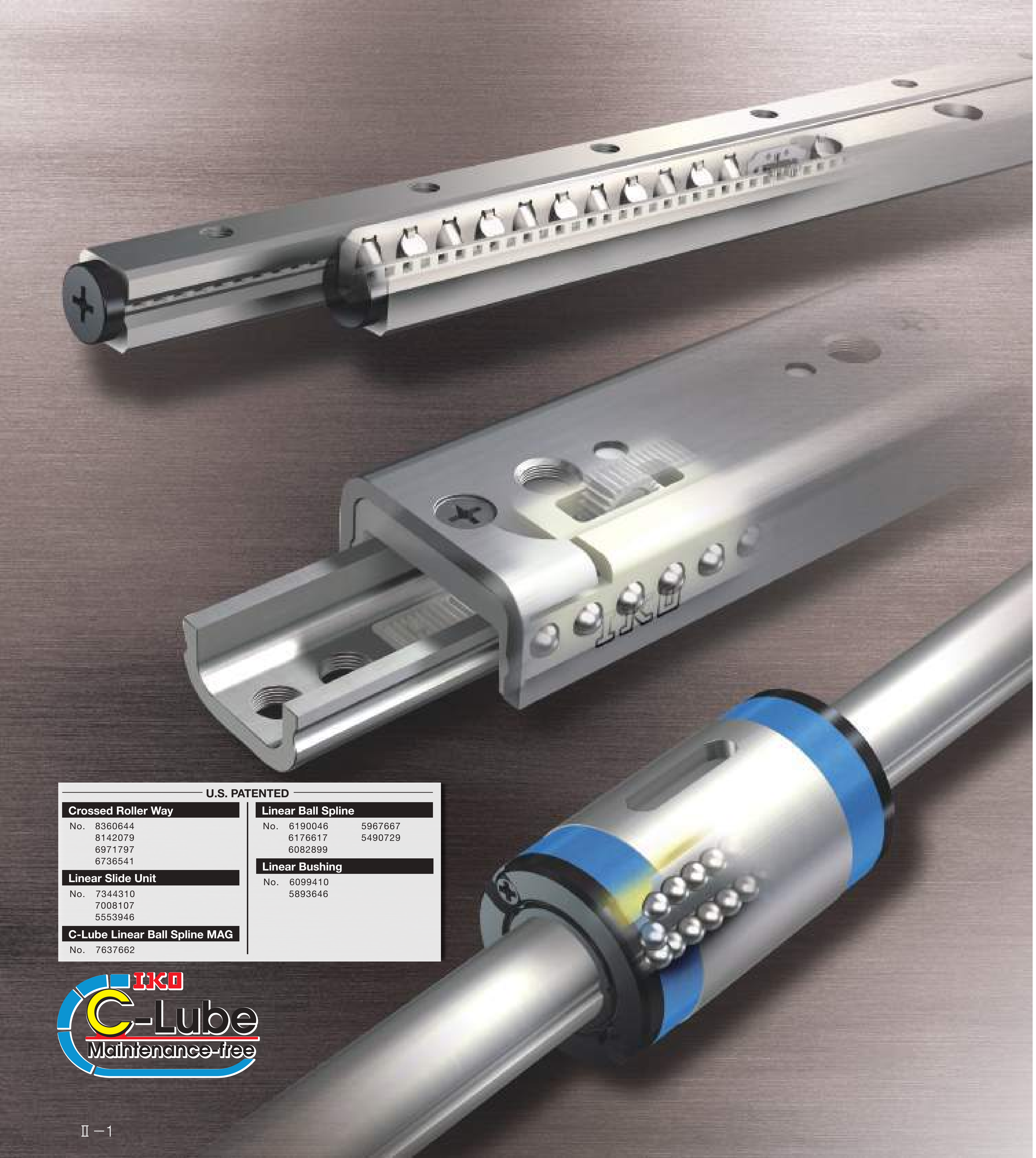
Ⅱ-195

Flat Roller Cage

FT FTW…A

High accuracy linear motion rolling guide providing high rigidity in load direction

Ⅱ-205



U.S. PATENTED

Crossed Roller Way

No. 8360644
8142079
6971797
6736541

Linear Slide Unit

No. 7344310
7008107
5553946

C-Lube Linear Ball Spline MAG

No. 7637662

Linear Ball Spline

No. 6190046 5967667
6176617 5490729
6082899

Linear Bushing

No. 6099410
5893646

IKO C-Lube Maintenance-free

Explanation and Dimension Table for Respective Product Series

Rail Guide Type

Crossed Roller Way

Linear Slide Unit

Shaft Guide Type

Linear Ball Spline

Linear Bushing

Stroke Rotary Bushing

Flat Guide Type

General Explanation

Crossed Roller Way

Anti-Creep Cage Crossed Roller Way
Anti-Creep Cage Crossed Roller Way H
Crossed Roller Way
Anti-Creep Cage Crossed Roller Way Unit
Crossed Roller Way Unit

A wide variety of series products including cage misalignment prevention mechanism are available!

Features of Crossed Roller Way

IKO Crossed Roller Way is a linear motion rolling guide incorporating a roller cage between two ways whose two V-shaped surfaces are used as track groove. Arrangement of cylindrical rollers by orthogonalizing them alternately allows receiving of loads in any direction and executes extremely high-accuracy and smooth linear motion.

Crossed Roller Way

CRW·CRWM

Crossed Roller Way Unit

CRWU

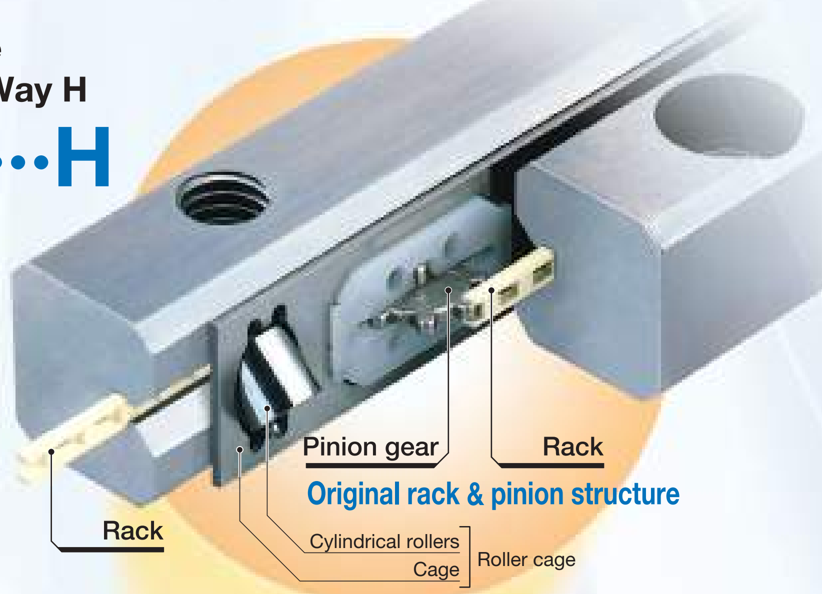
Anti-Creep Cage Crossed Roller Way

CRWG

Anti-Creep Cage Crossed Roller Way H

CRWG…H

IKO Anti-Creep Cage Crossed Roller Way CRWG is a product with a cage creep IKO proof function using a rack and pinion mechanism originated from the Crossed Roller Way CRW featuring smooth linear motion with super high accuracy.
CRWG … H is high load capacity type of CRWG, which has achieved greatly increased load rating by redesigning of raceway of CRWG.



Original rack & pinion structure

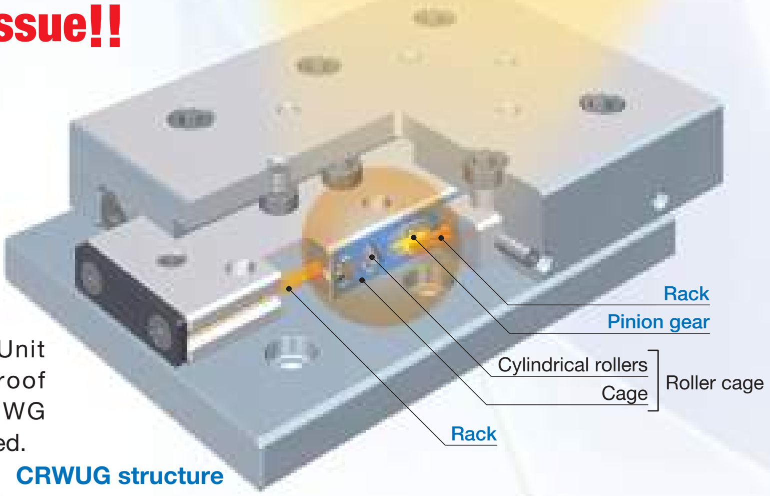
Built-in rack & pinion type

Solves cage creep issue!!

Anti-Creep Cage Crossed Roller Way Unit

CRWUG

IKO Anti-Creep Cage Crossed Roller Way Unit CRWUG is a product with a cage creep proof function-provided Crossed Roller Way CRWG mounted into a ground-finished rigid table and bed.



CRWUG structure

Features of Built-in Rack & Pinion Type

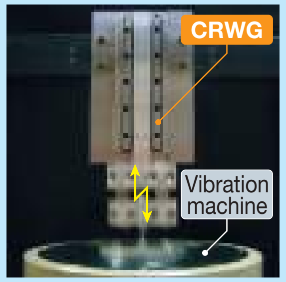
Solves Cage Creep Issue!

Perfect solution for cage creep issues by a built-in rack and pinion mechanism as an original design.

No cage creep even under high-tact operation in vertical axis!

《Durability test》 Test conditions

Model number	CRWG3	
Test method	Vibration test machine	
Condition	Posture	Vertical
	Maximum velocity	827 mm/s
	Acceleration	15 G
	Number of cycle	31 Hz
	Stroke length	8 mm
	Mass of moving part	330 g
Total cycles	100,000,000 cycles	



《Result》 No cage creep nor material damage in any component is found.

Freedom in Mounting

This series is reliable for applications such as vertical axis where Crossed Roller Way may have chances of cage creep.

High-Speed and High-Tact Operation

Any corrective operation for cage creep is not necessary even for high velocity operation.

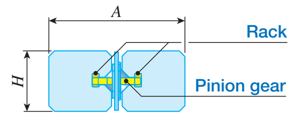
Saving Energy

No remedy motion of cage is necessary even in long term operation.

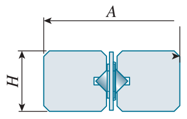
Interchangeable in Mounting Dimensions!

Adoption of original structure of arranging a rack inside the way keeps the same mounting dimensions as conventional Crossed Roller Way CRW.

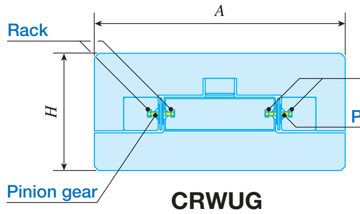
* The mounting dimensions of CRWG1… H and CRW1 are different.



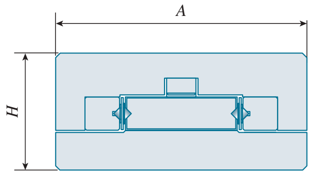
CRWG
CRWG…H



CRW



CRWUG



CRWU

Easy Replacement

Since they have the same external dimensions to those of the existing Crossed Roller Way and Crossed Roller Way Unit, existing Crossed Roller Way and Crossed Roller Way Unit can be replaced without any mounting dimensions modification.

Smooth and Extremely-High Accurate Operation!

Combination of precisely finished raceways and non-recirculating type linear motion rolling guide with super high precision rollers provides superbly smooth motion with very high accuracy.

Improved Running Accuracy

Extremely high running accuracy can be achieved without run deflection by recirculating type linear motion rolling guide.

Suitable for Micro-Feeding

Improvement of precision positioning accuracy and superior corresponding feature to micro-feeding command can be expected because of the linear motion without stick-slip by extremely small frictional resistance.

Anti-Creep Cage
Crossed Roller Way
CRWG

Anti-Creep Cage
Crossed Roller Way H
CRWG···H

Crossed Roller Way
CRW/CRWM

Points

● Superior load balance

1 This unit has a roller cage with cylindrical rollers alternately orthogonalized between two ways whose two V-shaped surfaces are used as track groove, which allows receiving of loads in any direction.

● Solves cage creep problem

2 CRWG and CRWG···H units, which have originally-designed rack and pinion mechanism built-in, solve the cage creep issue and support high-speed & high-tact operation and vertical axis application.

● High load capacity type CRWG···H

3 CRWG···H has achieved greatly increased load rating by redesigning of raceway of CRWG, thereby downsizing the machine and equipment and prolonging their lifetime.

● Standard type and module type

4 There are two types in the CRW: one is standard type of using four ways and two roller cages in combination as a set and the other is module type of integrating two internal ways in a single structure.

● Easy mounting

5 The mounting holes of the way are provided with boring and female thread, so that the mounting structure is not restricted. The module type with two internal ways integrated in a single structure is simple in mounting structure, thus producing high accuracy linear motion.

● Stainless steels superior in corrosion resistance are listed on lineup.

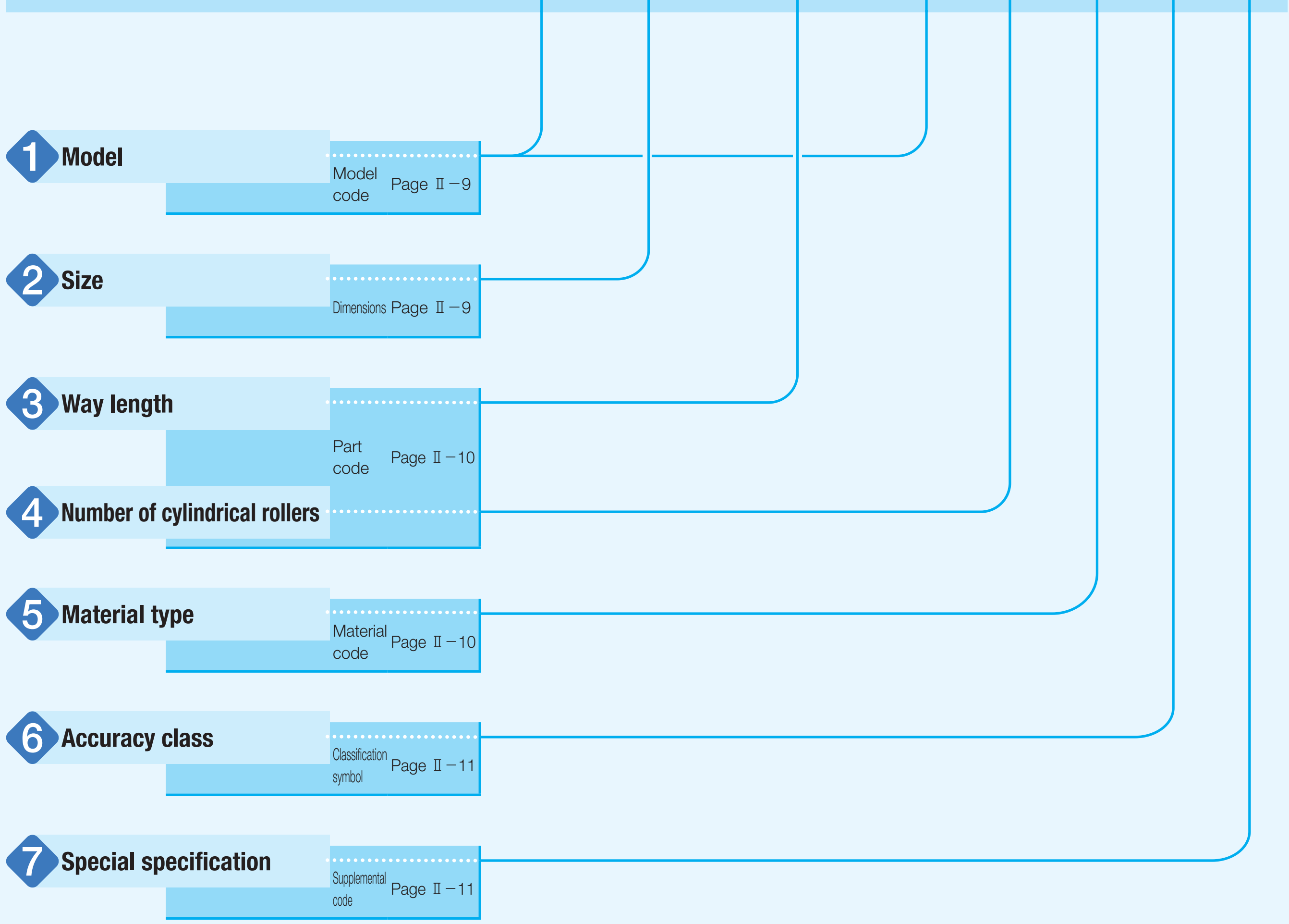
6 Products made of stainless steel are highly resistance to corrosion, so that they are suitable for applications where rust prevention oil is not preferred, such as in a cleanroom environment.

Identification Number and Specification

Example of an identification number

The specifications of CRWG series, CRWG···H series, and CRW series are indicated by the identification number. Indicate the identification number, consisting of a model code, a dimension, a part code, a material code, a classification symbol, and any supplemental codes for each specification to apply.

		1	2		3	1	4	5	6	7
CRWG series CRWG···H series		CRWG	3	–	150	H			SP	/B
CRW series	Standard type	CRW	3	–	150		C20	SL	SP	/U
		CRW	3	–	250×300		C36	SL	SP	/U
	Module type	CRWM	3	–	150		C20		SP	
		CRWM	3	–	250×150		C20		SP	



1 **Model** — Model code Page Ⅱ－9

2 **Size** — Dimensions Page Ⅱ－9

3 **Way length** — Part code Page Ⅱ－10

4 **Number of cylindrical rollers** — Part code Page Ⅱ－10

5 **Material type** — Material code Page Ⅱ－10

6 **Accuracy class** — Classification symbol Page Ⅱ－11

7 **Special specification** — Supplemental code Page Ⅱ－11

Note: One set of the CRW, CRWG, and CRWG...H series consists of a combination of four ways and two roller cages.

Identification Number and Specification —Model · Size—

1 Model

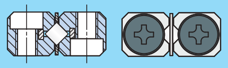
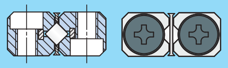
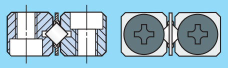
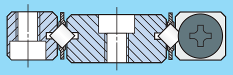
Anti-Creep Cage Crossed Roller Way (CRWG series)	: CRWG
Anti-Creep Cage Crossed Roller Way H (CRWG···H series)	: CRWG···H
Crossed Roller Way (CRW series) Standard type	: CRW
Crossed Roller Way (CRW series) Module type	: CRWM

For applicable models and sizes, see Fig. 1.

2 Size

1, 2, 3, 4, 6, 9, 12, 15, 18, 24 For applicable models and sizes, see Table 1.

Table 1 Models and Sizes of CRWG series, CRWG···H series, and CRW series

Series	Shape	Material	Model	Size									
				1	2	3	4	6	9	12	15	18	24
CRWG		High carbon steel made	CRWG	—	○	○	○	○	—	—	—	—	—
CRWG···H		High carbon steel made	CRWG···H	○	○	○	○	—	—	—	—	—	—
CRW	Standard type 	High carbon steel made	CRW	○	○	○	○	○	○	○	○	○	○
		Stainless steel made	CRW···SL	○	○	○	○	○	—	—	—	—	—
	Module type 	High carbon steel made	CRWM	○	○	○	○	—	—	—	—	—	—

—Way length · Number of Cylindrical Rollers · Material Type—

3 Way length

○

○×○

The way length is indicated in mm. The CRW series can be combined with a way of different length. For details of way length, see the dimension tables on pages Ⅱ-27 to Ⅱ-52.

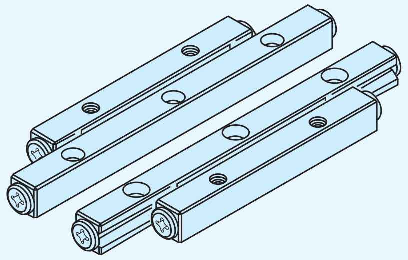
Specifying the combination of different way lengths

Combination of standard type

This combination consists of two short ways, two long ways, and two roller cages, as a set.
In this case, make sure to specify the number of rollers to be incorporated in the roller cages. (For calculation of incorporated rollers, see the Selection of CRW Series on page Ⅱ-17.)

Example **CRW 6 – 300 × 400 C24**

The number of cylindrical rollers to be incorporated in a unit: 24
Length of long way: 400 mm
Length of short way: 300 mm

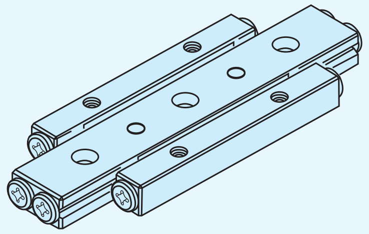


Combination of module type

This combination consists of one long center way, two short ways, and two roller cages, as a set.
In this case, make sure to specify the number of rollers to be incorporated in the roller cages. (For calculation of incorporated rollers, see the Selection of CRW Series on page Ⅱ-17.)

Example **CRWM 3 – 200 × 150 C20**

The number of cylindrical rollers to be incorporated in a unit: 20
Length of short outside way: 150 mm
Length of long center way: 200 mm



4 Number of cylindrical rollers

: No symbol
: C○

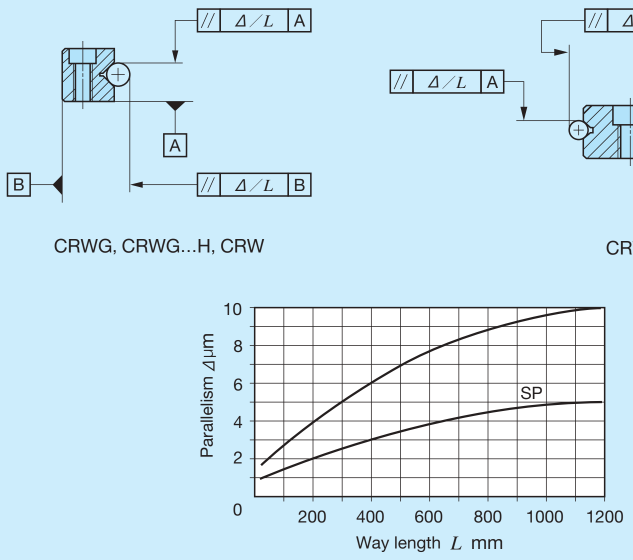
This represents the number of cylindrical rollers incorporated into a CRW series cage. If not directed, the number of cylindrical rollers indicated in the dimension table shall be incorporated in a roller cage.

5 Material type

High carbon steel made	: No symbol	For applicable models and sizes, see Fig. 1.
Stainless steel made	: SL	

⑥ Accuracy class

Standard	: No symbol	For parallelism of the raceway to reference mounting surface and the tolerance of the parallelism of two raceways of CRWM, see Fig. 1.
Super precision	: SP	



CRWG, CRWG...H, CRW

CRWM

Fig. 1 Accuracy

⑦ Special specification

B, M, SA, SB, U

For applicable special specifications, see Table 2.
For combination of multiple special specifications, see Table 3.
For details of special specifications, see pages Ⅱ-11 to Ⅱ-14.

Table 2 Application of special specifications

Special specification	Supplemental code	Size									
		1	2	3	4	6	9	12	15	18	24
Special mounting screw	/B	–	–	○	○	○	○	○	○	○	○
High rigidity roller cage (1)	/M	–	–	–	–	○	○	○	○	○	○
End stopper SA (1)	/SA	–	○	○	○	○	○	○	○	○	○
End stopper SB (1)	/SB	–	○	○	○	○	○	○	○	○	○
Wiper seal (1)	/U	–	○	○	○	○	○	○	○	○	○

Notes (1) Applicable only to CRW series standard type. Not applicable to other series or shapes.

Table 3 Combination of special specifications

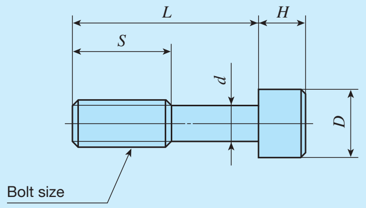
M	○			
SA	○	○		
SB	○	○	–	
U	○	○	–	–
	B	M	SA	SB

Remarks 1. The combination of "－" shown in the table is not available.
2. When using multiple types for combination, please indicate by arranging the symbols in alphabetical order.

Special mounting screw /B

Preload adjusting-side way can be moved by adjusting the preload. Allowance for movement is required between a way fixing screw and mounting hole, but special mounting screws are provided for the cases where enough allowance is not provided or a fixing screw should be mounted from the way side as shown in Fig. 2.
This special mounting screw can also be used for the case where the mounting hole for mounting the fixed-side way and positioning accuracy of female thread are not enough. This special mounting screw is high carbon steel-made only.

Table 4 Dimensions of special mounting screw



unit: mm

Size	Bolt size	*d*	*D*	*H*	*L*	*S*
3	M 3	2.3	5	3	12	5
4	M 4	3.1	6	4	15	6
6	M 5	3.9	8	5	20	8
9	M 6	4.6	8.5	6	30	12
12	M 8	6.2	11.5	8	40	17
15	M10	7.9	14	10	45	16
18	M12	9.6	16	12	50	19
24	M14	11.2	19.5	14	70	26

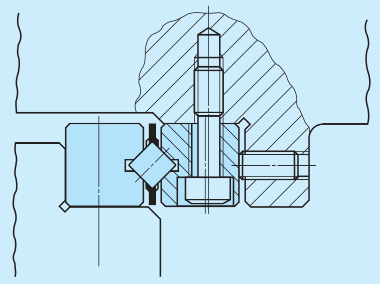
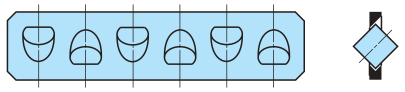


Fig. 2 Mounting by special mounting screw

High rigidity roller cage /M

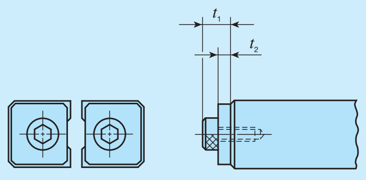


The cage is changed into a high rigidity copper alloy-made cage designed to suit vertical axis application. This cage has a structure to prevent a roller from dropping off in one-side direction.
For using a high rigidity roller cage for vertical axis application, it is recommended to use the cage in combination with end stopper SB.

End stopper SA /SA

When the stroke frequency is high and cage creep may be caused by the vibration and non-uniformly varying load, the end screw is changed into end stopper SA.
For the series of size 1, an end stopper SA according to end stopper SA is included as standard.

Table 5 *Dimensions of end stopper SA*



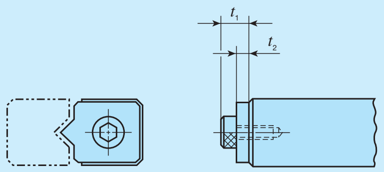
unit: mm

Size	t_1	t_2
2	4.5	2
3	5	2
4	7	3
6	8	3
9	10	4
12	11	5
15	14	6
18	14	6
24	16	6

End stopper SB /SB

When using a high rigidity roller cage for vertical axis application, the end screw is changed into end stopper SB to regulate the cage stroke at the end.
The end stopper SB cannot be mounted on all way ends. Standard mounting positions are shown in Fig. 3. The mounting positions can be changed by loosening the screw.

Table 6 *Dimensions of end stopper SB*



unit: mm

Size	t_1	t_2
2	4.5	2
3	5	2
4	7	3
6	8	3
9	10	4
12	11	5
15	14	6
18	14	6
24	16	6

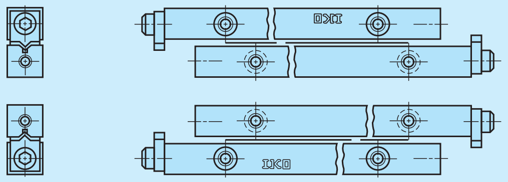
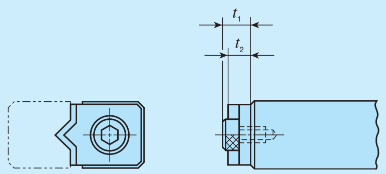


Fig. 3 Arrangement of end stopper SB

Wiper seal /U

In order to prevent foreign substances from entering into a raceway, the wiper seal is changed into the one with a function of end stopper SB.
The wiper seal cannot be mounted on all way ends. Standard mounting positions are shown in Fig. 4. The mounting positions can be changed by loosening the screw.

Table 7 *Dimensions of wiper seal*



unit: mm

Size	t_1	t_2
2	4.5	4
3	5	4
4	7	6
6	8	6
9	10	7.5
12	11	8.5
15	14	11
18	14	11
24	16	11

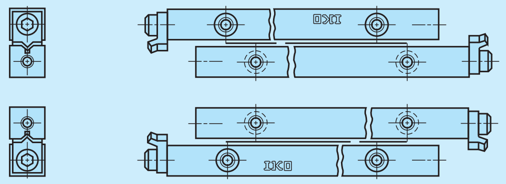


Fig. 4 Arrangement of wiper seal

Load Rating and Allowable Load

Basic dynamic load rating C, basic static load rating C_0, and allowable load F of the CRWG series and CRWG···H series show values for downward loads in case of parallel arrangement of four ways and two pairs of roller cages as one set. (Refer to Fig. 5) In addition, the upward and lateral load rating is the same as downward load rating.

For the CRW series, since the number of cylindrical rollers that share load of each direction varies, the load rating for each load direction and allowable load must be obtained. In addition, basic dynamic load rating C_U, basic static load rating C_{0U}, and allowable load F_U in the dimension table show values per cylindrical roller.

Basic dynamic load rating C, basic static load rating C_0, and allowable load F of the CRW series are obtained based on the equation indicated in Table 8.1 and Table 8.2.

For more information on the definition of load rating and calculated load, see page Ⅲ-3.

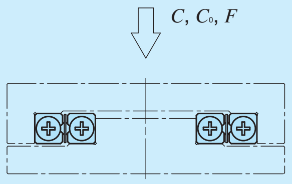


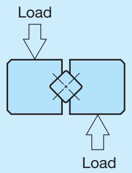
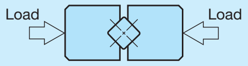
Fig. 5 Direction of load rating of the CRWG series and CRWG···H series

Allowable load

Allowable load refers to load of smooth rolling motion on contact surface to which maximum contact stress is applied and the sum of whose elastic deformation of rolling elements and raceway is small.

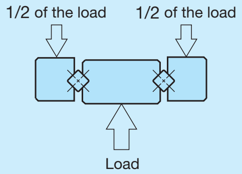
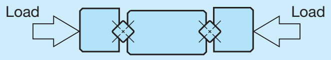
Therefore, use applied load within the allowable load range if very smooth rolling motion and high accuracy are required.

Table 8.1 Calculating formula of load rating and allowable load of standard type CRW series

	Upward and downward load (¹)	Lateral load
Load direction		
Basic dynamic load rating C N	$C_r=\left\{\left(\frac{Z}{2}-1\right)2p\right\}^{1/36}\left(\frac{Z}{2}\right)^{3/4}C_U$ ……(1)	$C_a=\left\{\left(\frac{Z}{2}-1\right)2p\right\}^{1/36}\left(\frac{Z}{2}\right)^{3/4}2^{7/9}C_U$ ……(4)
Basic static load rating C_0 N	$C_{0r}=\left(\frac{Z}{2}\right)C_{0U}$ ……(2)	$C_{0a}=2\left(\frac{Z}{2}\right)C_{0U}$ ……(5)
Allowable load F N	$F_r=\left(\frac{Z}{2}\right)F_U$ ……(3)	$F_a=2\left(\frac{Z}{2}\right)F_U$ ……(6)
Code description	C_r : Basic dynamic load rating in case upward and downward load is applied N	
	C_a : Basic dynamic load rating in case lateral load is applied N	
	C_{0r} : Basic static load rating in case upward and downward load is applied N	
	C_{0a} : Basic static load rating in case lateral load is applied N	
	F_r : Allowable load in case upward and downward load is applied N	
	F_a : Allowable load in case lateral load is applied N	
	Z : The number of cylindrical rollers incorporated in a roller cage (omit the figures after the decimal fractions for $\frac{Z}{2}$)	
	p : Inter-pitch dimensions of cylindrical rollers mm	
	C_U : Basic dynamic load rating per cylindrical roller N	
	C_{0U} : Basic static load rating per cylindrical roller N	
	F_U : Allowable load per cylindrical roller N	

Note (¹) : In case of parallel arrangement in this load direction, calculation must be performed based on the equations (7) , (8) , and (9) in Table 8.2.

Table 8.2 Calculating formula of load rating and allowable load of module type CRW series

	Upward and downward load	Lateral load
Load direction		
Basic dynamic load rating C N	$C_r=\left\{\left(\frac{Z}{2}-1\right)2p\right\}^{1/36}\left(\frac{Z}{2}\right)^{3/4}2^{7/9}C_U$ ……(7)	$C_a=\left\{\left(\frac{Z}{2}-1\right)2p\right\}^{1/36}\left(\frac{Z}{2}\right)^{3/4}2^{7/9}C_U$ ……(10)
Basic static load rating C_0 N	$C_{0r}=2\left(\frac{Z}{2}\right)C_{0U}$ ……(8)	$C_{0a}=2\left(\frac{Z}{2}\right)C_{0U}$ ……(11)
Allowable load F N	$F_r=2\left(\frac{Z}{2}\right)F_U$ ……(9)	$F_a=2\left(\frac{Z}{2}\right)F_U$ ……(12)
Code description	C_r : Basic dynamic load rating in case upward and downward load is applied N	
	C_a : Basic dynamic load rating in case lateral load is applied N	
	C_{0r} : Basic static load rating in case upward and downward load is applied N	
	C_{0a} : Basic static load rating in case lateral load is applied N	
	F_r : Allowable load in case upward and downward load is applied N	
	F_a : Allowable load in case lateral load is applied N	
	Z : The number of cylindrical rollers incorporated in a roller cage (omit the figures after the decimal fractions for $\frac{Z}{2}$)	
	p : Inter-pitch dimensions of cylindrical rollers mm	
	C_U : Basic dynamic load rating per cylindrical roller N	
	C_{0U} : Basic static load rating per cylindrical roller N	
	F_U : Allowable load per cylindrical roller N	

Selection of CRW Series

For selection of CRW series specifications, stroke length and the number of cylindrical rollers, as well as accuracy, load rating and allowable load, must be determined.

Stroke length and the number of cylindrical rollers

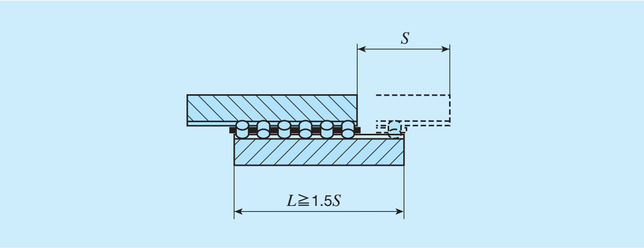
Stroke length of the CRW series affects the way length and the number of cylindrical rollers.
Therefore, select specifications by following the procedure below taking into account the stroke length used and applied load.

❶ Calculation of way length

The way length, which should be 1.5 times longer than the stroke length used, is obtained from the equation below.

$$L \geqq 1.5S \quad \cdots\cdots (13)$$

Where L: Way length mm
S: Stroke length used mm



❷ Calculation of maximum stroke length

Ideally the stroke length used should be less than 80% of the maximum stroke length, which is obtained from the equation below.

$$S_1 \geqq \frac{1}{0.8} S \quad \cdots\cdots (14)$$

Where S_1: Maximum stroke length mm
S: Stroke length used mm

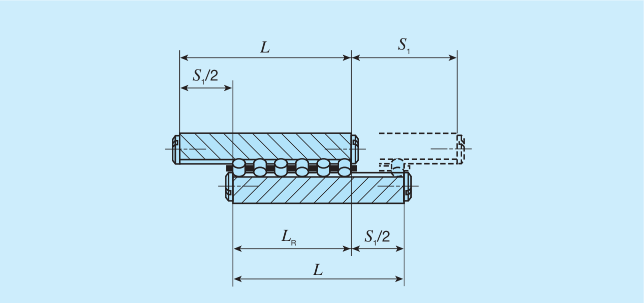
❸ Calculation of cage length and the number of rollers

With the way length and maximum stroke length determined, the allowable length for cage can be calculated.
Calculation method of the cage length varies depending on specifications of end screws and end stopper fitted to the way end.

(1) With standard end screws and end stopper SA (excluding Size 1 series)
The dimensions between rollers at both ends is obtained from the following equation by using a value obtained by subtracting a half of the maximum stroke length from the way length.

$$L_R = L - \frac{S_1}{2} \quad \cdots\cdots (15)$$

Where L_R : Allowable dimensions between rollers at both ends mm
L : Way length mm
S_1 : Maximum stroke length mm



The number of rollers to be incorporated in a roller cage is obtained by the following equation.

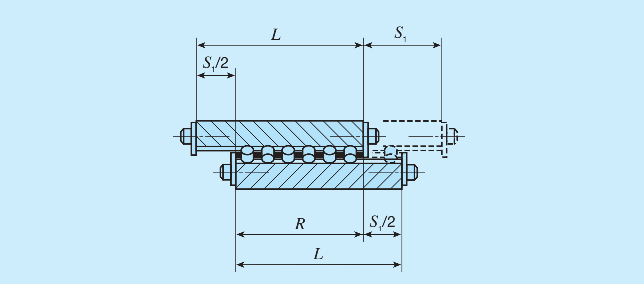
$$Z = \frac{L_R - D_W}{p} + 1 \quad \cdots\cdots (16)$$

Where Z : Number of cylindrical rollers (figures after the decimal fractions are omitted)
L_R : Allowed dimensions between rollers at both ends mm
D_W: Diameter of cylindrical rollers (refer to the dimension table) mm
p : Inter-pitch dimensions of cylindrical rollers (refer to the dimension table) mm

(2) For Size 1 series
The stroke length is regulated by cage and end stopper and the cage length is obtained by the following equation.

$$R = L - \frac{S_1}{2} \quad \cdots\cdots (17)$$

Where R: Allowable cage length mm
L: Way length mm
S_1: Maximum stroke length mm



The number of rollers to be incorporated in a roller cage is obtained by the following equation.

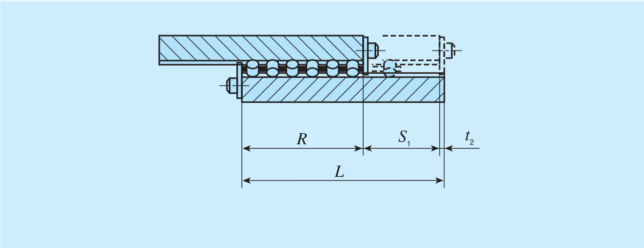
$$Z = \frac{R - 2e}{p} + 1 \quad \cdots\cdots (18)$$

Where Z : Number of cylindrical rollers (figures after the decimal fractions are omitted)
R: Allowable cage length mm
e : End dimension of cage (refer to the dimension table) mm
p: Inter-pitch dimensions of cylindrical rollers (refer to the dimension table) mm

(3) For end stopper SB and wiper seal
The stroke length is regulated by cage and end stopper or wiper seal and the cage length is obtained by the following equation.

$$R = L - t_2 - S_1 \quad \cdots\cdots (19)$$

Where R : Allowable cage length mm
L : Way length mm
S_1: Maximum stroke length mm
t_2 : Thickness of end stopper SB or wiper seal mm (See Table 6 in page Ⅱ-13, and Table 7 in page Ⅱ-14)



The number of rollers to be incorporated in a roller cage is obtained by the equation (18) as with the Size 1 series.

Calculation examples

Form of use ………………………… CRW 6
Applied load ………………………… P = 7000 N
Stroke length ………………………… S = 195 mm

Select specifications for parallel use of Crossed Roller Way under the above conditions (refer to Fig. 26 in page Ⅱ-23).

❶ Calculation of way length

The way length L is calculated from the equation (13).

$$L \geqq 1.5S = 1.5 \times 195 = 292.5$$

Therefore, select L = 300 mm based on the standard length in the dimension table.

❷ Calculation of maximum stroke length

The maximum stroke length S_1 is calculated from the equation (14) .

$$S_1 \geqq \frac{1}{0.8} \quad S = \frac{1}{0.8} \times 195 \fallingdotseq 244$$

Allowable dimensions between rollers at both ends L_R is calculated from the equation (15).

$$L_R = L - \frac{S_1}{2} = 300 - \frac{244}{2} = 178$$

❸ Calculation of the number of rollers

The number of cylindrical rollers Z is calculated from the equation (16). However, D_W and p in this form are D_W = 6 mm、p = 9 mm according to the dimension table.

$$Z = \frac{L_R - D_W}{p} + 1 = \frac{178 - 6}{9} + 1 \fallingdotseq 20.1$$

Therefore, it should be Z = 20 by omitting figures after the decimal fractions.

❹ Calculation of allowable load

Allowable load in parallel arrangement F is calculated from equation (9) described in Table 8.2 in page Ⅱ-16. However, allowable load per cylindrical roller F_U is F_U = 769 N according to the dimension table.

$$F = 2\left(\frac{Z}{2}\right)F_U = 2\left(\frac{20}{2}\right) \times 769 = 15380$$

Therefore, allowable load F is larger than applied load P = 7000 N. When allowable load becomes smaller than applied load, it is necessary to increase the number of cylindrical rollers by extending way length, or increase the cylindrical roller diameter.

❺ Determination of specifications

Specifications obtained in accordance with the above is CRW6-300 and the number of cylindrical rollers is 20.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Lubrication

Grease is not pre-packed in the CRWG series, CRWG…H series and CRW series, so please perform adequate lubrication as needed.

Both of oil lubrication and grease lubrication are available in the CRWG series, CRWG…H series and CRW series. Generally, oil lubrication should be selected for high speed or low frictional resistance, and grease lubrication for low speed. For grease lubrication, use of high-quality lithium-soap base grease is recommended. For light load and low speed, apply grease or oil to raceway, rack and pinion gear first and then reapply accordingly. However, the structure as indicated in the Fig. 6 allows for easy reapplication. In addition, since the clearance between ways is small for CRWG…H series, apply grease or oil directly to raceway for re-greasing.

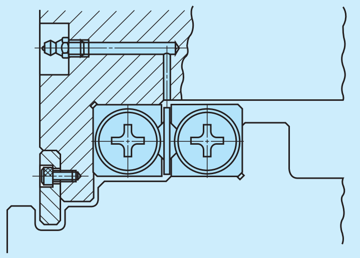


Fig. 6 Example of lubrication system

Dust Protection

Since the CRWG series, CRWG…H series and CRW series are finished with high accuracy, harmful foreign substances such as dust and particles entering into the bearing will cause low life or impaired accuracy. To prevent harmful foreign substances such as dust, particles and water from outside from entering, it is recommended to attach non-contact type labyrinth seal as indicated in Fig. 7, or contact type wiper seal as indicated in the Fig. 8 to both sides.

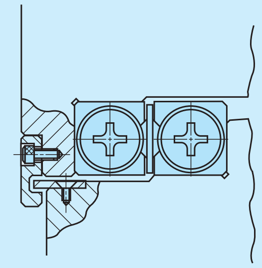


Fig. 7 Example of labyrinth seal

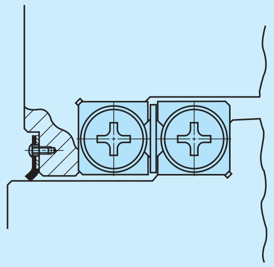


Fig. 8 Example of wiper seal

Precaution for Use

❶ Handling

As the CRWG series, CRWG…H series and CRW series are designed highly precisely, take extra care for handling.

A pinion gear and cylindrical roller are incorporated with the cage for the CRWG series and CRWG…H series. When the cage is dropped or handled roughly, the pinion gear and cylindrical roller may come off. Especially for CRWG…H, grabbing the cylindrical roller may take it off, so be sure to hold the cage body for handling. In addition, do not cut off the cage as doing so may cause pinion gear coming off and breakage of gear joint section.

A rack is incorporated with the way for the CRWG series and CRWG…H series. In operation, take note that the rack may come off when the end screw is removed.

Though the cage for the CRW series may cut off to necessary length, handle it with care not to deform it when cutting.

❷ Accuracy of mounting part

Examples of typical mounting surface processing are shown in Fig. 9.1 and Fig. 9.2.

General processing accuracy of mounting surface is according to Table 9. However, care should be exercised as mounting surface accuracy directly affects running accuracy. Especially when high running accuracy is required, the processing accuracy higher than that indicated in Table 9 is required.

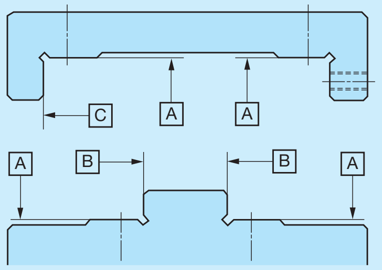


Fig. 9.1 Example of processing of CRWG, CRWG…H and CRW mounting surface

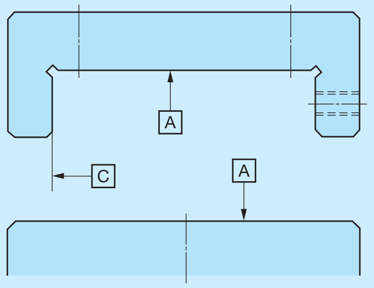


Fig. 9.2 Example of processing of CRWM mounting surface

Table 9 Accuracy of mounting part

Accuracy of A surface	· Directly affects running accuracy. For the flatness of two mounting surfaces on table and bed sides, allowable value approximate to the parallelism indicated in Fig. 1 in page Ⅱ-11 is recommended.
Accuracy of B and C surfaces	· Flatness Affects preload (refer to ❹ Preload adjustment mechanism). Ⅱ—11Allowable value approximate to the parallelism indicated in Fig. 1 in page Ⅱ-11 is recommended. · Squareness Affects rigidity in preload direction of the mounting part of the CRWG series, CRWG…H series and CRW series. Process to sufficiently high accuracy.

❸ Shape of mounting part

For the opposite corner of the mating reference mounting, it is recommended to have relieved fillet as indicated in Fig. 10.

In addition, a clearance of 0.5 mm or higher should be made between the way and the mating member material.

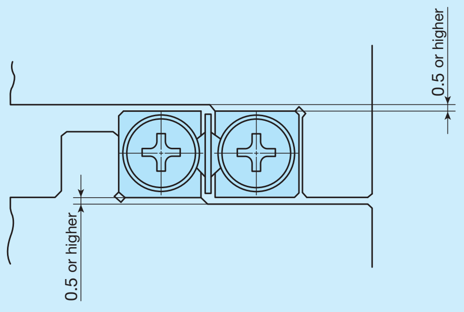


Fig. 10 Shape of mounting part

❹ Preload adjustment mechanism

For use with preload, use the preload adjusting screw as indicated in Fig. 11 as a general way. Preload adjusting screw nominal dimensions and mounting position should be in accordance with the way fixing bolt dimensions and position. Press the center of the way H dimensions.

Preload amount varies depending on operational conditions of your machine and device. However, as excessive preload may lead to short life and damage on the raceway, it is typically ideal to adjust to zero clearance or slight preload state. When accuracy and rigidity are required, use a push plate or tapered jib as indicated in Fig. 12 and Fig. 13, respectively.

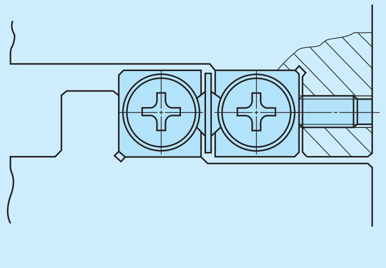


Fig. 11 Example of typical preload adjustment

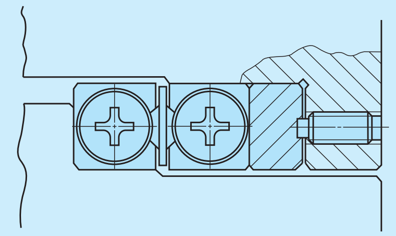


Fig. 12 Example of push plate

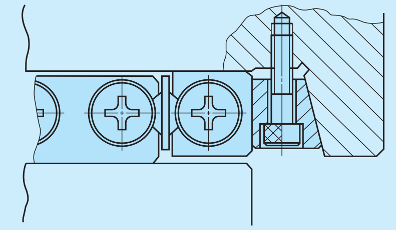


Fig. 13 Example of tapered jib

❺ Operating temperature

As synthetic resin components are used for the CRWG series and CRWG…H series, the maximum operating temperature is 120°C, while it should be lower than 100°C for continuous use. When it exceeds 100°C, contact IKO.

As synthetic resin components are not used for the CRW series, it may be used at high temperature. However, when it exceeds 100°C, contact IKO.

❻ Maximum velocity

Operating velocity should be lower than 50 m/min for the CRWG series and CRWG…H series, and lower than 30 m/min for the CRW series.

❼ Tightening torque for fixing screw

Typical tightening torque for mounting of the CRWG series, CRWG…H series and CRW series is indicated in Table 10. When vibration and shock are large or moment load is applied, it is recommended to fix by using the torque 1.3 times larger than that indicated in the table. In addition, when high running accuracy is required with no vibration and shock, it may be fixed by using torque smaller than that indicated in the table, however, it is recommended to use adhesive agent to fasten the screw, or to use stop bolts.

Table 10 Tightening torque for fixing screw

Bolt size	Tightening torque N・m
M 1.6×0.35	0.20
M 2 ×0.4	0.40
M 3 ×0.5	1.4
M 4 ×0.7	3.2
M 5 ×0.8	6.4
M 6 ×1	10.9
M 8 ×1.25	26.1
M10 ×1.5	51.1
M12 ×1.75	88.2
M14 ×2	140
M16 ×2	215

Remark:
When fixing screws used on the table side and bed side are not identical, fasten them all to the smaller tightening torque.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Mounting

Mounting of standard type CRW series, CRWG series, and CRWG…H series

Typical mounting structure is shown in Fig. 14. For mounting at this point, generally follow the procedure below.

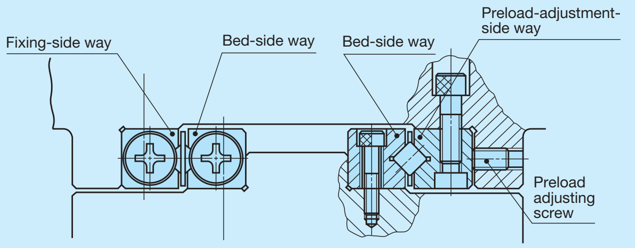


Fig. 14 Mounting example of standard type CRW series, CRWG, and CRWG…H

❶ Preparation for mounting

- Products are packed by set (4 ways and 2 pairs of roller cages). Be careful not to mix with other sets.
- Clean each part with clean wash fluid and then apply rust prevention and lubrication oil. To clean further, remove the end screw first.

❷ Cleanup of mounting surface

- Remove burrs and blemishes on the machine mounting surface with an oil-stone, etc. Be careful about corner groove on the mounting surface, too.
- Wipe off dust and dirt with clean cloth and apply rust prevention and lubrication oil lightly.

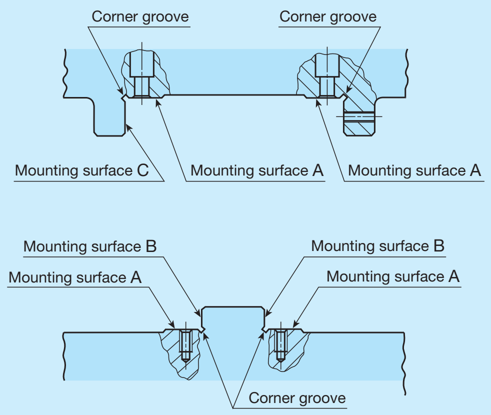


Fig. 15 Mounting surface

❸ Mounting of bed-side way

- Properly align the way with mounting surface and temporarily tighten fixing screws evenly to the tightening torque.
- While making the way sticking to B surface (refer to Fig. 15) tight, fully tighten the screws to the specified torque.
- When high running accuracy is required, fully and evenly tighten them to the specified torque while checking the parallelism of the raceway along the full length of the way.
- Typical tightening torque for fixing screw is according to Table 10 in page Ⅱ-20.

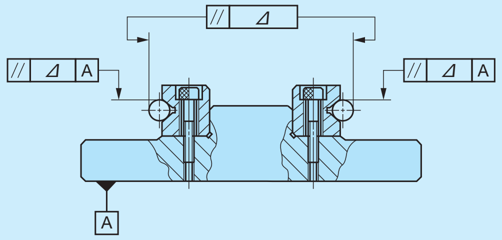


Fig. 16 Accuracy of way mounting

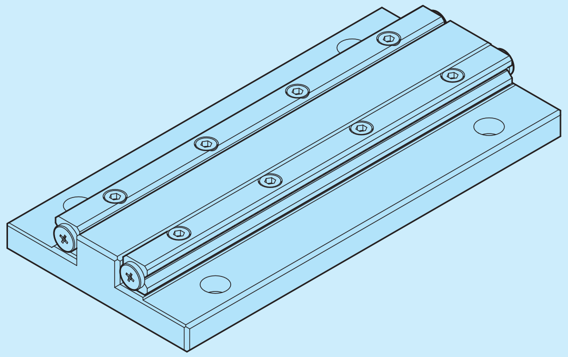


Fig. 17

❹ Operation of table and bed

- Position the roller cages at the stroke end positions of the bed-side way. (Refer to Fig. 18)
- For CRWG and CRWG…H series, mate the pinion gear at the center of the cage and the rack of the way.
- At this point, be careful not to deform the cage.

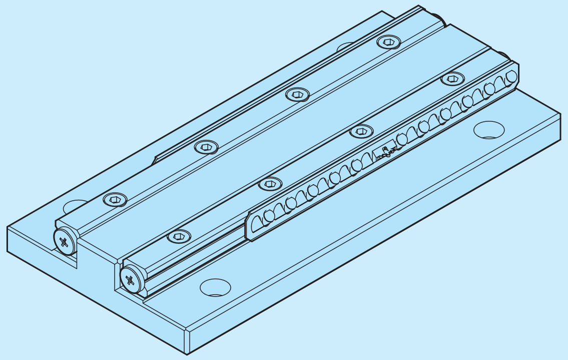


Fig. 18

- Position the table-side way in the stroke end position. (Refer to Fig. 19)
- For CRWG and CRWG…H series, mate the pinion gear at the center of the cage and the rack of the table-side way.

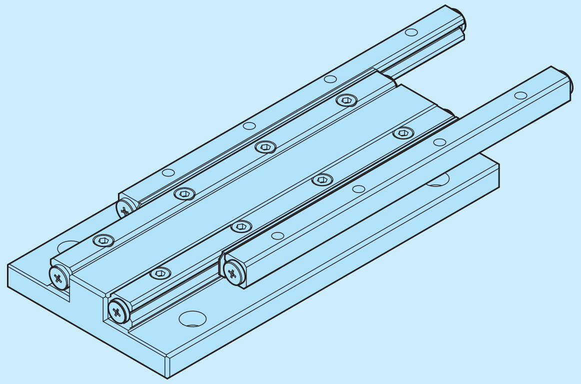


Fig. 19

- Position the table-side way approximately in the stroke center position. (Refer to Fig. 20)

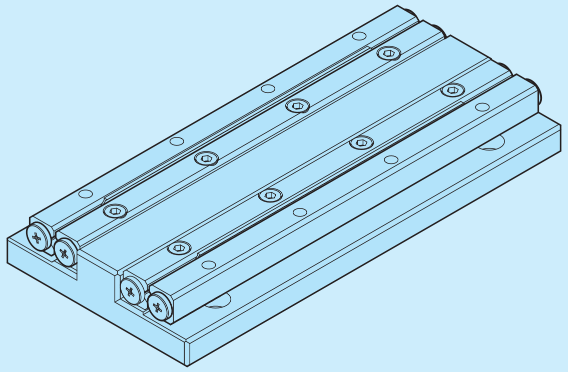


Fig. 20

- Position the table while holding the way to prevent it from moving. (Refer to Fig. 21)

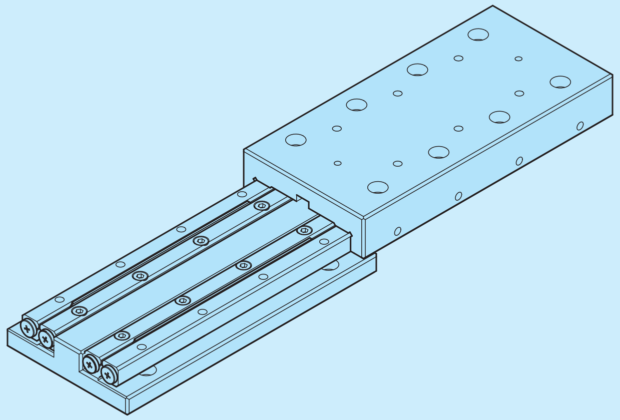


Fig. 21

- Temporarily tighten the table fixing screws. (Refer to Fig. 22)
- While tightly pressing the fixing-side way to C surface (refer to Fig. 15), fully tighten the screws to the specified torque.

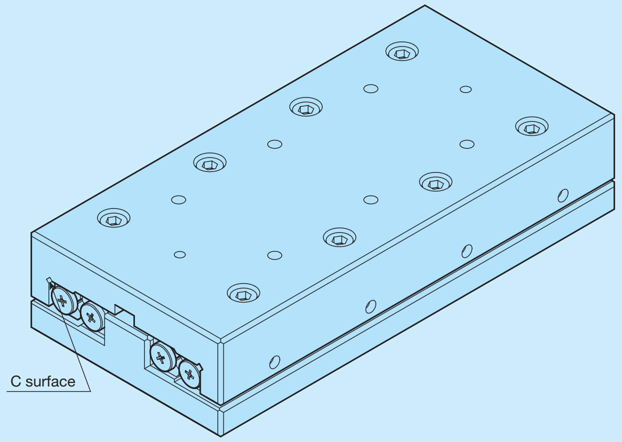


Fig. 22

- Fully stroke the table softly and check that it is within the stroke range used and cylindrical rollers on both ends of the cage do not contact with end screws of the way. If they make contact, take the procedure again. (Refer to Fig. 23)

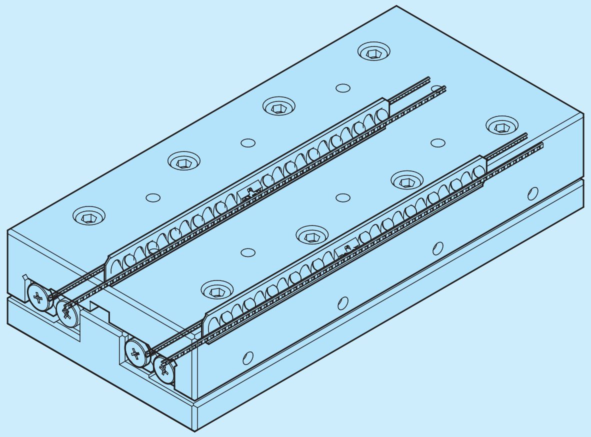


Fig. 23

❺ Preload adjustment

- Preload adjustment is performed with fixing screws of the table-side way tightened temporarily.
- Preload adjustment is started from the preload adjusting screw at the center of way length and then both ends in turn.
- While measuring the clearance on the table sides, tighten the preload adjusting screws subsequently until deflection of the dial gauge stops. Measure the tightening torque for preload adjusting screws at this point.
- When adjusting preload adjusting screw near either end, stroke the table softly and check that the cylindrical roller is on the preload adjusting screw section.
- After the above procedure, the clearance becomes zero or in slight preload state, but preload is still not adjusted evenly. With the same procedure again, re-adjust all the preload adjusting screws evenly to the torque previously measured.

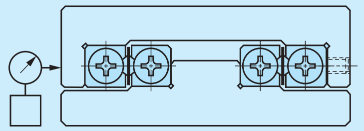


Fig. 24 Example of preload adjustment method

❻ Full tightening of preload-adjustment-side way

- Fixing screws are lightly tightened to even torque. As with preload adjusting screws, temporarily fix them to torque similar to the specified torque in turn from the way center to both ends.
- When tightening fixing screws near either end, stroke the table softly and check that the cylindrical roller is on fixing screw section.
- Finally with the same procedure, fully tighten all the fixing screws evenly to the specified torque.

❼ Check after assembly

- Fully stroke the table softly and check that running is smooth without abnormal noise.
- Measure the table upper and side surfaces with dial gauge or the like and check the running accuracy.

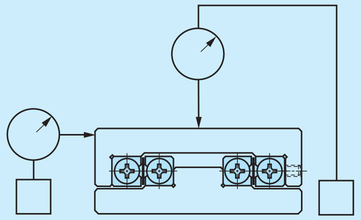


Fig. 25 Accuracy check after assembly

High-accuracy mounting of standard type CRW series

Typical mounting structure is shown in Fig. 26. For mounting at this point, generally follow the procedure below.

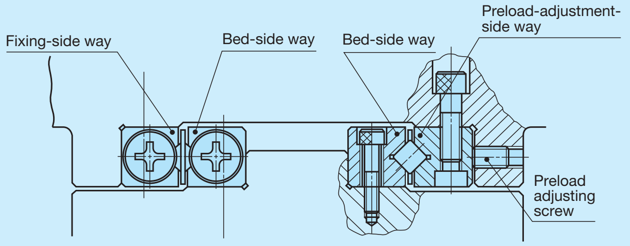


Fig. 26 Mounting example of standard type CRW series

❶ Preparation for mounting

- Products are packed by set (4 ways and 2 pairs of roller cages). Be careful not to mix with other sets.
- Clean each part with clean wash fluid and then apply rust prevention and lubrication oil. To clean further, remove the end screw first.

❷ Cleanup of mounting surface

- Remove burrs and blemishes on the machine mounting surface with an oil-stone, etc. Be careful about corner groove on the mounting surface, too.
- Wipe off dust and dirt with clean cloth and apply rust prevention and lubrication oil lightly.

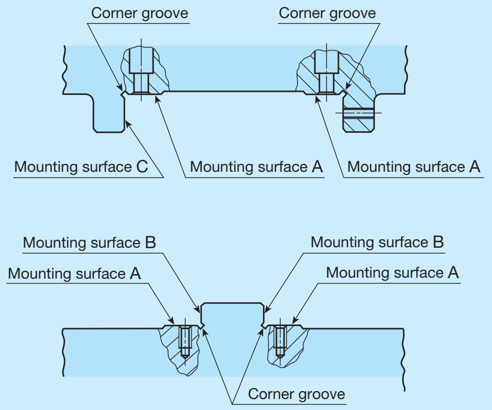


Fig. 27 Mounting surface

❸ Mounting of bed-side way

- Properly align the way with mounting surface and temporarily tighten fixing screws evenly to the tightening torque.
- While making the way sticking to B surface (refer to Fig. 27) tight, fully tighten the screws to the specified torque.
- When high running accuracy is required, fully and evenly tighten them to the specified torque while checking the parallelism of the raceway along the full length of the way.
- Typical tightening torque for fixing screw is according to Table 10 in page Ⅱ-20.

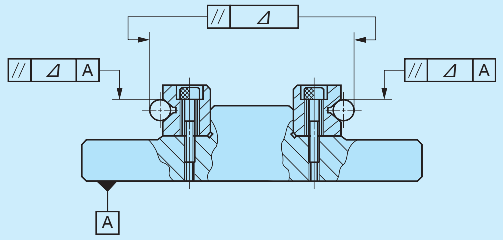


Fig. 28 Accuracy of way mounting

❹ Mounting of table-side way

- Properly align the fixing-side way with mounting surface and temporarily tighten fixing screws evenly to the tightening torque.
- While making the fixing-side way sticking to C surface tight, fully tighten the screws to the specified torque.
- Set back the preload adjusting screws in advance, make the preload-adjusting-side way sticking to the mounting surface, and then temporarily tighten fixing screws lightly to the even torque.

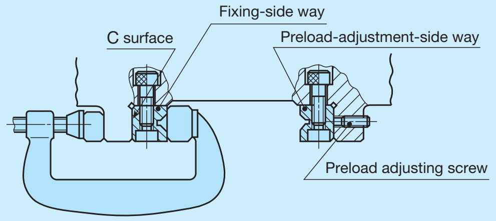


Fig. 29 Mounting of table-side way

❺ Operation of table and bed

- Make alignment of the position in height and cross direction so that the roller cage can be inserted between the table-side way and bed-side way.
- Carefully insert the roller cage and assembly it at approximate center of the way length. At this point, be careful not to deform the cage.
- Mount end screws and end stopper of each way.
- Push the entire table against the preload adjusting screws and tighten the preload adjusting screws to make temporary adjustment until the clearance between ways becomes zero.
- Fully stroke the table softly and correct the roller cage position to the center.

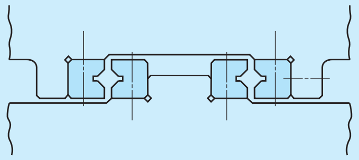


Fig. 30 Position alignment before operation

❻ Preload adjustment

- Preload adjustment is performed with fixing screws of the preload-adjusting-side way tightened temporarily.
- Preload adjustment is started from the preload adjusting screw at the center of way length and then both ends in turn.
- While measuring the clearance on the table sides, tighten the preload adjusting screws subsequently until deflection of the dial gauge stops. Measure the tightening torque for preload adjusting screws at this point.
- When adjusting preload adjusting screw near either end, stroke the table softly and check that the cylindrical roller is on the preload adjusting screw section.
- After the above procedure, the clearance becomes zero or in slight preload state, but preload is still not adjusted evenly. With the same procedure again, re-adjust all the preload adjusting screws evenly to the torque previously measured.

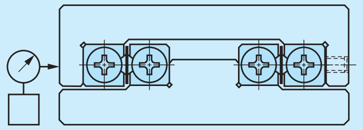


Fig. 31 Example of preload adjustment method

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

❼ Full tightening of preload-adjustment-side way

- Fixing screws are lightly tightened to even torque. As with preload adjusting screws, temporarily fix them to torque similar to the specified torque in turn from the way center to both ends.
- When tightening fixing screws near either end, stroke the table softly and check that the cylindrical roller is on fixing screw section.
- Finally with the same procedure, fully tighten all the fixing screws evenly to the specified torque.

❽ Check after assembly

- Fully stroke the table softly and check that running is smooth without abnormal noise.
- Measure the table upper and side surfaces with dial gauge or the like and check the running accuracy.

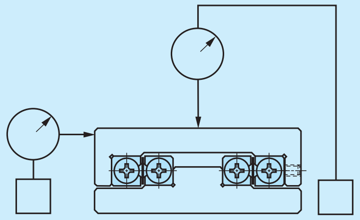


Fig. 32 Accuracy check after assembly

Mounting of module type CRW series

Typical mounting structure of CRWM is shown in Fig. 33. For mounting at this point, generally follow the procedure below.

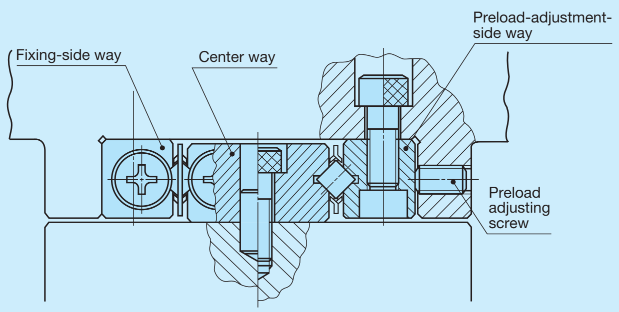


Fig. 33 Example of mounting of CRWM

❶ Preparation for mounting

- Crossed Roller Way CRWM is packed by set (1 center way, 2 ways and 2 pairs of roller cages). Be careful not to mix with other sets.
- Remove end screws and end stopper, clean up each part with clean wash fluid and then apply rust prevention and lubrication oil.

❷ Cleanup of mounting surface

- Remove burrs and blemishes on the machine mounting surface with an oil-stone, etc. Be careful about corner groove on the mounting surface, too.
- Rust prevention and lubrication oil should be applied after cleaning each part with clean wash fluid. Remove end screws and end stopper if additional cleaning is necessary.

❸ Mounting of center way

- Roughly align the center way to the mounting surface and lightly fix it with fixing screws.
- While measuring mounting parallelism of the center way and raceway to the reference surface of running parallelism for position correction, temporarily tighten the fixing screws to the even tightening torque.
- Evenly tighten all the fixing screws to the specified tightening torque.

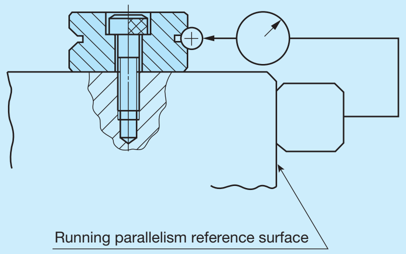


Fig. 34 Mounting accuracy check for center way

❹ Processing of dowel pin hole

- When dowel pins are used, machine holes on the bed in alignment with dowel pin holes near either end of the center way.
- Dowel pin hole of the center way is finished for H7. Finish bed holes in the same way.
- Diameter and its allowance of dowel pin hole of the center way vary depending on the dimension table.
- Eliminate cutting chips and clean up again as necessary. When machines for mounting of the center way are large, clean them up with the center way removed and then reassemble.
- Load the dowel pins and check the parallelism of the reference surface of the running parallelism and the raceway of the center way again.

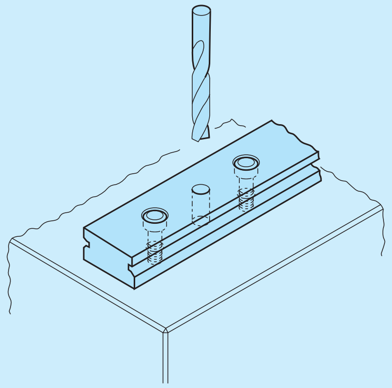


Fig. 35 Machining of dowel pin hole

❺ Operation of table and bed

- Complies with mounting of standard type CRW series, CRWG series, and CRWG…H series.

❻ Preload adjustment

- Complies with mounting of standard type CRW series, CRWG series, and CRWG…H series.

❼ Full tightening of preload-adjustment-side way

- Complies with mounting of standard type CRW series, CRWG series, and CRWG…H series.

❽ Check after assembly

- Complies with mounting of standard type CRW series, CRWG series, and CRWG…H series.

Mating marks module type CRW series

CRWM has mating marks to ensure the best running accuracy after mounting based on the parallelism measurement result of reference mounting surface and raceway. When assembling the ways, align the mating marks of ways with the same end side as indicated in Fig. 36.

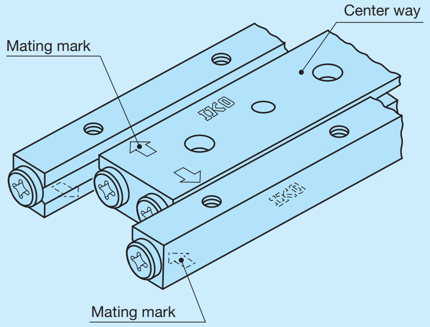
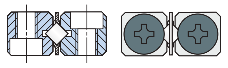
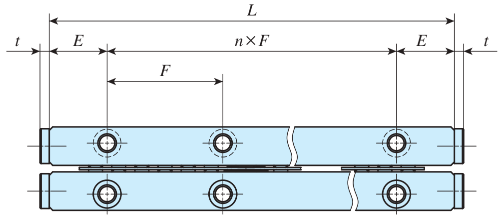
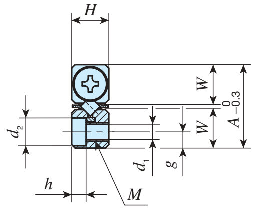


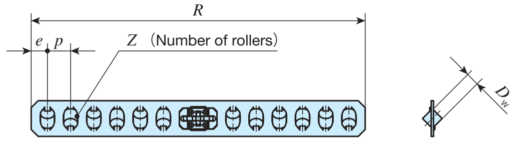
Fig. 36 Mating marks of CRWM

Anti-Creep Cage Crossed Roller Way

Shape	CRWG 		
Size	**2**	**3**	4	6





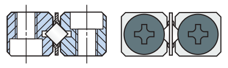


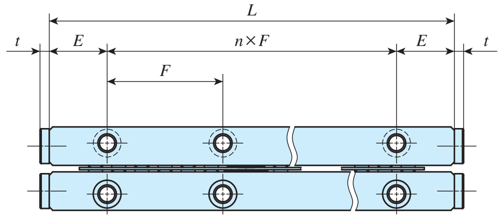
Identification number	Mass (Ref.)		Nominal dimensions mm																	Maximum stroke length	Basic dynamic load rating	Basic static load rating	Allowable load
	Way (1)	Roller cage (2)	Boundary dimensions				Dimension of roller cage					Mounting dimensions									C(3)	C_0(3)	F(3)
	g	g	A	H	$L(n×F)$	E	D_w	R	Z	p	e	W	g	M	d_1	d_2	h	t		mm	N	N	N
CRWG 2- 30	6.53	0.38	12	6	30(1×15)	7.5	2	25.6	4	4	2.8	5.5	2.5	M3	2.55	4.4	2	1.5		9	913	1 180	392
CRWG 2- 45	9.53	0.72			45(2×15)			41.6	8											7	1 570	2 350	783
CRWG 2- 60	12.5	0.88			60(3×15)			49.6	10											21	1 860	2 940	979
CRWG 2- 75	15.5	1.22			75(4×15)			65.6	14											19	2 420	4 110	1 370
CRWG 2- 90	18.5	1.39			90(5×15)			73.6	16											33	2 680	4 700	1 570
CRWG 2-105	21.5	1.72			105(6×15)			89.6	20											31	3 190	5 880	1 960
CRWG 2-120	24.5	1.89			120(7×15)			97.6	22											45	3 440	6 460	2 150
CRWG 2-135	27.5	2.22			135(8×15)			113.6	26											43	3 910	7 640	2 550
CRWG 2-150	30.5	2.39			150(9×15)			121.6	28											57	4 150	8 230	2 740
CRWG 3- 50	22.8	1.69	18	8	50(1×25)	12.5	3	42	6	5	3.5	8.3	3.5	M4	3.3	6	3.1	2		13	2 740	3 660	1 220
CRWG 3- 75	33.3	2.71			75(2×25)			62	10											23	4 080	6 090	2 030
CRWG 3-100	43.8	3.72			100(3×25)			82	14											33	5 300	8 530	2 840
CRWG 3-125	54.4	4.74			125(4×25)			102	18											43	6 440	11 000	3 660
CRWG 3-150	64.9	5.75			150(5×25)			122	22											53	7 530	13 400	4 470
CRWG 3-175	75.4	6.77			175(6×25)			142	26											63	8 570	15 800	5 280
CRWG 3-200	85.9	7.78			200(7×25)			162	30											73	9 580	18 300	6 090
CRWG 3-225	96.4	8.80			225(8×25)			182	34											83	10 600	20 700	6 910
CRWG 3-250	107	9.81			250(9×25)			202	38											93	11 500	23 200	7 720

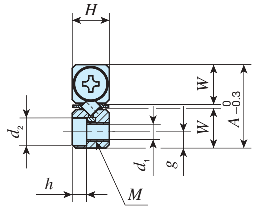
Notes (1) The value shows the mass of a piece of way.
(2) The value shows the mass of a roller cage.
(3) This is the value when a combination of four ways and two roller cages is used in parallel arrangement.

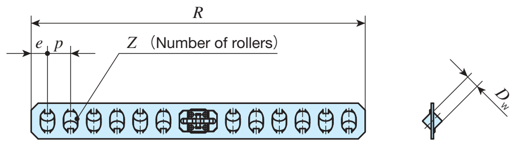
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO Anti-Creep Cage Crossed Roller Way

Shape	CRWG 			
Size	2	3	4	6





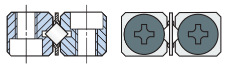


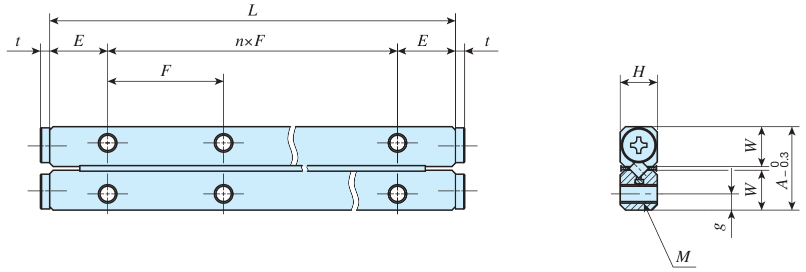
Identification number	Mass (Ref.)		Nominal dimensions mm																Maximum stroke length	Basic dynamic load rating	Basic static load rating	Allowable load
	Way (1)	Roller cage (2)	Boundary dimensions				Dimension of roller cage					Mounting dimensions								C(3)	C_0(3)	F(3)
	g	g	A	H	$L(n\times F)$	E	D_w	R	Z	p	e	W	g	M	d_1	d_2	h	t	mm	N	N	N
CRWG 4- 80	59.6	9.70	22	11	80(1×40)	20	4	73	8	7	5	10	4.5	M5	4.3	7.5	4.1	2	14	6 690	9 400	3 130
CRWG 4-120	88.0	12.0			120(2×40)			101	12										38	9 180	14 100	4 700
CRWG 4-160	116	14.3			160(3×40)			129	16										62	11 500	18 800	6 270
CRWG 4-200	145	16.7			200(4×40)			157	20										86	13 700	23 500	7 830
CRWG 4-240	173	20.1			240(5×40)			199	26										82	16 700	30 600	10 200
CRWG 4-280	201	22.5			280(6×40)			227	30										106	18 700	35 300	11 800
CRWG 4-320	230	24.8			320(7×40)			255	34										130	20 600	40 000	13 300
CRWG 6-100	147	12.0	31	15	100(1×50)	25	6	75	6	9	6	14	6	M6	5.3	9.5	5.2	3	48	11 200	13 800	4 610
CRWG 6-150	216	22.6			150(2×50)			129	12										40	19 300	27 700	9 230
CRWG 6-200	285	29.7			200(3×50)			165	16										68	24 100	36 900	12 300
CRWG 6-250	353	36.8			250(4×50)			201	20										96	28 700	46 100	15 400
CRWG 6-300	422	43.9			300(5×50)			237	24										124	33 000	55 400	18 500
CRWG 6-350	491	51.0			350(6×50)			273	28										150	37 200	64 600	21 500

Notes (1) The value shows the mass of a piece of way.
(2) The value shows the mass of a roller cage.
(3) This is the value when a combination of four ways and two roller cages is used in parallel arrangement.

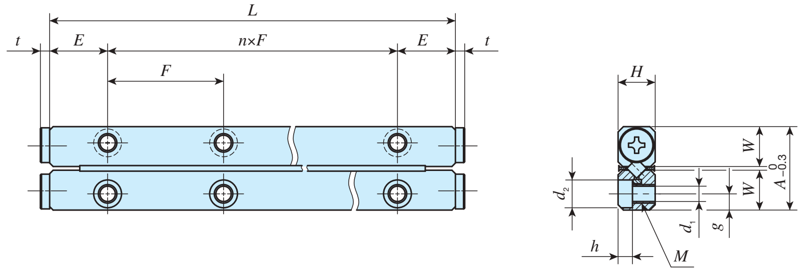
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO Anti-Creep Cage Crossed Roller Way H

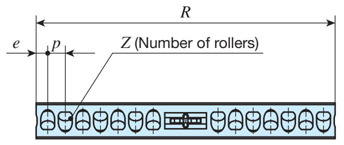
	CRWG…H			
Shape				
Size	1	2	3	4

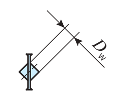


CRWG 1…H



CRWG…H



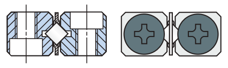


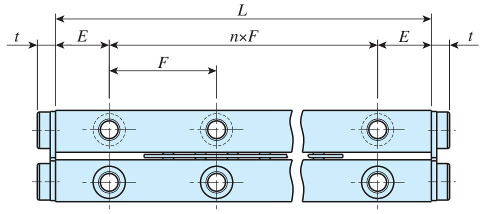
Identification number	Mass (Ref.)		Nominal dimensions mm																Maximum stroke length	Basic dynamic load rating	Basic static load rating	Allowable load
	Way (1)	Roller cage (2)	Boundary dimensions				Dimension of roller cage					Mounting dimensions								C (3)	C_0 (3)	F (3)
	g	g	A	H	$L(n \times F)$	E	D_w	R	Z	p	e	W	g	M	d_1	d_2	h	t	mm	N	N	N
CRWG 1- 20H	2.05	0.16	8.5	4	20(1×10)	5	1.5	16.5	6	2	1.25	3.9	1.7	M1.6	–	–	–	0.7	3	525	717	239
CRWG 1- 30H	3.07	0.25			30(2×10)			24.5	10										7	782	1 200	398
CRWG 1- 40H	4.10	0.30			40(3×10)			28.5	12										19	901	1 430	478
CRWG 1- 50H	5.13	0.39			50(4×10)			36.5	16										23	1 130	1 910	638
CRWG 1- 60H	6.15	0.44			60(5×10)			40.5	18										35	1 230	2 150	717
CRWG 1- 70H	7.18	0.53			70(6×10)			48.5	22										39	1 440	2 630	877
CRWG 1- 80H	8.21	0.67			80(7×10)			61.5	28		1.75								35	1 740	3 350	1 120
CRWG 2- 30H	6.53	0.40	12	6	30(1×15)	7.5	2	21.7	6	2.5	1.6	5.5	2.5	M3	2.55	4.4	2	1.5	12	1 090	1 500	500
CRWG 2- 45H	9.53	0.73			45(2×15)			36.7	12										12	1 860	3 000	1 000
CRWG 2- 60H	12.5	0.95			60(3×15)			46.7	16										22	2 330	4 000	1 330
CRWG 2- 75H	15.5	1.27			75(4×15)			61.7	22										22	2 980	5 500	1 830
CRWG 2- 90H	18.5	1.38			90(5×15)			66.7	24										42	3 190	6 000	2 000
CRWG 2-105H	21.5	1.71			105(6×15)			81.7	30										42	3 790	7 500	2 500
CRWG 2-120H	24.5	1.93			120(7×15)			91.7	34										52	4 180	8 500	2 830
CRWG 2-135H	27.5	2.26			135(8×15)			106.7	40										52	4 740	10 000	3 330
CRWG 2-150H	30.5	2.48			150(9×15)			117.5	44		2								62	5 100	11 000	3 670
CRWG 3- 50H	22.8	1.58	18	8	50(1×25)	12.5	3	41.8	8	3.8	2.5	8.6	3.5	M4	3.3	6	3.1	2	9	4 260	6 490	2 160
CRWG 3- 75H	33.7	2.28			75(2×25)			57	12										29	5 840	9 730	3 240
CRWG 3-100H	44.7	3.33			100(3×25)			79.8	18										33	8 000	14 600	4 870
CRWG 3-125H	55.7	4.02			125(4×25)			95	22										53	9 350	17 800	5 950
CRWG 3-150H	66.7	5.07			150(5×25)			117.8	28										57	11 300	22 700	7 570
CRWG 3-175H	77.6	5.69			175(6×25)			133	32										77	12 500	26 000	8 650
CRWG 3-200H	88.6	6.81			200(7×25)			155.8	38										81	14 300	30 800	10 300
CRWG 3-225H	99.6	7.85			225(8×25)			178.6	44										86	16 000	35 700	11 900
CRWG 3-250H	111	8.55			250(9×25)			193.8	48										105	17 100	38 900	13 000
CRWG 4- 80H	61.4	4.35	22	11	80(1×40)	20	4	59.4	10	4.8	3	10.6	4.5	M5	4.3	7.5	4.1	2	33	10 500	17 100	5 690
CRWG 4-120H	92.7	6.80			120(2×40)			88.2	16										55	15 200	27 300	9 100
CRWG 4-160H	124	9.25			160(3×40)			117	22										78	19 500	37 500	12 500
CRWG 4-200H	155	11.7			200(4×40)			145.8	28										100	23 500	47 800	15 900
CRWG 4-240H	186	15.0			240(5×40)			184.2	36										103	28 600	61 400	20 500
CRWG 4-280H	218	17.4			280(6×40)			213	42										126	32 200	71 700	23 900
CRWG 4-320H	249	19.9			320(7×40)			241.8	48										148	35 700	81 900	27 300

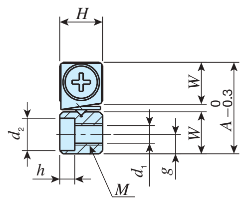
Notes (1) The value shows the mass of a piece of way.
(2) The value shows the mass of a roller cage.
(3) This is the value when a combination of four ways and two roller cages is used in parallel arrangement.

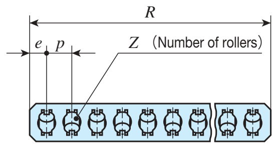
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

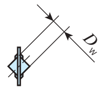
IKO Crossed Roller Way

Standard type					
Shape	CRW CRW···SL 				
Size	**1**	2	3	4	6
	9	12	15	18	24





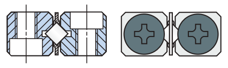


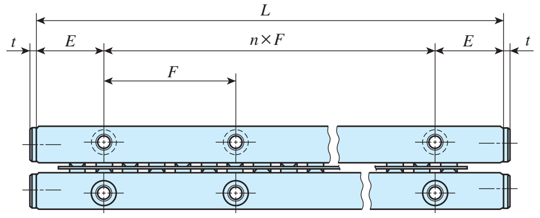


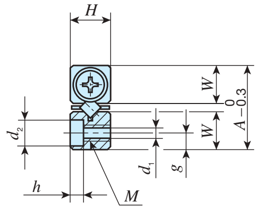
Identification number	Mass (Ref.)		Nominal dimensions mm																	Basic dynamic load rating	Basic static load rating	Allowable load
			Boundary dimensions				Dimension of roller cage						Mounting dimensions									
	Way (1)	Roller cage (2)	A	H	$L(n\times F)$	E	D_w	R		Z	p	e	W	g	M	d_1	d_2	h	t	C_u(3)	C_{0u}(3)	F_u(3)
	kg/m	g																		N	N	N
CRW 1- 20	0.12	0.38	8.5	4	20（1×10）	5	1.5	16.5		5	3	2.25	3.9	1.8	M2	1.65	3	1.4	1.7	125	120	39.8
CRW 1- 20 SL																						
CRW 1- 30					30（2×10）			25.5		8												
CRW 1- 30 SL																						
CRW 1- 40					40（3×10）			31.5		10												
CRW 1- 40 SL																						
CRW 1- 50					50（4×10）			37.5		12												
CRW 1- 50 SL																						
CRW 1- 60					60（5×10）			43.5		14												
CRW 1- 60 SL																						
CRW 1- 70					70（6×10）			52.5		17												
CRW 1- 70 SL																						
CRW 1- 80					80（7×10）			61.5		20												
CRW 1- 80 SL																						

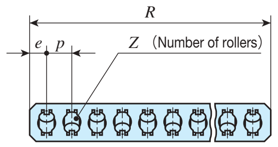
Notes (1) The value shows the mass per meter of a way.
(2) The value shows the mass of a roller cage with ten cylindrical rollers.
(3) The value shows the load of a cylindrical roller.

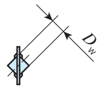
IKO Crossed Roller Way

Standard type					
Shape	**CRW** **CRW…SL** 				
Size	1	**2**	3	4	6
	9	12	15	18	24





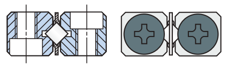


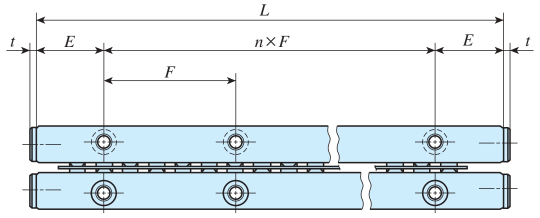


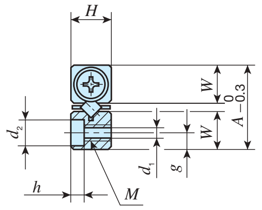
Identification number	Mass (Ref.)		Nominal dimensions mm																	Basic dynamic load rating	Basic static load rating	Allowable load
			Boundary dimensions				Dimension of roller cage						Mounting dimensions									
	Way (1)	Roller cage (2)	A	H	$L(n\times F)$	E	D_w	R		Z	p	e	W	g	M	d_1	d_2	h	t	C_u (3)	C_{0u} (3)	F_u (3)
	kg/m	g																		N	N	N
CRW 2- 30	0.24	0.98	12	6	30（ 1×15）	7.5	2	29.6		7	4	2.8	5.5	2.5	M3	2.55	4.4	2	1.5	293	294	97.9
CRW 2- 30 SL																						
CRW 2- 45					45（ 2×15）			41.6		10												
CRW 2- 45 SL																						
CRW 2- 60					60（ 3×15）			53.6		13												
CRW 2- 60 SL																						
CRW 2- 75					75（ 4×15）			65.6		16												
CRW 2- 75 SL																						
CRW 2- 90					90（ 5×15）			77.6		19												
CRW 2- 90 SL																						
CRW 2-105					105（ 6×15）			89.6		22												
CRW 2-105 SL																						
CRW 2-120					120（ 7×15）			101.6		25												
CRW 2-120 SL																						
CRW 2-135					135（ 8×15）			113.6		28												
CRW 2-135 SL																						
CRW 2-150					150（ 9×15）			125.6		31												
CRW 2-150 SL																						
CRW 2-165					165（10×15）			137.6		34												
CRW 2-165 SL																						
CRW 2-180					180（11×15）			149.6		37												
CRW 2-180 SL																						

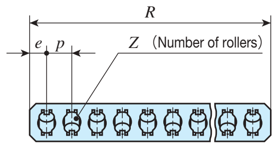
Notes (1) The value shows the mass per meter of a way.
(2) The value shows the mass of a roller cage with ten cylindrical rollers.
(3) The value shows the load of a cylindrical roller.

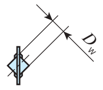
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Standard type					
Shape	CRW CRW···SL 				
Size	1	2	**3**	4	6
	9	12	15	18	24







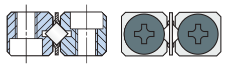


Identification number	Mass (Ref.)		Nominal dimensions mm																	Basic dynamic load rating	Basic static load rating	Allowable load
	Way (1)	Roller cage (2)	Boundary dimensions				Dimension of roller cage						Mounting dimensions							C_u (3)	C_{0u} (3)	F_u (3)
			A	H	$L(n\times F)$	E	D_w	R		Z	p	e	W	g	M	d_1	d_2	h	t			
	kg/m	g																		N	N	N
CRW 3- 50	0.50	2.96	18	8	50 (1×25)	12.5	3	42		8	5	3.5	8.3	3.5	M4	3.3	6	3.1	2	638	609	203
CRW 3- 50 SL																						
CRW 3- 75					75 (2×25)			62		12												
CRW 3- 75 SL																						
CRW 3-100					100 (3×25)			82		16												
CRW 3-100 SL																						
CRW 3-125					125 (4×25)			102		20												
CRW 3-125 SL																						
CRW 3-150					150 (5×25)			122		24												
CRW 3-150 SL																						
CRW 3-175					175 (6×25)			142		28												
CRW 3-175 SL																						
CRW 3-200					200 (7×25)			162		32												
CRW 3-200 SL																						
CRW 3-225					225 (8×25)			182		36												
CRW 3-225 SL																						
CRW 3-250					250 (9×25)			202		40												
CRW 3-250 SL																						
CRW 3-275					275 (10×25)			222		44												
CRW 3-275 SL																						
CRW 3-300					300 (11×25)			242		48												
CRW 3-300 SL																						

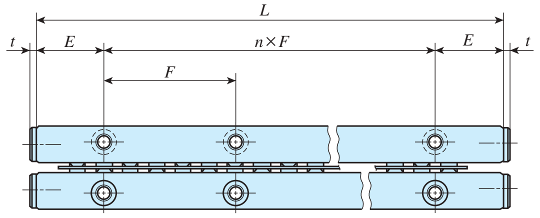
Notes (1) The value shows the mass per meter of a way.
(2) The value shows the mass of a roller cage with ten cylindrical rollers.
(3) The value shows the load of a cylindrical roller.

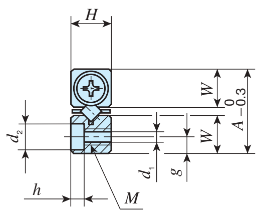
IKO Crossed Roller Way

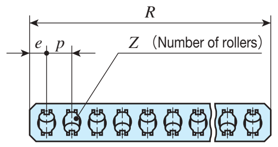
Standard type	
Shape	**CRW** **CRW···SL**

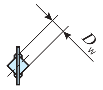


Size	1	2	3	**4**	6
	9	12	15	18	24





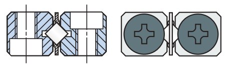


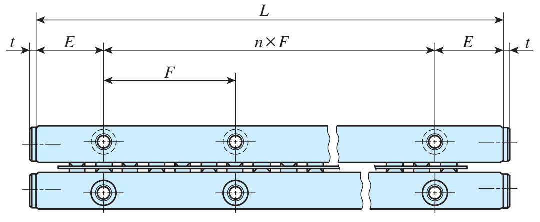


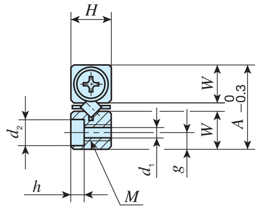
Identification number	Mass (Ref.)		Nominal dimensions mm																Basic dynamic load rating	Basic static load rating	Allowable load
			Boundary dimensions				Dimension of roller cage					Mounting dimensions									
	Way (1)	Roller cage (2)	A	H	$L(n\times F)$	E	D_w	R	Z	p	e	W	g	M	d_1	d_2	h	t	C_u (3)	C_{0u} (3)	F_u (3)
	kg/m	g																	N	N	N
CRW 4- 80	0.82	6.91	22	11	80 (1×40)	20	4	73	10	7	5	10	4.5	M5	4.3	7.5	4.1	2	1 230	1 180	392
CRW 4- 80 SL																					
CRW 4-120					120 (2×40)			101	14												
CRW 4-120 SL																					
CRW 4-160					160 (3×40)			136	19												
CRW 4-160 SL																					
CRW 4-200					200 (4×40)			164	23												
CRW 4-200 SL																					
CRW 4-240					240 (5×40)			199	28												
CRW 4-240 SL																					
CRW 4-280					280 (6×40)			227	32												
CRW 4-280 SL																					
CRW 4-320					320 (7×40)			262	37												
CRW 4-320 SL																					
CRW 4-360					360 (8×40)			297	42												
CRW 4-360 SL																					
CRW 4-400					400 (9×40)			325	46												
CRW 4-400 SL																					
CRW 4-440					440 (10×40)			360	51												
CRW 4-440 SL																					
CRW 4-480					480 (11×40)			388	55												
CRW 4-480 SL																					

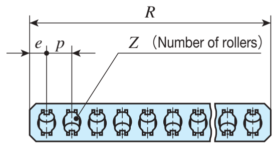
Notes (1) The value shows the mass per meter of a way.
(2) The value shows the mass of a roller cage with ten cylindrical rollers.
(3) The value shows the load of a cylindrical roller.

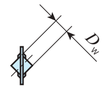
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Standard type					
Shape	**CRW** **CRW…SL** 				
Size	1	2	3	4	6
	9	12	15	18	24





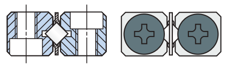


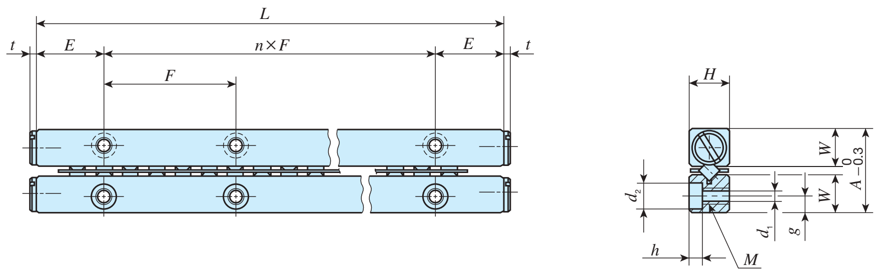


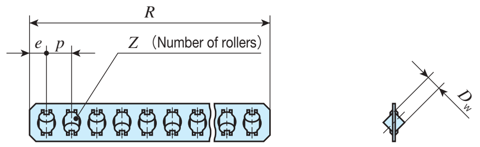
Identification number	Mass (Ref.)		Nominal dimensions mm																	Basic dynamic load rating	Basic static load rating	Allowable load
	Way (1) kg/m	Roller cage (2) g	Boundary dimensions				Dimension of roller cage						Mounting dimensions							C_u (3) N	C_{0u} (3) N	F_u (3) N
			A	H	$L(n\times F)$	E	D_w	R		Z	p	e	W	g	M	d_1	d_2	h	t			
CRW 6-100	1.57	20.3	31	15	100 (1×50)	25	6	84		9	9	6	14	6	M6	5.3	9.5	5.2	3	2 570	2 310	769
CRW 6-100 SL																						
CRW 6-150					150 (2×50)			129		14												
CRW 6-150 SL																						
CRW 6-200					200 (3×50)			165		18												
CRW 6-200 SL																						
CRW 6-250					250 (4×50)			210		23												
CRW 6-250 SL																						
CRW 6-300					300 (5×50)			246		27												
CRW 6-300 SL																						
CRW 6-350					350 (6×50)			282		31												
CRW 6-350 SL																						
CRW 6-400					400 (7×50)			327		36												
CRW 6-400 SL																						
CRW 6-450					450 (8×50)			363		40												
CRW 6-450 SL																						
CRW 6-500					500 (9×50)			408		45												
CRW 6-500 SL																						
CRW 6-550					550 (10×50)			444		49												
CRW 6-550 SL																						
CRW 6-600					600 (11×50)			489		54												
CRW 6-600 SL																						

Notes (1) The value shows the mass per meter of a way.
(2) The value shows the mass of a roller cage with ten cylindrical rollers.
(3) The value shows the load of a cylindrical roller.

Standard type

Shape	**CRW** 
Size	1 2 3 4 6 **9** **12** 15 18 24



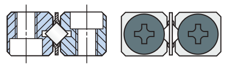


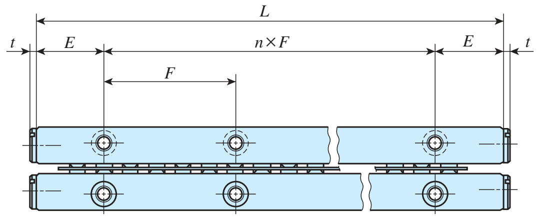
Identification number	Mass (Ref.)		Nominal dimensions mm																	Basic dynamic load rating	Basic static load rating	Allowable load
			Boundary dimensions				Dimension of roller cage						Mounting dimensions									
	Way (1) kg/m	Roller cage (2) g	A	H	$L(n\times F)$	E	D_W	R		Z	p	e	W	g	M	d_1	d_2	h	t	C_U(3) N	C_{0U}(3) N	F_U(3) N
CRW 9- 200	3.3	64.8	44	22	200 (1×100)	50	9	173		12	14	9.5	20.2	9	M 8	6.8	10.5	6.2	3	7 190	6 600	2 200
CRW 9- 300					300 (2×100)			257		18												
CRW 9- 400					400 (3×100)			327		23												
CRW 9- 500					500 (4×100)			411		29												
CRW 9- 600					600 (5×100)			495		35												
CRW 9- 700					700 (6×100)			565		40												
CRW 9- 800					800 (7×100)			649		46												
CRW 9- 900					900 (8×100)			733		52												
CRW 9-1000					1 000 (9×100)			817		58												
CRW 9-1100					1 100 (10×100)			887		63												
CRW 9-1200					1 200 (11×100)			971		69												
CRW 12- 200	5.57	146	58	28	200 (1×100)	50	12	168		9	18	12	26.9	12	M10	8.5	13.5	8.2	3	14 700	13 600	4 540
CRW 12- 300					300 (2×100)			258		14												
CRW 12- 400					400 (3×100)			330		18												
CRW 12- 500					500 (4×100)			420		23												
CRW 12- 600					600 (5×100)			492		27												
CRW 12- 700					700 (6×100)			564		31												
CRW 12- 800					800 (7×100)			654		36												
CRW 12- 900					900 (8×100)			726		40												
CRW 12-1000					1 000 (9×100)			816		45												
CRW 12-1100					1 100 (10×100)			888		49												
CRW 12-1200					1 200 (11×100)			978		54												

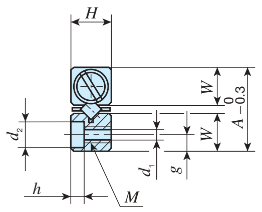
Notes (1) The value shows the mass per meter of a way.
(2) The value shows the mass of a roller cage with ten cylindrical rollers.
(3) The value shows the load of a cylindrical roller.

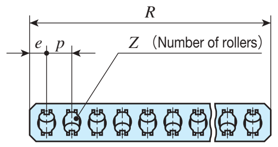
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

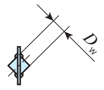
Standard type

Shape	**CRW** 
Size	1 / 9, 2 / 12, **3 / 15**, **4 / 18**, 6 / 24





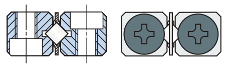


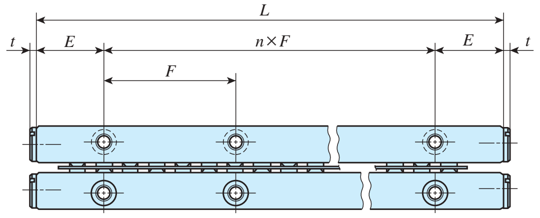


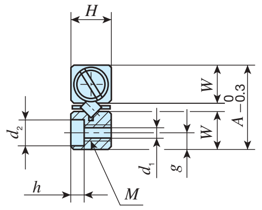
Identification number	Mass (Ref.)		Nominal dimensions mm																	Basic dynamic load rating	Basic static load rating	Allowable load
	Way (1)	Roller cage (2)	Boundary dimensions				Dimension of roller cage						Mounting dimensions									
			A	H	L(n×F)	E	D_w	R		Z	p	e	W	g	M	d_1	d_2	h	t	C_u(3)	C_{0u}(3)	F_u(3)
	kg/m	g																		N	N	N
CRW 15- 300*	8.75	273	71	36	300 (2×100)	50	15	261		11	23	15.5	33	14	M12	10.5	16.5	10.2	5	23 800	21 900	7 300
CRW 15- 400*					400 (3×100)			330		14												
CRW 15- 500*					500 (4×100)			422		18												
CRW 15- 600*					600 (5×100)			491		21												
CRW 15- 700*					700 (6×100)			583		25												
CRW 15- 800*					800 (7×100)			652		28												
CRW 15- 900*					900 (8×100)			744		32												
CRW 15-1000*					1 000 (9×100)			813		35												
CRW 15-1100*					1 100 (10×100)			905		39												
CRW 15-1200*					1 200 (11×100)			974		42												
CRW 18- 300*	11.3	447	83	40	300 (2×100)	50	18	262		9	28	19	38.5	18	M14	12.5	18.5	12.2	5	35 800	32 700	10 900
CRW 18- 400*					400 (3×100)			346		12												
CRW 18- 500*					500 (4×100)			430		15												
CRW 18- 600*					600 (5×100)			514		18												
CRW 18- 700*					700 (6×100)			570		20												
CRW 18- 800*					800 (7×100)			654		23												
CRW 18- 900*					900 (8×100)			738		26												
CRW 18-1000*					1 000 (9×100)			822		29												
CRW 18-1100*					1 100 (10×100)			906		32												
CRW 18-1200*					1 200 (11×100)			990		35												

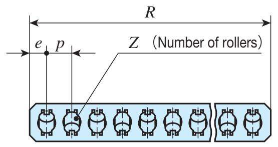
Notes (1) The value shows the mass per meter of a way.
(2) The value shows the mass of a roller cage with ten cylindrical rollers.
(3) The value shows the load of a cylindrical roller.
Remark: The identification numbers with * are our semi-standard items.

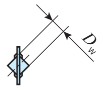
IKO Crossed Roller Way

Standard type					
Shape	CRW 				
Size	1	2	3	4	6
	9	12	15	18	**24**









Identification number	Mass (Ref.)		Nominal dimensions mm																	Basic dynamic load rating	Basic static load rating	Allowable load
			Boundary dimensions				Dimension of roller cage						Mounting dimensions									
	Way (1)	Roller cage (2)	A	H	$L(n\times F)$	E	D_w	R		Z	p	e	W	g	M	d_1	d_2	h	t	C_u (3)	C_{0u} (3)	F_u (3)
	kg/m	g																		N	N	N
CRW 24- 400*	20.6	1 060	110	55	400 (3×100)	50	24	336		9	36	24	51.5	24	M16	14.5	22.5	14.2	5	69 600	63 500	21 200
CRW 24- 500*					500 (4×100)			408		11												
CRW 24- 600*					600 (5×100)			516		14												
CRW 24- 700*					700 (6×100)			588		16												
CRW 24- 800*					800 (7×100)			660		18												
CRW 24- 900*					900 (8×100)			732		20												
CRW 24-1000*					1 000 (9×100)			840		23												
CRW 24-1100*					1 100 (10×100)			912		25												
CRW 24-1200*					1 200 (11×100)			984		27												

Notes (1) The value shows the mass per meter of a way.
(2) The value shows the mass of a roller cage with ten cylindrical rollers.
(3) The value shows the load of a cylindrical roller.

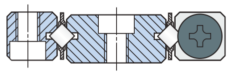
Remark: The identification numbers with * are our semi-standard items.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

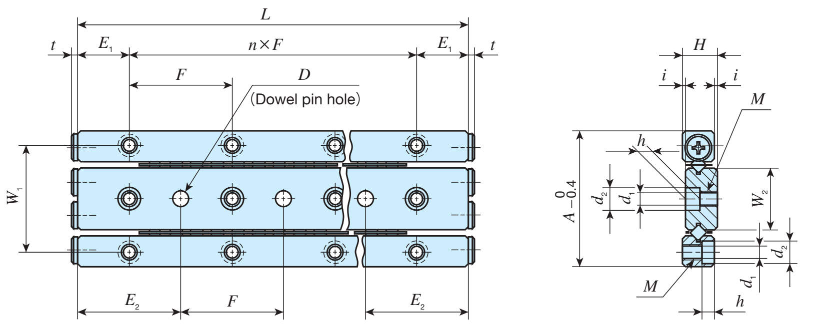
Module type

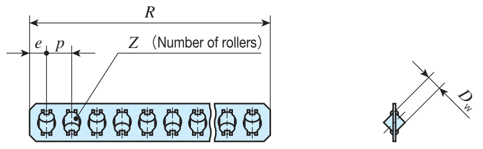
CRWM

Shape



Size **1** **2** 3 4

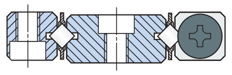


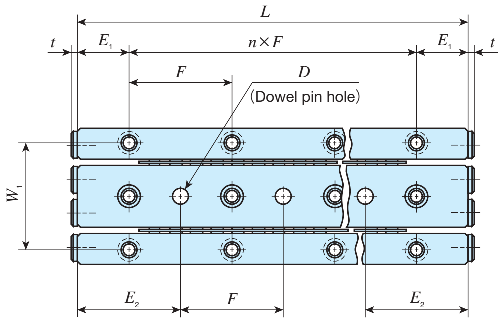


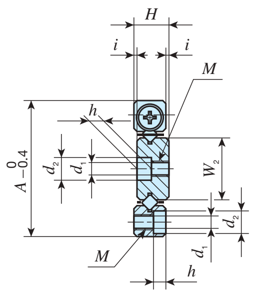
Identification number	Mass (Ref.)		Nominal dimensions and tolerances mm																					Basic dynamic load rating	Basic static load rating	Allowable load
			Boundary dimensions				Dimension of roller cage				Mounting dimensions															
	Way (1)	Roller cage (2)	A	H	$L(n\times F)$	i	D_W	R	Z		p	e	W_1	W_2	E_1	E_2	M	d_1	d_2	h	D	Dim. D tolerance	t	C_U (3)	C_{0U} (3)	F_U (3)
	kg/m	g																						N	N	N
CRWM 1- 20	0.49	0.38	17	4.5	20 (1×10)	0.5	1.5	16.5	5		3	2.25	13.4	7.8	5	10	M2	1.65	3	1.4	2	$^{+0.010}_{0}$	1.7	125	120	39.8
CRWM 1- 30					30 (2×10)			25.5	8																	
CRWM 1- 40					40 (3×10)			31.5	10																	
CRWM 1- 50					50 (4×10)			37.5	12																	
CRWM 1- 60					60 (5×10)			43.5	14																	
CRWM 1- 70					70 (6×10)			52.5	17																	
CRWM 1- 80					80 (7×10)			61.5	20																	
CRWM 2- 30	0.99	0.98	24	6.5	30 (1×15)	0.5	2	29.6	7		4	2.8	19	11	7.5	15	M3	2.55	4.4	2	3	$^{+0.010}_{0}$	1.5	293	294	97.9
CRWM 2- 45					45 (2×15)			41.6	10																	
CRWM 2- 60					60 (3×15)			53.6	13																	
CRWM 2- 75					75 (4×15)			65.6	16																	
CRWM 2- 90					90 (5×15)			77.6	19																	
CRWM 2-105					105 (6×15)			89.6	22																	
CRWM 2-120					120 (7×15)			101.6	25																	
CRWM 2-135					135 (8×15)			113.6	28																	
CRWM 2-150					150 (9×15)			125.6	31																	
CRWM 2-165					165 (10×15)			137.6	34																	
CRWM 2-180					180 (11×15)			149.6	37																	

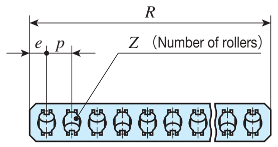
Notes (1) The value shows the total mass per meter of a set of three ways.
(2) The value shows the mass of a roller cage with ten cylindrical rollers.
(3) The value shows the load of a cylindrical roller.

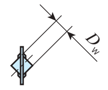
Module type

Shape	**CRWM** 			
Size	1	2	**3**	**4**







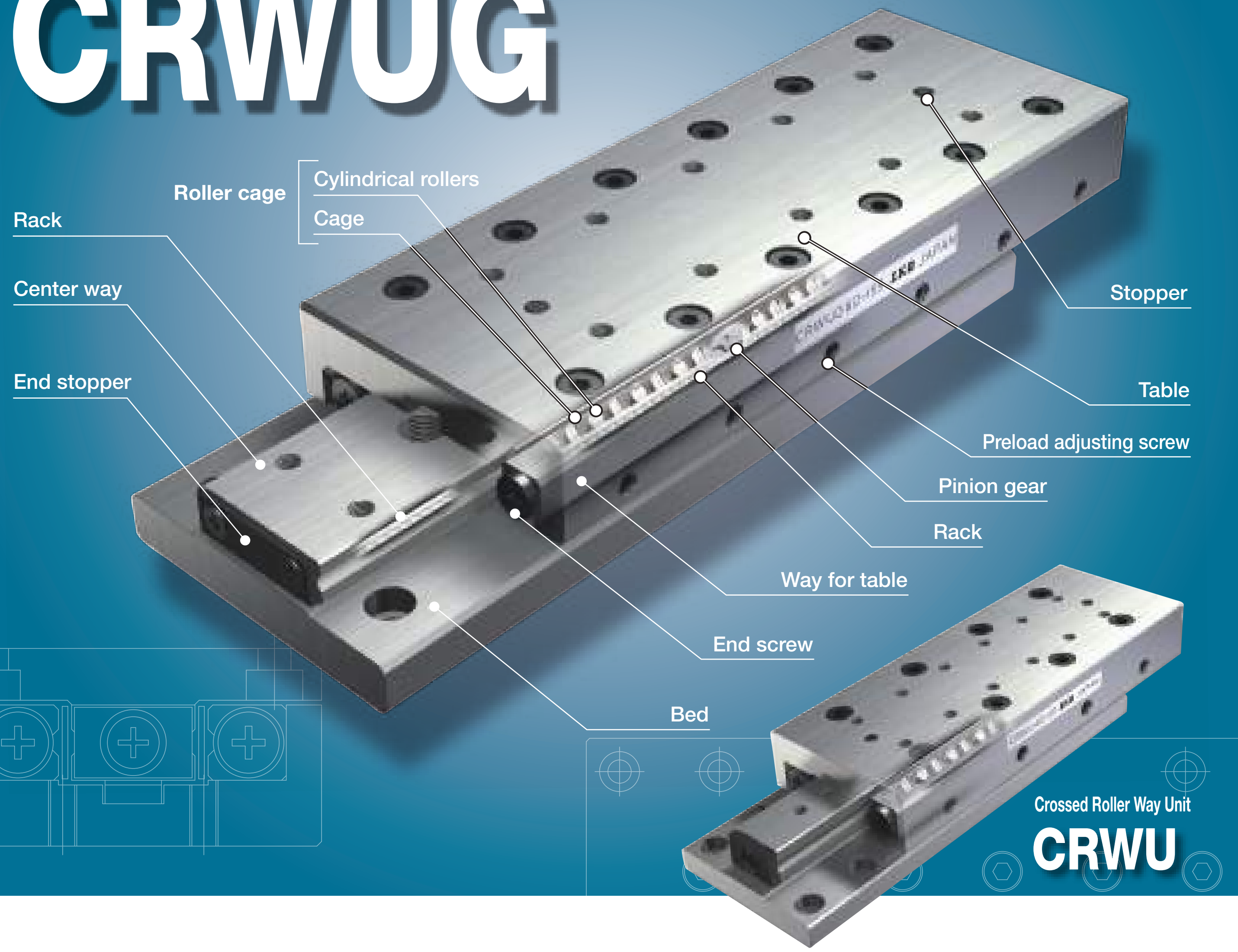


Identification number	Mass (Ref.)		Nominal dimensions and tolerances mm																					Basic dynamic load rating	Basic static load rating	Allowable load
	Way (1) kg/m	Roller cage (2) g	Boundary dimensions				Dimension of roller cage			Mounting dimensions														C_u (3) N	C_{0u} (3) N	F_u (3) N
			A	H	$L(n\times F)$	i	D_w	R	Z	p	e	W_1	W_2	E_1	E_2	M	d_1	d_2	h	D	Dim. D tolerance	t				
CRWM 3- 50	1.99	2.96	36	8.5	50 (1×25)	0.5	3	42	8	5	3.5	29	16.6	12.5	25	M4	3.3	6	3.1	4	+0.012 0	2	638	609	203
CRWM 3- 75					75 (2×25)			62	12																
CRWM 3-100					100 (3×25)			82	16																
CRWM 3-125					125 (4×25)			102	20																
CRWM 3-150					150 (5×25)			122	24																
CRWM 3-175					175 (6×25)			142	28																
CRWM 3-200					200 (7×25)			162	32																
CRWM 3-225					225 (8×25)			182	36																
CRWM 3-250					250 (9×25)			202	40																
CRWM 3-275					275 (10×25)			222	44																
CRWM 3-300					300 (11×25)			242	48																
CRWM 4- 80	3.28	6.91	44	11.5	80 (1×40)	0.5	4	73	10	7	5	35	20	20	40	M5	4.3	7.5	4.1	5	+0.012 0	2	1 230	1 180	392
CRWM 4-120					120 (2×40)			101	14																
CRWM 4-160					160 (3×40)			136	19																
CRWM 4-200					200 (4×40)			164	23																
CRWM 4-240					240 (5×40)			199	28																
CRWM 4-280					280 (6×40)			227	32																
CRWM 4-320					320 (7×40)			262	37																
CRWM 4-360					360 (8×40)			297	42																
CRWM 4-400					400 (9×40)			325	46																
CRWM 4-440					440 (10×40)			360	51																
CRWM 4-480					480 (11×40)			388	55																

Notes (1) The value shows the total mass per meter of a set of three ways.
(2) The value shows the mass of a roller cage with ten cylindrical rollers.
(3) The value shows the load of a cylindrical roller.

Anti-Creep Cage
Crossed Roller Way Unit

CRWUG



Points

● High rigidity and high accuracy

1 Since CRWG or CRW with excellent load balance is incorporated with grounded high rigidity table and bed, elastic deformation is small for load in every direction, leading to highly accurate and stable linear motion.

● Solves cage creep issue

2 As CRWG with cage creep proof function is incorporated with CRWUG, there is no risk of cage creep and it works reliable in high-speed and high-tact operation, or in vertical axis.

● Wide variation

3 Three types of CRWU with different sectional shapes are available with many size variations. You can select an optimal product for the specifications of your machine and device.

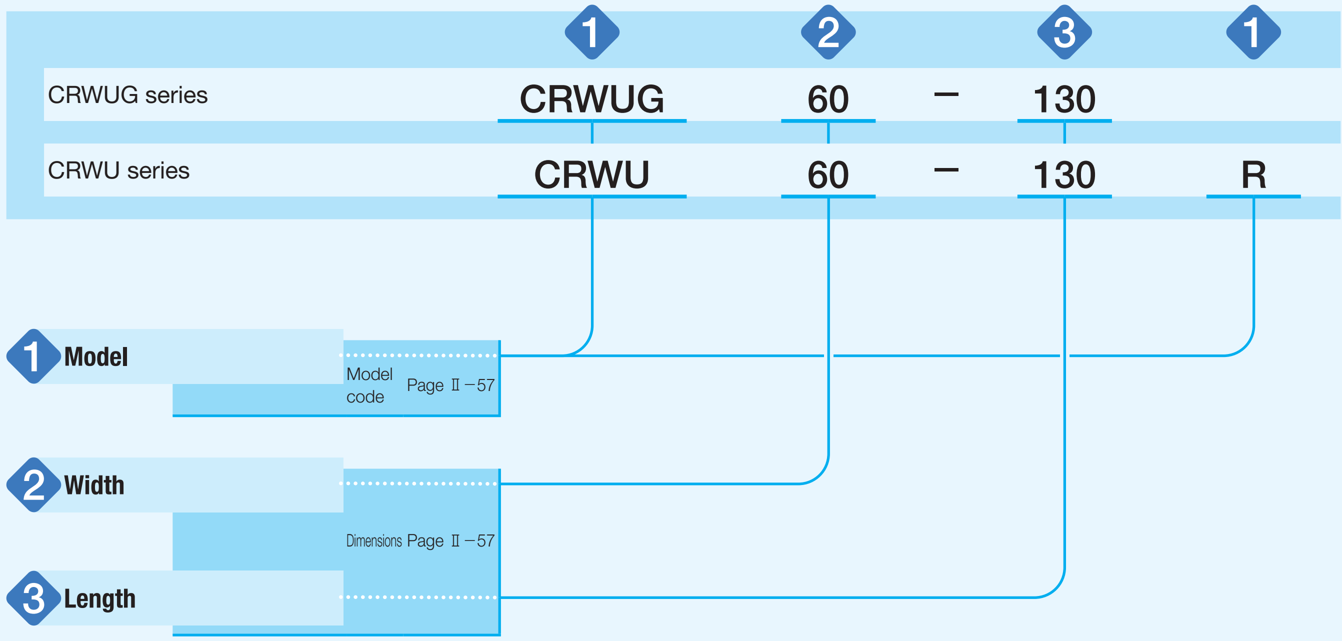
● Easy mounting

4 Mounting surface is precisely grounded. In addition, female screws and boring are used for table and bed, respectively to ensure appropriate preload state. Therefore, highly reliable linear motion can be achieved just by fitting them to the machine and device.

Identification Number and Specification

Example of an identification number

The specification of CRWUG and CRWU series is indicated by the identification number. Indicate the identification number, consisting of a model code, width, and length for each specification to apply.



	1	2		3	1
CRWUG series	CRWUG	60	－	130	
CRWU series	CRWU	60	－	130	R

1 **Model** Model code Page Ⅱ－57

2 **Width** Dimensions Page Ⅱ－57

3 **Length**

Identification Number and Specification

1 Model

Anti-Creep Cage Crossed Roller Way Unit (CRWUG series) : CRWUG

Crossed Roller Way Unit (CRWU series) : CRWU
: CRWU…R
: CRWU…RS

For applicable models and width, see Fig. 1.

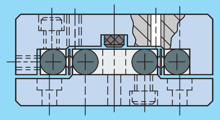
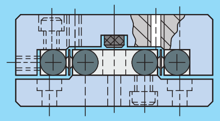
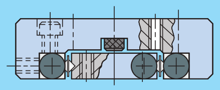
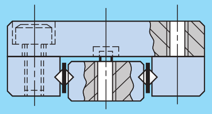
2 Width

20, 30, 40, 60, 80, 100, 145 Indicate the table width in mm.
For applicable models and width, see Table 1.

3 Length

Indicate the table length in mm.

Table 1 Models and width of CRWUG series and CRWU series

Series	Shape	Model	Characteristics	Width						
				20	30	40	60	80	100	145
CRWUG		CRWUG	A unit with cage creep proof function that realizes complete compatibility with CRWU in mounting dimensions. As external dimensions are the same, this can replace machine or device using CRWU without changing mounting dimensions, as well as new applications.	–	–	○	○	○	–	–
CRWU		CRWU	An ordinary type unit to be fixed to machine or device with bolts as it is, thanks to table and bed mounted to high accuracy.	–	○	○	○	○	○	○
		CRWU…R	Low height unit without CRWU bed. Linear motion with stable accuracy and high rigidity can be achieved for load in every direction.	–	○	○	○	○	○	○
		CRWU…RS	A compact and light unit of very simple structure. This may be used as a high-accuracy unit with small motion inertia by moving the center way.	○	○	○	–	–	–	–

Load Rating and Allowable Load

Indicate values for down direction for load rating of CRWUG and CRWU series.
In addition, the upward and lateral load rating is the same as downward load rating.
For more information on the definition of load rating and calculated load, see page Ⅲ-3.

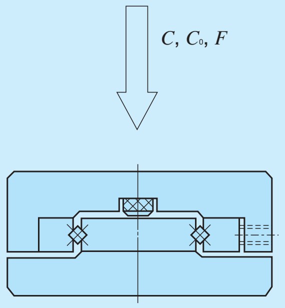


Fig. 1 Direction of load rating

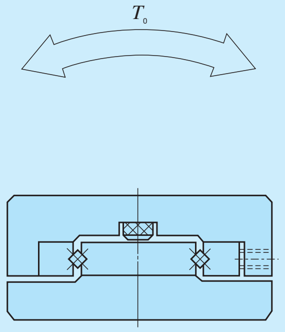


Fig. 2 Direction of static moment rating

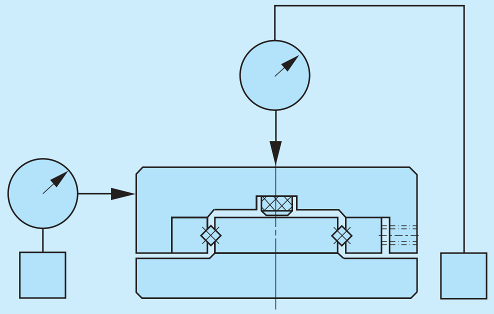
Allowable load

Allowable load refers to load of smooth rolling motion on contact surface to which maximum contact stress is applied and the sum of whose elastic deformation of rolling elements and raceway is small.
Therefore, use applied load within the allowable load range if very smooth rolling motion and high accuracy are required.

Accuracy

Accuracy of CRWUG series and CRWU series is indicated in Table 2. Parallelism at the center of the table represents parallelism of height when the table is stroked.
Parallelism at the side of the table represents parallelism of the side (preload adjusting screw side) when the table is stroked.
In addition, though allowance of unit height H is designed as ±0.1 mm, units with height variation of less than 0.01 mm among multiple units are also available. When special accuracy is needed, contact IKO.

Table 2 Running accuracy



unit: μm

Unit length L mm		Parallelism at the table center	Parallelism on the table side
Over	Incl.		
–	50	2	4
50	100	2	5
100	160	3	6
160	310	3	7
310	510	4	8
510	710	4	9
710	–	5	10

Lubrication

Grease is not pre-packed in the CRWUG series and CRWU series, so please perform adequate lubrication as needed. Both of oil lubrication and grease lubrication are available in the CRWUG series and CRWU series. Generally, oil lubrication should be selected for high speed or low frictional resistance, and grease lubrication for low speed. For grease lubrication, use of high-quality lithium-soap base grease is recommended.

Dust Protection

Since the CRWUG series and CRWU series are finished with high accuracy, harmful foreign substances such as dust and particles entering into the bearing will cause low life or impaired accuracy. For applications in other than clean environment, cover the entire unit with a protective case, etc. to prevent harmful foreign substances such as dust, particles and water from outside from entering.

Precaution for Use

❶ Handling

As the CRWUG series and CRWU series are designed highly precisely, take extra care for handling.
Cage of the CRWUG series has a pinion gear incorporated. When the cage is dropped or handled roughly, the pinion gear may come off. In addition, do not cut off the cage as doing so may cause pinion gear coming off and breakage of gear joint section.
Way of the CRWUG series has a rack incorporated. In operation, take note that the rack may come off when the end screw is removed.
For the CRWU series, the cage may be deviated from the right position due to offset load or irregular and high-velocity motion, etc. Fully stroke it once in certain operating time or certain number of reciprocating motion to correct the cage position.

❷ Preload re-adjustment

Preload amount of the CRWUG series and CRWU series is adjusted to zero or slight preload state, so they may be used as they are.
Preload amount of the CRWUG series, CRWU, and CRWU···R may be re-adjusted by following the procedure below.
Preload adjustment is started from the preload adjusting screw at the center of way length and then both ends in turn, with fixing screws of the preload adjusting side way temporarily fixed.
While measuring the clearance on the table sides, tighten the preload adjusting screws subsequently until deflection of the dial gauge stops. Measure the tightening torque for preload adjusting screws at this point.
When adjusting preload adjusting screw near either end, stroke the table softly and check that the cylindrical roller is on the preload adjusting screw section.
After the above procedure, the clearance becomes zero or in slight preload state, but preload is still not adjusted evenly. With the same procedure again, re-adjust all the preload adjusting screws evenly to the torque previously measured.

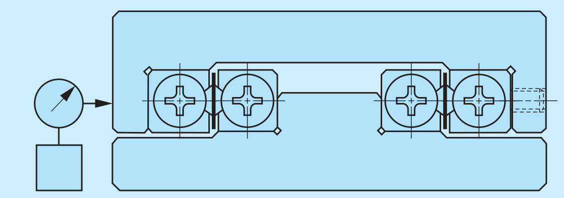


Fig. 3 Example of preload adjustment method

❸ Operating temperature

As synthetic resin components are used for the CRWUG series, the maximum operating temperature is 120°C, while it should be lower than 100°C for continuous use. When it exceeds 100°C, contact IKO.
As synthetic resin components are not used for the CRWU series, it may be used at high temperature. However, when it exceeds 100°C, contact IKO.

❹ Maximum velocity

Operating velocity should not exceed 30 m/min during operation.

❺ Tightening torque for fixing screw

Table 3 shows typical tightening torque for mounting CRWUG Series and CRWU Series. When vibration and shock are large or moment load is applied, it is recommended to fix by using the torque 1.3 times larger than that indicated in the table. In addition, when high running accuracy is required with no vibration and shock, it may be fixed by using torque smaller than that indicated in the table, however, it is recommended to use adhesive agent to fasten the screw, or to use stop bolts.

Table 3 Tightening torque for fixing screw

Bolt size	Tightening torque N・m
M 2 ×0.4	0.40
M 2.5×0.45	0.80
M 3 ×0.5	1.4
M 4 ×0.7	3.2
M 5 ×0.8	6.4
M 6 ×1	10.9
M 8 ×1.25	26.1

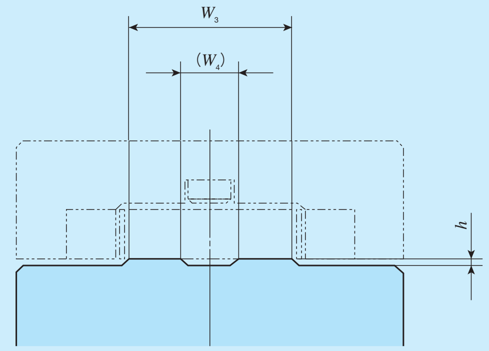
❻ Dowel pin hole of CRWU···R

A dowel pin hole is machined on the center way of the CRWU···R. When a dowel pin is used, machine a hole on the mounting surface of the machine after mounting of the center way.
Refer to the dimension table for diameter and its tolerances of dowel pin hole of the center way.

❼ Mounting part dimensions of CRWU···R

Not to allow the table to interfere with the mounting surface, it is necessary to set mounting surface height referring to the dimensions H_1 and H in the dimension table.
Example bed mounting dimensions are indicated in Table 4.

Table 4 Example of mounting dimensions of CRWU···R bed

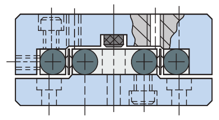


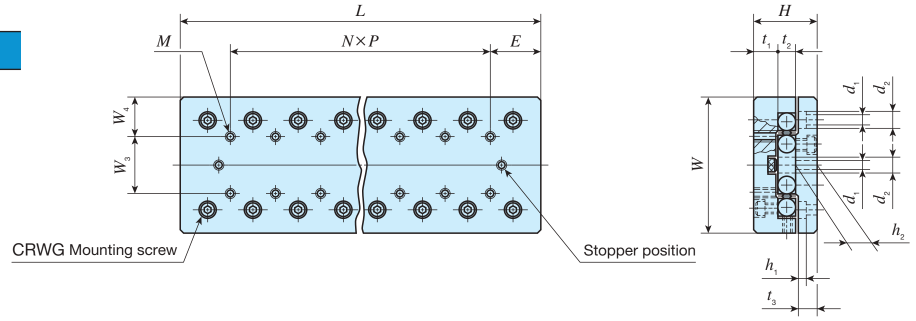
unit: μm

Identification number	h (minimum)	W_3	W_4
CRWU 30 ···R	0.5	13	–
CRWU 40-35R	0.5	18	–
CRWU 40 ···R		13	
CRWU 60 ···R	0.5	26.5	–
CRWU 80 ···R	0.5	38	16
CRWU100 ···R	0.5	42	14
CRWU145 ···R	1.0	68.5	28.5

IKO Anti-Creep Cage Crossed Roller Way Unit

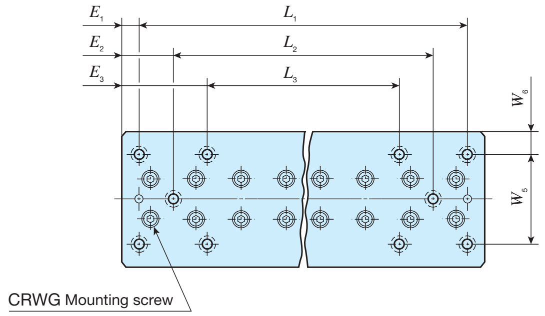
Shape	CRWUG		
Size	40	60	80





CRWG Mounting screw

Stopper position

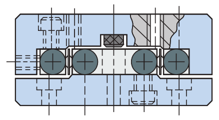


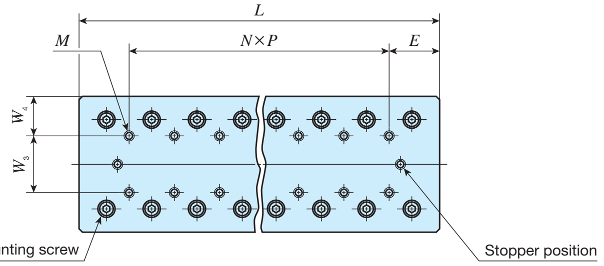
CRWG Mounting screw

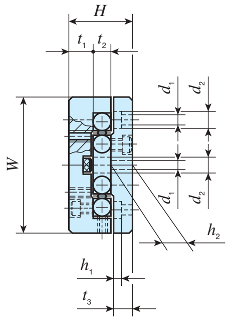
Identification number	Mass (Ref.) kg	Nominal dimensions and tolerances mm W	Dim. W tolerance	H	Dim. H tolerance	L	t_1	t_2	t_3	Maximum stroke length	Table mounting dimensions mm W_3	W_4	$N×P$	E	M	Bed mounting dimensions mm W_5	W_6	L_1	E_1	L_2	E_2	L_3	E_3	d_1	d_2	h_1	h_2	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable load F N	Static moment rating T_0 N・m
CRWUG 40- 35	0.21	40	±0.1	21	±0.1	35	8	6	6.5	18	15	12.5	–	17.5	M3	30	5	25	5.0	–	–	–	–	3.5	6	3.5	7	913	1 180	392	10.6
CRWUG 40- 50	0.30					50	7	8	5.5	30			1×15					40								3.2	6	2 000	2 440	813	17.7
CRWUG 40- 65	0.36					65				40			2×15					55										2 000	2 440	813	17.7
CRWUG 40- 80	0.47					80				50			3×15					70				40	20					3 430	4 880	1 630	35.3
CRWUG 40- 95	0.53					95				60			4×15					85				55						2 740	3 660	1 220	26.5
CRWUG 40-110	0.63					110				70			5×15					100				70						4 080	6 090	2 030	44.2
CRWUG 40-125	0.70					125				80			6×15					115				85						4 080	6 090	2 030	44.2
CRWUG 60- 55	0.67	60	±0.1	28	±0.1	55	10.5	8	9	30	25	17.5	–	27.5	M4	40	10	35	10.0	–	–	–	–	4.5	7.5	4.5	9.5	2 000	2 440	813	35.3
CRWUG 60- 80	0.99					80				45			1×25					60										3 430	4 880	1 630	70.7
CRWUG 60-105	1.28					105				60			2×25					85										4 700	7 310	2 440	106
CRWUG 60-130	1.57					130				75			3×25					110										5 300	8 530	2 840	124
CRWUG 60-155	1.86					155				90			4×25					135		85	35							6 440	11 000	3 660	159
CRWUG 80- 85	1.78	80	±0.1	35	±0.1	85	13	11	10.5	50	40	20	–	42.5	M5	60	10	65	10.0	–	–	–	–	5.5	9.5	6	11	5 350	7 050	2 350	145
CRWUG 80-125	2.56					125				75			1×40					80	22.5									7 960	11 800	3 920	241
CRWUG 80-165	3.34					165				105			2×40					120										9 180	14 100	4 700	289
CRWUG 80-205	4.12					205				135			3×40					160				80	62.5					11 500	18 800	6 270	385

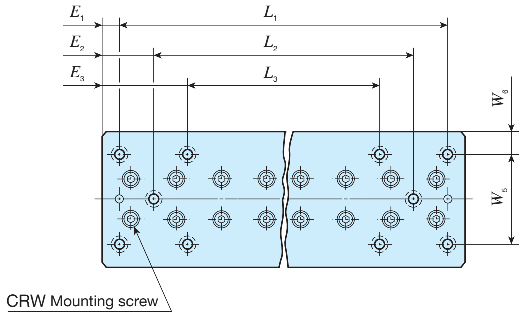
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO Crossed Roller Way Unit

	CRWU
Shape	
Size	**30** **40** **60** 80 100 145



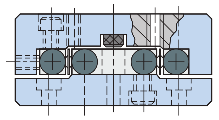


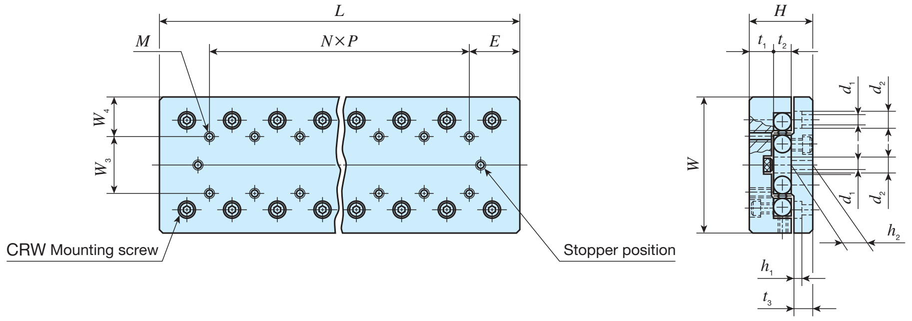


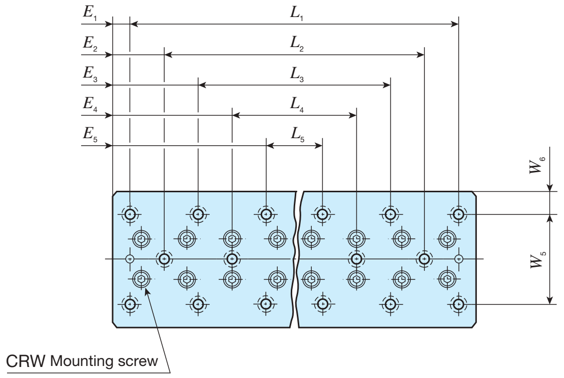
Identification number	Mass (Ref.)	Nominal dimensions and tolerances mm									Table mounting dimensions mm					Bed mounting dimensions mm												Basic dynamic load rating	Basic static load rating	Allowable load	Static moment rating
	kg	W	Dim. W tolerance	H	Dim. H tolerance	L	t_1	t_2	t_3	Maximum stroke length	W_3	W_4	$N×P$	E	M	W_5	W_6	L_1	E_1	L_2	E_2	L_3	E_3	d_1	d_2	h_1	h_2	C N	C_0 N	F N	T_0 N・m
CRWU 30- 25	0.09	30	±0.1	17	±0.1	25	7	4	5.5	12	10	10	–	12.5	M2	22	4	18	3.5	–	–	–	–	2.55	4.1	2.5	6	380	478	159	3.2
CRWU 30- 35	0.13					35				18			1×10					28										525	717	239	4.8
CRWU 30- 45	0.17					45				25			2×10					38										659	956	319	6.5
CRWU 30- 55	0.20					55				32			3×10					48				28	13.5					786	1 200	398	8.1
CRWU 30- 65	0.24					65				40			4×10					58				38						906	1 430	478	9.7
CRWU 30- 75	0.28					75				45			5×10					68				45						1 020	1 670	558	11.3
CRWU 30- 85	0.32					85				50			6×10					78				58						1 140	1 910	638	12.9
CRWU 40- 35	0.21	40	±0.1	21	±0.1	35	8	6	6.5	18	15	12.5	–	17.5	M3	30	5	25	5	–	–	–	–	3.5	6	3.5	7	896	1 180	392	10.6
CRWU 40- 50	0.30					50	7	8	5.5	30			1×15					40								3.2	6	2 710	3 660	1 220	26.5
CRWU 40- 65	0.37					65				40			2×15					55										2 710	3 660	1 220	26.5
CRWU 40- 80	0.48					80				50			3×15					70				40	20					4 050	6 090	2 030	44.2
CRWU 40- 95	0.54					95				60			4×15					85				55						3 400	4 880	1 630	35.3
CRWU 40-110	0.65					110				70			5×15					100				70						4 680	7 310	2 440	53.0
CRWU 40-125	0.72					125				80			6×15					115				85						4 680	7 310	2 440	53.0
CRWU 60- 55	0.68	60	±0.1	28	±0.1	55	10.5	8	9	30	25	17.5	–	27.5	M4	40	10	35	10	–	–	–	–	4.5	7.5	4.5	9.5	2 710	3 660	1 220	51.2
CRWU 60- 80	1.0					80				45			1×25					60										4 050	6 090	2 030	85.3
CRWU 60-105	1.3					105				60			2×25					85										5 270	8 530	2 840	119
CRWU 60-130	1.6					130				75			3×25					110										5 860	9 750	3 250	137
CRWU 60-155	1.9					155				90			4×25					135		85	35							6 970	12 200	4 060	171
CRWU 60-180	2.2					180				105			5×25					160		110								8 040	14 600	4 880	205
CRWU 60-205	2.5					205				130			6×25					185		135		85	60					8 550	15 800	5 280	222

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO Crossed Roller Way Unit

Shape	CRWU 					
Size	30	40	60	80	100	145



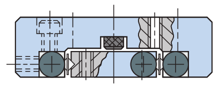


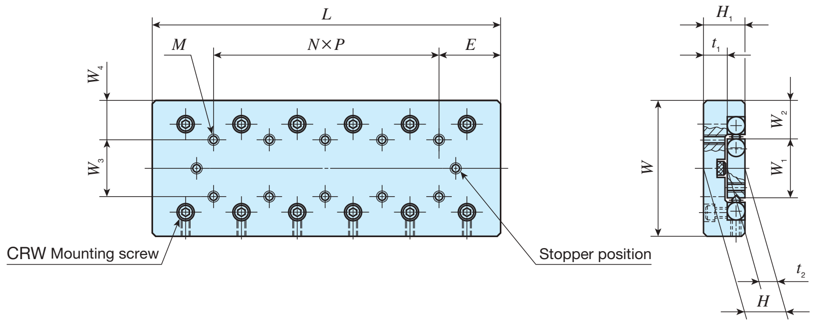
Identification number	Mass (Ref.)	Nominal dimensions and tolerances mm									Table mounting dimensions mm					Bed mounting dimensions mm																		Basic dynamic load rating	Basic static load rating	Allowable load	Static moment rating
		W	Dim. W tolerance	H	Dim. H tolerance	L	t_1	t_2	t_3	Maximum stroke length	W_3	W_4	$N\times P$	E	M	W_5	W_6	L_1	E_1	L_2	E_2	L_3	E_3	L_4	E_4	L_5	E_5	d_1	d_2	h_1	h_2	C	C_0	F	T_0
	kg																															N	N	N	N · m
CRWU 80- 85	1.8	80	±0.1	35	±0.1	85	13	11	10.5	50	40	20	–	42.5	M5	60	10	65	10	–	–	–	–	–	–	–	–	5.5	9.5	6	11	6 640	9 400	3 130	188
CRWU 80-125	2.6					125				75			1× 40					80	22.5													9 130	14 100	4 700	282
CRWU 80-165	3.4					165				105			2× 40					120														10 300	16 500	5 480	329
CRWU 80-205	4.2					205				135			3× 40					160				80	62.5									12 500	21 200	7 050	423
CRWU 80-245	5.1					245				155			4× 40					200				120										14 700	25 900	8 620	517
CRWU 80-285	5.9					285				185			5× 40					240				160										16 700	30 600	10 200	611
CRWU 80-325	6.7					325				215			6× 40					280				200				120	102.5					18 700	35 300	11 800	705
CRWU 100-110*	3.6	100	±0.15	45	±0.1	110	16	15	13	60	50	25	–	55	M6	60	20	90	10	–	–	–	–	–	–	–	–	7	11	6.5	14	13 900	18 500	6 150	415
CRWU 100-160*	5.2					160				95			1× 50					140														16 600	23 100	7 690	519
CRWU 100-210*	6.9					210				130			2× 50					190		90	60											21 600	32 300	10 800	727
CRWU 100-260*	8.5					260				165			3× 50					240		140												26 300	41 500	13 800	934
CRWU 100-310*	10.2					310				200			4× 50					290		190												30 800	50 700	16 900	1 140
CRWU 100-360*	11.8					360				235			5× 50					340		240		140	110									35 100	60 000	20 000	1 350
CRWU 100-410*	13.5					410				265			6× 50					390		290		190										37 200	64 600	21 500	1 450
CRWU 145-210*	13.2	145	±0.2	60	±0.1	210	21	22	16	130	85	30	–	105	M8	90	27.5	100	55	–	–	–	–	–	–	–	–	9	14	8.5	17.5	39 400	52 800	17 600	1 900
CRWU 145-310*	19.6					310				180			1×100					200														61 200	92 300	30 800	3 320
CRWU 145-410*	25.9					410				350			2×100					300		100	155											67 900	106 000	35 200	3 800
CRWU 145-510*	32.2					510				450			3×100					400		200												74 400	119 000	39 600	4 270
CRWU 145-610*	38.6					610				550			4×100					500		300		100	255									87 100	145 000	48 400	5 220
CRWU 145-710*	45.0					710				650			5×100					600		400		200										99 200	172 000	57 200	6 170
CRWU 145-810*	51.3					810				750			6×100					700		500		300		100	355							111 000	198 000	66 000	7 120

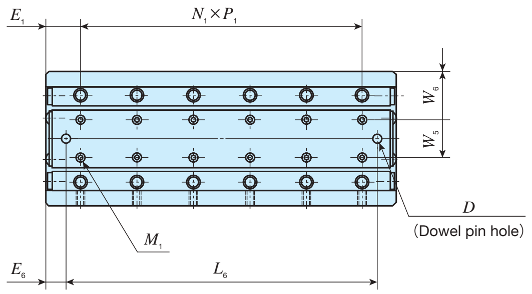
Remark: The identification numbers with * are our semi-standard items.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Crossed Roller Way Unit

Shape	CRWU···R
	
Size	**30** **40** **60** 80 100 145

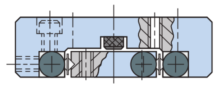


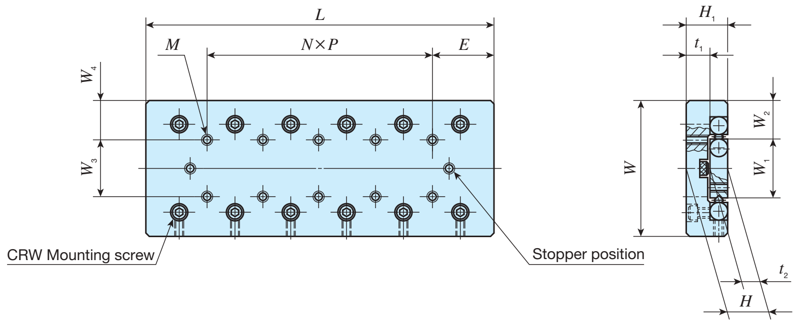


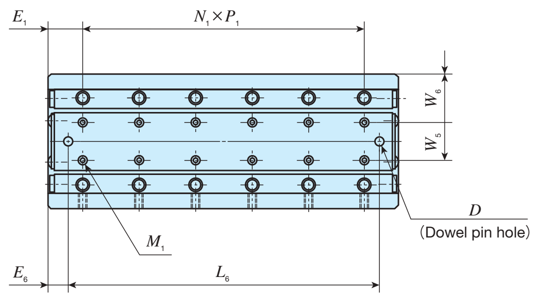
Identification number	Mass (Ref.)	Nominal dimensions and tolerances mm						Table mounting dimensions mm							Center way mounting dimensions and tolerances mm												Basic dynamic load rating	Basic static load rating	Allowable load	Static moment rating
		W	Dim. W tolerance	H	Dim. H tolerance	L	Maximum stroke length	W_3	W_4	$N\times P$	E	M	H_1	t_1	W_5	W_6	$N_1\times P_1$	E_1	M_1	D	Dim. D tolerance	L_6	E_6	W_1	W_2	t_2	C	C_0	F	T_0
	kg																										N	N	N	N · m
CRWU 30- 25R	0.06	30	±0.1	11	±0.1	25	12	10	10	–	12.5	M2	11	7	–	15	1×10	7.5	M2	–	–	–	–	12.8	8.6	4	380	478	159	3.2
CRWU 30- 35R	0.08					35	18			1×10							2×10										525	717	239	4.8
CRWU 30- 45R	0.11					45	25			2×10							3×10										659	956	319	6.5
CRWU 30- 55R	0.13					55	32			3×10							4×10			2	+0.020 0	30	12.5				786	1 200	398	8.1
CRWU 30- 65R	0.16					65	40			4×10							5×10					40					906	1 430	478	9.7
CRWU 30- 75R	0.18					75	45			5×10							6×10					50					1 020	1 670	558	11.3
CRWU 30- 85R	0.21					85	50			6×10							7×10					60					1 140	1 910	638	12.9
CRWU 40- 35R	0.13	40	±0.1	14	±0.1	35	18	15	12.5	–	17.5	M3	14	8	–	20	1×15	10	M3	–	–	–	–	17	11.5	6	896	1 180	392	10.6
CRWU 40- 50R	0.21			15		50	30			1×15			15	7			2×15							13.1	13.45	8	2 710	3 660	1 220	26.5
CRWU 40- 65R	0.26					65	40			2×15							2×15	17.5									2 710	3 660	1 220	26.5
CRWU 40- 80R	0.34					80	50			3×15							4×15	10		3	+0.020 0	45	17.5				4 050	6 090	2 030	44.2
CRWU 40- 95R	0.38					95	60			4×15							4×15	17.5					25				3 400	4 880	1 630	35.3
CRWU 40-110R	0.46					110	70			5×15							5×15					60					4 680	7 310	2 440	53.0
CRWU 40-125R	0.50					125	80			6×15							5×15	25					32.5				4 680	7 310	2 440	53.0
CRWU 60- 55R	0.44	60	±0.1	18.5	±0.1	55	30	25	17.5	–	27.5	M4	18.5	10.5	17	21.5	1×25	15	M4	4	+0.020 0	35	10	26.6	16.7	8	2 710	3 660	1 220	51.2
CRWU 60- 80R	0.66					80	45			1×25							2×25					60					4 050	6 090	2 030	85.3
CRWU 60-105R	0.85					105	60			2×25							3×25					85					5 270	8 530	2 840	119
CRWU 60-130R	1.1					130	75			3×25							4×25					110					5 860	9 750	3 250	137
CRWU 60-155R	1.3					155	90			4×25							5×25					135					6 970	12 200	4 060	171
CRWU 60-180R	1.5					180	105			5×25							6×25					160					8 040	14 600	4 880	205
CRWU 60-205R	1.7					205	130			6×25							7×25					185					8 550	15 800	5 280	222

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Crossed Roller Way Unit

Shape	CRWU…R
	
Size	30 40 60 **80** **100** **145**



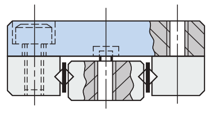


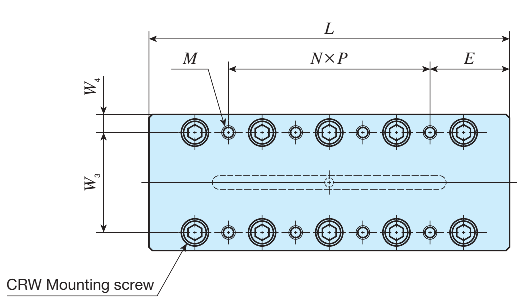
Identification number	Mass (Ref.)	Nominal dimensions and tolerances mm						Table mounting dimensions mm							Center way mounting dimensions and tolerances mm												Basic dynamic load rating	Basic static load rating	Allowable load	Static moment rating
	kg	W	Dim. W tolerance	H	Dim. H tolerance	L	Maximum stroke length	W_3	W_4	$N \times P$	E	M	H_1	t_1	W_5	W_6	$N_1 \times P_1$	E_1	M_1	D	Dim. D tolerance	L_6	E_6	W_1	W_2	t_2	C N	C_0 N	F N	T_0 N·m
CRWU 80- 85R	1.2	80	±0.1	24	±0.1	85	50	40	20	–	42.5	M5	24	13	27	26.5	1×40	22.5	M5	5	+0.020 0	55	15	38	21	11	6 640	9 400	3 130	188
CRWU 80-125R	1.8					125	75			1×40							2×40					95					9 130	14 100	4 700	282
CRWU 80-165R	2.3					165	105			2×40							3×40					135					10 300	16 500	5 480	329
CRWU 80-205R	2.9					205	135			3×40							4×40					175					12 500	21 200	7 050	423
CRWU 80-245R	3.5					245	155			4×40							5×40					215					14 700	25 900	8 620	517
CRWU 80-285R	4.0					285	185			5×40							6×40					255					16 700	30 600	10 200	611
CRWU 80-325R	4.6					325	215			6×40							7×40					295					18 700	35 300	11 800	705
CRWU 100-110R*	2.4	100	±0.15	31	±0.1	110	60	50	25	–	55	M6	31	16	26	37	1×50	30	M6	5	+0.020 0	70	20	42	29	15	13 900	18 500	6 150	415
CRWU 100-160R*	3.6					160	95			1×50							2×50					120					16 600	23 100	7 690	519
CRWU 100-210R*	4.7					210	130			2×50							3×50					170					21 600	32 300	10 800	727
CRWU 100-260R*	5.9					260	165			3×50							4×50					220					26 300	41 500	13 800	934
CRWU 100-310R*	7.0					310	200			4×50							5×50					270					30 800	50 700	16 900	1 140
CRWU 100-360R*	8.1					360	235			5×50							6×50					320					35 100	60 000	20 000	1 350
CRWU 100-410R*	9.3					410	265			6×50							7×50					370					37 200	64 600	21 500	1 450
CRWU 145-210R*	9.4	145	±0.2	42.5	±0.1	210	130	85	30	–	105	M8	43	21	46	49.5	1×100	55	M8	5	+0.020 0	150	30	68.4	38.3	21	39 400	52 800	17 600	1 900
CRWU 145-310R*	13.9					310	180			1×100							2×100					250					61 200	92 300	30 800	3 320
CRWU 145-410R*	18.4					410	350			2×100							3×100					350					67 900	106 000	35 200	3 800
CRWU 145-510R*	23.0					510	450			3×100							4×100					450					74 400	119 000	39 600	4 270
CRWU 145-610R*	27.5					610	550			4×100							5×100					550					87 100	145 000	48 400	5 220
CRWU 145-710R*	32.0					710	650			5×100							6×100					650					99 200	172 000	57 200	6 170
CRWU 145-810R*	36.6					810	750			6×100							7×100					750					111 000	198 000	66 000	7 120

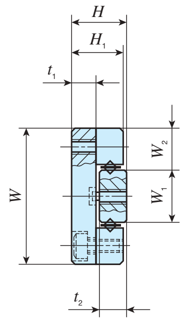
Remark: The identification numbers with * are our semi-standard items.

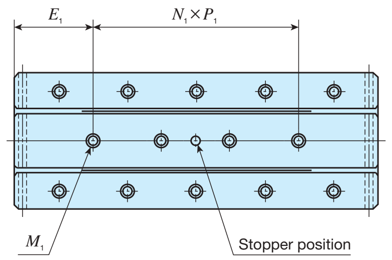
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO Crossed Roller Way Unit

Shape	**CRWU···RS** 		
Size	20	30	40







Identification number	Mass (Ref.)	Nominal dimensions and tolerances mm						Table mounting dimensions mm								Center way mounting dimensions mm						Basic dynamic load rating	Basic static load rating	Allowable load	Static moment rating
	kg	W	Dim. W tolerance	H	Dim. H tolerance	L	Maximum stroke length	W_3	W_4	$N \times P$	E		M	H_1	t_1	W_1	W_2	$N_1 \times P_1$	E_1	M_1	t_2	C N	C_0 N	F N	T_0 N・m
CRWU 20- 25RS	0.03	20	±0.1	8	±0.1	25	12	14	3	1×18	3.5		M2.5	7.5	3.5	7	6.5	2× 7.5	5	M2.5	4	380	478	159	1.8
CRWU 20- 35RS	0.05					35	18			1×28								2×10	7.5			525	717	239	2.8
CRWU 20- 45RS	0.06					45	25			1×20	12.5							3×10				659	956	319	3.7
CRWU 20- 55RS	0.07					55	32			1×30								4×10				786	1 200	398	4.6
CRWU 30- 65RS	0.20	30	±0.1	12	±0.1	65	40	22	4	1×30	17.5		M3	11.5	5.5	12	9	3×15	10	M3	6	1 850	2 940	979	19.1
CRWU 30- 80RS	0.24					80	50			1×45								4×15				2 130	3 530	1 180	22.9
CRWU 30- 95RS	0.29					95	60			2×30								5×15				2 410	4 110	1 370	26.7
CRWU 40-105RS	0.58	40	±0.1	16	±0.1	105	60	30	5	1×50	27.5		M4	15.5	7.5	16	12	3×25	15	M4	8	4 680	7 310	2 440	63.6
CRWU 40-130RS	0.72					130	75			1×75								4×25				5 860	9 750	3 250	84.8
CRWU 40-155RS	0.85					155	90			2×50								5×25				6 970	12 200	4 060	106

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Linear Slide Unit

High Rigidity Precision Linear Slide Unit
Precision Linear Slide Unit
Linear Slide Unit

High Rigidity Precision Linear Slide Unit

BWU

Points

● Simple limited linear motion guide structure

Small and simple limited stroke type structure incorporated with balls and retainer between integrated table and bed. With two-row four-point contact structure, stable accuracy and rigidity can be achieved even in applications where fluctuating load and complex load are applied.

● High accuracy

Simultaneous grinding process of two-row track grooves is applied to table and bed, which provides small processing errors and realizes linear motion of high accuracy.

● Smooth operations

As each component is finished with accuracy without recirculation resistance of the balls, light and smooth operations are obtained.

● Stainless steel selections for excellent corrosion resistance

Stainless steel highly resistant to corrosion is used for all steel components, so that they are suitable for applications where rust prevention oil is not preferred, such as in a cleanroom environment.

Identification Number and Specification

Example of an identification number

The specification of BWU series is indicated by the identification number. Indicate the identification number, consisting of a model code and dimensions for each specification to apply.

① BWU ② 60 - ③ 100

① **Model** — Model code Page Ⅱ−76

② **Width** — Dimensions Page Ⅱ−76

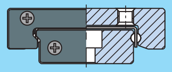
③ **Length**

Identification Number and Specification

① **Model**	High Rigidity Precision Linear Slide Unit (BWU series) : BWU For applicable models, width and length, see Table 1.	
② **Width**	6, 8, 10, 12, 17, 25, 30, 40, 60	Indicate the table width in mm. For applicable models, width and length, see Table 1.
③ **Length**		Indicate the table length in mm. For applicable models, width and length, see Table 1.

Table 1 Width and length of BWU series

unit: mm

Shape	Model	Width	Length												
			10	15	20	25	30	40	45	60	75	80	90	100	120
	BWU	6	○	−	○	−	○	−	−	−	−	−	−	−	−
		8	○	−	○	−	○	−	−	−	−	−	−	−	−
		10	−	○	−	○	−	○	−	−	−	−	−	−	−
		12	−	−	○	−	○	−	○	−	−	−	−	−	−
		17	−	−	○	−	○	−	○	−	−	−	−	−	−
		25	−	−	−	−	○	−	○	○	○	−	−	−	−
		30	−	−	−	−	○	−	○	○	○	−	○	−	−
		40	−	−	−	−	−	○	−	○	−	○	−	○	−
		60	−	−	−	−	−	−	−	○	−	○	−	○	○

Allowable Load

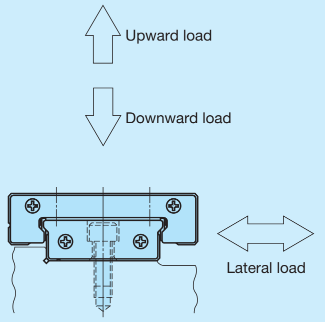
Allowable load refers to load of smooth rolling motion on contact surface to which maximum contact stress is applied and the sum of whose elastic deformation of rolling elements and raceway is small.

Therefore, use applied load within the allowable load range if very smooth rolling motion and high accuracy are required.

Load Direction and Load Rating

The BWU series must be used with its load rating corrected in accordance to the load direction. The basic dynamic load rating and basic static load rating shown in the dimension table should be corrected to values in Table 2.

Table 2 Load ratings corrected for load direction

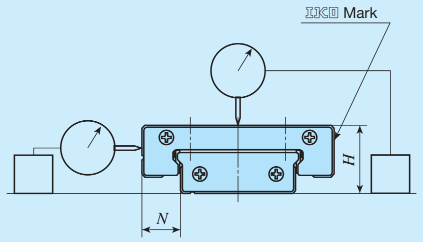


Load rating and load direction / Width	Basic dynamic load rating			Basic static load rating		
	Load direction			Load direction		
	Downward	Upward	Lateral	Downward	Upward	Lateral
6~60	C	C	$1.19C$	C_0	C_0	$1.19C_0$

Accuracy

Accuracy of the BWU series is indicated in Table 3 and Table 4.

Table 3 Accuracy



unit: mm

Item	Tolerance and allowance
Dim. H tolerance	±0.040
Dim. N tolerance	±0.050
Parallelism at the table center	See Table 4
Parallelism on the table side	See Table 4

Table 4 Running accuracy unit: μm

Nominal length L mm		Parallelism at the table center (1)	Parallelism on the table side (2)
Over	Incl.		
–	50	4	6
50	80	5	8
80	120	6	9

Notes (1) Parallelism at the center of the table represents parallelism of height when the table is stroked.

(2) Parallelism at the side of the table represents parallelism of the side (the opposite side of IKO mark) when the table is stroked.

Preload

Preload for the BWU series is adjusted to proper preload state.

Lubrication

Grease is not pre-packed in the BWU series, so please perform adequate lubrication as needed.

Upon delivery, anti-rust oil is applied. Therefore, perform cleaning with clean solution before mounting and apply high-quality lubrication oil or grease before use. For grease lubrication, use of high-quality lithium-soap base grease is recommended.

Since no grease nipple or oil hole is provided, apply grease directly to the raceway part of the bed when supplying the grease.

Dust Protection

No dust protection seal is provided for BWU series. For applications in other than clean environment, cover the entire unit with a protective case, etc. to prevent harmful foreign substances such as dust and particles from outside from entering.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Precaution for Use

❶ Handling

When high running accuracy is required, set the load point at the center of the table (or bed) and use with sufficient stroke length.

For the BWU series, the retainer may be deviated from the right position due to offset load or irregular and high-velocity motion, etc. Fully stroke it once in certain operating time or certain number of reciprocating motion to correct the retainer position.

Since there is no built-in mechanical stopper to regulate linear motion in the event of collision, install a stopper mechanism in proximity if risk of overstroke exists.

The fixing thread depth of mounting screws for table must not exceed the maximum fixing thread depth indicated in the table of dimensions. Since the mounting screw hole for the table is penetrated, the bed or retainer will be pushed by the screw if the fixing thread depth is too deep, and the running accuracy and life may be adversely affected.

❷ Operating temperature

As synthetic resin components are not used for the BWU series, it may be used at high temperature. However, when it exceeds 100°C, contact IKO.

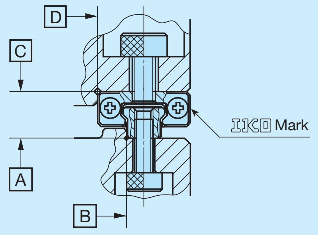
❸ Maximum velocity

Operating velocity should not exceed 30 m/min during operation.

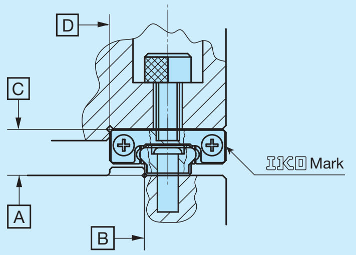
Precaution for Mounting

❶ Reference mounting surface

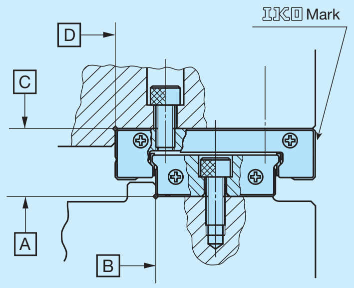
Reference mounting surface of the BWU series is the opposite side of the IKO mark. (See Fig. 1)



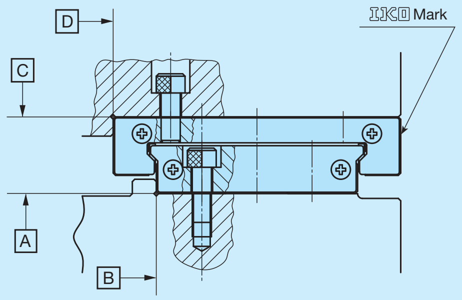
BWU6, BWU8



BWU10, BWU12



BWU17~BWU40



BWU60

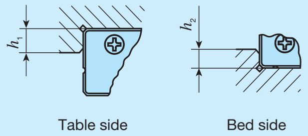
Fig. 1 Reference mounting surface and mounting examples

❷ Typical mounting structure

As indicated in Fig.1, reference mounting surfaces B and D, and mounting surfaces A and C are precisely ground. Therefore, by machining the reference mounting surface of the mating member and the mounting surface, such as machine or device, to high accuracy and mounting them properly, stable linear motion with high accuracy is realized.

For the opposite corner of the mating reference mounting, it is recommended to have relieved fillet as indicated in the illustration in Table 5. The value indicated in Table 5 is recommended for the shoulder height on the mating side.

Table 5 Shoulder height



unit: mm

Width	Shoulder height of the table side h_1	Shoulder height of the bed side h_2
6	1	0.5
8	1.2	0.8
10	1.2	0.8
12	1.5	0.8
17	2.5	1.2
25	2.5	1.5
30	3	2
40	3	2.5
60	4	2.5

❸ When lateral load is the primary load

As indicated in Fig. 2, firmly fix the sides of the table and bed with pressure plates.

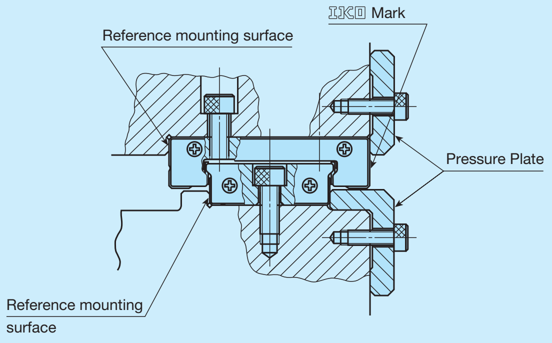


Fig. 2 Mounting example when lateral load is the primary load

❹ Tightening torque for fixing screw

Typical tightening torque for mounting of the BWU series to the steel mating member material is indicated in Table 6. If the mating member material is cast iron or aluminum alloy, reduce the tightening torque depending on the strength characteristics of the mating member material.

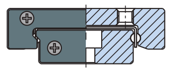
Table 6 Tightening torque for fixing screw

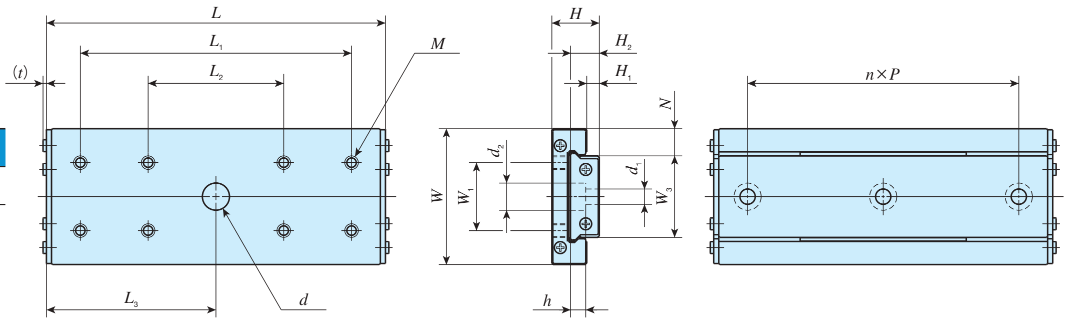
Bolt size	Tightening torque N・m
M1 ×0.25	0.04
M1.4×0.3	0.10
M1.6×0.35	0.15
M2 ×0.4	0.31
M3 ×0.5	1.1
M4 ×0.7	2.5

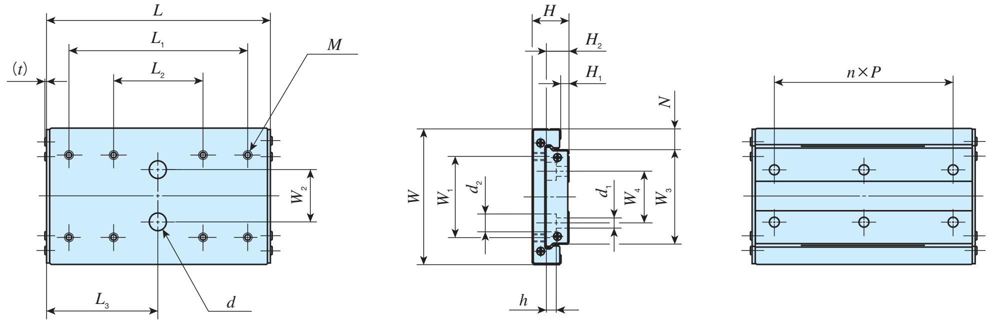
Remark: The tightening torque is calculated based on property division A2-70 of stainless steel hexagon socket head bolt.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO High Rigidity Precision Linear Slide Unit

	BWU				
Shape					
Size	6	8	10	12	17
	25	30	40	60	





BWU60-100, BWU60-120

Identification number	Mass (Ref.)	Nominal dimensions mm						Table mounting dimensions mm									Bed mounting dimensions mm								Basic dynamic load rating	Basic static load rating	Allowable load	Static moment rating
	g	W	H	H_1	N	L	Maximum stroke length	W_1	L_1	L_2	M	Maximum fixing thread depth	W_2	L_3	d	t	W_3	H_2	W_4	n	P	d_1	d_2	h	C N	C_0 N	F N	T_0 N・m
BWU 6- 10	1.0	6	3.2	0.7	2	10	3	–	4	–	M1.4	0.8	–	–	–	0.46	2	1.9	–	1	4	M1.0 Through	–	–	154	181	60.2	0.21
BWU 6- 20	2.2					20	11		10												8				252	361	120	0.42
BWU 6- 30	3.3					30	16		18	10										2					355	587	196	0.68
BWU 8- 10	1.7	8	4	1	2.5	10	4	–	5.5	–	M2	0.8	–	–	–	0.45	3	2.6	–	1	5	M1.6 Through	–	–	203	212	70.6	0.36
BWU 8- 20	3.5					20	16		10												10				292	353	118	0.60
BWU 8- 30	5.2					30	20		21	10										2					442	635	212	1.1
BWU 10- 15(1)	3.2	10	4	1	3	15	8	–	6.5	–	M2	0.8	–	7.5	3	0.45	4	2.6	–	1	5	1.8	2.8	0.75	249	282	94.1	0.62
BWU 10- 25(1)	5.7					25	16		13					–	–						10				370	494	165	1.1
BWU 10- 40(1)	9.0					40	22		26	13				20	3					3					572	917	306	2.0
BWU 12- 20(2)	6.2	12	4.5	1	3	20	16	–	8	–	M2	1.1	–	–	–	0.45	6	2.8	–	1	7.5	2.4	4	1.5	292	353	118	1.1
BWU 12- 30(2)	9.5					30	20		15												15				442	635	212	2.0
BWU 12- 45(2)	14.1					45	30		31	15				22.5	4.5					2					603	988	329	3.2
BWU 17- 20	15.0	17	8	1.5	5	20	14	12	10	–	M2	3	–	10	4.5	0.8	7	5	–	1	7.5	2.4	4.2	2.3	588	635	212	2.5
BWU 17- 30	23.7					30	19		20					–	–						15				874	1 110	370	4.4
BWU 17- 45	35.4					45	29		30					22.5	4.5					2					1 200	1 750	582	6.9
BWU 25- 30	40.6	25	9	1.8	5.5	30	23	10	15	–	M3	2.5	–	–	–	0.9	14	5.2	–	1	15	3.5	6	3.2	783	953	318	7.1
BWU 25- 45	62.5					45	28		25												30				1 200	1 750	582	13.0
BWU 25- 60	84.3					60	38																		1 490	2 380	794	17.7
BWU 25- 75	104					75	48		55	25				37.5	6.5					2					1 760	3 020	1 010	22.5
BWU 30- 30	64.4	30	12	3.4	6	30	23	14	15	–	M3	3	–	–	–	1.0	18	7.5	–	1	15	3.5	6.5	4.5	1 270	1 410	470	13.4
BWU 30- 45	99.1					45	29		25												30				1 920	2 540	847	24.1
BWU 30- 60	133					60	35																		2 490	3 670	1 220	34.9
BWU 30- 75	165					75	47		55	25				37.5	6.5					2					2 880	4 520	1 510	42.9
BWU 30- 90	199					90	59							45											3 250	5 360	1 790	50.9
BWU 40- 40	136	40	14	3.5	8	40	31	20	20	–	M4	4	–	–	–	1.0	24	8.5	–	1	20	4.5	8	4.5	2 040	2 210	735	27.8
BWU 40- 60	209					60	39		40												40				3 100	3 970	1 320	50.0
BWU 40- 80	281					80	47																		4 010	5 730	1 910	72.2
BWU 40-100	346					100	63		80	40				50	8					2					4 640	7 060	2 350	88.9
BWU 60- 60	363	60	16	3.6	9	60	34	36	40	–	M4	4	–	–	–	1.1	42	10	23	1	40	4.5	8	4.5	4 740	5 690	1 900	124
BWU 60- 80	487					80	45																		5 930	7 820	2 610	171
BWU 60-100	597					100	56		80	40			23	50	8					2					7 020	9 960	3 320	217
BWU 60-120	723					120	68		100					60											8 050	12 100	4 030	264

Notes (1) Bed mounting bolts (cross-recessed pan head screw for precision equipment M1.6×5) are appended.
(2) Bed mounting bolts (cross-recessed pan head screw for precision equipment M2×4) are appended.

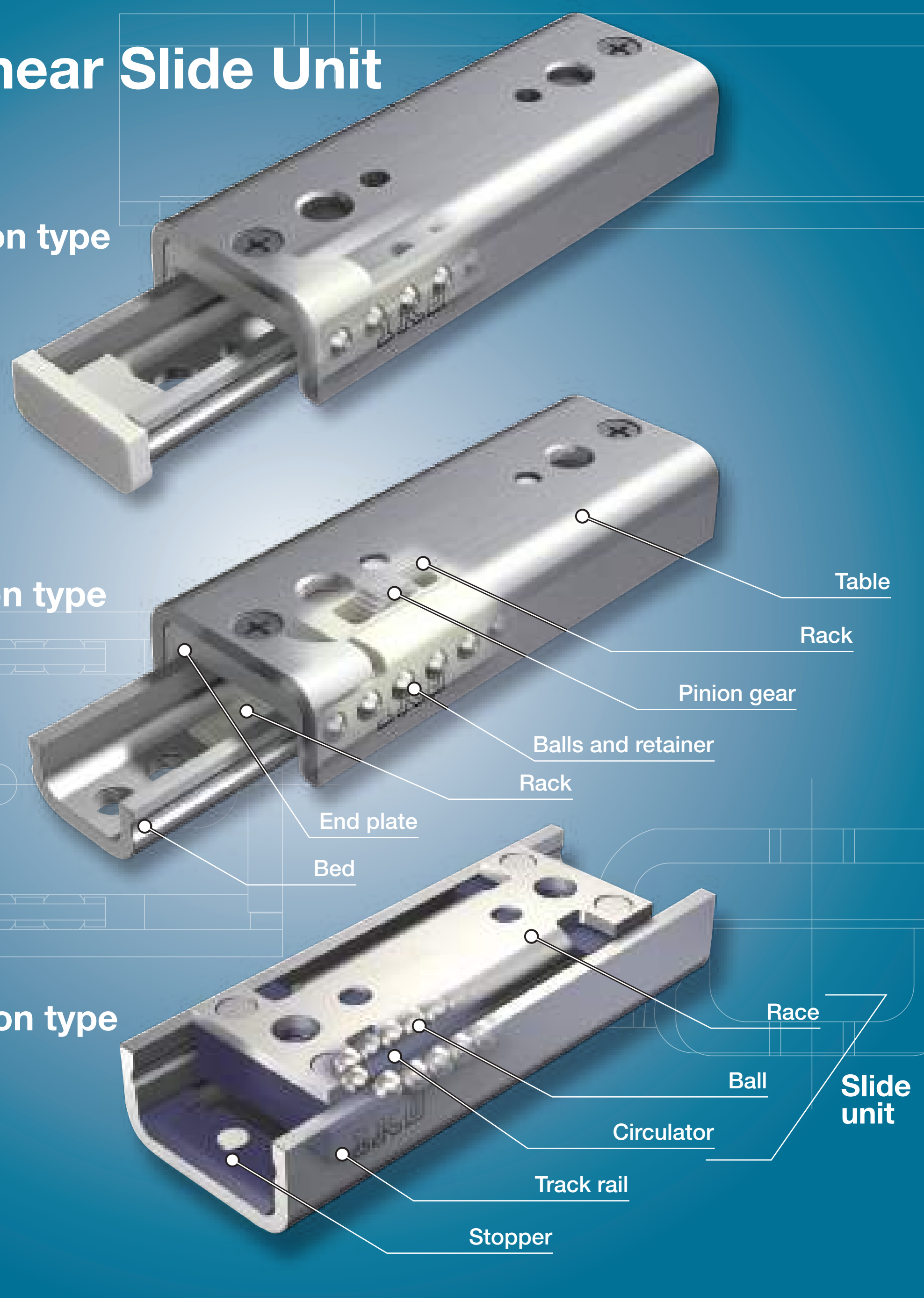
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Precision Linear Slide Unit

Limited linear motion type
BSP

Built-in rack & pinion type
BSPG

Endless linear motion type
BSR



Points

Light weight and compact

1 Weight is saved by precise forming of stainless steel plate to U shape and integration of the way and mounting surface, and downsizing was realized by functional allocation of parts.

Stable performance

2 With simple two-row four-point contact structure, motion accuracy with stable load carrying capacity and high motion accuracy can be achieved for load in every direction.

Quiet and smooth operations

3 The excellent retaining and guiding mechanism of the ball and precisely-finished raceway realizes very quiet and smooth operations. High response characteristics and positioning accuracy are obtained for micro-feeding operation as well.

High safety

4 Since non-combustible or self-extinguishing materials are used for all synthetic resin components, they may be used for wide range of applications including household office automation equipment that requires incombustibility.

Stainless steel selections for excellent corrosion resistance

5 Stainless steel highly resistant to corrosion is used for all steel components, so that they are suitable for applications where rust prevention oil is not preferred, such as in a cleanroom environment.

Identification Number and Specification

Example of an identification number

The specifications of BSP, BSPG and BSR are indicated by the identification number. Indicate the identification number, consisting of a model code, dimensions, a material code, and a clearance code for each specification to apply.

1	2	3	4	5
BSP	15	50	SL	T1
BSPG	12	35	SL	T1
BSR	20	60	SL	T1

1	**Model**	Model code Page Ⅱ−85
2	**Width**	Dimensions Page Ⅱ−85
3	**Length**	
4	**Material type**	Material code Page Ⅱ−85
5	**Clearance amount**	Clearance code Page Ⅱ−85

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Identification Number and Specification

1 Model

Precision Linear Slide Unit

Limited linear motion type : BSP
Built-in rack & pinion type : BSPG
Endless linear motion type : BSR

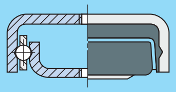
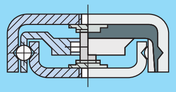
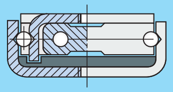
For applicable models and width, see Table 1.

2 Width

7, 10, 12, 15, 20, 25

Indicate the width in mm.
For applicable models and width, see Table 1.

Table 1 Models and width

Shape	Model	Characteristics	Width					
			7	10	12	15	20	25
Limited linear motion type 	BSP	Retainer made of special synthetic resin is used to prevent interference noise from contact of balls. This type performs very smooth and light limited linear motion without stick-slip.	○	○	–	○	○	○
Built-in rack & pinion type 	BSPG	A pinion gear assembled in the retainer integrated with two-row ball raceway is engaged with the racks fixed to the table and bed to prevent creeping of retainer position. Like BSP, this type also performs smooth linear motion.	–	–	○	○	○	○
Endless linear motion type 	BSR	The ball circulation structure made of special synthetic resin realizes quiet and smooth endless linear motion according to the length of a track rail.	–	–	○	○	○	○

3 Length

Indicate the length in mm.

4 Material type

Stainless steel made : SL

Stainless steel (SL) can be specified only for the material type.

5 Clearance amount

Standard : No symbol
T_1Clearance : T_1

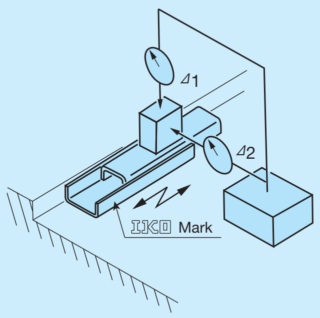
For details of clearance amount, see Table 2.
Typically, apply the standard clearance for use in small frictional resistance and the clearance adjusted to the clearance code T_1 for applications requiring high linear motion accuracy.

Table 2 Clearance of raceways unit: μm

Type and code	Clearance of raceways
Standard (no symbol)	0 ～ +4
T_1	−4 ～ 0

Accuracy

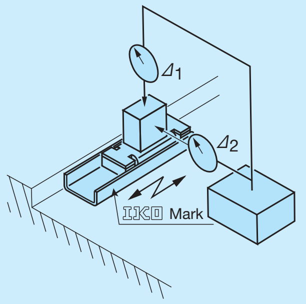
Table 3 Running accuracy for BSP and BSPG



unit: μm

Stroke length mm		Parallelism at the bed center against the table mounting surface Δ_1	Parallelism at the bed center against the table reference mounting surface Δ_2
Over	Incl.		
–	18	3	6
18	30	4	8
30	50	5	10
50	80	6	12

Table 4 Running accuracy for BSR



unit: μm

Stroke length mm		Parallelism at the slide unit center against the track rail mounting surface Δ_1	Parallelism at the slide unit center against the track rail reference mounting surface Δ_2
Over	Incl.		
–	18	3	6
18	30	4	8
30	50	5	10
50	80	6	12

Lubrication

Grease is not pre-packed in the BSP and BSR, so please perform adequate lubrication as needed.
Upon delivery, anti-rust oil is applied. Therefore, perform cleaning with clean solution before mounting, apply high-quality lubrication oil or grease to the raceway, and conduct shakedown before use.
The BSPG is packed with special grease applied to the raceway and rack and pinion. In general applications, keep cleanliness and mount it as it is.

Precaution for Use

❶ Applied load

For use with stable and high running accuracy, it is recommended to use applied load around 20% or lower of the basic static load rating.

❷ Handling

When high running accuracy is required for BSP and BSPG, set the load point at the center of the table (or bed) and use with sufficient stroke length.
For the BSP, the retainer may be deviated from the right position due to offset load or irregular and high-velocity motion, etc. Fully stroke it once in certain operating time or certain number of reciprocating motion to correct the retainer position. If it is difficult to correct the retainer position, use BSPG or BSR.
Since BSP, BSPG and BSR have no built-in mechanical stopper to regulate linear motion in the event of collision, install a stopper mechanism in proximity if risk of overstroke exists.

❸ Operating temperature

The maximum operating temperature is 120°C and temperature up to 100°C is allowed for continuous operation. However, when it exceeds 100°C, contact IKO.

❹ Maximum velocity

Operating velocity should not exceed 30 m/min during operation.

Precaution for Mounting

❶ Reference mounting surface

Reference mounting surface is the opposite side of the IKO mark.

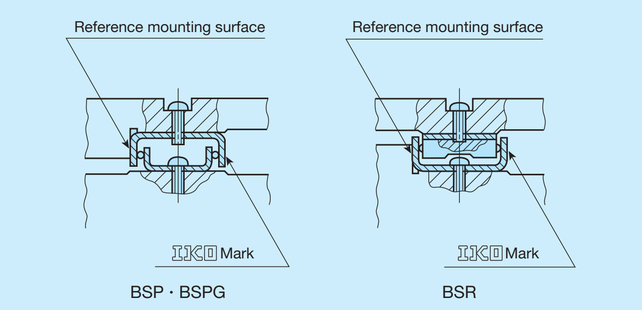


Fig. 1 Reference mounting surface

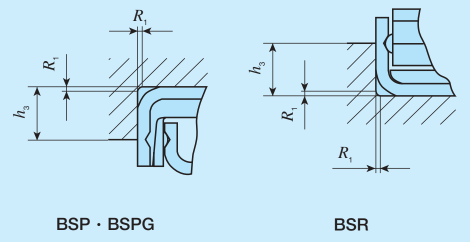
❷ Typical mounting structure

The mating surface to mount BSP, BSPG and BSR should be finished to high accuracy as much as possible so as not to affect the motion accuracy.
For the opposite corner of the mating reference mounting, it is recommended to have relieved fillet as indicated in Fig. 1, but you may also mount it based on R_1 dimension indicated in Table 5. The value indicated in Table 5 is recommended for the shoulder height on the mating side.

❸ Mounting

The fixing thread depth of fixing screws must not exceed the maximum fixing thread depth indicated in the dimension table.
When mounting BSP and BSPG, use female screws of the table and bed, or insert screws smaller by one size to the female screws. However, note that BSP 715 SL through BSP 740 SL cannot be mounted from the inside of the table and bed.
When mounting the track rail of BSR, use female screws of the track rail or insert screws smaller by one size to the female screws. However, note that BSR 1530 SL through BSR 2040 SL cannot be mounted from the inside of the track rail. In addition, when BSR 1230 SL through BSR 1260 SL are to be mounted from the inside of the track rail, contact IKO.

Table 5 Shoulder height and corner radius of the reference mounting surface



unit: mm

Identification number			Shoulder height h_3	Corner radius R_1 (maximum)
–	–	BSR 12	2.5	0.5
BSP 7	–	–	3	
BSP 10	–	–	4	
–	BSPG 12	–		
BSP 15	BSPG 15	BSR 15	5	
BSP 20	BSPG 20	BSR 20	6	
BSP 25	BSPG 25	BSR 25		

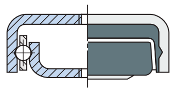
❹ Tightening torque for fixing screw

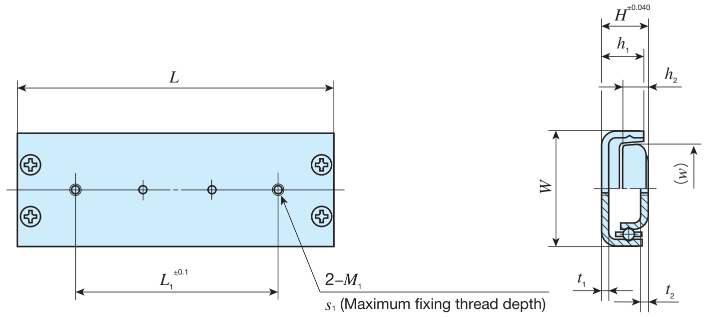
If the fixing force of BSP, BSPG and BSR toward the mating surface is too strong, performance and accuracy are adversely affected. Although it depends on material, rigidity and finishing condition of the mating surface, it is generally recommended to use smaller tightening torque for fixing screws and use value comparable to Table 6. In addition, use a stopper measure such as adhesive agent if fixing screw may be loosened by vibration, etc.

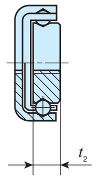
Table 6 Tightening torque for fixing screw

Bolt size	Tightening torque N・m
M2 × 0.4	0.065
M2.3 × 0.4	0.10
M2.6 × 0.45	0.15
M3 × 0.5	0.24

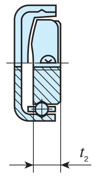
Limited linear motion type

	BSP
Shape	
Size	7 / 10 / 15 / 20 / 25

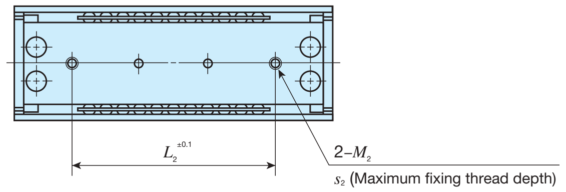




BSP 7



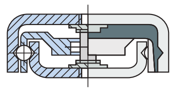
BSP 10

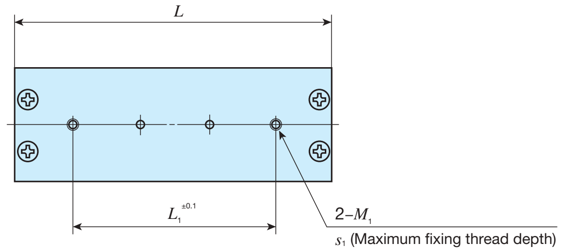


Identification number	Mass (Ref.)	Nominal dimensions mm				Table mounting dimensions mm					Bed mounting dimensions mm						Basic dynamic load rating	Basic static load rating
	g	W	H	L	Maximum stroke length	L_1	M_1	Maximum fixing thread depth s_1	h_1	t_1	w	L_2	M_2	Maximum fixing thread depth s_2	h_2	t_2	C N	C_0 N
BSP 7 15 SL(1)	2.1	7	4	15	9	5	M2	1	3.4	0.9	3.6	5	M2	2	–	2	93.3	42.0
BSP 7 20 SL(1)	2.8			20		10						10					134	70.0
BSP 7 30 SL(1)	4.2			30	18	20						20					170	98.0
BSP 7 40 SL(1)	5.6			40	23	30						30					203	126
BSP 10 25 SL	6.2	10	6	25	15	15	M2.6	1.5	5.8	1.1	6.2	15	M2.6	2.7	3.7	2.7	340	156
BSP 10 35 SL	8.8			35	26	25						25					398	194
BSP 10 45 SL	11.3			45	38	35						35					453	233
BSP 15 30 SL	11	15	8	30	22	14	M3	2.5	7	1.2	11.2	14	M3	3	4.5	1.2	395	194
BSP 15 40 SL	14.7			40	24	24						24					550	311
BSP 15 50 SL	18.4			50	32	34						34					644	389
BSP 15 60 SL	22.1			60	40	40						40					732	467
BSP 20 40 SL	23.7	20	10	40	22	24	M3	3.2	9	1.4	16	24	M3	3.5	6.2	1.4	726	386
BSP 20 50 SL	29.7			50	28	34						34					866	496
BSP 20 60 SL	35.7			60	34	40						40					998	606
BSP 20 70 SL	41.7			70	40	45						45					1 120	717
BSP 20 80 SL	47.6			80	53	50						50					1 180	772
BSP 25 50 SL	37.6	25	10	50	26	34	M3	3.5	9	1.6	20.5	34	M3	3	5.7	1.6	866	496
BSP 25 60 SL	45.3			60	32	40						40					998	606
BSP 25 70 SL	52.9			70	40	45						45					1 120	717
BSP 25 80 SL	60.5			80	51	50						50					1 180	772
BSP 25 100 SL	75.8			100	63	60						60					1 410	992

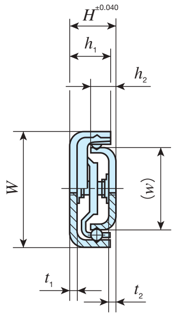
Note (1) BSP 715 SL through BSP 740 SL cannot be mounted from the inside of the table and bed.

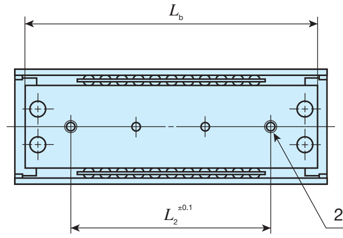
Built-in rack & pinion type

	BSPG			
Shape				
Size	12	15	20	25



s_1 (Maximum fixing thread depth)



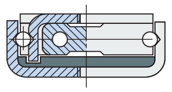


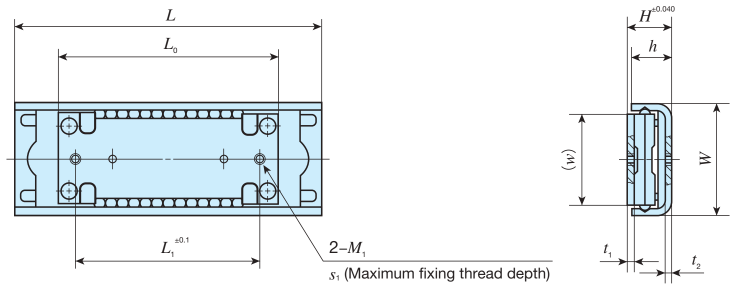
s_2 (Maximum fixing thread depth)

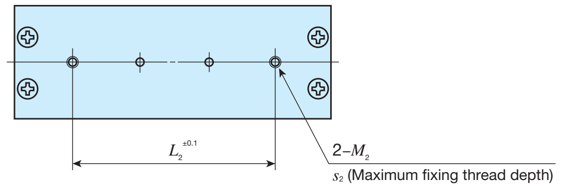
Identification number	Mass (Ref.) g	Nominal dimensions mm				Table mounting dimensions mm					Bed mounting dimensions mm							Basic dynamic load rating	Basic static load rating
		W	H	L	Maximum stroke length	L_1	M_1	Maximum fixing thread depth s_1	h_1	t_1	L_b	w	L_2	M_2	Maximum fixing thread depth s_2	h_2	t_2	C N	C_0 N
BSPG 12 25 SL	6.5	12	6	25	14	15	M2.6	2	5.2	1.2	23.6	7.6	15	M2.6	2	3	1	244	131
BSPG 12 35 SL	9.0			35	24	24					33.6		24					299	175
BSPG 12 45 SL	11.6			45	34	34					43.6		34					350	219
BSPG 15 40 SL	15.8	15	8	40	24	24	M3	2.5	7	1.2	37	9.6	24	M3	3	4.5	1.2	550	311
BSPG 15 50 SL	19.6			50	32	34					47		34					644	389
BSPG 15 60 SL	23.5			60	40	40					57		40					732	467
BSPG 20 40 SL	25.5	20	10	40	22	24	M3	3.2	9	1.4	37	13.8	24	M3	3.5	6.2	1.4	726	386
BSPG 20 50 SL	31.8			50	28	34					47		34					866	496
BSPG 20 60 SL	38.1			60	34	40					57		40					998	606
BSPG 20 70 SL	44.4			70	40	45					67		45					1 120	717
BSPG 20 80 SL	50.5			80	47	50					77		50					1 240	827
BSPG 25 50 SL	40.3	25	10	50	26	34	M3	3.5	9	1.6	46	18.4	34	M3	3	5.7	1.6	866	496
BSPG 25 60 SL	48.3			60	32	40					56		40					998	606
BSPG 25 70 SL	56.2			70	38	45					66		45					1 120	717
BSPG 25 80 SL	64.1			80	44	50					76		50					1 240	827
BSPG 25 100 SL	80.0			100	56	60					96		60					1 460	1 050

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Endless linear motion type

	BSR
Shape	
Size	12 / 15 / 20 / 25





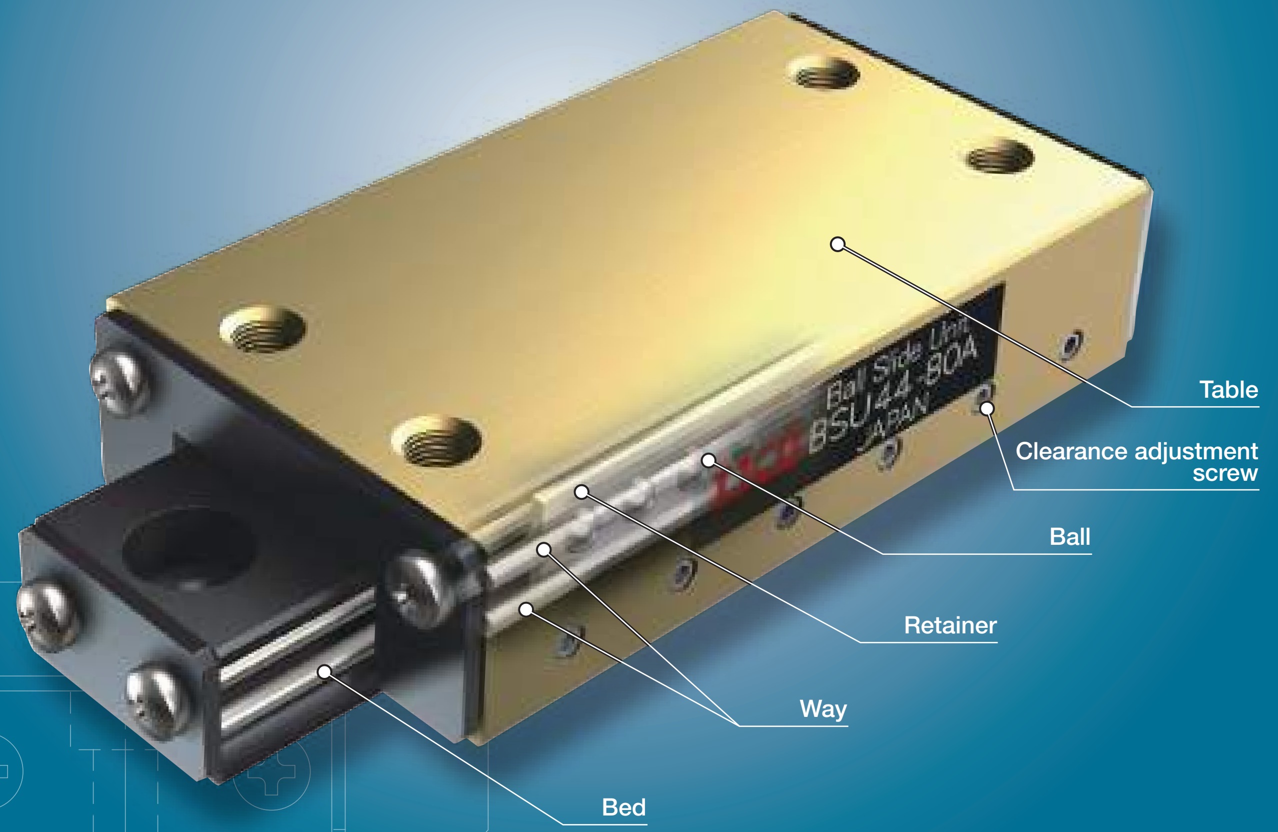
Identification number	Mass (Ref.)	Nominal dimensions mm				Slide Unit mm			Mounting dimensions			Track rail mounting dimensions mm					Basic dynamic load rating	Basic static load rating
	g	W	H	L	Maximum stroke length	w	L_0	L_1	M_1	Maximum fixing thread depth s_1	t_1	L_2	M_2	Maximum fixing thread depth s_2	h	t_2	C N	C_0 N
BSR 12 30 SL(1)	5.8	12	4.5	30	13	9.8	21.5	15	M2	1.3	0.9	15	M2	1.6	4	0.9	214	140
BSR 12 40 SL(1)	7.0			40	23							20						
BSR 12 50 SL(1)	8.2			50	33							34						
BSR 12 60 SL(1)	9.3			60	43							40						
BSR 15 30 SL(2)	12.6	15	8	30	10	12.2	30	24	M3	1.8	1	14	M3	3	7	1.2	543	311
BSR 15 40 SL	14.8			40	20							24						
BSR 15 50 SL	17.1			50	30							34						
BSR 15 60 SL	19.3			60	40							40						
BSR 20 40 SL(2)	27.6	20	10	40	12	16.8	40	32	M3	2.2	1.4	24	M3	3.5	9	1.4	921	551
BSR 20 50 SL	31.1			50	22							34						
BSR 20 60 SL	34.6			60	32							40						
BSR 20 70 SL	38.1			70	42							45						
BSR 20 80 SL	41.6			80	52							50						
BSR 25 70 SL	53.8	25	10	70	33	21.4	50	42	M3	2.4	1.6	45	M3	3.5	9	1.6	1 170	772
BSR 25 80 SL	58.4			80	43							50						
BSR 25 100 SL	67.4			100	63							60						

Notes (1) When BSR 1230 SL through BSR 1260 SL are to be mounted from the inside of the track rail, contact IKO.
(2) BSR 1530 SL and BSR 2040 SL cannot be mounted from the inside of the track rail.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Linear Slide Unit

BSU···A



Points

Light weight linear motion guide unit

Since the product uses aluminum alloy for table and bed, it is a light weight and compact limited linear motion guide unit.

Smooth operations

Since the ball is guided by the retainer made of synthetic resin and rotates on high accuracy round shank way, it can obtain a light and smooth motion.

Easy mounting

Since the product is properly preloaded, it can easily gain a stable linear motion only by fixing it against precisely grounded mounting surface with bolts.

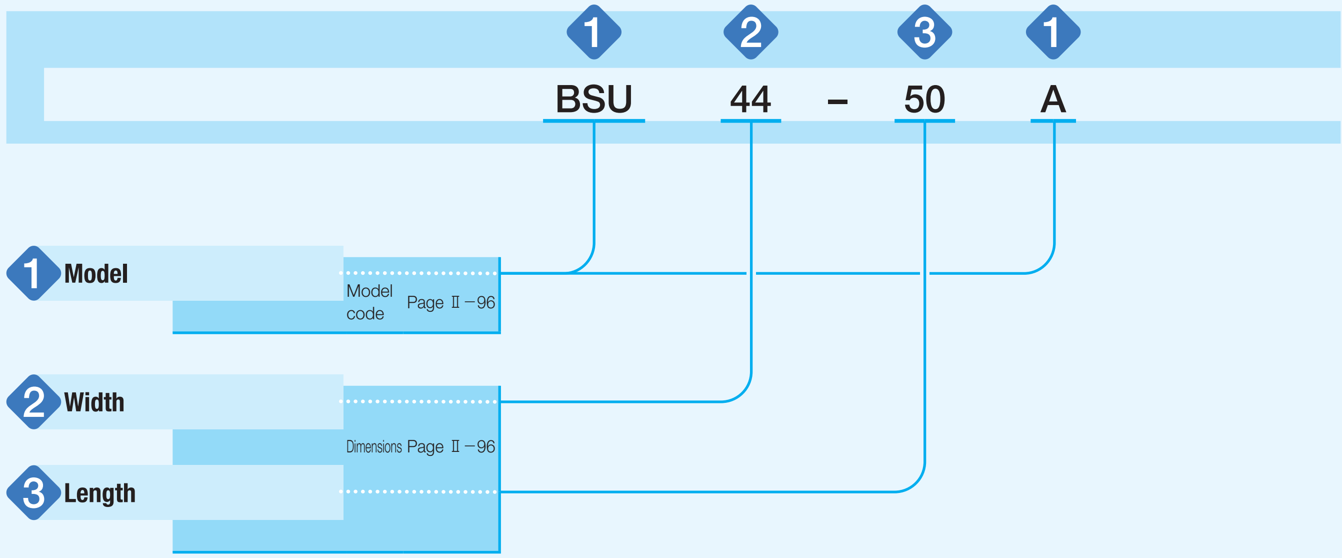
Excellent corrosion resistance

The ball and way are mode of stainless steel and the surface of table and bed have anodic oxidization coating, allowing high corrosion resistance.

Identification Number and Specification

Example of an identification number

The specification of BSU···A series is indicated by the identification number. Indicate the identification number, consisting of a model code and dimensions for each specification to apply.

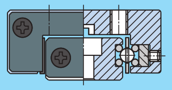


Identification Number and Specification

① Model	Linear Slide Unit : BSU···A For applicable models, width and length, see Table 1.	
② Width	44, 66	Indicate the table width in mm. For applicable models, width and length, see Table 1.
③ Length		Indicate the length in mm. For applicable models, width and length, see Table 1.

Table 1 Width and length of BSU···A series

unit: mm

Shape	Model	Width	Length				
			50	80	100	125	150
	BSU···A	44	○	○	○	−	−
		66	−	−	○	○	○

Allowable Load

Allowable load refers to load of smooth rolling motion on contact surface to which maximum contact stress is applied and the sum of whose elastic deformation of rolling elements and raceway is small.

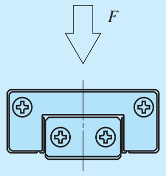


Fig.1 Direction of allowable load

Accuracy

❶ Running accuracy

Parallelism at the table center against the bed mounting surface (see Fig. 2): 10 μm / 10 mm

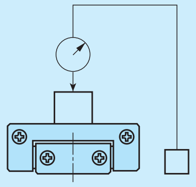


Fig.2 Parallelism at the table center

❷ Allowance of deviation at the table center

Deviation at the table center after stroking the table and returning to the same position (see Fig. 3.): 1.5 μm

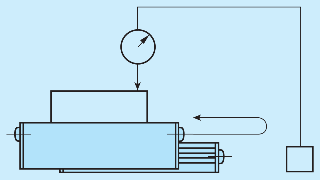


Fig.3 Deviation at the table center

Lubrication

Grease is not pre-packed in the BSU···A series, so perform adequate lubrication as needed.

Perform cleaning with clean solution before mounting and apply high-quality lubrication oil or grease to the raceway before use.

Precaution for Use

❶ Handling

When high running accuracy is required, set the load point at the center of the table (or bed) and use with sufficient stroke length.

For the BSU···A series, the retainer may be deviated from the right position due to offset load or irregular and high-velocity motion, etc. Fully stroke it once in certain operating time or certain number of reciprocating motion to correct the retainer position.

Since BSU···A series have small allowable load F, handling requires special care. Especially when clearance adjustment is performed, too much tightening of clearance adjustment screw will create impression on ball or way, which can adversely affect the friction, noise and vibration of the bearing. When performing clearance adjustment, gradually rotate the clearance adjustment screw by checking the motion status and paying special attention.

❷ Operating temperature

The table and bed of BSU···A series are made of aluminum alloy, and the clearance may change by the operating temperature. When using in the temperature outside the normal temperature, contact IKO. When using in wide operating temperature range, it is recommended to use IKO High Rigidity Precision Linear Slide Unit.

❸ Maximum velocity

Operating velocity should not exceed 30 m/min during operation.

Precaution for Mounting

❶ Mounting

The fixing thread depth of fixing screws must not exceed the maximum fixing thread depth indicated in the dimension table. Since the fixing screw hole for the table is penetrated, the bed or retainer will be pushed by the screw if the fixing thread depth is too deep, and the running accuracy and life may be adversely affected.

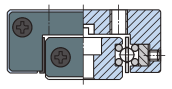
❷ Tightening torque for fixing screw

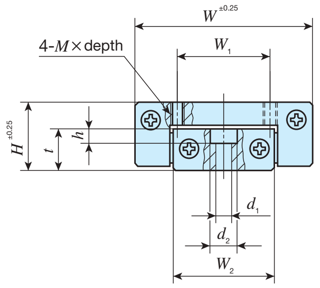
Typical tightening torque for mounting of the BSU···A series to the steel mating member material is indicated in Table 2. If the mating member material is cast iron or aluminum alloy, reduce the tightening torque depending on the strength characteristics of the mating member material.

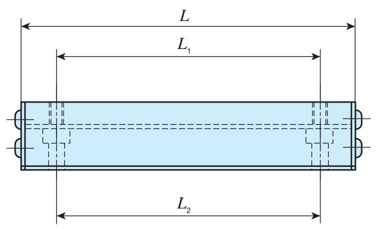
Table 2 Tightening torque for fixing screw

Bolt size	Tightening torque N・m
M5×0.8	5.0

Remark: The tightening torque is calculated based on property division A2-70 of stainless steel hexagon socket head bolt.

Shape	**BSU···A** 	
Size	44	66





Identification number	Mass (Ref.)	Nominal dimensions mm				Table mounting dimensions mm			Bed mounting dimensions mm						Allowable load F
	g	H	W	L	Stroke length	W_1	L_1	M×depth	W_2	t	L_2	d_1	d_2	h	N
BSU 44- 50 A	110	20	44	50	25	20	35	M5×7	21.8	12.3	35	5.3	10	5.3	98.1
BSU 44- 80 A	175			80	50		65				65				177
BSU 44-100 A	220			100	75		85				85				235
BSU 66-100 A	420	25	66	100	50	35	75	M5×8	37	16	75	5.3	10	5.3	265
BSU 66-125 A	525			125	75		100				100				392
BSU 66-150 A	625			150	100		125				125				510

Linear Ball Spline

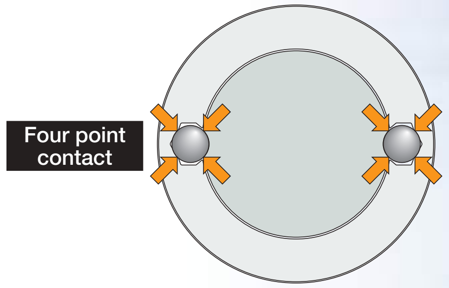
C-Lube Linear Ball Spline MAG
Linear Ball Spline G

Excellent features of compact linear ball spline realized by a simple structure by four-points contact in two-row raceways

IKO Linear Ball Spline is a linear motion rolling guide in which an external cylinder makes linear motion along the spline shaft. Since the structure lets a ball to rotate on the spline track groove, it can receive not only the radial load but also rotating torque. Therefore it best fits the structure in which torque transmission and linear motion take place in parallel.

High rigidity despite of compact size

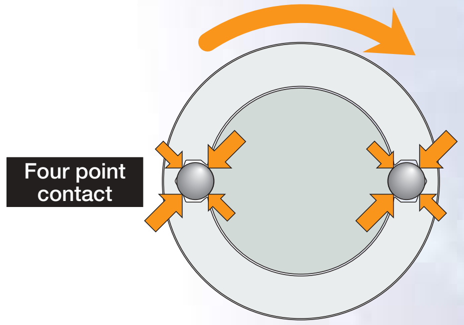
The structure places large diameter balls in two rows and has four-point contact with the track, allowing greater rigidity and compact design.



For the load from all directions it gives a good balance and high rigidity!

Allows high accuracy and accurate positioning

Preload removes the clearance along the rotation direction, allowing accurate positioning along the rotation direction.



No play along the rotation direction!

Low frictional resistance and smooth motion

The optimum design based on the thorough analysis of ball recirculating route realized low frictional resistance and smooth linear motion durable for high speed operations.

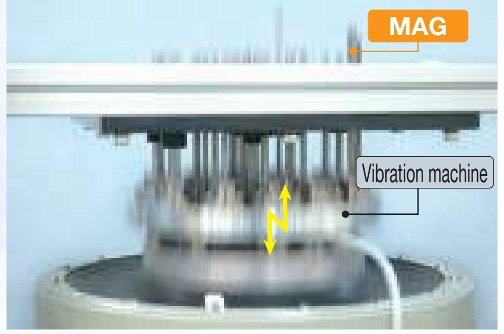
Both high speed durability performance and maintenance free performance are achieved

C-lube Linear Ball Spline MAG realizes a long term maintenance free using the built-in lubrication parts C-Lube for ball recirculation way in external cylinder. Since the lubrication oil inside C-Lube maintains the lubrication performance for a long time, it reduces the annoying lubricating management works and also allows total system cost saving by reducing the oil supply structures.

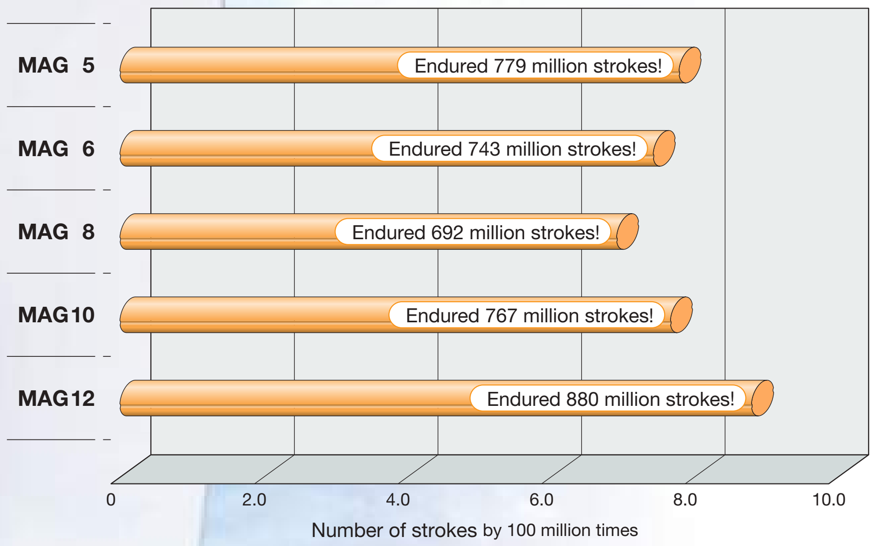
Durability test assuming the chip mounter

《Test conditions》

Lubrication conditions	Only lubrication oil inside C-lube, with no pre-packed grease	
Test method	Vibration test machine	
Operation condition	Posture	Vertical
	Maximum velocity	860 mm/s
	Acceleration	10 G
	Number of cycle	18.2 Hz
	Stroke length	15 mm



《Result》



Endured total strokes of 200 million times without a problem, only by lubrication oil inside C-Lube, for vertical shaft and super high tact operation!
Realized the maintenance free of 10 years of use equivalent to 10 years, in the test condition assuming the use for general chip mounters!!

Achieved maintenance free of **more than 600 million** total strokes in this severe operation conditions!!

IKO Features of Linear Ball Spline series ②

Free combination is enabled for model/accuracy/preload!!

Extreme interchangeable system

Interchangeable specification

Interchangeable specification allows for external cylinder and spline shaft dimensions to be strictly managed based on unique advanced processing technology, resulting in an unparalleled level of interchangeability. This allows external cylinders and spline shafts to be handled independently and selected in any combination, allowing you to order just what you need, when you need it, and in the quantity you require.

Requirements of ;

- Wish to improve the rigidity and life of machines
- Wish to improve the accuracy of machines
- Wish to replace the external cylinder immediately
- There are not enough external cylinders
- Wish to replace the spline shaft immediately
- The length of spline shaft is not sufficient
- Wish to store only the external cylinders in stock for emergency

Help

Interchangeable specification realizes ;

- Wish to prepare for a sudden design change
- Wish to select freely the combination of high accuracy and preload
- Independent handling of external cylinders and spline shafts
- Free and independent combination of external cylinders and spline shafts
- Compactness - independent storing of external cylinders and spline shafts

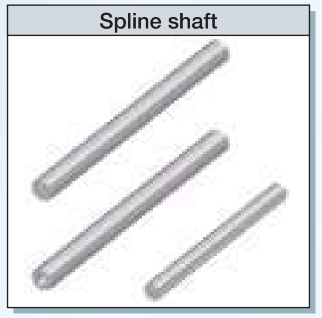
Sorted out

Select the products as many as you wish.

External cylinder

\+

Spline shaft



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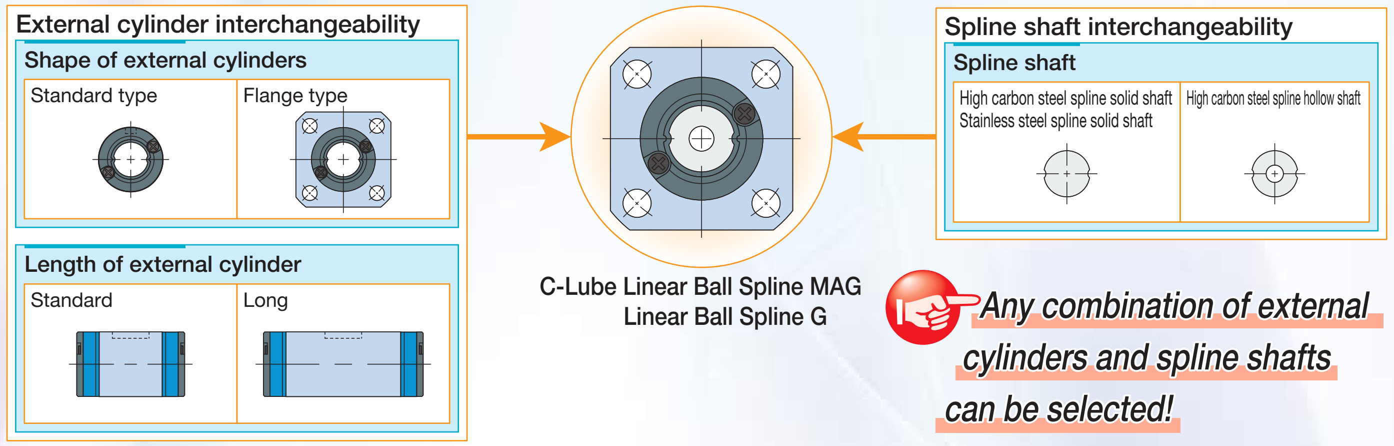
Assembled set

External cylinder interchangeability

A wide variety of models with different sectional shape and length are provided, for free replacement on the same spline shaft.



C-Lube Linear Ball Spline MAG
Linear Ball Spline G

Any combination of external cylinders and spline shafts can be selected!

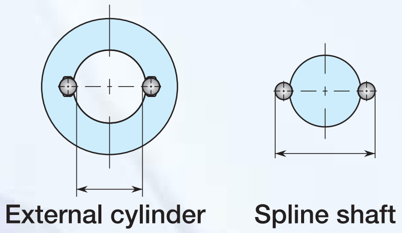
Accuracy interchangeability

The simple structure of four-contact in two-row raceway yields small manufacturing errors or accuracy measurement errors, allowing the maintenance of each raceway in the high dimensions accuracy.
Two accuracy classes of ordinary and high level are provided, to support even high traveling accuracy purposes.

It allows the accuracy improvement of units without design changes!

Preload interchangeability

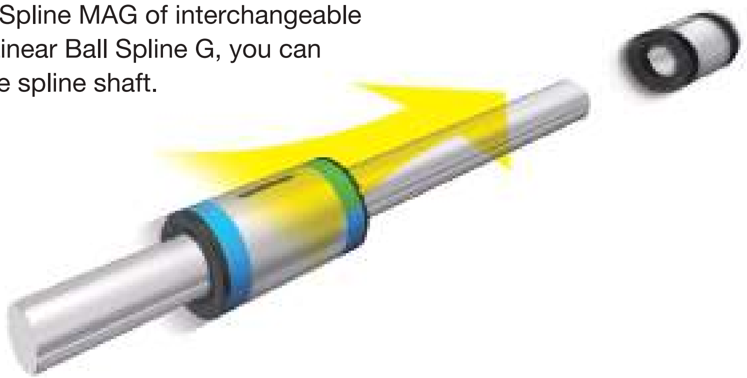
The simple structure is leveraged to allow dimensions to be managed with high accuracy, for preloaded external cylinders that are interchangeable.
It supports the applications requiring the rigidity of one higher rank.



It allows the rigidity improvement of units without design changes!

Maintenance free is achieved only by replacing the external cylinder!

By exchanging the external cylinder of Linear Ball Spline MAG of interchangeable specification with an external cylinder of C-Lube Linear Ball Spline G, you can achieve the maintenance free without changing the spline shaft.



C-Lube Linear Ball Spline MAG

MAG

Points

1 Compact size

Uses a unique ball retaining mechanism without using a retainer, allowing a small external cylinder outside diameter against shaft diameter.

2 Extremely small size realized by simple structure

The minimum size LSAG2 realizes an unparalleled small size of 2 mm shaft diameter and 6 mm external cylinder's outside diameter.

3 Wide range of variations for your needs

The external cylinder shape can be selected from two types, the standard (cylindrical shape) type and the flange type, and there are two types with different length of external cylinder with same section.
Also for spline shaft, the solid shaft and the hollow shaft that allows piping/wiring/air removal are prepared for your selection to meet the requirements of mechanical/unit specifications.

4 Stainless steel shaft with high corrosion resistance

The spline shafts made of stainless steel are highly corrosion-resistant. They are suitable where rust prevention oil is not preferred, such as in a cleanroom environment.

Identification Number and Specification

Example of an identification number

The specifications of MAG and LSAG series are indicated by the identification number. Indicate the identification number, consisting of a model code, dimensions, a part code, a preload symbol, a classification symbol, an interchangeable code, and any supplemental codes for each specification to apply.

Non-interchangeable specification	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩
Assembled set	MAG	L	T	5	C1	R150	T_1	H		/N
Interchangeable specification										
Single external cylinder	MAG	L		5	C1		T_1	H	S1	/N
Single spline shaft (¹)	LSAG		T	5		R150		H	S1	
Assembled set	MAG	L	T	5	C1	R150	T_1	H	S1	/N

No.	Item	Code	Reference
①	**Model**	Model code	Page Ⅱ－109
②	**External cylinder length**	Model code	Page Ⅱ－109
③	**Spline shaft shape**	Model code	Page Ⅱ－109
④	**Size**	Dimensions	Page Ⅱ－109
⑤	**Number of external cylinders**	Part code	Page Ⅱ－109
⑥	**Spline shaft length**	Part code	Page Ⅱ－109
⑦	**Preload amount**	Preload symbol	Page Ⅱ－111
⑧	**Accuracy class**	Classification symbol	Page Ⅱ－112
⑨	**Interchangeable**	Interchangeable code	Page Ⅱ－115
⑩	**Special specification**	Supplemental code	Page Ⅱ－115

Note (¹) Indicate "LSAG" (solid shaft) or "LSAGT" (hollow shaft) for the model code of the single spline shaft regardless of the series and the combination of external cylinder models.

Identification Number and Specification —Model · External Cylinder Length · Spline Shaft Shape · Size · Number of External Cylinders · Spline Shaft Length—

1 Model

C-Lube Linear Ball Spline MAG (MAG series)
Standard type : MAG
Flange type : MAGF

Linear Ball Spline G (1) (LSAG series)
Standard type : LSAG
Flange type : LSAGF

For applicable models and sizes, see Table 1.
Indicate "LSAG" (solid shaft) or "LSAGT" (hollow shaft) for the model code of the single spline shaft regardless of the series and the combination of external cylinder models.

Note (1) This model has no built-in C-Lube.

2 External cylinder length

Standard : No symbol
Long : L

For applicable models and sizes, see Table 1.

3 Spline shaft shape

Solid shaft : No symbol
Hollow shaft : T

For applicable models and sizes, see Table 1.

4 Size

2, 3, 4, 5, 6, 8, 10, 12, 15
20, 25, 30

For applicable models and sizes, see Table 1.

5 Number of external cylinders

: C○

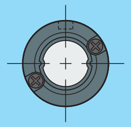
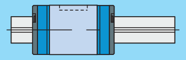
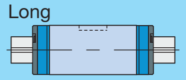
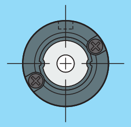
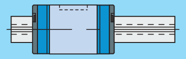
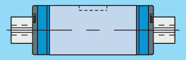
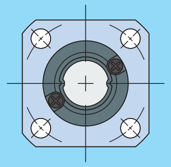
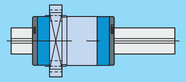
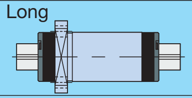
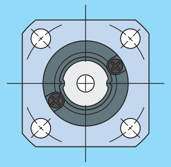
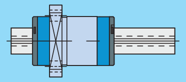
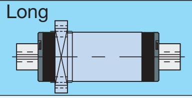
For an assembled set, indicates the number of external cylinders assembled on a spline shaft. For a single external cylinder, only "C1" is specified.

6 Spline shaft length

: R○

The spline shaft length is indicated in mm.
For standard and maximum lengths, see the dimension table.

Table 1 Models and sizes of MAG and LSAG series

Shape	External cylinder length	Model	Size											
			2	3	4	5	6	8	10	12	15	20	25	30
Standard type Solid shaft 	Standard 	MAG	–	–	○	○	○	○	○	○	–	–	–	–
		LSAG	○	○	○	○	○	○	○	○	○	○	○	○
	Long 	MAGL	–	–	○	○	○	○	–	–	–	–	–	–
		LSAGL	–	–	–	○	○	○	○	○	○	○	○	○
Standard type Hollow shaft 	Standard 	MAGT	–	–	○	○	○	○	○	○	–	–	–	–
		LSAGT	–	–	○	○	○	○	○	○	–	–	–	–
	Long 	MAGLT	–	–	○	○	○	○	–	–	–	–	–	–
		LSAGLT	–	–	–	○	○	○	○	○	–	–	–	–
Flange type Solid shaft 	Standard 	MAGF	–	–	–	○	○	○	○	○	–	–	–	–
		LSAGF	○	○	○	○	○	○	○	○	○	○	○	○
	Long 	LSAGFL	–	–	–	○	○	○	○	○	○	○	○	○
Flange type Hollow shaft 	Standard 	MAGFT	–	–	–	○	○	○	○	○	–	–	–	–
		LSAGFT	–	–	○	○	○	○	○	○	–	–	–	–
	Long 	LSAGFLT	–	–	–	○	○	○	○	○	–	–	–	–

Remark: For the models indicated in ▭ , the interchangeable specification is available.

7 Preload amount

Clearance Standard : T₀ Specify this item for an assembled set or a single
Light preload : No symbol external cylinder.
: T₁ For details of the preload amount, see Table 2.
For applicable preload types, see Table 3.

Table 2 Preload amount

Preload type \ Item	Preload symbol	Preload amount N	Operational conditions
Clearance	T₀	0(1)	· Very light motion
Standard	(No symbol)	0(2)	· Light and precise motion
Light preload	T₁	0.02 C_0	· Almost no vibrations · Load is evenly balanced · Light and precise motion

Notes (1) There is zero or subtle clearance.
(2) Indicates zero or minimal amount of preload.
Remark: C_0 indicates the basic static load rating.

Table 3 Application of preload

Size	Preload type (preload symbol)		
	Clearance (T₀)	Standard (No symbol)	Light preload (T₁)
2	○	○	–
3	○	○	–
4	○	○	–
5	–	○	○
6	–	○	○
8	–	○	○
10	–	○	○
12	–	○	○
15	–	○	○
20	–	○	○
25	–	○	○
30	–	○	○

Remark: The mark ▭ indicates that interchangeable specifications products are available.

8 Accuracy class

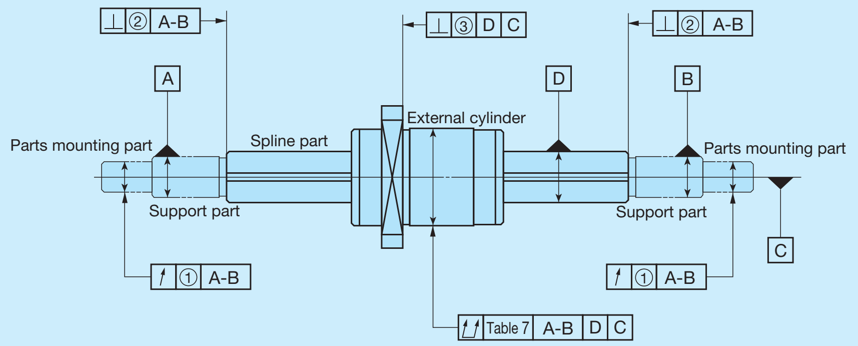
Ordinary : No symbol For interchangeable specification products, assemble
High : H an external cylinder and a spline shaft of the same
Precision : P accuracy class.
For applicable accuracy class, see Table 4.
For details of accuracy class, see Table 5, Table 6, and Table 7.

Table 4 Application of accuracy class

Size	Class (classification symbol)		
	Ordinary (No symbol)	High (H)	Precision (P)
2	○	○	○
3	○	○	○
4	○	○	○
5	○	○	○
6	○	○	○
8	○	○	○
10	○	○	○
12	○	○	○
15	○	○	○
20	○	○	○
25	○	○	○
30	○	○	○

Remark: The mark ▭ indicates that interchangeable specifications products are available.

Table 5 Tolerance of each part



unit: μm

Size	Relative to axial line of supporting part of spline shaft						③ Perpendicularity of mounting surface of flange with respect to axial line of spline shaft (2)		
	① Radial runout of periphery of parts mounting part (1)			② Perpendicularity of spline part end face (1)					
	Ordinary (No symbol)	High (H)	Precision (P)	Ordinary (No symbol)	High (H)	Precision (P)	Ordinary (No symbol)	High (H)	Precision (P)
2	33	14	8	22	9	6	27	11	8
3	33	14	8	22	9	6	27	11	8
4	33	14	8	22	9	6	27	11	8
5	33	14	8	22	9	6	27	11	8
6	33	14	8	22	9	6	27	11	8
8	33	14	8	22	9	6	27	11	8
10	41	17	10	22	9	6	33	13	9
12	41	17	10	22	9	6	33	13	9
15	46	19	12	27	11	8	33	13	9
20	46	19	12	27	11	8	33	13	9
25	53	22	13	33	13	9	39	16	11
30	53	22	13	33	13	9	39	16	11

Notes (1) The values are for the processed shaft ends.
(2) Applicable to the flange type.

***Table 6** Twist of grooves with respect to effective length of the spline part*

unit: μm

Accuracy class	Ordinary (No symbol)	High (H)	Precision (P)
Allowable value	33	13	6

Remark: The values can be applied to 100 mm of the effective length of the spline at any position.

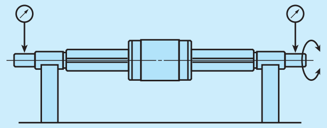
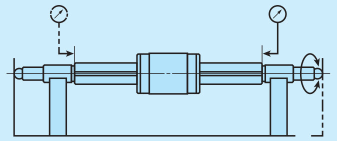
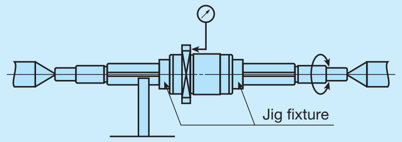
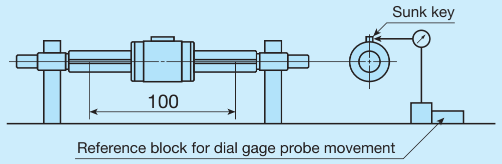
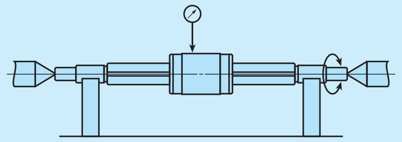
***Table 7** Allowable values of total radial runout of spline shaft axial line*

unit: μm

Overall length of spline shaft mm		Size and accuracy class: Size 2, 3, 4, 5, 6, 8 Ordinary (No symbol)	2, 3, 4, 5, 6, 8 High (H)	2, 3, 4, 5, 6, 8 Precision (P)	10, 12 Ordinary (No symbol)	10, 12 High (H)	10, 12 Precision (P)	15, 20 Ordinary (No symbol)	15, 20 High (H)	15, 20 Precision (P)
–	200	72	46	26	59	36	20	56	34	18
200	315	133	89	57	83	54	32	71	45	25
315	400	185	126	82	103	68	41	83	53	31
400	500	236	163	108	123	82	51	95	62	38
500	630	–	–	–	151	102	65	112	75	46
630	800	–	–	–	190	130	85	137	92	58
800	1 000	–	–	–	–	–	–	170	115	75
1 000	1 250	–	–	–	–	–	–	–	–	–

Overall length of spline shaft mm		Size and accuracy class: Size 25, 30 Ordinary (No symbol)	25, 30 High (H)	25, 30 Precision (P)
–	200	53	32	18
200	315	58	39	21
315	400	70	44	25
400	500	78	50	29
500	630	88	57	34
630	800	103	68	42
800	1 000	124	83	52
1 000	1 250	151	102	65

***Table 8** Measuring methods of accuracy*

Item	Measuring method	Illustration of measuring method
(1) Radial runout of periphery of parts mounting part with respect to axial line of supporting part of spline shaft (see Table 5 ①)	While supporting the spline shaft at its support part, place the dial gage probes on the outer peripheral faces of the parts mounting part and measure the deflection from one rotation of the spline shaft.	
(1) Perpendicularity of spline part end face with respect to axial line of supporting part of spline shaft (See Table 5 ②)	While supporting the spline shaft at its support part and one spline shaft end, place the dial gage probes on the spline end faces and obtain perpendicularity by measuring the deflection from one rotation of the spline shaft.	
Perpendicularity of mounting surface of flange with respect to axial line of spline shaft (see Table 5 ③)	While supporting the spline shaft at both centers and the outer peripheral faces of the spline shaft near the external cylinder and fixing the external cylinder on the spline shaft, place the dial gage probe on the flange mounting surface and obtain perpendicularity by measuring the deflection from one rotation of the spline shaft.	
Twist of grooves with respect to effective length of the spline part (see Table 6)	While supporting the spline shaft fixed, apply a unidirectional torsion moment load to the external cylinder (or measuring unit), place the dial gage probe vertically to the spline shaft on the side face of the sunk key attached on the external cylinder, and measure the deflection when the external cylinder and the dial gage probe are moved 100 mm in the axial direction at any position on the effective length of the spline shaft. However, the dial gage probe should be applied as near as possible to the outer peripheral face of the external cylinder.	
Total radial runout of axial line of spline shaft (see Table 7)	While supporting the spline shaft at its support part or at both centers, place a dial gage probe on the outer peripheral face of the external cylinder (or measuring unit) and measure the deflection from one rotation of the spline shaft at several positions in the axial direction to obtain the maximum value.	

Note (1) The accuracy are for the processed shaft ends.

9 Interchangeable	S1 specification S2 specification Non-interchangeable specification	: S1 : S2 : No symbol	This is specified for the interchangeable specifications. Assemble a spline shaft and an external cylinder with the same interchangeable code. When using in combination with different interchangeable codes, please contact IKO. Note that the combination of interchangeable codes will not have any effect on accuracy. For applicable models and sizes, see Table 1. "No symbol" is indicated for non-interchangeable specification.
10 Special specification	/BS, /N, /OH, /Q, /RE, /S, /Y		For applicable special specifications, see Table 9.1 and Table 9.2. For combination of multiple special specifications, see Table 10. For details of special specifications, see pages Ⅱ-116 and Ⅱ-117.

Table 9.1 Application of special specifications (Interchangeable specification, single external cylinder, and assembled set)

Special specification	Supplemental code	Size											
		2	3	4	5	6	8	10	12	15	20	25	30
No seal	/N	–	–	–	○	○	○	○	○	○	○	○	○
Oil hole (1)	/OH	–	–	–	○	○	○	○	○	○	○	○	○
With C-Lube plate (1)	/Q	–	–	–	○	○	○	○	○	–	–	–	–

Note (1) Applicable to LSAG series.

Table 9.2 Application of special specifications (Non-interchangeable specification)

Special specification	Supplemental code	Size											
		2	3	4	5	6	8	10	12	15	20	25	30
Stainless steel end plate (1)	/BS	–	–	–	○	○	○	○	○	○	–	–	–
No seal	/N	–	–	–	○	○	○	○	○	○	○	○	○
Oil hole (1)	/OH	–	○	○	○	○	○	○	○	○	○	○	○
With C-Lube plate (1)	/Q	–	–	–	○	○	○	○	○	–	–	–	–
Special environment seal (1)	/RE	–	–	–	○	○	○	○	○	○	–	–	–
Stainless steel spline shaft (2)	/S	–	–	–	○	○	○	○	○	○	○	○	○
Specified grease (1)	/Y	–	–	–	○	○	○	○	○	○	–	–	–

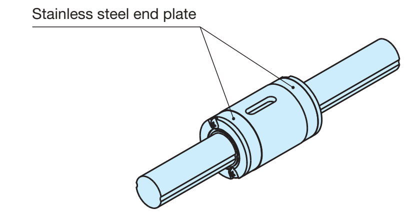
Notes (1) Applicable to LSAG series.
(2) Applicable to solid shaft.

Table 10 Combination of supplemental codes

N	●					
OH	●	○				
Q	●	○	○			
RE	●	–	●	●		
S	●	●	●	●	●	
Y	●	●	●	–	●	●
	BS	N	OH	Q	RE	S

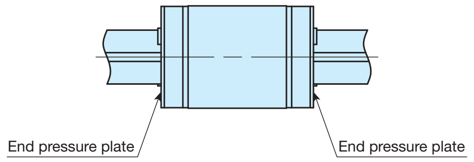
Remarks 1. The combination of "-" shown in the table is not available.
2. Contact IKO for the combination of the interchangeable specification marked with ●.
3. When using multiple types for combination, please indicate by arranging the symbols in alphabetical order.

Stainless steel end plate /BS



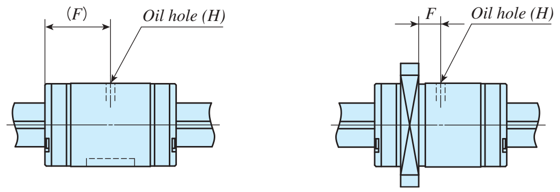
The standard synthetic resin end plates are replaced with stainless steel end plates. The total length of the external cylinder remains unchanged.

No seal /N



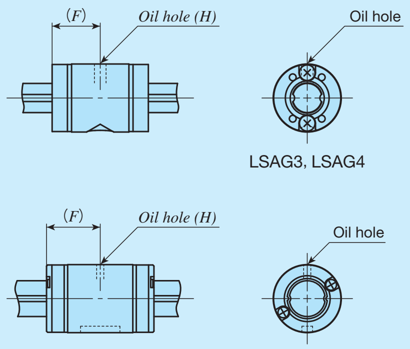
Seals at both ends of the external cylinder can be replaced with end pressure plates, which do not come in contact with the spline shaft, to reduce frictional resistance.
This specification is not effective for dust protection.

Oil hole /OH



An oil hole is created on the external cylinder. For dimensions, see Table 11.1 and Table 11.2.

Table 11.1 Location and diameter of oil hole on a standard type external cylinder (Supplemental code /OH)

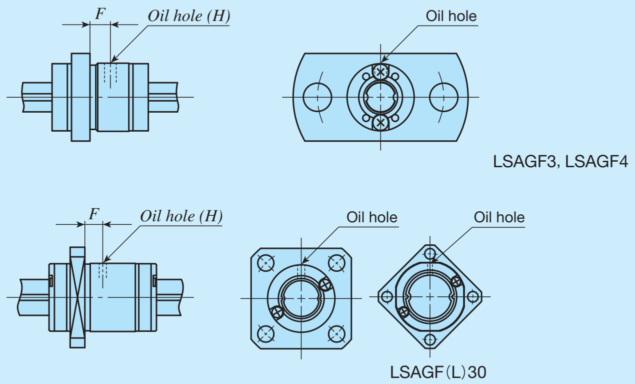


unit: mm

Identification number	F	H	Identification number	F	H
LSAG 3	5	1.2	–	–	–
LSAG 4	6	1.5	–	–	–
LSAG 5	9		LSAGL 5	13	1.5
LSAG 6	10.5		LSAGL 6	15	
LSAG 8	12.5		LSAGL 8	18.5	
LSAG10	15	2	LSAGL10	23.5	2
LSAG12	17.5		LSAGL12	27	
LSAG15	20		LSAGL15	32.5	
LSAG20	25	3	LSAGL20	35.5	3
LSAG25	30		LSAGL25	42	
LSAG30	35		LSAGL30	49	

Remark: A typical identification number is indicated, but is applied to all LSAG series standard type models of the same size.

Table 11.2 Location and diameter of oil hole on a flange type external cylinder (Supplemental code /OH)

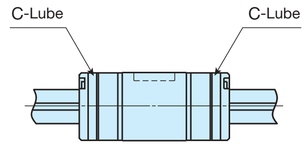


unit: mm

Identification number	F	H	Identification number	F	H
LSAGF 3	2.1	1.2	–	–	–
LSAGF 4	2.8	1.5	–	–	–
LSAGF 5			LSAGFL 5	5.8	1.5
LSAGF 6	3.5		LSAGFL 6	8	
LSAGF 8			LSAGFL 8	9.5	
LSAGF10	5	2	LSAGFL10	13.3	2
LSAGF12	7.5		LSAGFL12	17	
LSAGF15	9		LSAGFL15	21.5	
LSAGF20	11	3	LSAGFL20	21.5	3
LSAGF25	13		LSAGFL25	25	
LSAGF30	14		LSAGFL30	28	

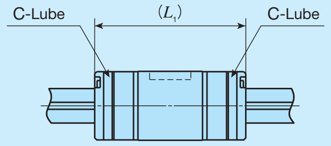
Remark: A typical identification number is indicated, but is applied to all LSAG series flange type models of the same size.

With C-Lube plate /Q



The C-Lube impregnated with lubrication oil is attached inside the seal of the external cylinder, so that the interval for reapplicating lubricant can be extended. For the total length of the external cylinder with C-Lube plate, see Table 12.

Table 12 Dimension of external cylinder with C-Lube plate (Supplemental code /Q)

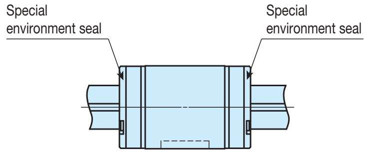


unit: mm

Identification number	L_1	Identification number	L_1
LSAG 5	24	LSAGL 5	32
LSAG 6	27	LSAGL 6	36
LSAG 8	33	LSAGL 8	45
LSAG10	38	LSAGL10	55
LSAG12	43	LSAGL12	62

Remarks 1. The dimensions of the external cylinder with C-Lube at both ends are indicated.
2. A typical identification number is indicated, but is applied to all LSAG series models of the same size.

Special environment seal /RE



The standard seals are replaced with seals for special environment that can be used at high temperatures. The total length of the external cylinder remains unchanged.

Stainless steel spline shaft /S

The material of the solid spline shaft is changed to stainless steel. The load rating will change to a value obtained by multiplying the load rating for the steel spline shaft by a factor of 0.8.

Specified grease /YCG /YCL /YAF /YBR /YNG

The type of pre-packed grease can be changed by the supplemental code.

① /YCG Low Dust-Generation Grease for Clean Environment CG2 is pre-packed.
② /YCL Low Dust-Generation Grease for Clean Environment CGL is pre-packed.
③ /YAF Anti-Fretting Corrosion Grease AF2 is pre-packed.
④ /YBR MOLYCOTE BR2 Plus Grease [Dow Corning] is pre-packed.
⑤ /YNG No grease is pre-packed.

Spline shaft strength

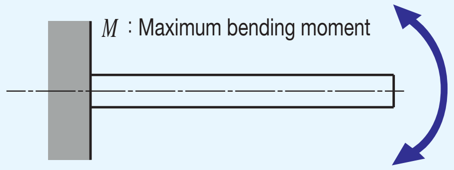
IKO Linear Ball Spline spline shafts can receive loads in all directions. Therefore, attention must be paid to spline shaft strength.

For bending load

For bending load on the spline shaft, select a shaft diameter that fulfills the conditions in formula (1).

$$M = \sigma \times Z \quad \cdots\cdots (1)$$

M : Maximum bending moment acting on spline shaft N·mm
σ : Spline shaft allowable bending stress 98 N/mm^2
Z : Section modulus of spline shaft mm^3 (See Table 13)

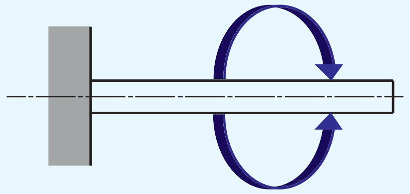


For torsion load

For torsion load on the spline shaft, select a shaft diameter that fulfills the conditions in formula (2).

$$T = \tau a \times Zp \quad \cdots\cdots (2)$$

T : Maximum torsion moment N·mm
τa : Spline shaft allowable torsion stress 49 N/mm^2
Zp : Polar section modulus of spline shaft mm^3 (See Table 13)



For simultaneous torsion and bending load

For simultaneous torsion and bending load on the spline shaft, calculate the shaft diameters from the equivalent bending moment formula (3) and the equivalent torsion moment formula (4) and use the larger value.

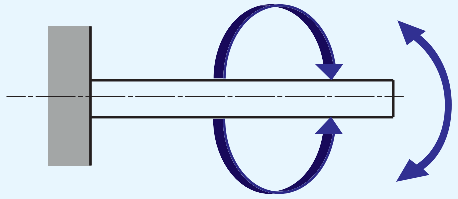
T : Maximum torsion moment

Equivalent bending moment Me

$$Me = \frac{1}{2}\left(M + \sqrt{M^2+T^2}\right) \quad \cdots\cdots (3)$$
$$Me = \sigma \times Z$$

Equivalent torsion moment Te

$$Te = \sqrt{M^2+T^2} \quad \cdots\cdots (4)$$
$$Te = \tau a \times Zp$$

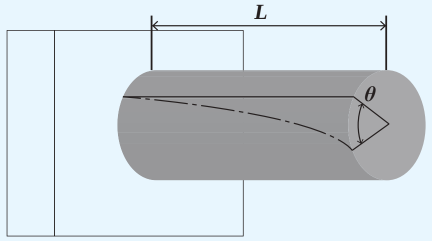


Stiffness of spline shaft

The torsion angle of the spline shaft caused by torsion moment must not exceed 0.25° per 1 meter.

$$\theta = \frac{T \times L}{G \times Ip} \times \frac{360}{2\pi} \quad \cdots\cdots (5)$$
$$0.25^\circ \geqq \frac{1000}{L}\theta$$

θ : Torsion angle °
L : Spline shaft length mm
G : Shear Modulus 7.9×10^4 N/mm^2
Ip : Polar moment of inertia of section area of spline shaft mm^4 (See Table 13)



Spline shaft sectional characteristics

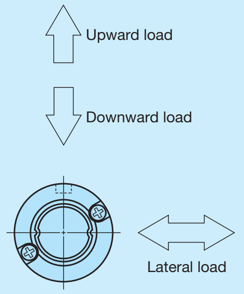
Table 13 Spline shaft sectional characteristics

Size	Moment of inertia of sectional area mm⁴		Section modulus : Z mm³		Polar moment of inertia of section area of spline shaft: I_P mm⁴		Polar section modulus : Z_P mm³	
	Solid shaft	Hollow shaft	Solid shaft	Hollow shaft	Solid shaft	Hollow shaft	Solid shaft	Hollow shaft
2	0.60	–	0.65	–	1.4	–	1.4	–
3	3.6	–	2.5	–	7.5	–	5.0	–
4	12	12	6.0	6.0	24	24	12	12
5	29	28	12	11	59	58	24	23
6	61	60	21	20	120	120	41	41
8	190	190	49	47	390	380	98	96
10	470	460	95	93	960	940	190	190
12	990	920	170	160	2 010	1 880	330	310
15	1 580	–	240	–	3 260	–	480	–
20	5 100	–	570	–	10 500	–	1 150	–
25	12 000	–	1 080	–	24 800	–	2 200	–
30	25 300	–	1 890	–	52 200	–	3 840	–

Load Direction and Load Rating

The MAG and LSAG series must be used with their load rating corrected in accordance to the load direction. The basic dynamic load rating and basic static load rating shown in the dimension table should be corrected to values in Table 14.

Table 14 Load ratings corrected for load direction



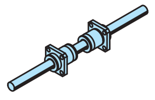
Size \ Load rating and load direction	Basic dynamic load rating			Basic static load rating		
	Load direction			Load direction		
	Downward	Upward	Lateral	Downward	Upward	Lateral
2~12	C	C	$1.47C$	C_0	C_0	$1.73C_0$
15~30	C	C	$1.13C$	C_0	C_0	$1.19C_0$

Identification number and quantity for ordering

To order an assembled set of MAG and LSAG series, please specify the number of sets based on the number of spline shafts. For single external cylinder or single spline shaft of the interchangeable specification, please specify the number of units.

Non-interchangeable specification

Assembled set



(When 1 set is needed)

Example of identification number indication

MAGF 10 C2 R200 T1 H /N

Order quantity
1 set

Interchangeable specification

Single external cylinder

(When 2 pieces are needed)

Example of identification number indication

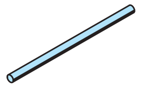
MAGF 10 C1 T1 H S○ /N

Please specify S1 or S2.

Only C1 can be specified.

Order quantity
2 pieces

Single spline shaft



(When 1 unit is needed)

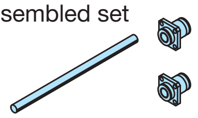
Example of identification number indication

LSAG 10 R200 H S○

Please specify S1 or S2.

Order quantity
1 unit

Assembled set



(When 1 set is needed)

Example of identification number indication

MAGF 10 C2 R200 T1 H S○ /N

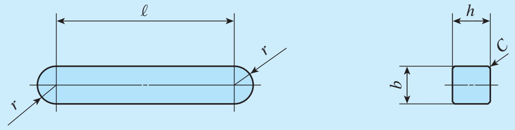
Please specify S1 or S2.

Order quantity
1 set

Dimensions of Attached Key

The MAG and LSAG series standard types have keys shown in Table 15 attached.

Table 15 Dimensions and tolerance of attached key



unit: mm

Size	b	Dim. b tolerance	h	Dim. h tolerance	ℓ	r	C
5	2	+0.016 +0.006	2	0 −0.025	3.8	1	0.16~0.25
6					5.8		
8	2.5		2.5			1.25	
10	3		3		7.8	1.5	
12					11.8		
15	3.5	+0.024 +0.012	3.5	0 −0.030	16	1.75	
20	4		4		21.5	2	
25	5		5		23.5	2.5	0.25~0.4
30	7	+0.030 +0.015	7	0 −0.036	27.5	3.5	

Remark: No key is attached to the Size 2, 3, and 4 series. For details of how to fix the key, see page Ⅱ-121.

Lubrication

Lithium-soap base grease with extreme-pressure additive (Alvania EP Grease 2 [Shell Lubricants Japan K.K.]) is pre-packed in MAG and LSAG series. Additionally, MAG series has C-Lube placed in the recirculation part of balls, so that the interval for reapplicating lubricant can be extended and maintenance works such as grease job can be reduced significantly.

Perform re-greasing as below.

(1) Size 2, 3, and 4 series

Specify either direct application of grease to the spline shaft raceway surface or oil hole specification (/OH). Note that the oil hole specification (/OH) is not available for the Size 2 series.

(2) Size 5 and higher series

Apply grease directly to the spline shaft raceway surface or the rolling elements. You may also specify the oil hole specification (/OH).

Dust Protection

The external cylinders of MAG and LSAG series are equipped with special rubber seals as standard for dust protection. However, if large amount of contaminant or dust are floating, or if large particles of foreign substances such as chips or sand may adhere to the spline shaft, it is recommended to attach a protective cover to the linear motion mechanism.

The Size 2, 3, and 4 series are not provided with seals. If the Size 3 and 4 series with seals is needed, contact IKO.

Precaution for Use

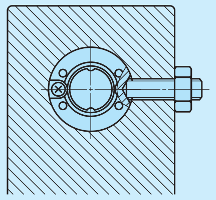
❶Fitting of external cylinder

Generally, transition fit (J7) is used for fitting between the external cylinder and the housing bore. When high accuracy and high rigidity are not required, clearance fit (H7) can also be used.

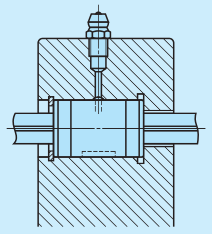
❷ Typical mounting structure

Mounting examples of the external cylinder are shown in Fig. 1.

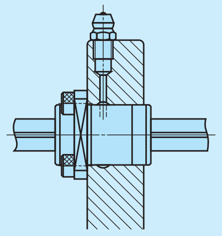
The rotation detent for external cylinders of the Size 2, 3, and 4 series should be mounted using the countersink provided on the external cylinder. Use screws M1.2 to M1.6 for Size 2, M1.6 to M2 for Size 3, and M2 to M2.5 for Size 4. At this point, be careful not to deform the external cylinder with screws.



Rotation detent for external cylinder for size 2, 3 and 4



Mounting example for standard type
(Oil hole /OH specification)



Mounting example for flange type
(Oil hole /OH specification)

Fig. 1 Mounting examples of external cylinder

❸ Multiple external cylinders used in close proximity

When using multiple external cylinders in close proximity, greater load may be applied than the calculated value depending on the accuracy of the mounting surfaces and reference mounting surfaces of the machine or device. In such cases, allowance for greater applied load than the calculated value should be made.

If two or more external cylinders are assembled on a spline shaft and two or more keys are used to fix the rotational direction of the external cylinder, the keyway position of the external cylinders are aligned before delivery. Please contact IKO.

❹ Additional machining of spline shaft end

- When machining the outside surface of the spline shaft, make sure that the maximum diameter of the end machining part does not exceed d_l in the dimension table. If the machined outside surface exceeds d_l, it will leave a track groove.
- Perform annealing if additional machining will be performed.
- Shaft guide shapes for spline shafts can be prepared upon request. Please contact IKO for further information.

❺ Operating temperature

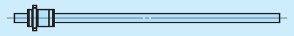
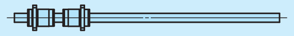
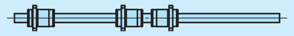
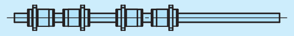
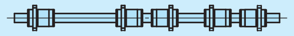
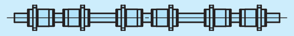
MAG Series contains C-Lube. The operating temperature should not exceed 80˚C. The maximum operating temperature for LSAG series is 120˚C and temperature up to 100˚C is allowed for continuous operation. When the temperature exceeds 100˚C, contact IKO.

When specifying LSAG series special specification with C-Lube plate (supplemental code /Q), utilize it below 80˚C.

❻ Arrangement of flange type (non-interchangeable specification) external cylinder

Table 16 shows arrangements of multiple flange type external cylinders in non-interchangeable specification. Arrangements that are not in Table 16 can be prepared upon request. Contact IKO for further information.

Table 16 Arrangement of flange type (Non-interchangeable specification) external cylinder

Number of external cylinders	Arrangement of external cylinders
1	
2	
3	
4	
5	
6	

❼ When mounting multiple assembled sets at the same time

For interchangeable specification products, assemble an external cylinder and a spline shaft with the same interchangeable code ("S1" or "S2").

For non-interchangeable specification products, use the same combination of external cylinder and spline shaft upon delivery.

❽ Assembly of external cylinder on spline shaft

When assembling the external cylinder on the spline shaft, correctly fit the grooves of the external cylinder and the spline shaft and move the external cylinder softly in parallel direction. Rough handling may result in damaging of seals or dropping of steel balls.

The non-interchangeable specification products are already adjusted so as to provide the best accuracy when the IKO marks of the external cylinder and the spline shaft face the same direction (see Fig. 2). Be careful not to change the assembly direction.

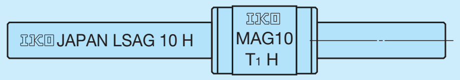


Fig. 2 Assembly direction of external cylinder

❾ Mounting of external cylinder

When press-fitting the external cylinder to the housing, assemble them correctly by using a press and a suitable jig fixture. (See Fig. 3.)

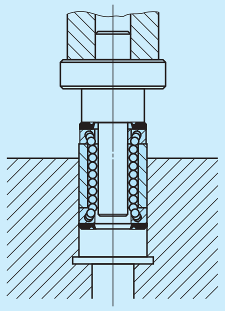
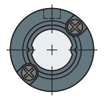
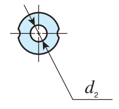


Fig. 3 Press-fitting of external cylinder

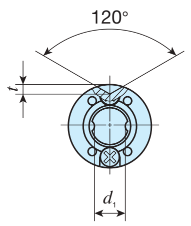
IKO C-Lube Linear Ball Spline MAG

Standard type

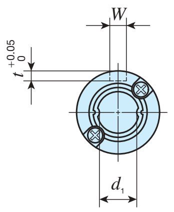
Shape	**MAG**・**LSAG** 					
Size	2	3	4	5	6	8
	10	12	15	20	25	30

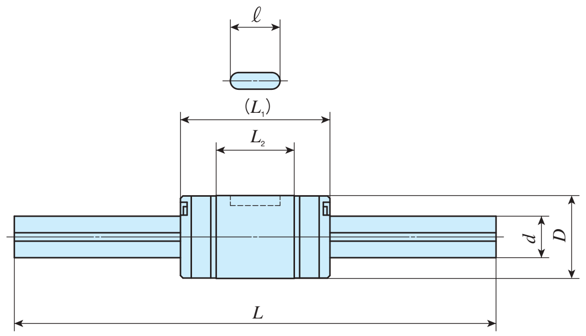


MAG(L)T
Hollow shaft dimension for LSAG(L)T



MAG(L)(T)4
LSAG 2
LSAG 3
LSAG(T) 4





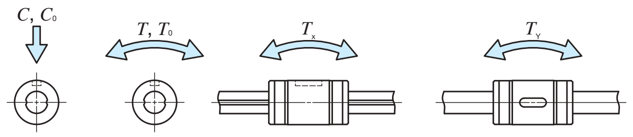
Identification number		Interchangeable	Mass (Ref.) g		External cylinder dimensions and tolerances mm								Spline shaft dimensions and tolerances mm						Basic dynamic load rating (4)	Basic static load rating (4)	Dynamic torque rating (4)	Static torque rating (4)	Static moment rating (4)	
MAG series	LSAG series (No C-Lube)		External cylinder	Spline shaft (per 100 mm)	D	Dim. D tolerance	L_1	L_2	W	Dim. W tolerance	t	ℓ	d	Dim. d tolerance	d_1(2)	d_2	L(3)	Maximum length	C N	C_0 N	T N・m	T_0 N・m	T_X N・m	T_Y N・m
–	LSAG 2(1)	–	1.0	2.3	6	0 -0.008	8.5	4.7	–	–	0.7	–	2	0 -0.010	1.2	–	50 100	100	222	237	0.28	0.30	0.22 1.4	0.39 2.4
–	LSAG 3(1)	–	2.1	5.4	7	0 -0.009	10	5.9	–	–	0.8	–	3	0 -0.010	2.2	–	100 150	150	251	285	0.45	0.51	0.31 1.9	0.53 3.3
MAG 4(1)		–	2.5	9.6	8	0 -0.009	15	7.9	–	–	1	–	4	0 -0.012	3.2	–	100 150	200	303	380	0.70	0.87	0.52 3.80	0.90 6.50
	LSAG 4(1)	–					12																0.52 2.9	0.90 5.0
MAGT 4(1)		–		8.2			15									1.5		150					0.52 3.80	0.90 6.50
	LSAGT 4(1)	–					12																0.52 2.9	0.90 5.0
MAGL 4(1)	–	–	4.1	9.6			21	13.9								–		200	441	665	1.00	1.50	1.50 8.60	2.60 15.0
MAGLT 4(1)	–	–		8.2												1.5		150						
MAG 5	LSAG 5	○	4.8	14.9	10	0 -0.009	18	9.4	2	+0.014 0	1.2	6	5	0 -0.012	4.2	–	100 150	200	587	641	1.8	1.9	1.0 7.9	1.8 13.6
MAGT 5	LSAGT 5	○		12.4												2								
MAGL 5	LSAGL 5	○	8.1	14.9			26	16.9								–			879	1 180	2.6	3.5	3.2 19.3	5.5 33.4
MAGLT 5	LSAGLT 5	○		12.4												2								
MAG 6	LSAG 6	○	8.9	19	12	0 -0.011	21	12.4	2	+0.014 0	1.2	8	6	0 -0.012	5.2	–	150 200	300	711	855	2.5	3.0	1.7 11.7	3.0 20.3
MAGT 6	LSAGT 6	○		16.5												2								
MAGL 6	LSAGL 6	○	14.5	19			30	21.4								–			1 030	1 500	3.6	5.2	5.0 27.6	8.6 47.8
MAGLT 6	LSAGLT 6	○		16.5												2								
MAG 8	LSAG 8	○	15.9	39	15	0 -0.011	25	14.6	2.5	+0.014 0	1.5	8.5	8	0 -0.015	7	–	150 200 250	500	1 190	1 330	5.5	6.2	3.3 22.0	5.6 38.1
MAGT 8	LSAGT 8	○		33												3		400						
MAGL 8	LSAGL 8	○	26.5	39			37	26.6								–		500	1 800	2 470	8.4	11.5	10.3 56.3	17.8 97.5
MAGLT 8	LSAGLT 8	○		33												3		400						

Notes (1) No seal is included.

(2) d_1 represents the maximum diameter for end machining. (Perform annealing if end machining will be performed.)

(3) Represents standard length. We can produce other than the standard length, please specify the length of spline shaft by indicating the length in mm with the identification number.

(4) The direction of basic dynamic load rating (C), basic static load rating (C_0), dynamic torque rating (T), static torque rating and static moment rating (T_0, T_X, T_Y) are shown in the sketches below.
The upper values of T_X and T_Y are for one external cylinder and the lower values are for two external cylinders inclose contact.



Example of identification number of assembled set

Model code			Dimensions	Part code		Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MAG	L	T	5	C2	R150	T1	H		/N
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩

① Model	
MAG	Standard type
LSAG	

② Length of external cylinder	
No symbol	Standard
L	Long

③ Spline shaft shape	
No symbol	Solid shaft
T	Hollow shaft

④ Size
2, 3, 4, 5, 6, 8

⑤ Number of external cylinders (2)

⑥ Length of spline shaft (150 mm)

⑦ Preload amount	
T0	Clearance
No symbol	Standard
T1	Light preload

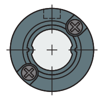
⑧ Accuracy class	
No symbol	Ordinary
H	High
P	Precision

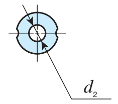
⑨ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

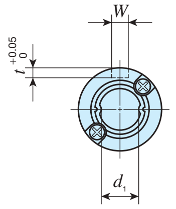
⑩ Special specification
BS, N, OH, Q, RE, S, Y

IKO C-Lube Linear Ball Spline MAG

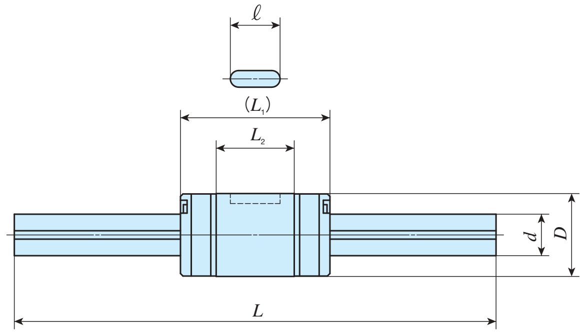
Standard type						
Shape	**MAG** · **LSAG**					
Size	2 10	3 12	4 15	5 20	6 25	8 30





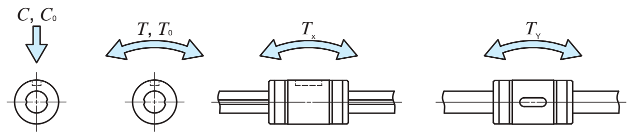


MAGT
Hollow shaft dimension for LSAG(L)T



Identification number		Interchangeable	Mass (Ref.) g		External cylinder dimensions and tolerances mm								Spline shaft dimensions and tolerances mm						Basic dynamic load rating (3)	Basic static load rating (3)	Dynamic torque rating (3)	Static torque rating (3)	Static moment rating (3)	
MAG series	LSAG series (No C-Lube)		External cylinder	Spline shaft (per 100 mm)	D	Dim. D tolerance	L_1	L_2	W	Dim. W tolerance	t	ℓ	d	Dim. d tolerance	d_1(1)	d_2	L(2)	Maximum length	C N	C_0 N	T N・m	T_0 N・m	T_X N・m	T_Y N・m
MAG 10	LSAG 10	○	31.5	60.5	19	0 -0.013	30	18.2	3	+0.014 0	1.8	11	10	0 -0.015	8.9	–	200 300	600	1 880	2 150	10.9	12.5	7.0 41.5	12.1 71.9
MAGT 10	LSAGT 10	○		51												4								
–	LSAGL 10	○	56.5	60.5			47	34.9								–			2 850	4 040	16.6	23.4	22.7 115	39.3 200
–	LSAGLT 10	○		51												4								
MAG 12	LSAG 12	○	44	87.5	21	0 -0.013	35	23	3	+0.014 0	1.8	15	12	0 -0.018	10.9	–	200 300 400	800	2 180	2 690	14.8	18.3	10.6 59.1	18.3 102
MAGT 12	LSAGT 12	○		66												6								
–	LSAGL 12	○	76.8	87.5			54	42								–			3 220	4 850	21.9	33.0	32.2 157	55.7 272
–	LSAGLT 12	○		66												6								
–	LSAG 15	○	59.5	111	23	0 -0.013	40	27	3.5	+0.018 0	2	20	13.6	0 -0.018	11.6	–	200 300 400	1 000	4 180	6 070	31.3	45.6	27.8 152	33.2 181
–	LSAGL 15	○	110				65	52								–			6 400	11 500	48.0	86.5	94.0 449	112 535
–	LSAG 20	○	130	202	30	0 -0.016	50	33	4	+0.018 0	2.5	26	18.2	0 -0.021	15.7	–	300 400 500 600	1 000	6 600	9 040	66.0	90.4	48.6 288	58.0 343
–	LSAGL 20	○	198				71	54								–			9 270	15 100	92.7	151	127 650	151 774
–	LSAG 25	○	220	310	37	0 -0.016	60	39.2	5	+0.018 0	3	29	22.6	0 -0.021	19.4	–	300 400 500 600 800	1 200	11 200	14 300	139	178	92.8 551	111 656
–	LSAGL 25	○	336				84	63.2								–			15 400	23 200	193	290	229 1 190	273 1 420
–	LSAG 30	○	430	450	45	0 -0.016	70	43	7	+0.022 0	4	35	27.2	0 -0.021	23.5	–	400 500 600 700 1 100	1 200	15 400	19 400	231	292	147 874	176 1 040
–	LSAGL 30	○	634				98	71								–			21 300	31 600	320	474	364 1 900	434 2 260

Notes (1) d_1 represents the maximum diameter for end machining. (Perform annealing if end machining will be performed.)
(2) Represents standard length. We can produce other than the standard length, please specify the length of spline shaft by indicating the length in mm with the identification number.
(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), dynamic torque rating (T), static torque rating and static moment rating (T_0, T_X, T_Y) are shown in the sketches below.
The upper values of T_X and T_Y are for one external cylinder and the lower values are for two external cylinders inclose contact.



Example of identification number of assembled set

Model code		Dimensions	Part code			Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MAG		T	12	C2	R300	T1	H		/N
1	2	3	4	5	6	7	8	9	10

① Model	
MAG LSAG	Standard type

② Length of external cylinder	
No symbol	Standard
L	Long

③ Spline shaft shape	
No symbol	Solid shaft
T	Hollow shaft

④ Size
10, 12, 15, 20, 25, 30

⑤ Number of external cylinders (2)

⑥ Length of spline shaft (300 mm)

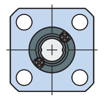
⑦ Preload amount	
No symbol	Standard
T1	Light preload

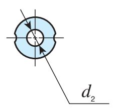
⑧ Accuracy class	
No symbol	Ordinary
H	High
P	Precision

⑨ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

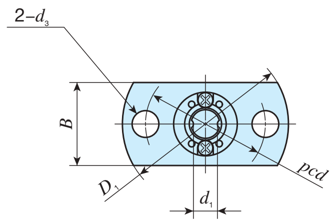
⑩ Special specification
BS, N, OH, Q, RE, S, Y

IKO C-Lube Linear Ball Spline MAG

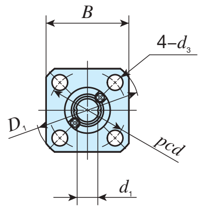
Flange type						
	MAGF · LSAGF					
Shape						
Size	2	3	4	5	6	8
	10	12	15	20	25	30

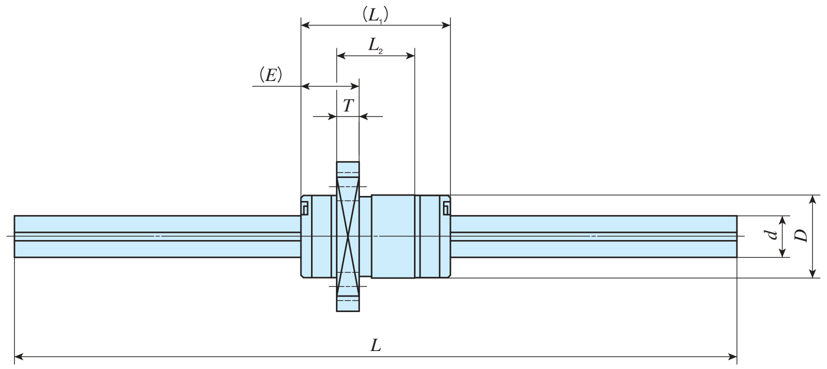


MAGFT
Hollow shaft dimension for LSAGF(L)T



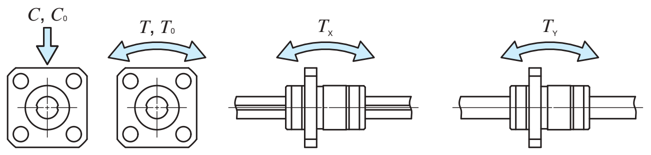
LSAGF 2
LSAGF 3
LSAGF(T) 4





Identification number		Interchangeable	Mass (Ref.) g		External cylinder dimensions and tolerances mm										Spline shaft dimensions and tolerances mm						Basic dynamic load rating (4)	Basic static load rating (4)	Dynamic torque rating (4)	Static torque rating (4)	Static moment rating (4)	
MAG series	LSAG series (No C-Lube)		External cylinder	Spline shaft (per 100 mm)	D	Dim. D tolerance	L_1	L_2	D_1	B	E	T	pcd	d_3	d	Dim. d tolerance	d_1 (2)	d_2	L (3)	Maximum length	C N	C_0 N	T N・m	T_0 N・m	T_X N・m	T_Y N・m
–	LSAGF 2(1)	–	1.9	2.3	6	0 -0.008	8.5	4.7	15.5	8	3.4	1.5	11	2.4	2	0 -0.010	1.2	–	50 100	100	222	237	0.28	0.30	0.22 1.4	0.39 2.4
–	LSAGF 3(1)	–	3.7	5.4	7	0 -0.009	10	5.9	18	9	4	1.9	13	2.9	3	0 -0.010	2.2	–	100 150	150	251	285	0.45	0.51	0.31 1.9	0.53 3.3
–	LSAGF 4(1)	–	5.1	9.6	8	0 -0.009	12	7.9	21	10	4.6	2.5	15	3.4	4	0 -0.012	3.2	–	100 150	200	303	380	0.70	0.87	0.52 2.9	0.90 5.0
–	LSAGFT 4(1)	–		8.2														1.5		150						
MAGF 5	LSAGF 5	○	8.9	14.9	10	0 -0.009	18	9.4	23	18	7	2.7	17	3.4	5	0 -0.012	4.2	–	100 150	200	587	641	1.8	1.9	1.0 7.9	1.8 13.6
MAGFT 5	LSAGFT 5	○		12.4														2								
–	LSAGFL 5	○	12	14.9			26	16.9										–			879	1 180	2.6	3.5	3.2 19.3	5.5 33.4
–	LSAGFLT 5	○		12.4														2								
MAGF 6	LSAGF 6	○	13.9	19	12	0 -0.011	21	12.4	25	20	7	2.7	19	3.4	6	0 -0.012	5.2	–	150 200	300	711	855	2.5	3.0	1.7 11.7	3.0 20.3
MAGFT 6	LSAGFT 6	○		16.5														2								
–	LSAGFL 6	○	19.5	19			30	21.4										–			1 030	1 500	3.6	5.2	5.0 27.6	8.6 47.8
–	LSAGFLT 6	○		16.5														2								
MAGF 8	LSAGF 8	○	23.5	39	15	0 -0.011	25	14.6	28	22	9	3.8	22	3.4	8	0 -0.015	7	–	150 200 250	500	1 190	1 330	5.5	6.2	3.3 22.0	5.6 38.1
MAGFT 8	LSAGFT 8	○		33														3		400						
–	LSAGFL 8	○	34.1	39			37	26.6										–		500	1 800	2 470	8.4	11.5	10.3 56.3	17.8 97.5
–	LSAGFLT 8	○		33														3		400						

Notes (1) No seal is included.
(2) d_1 represents the maximum diameter for end machining. (Perform annealing if end machining will be performed.)
(3) Represents standard length. We can produce other than the standard length, please specify the length of spline shaft by indicating the length in mm with the identification number.
(4) The direction of basic dynamic load rating (C), basic static load rating (C_0), dynamic torque rating (T), static torque rating and static moment rating (T_0, T_X, T_Y) are shown in the sketches below.
The upper values of T_X and T_Y are for one external cylinder and the lower values are for two external cylinders inclose contact.



Example of identification number of assembled set

Model code			Dimensions	Part code		Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MAGF	L	T	5	C2	R150	T_1	H	_	/N
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩

① Model	
MAGF LSAGF	Flange type

② Length of external cylinder	
No symbol	Standard
L	Long

③ Spline shaft shape	
No symbol	Solid shaft
T	Hollow shaft

④ Size
2, 3, 4, 5, 6, 8

⑤ Number of external cylinders (2)

⑥ Length of spline shaft (150 mm)

⑦ Preload amount	
T_0	Clearance
No symbol	Standard
T_1	Light preload

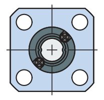
⑧ Accuracy class	
No symbol	Ordinary
H	High
P	Precision

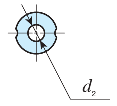
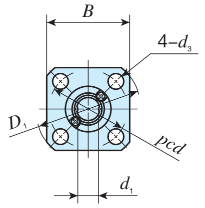
⑨ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

⑩ Special specification
BS, N, OH, Q, RE, S, Y

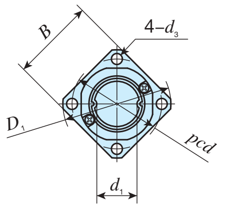
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Flange type

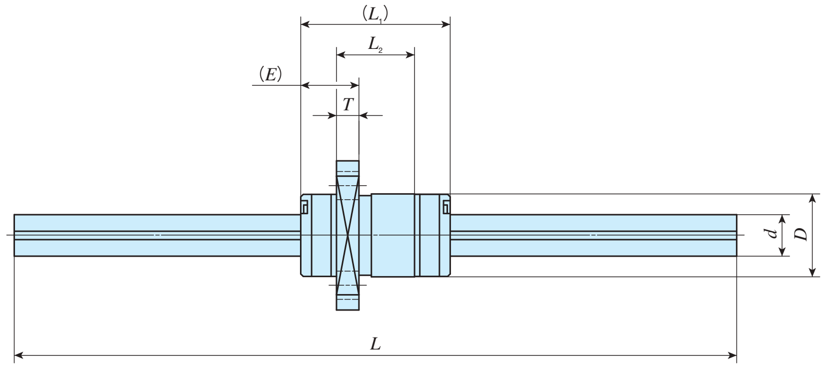
Shape	**MAGF・LSAGF** 
Size	2 3 4 5 6 8 10 12 15 20 25 30

MAGFT
Hollow shaft dimension for LSAGF(L)T

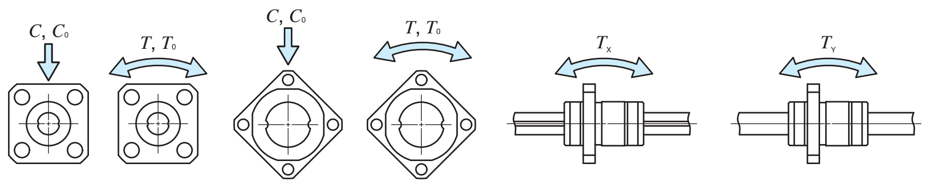


LSAGF(L) 30



Identification number		Interchangeable	Mass (Ref.) g		External cylinder dimensions and tolerances mm										Spline shaft dimensions and tolerances mm						Basic dynamic load rating [3]	Basic static load rating [3]	Dynamic torque rating [3]	Static torque rating [3]	Static moment rating [3]	
MAG series	LSAG series (No C-Lube)		External cylinder	Spline shaft (per 100 mm)	D	Dim. D tolerance	L_1	L_2	D_1	B	E	T	pcd	d_3	d	Dim. d tolerance	d_1 [1]	d_2	L [2]	Maximum length	C	C_0	T	T_0	T_X	T_Y
																					N	N	N・m	N・m	N・m	N・m
MAGF 10	LSAGF 10	○	45	60.5	19	0 -0.013	30	18.2	36	28	10	4.1	28	4.5	10	0 -0.015	8.9	–	200 300	600	1 880	2 150	10.9	12.5	7.0 41.5	12.1 71.9
MAGFT 10	LSAGFT 10	○		51														4								
–	LSAGFL 10	○	70.1	60.5			47	34.9										–			2 850	4 040	16.6	23.4	22.7 115	39.3 200
–	LSAGFLT 10	○		51														4								
MAGF 12	LSAGF 12	○	59	87.5	21	0 -0.013	35	23	38	30	10	4	30	4.5	12	0 -0.018	10.9	–	200 300 400	800	2 180	2 690	14.8	18.3	10.6 59.1	18.3 102
MAGFT 12	LSAGFT 12	○		66														6								
–	LSAGFL 12	○	91.8	87.5			54	42										–			3 220	4 850	21.9	33.0	32.2 157	55.7 272
–	LSAGFLT 12	○		66														6								
–	LSAGF 15	○	77	111	23	0 -0.013	40	27	40	31	11	4.5	32	4.5	13.6	0 -0.018	11.6	–	200 300 400	1 000	4 180	6 070	31.3	45.6	27.8 152	33.2 181
–	LSAGFL 15	○	128				65	52										–			6 400	11 500	48.0	86.5	94.0 449	112 535
–	LSAGF 20	○	150	202	30	0 -0.016	50	33	46	35	14	5.5	38	4.5	18.2	0 -0.021	15.7	–	300 400 500 600	1 000	6 600	9 040	66.0	90.4	48.6 288	58.0 343
–	LSAGFL 20	○	218				71	54										–			9 270	15 100	92.7	151	127 650	151 774
–	LSAGF 25	○	255	310	37	0 -0.016	60	39.2	57	43	17	6.6	47	5.5	22.6	0 -0.021	19.4	–	300 400 500 600 800	1 200	11 200	14 300	139	178	92.8 551	111 656
–	LSAGFL 25	○	371				84	63.2										–			15 400	23 200	193	290	229 1 190	273 1 420
–	LSAGF 30	○	476	450	45	0 -0.016	70	43	65	50	21	7.5	54	6.6	27.2	0 -0.021	23.5	–	400 500 600 700 1 100	1 200	15 400	19 400	231	292	147 874	176 1 040
–	LSAGFL 30	○	680				98	71										–			21 300	31 600	320	474	364 1 900	434 2 260

Notes (1) d_1 represents the maximum diameter for end machining. (Perform annealing if end machining will be performed.)
(2) Represents standard length. We can produce other than the standard length, please specify the length of spline shaft by indicating the length in mm with the identification number.
(3) The direction of basic dynamic load rating (C), basic static load rating (C_0), dynamic torque rating (T), static torque rating and static moment rating (T_0, T_X, T_Y) are shown in the sketches below.
The upper values of T_X and T_Y are for one external cylinder and the lower values are for two external cylinders inclose contact.



LSAGF(L) 30

Example of identification number of assembled set

Model code			Dimensions	Part code		Preload symbol	Classification symbol	Interchangeable code	Supplemental code
MAGF		T	12	C2	R300	T1	H		/N
1	2	3	4	5	6	7	8	9	10

① Model	
MAGF LSAGF	Flange type

② Length of external cylinder	
No symbol	Standard
L	Long

③ Spline shaft shape	
No symbol	Solid shaft
T	Hollow shaft

④ Size
10, 12, 15, 20, 25, 30

⑤ Number of external cylinders (2)

⑥ Length of spline shaft (300 mm)

⑦ Preload amount	
No symbol	Standard
T1	Light preload

⑧ Accuracy class	
No symbol	Ordinary
H	High
P	Precision

⑨ Interchangeable	
No symbol	Non-interchangeable specification
S1	S1 specification
S2	S2 specification

⑩ Special specification
BS, N, OH, Q, RE, S, Y

Linear Bushing

Linear Bushing G
Linear Bushing
Miniature Linear Bushing

Linear Bushing G

LMG

Points

1

● High load capacity

The structure that balls in two rows have contact with the track groove of the shaft allows greater rigidity and larger load capacity.

2

● Solid shaft and hollow shaft

There are two types of shafts with grooved raceway: a solid shaft and a hollow shaft. The hollow shaft is useful for piping, wiring, air removal, etc.

3

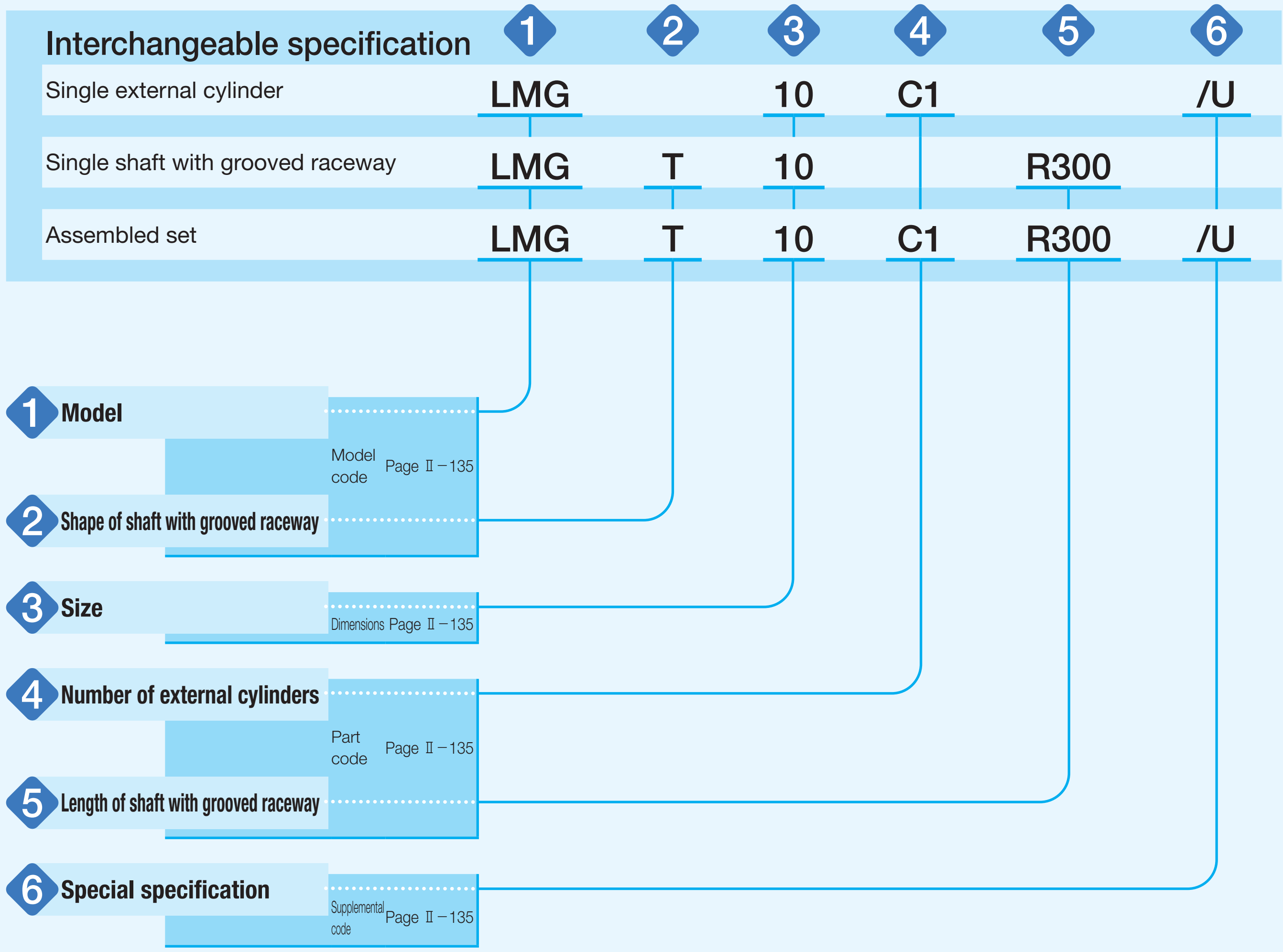
● Dimensionally compatible with Linear Bushing LM

LMG series are dimensionally compatible with Linear Bushing LM to allow easy replacement.

Identification Number and Specification

Example of an identification number

The specification of LMG series is indicated by the identification number. Indicate the identification number, consisting of a model code, dimensions, a part code, and a supplemental code for each specification to apply.



Interchangeable specification	1	2	3	4	5	6
Single external cylinder	LMG		10	C1		/U
Single shaft with grooved raceway	LMG	T	10		R300	
Assembled set	LMG	T	10	C1	R300	/U

Identification Number and Specification

–Model・Shape of Shaft・Size・Number of External Cylinders・Length of Shaft・Special Specification–

1 Model

Linear Bushing G : LMG
(LMG series)

For applicable models and sizes, see Table 1.

2 Shape of shaft with grooved raceway

Solid shaft : No symbol
Hollow shaft : T

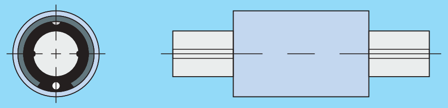
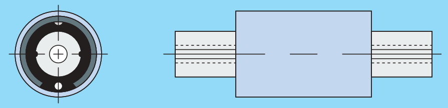
For applicable models and sizes, see Table 1.

3 Size

6, 8, 10, 13, 16, 20

Indicate the shaft diameter in mm.
For applicable models and sizes, see Table 1.

Table 1 Models and sizes of LMG series

Shape	Model	Size					
		6	8	10	13	16	20
Solid shaft 	LMG	○	○	○	○	○	○
Hollow shaft 	LMGT	○	○	○	○	○	○

Remark: LMG series are all interchangeable specification. Non-interchangeable specification is not available.

4 Number of external cylinders

: C○

For an assembled set, indicates the number of external cylinders assembled on a shaft with grooved raceway.
For a single external cylinder, only "C1" is specified.

5 Length of shaft with grooved raceway

: R○

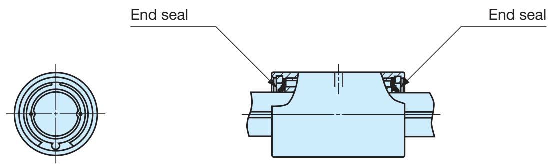
Indicate the length of the shaft with grooved raceway in mm.
For standard and maximum lengths, see the dimension table.

6 Special specification

With end seal /U

Applicable to all models and sizes.

With end seal /U



End seals are attached to both ends of the external cylinder to prevent foreign substances from entering.

Accuracy

Table 2 Twist of grooves with respect to effective length of track groove

unit: μm

Allowable value	33

Remark: The values can be applied to 100 mm of the effective length of the track groove part at any position.

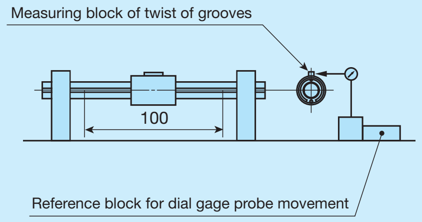
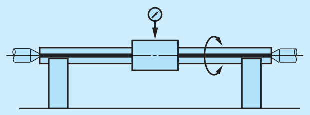
Table 3 Allowable values of total radial runout of shaft with grooved raceway axial line

unit: μm

Overall length of shaft with grooved raceway mm		Size				
Over	Incl.	6	8	10	13	16, 20
–	200	142	142	129	129	126
200	315	203	203	153	153	141
315	400	–	255	173	173	153
400	500	–	306	193	193	165
500	630	–	–	221	221	182
630	800	–	–	–	260	207
800	1 000	–	–	–	–	240

Remark: These are values when an internal clearance is 0 μm.

Table 4 Measuring methods of accuracy

Item	Measuring method	Illustration of measuring method
Twist of grooves with respect to effective length of track groove (See Table 2)	While supporting the shaft with grooved raceway, apply a unidirectional torsion moment load to the external cylinder, place the dial gage probe vertically to the shaft with grooved raceway on the side face of the measuring block of twist of grooves attached on the external cylinder, and measure the deflection when the external cylinder and the dial gage probe are moved 100 mm in the axial direction at any position on the effective length of track groove of the shaft with grooved raceway. However, the dial gage probe should be applied as near as possible to the outer peripheral face of the external cylinder.	 Measuring block of twist of grooves 100 Reference block for dial gage probe movement
Total radial runout of axial line of shaft with grooved raceway (See Table 3)	While supporting the shaft with grooved raceway at its supporting parts or at both centers, place a dial gage probe on the outer peripheral face of the external cylinder, and measure the deflection from one rotation of the shaft with grooved raceway at several positions in the axial direction to obtain the maximum value.	

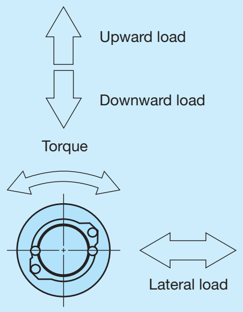
Internal Clearance

The internal clearance of LMG series is approximately 10 μm.

Load Direction and Load Rating

The LMG series must be used with its load rating corrected in accordance to the load direction. The basic dynamic load rating and basic static load rating shown in the dimension table should be corrected to values in Table 4.

Table 4 Load ratings corrected for load direction

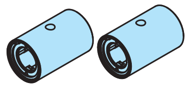


Load rating and load direction / Size	Basic dynamic load rating			Basic static load rating		
	Load direction			Load direction		
	Downward	Upward	Lateral	Downward	Upward	Lateral
6~20	C	C	$1.43C$	C_0	C_0	$1.73C_0$

Identification number and quantity for ordering

To order an assembled set of LMG series, please specify the number of sets based on the number of shafts with grooved raceway. For external cylinders or single shafts with grooved raceway, please specify the number of units.

Single external cylinder



(When 2 pieces are needed)

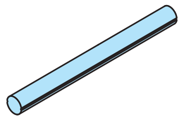
Example of identification number indication

LMG 10 C1 /U

Only C1 can be specified.

Order quantity
2 pieces

Shaft with grooved raceway



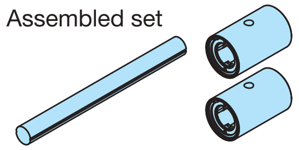
(When 1 unit is needed)

Example of identification number indication

LMG T 10 R300

Order quantity
1 unit

Assembled set



(When 1 set is needed)

Example of identification number indication

LMG T 10 C2 R300 /U

Order quantity
1 set

Moment of Inertia of Sectional Area and Section Coefficient of Shaft with Grooved Raceway

Table 5 Moment of inertia of sectional area and section coefficient of shaft with grooved raceway

Size	Moment of inertia of sectional area mm^4		Section coefficient mm^3	
	Solid shaft	Hollow shaft	Solid shaft	Hollow shaft
6	60	59	20	20
8	190	190	49	48
10	470	460	95	93
13	1 360	1 300	210	200
16	3 130	2 930	390	360
20	7 720	7 230	770	720

Lubrication

Grease is not pre-packed in the LMG series, so please perform adequate lubrication as needed.
Both oil lubrication and grease lubrication are available in the LMG series. For grease lubrication, use of high-quality lithium-soap base grease is recommended.

Dust Protection

No dust protection seal is provided for LMG series. For applications in other than clean environment, cover the entire unit with a protective case, etc. to prevent harmful foreign substances such as dust and particles from outside from entering.
The special specification with end seals (supplemental code / U) has a dust protection effect. However, if large amount of contaminant or dust are floating, or if large particles of foreign substances such as chips or sand may adhere to the shaft with grooved raceway, it is recommended to attach a protective cover to the linear motion mechanism.

Precaution for Use

❶ Fitting of external cylinder
Generally, clearance fit (H7) is recommended for fitting between the external cylinder and the housing bore. The transition fit (J7) may be applied for special use.

❷ Typical mounting structure
Mounting examples of the external cylinder are shown in Fig. 1. The fixing thread depth of mounting screws for the external cylinder must not exceed the maximum fixing thread depth indicated in the dimension table. Since the screw hole for the external cylinder is penetrated, the shaft with grooved raceway will be pushed by the screw if the fixing thread depth is too deep, and the running accuracy and life will be adversely affected.

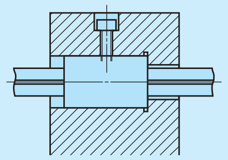


Fig. 1 Mounting examples of external cylinder

❸ Multiple external cylinders used in close proximity
When using multiple external cylinders in close distance to the same housing, it is recommended to ensure that the distance between the external cylinders is three times as long as the length of the external cylinder. When using multiple external cylinders in closer distance, contact IKO.

❹ Loaded condition with rotating torque
Use IKO Linear Ball Spline G under loaded conditions with a rotating torque bi-directionally or repeatedly.

❺ Operating temperature
The maximum operating temperature is 120˚C and temperature up to 100˚C is allowed for continuous operation. When the temperature exceeds 100˚C, contact IKO.

❻ Mounting of external cylinder
When press-fitting the external cylinder to the housing, assemble them correctly by using a press and a suitable jig fixture. (See Fig. 2.)

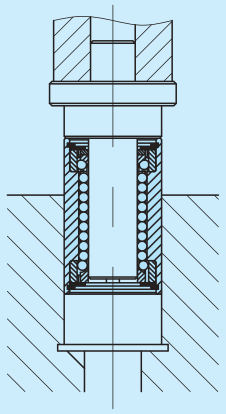
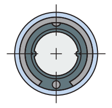
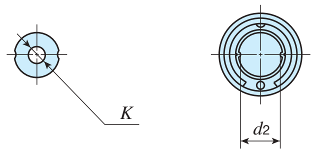
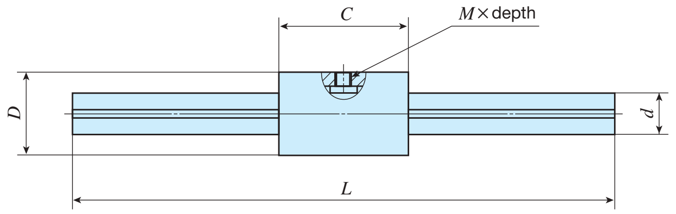


Fig. 2 Press-fitting of external cylinder

Shape	LMG 
Size	6 8 10 13 16 20



Hollow shaft dimension for LMGT



Identification number	Interchangeable	Mass (Ref.) g		Nominal dimensions and tolerances mm											Basic dynamic load rating	Basic static load rating	Dynamic (5) torque rating	Static (5) torque rating
		External cylinder	Shaft with grooved raceway (1)	D	Dim. D tolerance	C	Dim. C tolerance	M×depth (2)	d	Dim. d tolerance	d_2(3)	K	L(4)	Maximum length	C N	C_0 N	T N・m	T_0 N・m
LMG 6	○	9.4	22.0	12	0 −0.011	19	0 −0.200	M2.5×1.9 (2.5)	6	0 −0.012	5.2	–	150 200	300	587	641	2.1	2.2
LMGT 6	○		19.5									2						
LMG 8	○	15.7	39.3	15	0 −0.011	24	0 −0.200	M3 ×2.4 (3)	8	0 −0.015	7	–	150 200 250	500	769	962	3.5	4.3
LMGT 8	○		33.7									3		400				
LMG 10	○	31.5	61.2	19	0 −0.013	29	0 −0.200	M3 ×3.1 (4)	10	0 −0.015	8.9	–	200 300	600	1 410	1 710	8.0	9.7
LMGT 10	○		51.4									4						
LMG 13	○	45.4	104	23	0 −0.013	32	0 −0.200	M3 ×3.4 (4.5)	13	0 −0.018	11.9	–	200 300 400	800	1 880	2 150	13.7	15.7
LMGT 13	○		81.4									6						
LMG 16	○	78.2	157	28	0 −0.013	37	0 −0.200	M4 ×4.1 (5.5)	16	0 −0.018	14	–	200 300 400	1 000	2 590	2 930	23.1	26.1
LMGT 16	○		118									8						
LMG 20	○	110	246	32	0 −0.016	42	0 −0.200	M4 ×4.1 (5.5)	20	0 −0.021	17.5	–	300 400 500 600	1 000	3 010	3 660	32.8	39.9
LMGT 20	○		185									10						

Notes (1) The mass of the shaft with grooved raceway is the value per 100 mm of the track groove part.
(2) The values in ( ) are the maximum fixing thread depth.
(3) d_2 represents the maximum diameter for end machining. (Perform annealing if end machining will be performed.)
(4) Represents standard length. We can produce other than the standard length, please specify the length of the shaft with grooved raceway by indicating the length in mm with the identification number.
(5) Applicable under loaded conditions with an unidirectional torque at all times.
Use IKO Linear Ball Spline G under loaded conditions with a rotating torque bi-directionally or repeatedly.

Remark: Linear Bushing G are all interchangeable specification.

Linear Bushing

LM

Points

Simple replacement for rolling guide

Since the structure adopts the raceway to be run along the shaft, the rolling guide of conventional bushing type can be easily modified to rolling guide without major design changes.

Wide range of variations for your needs

For each dimensional series, standard, adjustable clearance, and open types are available with and without seals. You can select an optimal Linear Bushing for the specifications of your machine and device.

Stainless steel superior in corrosion resistance are listed on lineup.

Products made of stainless steel are highly resistant to corrosion, so that they are suitable for applications where rust prevention oil is not preferred, such as in a cleanroom environment.

Identification Number and Specification

Example of an identification number

The specification of LM series is indicated by the identification number. Indicate the identification number, consisting of a model code, dimensions, a material code, a part code, a shape code, and a classification symbol for each specification to apply.

1	2	3	4	5	6	7	8	9
LM	10	19	29	N	F	UU	AJ	

	Specification	Code	Page
1	Model	Model code	Page Ⅱ－143
2	Inscribed circle diameter	Dimensions	Page Ⅱ－143
3	Outside diameter of external cylinder		
4	External cylinder length		
5	Retainer material	Material code	Page Ⅱ－143
6	Material type		
7	Seal structure	Part code	Page Ⅱ－143
8	Shape of external cylinders	Shape code	Page Ⅱ－143
9	Accuracy class	Classification symbol	Page Ⅱ－143

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Identification Number and Specification –Model · Inscribed Circle Diameter · Outside Diameter of External Cylinder · External Cylinder Length · Retainer Material · Material Type · Seal Structure · Shape of External Cylinder · Accuracy Class–

1 Model

Linear Bushing (LM Series)

Metric series : LM
: LME (European specification [1])
Inch series : LMB

For applicable models and sizes, see Table 1.

2 Inscribed circle diameter

For the metric series, indicate the inscribed circle diameter in mm.
For the inch series, indicate the inscribed circle diameter in the unit of 1/16 inch.

3 Outside diameter of external cylinder

For the metric series, indicate the outside diameter of external cylinder in mm.
For the inch series, indicate the outside diameter of external cylinder in the unit of 1/16 inch.

4 External cylinder length

For the metric series, indicate the length of the external cylinder in mm.
For the inch series, indicate the length of external cylinder in the unit of 1/16 inch.

5 Retainer material

High carbon steel made : No symbol
Synthetic resin made : N

Specify the retainer material. For applicable models and sizes, see the "Identification number" column in the dimension table on pages Ⅱ-147 to Ⅱ-168.

6 Material type

High carbon steel made : No symbol
Stainless steel made : F [2]

Specify the component part material. For applicable models and sizes, see the "Identification number" column in the dimension table on pages Ⅱ-147 to Ⅱ-168.

7 Seal structure

Without seal : No symbol
With one end seal : U
With two end seals : UU

The models with one end seal and two end seals incorporate seals with superior dust protection performance for preventing intrusion of foreign substances. For the inch series, only the type without seal (no symbol) can be specified. The maximum allowable temperature for seals is 120°C.

8 Shape of external cylinders

Standard type : No symbol
Adjustable clearance type : AJ
Open type : OP

For applicable models and sizes, see Table 1.

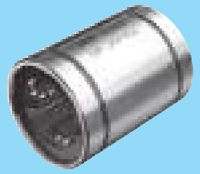
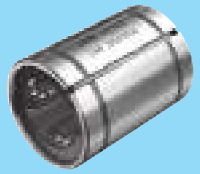
9 Accuracy class

High : No symbol
Precision : P

High class (no symbol) and precision class (P) are available for the accuracy class of LM and LMB standard type series.
For the adjustable clearance type and the open type, only high class (no symbol) is available, and the accuracy values are applicable only before cutting the external cylinders.
For details of accuracy, see the dimension table on pages Ⅱ-147 to Ⅱ-168.

Note [1] It is specification with the dimensions and tolerances generally used in Europe.
[2] The cage will be always stainless steel even when high carbon steel (no symbol) is specified.

Table. 1 Models and sizes of LM series

External cylinder shape	Dimensional series	Material type	Seal structure	Model	Size (Shaft diameter)
Standard type 	Metric series	High carbon steel made	Without seal	LM	6 ~150 mm
				LME	5 ~ 80 mm
			With one end seal	LM ··· U	6 ~150 mm
				LME ··· U	5 ~ 80 mm
			With two end seals	LM ··· UU	6 ~150 mm
				LME ··· UU	5 ~ 80 mm
		Stainless steel made	Without seal	LM ··· F	6 ~ 60 mm
				LME ··· F	5 ~ 60 mm
			With one end seal	LM ··· F U	6 ~ 60 mm
				LME ··· F U	5 ~ 60 mm
			With two end seals	LM ··· F UU	6 ~ 60 mm
				LME ··· F UU	5 ~ 60 mm
	Inch series	High carbon steel made	Without seal	LMB	6.350~101.6 mm (1/4~ 4in)
Adjustable clearance type 	Metric series	High carbon steel made	Without seal	LM ··· AJ	6 ~150 mm
				LME ··· AJ	5 ~ 80 mm
			With one end seal	LM ··· U AJ	6 ~150 mm
				LME ··· U AJ	5 ~ 80 mm
			With two end seals	LM ··· UU AJ	6 ~150 mm
				LME ··· UU AJ	5 ~ 80 mm
		Stainless steel made	Without seal	LM ··· F AJ	6 ~ 60 mm
				LME ··· F AJ	5 ~ 60 mm
			With one end seal	LM ··· F U AJ	6 ~ 60 mm
				LME ··· F U AJ	5 ~ 60 mm
			With two end seals	LM ··· F UU AJ	6 ~ 60 mm
				LME ··· F UU AJ	5 ~ 60 mm
	Inch series	High carbon steel made	Without seal	LMB ··· AJ	6.350~101.6 mm (1/4~ 4in)
Open type 	Metric series	High carbon steel made	Without seal	LM ··· OP	10 ~150 mm
				LME ··· OP	12 ~ 80 mm
			With one end seal	LM ··· U OP	10 ~150 mm
				LME ··· U OP	12 ~ 80 mm
			With two end seals	LM ··· UU OP	10 ~150 mm
				LME ··· UU OP	12 ~ 80 mm
		Stainless steel made	Without seal	LM ··· F OP	10 ~ 60 mm
				LME ··· F OP	12 ~ 60 mm
			With one end seal	LM ··· F U OP	10 ~ 60 mm
				LME ··· F U OP	12 ~ 60 mm
			With two end seals	LM ··· F UU OP	10 ~ 60 mm
				LME ··· F UU OP	12 ~ 60 mm
	Inch series	High carbon steel made	Without seal	LMB ··· OP	12.700~101.6 mm (1/2~ 4in)

Standard type	: Product with high accuracy used generally over a wide range
Adjustable clearance type	:This type has a cut-away slit in an axial direction of external cylinder, which is capable of clearance adjustment. If installed in a housing whose inscribed circle diameter is adjustable, it enables radial clearance to be freely adjusted without optional fitting and also enables preloading to operate.
Open type	: This type is in sectoral form with the external cylinder cut away in slit by one-row raceway or two-row raceways of ball in an axial direction. In order to avoid the occurrence of long shaft deflection, it is possible to accordingly add the shaft support block tailored to (*E*) dimension of the sectoral form shown in the dimension table, in a midway point. And, it is also capable of clearance adjustment.

Relationship between Load Rating and Ball Raceway

The load rating of LM series varies according to the loading direction and position of ball raceway. The dimension table describes two types of values shown in Fig. 1.1 and Fig. 1.2 according to the loading direction and position of ball raceway.
Fig. 1.1 shows the case where the loading direction and ball raceway position coincides with each other, representing the loading direction A in the dimension table. Generally, this is applied when the ball raceway position cannot be specified to indeterminate direction load or loading direction.
Fig. 1.2 shows the case where the loading direction is positioned between ball raceways, representing the loading direction B in the dimension table. Generally, this can be subjected to load bigger than loading direction A.

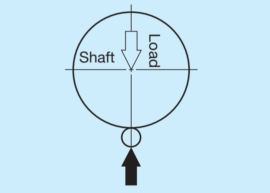


Fig. 1.1 Loading direction A

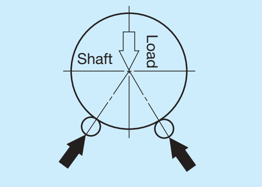


Fig. 1.2 Loading direction B

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Lubrication

Grease is not pre-packed in the LM series, so please perform adequate lubrication as needed. Both of oil lubrication and grease lubrication are available in the LM series. For grease lubrication, use of high-quality lithium-soap base grease is recommended.

Precaution for Use

❶Fitting

For fitting with a housing hole, clearance fit is usually used but transition fit can also be used for special usage.

For adjustable clearance type and open type, the shaft diameter shall be set as much as possible to less than the lower limit of the allowance of the inscribed circle diameter, and while the dimension of a housing hole shall be set to more than the upper limit of the allowance of the outside diameter of the external cylinder.

Table 2 Recommended fit

Models and accuracy class		Tolerance class			
		Shaft		Housing hole	
		Ordinary clearance	Interference fit	Clearance fit	Transition fit
LM, LMB	High	f6, g6	h6	H7	J7
	Precision	f5, g5	h5	H6	J6
LME	–	h6	j6	H7	J7

❷Clearance

For adjustable clearance type and open type, clearance adjustment can be easily performed if the unit is mounted into a housing with the bore diameter dimension adjustable. However, if a large preload is produced due to the clearance adjustment, the deformation at the contact portion of the external cylinder and ball may become large, thereby deteriorating the life. Therefore, it is recommended to finish the shaft dimension within the allowance of the recommended fitting and set the clearance at zero or under a slightly-preloaded condition.

Although the clearance adjustment is performed while measuring the clearance with a dial gauge after fitting in a shaft, a method is generally taken to rotate the shaft under unloaded condition during clearance adjustment and stop the adjustment at the timing when detecting a slight resistance. At this time, the Linear Bushing clearance is at zero or under a slight preload condition. Meanwhile, the clearance adjustment for open type with three-row ball raceways cannot be performed.

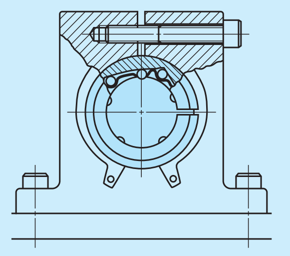


Fig. 2 Example of clearance adjustment

❸Raceway

Since LM series operates with a shaft as a raceway surface, the shaft should be heat-treated and ground. Recommended values for surface hardness and roughness of the shaft are shown in Table 3 and the recommended value for the minimum effective hardening depth is shown in Table 4.

Table 3 Surface hardness and roughness of shaft

Item	Recommended value	Remark
Surface hardness	58～64HRC	When the surface hardness is low, multiply the load rating by hardness factor ⁽¹⁾ .
Surface roughness	0.2 μmRa or lower (0.8 μmRy or lower)	Where accuracy standard is low, around 0.8 μmRa (3.2 μmRy) is also allowed.

Note ⁽¹⁾ For hardness factor, refer to Fig. 3 in page Ⅲ-5.

Table 4 Minimum effective hardening depth of shaft unit : mm

Shaft diameter		Recommended value for minimum effective hardening depth
Over	Incl.	
–	28	0.8
28	50	1.0
50	100	1.5
100	150	2.0

❹When accompanied by rotational motion

LM series units support only linear motion but do not support rotational motion. When performing rotational motion and linear motion of short stroke length, IKO Stroke Rotary Bushing is recommended to be used. And, for the usage requiring rotational motion and linear motion of long stroke length, it is recommended to use in combination with IKO needle bearing as shown in Fig. 3.

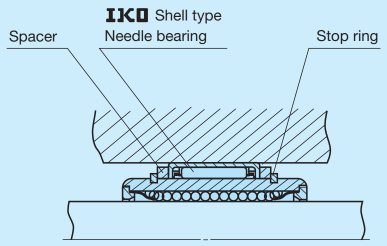


Fig. 3 Example of linear motion and rotational motion

❺Precaution for use of open type with three-row linear bushing

The open type with three-row Linear Bushing of balls may only be used with load direction indicated in Fig. 4.1. In addition, if two of them are used in parallel, mount them as indicated in 4.2, taking into account the load distribution to rolling elements. And, note that the clearance adjustment cannot be performed.

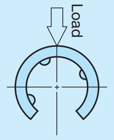


Fig. 4.1

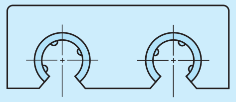


Fig. 4.2

❻Operating temperature

If the retainer is made of carbon steel, it can withstand higher temperature. However, if you use it in an environment exceeding 100℃, please contact IKO. The maximum operating temperature of synthetic resin made products is 100℃ and temperature up to 80℃ is allowed for continuous operation.

❼Mounting

When pressing an external cylinder into the housing hole, do is softly while applying a jig to the sides of the external cylinder not to hit the end plate (see Fig. 5). After pressing-in, use a stop ring or stopper plate to fix it in an axial direction. When inserting shaft after mounting the external cylinder, be careful not to shock the ball or retainer.

In addition, when two shafts are used, mount one accurately and then the other by referring to the first one so as to ensure parallelism with it. Typical mounting example is shown in Fig. 6.

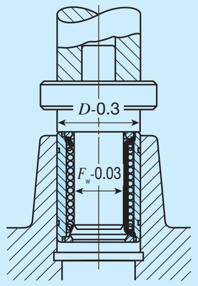


Fig. 5 Press-fitting of external cylinder

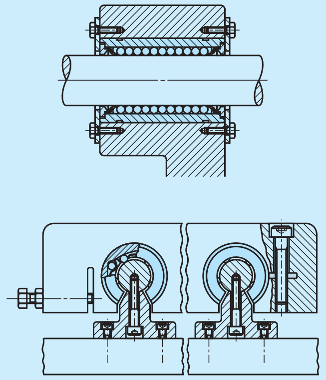


Fig. 6 Mounting example

Related Products

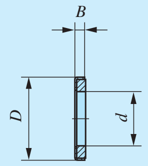
Slide shaft

To make full use of performance of the LM series, we also offer shaft with high accuracy for Linear Bushing grounded after heat treatment. If you are interested, contact IKO. Conventional ordinary type shafts are also available.

Felt seals for Linear Bushing

Though the type with seal is standardized for the LM series, the type without seal and felt seals may be used together when emphasis is put on rolling friction resistance. Dimensions for felt seals are shown in Table 5.

Table 5 Dimensions of felt seals for Linear Bushing



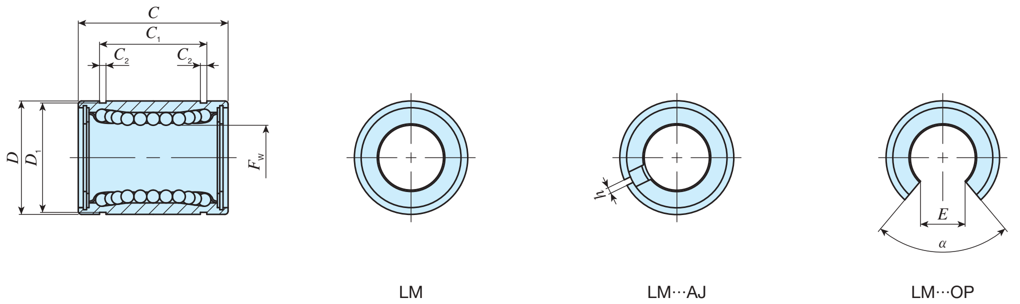
unit: mm

Identification number	d	D	B
FLM 6	6	12	2
FLM 8	8	15	2
FLM 10	10	19	3
FLM 13	13	23	3
FLM 16	16	28	4
FLM 20	20	32	4
FLM 25	25	40	5
FLM 30	30	45	5
FLM 35	35	52	5
FLM 40	40	60	5
FLM 50	50	80	10
FLM 60	60	90	10
FLM 80	80	120	10
FLM 100	100	150	10

Remark: For adjustable clearance type, open type and inch series felt seals, contact IKO.

IKO Linear Bushing

	Standard type	Adjustable clearance type	Open type
Shape	LM LM…N 	LM…　AJ LM…N AJ 	LM…　OP LM…N OP 
Shaft diameter	6 8 10 12 13 16 20 25 30 35 40 50 60 80 100 120 150	6 8 10 12 13 16 20 25 30 35 40 50 60 80 100 120 150	— — 10 12 13 16 20 25 30 35 40 50 60 80 100 120 150



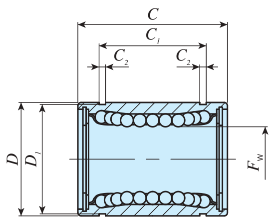
Shaft diameter mm	Identification number									Nominal dimensions and tolerances mm														Eccentricity		Basic dynamic load rating		Basic static load rating	
	Standard type	Ball raceway	Mass (Ref.) g	Adjustable clearance type	Ball raceway	Mass (Ref.) g	Open type	Ball raceway	Mass (Ref.) g	F_w	Dim. F w tolerance µm P	Dim. F w tolerance µm H	D	Dim. D tolerance µm	C	Dim. C tolerance µm	C_1 (1)	Dim. C_1 tolerance µm	C_2	D_1	h	E	α Degree	Maximum µm P	Maximum µm H	C Load direction A N	C Load direction B N	C_0 Load direction A N	C_0 Load direction B N
6	LM 61219	4	8	———	–	–	———	–	–	6	0 −6	0 −9	12	0 −11	19	0 −200	13.5	0 −200	1.1	11.5	–	–	–	8	12	80.7	92.7	167	237
	LM 61219 N	4	7.6	LM 61219 N AJ*	4	7.5															1								
8	LM 81517	4	13	———	–	–	———	–	–	8			15		17		11.5		1.1	14.3	–	–	–			87.4	100	160	226
	LM 81517 N	4	10.4	LM 81517 N AJ*	4	10															1								
	LM 81524	4	18	———	–	–	———	–	–	8			15		24		17.5		1.1	14.3	–	–	–			121	139	255	361
	LM 81524 N	4	15	LM 81524 N AJ*	4	14.7															1								
10	LM 101929	4	30	———	–	–	———	–	–	10			19	0 −13	29		22		1.3	18	–	–	–			179	206	354	501
	LM 101929 N	4	27.5	LM 101929 N AJ*	4	26.5	LM 101929 N OP*	3	18												1	6.8	80						
12	LM 122130	4	29	LM 122130 AJ*	4	28	LM 122130 OP*	3	19	12			21		30		23		1.3	20	1.5	8	80			259	298	503	711
	LM 122130 N	4	31.5	LM 122130 N AJ*	4	30.5	LM 122130 N OP*	3	22																				
13	LM 132332	4	43	LM 132332 AJ*	4	42	LM 132332 OP*	3	31	13			23		32		23		1.3	22	1.5	9	80			266	306	506	716
	LM 132332 N	4	42.5	LM 132332 N AJ*	4	41.5	LM 132332 N OP*	3	31																				
16	LM 162837	4	70	LM 162837 AJ*	4	69.5	LM 162837 OP*	3	58	16			28		37		26.5		1.6	27	1.5	11	80			426	489	766	1 080
	LM 162837 N	4	69	LM 162837 N AJ*	4	68	LM 162837 N OP*	3	52																				
20	LM 203242	5	92	LM 203242 AJ*	5	91	LM 203242 OP*	4	79	20	0 −7	0 −10	32	0 −16	42		30.5		1.6	30.5	1.5	11	60	10	15	562	668	1 010	1 470
	LM 203242 N	5	87	LM 203242 N AJ*	5	85	LM 203242 N OP*	4	69																				
25	LM 254059	6	226	LM 254059 AJ*	6	222	LM 254059 OP*	5	203	25			40		59	0 −300	41	0 −300	1.85	38	2	12	50			920	974	1 780	2 280
	LM 254059 N	6	220	LM 254059 N AJ*	6	216	LM 254059 N OP*	5	188																				
30	LM 304564	6	253	LM 304564 AJ*	6	250	LM 304564 OP*	5	228	30			45		64		44.5		1.85	43	2.5	15	50			1 460	1 540	2 780	3 560
	LM 304564 N	6	250	LM 304564 N AJ*	6	245	LM 304564 N OP*	5	210																				
35	LM 355270	6	388	LM 355270 AJ*	6	380	LM 355270 OP*	5	355	35	0 −8	0 −12	52	0 −19	70		49.5		2.1	49	2.5	17	50	12	20	1 610	1 710	3 080	3 940
	LM 355270 N	6	380	LM 355270 N AJ*	6	375	LM 355270 N OP*	5	335																				
40	LM 406080	6	596	LM 406080 AJ*	6	585	LM 406080 OP*	5	546	40			60		80		60.5		2.1	57	3	20	50			2 030	2 150	3 620	4 640
	LM 406080 N	6	585	LM 406080 N AJ*	6	579	LM 406080 N OP*	5	500																				
50	LM 5080100	6	1 615	LM 5080100 AJ*	6	1 595	LM 5080100 OP*	5	1 420	50			80		100		74		2.6	76.5	3	25	50			3 940	4 180	7 130	9 120
	LM 5080100 N	6	1 580	LM 5080100 N AJ*	6	1 560	LM 5080100 N OP*	5	1 340																				

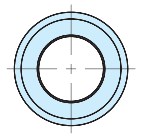
Note (1) The width of hub for fixing with circlip should be the value obtained by subtracting a circlip width value times two from the C_1 dimension.

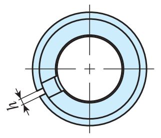
Remarks 1. "P" and "H" in Dim. F_w tolerance and Eccentricity represent precision and high, respectively.
2. Standard type and adjustable clearance type end plates are fixed with stop ring for holes.
3. The identification numbers with * are our semi-standard items.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

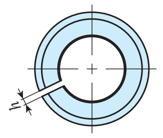
	Standard type	Adjustable clearance type	Open type
Shape	LM LM···N 	LM··· AJ LM···N AJ 	LM··· OP LM···N OP 
Shaft diameter	6 8 10 12 13 16 20 25 30 35 40 50 60 80 100 120 150	6 8 10 12 13 16 20 25 30 35 40 50 60 80 100 120 150	— — 10 12 13 16 20 25 30 35 40 50 60 80 100 120 150



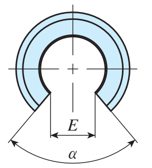

LM



LM 6090110 AJ
LM 6090110 N AJ



LM···AJ



LM···OP

Shaft diameter mm	Identification number: Standard type	Ball raceway	Mass (Ref.) g	Adjustable clearance type	Ball raceway	Mass (Ref.) g	Open type	Ball raceway	Mass (Ref.) g
60	LM 6090110	6	1 817	LM 6090110 AJ*	6	1 788	LM 6090110 OP*	5	1 650
	LM 6090110 N	6	1 787	LM 6090110 N AJ*	6	1 757	LM 6090110 N OP*	5	1 610
80	LM 80120140*	6	4 520	LM 80120140 AJ*	6	4 400	LM 80120140 OP*	5	3 750
100	LM 100150175*	6	8 600	LM 100150175 AJ*	6	8 540	LM 100150175 OP*	5	7 200
120	LM 120180200*	8	15 000	LM 120180200 AJ*	8	14 900	LM 120180200 OP*	6	11 600
150	LM 150210240*	8	20 250	LM 150210240 AJ*	8	20 150	LM 150210240 OP*	6	15 700

Shaft diameter mm	Nominal dimensions and tolerances mm: F_w	Dim. F_w tolerance μm P	Dim. F_w tolerance μm H	D	Dim. D tolerance μm	C	Dim. C tolerance μm	C_1 (1)	Dim. C_1 tolerance μm	C_2	D_1	h	E	α Degree	Eccentricity Maximum μm P	Eccentricity Maximum μm H	Basic dynamic load rating C Load direction A N	Basic dynamic load rating C Load direction B N	Basic static load rating C_0 Load direction A N	Basic static load rating C_0 Load direction B N
60	60	0 − 9	0 −15	90	0 −22	110	0 −300	85	0 −300	3.15	86.5	3	30	50	17	25	4 760	5 040	8 150	10 400
80	80			120		140	0 −400	105.5	0 −400	4.15	116	3	40	50			8 710	9 220	14 500	18 500
100	100	0 −10	0 −20	150	0 −25	175		125.5		4.15	145	3	50	50	20	30	14 500	15 300	22 800	29 200
120	120			180		200		158.6		4.15	175	3	85	80			25 800	25 500	44 300	49 400
150	150	0 −13	0 −25	210	0 −29	240		170.6		5.15	204	3	105	80	25	40	35 600	35 100	61 200	68 200

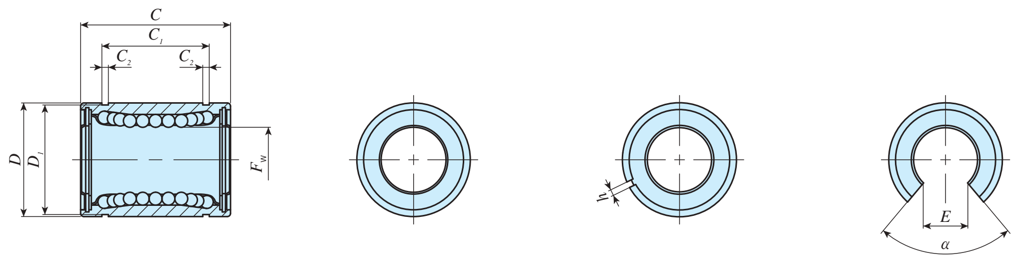
Note (1) The width of hub for fixing with circlip should be the value obtained by subtracting a circlip width value times two from the C_1 dimension.

Remarks 1. "P" and "H" in Dim. F_w tolerance and Eccentricity represent precision and high, respectively.
2. Standard type and adjustable clearance type (shaft diameter 60 mm) end plates are fixed with stop ring for holes.
3. The identification numbers with * are our semi-standard items.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO Linear Bushing With Seal

	Standard type	Adjustable clearance type	Open type
Shape	LM··· UU LM···N UU 	LM··· UU AJ LM···N UU AJ 	LM··· UU OP LM···N UU OP 
Shaft diameter	6 8 10 12 13 16 20 25 30 35 40 50 60 80 100 120 150	6 8 10 12 13 16 20 25 30 35 40 50 60 80 100 120 150	— — 10 12 13 16 20 25 30 35 40 50 60 80 100 120 150



LM···UU

LM···UU AJ

LM···UU OP

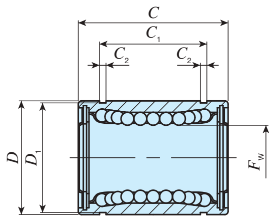
Shaft diameter mm	Identification number: Standard type	Ball raceway	Mass (Ref.) g	Adjustable clearance type	Ball raceway	Mass (Ref.) g	Open type	Ball raceway	Mass (Ref.) g	F_w	Dim. F_w tolerance µm P	H	D	Dim. D tolerance µm	C	Dim. C tolerance µm	C_1 (1)	Dim. C_1 tolerance µm	C_2	D_1	h	E	α Degree	Eccentricity Maximum µm P	H	Basic dynamic load rating C Load direction A N	Load direction B N	Basic static load rating C_0 Load direction A N	Load direction B N
6	LM 61219 UU	4	8	———	–	–	———	–	–	6	0 −6	0 −9	12	0 −11	19	0 −200	13.5	0 −200	1.1	11.5	–	–	–	8	12	80.7	92.7	167	237
	LM 61219 N UU	4	7.6	LM 61219 N UU AJ*	4	7.5															1								
8	LM 81517 UU	4	13	———	–	–	———	–	–	8			15		17		11.5		1.1	14.3	–	–	–			87.4	100	160	226
	LM 81517 N UU	4	10.4	LM 81517 N UU AJ*	4	10															1								
	LM 81524 UU	4	18	———	–	–	———	–	–	8			15		24		17.5		1.1	14.3	–	–	–			121	139	255	361
	LM 81524 N UU	4	15	LM 81524 N UU AJ*	4	14.7															1								
10	LM 101929 UU	4	30	———	–	–	———	–	–	10			19	0 −13	29		22		1.3	18	–	–	–			179	206	354	501
	LM 101929 N UU	4	27.5	LM 101929 N UU AJ*	4	26.5	LM 101929 N UU OP*	3	18												1	6.8	80						
12	LM 122130 UU	4	29	LM 122130 UU AJ*	4	28	LM 122130 UU OP*	3	19	12			21		30		23		1.3	20	1.5	8	80			259	298	503	711
	LM 122130 N UU	4	31.5	LM 122130 N UU AJ*	4	30.5	LM 122130 N UU OP*	3	22																				
13	LM 132332 UU	4	43	LM 132332 UU AJ*	4	42	LM 132332 UU OP*	3	31	13			23		32		23		1.3	22	1.5	9	80			266	306	506	716
	LM 132332 N UU	4	42.5	LM 132332 N UU AJ*	4	41.5	LM 132332 N UU OP*	3	31																				
16	LM 162837 UU	4	70	LM 162837 UU AJ*	4	69.5	LM 162837 UU OP*	3	58	16			28		37		26.5		1.6	27	1.5	11	80			426	489	766	1 080
	LM 162837 N UU	4	69	LM 162837 N UU AJ*	4	68	LM 162837 N UU OP*	3	52																				
20	LM 203242 UU	5	92	LM 203242 UU AJ*	5	91	LM 203242 UU OP*	4	79	20	0 −7	0 −10	32	0 −16	42		30.5		1.6	30.5	1.5	11	60	10	15	562	668	1 010	1 470
	LM 203242 N UU	5	87	LM 203242 N UU AJ*	5	85	LM 203242 N UU OP*	4	69																				
25	LM 254059 UU	6	226	LM 254059 UU AJ*	6	222	LM 254059 UU OP*	5	203	25			40		59	0 −300	41	0 −300	1.85	38	2	12	50			920	974	1 780	2 280
	LM 254059 N UU	6	220	LM 254059 N UU AJ*	6	216	LM 254059 N UU OP*	5	188																				
30	LM 304564 UU	6	253	LM 304564 UU AJ*	6	250	LM 304564 UU OP*	5	228	30			45		64		44.5		1.85	43	2.5	15	50			1 460	1 540	2 780	3 560
	LM 304564 N UU	6	250	LM 304564 N UU AJ*	6	245	LM 304564 N UU OP*	5	210																				
35	LM 355270 UU	6	387	LM 355270 UU AJ*	6	380	LM 355270 UU OP*	5	355	35	0 −8	0 −12	52	0 −19	70		49.5		2.1	49	2.5	17	50	12	20	1 610	1 710	3 080	3 940
	LM 355270 N UU	6	380	LM 355270 N UU AJ*	6	375	LM 355270 N UU OP*	5	335																				
40	LM 406080 UU	6	596	LM 406080 UU AJ*	6	585	LM 406080 UU OP*	5	546	40			60		80		60.5		2.1	57	3	20	50			2 030	2 150	3 620	4 640
	LM 406080 N UU	6	585	LM 406080 N UU AJ*	6	579	LM 406080 N UU OP*	5	500																				
50	LM 5080100 UU	6	1 615	LM 5080100 UU AJ*	6	1 595	LM 5080100 UU OP*	5	1 420	50			80		100		74		2.6	76.5	3	25	50			3 940	4 180	7 130	9 120
	LM 5080100 N UU	6	1 580	LM 5080100 N UU AJ*	6	1 560	LM 5080100 N UU OP*	5	1 340																				

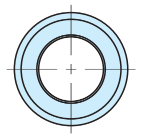
Note (1) The width of hub for fixing with circlip should be the value obtained by subtracting a circlip width value times two from the C_1 dimension.

Remarks 1. "P" and "H" in Dim. F_w tolerance and Eccentricity represent precision and high, respectively.
2. Standard type and adjustable clearance type end plates are fixed with stop ring for holes.
3. The identification numbers with * are our semi-standard items.

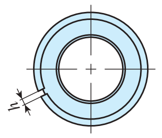
IKO Linear Bushing (With Seal)

	Standard type						Adjustable clearance type						Open type					
Shape	LM⋯ UU LM⋯N UU 						LM⋯ UU AJ LM⋯N UU AJ 						LM⋯ UU OP LM⋯N UU OP 					
Shaft diameter	6	8	10	12	13	16	6	8	10	12	13	16	—	—	10	12	13	16
	20	25	30	35	40	50	20	25	30	35	40	50	20	25	30	35	40	50
	60	80	100	120	150		60	80	100	120	150		60	80	100	120	150	

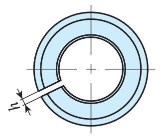




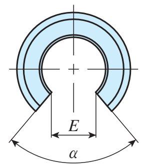
LM⋯UU



LM 6090110 UU AJ
LM 6090110 N UU AJ



LM⋯UU AJ



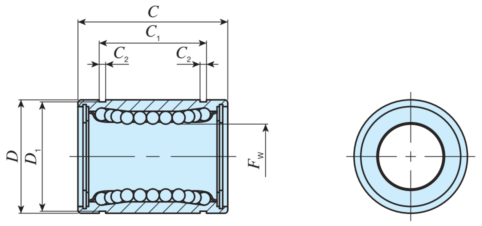
LM⋯UU OP

Shaft diameter mm	Identification number									Nominal dimensions and tolerances mm														Eccentricity		Basic dynamic load rating C		Basic static load rating C_0	
	Standard type	Ball raceway	Mass (Ref.) g	Adjustable clearance type	Ball raceway	Mass (Ref.) g	Open type	Ball raceway	Mass (Ref.) g	F_w	Dim. Fw tolerance µm P	Dim. Fw tolerance µm H	D	Dim. D tolerance µm	C	Dim. C tolerance µm	C_1 (1)	Dim. C_1 tolerance µm	C_2	D_1	h	E	α Degree	Maximum µm P	Maximum µm H	Load direction A N	Load direction B N	Load direction A N	Load direction B N
60	LM 6090110 UU	6	1 817	LM 6090110 UU AJ*	6	1 788	LM 6090110 UU OP*	5	1 650	60	0 − 9	0 −15	90	0 −22	110	0 −300	85	0 −300	3.15	86.5	3	30	50	17	25	4 760	5 040	8 150	10 400
	LM 6090110 N UU	6	1 787	LM 6090110 N UU AJ*	6	1 757	LM 6090110 N UU OP*	5	1 610																				
80	LM 80120140 UU*	6	4 400	LM 80120140 UU AJ*	6	4 360	LM 80120140 UU OP*	5	3 640	80			120		140	0 −400	105.5	0 −400	4.15	116	3	40	50			8 710	9 220	14 500	18 500
100	LM 100150175 UU*	6	8 500	LM 100150175 UU AJ*	6	8 450	LM 100150175 UU OP*	5	7 120	100	0 −10	0 −20	150	0 −25	175		125.5		4.15	145	3	50	50	20	30	14 500	15 300	22 800	29 200
120	LM 120180200 UU*	8	14 700	LM 120180200 UU AJ*	8	14 600	LM 120180200 UU OP*	6	11 400	120			180		200		158.6		4.15	175	3	85	80			25 800	25 500	44 300	49 400
150	LM 150210240 UU*	8	19 900	LM 150210240 UU AJ*	8	19 800	LM 150210240 UU OP*	6	15 400	150	0 −13	0 −25	210	0 −29	240		170.6		5.15	204	3	105	80	25	40	35 600	35 100	61 200	68 200

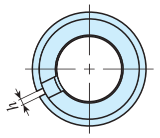
Note (1) The width of hub for fixing with circlip should be the value obtained by subtracting a circlip width value times two from the C_1 dimension.

Remarks 1. "P" and "H" in Dim. F_w tolerance and Eccentricity represent precision and high, respectively.
2. Standard type and adjustable clearance type (shaft diameter 60 mm) end plates are fixed with stop ring for holes.
3. The identification numbers with * are our semi-standard items.

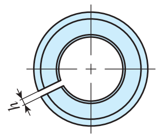
	Standard type	Adjustable clearance type	Open type
Shape	LME LME···N 	LME··· AJ LME···N AJ 	LME··· OP LME···N OP 
Shaft diameter	5 8 12 16 20 25 30 40 50 60 80	5 8 12 16 20 25 30 40 50 60 80	— — 12 16 20 25 30 40 50 60 80



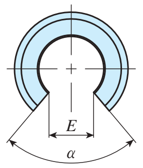
LME



LME···AJ



LME 80120165 AJ



LME···OP

Shaft diameter mm	Identification number: Standard type	Ball raceway	Mass (Ref.) g	Adjustable clearance type	Ball raceway	Mass (Ref.) g	Open type	Ball raceway	Mass (Ref.) g	Nominal dimensions and tolerances mm: F_w	Dim. F_w tolerance μm	D	Dim. D tolerance μm	C	Dim. C tolerance μm	C_1 (1)	Dim. C_1 tolerance μm	C_2	D_1	h	E	α Degree	Eccentricity Maximum μm	Basic dynamic load rating C Load direction A N	Basic dynamic load rating C Load direction B N	Basic static load rating C_0 Load direction A N	Basic static load rating C_0 Load direction B N
5	LME 51222 N*	4	11	LME 51222 N AJ*	4	9.5	———	–	–	5	+8 0	12	0 −8	22	0 −200	14.5	0 −200	1.1	11.5	1	–	–	12	90.8	104	219	310
8	LME 81625 *	4	20	———	–	–	———	–	–	8		16		25		16.5		1.1	15.2	–	–	–		121	139	255	361
	LME 81625 N*	4	20	LME 81625 N AJ*	4	19.5														1							
12	LME 122232 *	4	41.5	LME 122232 AJ*	4	40.5	LME 122232 OP*	3	32	12		22	0 −9	32		22.9		1.3	21	1.5	7.5	78		259	298	503	711
	LME 122232 N*	4	40	LME 122232 N AJ*	4	39	LME 122232 N OP*	3	30																		
16	LME 162636 *	4	56.5	LME 162636 AJ*	4	55.5	LME 162636 OP*	3	48	16	+9 −1	26		36		24.9		1.3	24.9	1.5	10	78		283	325	514	726
	LME 162636 N*	4	55	LME 162636 N AJ*	4	54	LME 162636 N OP*	3	46																		
20	LME 203245 *	5	97	LME 203245 AJ*	5	96	LME 203245 OP*	4	84	20		32	0 −11	45		31.5		1.6	30.3	2	10	60	15	562	668	1 010	1 470
	LME 203245 N*	5	91	LME 203245 N AJ*	5	90	LME 203245 N OP*	4	75																		
25	LME 254058 *	6	222	LME 254058 AJ*	6	219	LME 254058 OP*	5	195	25	+11 −1	40		58	0 −300	44.1	0 −300	1.85	37.5	2	12.5	60		920	974	1 780	2 280
	LME 254058 N*	6	215	LME 254058 N AJ*	6	212	LME 254058 N OP*	5	181																		
30	LME 304768 *	6	338	LME 304768 AJ*	6	333	LME 304768 OP*	5	309	30		47		68		52.1		1.85	44.5	2	12.5	50		1 350	1 430	2 500	3 200
	LME 304768 N*	6	325	LME 304768 N AJ*	6	320	LME 304768 N OP*	5	272																		
40	LME 406280 *	6	712	LME 406280 AJ*	6	701	LME 406280 OP*	5	665	40	+13 −2	62	0 −13	80		60.6		2.15	59	3	16.8	50	17	2 030	2 150	3 620	4 640
	LME 406280 N*	6	705	LME 406280 N AJ*	6	694	LME 406280 N OP*	5	600																		
50	LME 5075100 *	6	1 147	LME 5075100 AJ*	6	1 127	LME 5075100 OP*	5	1 080	50		75		100		77.6		2.65	72	3	21	50		3 940	4 180	7 130	9 120
	LME 5075100 N*	6	1 130	LME 5075100 N AJ*	6	1 110	LME 5075100 N OP*	5	970																		
60	LME 6090125 *	6	2 051	LME 6090125 AJ*	6	2 001	LME 6090125 OP*	5	1 900	60		90	0 −15	125	0 −400	101.7	0 −400	3.15	86.5	3	27.2	54	20	4 760	5 040	8 150	10 400
	LME 6090125 N*	6	2 050	LME 6090125 N AJ*	6	2 000	LME 6090125 N OP*	5	1 580																		
80	LME 80120165 *	6	5 140	LME 80120165 AJ*	6	5 000	LME 80120165 OP*	5	4 380	80	+16 −4	120		165		133.7		4.15	116	3	36.3	54		8 710	9 220	14 500	18 500

Note (1) The width of hub for fixing with circlip should be the value obtained by subtracting a circlip width value times two from the C_1 dimension.

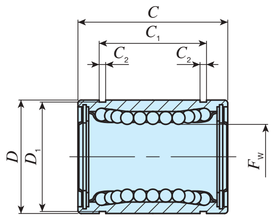
Remarks 1. High carbon steel-made retainer (shaft diameter 8 mm), and standard type and adjustable clearance type (shaft diameter 12 mm to 60 mm) end plates are fixed with stop ring for holes.

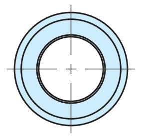
2. The identification numbers with * are our semi-standard items.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

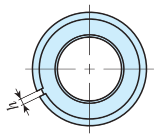
IKO Linear Bushing (With Seal)

	Standard type	Adjustable clearance type	Open type
Shape	LME··· UU LME···N UU 	LME··· UU AJ LME···N UU AJ 	LME··· UU OP LME···N UU OP 
Shaft diameter	5 8 12 16 20 25 30 40 50 60 80	5 8 12 16 20 25 30 40 50 60 80	– – 12 16 20 25 30 40 50 60 80

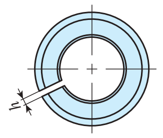




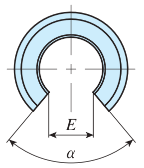
LME···UU



LME···UU AJ



LME 80120165 UU AJ



LME···UU OP

Shaft diameter mm	Identification number: Standard type	Ball raceway	Mass (Ref.) g	Adjustable clearance type	Ball raceway	Mass (Ref.) g	Open type	Ball raceway	Mass (Ref.) g
5	LME 51222 N UU*	4	11	LME 51222 N UU AJ*	4	9.5	———	–	–
8	LME 81625 UU*	4	20	———	–	–	———	–	–
	LME 81625 N UU*	4	20	LME 81625 N UU AJ*	4	19			
12	LME 122232 UU*	4	41.5	LME 122232 UU AJ*	4	40.5	LME 122232 UU OP*	3	32
	LME 122232 N UU*	4	40	LME 122232 N UU AJ*	4	39	LME 122232 N UU OP*	3	30
16	LME 162636 UU*	4	56.5	LME 162636 UU AJ*	4	55.5	LME 162636 UU OP*	3	48
	LME 162636 N UU*	4	55	LME 162636 N UU AJ*	4	54	LME 162636 N UU OP*	3	46
20	LME 203245 UU*	5	97	LME 203245 UU AJ*	5	96	LME 203245 UU OP*	4	84
	LME 203245 N UU*	5	91	LME 203245 N UU AJ*	5	90	LME 203245 N UU OP*	4	75
25	LME 254058 UU*	6	222	LME 254058 UU AJ*	6	219	LME 254058 UU OP*	5	195
	LME 254058 N UU*(2)	6	215	LME 254058 N UU AJ*(2)	6	212	LME 254058 N UU OP*(2)	5	181
30	LME 304768 UU*	6	338	LME 304768 UU AJ*	6	333	LME 304768 UU OP*	5	309
	LME 304768 N UU*	6	325	LME 304768 N UU AJ*	6	320	LME 304768 N UU OP*	5	272
40	LME 406280 UU*	6	712	LME 406280 UU AJ*	6	701	LME 406280 UU OP*	5	665
	LME 406280 N UU*	6	705	LME 406280 N UU AJ*	6	694	LME 406280 N UU OP*	5	600
50	LME 5075100 UU*	6	1 147	LME 5075100 UU AJ*	6	1 127	LME 5075100 UU OP*	5	1 080
	LME 5075100 N UU*	6	1 130	LME 5075100 N UU AJ*	6	1 110	LME 5075100 N UU OP*	5	970
60	LME 6090125 UU*	6	2 051	LME 6090125 UU AJ*	6	2 001	LME 6090125 UU OP*	5	1 900
	LME 6090125 N UU*	6	2 050	LME 6090125 N UU AJ*	6	2 000	LME 6090125 N UU OP*	5	1 580
80	LME80120165 UU*	6	5 030	LME80120165 UU AJ*	6	4 930	LME80120165 UU OP*	5	4 210

Nominal dimensions and tolerances mm													Eccentricity	Basic dynamic load rating C		Basic static load rating C_0	
F_w	Dim. Fw tolerance µm	D	Dim. D tolerance µm	C	Dim. C tolerance µm	C_1(1)	Dim. C_1 tolerance µm	C_2	D_1	h	E	α Degree	Maximum µm	Load direction A N	Load direction B N	Load direction A N	Load direction B N
5	+8 0	12	0 −8	22	0 −200	14.5	0 −200	1.1	11.5	1	–	–	12	90.8	104	219	310
8		16		25		16.5		1.1	15.2	– 1	–	–		121	139	255	361
12		22	0 −9	32		22.9		1.3	21	1.5	7.5	78		259	298	503	711
16	+9 −1	26		36		24.9		1.3	24.9	1.5	10	78		283	325	514	726
20		32	0 −11	45		31.5		1.6	30.3	2	10	60	15	562	668	1 010	1 470
25	+11 −1	40		58	0 −300	44.1	0 −300	1.85	37.5	2	12.5	60		920	974	1 780	2 280
30		47		68		52.1		1.85	44.5	2	12.5	50		1 350	1 430	2 500	3 200
40	+13 −2	62	0 −13	80		60.6		2.15	59	3	16.8	50	17	2 030	2 150	3 620	4 640
50		75		100		77.6		2.65	72	3	21	50		3 940	4 180	7 130	9 120
60		90	0 −15	125	0 −400	101.7	0 −400	3.15	86.5	3	27.2	54	20	4 760	5 040	8 150	10 400
80	+16 −4	120		165		133.7		4.15	116	3	36.3	54		8 710	9 220	14 500	18 500

Notes (1) The width of hub for fixing with circlip should be the value obtained by subtracting a circlip width value times two from the C_1 dimension.

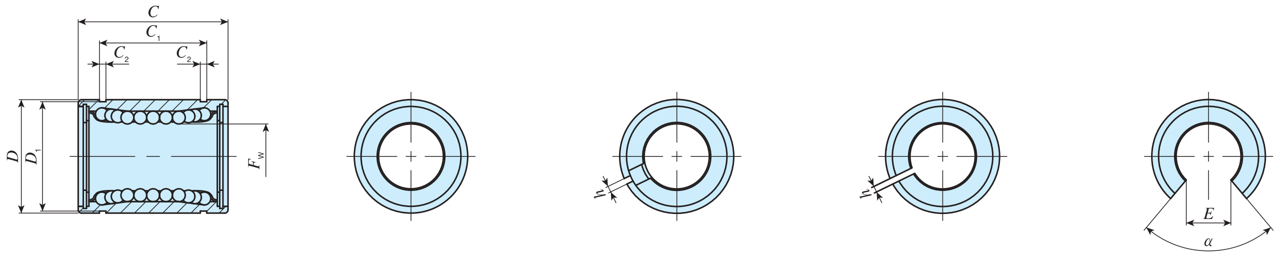
(2) The seal is slightly off from the external cylinder end.

Remarks 1. High carbon steel-made retainer (shaft diameter 8 mm), and standard type and adjustable clearance type (shaft diameter 12 mm to 60 mm) end plates are fixed with stop ring for holes.

2. The identification numbers with * are our semi-standard items.

IKO Linear Bushing (Inch Series)

	Standard type				Adjustable clearance type				Open type			
Shape	LMB LMB···N 				LMB··· AJ LMB···N AJ 				LMB··· OP LMB···N OP 			
Shaft diameter	6.350	9.525	12.700	15.875	6.350	9.525	12.700	15.875	–	–	12.700	15.875
	19.050	25.400	31.750	38.100	19.050	25.400	31.750	38.100	19.050	25.400	31.750	38.100
	50.800	63.500	76.200	101.600	50.800	63.500	76.200	101.600	50.800	63.500	76.200	101.600



LMB

LMB···AJ

LMB 406080 AJ
LMB 487296 AJ
LMB 6496128 AJ

LMB···OP

Shaft diameter mm (inch)	Identification number: Standard type	Ball raceway	Mass (Ref.) g	Adjustable clearance type	Ball raceway	Mass (Ref.) g	Open type	Ball raceway	Mass (Ref.) g	Nominal dimensions and tolerances inch/mm: F_w	Dim. Fw tolerance μm P	Dim. Fw tolerance μm H	D	Dim. D tolerance μm	C	Dim. C tolerance μm	C_1(1)	Dim. C_1 tolerance μm	C_2	D_1	h	E	α Degree	Eccentricity Maximum μm P	Eccentricity Maximum μm H	Basic dynamic load rating C Load direction A N	Basic dynamic load rating C Load direction B N	Basic static load rating C_0 Load direction A N	Basic static load rating C_0 Load direction B N
6.350 (1/4)	LMB 4812 * LMB 4812 N*	4 4	10.5 8.5	——— LMB 4812 N AJ*	– 4	– 8	———	–	–	1/4 6.350	0 − 6	0 − 9	1/2 12.700	0 −11	3/4 19.050	0 −200	12.98	0 −200	0.992	11.906	– 1	–	–	8	12	82.6	94.9	168	238
9.525 (3/8)	LMB 61014 * LMB 61014 N*	4 4	16.5 12.5	——— LMB 61014 N AJ*	– 4	– 12	———	–	–	3/8 9.525			5/8 15.875	0 −13	7/8 22.225		16.15		0.992	14.935	– 1	–	–			94.8	109	174	246
12.700 (1/2)	LMB 81420 * LMB 81420 N*	4 4	37.5 37	LMB 81420 AJ* LMB 81420 N AJ*	4 4	36.5 36	LMB 81420 OP* LMB 81420 N OP*	3 3	28 27	1/2 12.700			7/8 22.225		1 1/4 31.750		24.46		1.168	20.853	1.5	7.9	80			264	303	505	714
15.875 (5/8)	LMB 101824 * LMB 101824 N*	4 4	79.6 76	LMB 101824 AJ* LMB 101824 N AJ*	4 4	77.6 74	LMB 101824 OP* LMB 101824 N OP*	3 3	64 57	5/8 15.875			1 1/8 28.575		1 1/2 38.100		28.04		1.422	26.899	1.5	9.5	80			424	488	766	1 080
19.050 (3/4)	LMB 122026 * LMB 122026 N*	5 5	99.5 95	LMB 122026 AJ* LMB 122026 N AJ*	5 5	97.5 93	LMB 122026 OP* LMB 122026 N OP*	4 4	86 76	3/4 19.050	0 − 7	0 −10	1 1/4 31.750	0 −16	1 5/8 41.275		29.61		1.422	29.870	1.5	11.1	60	10	15	554	659	1 000	1 470
25.400 (1)	LMB 162536 * LMB 162536 N*	6 6	207 200	LMB 162536 AJ* LMB 162536 N AJ*	6 6	205 198	LMB 162536 OP* LMB 162536 N OP*	5 5	190 170	1 25.400			1 9/16 39.688		2 1/4 57.150	0 −300	44.57	0 −300	1.727	37.306	1.5	14.3	50			923	978	1 780	2 280
31.750 (1 1/4)	LMB 203242 * LMB 203242 N*	6 6	434 421	LMB 203242 AJ* LMB 203242 N AJ*	6 6	424 411	LMB 203242 OP* LMB 203242 N OP*	5 5	390 375	1 1/4 31.750	0 − 8	0 −12	2 50.800	0 −19	2 5/8 66.675		50.92		1.727	47.904	2.5	15.9	50	12	20	1 370	1 450	2 510	3 210
38.100 (1 1/2)	LMB 243848 * LMB 243848 N*	6 6	662 646	LMB 243848 AJ* LMB 243848 N AJ*	6 6	652 636	LMB 243848 OP* LMB 243848 N OP*	5 5	610 595	1 1/2 38.100			2 3/8 60.325		3 76.200		61.26		2.184	56.870	3	19.1	50			2 010	2 130	3 610	4 620
50.800 (2)	LMB 324864 * LMB 324864 N*	6 6	1 185 1 140	LMB 324864 AJ* LMB 324864 N AJ*	6 6	1 165 1 120	LMB 324864 OP* LMB 324864 N OP*	5 5	1 120 980	2 50.800			3 76.200		4 101.600		81.07		2.616	72.085	3	25.4	50	17	25	3 960	4 190	7 140	9 130
63.500 (2 1/2)	LMB 406080 *	6	2 600	LMB 406080 AJ*	6	2 560	LMB 406080 OP*	5	2 230	2 1/2 63.500	0 − 9	0 −15	3 3/4 95.250	0 −22	5 127.000		100.99		3.048	90.220	3	31.8	50			5 190	5 490	9 090	11 600
76.200 (3)	LMB 487296 *	6	4 380	LMB 487296 AJ*	6	4 350	LMB 487296 OP*	5	3 750	3 76.200			4 1/2 114.300		6 152.400	0 −400	120.04	0 −400	3.048	109.474	3	38.1	50			8 620	9 120	14 500	18 500
101.600 (4)	LMB 6496128 *	6	10 200	LMB 6496128 AJ*	6	10 150	LMB 6496128 OP*	5	8 740	4 101.600	0 −10	0 −20	6 152.400	0 −25	8 203.200		158.95		3.53	145.923	3	50.8	50	20	30	17 000	18 000	28 600	36 500

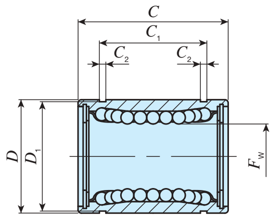
Notes (1) The width of hub for fixing with circlip should be the value obtained by subtracting a circlip width value times two from the C_1 dimension.

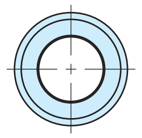
Remarks 1. "P" and "H" in Dim. F_w tolerance and Eccentricity represent precision and high, respectively.
2. High carbon steel-made retainer (shaft diameter 6.350 mm and 9.525 mm), and standard type and adjustable clearance type (shaft diameter 12.700 mm to 50.800 mm) end plates are fixed with stop ring for holes.
3. The identification numbers with * are our semi-standard items.

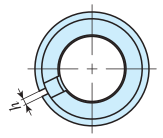
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO Linear Bushing Stainless Steel Made

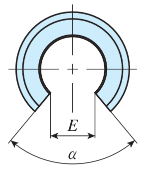
	Standard type					Adjustable clearance type					Open type				
Shape	LM··· F LM···N F 					LM··· F AJ LM···N F AJ 					LM··· F OP LM···N F OP 				
Shaft diameter	6	8	10	12	13	6	8	10	12	13	–	–	10	12	13
	16	20	25	30	35	16	20	25	30	35	16	20	25	30	35
	40	50	60			40	50	60			40	50	60		




LM···F



LM···F AJ



LM···F OP

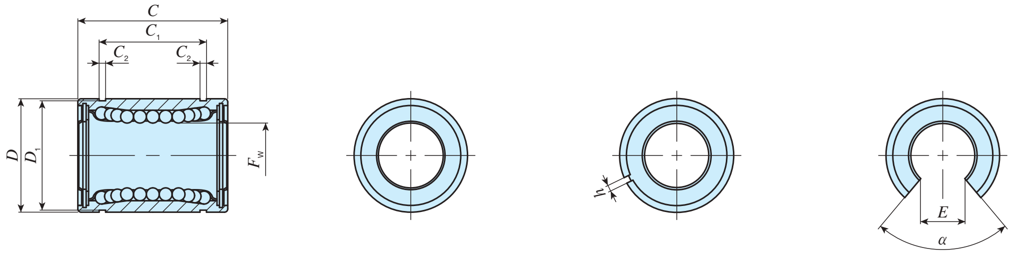
Shaft diameter mm	Identification number									Nominal dimensions and tolerances mm														Eccentricity		Basic dynamic load rating		Basic static load rating	
	Standard type	Ball raceway	Mass (Ref.) g	Adjustable clearance type	Ball raceway	Mass (Ref.) g	Open type	Ball raceway	Mass (Ref.) g	F_w	Dim. F_w tolerance μm		D	Dim. D tolerance μm	C	Dim. C tolerance μm	C_1 (1)	Dim. C_1 tolerance μm	C_2	D_1	h	E	α Degree	Maximum μm		C Load direction A N	C Load direction B N	C_0 Load direction A N	C_0 Load direction B N
											P	H												P	H				
6	LM 61219 F	4	8	———	–	–	———	–	–	6	0 −6	0 −9	12	0 −11	19	0 −200	13.5	0 −200	1.1	11.5	–	–	–	8	12	80.7	92.7	167	237
	LM 61219 N F	4	7.6	LM 61219 N F AJ*	4	7.5															1								
8	LM 81517 F	4	13	———	–	–	———	–	–	8			15		17		11.5		1.1	14.3	–	–	–			87.4	100	160	226
	LM 81517 N F	4	10.4	LM 81517 N F AJ*	4	10															1								
	LM 81524 F	4	18	———	–	–	———	–	–	8			15		24		17.5		1.1	14.3	–	–	–			121	139	255	361
	LM 81524 N F	4	15	LM 81524 N F AJ*	4	14.7															1								
10	LM 101929 F	4	30	———	–	–	———	–	–	10			19	0 −13	29		22		1.3	18	–	–	–			179	206	354	501
	LM 101929 N F	4	27.5	LM 101929 N F AJ*	4	26.5	LM 101929 N F OP*	3	18												1	6.8	80						
12	LM 122130 F	4	29	LM 122130 F AJ*	4	28	LM 122130 F OP*	3	19	12			21		30		23		1.3	20	1.5	8	80			259	298	503	711
	LM 122130 N F	4	31.5	LM 122130 N F AJ*	4	30.5	LM 122130 N F OP*	3	22																				
13	LM 132332 F	4	43	LM 132332 F AJ*	4	42	LM 132332 F OP*	3	31	13			23		32		23		1.3	22	1.5	9	80			266	306	506	716
	LM 132332 N F	4	42.5	LM 132332 N F AJ*	4	41.5	LM 132332 N F OP*	3	31																				
16	LM 162837 F	4	70	LM 162837 F AJ*	4	69.5	LM 162837 F OP*	3	58	16			28		37		26.5		1.6	27	1.5	11	80			426	489	766	1 080
	LM 162837 N F	4	69	LM 162837 N F AJ*	4	68	LM 162837 N F OP*	3	52																				
20	LM 203242 F	5	92	LM 203242 F AJ*	5	91	LM 203242 F OP*	4	79	20	0 −7	0 −10	32	0 −16	42		30.5		1.6	30.5	1.5	11	60	10	15	562	668	1 010	1 470
	LM 203242 N F	5	87	LM 203242 N F AJ*	5	85	LM 203242 N F OP*	4	69																				
25	LM 254059 F	6	226	LM 254059 F AJ*	6	222	LM 254059 F OP*	5	203	25			40		59	0 −300	41	0 −300	1.85	38	2	12	50			920	974	1 780	2 280
	LM 254059 N F	6	220	LM 254059 N F AJ*	6	216	LM 254059 N F OP*	5	188																				
30	LM 304564 F	6	253	LM 304564 F AJ*	6	250	LM 304564 F OP*	5	228	30			45		64		44.5		1.85	43	2.5	15	50			1 460	1 540	2 780	3 560
	LM 304564 N F	6	250	LM 304564 N F AJ*	6	245	LM 304564 N F OP*	5	210																				
35	LM 355270 F	6	387	LM 355270 F AJ*	6	380	LM 355270 F OP*	5	355	35	0 −8	0 −12	52	0 −19	70		49.5		2.1	49	2.5	17	50	12	20	1 610	1 710	3 080	3 940
	LM 355270 N F	6	380	LM 355270 N F AJ*	6	375	LM 355270 N F OP*	5	335																				
40	LM 406080 F	6	596	LM 406080 F AJ*	6	585	LM 406080 F OP*	5	546	40			60		80		60.5		2.1	57	3	20	50			2 030	2 150	3 620	4 640
	LM 406080 N F	6	585	LM 406080 N F AJ*	6	579	LM 406080 N F OP*	5	500																				
50	LM 5080100 F	6	1 615	LM 5080100 F AJ*	6	1 595	LM 5080100 F OP*	5	1 420	50			80		100		74		2.6	76.5	3	25	50			3 940	4 180	7 130	9 120
	LM 5080100 N F	6	1 580	LM 5080100 N F AJ*	6	1 560	LM 5080100 N F OP*	5	1 340																				
60	LM 6090110 F	6	1 817	LM 6090110 F AJ*	6	1 788	LM 6090110 F OP*	5	1 650	60	0 −9	0 −15	90	0 −22	110		85		3.15	86.5	3	30	50	17	25	4 760	5 040	8 150	10 400
	LM 6090110 N F	6	1 787	LM 6090110 N F AJ*	6	1 757	LM 6090110 N F OP*	5	1 610																				

Note (1) The width of hub for fixing with circlip should be the value obtained by subtracting a circlip width value times two from the C_1 dimension.

Remarks 1. "P" and "H" in Dim. F_w tolerance and Eccentricity represent precision and high, respectively.
2. Standard type and adjustable clearance type end plates are fixed with stop ring for holes.
3. The identification numbers with * are our semi-standard items.

IKO Linear Bushing Stainless Steel Made With Seal

	Standard type	Adjustable clearance type	Open type
Shape	LM… F UU LM…N F UU 	LM… F UU AJ LM…N F UU AJ 	LM… F UU OP LM…N F UU OP 
Shaft diameter	6 8 10 12 13 16 20 25 30 35 40 50 60	6 8 10 12 13 16 20 25 30 35 40 50 60	– – 10 12 13 16 20 25 30 35 40 50 60



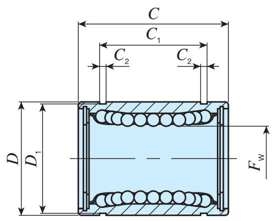
Shaft diameter	Identification number									Nominal dimensions and tolerances mm														Eccentricity		Basic dynamic load rating C		Basic static load rating C_0	
	Standard type	Ball raceway	Mass (Ref.)	Adjustable clearance type	Ball raceway	Mass (Ref.)	Open type	Ball raceway	Mass (Ref.)	F_w	Dim. Fw tolerance μm		D	Dim. D tolerance	C	Dim. C tolerance	C_1 (1)	Dim. C_1 tolerance	C_2	D_1	h	E	α	Maximum μm		Load direction A	Load direction B	Load direction A	Load direction B
mm			g			g			g		P	H		μm		μm		μm					Degree	P	H	N	N	N	N
6	LM 61219 F UU	4	8	———	–	–	———	–	–	6	0 −6	0 −9	12	0 −11	19	0 −200	13.5	0 −200	1.1	11.5	–	–	–	8	12	80.7	92.7	167	237
	LM 61219 N F UU	4	7.6	LM 61219 N F UU AJ*	4	7.5															1								
8	LM 81517 F UU	4	13	———	–	–	———	–	–	8			15		17		11.5		1.1	14.3	–	–	–			87.4	100	160	226
	LM 81517 N F UU	4	10.4	LM 81517 N F UU AJ*	4	10															1								
	LM 81524 F UU	4	18	———	–	–	———	–	–	8			15		24		17.5		1.1	14.3	–	–	–			121	139	255	361
	LM 81524 N F UU	4	15	LM 81524 N F UU AJ*	4	14.7															1								
10	LM 101929 F UU	4	30	———	–	–	———	–	–	10			19	0 −13	29		22		1.3	18	–	–	–			179	206	354	501
	LM 101929 N F UU	4	27.5	LM 101929 N F UU AJ*	4	26.5	LM 101929 N F UU OP*	3	18												1	6.8	80						
12	LM 122130 F UU	4	29	LM 122130 F UU AJ*	4	28	LM 122130 F UU OP*	3	19	12			21		30		23		1.3	20	1.5	8	80			259	298	503	711
	LM 122130 N F UU	4	31.5	LM 122130 N F UU AJ*	4	30.5	LM 122130 N F UU OP*	3	22																				
13	LM 132332 F UU	4	43	LM 132332 F UU AJ*	4	42	LM 132332 F UU OP*	3	31	13			23		32		23		1.3	22	1.5	9	80			266	306	506	716
	LM 132332 N F UU	4	42.5	LM 132332 N F UU AJ*	4	41.5	LM 132332 N F UU OP*	3	31																				
16	LM 162837 F UU	4	70	LM 162837 F UU AJ*	4	69.5	LM 162837 F UU OP*	3	58	16			28		37		26.5		1.6	27	1.5	11	80			426	489	766	1 080
	LM 162837 N F UU	4	69	LM 162837 N F UU AJ*	4	68	LM 162837 N F UU OP*	3	52																				
20	LM 203242 F UU	5	92	LM 203242 F UU AJ*	5	91	LM 203242 F UU OP*	4	79	20	0 −7	0 −10	32	0 −16	42		30.5		1.6	30.5	1.5	11	60	10	15	562	668	1 010	1 470
	LM 203242 N F UU	5	87	LM 203242 N F UU AJ*	5	85	LM 203242 N F UU OP*	4	69																				
25	LM 254059 F UU	6	226	LM 254059 F UU AJ*	6	222	LM 254059 F UU OP*	5	203	25			40		59	0 −300	41	0 −300	1.85	38	2	12	50			920	974	1 780	2 280
	LM 254059 N F UU	6	220	LM 254059 N F UU AJ*	6	216	LM 254059 N F UU OP*	5	188																				
30	LM 304564 F UU	6	253	LM 304564 F UU AJ*	6	250	LM 304564 F UU OP*	5	228	30			45		64		44.5		1.85	43	2.5	15	50			1 460	1 540	2 780	3 560
	LM 304564 N F UU	6	250	LM 304564 N F UU AJ*	6	245	LM 304564 N F UU OP*	5	210																				
35	LM 355270 F UU	6	387	LM 355270 F UU AJ*	6	380	LM 355270 F UU OP*	5	355	35	0 −8	0 −12	52	0 −19	70		49.5		2.1	49	2.5	17	50	12	20	1 610	1 710	3 080	3 940
	LM 355270 N F UU	6	380	LM 355270 N F UU AJ*	6	375	LM 355270 N F UU OP*	5	335																				
40	LM 406080 F UU	6	596	LM 406080 F UU AJ*	6	585	LM 406080 F UU OP*	5	546	40			60		80		60.5		2.1	57	3	20	50			2 030	2 150	3 620	4 640
	LM 406080 N F UU	6	585	LM 406080 N F UU AJ*	6	579	LM 406080 N F UU OP*	5	500																				
50	LM 5080100 F UU	6	1 615	LM 5080100 F UU AJ*	6	1 595	LM 5080100 F UU OP*	5	1 420	50			80		100		74		2.6	76.5	3	25	50			3 940	4 180	7 130	9 120
	LM 5080100 N F UU	6	1 580	LM 5080100 N F UU AJ*	6	1 560	LM 5080100 N F UU OP*	5	1 340																				
60	LM 6090110 F UU	6	1 817	LM 6090110 F UU AJ*	6	1 788	LM 6090110 F UU OP*	5	1 650	60	0 −9	0 −15	90	0 −22	110		85		3.15	86.5	3	30	50	17	25	4 760	5 040	8 150	10 400
	LM 6090110 N F UU	6	1 787	LM 6090110 N F UU AJ*	6	1 757	LM 6090110 N F UU OP*	5	1 610																				

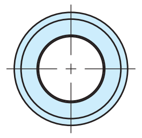
Note (1) The width of hub for fixing with circlip should be the value obtained by subtracting a circlip width value times two from the C_1 dimension.

Remarks 1. "P" and "H" in Dim. F_w tolerance and Eccentricity represent precision and high, respectively.
2. Standard type and adjustable clearance type end plates are fixed with stop ring for holes.
3. The identification numbers with * are our semi-standard items.

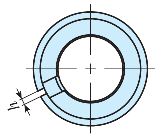
IKO Linear Bushing Stainless Steel Made

	Standard type	Adjustable clearance type	Open type
Shape	LME… F LME…N F 	LME… F AJ LME…N F AJ 	LME… F OP LME…N F OP 
Shaft diameter	5 8 12 16 20 25 30 40 50 60	5 8 12 16 20 25 30 40 50 60	– – 12 16 20 25 30 40 50 60

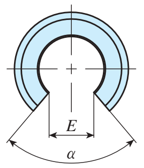




LME…F



LME…F AJ



LME…F OP

Shaft diameter mm	Identification number: Standard type	Ball raceway	Mass (Ref.) g	Adjustable clearance type	Ball raceway	Mass (Ref.) g	Open type	Ball raceway	Mass (Ref.) g
5	LME 51222 N F*	4	11	LME 51222 N F AJ*	4	9.5	———	–	–
8	LME 81625 F*	4	20	———	–	–	———	–	–
	LME 81625 N F*	4	20	LME 81625 N F AJ*	4	19.5			
12	LME 122232 F*	4	41.5	LME 122232 F AJ*	4	40.5	LME 122232 F OP*	3	32
	LME 122232 N F*	4	40	LME 122232 N F AJ*	4	39	LME 122232 N F OP*	3	30
16	LME 162636 F*	4	56.5	LME 162636 F AJ*	4	55.5	LME 162636 F OP*	3	48
	LME 162636 N F*	4	55	LME 162636 N F AJ*	4	54	LME 162636 N F OP*	3	46
20	LME 203245 F*	5	97	LME 203245 F AJ*	5	96	LME 203245 F OP*	4	84
	LME 203245 N F*	5	91	LME 203245 N F AJ*	5	90	LME 203245 N F OP*	4	75
25	LME 254058 F*	6	222	LME 254058 F AJ*	6	219	LME 254058 F OP*	5	195
	LME 254058 N F*	6	215	LME 254058 N F AJ*	6	212	LME 254058 N F OP*	5	181
30	LME 304768 F*	6	338	LME 304768 F AJ*	6	333	LME 304768 F OP*	5	309
	LME 304768 N F*	6	325	LME 304768 N F AJ*	6	320	LME 304768 N F OP*	5	272
40	LME 406280 F*	6	712	LME 406280 F AJ*	6	701	LME 406280 F OP*	5	665
	LME 406280 N F*	6	705	LME 406280 N F AJ*	6	694	LME 406280 N F OP*	5	600
50	LME 5075100 F*	6	1 147	LME 5075100 F AJ*	6	1 127	LME 5075100 F OP*	5	1 080
	LME 5075100 N F*	6	1 130	LME 5075100 N F AJ*	6	1 110	LME 5075100 N F OP*	5	970
60	LME 6090125 F*	6	2 051	LME 6090125 F AJ*	6	2 001	LME 6090125 F OP*	5	1 900
	LME 6090125 N F*	6	2 050	LME 6090125 N F AJ*	6	2 000	LME 6090125 N F OP*	5	1 580

Shaft diameter mm	F_w	Dim. Fw tolerance μm	D	Dim. D tolerance μm	C	Dim. C tolerance μm	C_1(1)	Dim. C_1 tolerance μm	C_2	D_1	h	E	α Degree	Eccentricity Maximum μm	Basic dynamic load rating C Load direction A N	Basic dynamic load rating C Load direction B N	Basic static load rating C_0 Load direction A N	Basic static load rating C_0 Load direction B N
5	5	+8 0	12	0 −8	22	0 −200	14.5	0 −200	1.1	11.5	1	–	–	12	90.8	104	219	310
8	8		16		25		16.5		1.1	15.2	– 1	–	–		121	139	255	361
12	12		22	0 −9	32		22.9		1.3	21	1.5	7.5	78		259	298	503	711
16	16	+9 −1	26		36		24.9		1.3	24.9	1.5	10	78		283	325	514	726
20	20		32	0 −11	45		31.5		1.6	30.3	2	10	60	15	562	668	1 010	1 470
25	25	+11 −1	40		58	0 −300	44.1	0 −300	1.85	37.5	2	12.5	60		920	974	1 780	2 280
30	30		47		68		52.1		1.85	44.5	2	12.5	50		1 350	1 430	2 500	3 200
40	40	+13 −2	62	0 −13	80		60.6		2.15	59	3	16.8	50	17	2 030	2 150	3 620	4 640
50	50		75		100		77.6		2.65	72	3	21	50		3 940	4 180	7 130	9 120
60	60		90	0 −15	125	0 −400	101.7	0 −400	3.15	86.5	3	27.2	54	20	4 760	5 040	8 150	10 400

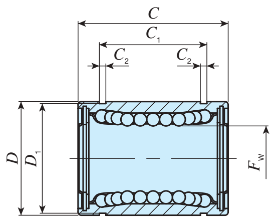
Note (1) The width of hub for fixing with circlip should be the value obtained by subtracting a circlip width value times two from the C_1 dimension.

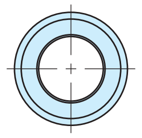
Remarks 1. Stainless steel-made retainer (shaft diameter 8 mm), and standard type and adjustable clearance type (shaft diameter 12 mm to 60 mm) end plates are fixed with stop ring for holes.

2. The identification numbers with * are our semi-standard items.

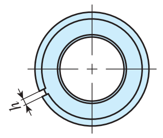
IKO Linear Bushing Stainless Steel Made With Seal

	Standard type	Adjustable clearance type	Open type
Shape	**LME… F UU** **LME…N F UU** 	**LME… FUU AJ** **LME…N FUU AJ** 	**LME… F UU OP** **LME…N F UU OP** 
Shaft diameter	5 8 12 16 20 25 30 40 50 60	5 8 12 16 20 25 30 40 50 60	— — 12 16 20 25 30 40 50 60

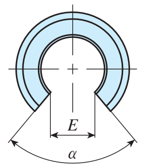




LME…FUU



LME…FUU AJ



LME…FUU OP

Shaft diameter mm	Identification number: Standard type	Ball raceway	Mass (Ref.) g	Adjustable clearance type	Ball raceway	Mass (Ref.) g	Open type	Ball raceway	Mass (Ref.) g	Nominal dimensions and tolerances mm: F_w	Dim. F_w tolerance μm	D	Dim. D tolerance μm	C	Dim. C tolerance μm	C_1(1)	Dim. C_1 tolerance μm	C_2	D_1	h	E	α Degree	Eccentricity Maximum μm	Basic dynamic load rating C Load direction A N	Basic dynamic load rating C Load direction B N	Basic static load rating C_0 Load direction A N	Basic static load rating C_0 Load direction B N
5	LME 51222 N F UU*	4	11	LME 51222 N F UU AJ*	4	9.5	———	–	–	5	+ 8 0	12	0 − 8	22	0 −200	14.5	0 −200	1.1	11.5	1	–	–	12	90.8	104	219	310
8	LME 81625 F UU*	4	20	———	–	–	———	–	–	8		16		25		16.5		1.1	15.2	–	–	–		121	139	255	361
	LME 81625 N F UU*	4	20	LME 81625 N F UU AJ*	4	19.5														1							
12	LME 122232 F UU*	4	41.5	LME 122232 F UU AJ*	4	40.5	LME 122232 F UU OP*	3	32	12		22	0 − 9	32		22.9		1.3	21	1.5	7.5	78		259	298	503	711
	LME 122232 N F UU*	4	40	LME 122232 N F UU AJ*	4	39	LME 122232 N F UU OP*	3	30																		
16	LME 162636 F UU*	4	56.5	LME 162636 F UU AJ*	4	55.5	LME 162636 F UU OP*	3	48	16	+ 9 − 1	26		36		24.9		1.3	24.9	1.5	10	78		283	325	514	726
	LME 162636 N F UU*	4	55	LME 162636 N F UU AJ*	4	54	LME 162636 N F UU OP*	3	46																		
20	LME 203245 F UU*	5	97	LME 203245 F UU AJ*	5	96	LME 203245 F UU OP*	4	84	20		32	0 −11	45		31.5		1.6	30.3	2	10	60	15	562	668	1 010	1 470
	LME 203245 N F UU*	5	91	LME 203245 N F UU AJ*	5	90	LME 203245 N F UU OP*	4	75																		
25	LME 254058 F UU*	6	222	LME 254058 F UU AJ*	6	219	LME 254058 F UU OP*	5	195	25	+11 − 1	40		58	0 −300	44.1	0 −300	1.85	37.5	2	12.5	60		920	974	1 780	2 280
	LME 254058 N F UU*(2)	6	215	LME 254058 N F UU AJ*(2)	6	212	LME 254058 N F UU OP*(2)	5	181																		
30	LME 304768 F UU*	6	338	LME 304768 F UU AJ*	6	333	LME 304768 F UU OP*	5	309	30		47		68		52.1		1.85	44.5	2	12.5	50		1 350	1 430	2 500	3 200
	LME 304768 N F UU*	6	325	LME 304768 N F UU AJ*	6	320	LME 304768 N F UU OP*	5	272																		
40	LME 406280 F UU*	6	712	LME 406280 F UU AJ*	6	701	LME 406280 F UU OP*	5	665	40	+13 − 2	62	0 −13	80		60.6		2.15	59	3	16.8	50	17	2 030	2 150	3 620	4 640
	LME 406280 N F UU*	6	705	LME 406280 N F UU AJ*	6	694	LME 406280 N F UU OP*	5	600																		
50	LME 5075100 F UU*	6	1 147	LME 5075100 F UU AJ*	6	1 127	LME 5075100 F UU OP*	5	1 080	50		75		100		77.6		2.65	72	3	21	50		3 940	4 180	7 130	9 120
	LME 5075100 N F UU*	6	1 130	LME 5075100 N F UU AJ*	6	1 110	LME 5075100 N F UU OP*	5	970																		
60	LME 6090125 F UU*	6	2 051	LME 6090125 F UU AJ*	6	2 001	LME 6090125 F UU OP*	5	1 900	60		90	0 −15	125	0 −400	101.7	0 −400	3.15	86.5	3	27.2	54	20	4 760	5 040	8 150	10 400
	LME 6090125 N F UU*	6	2 050	LME 6090125 N F UU AJ*	6	2 000	LME 6090125 N F UU OP*	5	1 580																		

Notes (1) The width of hub for fixing with circlip should be the value obtained by subtracting a circlip width value times two from the C_1 dimension.

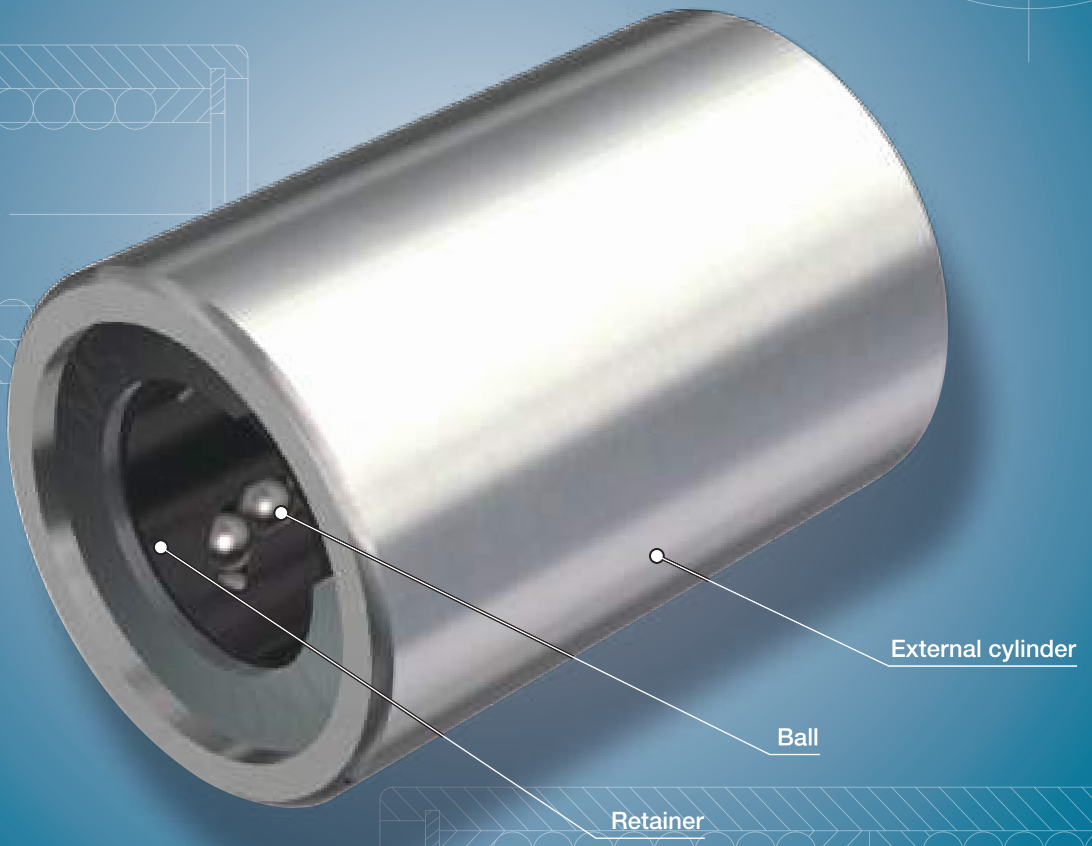
(2) The seal is slightly off from the external cylinder end.

Remarks 1. Stainless steel-made retainer (shaft diameter 8 mm), and standard type and adjustable clearance type (shaft diameter 12 mm to 60 mm) end plates are fixed with stop ring for holes.

2. The identification numbers with * are our semi-standard items.

Miniature Linear Bushing

LMS



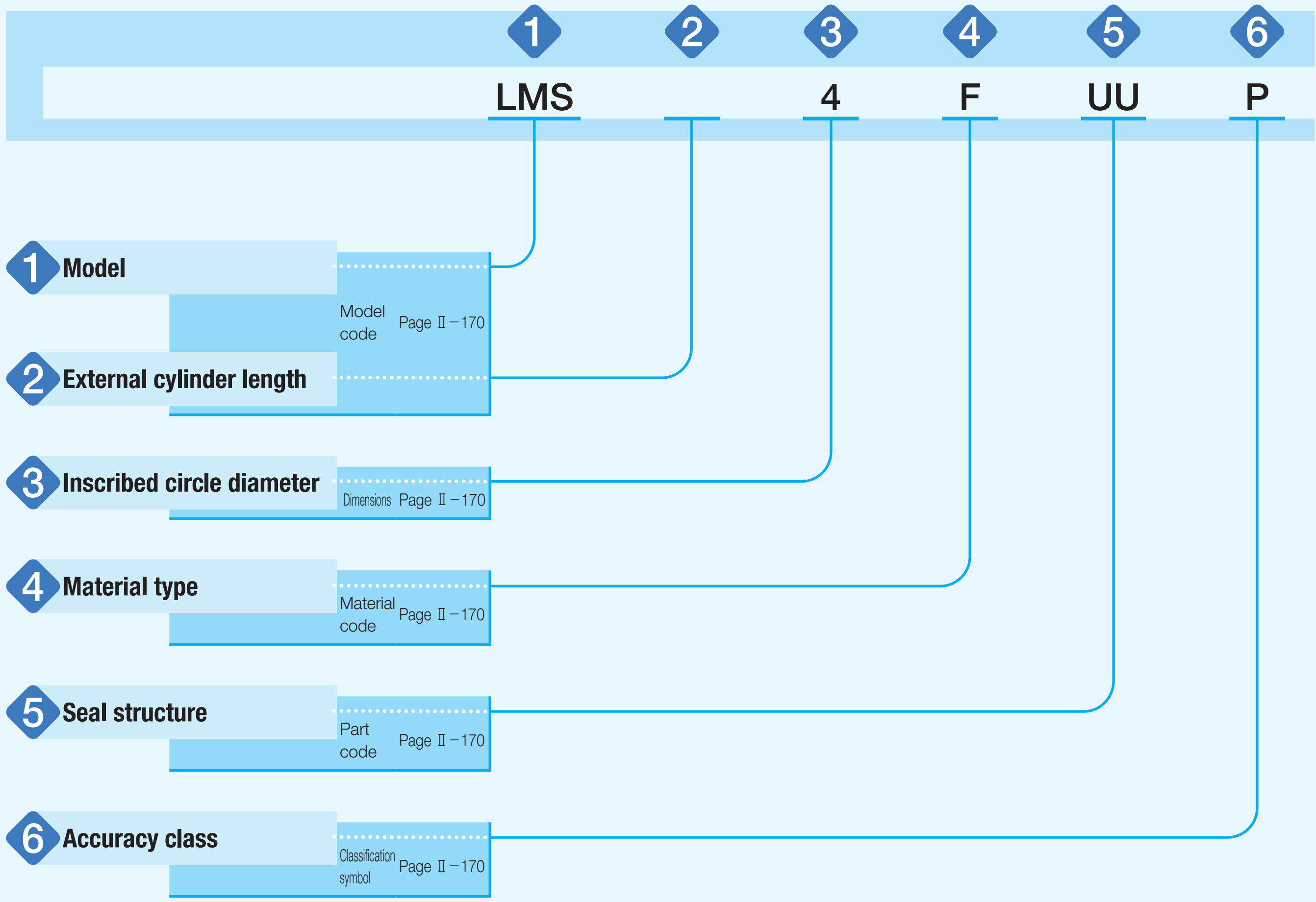
Points

- **Compact design**
  The ultra-small size allows for compact machine and device design.
- **Wide variation**
  As the lineup of two types of external cylinder length are available, i.e. standard and long, you can select an optimal Linear Bushing for the specifications of your machine and device.
- **Stainless steel selections for excellent corrosion resistance**
  Products made of stainless steel are highly resistant to corrosion, so that they are suitable for applications where rust prevention oil is not preferred, such as in a cleanroom environment.

Identification Number and Specification

Example of an identification number

The specification of LMS series is indicated by the identification number. Indicate the identification number, consisting of a model code, dimensions, a material code, a part code, and a classification symbol for each specification to apply.

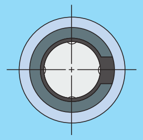
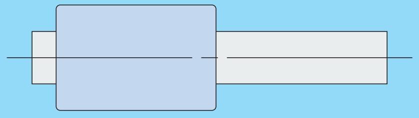
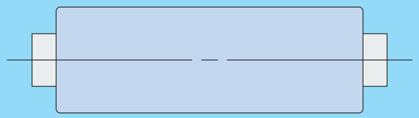


Identification Number and Specification

1 Model	Miniature Linear Bushing (LMS series)	: LMS	For applicable models and sizes, see Table 1.
2 External cylinder length	Standard Long	: No symbol : L	
3 Inscribed circle diameter			Indicate the inscribed circle diameter in mm.
4 Material type	High carbon steel made Stainless steel made	: No symbol : F	Specify the component part material. For applicable models and sizes, see Table 1.
5 Seal structure	Without seal With two end seals	: No symbol : UU	The models with two end seals incorporate seals with superior dust protection performance for preventing intrusion of foreign substances.
6 Accuracy class	High Precision	: No symbol : P	For details of accuracy, see the dimension table on page Ⅱ-172. Precision applies only to the standard type. Especially when it is necessary to control clearance with the shaft strictly, the tolerance of inscribed circle diameter can be sorted by 0.002 mm before delivery. Contact IKO for further information.

Identification Number and Specification

Table 1 Models and sizes of LMS series

Shape	External cylinder length	Material type	Seal structure	Model	Size		
					3	4	5
	Standard 	High carbon steel made	Without seal	LMS	○	○	○
			With two end seals	LMS···UU	○	○	○
		Stainless steel made	Without seal	LMS···F	○	○	○
			With two end seals	LMS···FUU	○	○	○
	Long 	High carbon steel made	Without seal	LMSL	○	○	○
			With two end seals	LMSL···UU	○	○	○
		Stainless steel made	Without seal	LMSL···F	○	○	○
			With two end seals	LMSL···FUU	○	○	○

Relationship between Load Rating and Ball Raceway

The load rating of LMS series varies according to the loading direction and position of ball raceway. The dimension table describes two types of values shown in Fig. 1.1 and Fig. 1.2 according to the loading direction and position of ball raceway.
Fig. 1.1 shows the case where the loading direction and ball raceway position coincides with each other, representing the loading direction A in the dimension table. Generally, this is applied when the ball raceway position cannot be specified to indeterminate direction load or loading direction.
Fig. 1.2 shows the case where the loading direction is positioned between ball raceways, representing the loading direction B in the dimension table. Generally, this can be subjected to load bigger than loading direction A.

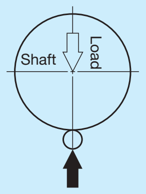


Fig. 1.1 Loading direction A

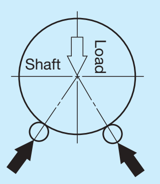


Fig. 1.2 Loading direction B

Lubrication

Grease is not pre-packed in the LMS series, so please perform adequate lubrication as needed.
Both of oil lubrication and grease lubrication are available in the LMS series. For grease lubrication, it is typically applied lightly to the shaft and each row. Use of high-quality lithium-soap base grease is recommended for the grease to use.

Related Products

Shaft for Miniature Linear Bushing

To make full use of performance of the LMS series, we also offer shaft with high accuracy for Miniature Linear Bushing grounded after heat treatment. If you are interested, contact IKO.

Precaution for Use

❶ Fitting of external cylinder

Recommended fit for the LMS series is indicated in Table 2. As the external cylinder is thin, use epoxy type adhesive agent for fixing to the housing hole, instead of press-fitting.

Table 2 Recommended fit
(Tolerances of dimensions for shaft and housing hole) unit: μm

Item / Accuracy class	Shaft	Housing hole
High	− 6 −14	+12 0
Precision	− 4 − 9	+ 8 0

❷ Raceway

LMS series operates with a shaft as a raceway surface, the shaft should be heat-treated and ground. Recommended surface hardness, roughness, and minimum effective hardening depth of shaft are indicated in Table 3.

Table 3 Surface hardness, roughness, and effective hardening depth of shaft

Item	Recommended value	Remark
Surface hardness	58～64HRC	When the surface hardness is low, multiply the load rating by hardness factor (1).
Surface roughness	0.2 μmRa or lower (0.8 μmRy or lower)	–
Effective hardening depth	0.8 mm or higher	–

Note (1) For hardness factor, refer to Fig. 3 in page Ⅲ-5.

❸ When accompanied by rotational motion

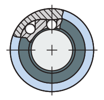
LMS series units support only linear motion but do not support rotational motion. When performing rotational motion and linear motion of short stroke length, IKO Miniature Stroke Rotary Bushing is recommended to be used.

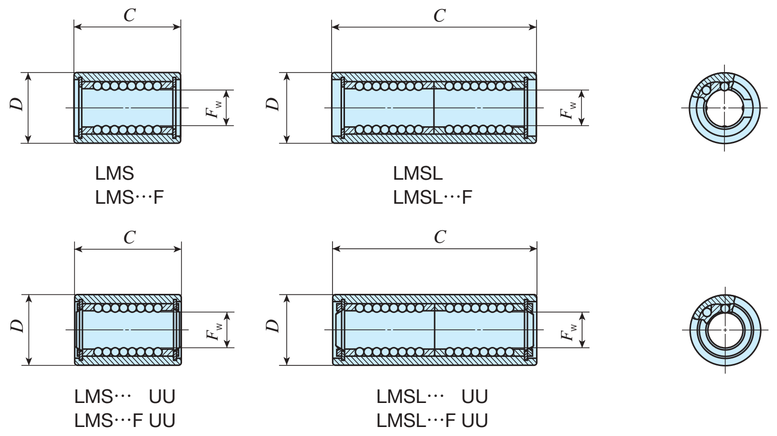
❹ Insertion of shaft

When inserting a shaft to the external cylinder, be careful not to let the shaft pried open as it may cause dropping of balls or deformation of the retainer.

❺ Operating temperature

The maximum operating temperature is 120˚C and temperature up to 100˚C is allowed for continuous operation. When the temperature exceeds 100˚C, contact IKO.

Shape	LMS 		
Shaft diameter	3	4	5



Shaft diameter	Identification number	Ball raceway	Mass (Ref.)	Nominal dimensions and tolerances mm								Eccentricity		Basic dynamic load rating		Basic static load rating	
					Dim. *Fw* tolerance			Dim. *D* tolerance				Maximum		C		C_0	
				F_w	μm		D	μm		C	Dim. C tolerance	μm		Load direction A	Load direction B	Load direction A	Load direction B
mm			g		P	H		P	H		μm	P	H	N	N	N	N
3	LMS 3	4	1.8	3	0 −5	0 − 8	7	0 −7	0 − 8	10	0 −120	2	4	48.9	56.1	37.4	52.9
	LMS 3 F																
	LMS 3 UU																
	LMS 3 F UU																
	LMSL 3		3.0		–	0 −10		–	0 −13	19	0 −300	–	5	79.5	91.4	74.8	106
	LMSL 3 F																
	LMSL 3 UU																
	LMSL 3 F UU																
4	LMS 4	4	2.8	4	0 −5	0 − 8	8	0 −7	0 − 8	12	0 −120	2	4	58.6	67.3	47.5	67.1
	LMS 4 F																
	LMS 4 UU																
	LMS 4 F UU																
	LMSL 4		4.3		–	0 −10		–	0 −13	23	0 −300	–	5	95.3	109	94.9	134
	LMSL 4 F																
	LMSL 4 UU																
	LMSL 4 F UU																
5	LMS 5	4	3.8	5	0 −5	0 − 8	10	0 −7	0 − 8	15	0 −120	2	4	135	155	103	146
	LMS 5 F																
	LMS 5 UU																
	LMS 5 F UU																
	LMSL 5		6.7		–	0 −10		–	0 −13	29	0 −300	–	5	219	252	206	292
	LMSL 5 F																
	LMSL 5 UU																
	LMSL 5 F UU																

Remark: "P" and "H" in Dim. F_w tolerance and Eccentricity represent precision and high, respectively.

Stroke Rotary Bushing

Stroke Rotary Bushing
Miniature Stroke Rotary Bushing
Stroke Rotary Cage

Stroke Rotary Bushing

ST

Points

Rotational and linear motions

With the combination of an external cylinder with cylindrical raceway and balls incorporated in the retainer, rotary and linear motion in the axial direction is possible simultaneously with rotational motion.

Small rolling frictional resistance

By building a ball with high accuracy into the precisely polished external cylinder, a small rolling frictional resistance and extremely smooth rolling motion together with reciprocal motion have been achieved.

Small inertia

The retainer has a high rigidity and light weight so that it has small motion inertia suitable for rolling motion and reciprocal motion in the high-speed operation.

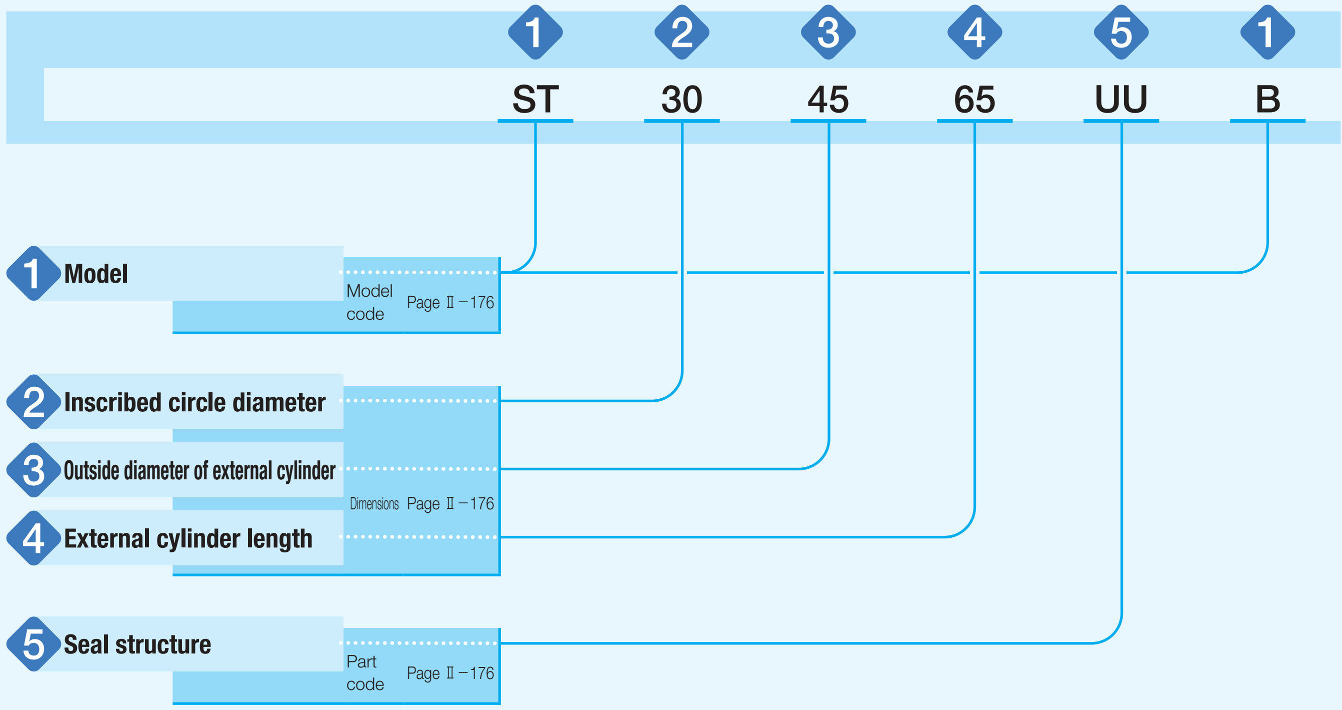
Wide variation

Ordinary type and heavy load type with different load rating are provided, and each are available with and without seals. You can select an optimal product for the specifications of your machine and device.

Identification Number and Specification

Example of an identification number

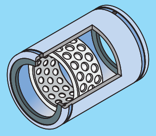
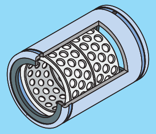
The specification of ST series is indicated by the identification number. Indicate the identification number, consisting of a model code, dimensions and a part code for each specification to apply.



Identification Number and Specification

1 **Model**	Stroke Rotary Bushing (ST series)	Ordinary type : ST Heavy load type : ST…B
	For applicable models and sizes, see Table 1.	
2 **Inscribed circle diameter**		Indicate the inscribed circle diameter in mm.
3 **Outside diameter of external cylinder**		Indicate the outside diameter of external cylinder in mm.
4 **External cylinder length**		Indicate the external cylinder length in mm.
5 **Seal structure**	Open type : No symbol With seal : UU	The models with seal type incorporate seals with superior dust protection performance for preventing intrusion of foreign substances.

Table 1 Models and sizes of ST series

Shape	Seal structure	Model	Size 4	5	6	8	10	12	16	20	25	30	35	40	45	50	55	60	70	80	90	100
Ordinary type 	Open type	**ST**	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	With seal	**ST···UU**	–	–	–	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Heavy load type 	Open type	**ST···B**	–	–	–	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	With seal	**ST···UUB**	–	–	–	–	–	–	–	–	–	○	○	○	○	○	○	○	○	○	○	○

Accuracy

Since outside diameter of external cylinder is deformed by stop ring tension, calculate the measurement point from the equation (1) and use the average diameter value at the point.

$$W = 4 + L_1 / 8 \cdots\cdots\cdots\cdots (1)$$

where, W: Distance from the end to measurement point P, mm (see Fig. 1)

L_1: External cylinder length, mm

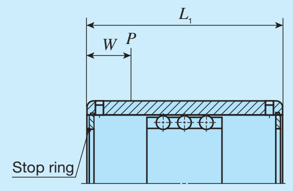


Fig. 1

Table 2 Tolerance of inscribed circle diameter and outside diameter of external cylinder unit: μm

Nominal dimensions of inscribed circle diameter F_w or outside diameter of external cylinder D mm		Tolerance of inscribed circle diameter F_w		Tolerance of outside diameter of external cylinder D_m (1)	
Over	Incl.	High	Low	High	Low
4	6	+18	+10	—	—
6	10	+22	+13	0	− 8
10	18	+27	+16	0	− 8
18	30	+33	+20	0	− 9
30	50	+41	+25	0	−11
50	80	+49	+30	0	−13
80	120	+58	+36	0	−15
120	150	—	—	0	−18

Note (1) D_m is an arithmetic mean value of the maximum diameter and minimum diameter obtained by two-point measurement of the outside diameter of external cylinder.

Table 3 Tolerance of external cylinder length unit: μm

Nominal dimensions of inscribed circle diameter F_w mm		Dim. L_1 tolerance of external cylinder length	
Over	Incl.	High	Low
—	20	0	−200
20	60	0	−300
60	100	0	−400

Allowance of Velocity

The ST series is capable of rotation and rotary and linear motion. However, allowance of velocity for these motions performed at the same time is obtained from the equation (2). Typical values are indicated in Table 4.

$$DN \geqq D_{pw}\, n + 10\, S\, n_1 \cdots\cdots\cdots\cdots (2)$$

where, DN : Allowance of velocity (see Table 4)

n : Rotational speed, min^{-1}

n_1 : Number of strokes per minute, min^{-1}

S : Stroke length, mm

D_{pw} : Pitch circle diameter of balls, mm ($D_{pw} \fallingdotseq 1.15F_w$)

F_w : Inscribed circle diameter, mm

However, applicable when $n_1 \leqq 5000$, $S\, n_1 \leqq 50000$.

Table 4 Allowance of velocity

Lubrication conditions	DN
Oil lubrication	600 000
Grease lubrication	300 000

Lubrication

Grease is not pre-packed in the ST series, so please perform adequate lubrication as needed.

Both of oil lubrication and grease lubrication are available in the ST series. For grease lubrication, use of high-quality lithium-soap base grease is recommended. Oil is fed from the oil hole on the external cylinder.

Precaution for Use

❶ Fitting

Recommended fit for the ST series is indicated in Table 5.

As the ST series performs rotation and rotary and linear motion at the same time, the radial internal clearance must be smaller when shock load or load accompanied by vibration is applied. Especially when vertical axis application or high accuracy motion is required, it is recommended to set the radial internal clearance at zero or under a slightly-preloaded condition.

Excessive preload will shorten the life, so be careful not to set lower limit value of radial internal clearance below the value stated in Table 6.

Table 5 Recommended fit

Operational conditions	Tolerance class	
	Shaft	Housing hole
Normal operational conditions	k5, m5	H6, H7
For vertical axis or high accuracy	n5, p6	J6, J7

Table 6 Lower limit of radial internal clearance unit: μm

Nominal dimensions of inscribed circle diameter F_w mm		Lower limit of radial internal clearance
Over	Incl.	
4	6	− 2
6	10	− 3
10	18	− 4
18	30	− 5
30	50	− 6
50	80	− 8
80	100	−10

❷ Raceway

Since ST series operates with a shaft as a raceway surface, the shaft should be heat-treated and ground. Recommended values for surface hardness and roughness of the shaft are shown in Table 7 and the recommended value for the minimum effective hardening depth is shown in Table 8.

Table 7 Surface hardness and roughness of raceway

Item	Recommended value	Remark
Surface hardness	58~64HRC	When the surface hardness is low, multiply the load rating by hardness factor (1).
Surface roughness	0.2 μmRa or lower (0.8 μmRy or lower)	Where accuracy standard is low, around 0.8 μmRa (3.2 μmRy) is also allowed.

Note (1) For hardness factor, refer to Fig. 3 in page Ⅲ-5.

Table 8 Minimum effective hardening depth of shaft unit: mm

Shaft diameter		Recommended value for minimum effective hardening depth
Over	Incl.	
—	28	0.8
28	50	1.0
50	100	1.5

❸ Stroke length

For stroke length used, 80% of the maximum stroke length stated in the dimension table is recommended.

❹ Operating temperature

The maximum operating temperature is 120˚C and temperature up to 100˚C is allowed for continuous operation. When the temperature exceeds 100˚C, contact IKO.

❺ Assembly operation of external cylinder and shaft

When inserting a shaft, be careful not to shock the ball. After assembling, correct the position of the retainer to be in the center of the external cylinder. After assembling the external cylinder to the housing, insert the shaft softly. Move the retainer as well as the shaft until they contact one side of the surface and stop. Then push the shaft not to damage balls or raceway to the position a half of the maximum stroke length and return it by the same length (a half of the maximum stroke) so that the retainer is positioned regularly at the center of the external cylinder.

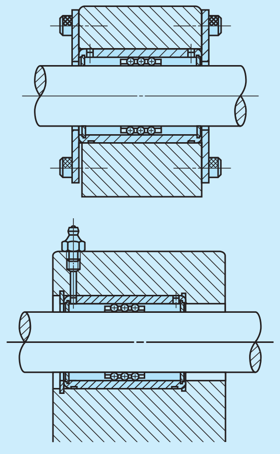
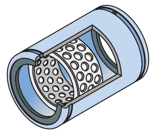
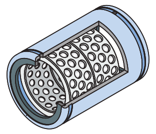
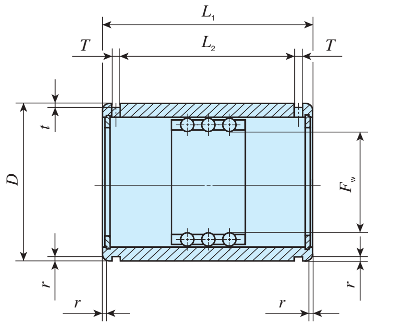


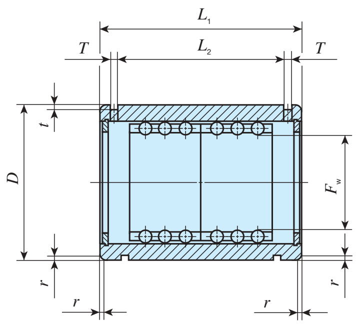
Fig. 2 Mounting examples

IKO Stroke Rotary Bushing Open Type

	Ordinary type							Heavy load type						
Shape	**ST** 							**ST…B** 						
Size	4	5	6	8	10	12	16	—	—	—	8	10	12	16
	20	25	30	35	40	45	50	20	25	30	35	40	45	50
	55	60	70	80	90	100		55	60	70	80	90	100	



ST

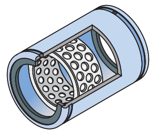
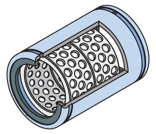


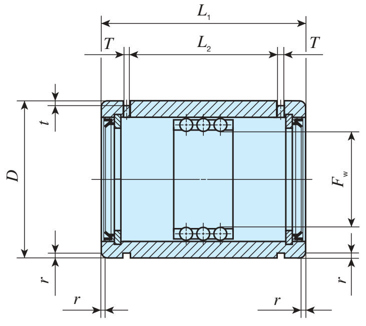
ST…B

Shaft diameter mm	Identification number				Nominal dimensions mm							ST			ST…B		
	Ordinary type	Mass (Ref.) g	Heavy load type	Mass (Ref.) g	F_w	D	L_1	L_2	T	t	r	Maximum stroke length mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum stroke length mm	Basic dynamic load rating C N	Basic static load rating C_0 N
4	ST 4814	2.9	——	——	4	8	14	9	1.1	0.25	0.3	10	112	59.5	——	——	——
5	ST 51016	5.6	——	——	5	10	16	10.6	1.1	0.25	0.3	13	121	68.3	——	——	——
6	ST 61219	8.9	——	——	6	12	19	13.2	1.1	0.25	0.3	15	278	168	——	——	——
8	ST 81524	15.6	ST 81524 B	16.8	8	15	24	17.1	1.5	0.5	0.5	24	315	211	8	512	422
10	ST 101930	28.8	ST 101930 B	31.2	10	19	30	22.7	1.5	0.5	0.5	30	659	466	8	1 070	932
12	ST 122332	42	ST 122332 B	46	12	23	32	24.5	1.5	0.5	0.5	32	1 110	822	8	1 800	1 640
16	ST 162837	71	ST 162837 B	75	16	28	37	29.1	1.5	0.5	0.5	40	1 230	998	16	1 990	2 000
20	ST 203245	99	ST 203245 B	106	20	32	45	35.8	2	0.5	0.5	54	1 390	1 250	28	2 250	2 500
25	ST 253745	117	ST 253745 B	125	25	37	45	35.8	2	0.5	1	54	1 450	1 430	28	2 360	2 850
30	ST 304565	205	ST 304565 B	220	30	45	65	53.5	2.5	0.5	1	82	3 110	3 160	44	5 060	6 320
35	ST 355270	329	ST 355270 B	346	35	52	70	58.5	2.5	0.7	1.5	92	3 290	3 550	54	5 340	7 100
40	ST 406080	516	ST 406080 B	540	40	60	80	68.3	2.5	0.7	1.5	108	4 340	4 810	66	7 050	9 630
45	ST 456580	563	ST 456580 B	588	45	65	80	68.3	2.5	0.7	1.5	108	4 550	5 330	66	7 390	10 700
50	ST 5072100	827	ST 5072100 B	862	50	72	100	86.4	3	1	1.5	138	5 790	6 970	88	9 400	13 900
55	ST 5580100	1 160	ST 5580100 B	1 200	55	80	100	86.4	3	1	2	138	6 030	7 630	88	9 800	15 300
60	ST 6085100	1 240	ST 6085100 B	1 290	60	85	100	86.4	3	1	2	138	6 260	8 300	88	10 200	16 600
70	ST 7095100	1 400	ST 7095100 B	1 450	70	95	100	86.4	3	1	2	138	6 510	9 320	88	10 600	18 600
80	ST 80110100	2 050	ST 80110100 B	2 110	80	110	100	86	3	1.5	2	132	8 230	12 200	76	13 400	24 400
90	ST 90120100	2 250	ST 90120100 B	2 330	90	120	100	86	3	1.5	2	132	8 550	13 500	76	13 900	27 000
100	ST 100130100	2 440	ST 100130100 B	2 520	100	130	100	86	3	1.5	2	132	8 820	14 800	76	14 300	29 500

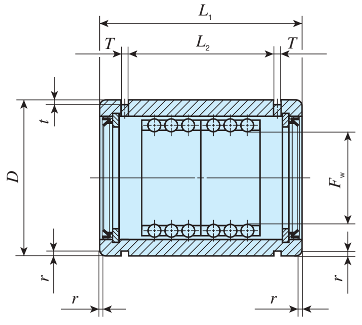
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO Stroke Rotary Bushing (With Seal)

	Ordinary type	Heavy load type
Shape	**ST···UU** 	**ST···UUB** 
Size	8 10 12 16 20 25 30 35 40 45 50 55 60 70 80 90 100	— — — — — — 30 35 40 45 50 55 60 70 80 90 100



ST···UU



ST···UUB

Shaft diameter mm	Identification number				Nominal dimensions mm							ST···UU			ST···UUB		
	Ordinary type	Mass (Ref.) g	Heavy load type	Mass (Ref.) g	F_w	D	L_1	L_2	T	t	r	Maximum stroke length mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum stroke length mm	Basic dynamic load rating C N	Basic static load rating C_0 N
8	ST 81524 UU	16.5	——	——	8	15	24	12.3	1.5	0.5	0.5	14	315	211	——	——	——
10	ST 101930 UU	30.7	——	——	10	19	30	15.5	1.5	0.5	0.5	16	659	466	——	——	——
12	ST 122332 UU	45	——	——	12	23	32	17.1	1.5	0.5	0.5	17	1 110	822	——	——	——
16	ST 162837 UU	74	——	——	16	28	37	21.1	1.5	0.5	0.5	24	1 230	998	——	——	——
20	ST 203245 UU	107	——	——	20	32	45	26.8	2	0.5	0.5	32	1 390	1 250	——	——	——
25	ST 253745 UU	121	——	——	25	37	45	26.8	2	0.5	1	32	1 450	1 430	——	——	——
30	ST 304565 UU	215	ST 304565 UU B	230	30	45	65	45.1	2.5	0.5	1	65	3 110	3 160	27	5 060	6 320
35	ST 355270 UU	342	ST 355270 UU B	359	35	52	70	50.1	2.5	0.7	1.5	75	3 290	3 550	37	5 340	7 100
40	ST 406080 UU	529	ST 406080 UU B	553	40	60	80	59.9	2.5	0.7	1.5	91	4 340	4 810	49	7 050	9 630
45	ST 456580 UU	577	ST 456580 UU B	602	45	65	80	59.9	2.5	0.7	1.5	91	4 550	5 330	49	7 390	10 700
50	ST 5072100 UU	836	ST 5072100 UU B	871	50	72	100	77.4	3	1	1.5	120	5 790	6 970	70	9 400	13 900
55	ST 5580100 UU	1 190	ST 5580100 UU B	1 230	55	80	100	77.4	3	1	2	120	6 030	7 630	70	9 800	15 300
60	ST 6085100 UU	1 270	ST 6085100 UU B	1 320	60	85	100	77.4	3	1	2	120	6 260	8 300	70	10 200	16 600
70	ST 7095100 UU	1 430	ST 7095100 UU B	1 480	70	95	100	77.4	3	1	2	120	6 510	9 320	70	10 600	18 600
80	ST 80110100 UU	2 080	ST 80110100 UU B	2 140	80	110	100	77	3	1.5	2	114	8 230	12 200	58	13 400	24 400
90	ST 90120100 UU	2 290	ST 90120100 UU B	2 370	90	120	100	77	3	1.5	2	114	8 550	13 500	58	13 900	27 000
100	ST 100130100 UU	2 540	ST 100130100 UU B	2 620	100	130	100	77	3	1.5	2	114	8 820	14 800	58	14 300	29 500

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Miniature
Stroke Rotary Bushing
STSI

Points

● Rotational and linear motions

With the combination of an external cylinder with cylindrical raceway and balls incorporated in the retainer, rotary and linear motion in the axial direction is possible simultaneously with rotational motion.

● Super small size

With the ultra-small sized balls incorporated in a thin external cylinder, small diameter and small sectional height are realized.

● Super precision

Balls of high accuracy are incorporated with super-finished external cylinder and shaft to be adjusted to zero or minimal amount of preload, which realizes rotational motion and rotary and linear motion of high accuracy.

● Extremely smooth operation

Since each component is precisely grounded and adjusted to ideal preload condition, extremely smooth and stable operation with small frictional resistance for long term can be achieved.

Identification Number and Specification

Example of an identification number

The specification of STSI series is indicated by the identification number. Indicate the identification number, consisting of a model code, dimensions, length, and a selection code for each specification to apply.

	1	2	3	4	5	6	7	1	8
Assembled set									
With a shaft	STSI	4			20 -	15 -	50		
Without a shaft	STS	4			20 -	15			/M1
Part									
External cylinder	OR		6	8	20			A	/M1
Ball cage	BK	4	6			15		A	
Shaft	SF	4					50	A	/M1

1 **Model** — Model code Page II－185

2 **Shaft diameter** (1)

3 **Bore diameter of external cylinder** (2)

4 **Outside diameter of external cylinder**

Dimensions Page II－185

5 **External cylinder length**

6 **Ball cage length**

7 **Shaft length**

Length Page II－185

8 **Selection class** — Selection code Page II－185

Notes (1) Indicates inscribed circle diameter for assembled set without a shaft or ball cage.
(2) Indicates circumscribed circle diameter for ball cage.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Identification Number and Specification

1 Model

Miniature Stroke Rotary Bushing (STSI series)

Assembled set with a shaft : STSI
Assembled set without a shaft : STS
External cylinder : OR…A
Ball cage : BK…A
Shaft : SF…A

2 Shaft diameter

Indicate the shaft diameter in mm. Indicates inscribed circle diameter for assembled set without a shaft or ball cage.

3 Bore diameter of external cylinder

Indicate the bore diameter of external cylinder in mm. Indicates circumscribed circle diameter for ball cage.

4 Outside diameter of external cylinder

Indicate the outside diameter of external cylinder in mm.

5 External cylinder length

Indicate the external cylinder length in mm.

6 Ball cage length

Indicate the ball cage length in mm.

7 Shaft length

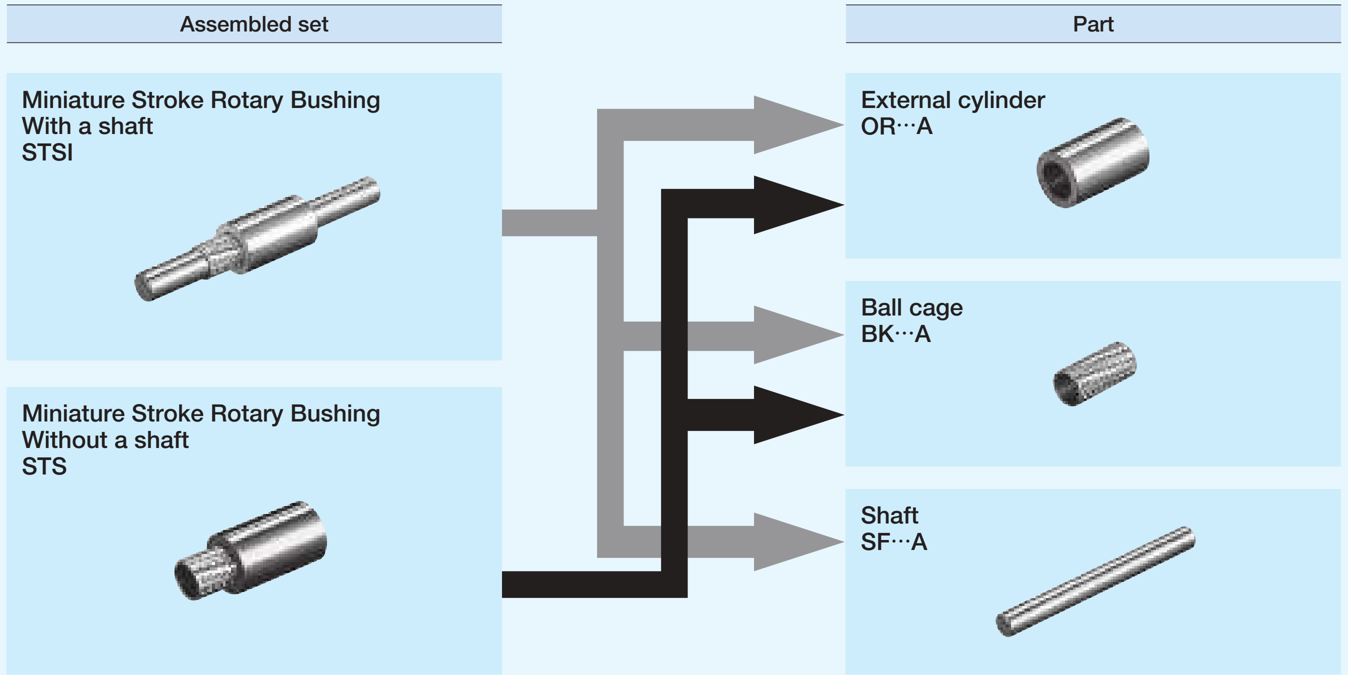
Indicate the shaft length in mm.

8 Selection class

M1 class : M1
M2 class : M2
M3 class : M3

Selection code and tolerances are shown in Table 3. For combination of each part, assemble parts with the same selection code.

Table 1 Models of STSI series



Accuracy

Table 2 Tolerance and allowance

Nominal dimensions of outside diameter of external cylinder mm		Tolerance of outside diameter of external cylinder µm		Radial runout of outside diameter of external cylinder µm	Tolerance of length of external cylinder and shaft mm
Over	Incl.	High	Low		
3	6	0	−5	8	±0.1
6	10	0	−6		
10	18	0	−8		
18	30	0	−9	9	

Table 3 Selection code and tolerance unit: µm

Selection code	Tolerance of bore diameter of external cylinder		Tolerance of inscribed circle diameter		Tolerance of shaft diameter	
	High	Low	High	Low	High	Low
M1	−1	−3	−1	−3	0	−1
M2	−2	−4	−2	−4	−1	−2
M3	−3	−5	−3	−5	−2	−3

Load Rating

Load rating of the STSI series represents the value obtained when load is evenly distributed without the ball incorporated in the ball cage being dropped from the external cylinder and shaft end.

Lubrication

Grease is not pre-packed in the STSI series, so please perform adequate lubrication as needed.
Both of oil lubrication and grease lubrication are available in the STSI series. For grease lubrication, it is typically applied lightly to the shaft and raceway of the external cylinder. Use of high-quality lithium-soap base grease is recommended for the grease to use.

Precaution for Use

❶ Fitting

The STSI series is assembled to slight preload state to obtain high motion accuracy. Use external cylinder and housing hole of the STSI series with clearance fit to avoid any effect of press-fitting on inscribed circle diameter. In addition, for combination of an external cylinder, a ball cage and a shaft, select an external cylinder and a shaft with the same selection code to be combined with a ball cage.

❷ Operating temperature

The maximum operating temperature is 120˚C and temperature up to 100˚C is allowed for continuous operation. When the temperature exceeds 100˚C, contact IKO.

❸ Mounting

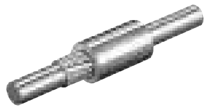
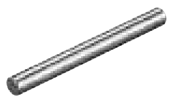
Typically, to fix the external cylinder and housing hole, the external cylinder end is fixed to the axial direction with stop ring or adhesive agent is used.
The ball cage is mounted through the shaft after the external cylinder is fixed to the housing hole. At this point, mounting becomes easier if the ball cage is shifted by one half of assembly insertion amount of the shaft in insert direction of the shaft so that the ball cage is positioned at the regular position after mounting.

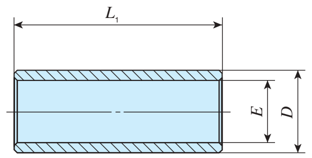
❹ Insertion of shaft

When inserting a shaft into an external cylinder, be careful not to pry open or give shock to the shaft.

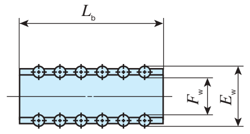
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO Miniature Stroke Rotary Bushing

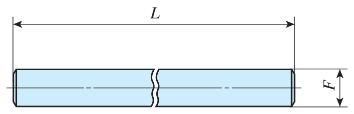
	Assembled set with a shaft	Assembled set without a shaft	External cylinder	Ball cage	Shaft
	STSI	**STS**	**OR···A**	**BK···A**	**SF···A**
Shape					
Size	2 3 4 5 6 8 10 12	2 3 4 5 6 8 10 12	2 3 4 5 6 8 10 12	2 3 4 5 6 8 10 12	2 3 4 5 6 8 10 12



External cylinder



Ball cage



Shaft

Shaft diameter mm	Identification number of assembled set without a shaft	External cylinder Identification number	External cylinder Mass (Ref.) g	External cylinder Nominal dimensions mm E	D	L_1	Ball cage Identification number	Ball cage Mass (Ref.) g	Ball cage Nominal dimensions mm F_w	E_w	L_b	Basic static load rating [(1)] C_0 N	Shaft Identification number	Shaft Mass (Ref.) g	Shaft Nominal dimensions mm F	L	Identification number of assembled set with a shaft
2	STS 2 L_1-L_b	OR 3 5 10 A OR 3 5 15 A	0.9 1.3	3.2	5	10 15	BK 2 3 5 A BK 2 3 10 A	0.1 0.3	2	3.2	5 10	10.5 21.0	SF 2 20 A SF 2 30 A	0.5 0.7	2	20 30	STSI 2 L_1-L_b-L
3	STS 3 L_1-L_b	OR 5 7 10 A OR 5 7 20 A OR 5 7 30 A	1.5 2.9 4.4	5	7	10 20 30	BK 3 5 10 A BK 3 5 15 A BK 3 5 20 A	0.7 1.1 1.4	3	5	10 15 20	38.4 57.7 76.9	SF 3 50 A SF 3 60 A	2.8 3.3	3	50 60	STSI 3 L_1-L_b-L
4	STS 4 L_1-L_b	OR 6 8 10 A OR 6 8 20 A OR 6 8 30 A	1.7 3.4 5.2	6	8	10 20 30	BK 4 6 10 A BK 4 6 15 A BK 4 6 20 A	0.9 1.3 1.8	4	6	10 15 20	59.5 89.3 119	SF 4 50 A SF 4 60 A	4.9 5.9	4	50 60	STSI 4 L_1-L_b-L
5	STS 5 L_1-L_b	OR 7 10 10 A OR 7 10 20 A OR 7 10 30 A	3.1 6.3 9.4	7	10	10 20 30	BK 5 7 10 A BK 5 7 15 A BK 5 7 20 A	1.0 1.6 2.0	5	7	10 15 20	81 121 162	SF 5 50 A SF 5 80 A	7.7 12.3	5	50 80	STSI 5 L_1-L_b-L
6	STS 6 L_1-L_b	OR 8 11 20 A OR 8 11 30 A OR 8 11 40 A	7.0 10.5 14.1	8	11	20 30 40	BK 6 8 10 A BK 6 8 15 A BK 6 8 20 A	1.2 1.8 2.3	6	8	10 15 20	103 154 206	SF 6 50 A SF 6 80 A	11.1 17.7	6	50 80	STSI 6 L_1-L_b-L
8	STS 8 L_1-L_b	OR 10 13 20 A OR 10 13 30 A OR 10 13 40 A	8.5 12.7 17.0	10	13	20 30 40	BK 8 10 10 A BK 8 10 15 A BK 8 10 20 A	1.6 2.4 3.2	8	10	10 15 20	105 157 209	SF 8 50 A SF 8 80 A SF 8 90 A	19.7 31.5 35.5	8	50 80 90	STSI 8 L_1-L_b-L
10	STS 10 L_1-L_b	OR 12 18 20 A OR 12 18 30 A OR 12 18 43 A	22.2 33.3 47.7	12	18	20 30 43	BK 10 12 15 A BK 10 12 20 A BK 10 12 25 A	2.8 3.8 4.8	10	12	15 20 25	191 254 318	SF 10 80 A SF 10 100 A SF 10 120 A	49.3 61.6 74.0	10	80 100 120	STSI 10 L_1-L_b-L
12	STS 12 L_1-L_b	OR 14 20 25 A OR 14 20 30 A OR 14 20 35 A OR 14 20 40 A	31.4 37.7 44.0 50.3	14	20	25 30 35 40	BK 12 14 20 A BK 12 14 25 A BK 12 14 30 A	4.3 5.4 6.1	12	14	20 25 30	341 427 512	SF 12 80 A SF 12 100 A SF 12 120 A	71.0 88.8 106.5	12	80 100 120	STSI 12 L_1-L_b-L

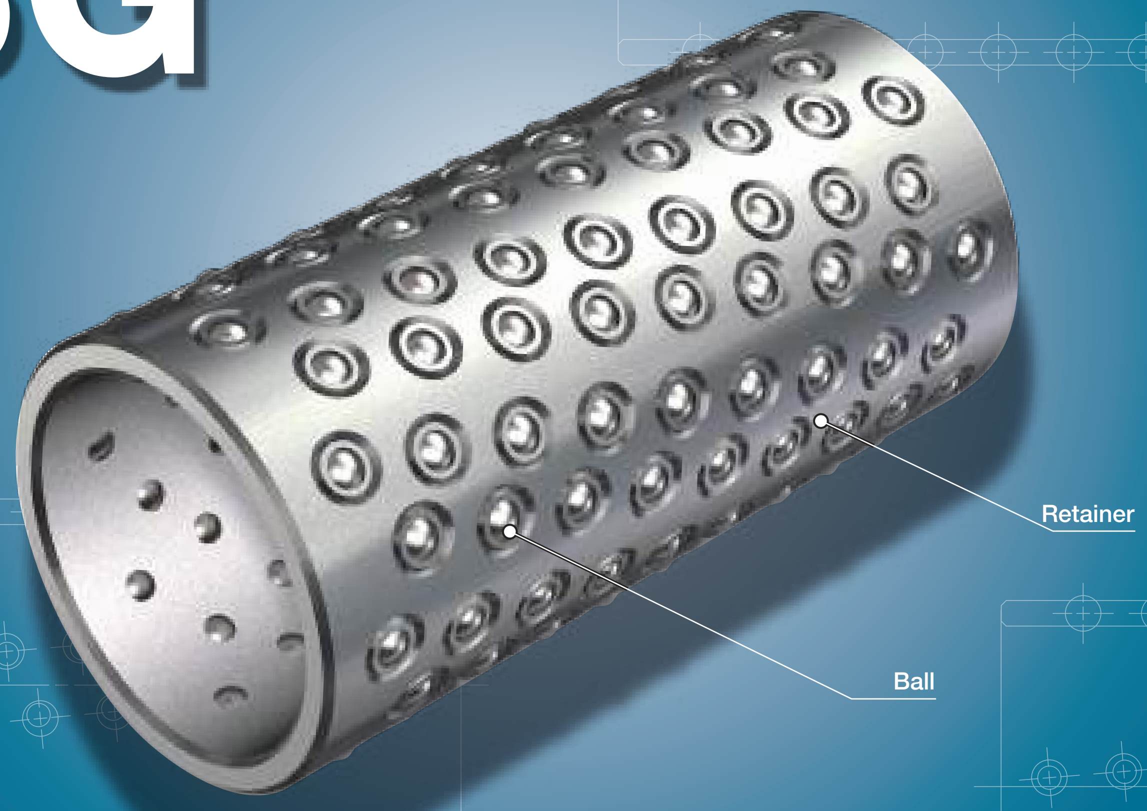
Note (1) Represents the value when load is evenly distributed without the ball incorporated in the ball cage being dropped from the external cylinder end.

Remark: L_1, L_b, and L in the identification number field of assembled set without a shaft and assembled set with a shaft represent length of the external cylinder, length of the ball cage, and length of the shaft in the dimension table.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Stroke Rotary Cage

BG



Points

Rotational and linear motions

High-accuracy balls incorporated into the retainer make use of the raceway accuracy to allow high-accuracy rotational motion and rotary and linear motion.

Superior high speed operation

As the retainers have high rigidity and light in weight with low inertia, this series is suitable for abrupt operations such as high-speed rotary and linear motion in axial direction.

Large load rating and high rigidity

In the retainer, balls are incorporated as many as possible. So the load ratings are large and the rigidity is high with small elastic deformation even under fluctuating load or offset load.

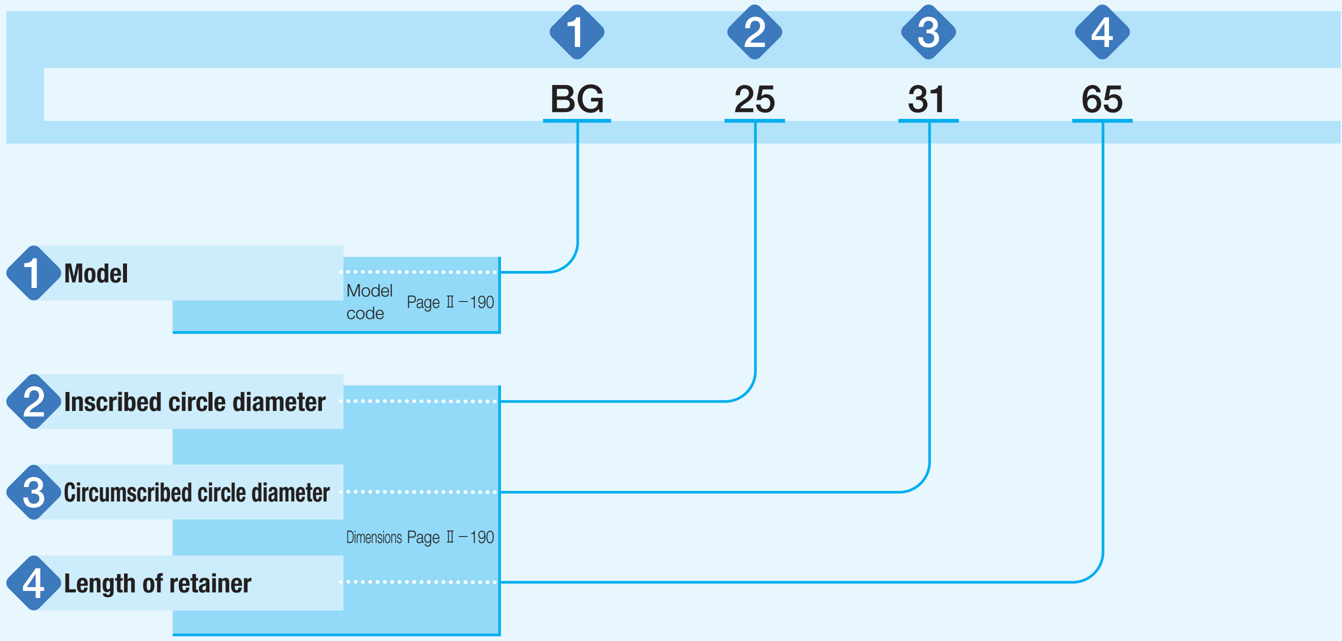
Long life

Each ball held in the retainer is arranged in a spiral formation in order to prevent the balls from tracing the same path. Rolling contact fatigue of the shaft and housing raceways is thereby minimized, and stable high accuracy can be assured for long periods of time.

Identification Number and Specification

Example of an identification number

The specification of BG series is indicated by the identification number. Indicate the identification number, consisting of a model code and dimensions.



Identification Number and Specification

1 **Model**	Stroke Rotary Cage (BG series)	: BG
2 **Inscribed circle diameter**		Indicate the inscribed circle diameter in mm.
3 **Circumscribed circle diameter**		Indicate the circumscribed circle diameter in mm.
4 **Length of retainer**		Indicate the length of retainer in mm.

Allowance of Velocity

The BG series is capable of rotation and rotary and linear motion. However, allowance of velocity for these motions performed at the same time is obtained from the equation (1). Typical values are indicated in Table 1.

$$DN \geqq D_{pw}\, n + 10\, S\, n_1 \cdots\cdots (1)$$

where, DN : Allowance of velocity (see Table 1)

n : Rotational speed, min^{-1}

n_1 : Number of strokes per minute, min^{-1}

S : Stroke length, mm

D_{pw} : Pitch circle diameter of balls, mm

$$\left(D_{pw} = \frac{F_w + E_w}{2}\right)$$

F_w : Inscribed circle diameter, mm

E_w : Circumscribed circle diameter, mm

However, applicable when $n_1 \leqq 5000$, $S\, n_1 \leqq 50000$.

Table 1 Allowance of velocity

Lubrication conditions	*DN*
Oil lubrication	600 000
Grease lubrication	300 000

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Precaution for Use

❶ Fitting

BG series is generally used with a slight radial internal clearance fit. Recommended fits are shown in Table 2.

When it is used for a guide post of the press die set or high operation accuracy is required, a preload is generally given. The tolerances of dimensions of the shaft and housing bore in this case are shown in Table 3. However, since excessive preload shortens the life of Stroke Rotary Cage, it is suggested that the lower limit of radial clearance is not smaller than the value shown in Table 4.

Table 2 General fit

Tolerance class	
Shaft	Housing hole
h5, h6	H6, H7

Table 3 Tolerances of dimensions for shaft and housing hole

unit: μm

Shaft			Housing hole		
Nominal dimensions mm	h5		Nominal dimensions mm	K5	
	H	L		H	L
19	0	− 9	25	+1	−8
22	0	− 9	28	+1	−8
25	0	− 9	31	+2	−9
28	0	− 9	36	+2	−9
32	0	−11	40	+2	−9
38	0	−11	48	+2	−9

Table 4 Lower limit of radial internal clearance unit: μm

Nominal dimensions of shaft mm	Lower limit of radial internal clearance
19	−5
22	−5
25	−5
28	−7
32	−7
38	−7

❷ Raceway

BG series is used with a shaft and housing hole as raceway surfaces. Recommended values for surface hardness and roughness of mating raceway are shown in Table 5 and the recommended values for the minimum effective hardening depth are shown in Table 6.

When some of the balls held in the retainer escape the housing raceway and operate in linear motion, it is recommended that the housing raceway ends should be slightly chamfered so that the balls enter or exit smoothly.

Table 5 Surface hardness and roughness of raceway

Item	Recommended value	Remark
Surface hardness	58～64HRC	When the surface hardness is low, multiply the load rating by hardness factor (1) .
Surface roughness	0.2 μmRa or lower (0.8 μmRy or lower)	Where accuracy standard is low, around 0.8 μmRa (3.2 μmRy) is also allowed.

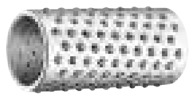
Note (1) For hardness factor, refer to Fig. 3 in page Ⅲ-5.

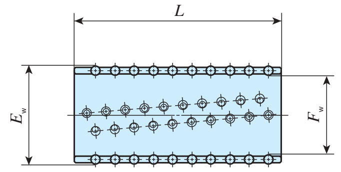
Table 6 Minimum effective hardening depth of raceway

unit: mm

Nominal dimensions of shaft and housing hole		Recommended value for minimum effective hardening depth
Over	Incl.	
–	28	0.8
28	50	1.0

IKO Stroke Rotary Cage

Shape	BG 		
Size	19	22	25
	28	32	38



Shaft diameter mm	Identification number	Mass (Ref.) g	Nominal dimensions mm F_w	E_w	L	Basic dynamic load rating (1) C N	Basic static load rating (1) C_0 N
19	BG 192555*	33	19	25	55	2 330	2 600
22	BG 222860*	40	22	28	60	2 490	2 950
25	BG 253165*	48	25	31	65	2 660	3 390
28	BG 283670*	76	28	36	70	3 830	4 660
32	BG 324075*	93	32	40	75	4 480	6 030
38	BG 384880*	162	38	48	80	6 750	9 390

Note (1) Basic dynamic load rating and basic static load rating are values when balls incorporated into the retainer share the load evenly without escaping the raceway.

Remark: The identification numbers with * are our semi-standard items.

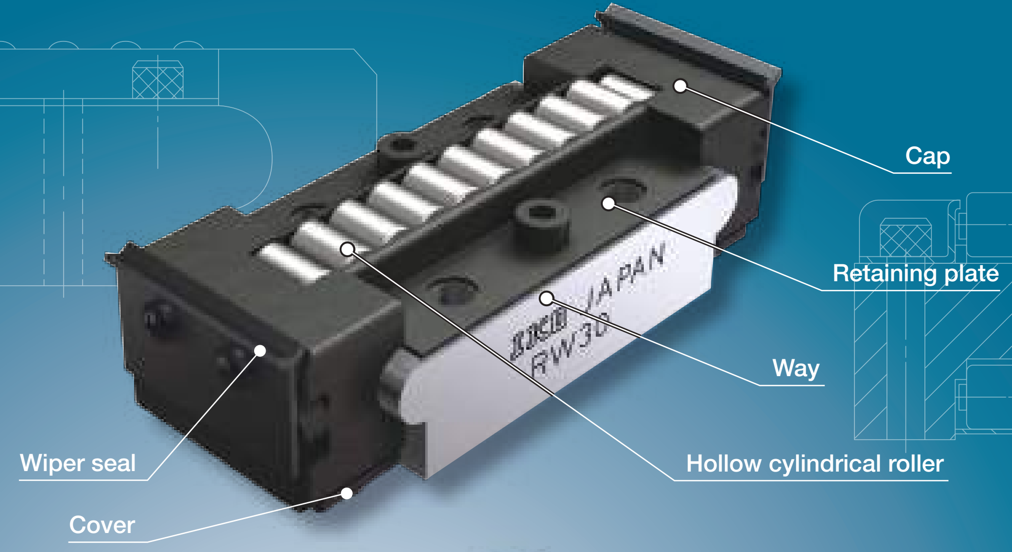
Roller Way & Flat Roller Cage

Roller Way

Flat Roller Cage

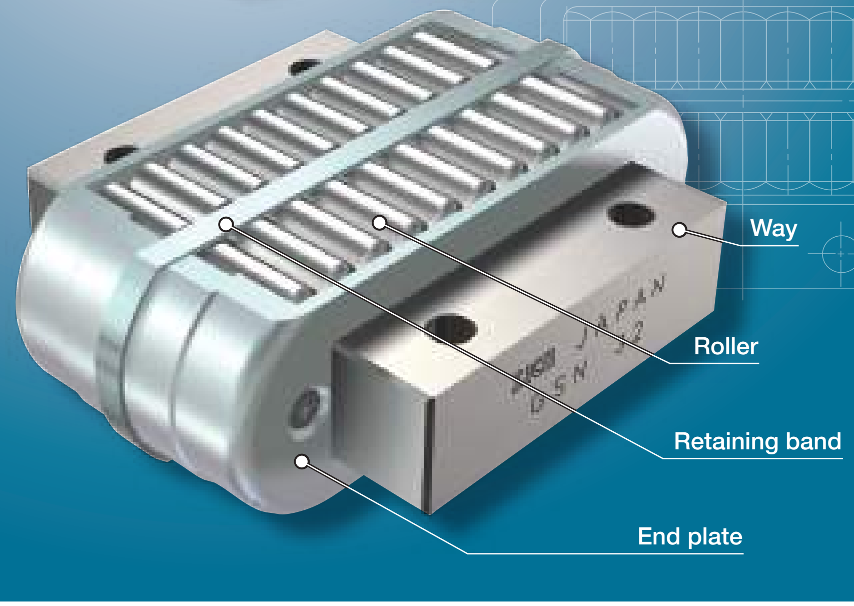
Roller Way

RW



SR

GSN



Points

High rigidity and accuracy

Since the high accuracy roller is built into the highly flat surface way finished by accurate ground, the product has a high rigidity and high accuracy. Also because the variation of operation height can be selected in the unit of 2 μm, the load can be evenly distributed even in the multiple-use environment.

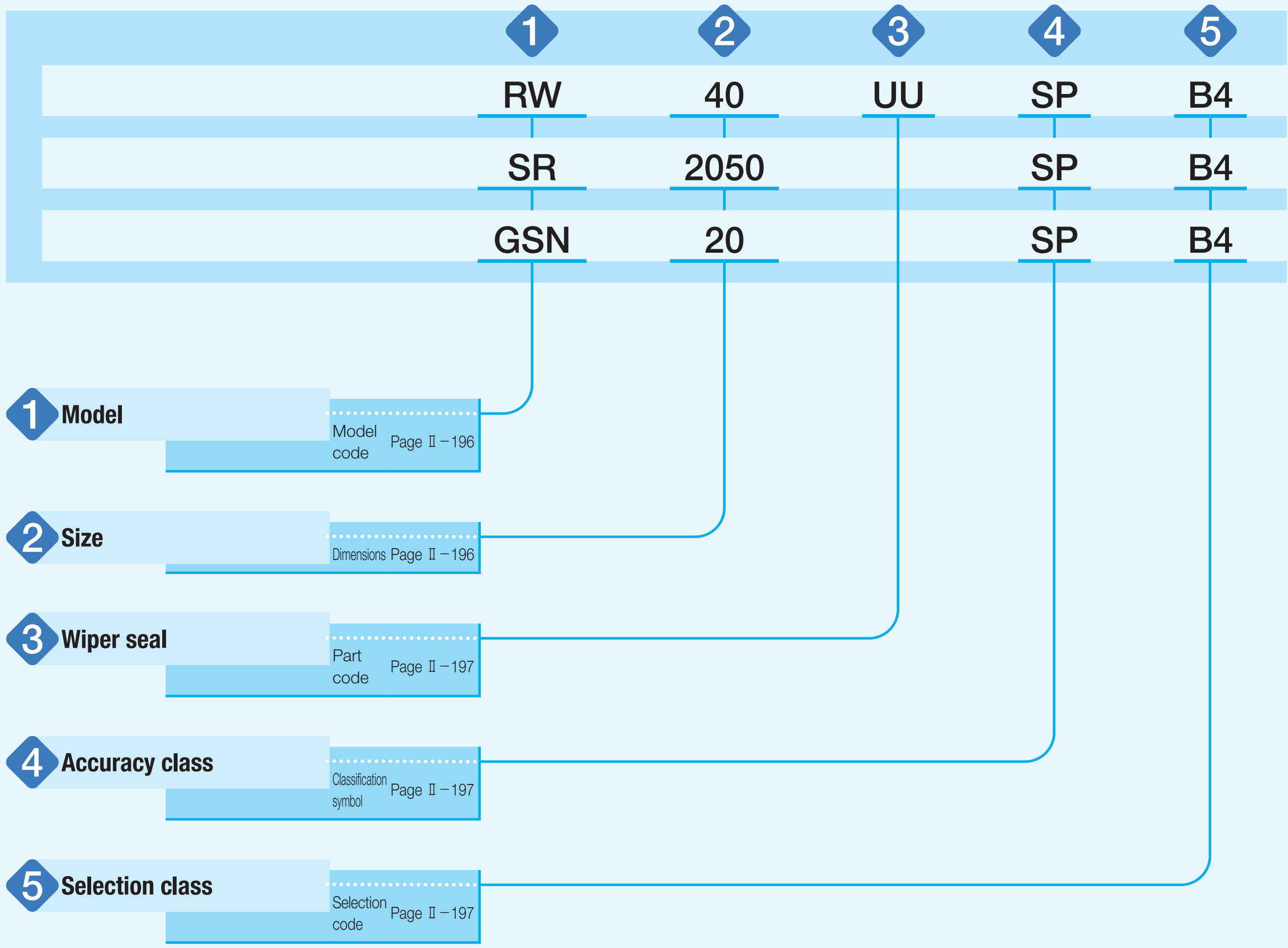
Smooth motion

The structure of all models lets the roller to be guided accurately without creating skew, yielding an extremely stable and smooth linear motion.

Identification Number and Specification

Example of an identification number

The specifications of RW, SR and GSN are indicated by the identification number. Indicate the identification number, consisting of a model code, dimensions, a part code, a classification symbol, and a selection code for each specification to apply.



①	②	③	④	⑤
RW	40	UU	SP	B4
SR	2050		SP	B4
GSN	20		SP	B4

①	**Model**	Model code	Page Ⅱ－196
②	**Size**	Dimensions	Page Ⅱ－196
③	**Wiper seal**	Part code	Page Ⅱ－197
④	**Accuracy class**	Classification symbol	Page Ⅱ－197
⑤	**Selection class**	Selection code	Page Ⅱ－197

Identification Number and Specification －Model・Size－

① Model

Roller Way RW : RW
Roller Way RW inch series : RWB
Roller Way SR : SR
Roller Way GSN : GSN

For applicable models and sizes, see Table 1.1 and Table 1.2.

② Size

Indicate the representative width in mm. For the inch series, indicate the width in the unit of 1/16 inch. For applicable models and sizes, see Table 1.1 and Table 1.2.

- Wiper Seal · Accuracy Class · Selection Class -

Table 1.1 Models and sizes of RW, SR and GSN (Metric series)

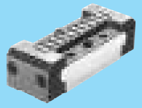
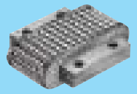
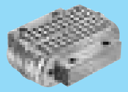
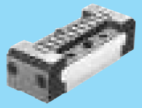
Shape	Model	Size 15	20	25	26	30	32	40	50	70	95
	RW	–	–	–	○	○	–	○	○	○	○
	SR	○	○	○	–	–	○	○	○	–	–
	GSN	○	○	○	–	–	○	○	○	–	–

Table 1.2 Models and sizes of RWB (Inch series)

Shape	Model	Size 14	16	24	32	48	64
	RWB	○	○	○	○	○	○

③ Wiper seal

Without wiper seal : No symbol Applicable to Roller Way RW.
With wiper seal : UU Attach the wiper seal in the linear motion direction. This wiper seal is made of special synthetic rubber in double-lipped shape and has high removal performance against foreign substances.

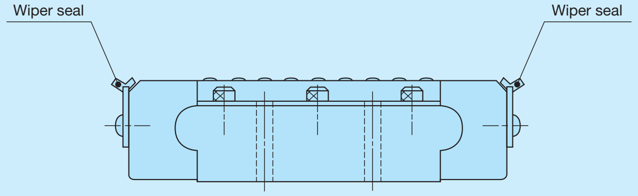


Fig. 1 Wiper seal

④ Accuracy class

Ordinary : No symbol
High : H
Precision : P
Super precision : SP

For applicable accuracy class, see Table 2.1 and Table 2.2.
For details of accuracy class, see Table 3.1, Table 3.2, and Table 4.

⑤ Selection class

When many are used on the same surface, it is required to use those with the same selection code from tolerances of dimensions in H of Table 4 to evenly distribute the load. When tolerances of dimensions of H is not specified, please specify a classification symbol only.

—Accuracy Class · Selection Class—

Table 2.1 Application of accuracy class of RW, SR and GSN (Metric series)

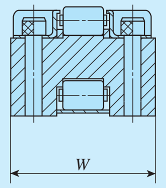
Size	Class (classification symbol) Ordinary (1) (No symbol)	High (H)	Precision (P)	Super precision (SP)
15	○	○	○	○
20	○	○	○	○
25	○	○	○	○
26	–	○	○	○
30	–	○	○	○
32	○	○	○	○
40	○	○	○	○
50	○	○	○	○ (2)
70	–	○	○	–
95	–	○	○	–

Notes (1) Applicable to SR and GSN.
(2) Applicable to RW.

Table 2.2 Application of accuracy class of RWB (Inch series)

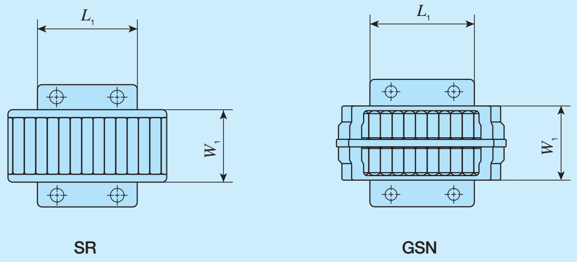
Size	Class (classification symbol) Ordinary (No symbol)	High (H)	Precision (P)	Super precision (SP)
14	–	○	○	○
16	–	○	○	○
24	–	○	○	○
32	–	○	○	○
48	–	○	○	–
64	–	○	○	–

Table 3.1 Tolerances of RW and RWB width W



RW Size	RW Dim. W tolerance mm	RWB Size	RWB Dim. W tolerance inch
26 30 40	0 −0.05	14 16 24	0 −0.002
50 70	0 −0.07	32 48	0 −0.003
95	0 −0.10	64	0 −0.004

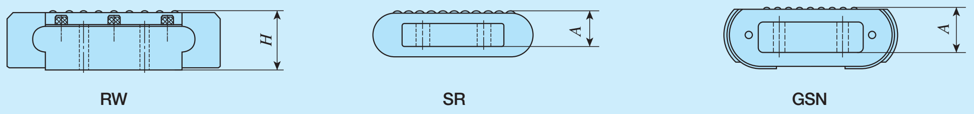
Table 3.2 Tolerances of SR and GSN width W_1, and length L_1



unit: mm

Size	Dim. W_1 tolerance	Dim. L_1 tolerance
15 20 25 32 40	0 −0.2	0 −0.2
50	0 −0.3	0 −0.3

Table 4 Selection code, and tolerance of height H and operation height A



Item / Accuracy class	Selection code	Dim. tolerance of height H and operation height A Metric series mm	Inch series inch
Ordinary (no symbol)	–	0 ～ −0.010	–
High (H)	E 5 E10	0 ～ −0.005 −0.005 ～ −0.010	0 ～ −0.0002 −0.0002 ～ −0.0004
Precision (P)	C 3 C 6 C 9	0 ～ −0.003 −0.003 ～ −0.006 −0.006 ～ −0.009	0 ～ −0.00012 −0.00012 ～ −0.00024 −0.00024 ～ −0.00036
Super precision (SP)	B 2 B 4 B 6 B 8 B10	0 ～ −0.002 −0.002 ～ −0.004 −0.004 ～ −0.006 −0.006 ～ −0.008 −0.008 ～ −0.010	0 ～ −0.00008 −0.00008 ～ −0.00016 −0.00016 ～ −0.00024 −0.00024 ～ −0.00032 −0.00032 ～ −0.00040

Precaution for Use

❶ Raceway

Recommended values for surface hardness and roughness of mating raceway are shown in Table 5 and the recommended value for the minimum effective hardening depth is shown in Table 6.1 and Table 6.2.

Table 5 Surface hardness and roughness of raceway

Item	Recommended value	Remark
Surface hardness	58～64HRC	When the surface hardness is low, multiply the load rating by hardness factor (1) .
Surface roughness	0.2 μmRa or lower (0.8 μmRy or lower)	Where accuracy standard is low, around 0.8 μmRa (3.2 μmRy) is also allowed.

Note (1) For hardness factor, refer to Fig. 3 in page Ⅲ-5.

Table 6.1 Minimum effective hardening depth of raceway (RW and RWB) unit: mm

Identification number		Recommended value for minimum effective hardening depth
RW 26	RWB 14	0.8
RW 30	RWB 16	1.0
RW 40	RWB 24	1.5
RW 50	RWB 32	2.0
RW 70	RWB 48	2.5
RW 95	RWB 64	3.0

Table 6.2 Minimum effective hardening depth of raceway (SR and GSN) unit: mm

Identification number		Recommended value for minimum effective hardening depth
SR 15	GSN 15	0.8
SR 20	GSN 20	
SR 25	GSN 25	1.0
SR 32	GSN 32	
SR 40	GSN 40	1.5
SR 50	GSN 50	2.0

❷ Accuracy of mounting surface

For accuracy of mounting surface, values in Table 7.1 and Table 7.2 are recommended.

Table 7.1 Accuracy of mounting surface (RW and RWB)

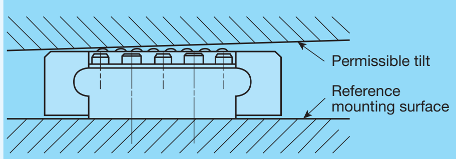
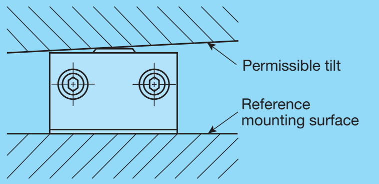
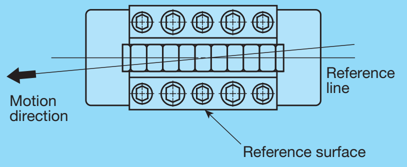
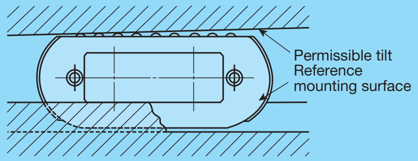
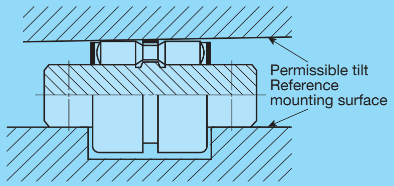
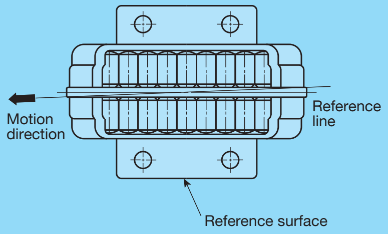
Item	Recommended value
	0.02/100 or lower
	0.015/100 or lower
	0.05/100 or lower

Table 7.2 Accuracy of mounting surface (SR and GSN)

Item	Recommended value
	0.02/100 or lower
	0.015/100 or lower
	0.05/100 or lower

❸ Groove machining on SR and GSN mounting surface

When mounting SR and GSN to the groove-machined mounting surface, the groove depth E should be deeper than the height from the bottom surface of the way to the bottom of the SR and GSN to provide clearance for oil pool. (See Fig. 2.)
Other than the above, groove width W corresponding to the width W_1 for SR should be as wide as clearance fit and the relation between the clearance and the groove position on the reference surface side must be considered.

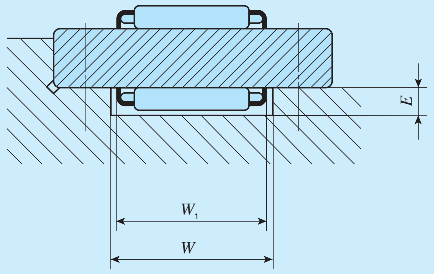


Fig. 2 Shape of groove on the mounting surface

❹ Operating temperature

The maximum operating temperature is 120℃ and temperature up to 100℃ is allowed for continuous operation. When the temperature exceeds 100℃, contact IKO.

Precaution for Mounting

❶ Reference mounting surface

To mount RW, RWB, SR, and GSN in the linear motion direction, mount them by referring the opposite side of the IKO mark on the way end as reference surface. (See Fig. 3.)
In addition, the surface under load is the upside of the IKO mark on the way end seen as the normal position.

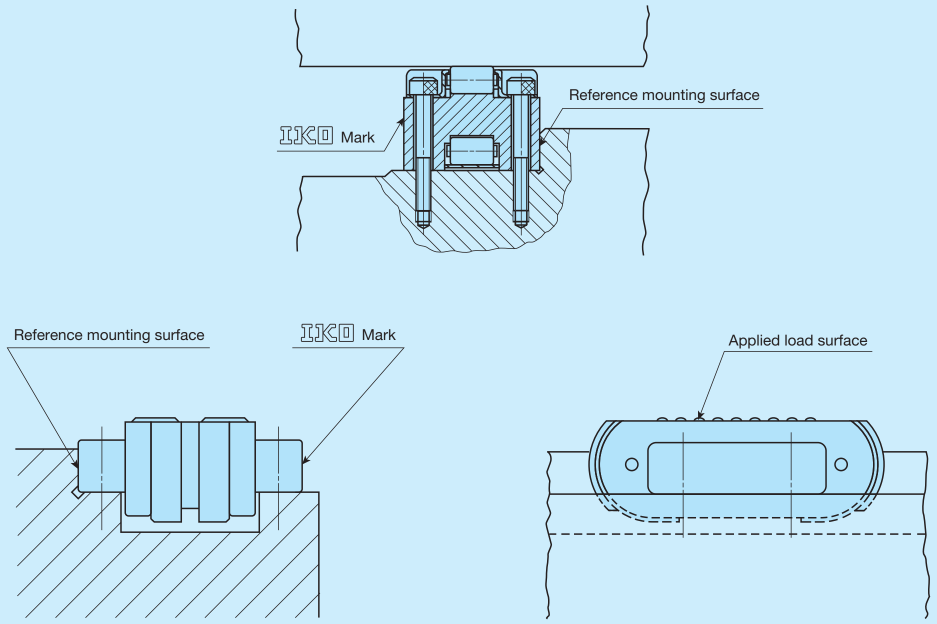


Fig. 3 Mounting examples

❷ How to mount SR and GSN

To mount it, fix the way directly to a table or a bed with bolts, or fix it with pressure plate as indicated in Fig. 4. For SR, mounting with pressure plate is recommended.

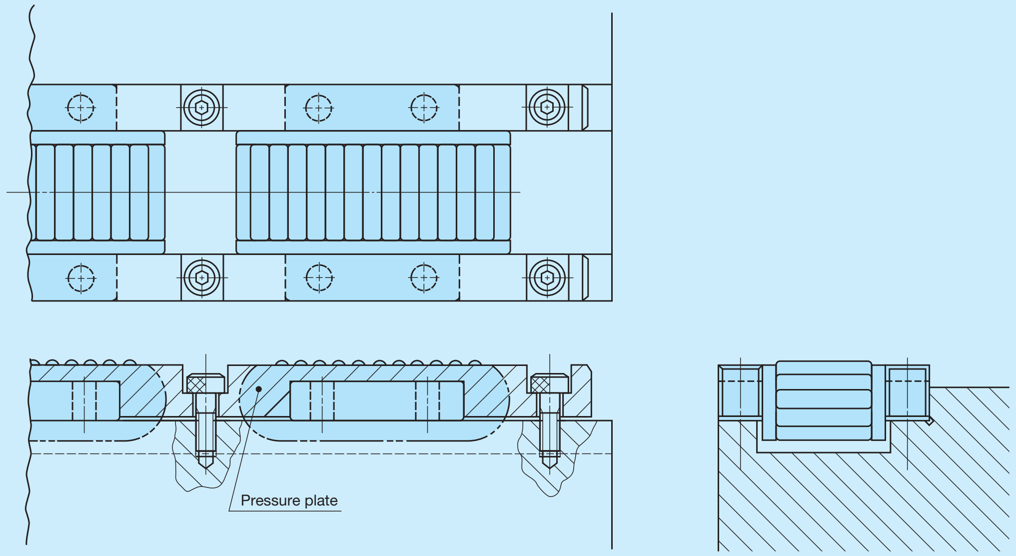
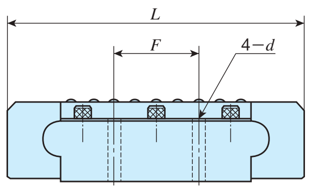


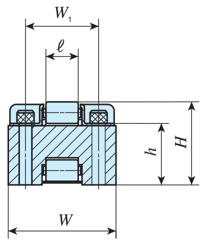
Fig. 4 Mounting with pressure plate

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO Roller Way

	RW		
Shape			
Size	**26**	**30**	**40**
	50	**70**	**95**

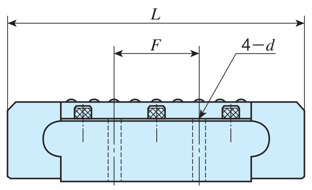


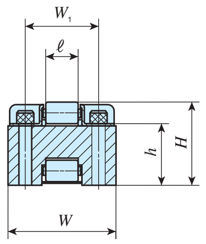


Identification number	Mass (Ref.)	Nominal dimensions mm								Basic dynamic load rating	Basic static load rating
	g	W	H	L	ℓ	F	W_1	h	d	C N	C_0 N
RW 26	74	26	14	50	6	19	16	10	3.4	25 000	40 100
RW 30	179	30	19	70	7.5	25.4	19	14	4.5	39 800	71 200
RW 40	740	40	28	100	11.3	38.1	26	21	5.5	85 700	160 000
RW 50	1 750	50	38	140	15	50.8	35	28.5	6.6	154 000	314 000
RW 70	5 260	70	57	200	22.5	76.2	48	42.5	9.0	306 000	638 000
RW 95	12 700	95	76	270	30	101.6	65	56.5	11.0	514 000	1 130 000

IKO Roller Way Inch Series

	RWB		
Shape			
Size	**14**	**16**	**24**
	32	**48**	**64**

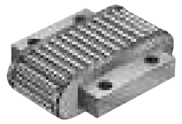


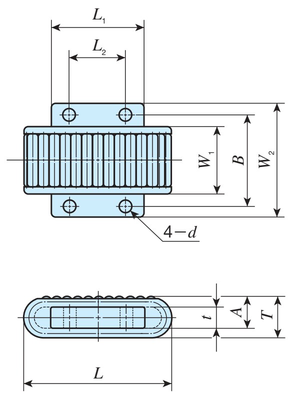


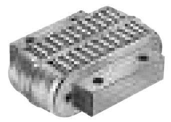
Identification number	Mass (Ref.)	Nominal dimensions inch / mm								Basic dynamic load rating	Basic static load rating
	g	W	H	L	ℓ	F	W_1	h	d	C N	C_0 N
RWB 14*	91	7/8 22.225	9/16 14.288	1.97 50	0.236 6	3/4 19.050	43/64 17.066	0.41 10.4	0.125 3.2	25 000	40 100
RWB 16*	227	1 25.400	3/4 19.050	2.76 70	0.295 7.5	1 25.400	13/16 20.638	0.56 14.2	0.125 3.2	39 800	71 200
RWB 24*	730	1 1/2 38.100	1 1/8 28.575	3.94 100	0.445 11.3	1 1/2 38.100	1 7/32 30.956	0.85 21.5	0.180 4.6	85 700	160 000
RWB 32*	1 770	2 50.800	1 1/2 38.100	5.51 140	0.591 15	2 50.800	1 5/8 41.275	1.12 28.5	0.206 5.2	154 000	314 000
RWB 48*	5 670	3 76.200	2 1/4 57.150	7.88 200	0.886 22.5	3 76.200	2 7/16 61.912	1.68 42.8	0.266 6.8	306 000	638 000
RWB 64*	13 500	4 101.600	3 76.200	10.63 270	1.181 30	4 101.600	3 1/4 82.550	2.24 57.0	0.328 8.3	514 000	1 130 000

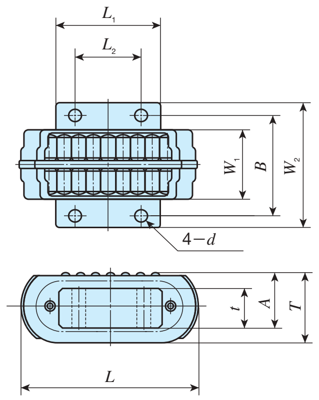
Remark: The identification numbers with * are our semi-standard items.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Shape	SR 		
Size	15	20	25
	32	40	50



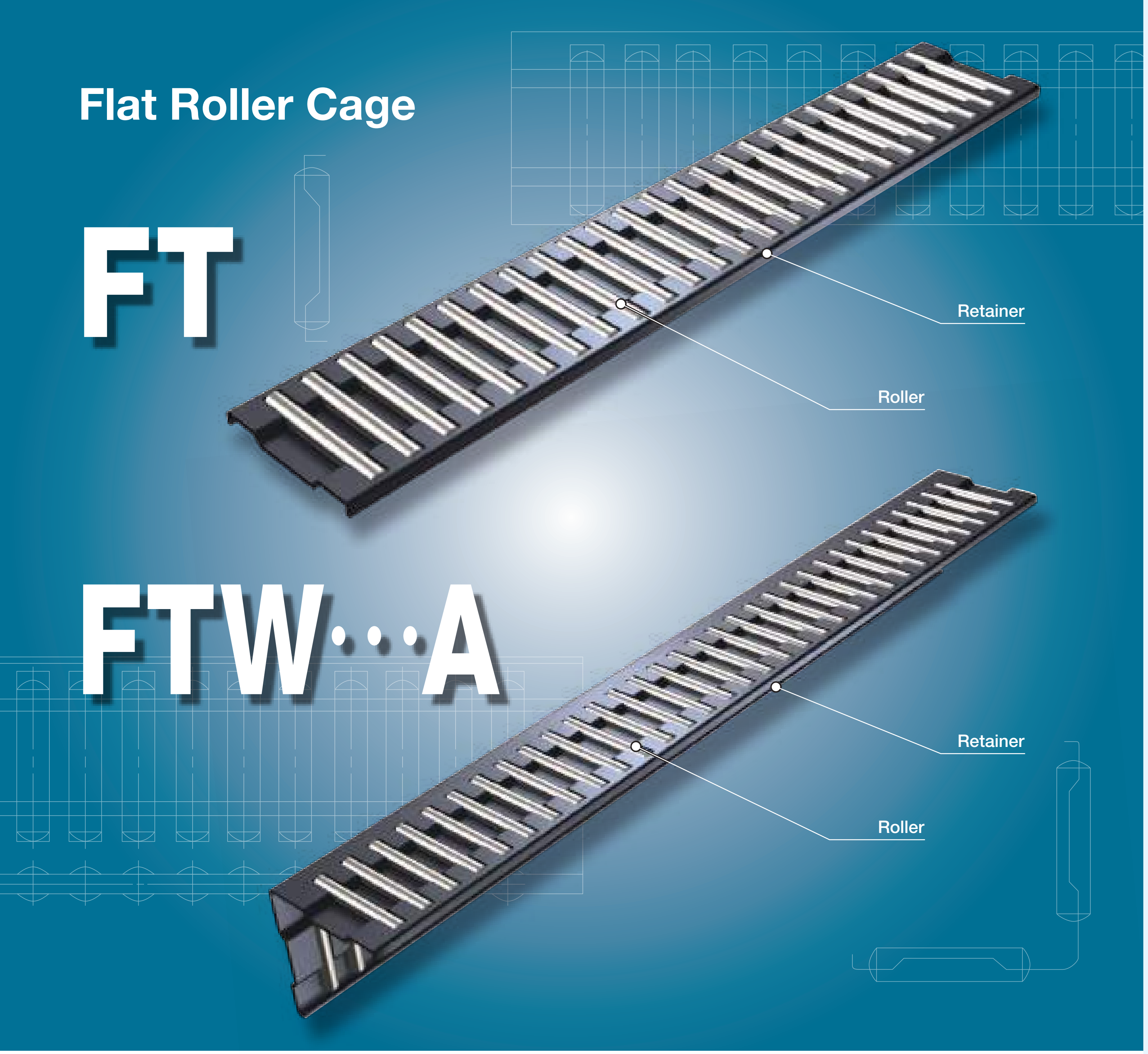
Shape	GSN 		
Size	15	20	25
	32	40	50



Identification number		Mass (Ref.)	Nominal dimensions mm											Basic dynamic load rating	Basic static load rating
		g	W_1	W_2	L	A		T	L_1	L_2	B	d	t	C N	C_0 N
SR 1540	——	62	15	30	40	11		15	20	12	23	3.3	7	26 500	45 900
———	GSN 15	82	15	30	40	15		20	19	12	23	3.4	11	22 300	36 000
SR 2050	——	120	20	36	50	12		16	30	18	29	3.8	8	42 800	96 300
———	GSN 20	145	20	36	50	15		20	29	18	29	3.4	11	40 100	87 900
SR 2560	——	210	25	45	60	14		19	35	20	36	4.8	9	67 300	156 000
———	GSN 25	260	25	45	60	18		24.5	35	20	36	4.5	13	58 900	131 000
SR 3270	——	345	32	55	70	15		20	45	27	44	5.5	10	97 500	271 000
———	GSN 32	413	32	55	70	18		24.5	45	27	44	4.5	13	88 800	241 000
SR 4090	——	750	40	68	87	21		28	55	35	54	6.5	14	143 000	373 000
———	GSN 40	940	40	68	92	25		34	54	35	54	5.5	18	133 000	337 000
SR 50125	——	1 870	50	82	125	30		40	78	50	66	8.5	20	252 000	673 000
———	GSN 50	1 800	50	82	121	30		42	77	50	66	6.6	20	242 000	634 000

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Flat Roller Cage



Points

● Low section

1 Flat Roller Cage is a limited linear motion guide consisting of high accuracy rollers and a very precise retainers and features low cross sectional height which is as high as the roller diameter.

● Large load rating

2 Rollers are assembled in a cage with a small pitch distance, so load ratings are large and the rigidity is high.

● Simple replacement for rolling guide

3 A single row model and a double row model with a 90° are standardized and can be easily used to modify the conventional plain guide ways of machine tools, etc. into a rolling guide type without a large-scale redesign of the bed.

● Smooth operations and low noise

4 As a retainer processed with high accuracy guides the rollers, the frictional resistance is very low without stick-slip, and stable linear motion is obtained. Retainers made of synthetic resin are most suitable for applications where low noise is required.

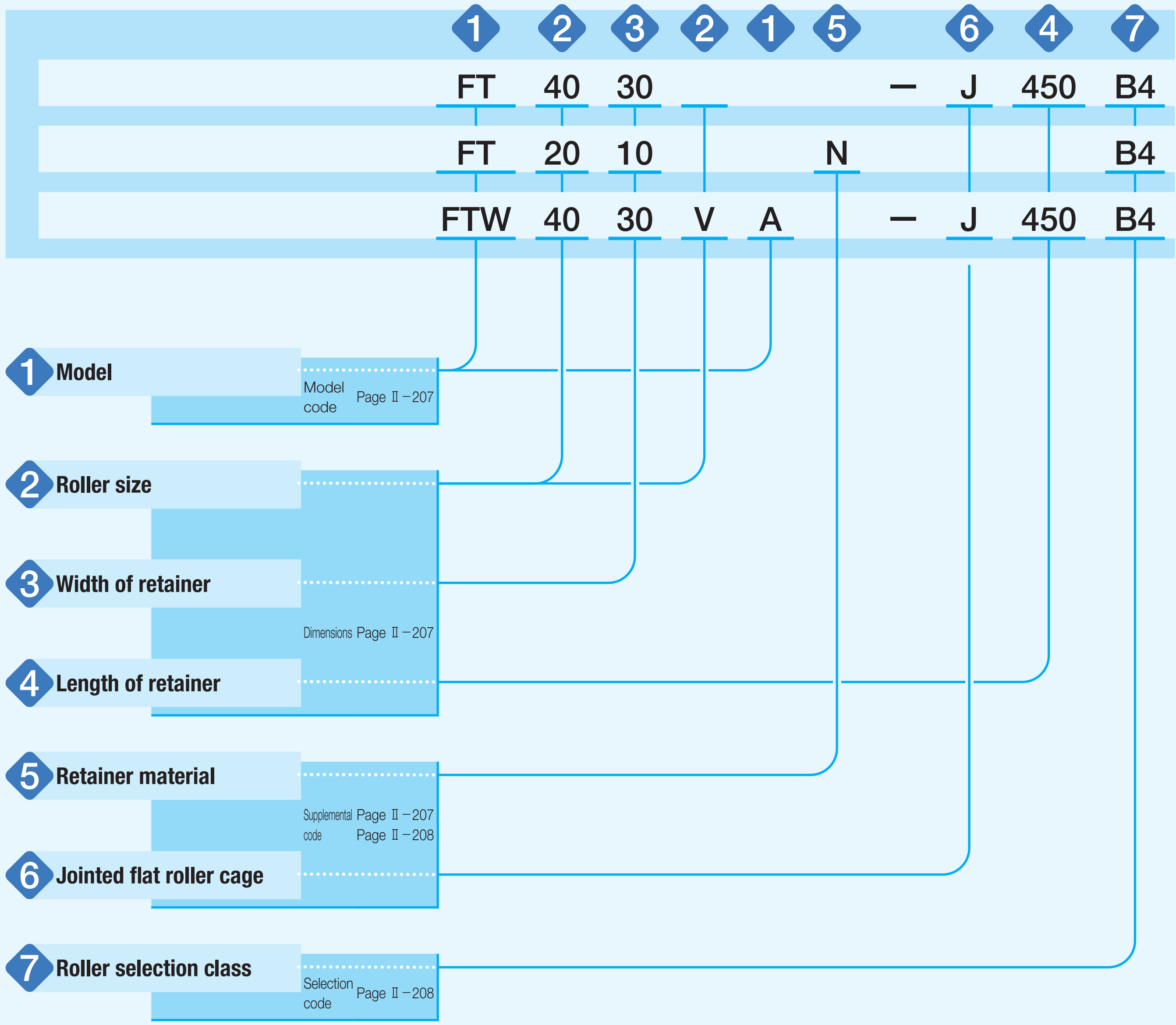
● Easy handling

5 The rollers are caged in a retainer securely, allowing easy handling.

Identification Number and Specification

Example of an identification number

The specification of FT and FTW···A are indicated by the identification number. Indicate the identification number, consisting of a model code, dimensions, a supplemental code, and a selection code for each specification to apply.



Identification Number and Specification –Model · Roller Size · Width of Retainer · Length of Retainer · Retainer Material –

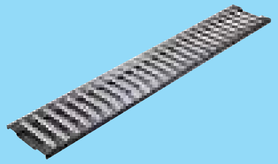
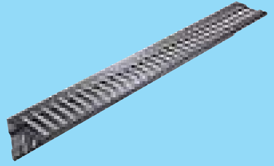
1 Model

Flat Roller Cage
Single row type : FT
Double row angle type : FTW···A
For applicable models and roller sizes, see Table 1.

2 Roller size

Indicate 10 times as large value as the roller diameter (mm).
Indicate 10$\sqrt{2}$ times as large integer value as roller diameter (mm) for those with code V.

Table 1 Models and sizes of FT and FTW···A

Shape	Retainer material	Model	Roller size							
			20	25	30	35	40	50	100	200
Single row type 	Steel made	FT	○	○	○	○	○	○	○	○
	Synthetic resin made	FT···N	○	○	○	○	–	–	–	–
Double row angle type 	Steel made	FTW···A	–	–	–	–	○	○	○	○

3 Width of retainer

Indicate the width of retainer in mm.

4 Length of retainer

Indicate the length of retainer in mm.
Length other than the standard length stated in the dimension table can be prepared upon request.
Contact IKO for further information.

5 Retainer material

Steel made : No symbol
Synthetic resin made : N
Specify the retainer material.
For applicable models and roller sizes, see Table 1.

- Jointed Flat Roller Cage · Roller Selection Class -

6 Jointed flat roller cage

Standard length retainer : No symbol
Jointed flat roller cage : J
Indicate full length of the retainer as well and specify ones longer than the standard length.

Flat Roller Cage with extended full length can be produced by connecting steel made retainers each other. If needed, please specify a retainer full length in mm after the supplemental code "J" following the way indicated in the example of an identification number. Maximum length of a jointed flat roller cage is indicated in Table 2.
Length longer than the maximum stated in Table 2 can be prepared upon request. Contact IKO for further information.

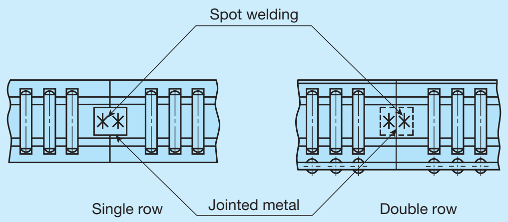


Fig. 1 Connection by spot welding

Table 2 Maximum length of jointed flat roller cage unit: mm

Identification number	Maximum length of retainer
FT 2010	300
FT 2515	
FT 3020	
FT 3525	375
FT 4030	600
FT 4035	
FT 4026 V	
FT 5038	1 000
FT 5043	
FT 5030 V	
FT 10080	
FT 10060 V	
FT 200120	1 500
FT 200100 V	1 000
FTW 4030 VA	600
FTW 5045 A	1 000
FTW 5050 A	
FTW 5035 VA	
FTW 10095 A	1 500
FTW 10070 VA	
FTW 200150 A	
FTW 200120 VA	

7 Roller selection class

For roller selection classes and tolerances of dimensions for roller diameters, see Table 3.

Tolerances of dimensions for roller diameters are indicated in Table 3. Normally, one of the standard selection classes is delivered.
To achieve accurate load distribution, it is necessary to combine products with the same selection code. If needed, please specify it following the way indicated in the example of an identification number.

Table 3 Roller selection class unit: μm

Selection class	Selection code	Average tolerances of dimensions for roller diameters (¹)
Standard	B2	0 ～ −2
	B4	−2 ～ −4
	B6	−4 ～ −6
	B8	−6 ～ −8
Semi-standard	A1	0 ～ −1
	A2	−1 ～ −2
	A3	−2 ～ −3
	A4	−3 ～ −4
	A5	−4 ～ −5
	A6	−5 ～ −6

Note (¹) The dimensional accuracy of rollers conforms to JIS B 1506 "Rolling bearings-Rollers." For detailed information on accuracy, please contact IKO.

Precaution for Use

❶ Raceway

Recommended values for surface hardness and roughness of mating raceway are shown in Table 4 and the recommended value for the minimum effective hardening depth is shown in Table 5.

Table 4 Surface hardness and roughness of raceway

Item	Recommended value	Remark
Surface hardness	58～64HRC	When the surface hardness is low, multiply the load rating by hardness factor (1).
Surface roughness	0.2 μmRa or lower (0.8 μmRy or lower)	Where accuracy standard is low, around 0.8 μmRa (3.2 μmRy) is also allowed.

Note (1) For hardness factor, refer to Fig. 3 in page Ⅲ-5.

Table 5 Minimum effective hardening depth of raceway

unit: mm

Roller diameter		Recommended value for minimum effective hardening depth
Over	Incl.	
–	3	0.5
3	4	0.8
4	5	1.0
5	8	1.5
8	10	2.0
10	14.142	2.5
14.142	20	3.5

❷ When used for bed surface and 90° V surface

After complete lapping as indicated in Fig. 2, mount FT to FTW…VA, or FT…V to FTW…A. Combination of Flat Roller Cage at this point is indicated in Table 6.

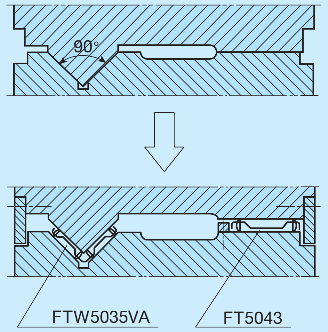


Fig. 2 Example of use on flat surface and 90° V surface

❸ Stroke length and retainer length

Movement in a linear direction as in Fig. 3 will move the Flat Roller Cage in the same direction by one half of the movement amount. Therefore, way length, stroke length and retainer length are correlated as follows:

$$L_1 = \frac{S}{2} + L \quad \cdots\cdots (1)$$

where, L_1 : Way length,   mm
S : Stroke length,   mm
L : Retainer length,   mm

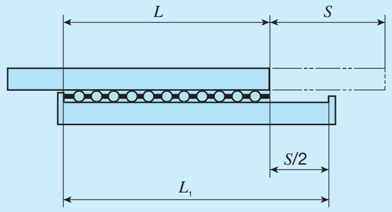


Fig. 3

❹ Operating temperature

If the retainer is made of steel, it can withstand higher temperature. However, if you use it in an environment exceeding 100˚C, please contact IKO.

The retainer made of synthetic resin can withstand up to 100˚C. For continuous operation, please keep it under 80˚C.

Table 6 Combination of Flat Roller Cage

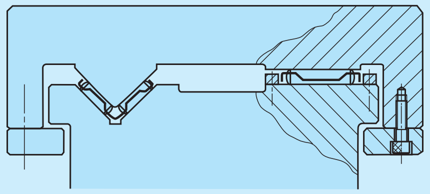
unit: mm

Combination Number	For flat surface		For 90° V surface	
	Identification number	Roller diameter D_w	Identification number	Roller diameter D_w
1	FT 4030	4	FTW 4030 VA	2.828
2	FT 4035	4	FTW 4030 VA	2.828
3	FT 5038	5	FTW 5035 VA	3.535
4	FT 5043	5	FTW 5035 VA	3.535
5	FT 10060 V	7.071	FTW 5045 A	5
6	FT 10060 V	7.071	FTW 5050 A	5
7	FT 10080	10	FTW 10070 VA	7.071
8	FT 200100 V	14.142	FTW 10095 A	10
9	FT 200120	20	FTW 200120 VA	14.142

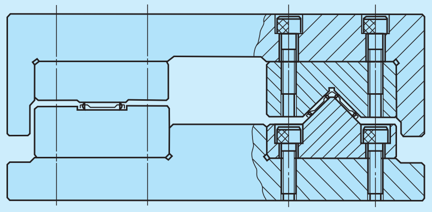
Precaution for Mounting

FT and FTW…A are typically mounted as indicated in Fig. 4. When the heat-treated and polished way is mounted to the device body, you must be careful not to make deformation by tightening.

① General case



② When a way is used



③ When overhanging load is applied

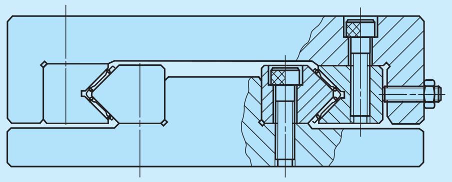
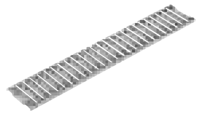
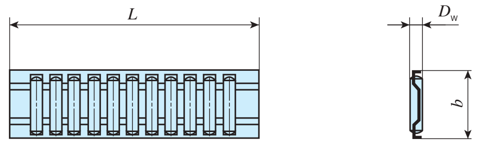


Fig. 4 Mounting examples

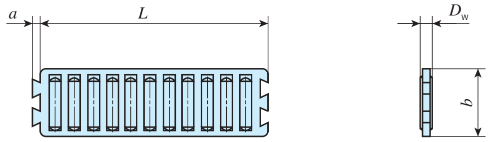
IKO Flat Roller Cage

Single row type Flat Roller Cage

	FT			
Shape				
Size	20	25	30	35
	40	50	100	200



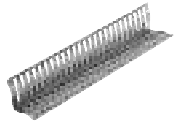
FT

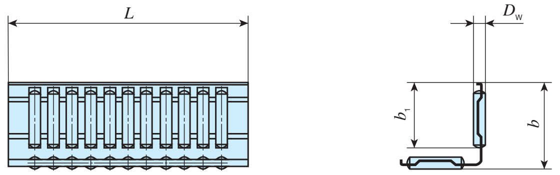


FT···N

Identification number		Mass (Ref.)	Nominal dimensions mm				Basic dynamic load rating	Basic static load rating
Steel retainer	Synthetic resin retainer	g	D_w	b	L	a	C N	C_0 N
———	FT 2010 N	1.63	2	10	32	2	8 660	19 800
FT 2010 - 32	——	1.91				–	9 710	22 900
FT 2010 - 100	——	5.8			100		22 900	68 700
———	FT 2515 N	4.3	2.5	15	45	2.5	17 300	41 100
FT 2515 - 45	——	5.6				–	22 000	56 200
FT 2515 - 100	——	11.6			100		37 900	112 000
———	FT 3020 N	9.7	3	20	60	3	31 600	78 800
FT 3020 - 60	——	12.5				–	37 100	96 700
———	FT 3525 N	18.6	3.5	25	75	3.5	51 400	132 000
FT 3525 - 75	——	23				–	58 400	155 000
FT 4030 - 150	——	73	4	30	150	–	127 000	382 000
FT 4035 - 150	——	86		35			143 000	446 000
FT 4026V - 150	——	45	2.828	26	150	–	97 300	347 000
FT 5038 - 250	——	195	5	38	250	–	267 000	851 000
FT 5043 - 250	——	200		43			306 000	1 020 000
FT 5030V - 250	——	103	3.535	30	250	–	180 000	652 000
FT 10080 - 500	——	1 610	10	80	500	–	1 390 000	4 370 000
FT 10060V - 500	——	870	7.071	60	500	–	838 000	2 900 000
FT 200120 - 500	——	4 940	20	120	500	–	3 120 000	7 670 000
FT 200100V - 500	——	2 860	14.142	100	500	–	2 090 000	5 820 000

Double row angle type Flat Roller Cage

	FTW···A			
Shape				
Size	—	—	—	—
	40	50	100	200



Identification number	Mass (Ref.)	Nominal dimensions mm				Basic dynamic load rating	Basic static load rating
	g	D_w	b	L	b_1	C N	C_0 N
FTW 4030 VA - 150	94	2.828	30	150	24.5	118 000	491 000
FTW 5045 A - 250	410	5	45	250	35.5	332 000	1 240 000
FTW 5050 A - 250	460		50		40.5	371 000	1 440 000
FTW 5035 VA - 250	220	3.535	35	250	29	218 000	922 000
FTW 10095 A - 500	3 360	10	95	500	77	1 680 000	6 180 000
FTW 10070 VA - 500	1 790	7.071	70	500	56.5	1 020 000	4 110 000
FTW 200150 A - 500	10 200	20	150	500	118	3 790 000	10 800 000
FTW 200120 VA - 500	5 940	14.142	120	500	96	2 530 000	8 220 000

General Explanation

Load Rating and Life

Life of linear motion rolling guides

Even in normal operational status, a linear motion rolling guide will reach the end of its life after a certain period of operations. As repeated load is constantly applied onto a raceway and rolling elements of the linear motion rolling guide, this leads to leprous damage (scale-like wear fragments) called fatigue flaking due to rolling contact fatigue of materials, it will be unusable at the end. Total traveling distance before occurrence of this fatigue flaking on a raceway or rolling elements is called the life of linear motion rolling guide.
As the life of linear motion rolling guide may vary depending on material fatigue phenomenon, rating life based on statistic calculation is used.

Rating life

Rating life of linear motion rolling guide refers to the total traveling distance (1) 90% of a group of the same linear motion rolling guide can operate without linear motion rolling guide material damages due to rolling contact fatigue when they are operated individually under the same conditions.

Note (1) Stroke Rotary Bushing is represented as total number of rotations.

Basic dynamic load rating C

Basic dynamic load rating refers to load with certain direction and size that is logically endurable for rating life indicated in Table 1 when a group of the same linear motion rolling guides is operated individually under the same conditions.

Table 1 Load rating

Series	Rating life
Crossed Roller Way Roller Way & Flat Roller Cage	100×10^{3}m
Linear Slide Unit Linear Ball Spline Linear Bushing	50×10^{3}m
Stroke Rotary Bushing	10^6 rotations

Basic static load rating C_0

Basic static load rating refers to static load generating a certain contact stress at the center of contact parts of the rolling elements and a raceway under maximum load, which is the load at the allowable limit for normal rolling motion. Generally, it is used considering static safety factor.

Allowable load F

Allowable load refers to load of smooth rolling motion on contact surface to which maximum contact stress is applied and the sum of whose elastic deformation of rolling elements and raceway is small.
Therefore, use applied load within the allowable load range if very smooth rolling motion and high accuracy are required.

Dynamic torque rating T

Dynamic torque rating refers to a torque with a certain direction and size with which 90% of a group of the same linear ball splines can run 50 x 10^{3}m without material damages due to rolling contact fatigue when they are operated individually.

Static torque rating T_0
Static moment rating T_0, T_X, T_Y

Static torque rating and static moment rating refer to static torque or moment load generating a certain level of contact stress at the center of contact parts of rolling elements and a raceway under the maximum load when the torque or moment load (see Fig. 1) are loaded, which is the torque or moment load at the allowable limit for normal rolling motion. Generally, it is used considering static safety factor.

Load direction and load rating

Linear motion rolling guide is used with its load rating corrected in accordance to the load direction. Basic dynamic load rating and basic static load rating indicated in the dimension table should be corrected before use. As the values to be corrected vary depending on series, please see an explanation for each series.

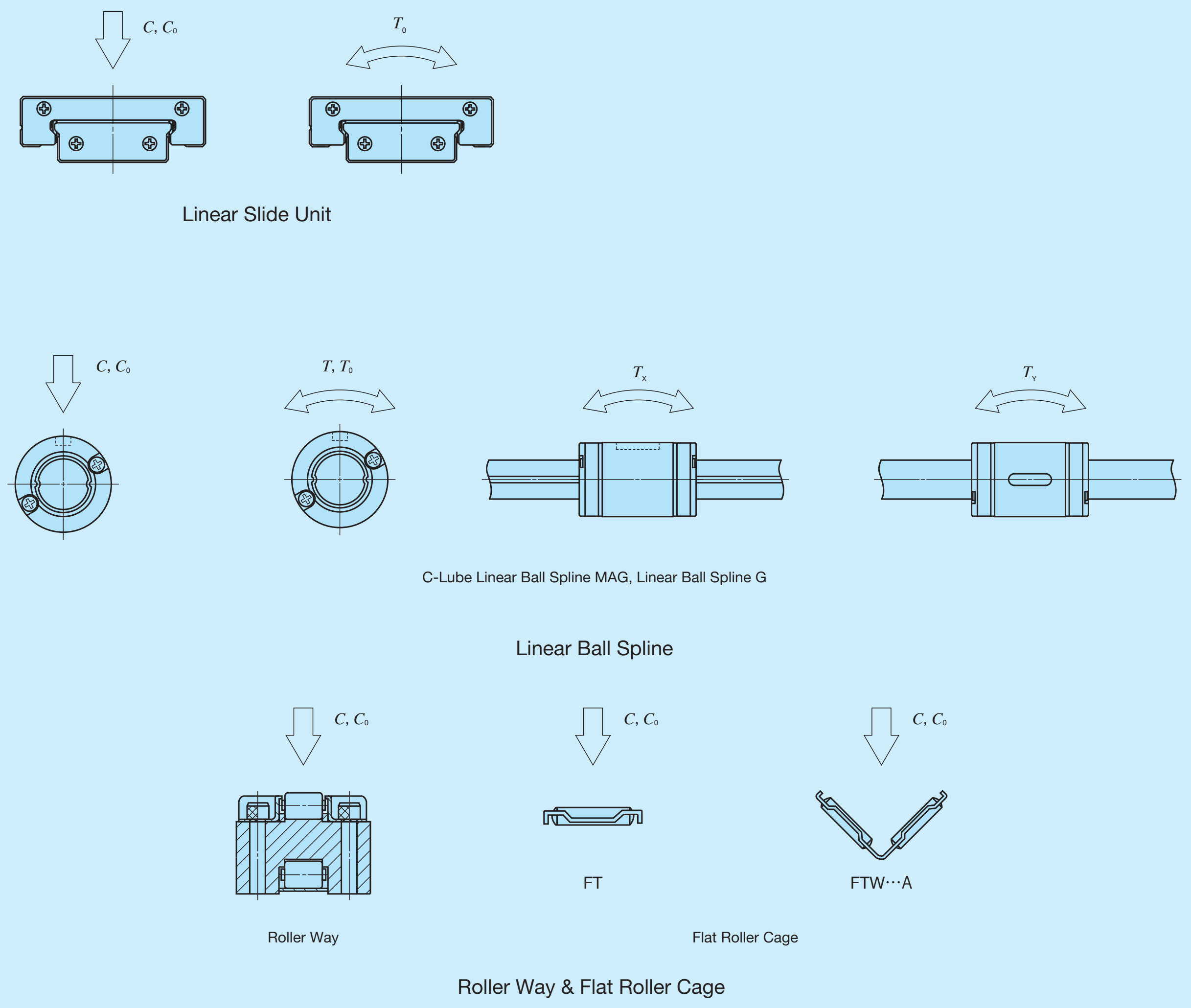


Fig. 1 Direction of load rating, torque rating, and moment load

Remark: For the cases of Crossed Roller Way and Linear Bushing, see an explanation of each series.

Calculating formula of life

Rating life and basic dynamic load rating of a linear motion rolling guide are correlated as indicated in Table 2.1 and Table 2.2.

Table 2.1 Calculating formula of life for each series

Series	Calculating formula of rating life Total traveling distance 10^3 m	Life length h	Code description
Crossed Roller Way Roller Way & Flat Roller Cage	$L=100\left(\frac{C}{P}\right)^{\frac{10}{3}}$	$L_h=\frac{10^6L}{2Sn_1\times60}$	L : Rating life, 10^3 m C : Basic dynamic load rating, N T : Dynamic torque rating, N·m P : Dynamic equivalent load (or applied load), N M : Applied torque N·m L_h : Rating life in hours h S : Stroke length mm n_1 : Number of strokes per minute min^{-1}
Linear Slide Unit Linear Bushing	$L=50\left(\frac{C}{P}\right)^3$		
Linear Ball Spline	$L=50\left(\frac{C}{P}\right)^3$ $L=50\left(\frac{T}{M}\right)^3$		

Table 2.2 Calculating formula of life for Stroke Rotary Bushing

Series	Calculating formula of rating life Total number of rotation 10^6 rotations	Life length h	Code description
Rotational motion	$L=\left(\frac{C}{P}\right)^3$	$L_h=\frac{10^6L}{60\sqrt{(D_{PW}\,n)^2+(10Sn_1)^2}/D_{PW}}$	L : Rating life, 10^6 rotations C : Basic dynamic load rating, N P : Applied load N L_h : Rating life in hours h n : Rotational speed min^{-1} n_1 : Number of strokes per minute min^{-1} S : Stroke length mm D_{PW} : Pitch circle diameter of balls mm ($D_{PW}\fallingdotseq1.15F_W$) F_W : Inscribed circle diameter mm
Rotational and rotary compound motion			
Rotary and linear motion		$L_h=\frac{10^6L}{600Sn_1/(\pi D_{PW})}$	

Temperature factor

As the allowable contact stress is decreased at operating temperature above 150°C, the basic dynamic load rating should be corrected by the following equation:

$$C_t=f_t\,C \cdots\cdots(1)$$

where,
C_t : Basic dynamic load rating taking into account temperature increase, N
f_t : Temperature factor (see Fig. 2)
C : Basic dynamic load rating, N

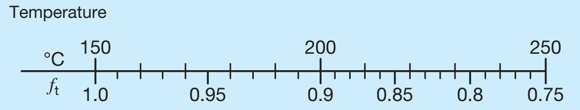


Fig. 2 Temperature factor

Hardness factor

Hardness of a raceway must be 58 to 64 HRC. When it is lower than 58 HRC, correct basic dynamic load rating by the following equation:

$$C_H=f_H\,C \cdots\cdots(2)$$

where,
C_H : Basic dynamic load rating taking into account the hardness, N
f_H : Hardness factor (see Fig. 3)
C : Basic dynamic load rating, N

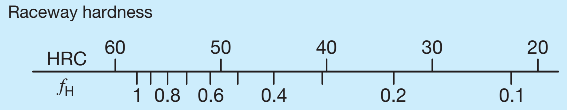


Fig. 3 Hardness factor

Load factor

Load applied to a linear motion rolling guide can be larger than theoretical load due to machine vibration or shock. Generally, the applied load is obtained by multiplying it by the load factor indicated in Table 3.

Table 3 Load factor

Operating conditions	f_w
Smooth operation free from shock	1 ～1.2
Normal operation	1.2～1.5
Operation with shock load	1.5～3

Static safety factor

Generally, basic static load rating and static moment rating (or static torque rating) is considered as load at the allowable limit for normal rolling motion. However, static safety factor must be considered according to operating conditions and required performance of the linear motion rolling guide.

Static safety factor can be obtained by the following equation and typical values are indicated in Table 4.

Equation (4) is a representative equation for moment load or torque. Static moment rating and maximum moment load in each direction is applied for the calculation.

$$f_S=\frac{C_0}{P_0}\cdots\cdots(3)$$

$$f_S=\frac{T_0}{M_0}\cdots\cdots(4)$$

where,
f_S : Static safety factor
C_0 : Basic static load rating, N
P_0 : Static equivalent load, N
(Or applied load (maximum load))
T_0 : Static moment rating, N·m
(Or static torque rating)
M_0 : Moment load or torque in each direction, N·m
(Maximum moment load or maximum torque)

Table 4 Static safety factor

Series	Operational condition and static safety factor Operation with vibration and/or shock	High operating performance	Normal operating conditions
Crossed Roller Way	4 ～6	3～5	2.5～3
Linear Slide Unit	3 ～5	2～4	1 ～3
Linear Ball Spline	5 ～7	4～6	3 ～5
Linear Bushing	2.5	2	1.5
Stroke Rotary Bushing	2.5	2	1.5
Roller Way & Flat Roller Cage	4 ～6	3～5	2.5～3

Preload

Objectives of preload

In some cases, the linear motion rolling guide is used with clearance given to the linear motion rolling guide when light motion with small load is required. However, for some applications it may be used with play in the guiding mechanism removed or with preload to increase rigidity.

Preload is applied to the contact parts of a raceway and rolling elements with internal stress generated in advance. When a external load is applied on the preloaded linear motion rolling guide, shock absorbing with this internal stress makes elastic deformation smaller, and its rigidity is increased. (See Fig.4)

Preload setting

Preload amount is determined by considering the characteristics of the machines or equipments on which the linear motion rolling guide is mounted and the nature of load acting on the linear motion rolling guide. The standard amount of preload for linear motion rolling guides is, in general, approx. 1/3 of load when the rolling elements are balls (steel balls) and approx. 1/2 of load when they are rollers (cylindrical rollers). If the linear motion rolling guides are required to have very high rigidity to withstand vibration or fluctuating load, a larger preload may be applied.

Precaution for preload selection

Even when high rigidity must be required, excessive preload should be avoided, because it will produce an excessive stress between rolling elements and raceways, and eventually result in short life of linear motion rolling guides. It is important to apply a proper amount of preload, considering the operational conditions. When using with a large preload, contact IKO.

Linear Bushing and Stroke Rotary Bushing should never be given a large amount of preload.

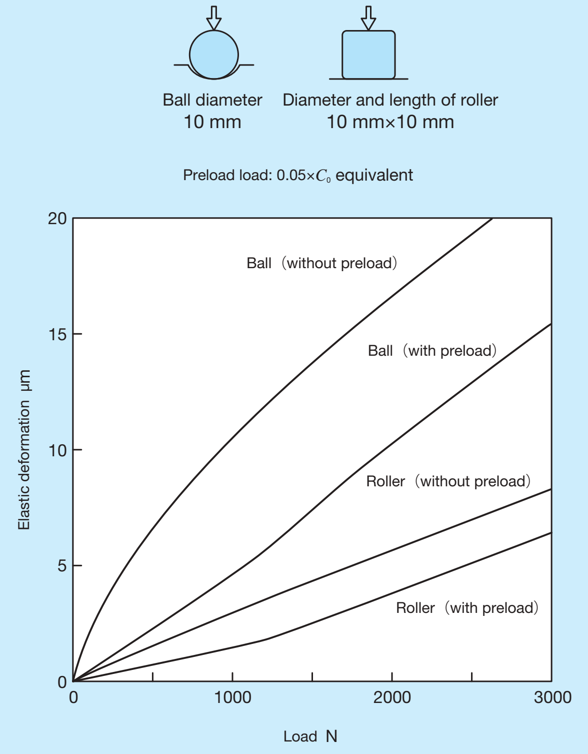


Figure 4 Preload and elastic deformation behavior

Friction

Friction of linear motion rolling guide

The static friction (start-up friction) of linear motion rolling guides is much lower than that of conventional plain guides. Also, the difference between static friction and dynamic friction is small, and frictional resistance varies little when velocity changes. These are excellent features of linear motion rolling guides, and account for their ability to reduce power consumption, suppress operating temperature rise, and increase traveling speed.

Since frictional resistance and variation are small, high speed response characteristics to motion commands and high accuracy positioning can be achieved.

Friction coefficient

The frictional resistance of linear motion rolling guides varies with their model, applied load, velocity and characteristics of lubricant. Generally, lubricant or seals are major factors in determining the frictional resistance in light load or high speed operation, while the amount of load is the major factor in heavy load or low speed operation. The frictional resistance of linear motion rolling guides depends on various factors, but generally the following formula is used.

$$F = \mu P \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (3)$$

where, F : Frictional resistance, N
μ : Dynamic friction coefficient
P : Applied load, N

For sealed guides, seal resistance is added to the above value, but this resistance varies greatly depending on the interference amount of seal lip and lubrication conditions.

Where the lubrication and mounting condition are correct and the load is moderate, the friction coefficients of linear motion rolling guide in operation are within the range shown in Table 5. Generally, friction coefficient is large under small load.

Table 5 Friction coefficient

Series name	Dynamic friction coefficient μ (1)
Crossed Roller Way	0.0010～0.0030
Linear Slide Unit	0.0010～0.0020
Linear Ball Spline	0.0020～0.0040
Linear Bushing	0.0020～0.0030
Stroke Rotary Bushing	0.0006～0.0012
Roller Way	0.0020～0.0040
Flat Roller Cage	0.0010～0.0030

Note (1) These friction coefficients do not include seal.

Lubrication

Objectives of lubrication

The objectives of applying lubricant for linear motion rolling guides is to keep raceways, rolling elements, etc. in a linear motion rolling guide from metal contact, and thereby reduce friction and wear preventing heat generation and seizure. When an adequate oil film is formed at the rolling contact area between the raceways and rolling elements, the contact stress due to load can be reduced. To manage the formation of adequate oil film is important for ensuring the reliability of linear motion rolling mechanism.

Selection of lubricant

To obtain the full performance of linear motion rolling guides, it is necessary to select an appropriate lubricant and lubrication method by considering the model, load and velocity of each linear motion rolling guide. However, as compared with plain guides, lubrication of linear motion rolling guides is much simpler. Only a small amount of lubrication oil is needed and replenishment interval is longer, so maintenance can be greatly reduced. Grease and oil are the two most commonly used lubricants for linear motion rolling guides.

Grease lubrication

For linear motion rolling guides, lithium-soap base grease (Consistency No.2 of JIS) is commonly used. For rolling guides operating under heavy load conditions, grease containing extreme pressure additives is recommended.

In clean and high-vacuum environments, where low dust generating performance and low vaporization characteristics are required, greases containing a synthetic-base oil or a soap other than the lithium-soap base are used. For applications in these environments, due consideration is necessary to select a grease that is suitable for the operating conditions of linear motion rolling guide and achieves satisfactory lubrication performance at the same time.

Table 6 Pre-packed grease list

Series name	Pre-packed grease
C-Lube Linear Ball Spline MAG Linear Ball Spline G	Alvania EP Grease 2 [Shell Lubricants Japan K.K.]

Grease replenishment interval

The quality of any grease will gradually deteriorate as operating time passes. Therefore, periodic replenishment is necessary. Grease replenishment interval varies depending on the operating conditions. A six month interval is generally recommended, and if the machine operation consists of reciprocating motions with many cycles and long strokes, replenishment every three month is recommended.

In addition, linear motion rolling guides in which the lubrication part "C-Lube" is built deliver long-term maintenance free performance. This eliminates the need for lubrication mechanism and workload which used to be necessary for linear motion rolling guides and significantly reduces maintenance cost.

Grease replenishment method

New grease must be supplied through a grease feed device such as a grease nipple until old grease is discharged. After grease is replenished, running-in is performed and excess grease will be discharged to outside of the linear motion rolling guide. Discharged grease must then be removed before starting the operation.

The amount of grease required for standard replenishment is about 1/3 to 1/2 of the free space inside the linear motion rolling guide. When grease is supplied from a grease nipple for the first time, there will be grease lost in the replenishment path. The amount lost should be taken into consideration.

Generally, immediately after grease is replenished, frictional resistance tends to increase. If additional running-in is performed for10 to 20 reciprocating cycles after excess grease is discharged, frictional resistance becomes small and stable.

For applications where low frictional resistance is required, the replenishment amount of grease may be reduced, but it must be kept to an appropriate level so as not to give a bad influence on the lubrication performance.

Mixing of different type of grease

Mixing different types of grease may result in changing the properties of base oil, soap base, or additives used, and, in some cases, severely deteriorate the lubrication performance or cause trouble due to chemical changes of additives. Old grease should therefore be removed thoroughly before filling with new grease.

Table 7 Grease brands used in linear motion rolling guide

Brand		Base oil	Thickener	Consistency	Range of operating temperature (2) ℃	Usage
Alvania EP Grease 2	[Shell Lubricants Japan K.K.]	Mineral oil	Lithium	284	−20～110	General application with extreme-pressure additive
Alvania Grease S2	[Shell Lubricants Japan K.K.]	Mineral oil	Lithium	283	−25～120	General application
Multemp PS No.2	[KYODO YUSHI CO., LTD.]	Synthetic oil, Mineral oil	Lithium	275	−50～130	General application
IKO Low Dust-Generation Grease for Clean Environment CG2	[NIPPON THOMPSON CO., LTD.]	Synthetic oil	Urea	280	−40～200	For clean environment Long life
IKO Low Dust-Generation Grease for Clean Environment CGL	[NIPPON THOMPSON CO., LTD.]	Synthetic oil, Mineral oil	Lithium / Calcium	225	−30～120	For clean environment Low sliding
Klüberalfa GR Y-VAC3 (1)	[NOK KLUEBER]	Synthetic oil	Ethylene tetra-fluoride	No.3	−20～250	For vacuum
IKO Anti-Fretting Grease AF2	[NIPPON THOMPSON CO., LTD.]	Synthetic oil	Urea	285	−50～170	Fretting-proof
6459 Grease N	[Shell Lubricants Japan K.K.]	Mineral oil	Poly-urea	305	−	Fretting-proof

Notes (1) Set replenishment intervals to short.
(2) The Ranges of operating temperature are quoted from the grease manufacturer's cataloged values, but do not guarantee regular use under high temperature environment.

Remarks Check with the chosen grease manufacturer's catalog before use.
For grease for applications other than those listed, please contact IKO.

Oil lubrication

For oil lubrication, heavy load requires high oil viscosity and high velocity requires low oil viscosity. Generally, for linear motion rolling guides operating under heavy load, lubrication oil with a viscosity of about 68 mm^2/s is used. For linear motion rolling guides under light load at high speed operation, lubrication oil with a viscosity of about 13 mm^2/s is used.

Lubrication part "C-Lube"

C-Lube Linear Ball Spline MAG has built-in lubrication part, "C-Lube".

C-Lube is a porous resin with molding formed fine resin powder. It is a lubrication part impregnated with a large amount of lubrication oil in its open pores by capillary action. Lubrication oil is supplied directly to balls (steel balls), not to the spline shaft. When the balls have contact with C-Lube built in the external cylinder, lubrication oil is supplied to the surface of the balls. As the steel balls circulate, the lubricant is distributed to the loading area along the track rail. This results in adequate lubrication oil being properly maintained in the loading area and lubrication performance will last for a long time.

The surface of C-Lube is always covered with the lubrication oil. Lubrication oil is continuously supplied to the surface of steel balls by surface tension in the contact of C-Lube surface and steel balls.

Precaution for Use

Cleaning and removing fat

Never clean a linear motion rolling guide that has integrated C-lube with organic solvents or white kerosene with fat removing properties.

Precautions regarding oil components

Rust prevention oil or grease is used for the linear motion rolling guide. Therefore, oil may drip or spatter depending on the operating conditions. Consider installing a shielding plate if necessary.

Storage

Store the linear motion rolling guide horizontally indoors in the IKO packing and packaging provided. Avoid high temperature, low temperature and high humidity. In products pre-packed with lubricant, the lubricant will deteriorate over time if products are stored for a long time. Be sure to reapply lubricant before use.

Statements

Unit Conversion Rate Table

SI, CGS series and gravity system unit cross-reference table

Amount / Unit system	Length	Mass	Time	Acceleration	Force	Stress and pressure	Energy	Power	Temperature	Viscosity	Kinetic viscosity	Flux	Flux density	Magnetic field intensity
SI	m	kg	s	m/s^2	N	Pa	J	W	K	Pa·s	m^2/s	Wb	T	A/m
CGS series	cm	g	s	Gal	dyn	dyn/cm^2	erg	erg/s	℃	P	St	Mx	Gs	Oe
Gravity system	m	kgf·s^2/m	s	m/s^2	kgf	kgf/m^2	kgf·m	kgf·m/s	℃	kgf·s/m^2	m^2/s	—	—	—

SI unit conversion

Amount	Unit name	Code	SI conversion rate	SI unit name	Code
Angle	D Min Sec	° ′ ″	π/180 π/10 800 π/648 000	Radian	rad
Length	Meter Micron Angstrom X ray unit Nautical mile	m μ Å n mile	1 10^{-6} 10^{-10} ≈1.002 08×10^{-13} 1852	Meter	m
Area	Square meter Are Hectare	m^2 a ha	1 10^{2} 10^{4}	Square meter	m^2
Volume	Cubic meter Liter	m^3 l, L	1 10^{-3}	Cubic meter	m^3
Mass	Kilogram Ton Atomic mass unit	kg t u	1 10^{3} ≈1.660 57×10^{-27}	Kilogram	kg
Time	Sec Min Hr Day	s min h d	1 60 3 600 86 400	Sec	s
Velocity	Meter per second Knot	m/s kn	1 1 852/3 600	Meter per second	m/s
Frequency and vibration	Number of cycle	s^{-1}	1	Hertz	Hz
Number of rotations	Rotation per minute	min^{-1}	1/60	Per second	s^{-1}
Angular velocity	Radian per second	rad/s	1	Radian per second	rad/s
Acceleration	Meter per second G	m/s^2 G	1 9.806 65	Meter per second	m/s^2
Force	Weight in kg Weight in ton Dyne	kgf tf dyn	9.806 65 9 806.65 10^{-5}	Newton	N
Force moment load	Weight in kg meter	kgf·m	9.806 65	Newton meter	N · m
Stress and pressure	Weight in kg per square meter Weight in kg per square cm Weight in kg per square mm	kgf/m^2 kgf/cm^2 kgf/mm^2	9.806 65 9.806 65×10^{4} 9.806 65×10^{6}	Pascal	Pa
Pressure	Meter water column millimeter of mercury column Torr Air pressure Bar	mH$_2$O mmHg Torr atm bar	9 806.65 101 325/760 101 325/760 101 325 10^{5}	Pascal	Pa
Energy	Erg IT calorie Weight in kg meter Kilowatt per hour French horse-power per hour Electron volt	erg cal$_{IT}$ kgf·m kW·h PS·h eV	10^{-7} 4.186 8 9.806 65 3.600×10^{6} ≈2.647 79×10^{6} ≈1.602 19×10^{-19}	Joule	J
Power and motivity	Watt French horse-power Weight in kg meter per second	W PS kgf·m/s	1 ≈735.5 9.806 65	Watt	W
Viscosity	Poise Centipoise Weight in kg second per square meter	P cP kgf·s/m^2	10^{-1} 10^{-3} 9.806 65	Pascal second	Pa·s
Kinetic viscosity	Stokes Centistokes	St cSt	10^{-4} 10^{-6}	Square meter per second	m^2/s
Temperature	D	℃	+273.15	Kelvin	K
Radioactivity	Curie	Ci	3.7×10^{10}	Becquerel	Bq
Exposure radiation dose	Roentgen	R	2.58×10^{-4}	Coulomb per kg	C/kg
Absorbed dose	Rad	rad	10^{-2}	Gray	Gy
Dose equivalent	Rem	rem	10^{-2}	Sievert	Sv
Flux	Maxwell	Mx	10^{-8}	Weber	Wb
Flux density	Gamma Gauss	γ Gs	10^{-9} 10^{-4}	Tesla	T
Magnetic field intensity	Oersted	Oe	$10^{3}/4\pi$	Ampere per meter	A/m
Electric charge	Coulomb	C	1	Coulomb	C
Electric potential difference	Volt	V	1	Volt	V
Capacitance	Farad	F	1	Farad	F
(Electric) Resistance	Ohm	Ω	1	Ohm	Ω
(Electric) Conductance	Siemens	S	1	Siemens	S
Inductance	Henry	H	1	Henry	H
Current	Ampere	A	1	Ampere	A

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Inch-mm Conversion Table

1 inch=25.4mm

inch		0″	1″	2″	3″	4″	5″	6″	7″	8″
Fractional number	Decimal number									
	0		25.400	50.800	76.200	101.600	127.000	152.400	177.800	203.200
1 / 64″	0.015625	0.397	25.797	51.197	76.597	101.997	127.397	152.797	178.197	203.597
1 / 32″	0.031250	0.794	26.194	51.594	76.994	102.394	127.794	153.194	178.594	203.994
3 / 64″	0.046875	1.191	26.591	51.991	77.391	102.791	128.191	153.591	178.991	204.391
1 / 16″	0.062500	1.588	26.988	52.388	77.788	103.188	128.588	153.988	179.388	204.788
5 / 64″	0.078125	1.984	27.384	52.784	78.184	103.584	128.984	154.384	179.784	205.184
3 / 32″	0.093750	2.381	27.781	53.181	78.581	103.981	129.381	154.781	180.181	205.581
7 / 64″	0.109375	2.778	28.178	53.578	78.978	104.378	129.778	155.178	180.578	205.978
1 / 8″	0.125000	3.175	28.575	53.975	79.375	104.775	130.175	155.575	180.975	206.375
9 / 64″	0.140625	3.572	28.972	54.372	79.772	105.172	130.572	155.972	181.372	206.772
5 / 32″	0.156250	3.969	29.369	54.769	80.169	105.569	130.969	156.369	181.769	207.169
11 / 64″	0.171875	4.366	29.766	55.166	80.566	105.966	131.366	156.766	182.166	207.566
3 / 16″	0.187500	4.762	30.162	55.562	80.962	106.362	131.762	157.162	182.562	207.962
13 / 64″	0.203125	5.159	30.559	55.959	81.359	106.759	132.159	157.559	182.959	208.359
7 / 32″	0.218750	5.556	30.956	56.356	81.756	107.156	132.556	157.956	183.356	208.756
15 / 64″	0.234375	5.953	31.353	56.753	82.153	107.553	132.953	158.353	183.753	209.153
1 / 4″	0.250000	6.350	31.750	57.150	82.550	107.950	133.350	158.750	184.150	209.550
17 / 64″	0.265625	6.747	32.147	57.547	82.947	108.347	133.747	159.147	184.547	209.947
9 / 32″	0.281250	7.144	32.544	57.944	83.344	108.744	134.144	159.544	184.944	210.344
19 / 64″	0.296875	7.541	32.941	58.341	83.741	109.141	134.541	159.941	185.341	210.741
5 / 16″	0.312500	7.938	33.338	58.738	84.138	109.538	134.938	160.338	185.738	211.138
21 / 64″	0.328125	8.334	33.734	59.134	84.534	109.934	135.334	160.734	186.134	211.534
11 / 32″	0.343750	8.731	34.131	59.531	84.931	110.331	135.731	161.131	186.531	211.931
23 / 64″	0.359375	9.128	34.528	59.928	85.328	110.728	136.128	161.528	186.928	212.328
3 / 8″	0.375000	9.525	34.925	60.325	85.725	111.125	136.525	161.925	187.325	212.725
25 / 64″	0.390625	9.922	35.322	60.722	86.122	111.522	136.922	162.322	187.722	213.122
13 / 32″	0.406250	10.319	35.719	61.119	86.519	111.919	137.319	162.719	188.119	213.519
27 / 64″	0.421875	10.716	36.116	61.516	86.916	112.316	137.716	163.116	188.516	213.916
7 / 16″	0.437500	11.112	36.512	61.912	87.312	112.712	138.112	163.512	188.912	214.312
29 / 64″	0.453125	11.509	36.909	62.309	87.709	113.109	138.509	163.909	189.309	214.709
15 / 32″	0.468750	11.906	37.306	62.706	88.106	113.506	138.906	164.306	189.706	215.106
31 / 64″	0.484375	12.303	37.703	63.103	88.503	113.903	139.303	164.703	190.103	215.503
1 / 2″	0.500000	12.700	38.100	63.500	88.900	114.300	139.700	165.100	190.500	215.900

1 inch=25.4mm

inch		0″	1″	2″	3″	4″	5″	6″	7″	8″
Fractional number	Decimal number									
33 / 64″	0.515625	13.097	38.497	63.897	89.297	114.697	140.097	165.497	190.897	216.297
17 / 32″	0.531250	13.494	38.894	64.294	89.694	115.094	140.494	165.894	191.294	216.694
35 / 64″	0.546875	13.891	39.291	64.691	90.091	115.491	140.891	166.291	191.691	217.091
9 / 16″	0.562500	14.288	39.688	65.088	90.488	115.888	141.288	166.688	192.088	217.488
37 / 64″	0.578125	14.684	40.084	65.484	90.884	116.284	141.684	167.084	192.484	217.884
19 / 32″	0.593750	15.081	40.481	65.881	91.281	116.681	142.081	167.481	192.881	218.281
39 / 64″	0.609375	15.478	40.878	66.278	91.678	117.078	142.478	167.878	193.278	218.678
5 / 8″	0.625000	15.875	41.275	66.675	92.075	117.475	142.875	168.275	193.675	219.075
41 / 64″	0.640625	16.272	41.672	67.072	92.472	117.872	143.272	168.672	194.072	219.472
21 / 32″	0.656250	16.669	42.069	67.469	92.869	118.269	143.669	169.069	194.469	219.869
43 / 64″	0.671875	17.066	42.466	67.866	93.266	118.666	144.066	169.466	194.866	220.266
11 / 16″	0.687500	17.462	42.862	68.262	93.662	119.062	144.462	169.862	195.262	220.662
45 / 64″	0.703125	17.859	43.259	68.659	94.059	119.459	144.859	170.259	195.659	221.059
23 / 32″	0.718750	18.256	43.656	69.056	94.456	119.856	145.256	170.656	196.056	221.456
47 / 64″	0.734375	18.653	44.053	69.453	94.853	120.253	145.653	171.053	196.453	221.853
3 / 4″	0.750000	19.050	44.450	69.850	95.250	120.650	146.050	171.450	196.850	222.250
49 / 64″	0.765625	19.447	44.847	70.247	95.647	121.047	146.447	171.847	197.247	222.647
25 / 32″	0.781250	19.844	45.244	70.644	96.044	121.444	146.844	172.244	197.644	223.044
51 / 64″	0.796875	20.241	45.641	71.041	96.441	121.841	147.241	172.641	198.041	223.441
13 / 16″	0.812500	20.638	46.038	71.438	96.838	122.238	147.638	173.038	198.438	223.838
53 / 64″	0.828125	21.034	46.434	71.834	97.234	122.634	148.034	173.434	198.834	224.234
27 / 32″	0.843750	21.431	46.831	72.231	97.631	123.031	148.431	173.831	199.231	224.631
55 / 64″	0.859375	21.828	47.228	72.628	98.028	123.428	148.828	174.228	199.628	225.028
7 / 8″	0.875000	22.225	47.625	73.025	98.425	123.825	149.225	174.625	200.025	225.425
57 / 64″	0.890625	22.622	48.022	73.422	98.822	124.222	149.622	175.022	200.422	225.822
29 / 32″	0.906250	23.019	48.419	73.819	99.219	124.619	150.019	175.419	200.819	226.219
59 / 64″	0.921875	23.416	48.816	74.216	99.616	125.016	150.416	175.816	201.216	226.616
15 / 16″	0.937500	23.812	49.212	74.612	100.012	125.412	150.812	176.212	201.612	227.012
61 / 64″	0.953125	24.209	49.609	75.009	100.409	125.809	151.209	176.609	202.009	227.409
31 / 32″	0.968750	24.606	50.006	75.406	100.806	126.206	151.606	177.006	202.406	227.806
63 / 64″	0.984375	25.003	50.403	75.803	101.203	126.603	152.003	177.403	202.803	228.203

● Hardness Conversion Table (Reference)

Rockwell C scale hardness Load 1471N HRC	Vickers hardness HV	Brinell hardness		Rockwell hardness		Shore hardness HS
		Standard ball	Tungsten Carbide ball	A scale Load 588.4N Diamond circular cone	B scale Load 980.7N Diameter $^{1}/_{16}$in ball	
68	940	—	—	85.6	—	97
67	900	—	—	85.0	—	95
66	865	—	—	84.5	—	92
65	832	—	(739)	83.9	—	91
64	800	—	(722)	83.4	—	88
63	772	—	(705)	82.8	—	87
62	746	—	(688)	82.3	—	85
61	720	—	(670)	81.8	—	83
60	697	—	(654)	81.2	—	81
59	674	—	(634)	80.7	—	80
58	653	—	615	80.1	—	78
57	633	—	595	79.6	—	76
56	613	—	577	79.0	—	75
55	595	—	560	78.5	—	74
54	577	—	543	78.0	—	72
53	560	—	525	77.4	—	71
52	544	(500)	512	76.8	—	69
51	528	(487)	496	76.3	—	68
50	513	(475)	481	75.9	—	67
49	498	(464)	469	75.2	—	66
48	484	451	455	74.7	—	64
47	471	442	443	74.1	—	63
46	458	432	432	73.6	—	62
45	446	421	421	73.1	—	60
44	434	409	409	72.5	—	58
43	423	400	400	72.0	—	57
42	412	390	390	71.5	—	56
41	402	381	381	70.9	—	55
40	392	371	371	70.4	—	54
39	382	362	362	69.9	—	52

Rockwell C scale hardness Load 1471N HRC	Vickers hardness HV	Brinell hardness		Rockwell hardness		Shore hardness HS
		Standard ball	Tungsten Carbide ball	A scale Load 588.4N Diamond circular cone	B scale Load 980.7N Diameter $^{1}/_{16}$in ball	
38	372	353	353	69.4	—	51
37	363	344	344	68.9	—	50
36	354	336	336	68.4	(109.0)	49
35	345	327	327	67.9	(108.5)	48
34	336	319	319	67.4	(108.0)	47
33	327	311	311	66.8	(107.5)	46
32	318	301	301	66.3	(107.0)	44
31	310	294	294	65.8	(106.0)	43
30	302	286	286	65.3	(105.5)	42
29	294	279	279	64.7	(104.5)	41
28	286	271	271	64.3	(104.0)	41
27	279	264	264	63.8	(103.0)	40
26	272	258	258	63.3	(102.5)	38
25	266	253	253	62.8	(101.5)	38
24	260	247	247	62.4	(101.0)	37
23	254	243	243	62.0	100.0	36
22	248	237	237	61.5	99.0	35
21	243	231	231	61.0	98.5	35
20	238	226	226	60.5	97.8	34
(18)	230	219	219	—	96.7	33
(16)	222	212	212	—	95.5	32
(14)	213	203	203	—	93.9	31
(12)	204	194	194	—	92.3	29
(10)	196	187	187	—	90.7	28
(8)	188	179	179	—	89.5	27
(6)	180	171	171	—	87.1	26
(4)	173	165	165	—	85.5	25
(2)	166	158	158	—	83.5	24
(0)	160	152	152	—	81.7	24

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Tolerances of Shaft Dimensions

Classification of diameter mm		b12		c12		d6		e6		e12		f5		f6		g5	
Above	Below	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L
—	3	−140	−240	−60	−160	−20	−26	−14	−20	−14	−114	−6	−10	−6	−12	−2	−6
3	6	−140	−260	−70	−190	−30	−38	−20	−28	−20	−140	−10	−15	−10	−18	−4	−9
6	10	−150	−300	−80	−230	−40	−49	−25	−34	−25	−175	−13	−19	−13	−22	−5	−11
10	18	−150	−330	−95	−275	−50	−61	−32	−43	−32	−212	−16	−24	−16	−27	−6	−14
18	30	−160	−370	−110	−320	−65	−78	−40	−53	−40	−250	−20	−29	−20	−33	−7	−16
30	40	−170	−420	−120	−370	−80	−96	−50	−66	−50	−300	−25	−36	−25	−41	−9	−20
40	50	−180	−430	−130	−380												
50	65	−190	−490	−140	−440	−100	−119	−60	−79	−60	−360	−30	−43	−30	−49	−10	−23
65	80	−200	−500	−150	−450												
80	100	−220	−570	−170	−520	−120	−142	−72	−94	−72	−422	−36	−51	−36	−58	−12	−27
100	120	−240	−590	−180	−530												
120	140	−260	−660	−200	−600	−145	−170	−85	−110	−85	−485	−43	−61	−43	−68	−14	−32
140	160	−280	−680	−210	−610												
160	180	−310	−710	−230	−630												
180	200	−340	−800	−240	−700	−170	−199	−100	−129	−100	−560	−50	−70	−50	−79	−15	−35
200	225	−380	−840	−260	−720												
225	250	−420	−880	−280	−740												
250	280	−480	−1000	−300	−820	−190	−222	−110	−142	−110	−630	−56	−79	−56	−88	−17	−40
280	315	−540	−1060	−330	−850												
315	355	−600	−1170	−360	−930	−210	−246	−125	−161	−125	−695	−62	−87	−62	−98	−18	−43
355	400	−680	−1250	−400	−970												
400	450	−760	−1390	−440	−1070	−230	−270	−135	−175	−135	−765	−68	−95	−68	−108	−20	−47
450	500	−840	−1470	−480	−1110												

unit: μm

g6		h5		h6		h7		h8		h9		h10		h11		Classification of diameter mm	
H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	Above	Below
−2	−8	0	−4	0	−6	0	−10	0	−14	0	−25	0	−40	0	−60	—	3
−4	−12	0	−5	0	−8	0	−12	0	−18	0	−30	0	−48	0	−75	3	6
−5	−14	0	−6	0	−9	0	−15	0	−22	0	−36	0	−58	0	−90	6	10
−6	−17	0	−8	0	−11	0	−18	0	−27	0	−43	0	−70	0	−110	10	18
−7	−20	0	−9	0	−13	0	−21	0	−33	0	−52	0	−84	0	−130	18	30
−9	−25	0	−11	0	−16	0	−25	0	−39	0	−62	0	−100	0	−160	30	40
																40	50
−10	−29	0	−13	0	−19	0	−30	0	−46	0	−74	0	−120	0	−190	50	65
																65	80
−12	−34	0	−15	0	−22	0	−35	0	−54	0	−87	0	−140	0	−220	80	100
																100	120
−14	−39	0	−18	0	−25	0	−40	0	−63	0	−100	0	−160	0	−250	120	140
																140	160
																160	180
−15	−44	0	−20	0	−29	0	−46	0	−72	0	−115	0	−185	0	−290	180	200
																200	225
																225	250
−17	−49	0	−23	0	−32	0	−52	0	−81	0	−130	0	−210	0	−320	250	280
																280	315
−18	−54	0	−25	0	−36	0	−57	0	−89	0	−140	0	−230	0	−360	315	355
																355	400
−20	−60	0	−27	0	−40	0	−63	0	−97	0	−155	0	−250	0	−400	400	450
																450	500

Classification of diameter mm		h12		js5		j5		js6		j6		j7		k5		k6	
Above	Below	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L
—	3	0	−100	+2	−2	+2	−2	+3	−3	+4	−2	+6	−4	+4	0	+6	0
3	6	0	−120	+2.5	−2.5	+3	−2	+4	−4	+6	−2	+8	−4	+6	+1	+9	+1
6	10	0	−150	+3	−3	+4	−2	+4.5	−4.5	+7	−2	+10	−5	+7	+1	+10	+1
10	18	0	−180	+4	−4	+5	−3	+5.5	−5.5	+8	−3	+12	−6	+9	+1	+12	+1
18	30	0	−210	+4.5	−4.5	+5	−4	+6.5	−6.5	+9	−4	+13	−8	+11	+2	+15	+2
30	40	0	−250	+5.5	−5.5	+6	−5	+8	−8	+11	−5	+15	−10	+13	+2	+18	+2
40	50																
50	65	0	−300	+6.5	−6.5	+6	−7	+9.5	−9.5	+12	−7	+18	−12	+15	+2	+21	+2
65	80																
80	100	0	−350	+7.5	−7.5	+6	−9	+11	−11	+13	−9	+20	−15	+18	+3	+25	+3
100	120																
120	140	0	−400	+9	−9	+7	−11	+12.5	−12.5	+14	−11	+22	−18	+21	+3	+28	+3
140	160																
160	180																
180	200	0	−460	+10	−10	+7	−13	+14.5	−14.5	+16	−13	+25	−21	+24	+4	+33	+4
200	225																
225	250																
250	280	0	−520	+11.5	−11.5	+7	−16	+16	−16	+16	−16	+26	−26	+27	+4	+36	+4
280	315																
315	355	0	−570	+12.5	−12.5	+7	−18	+18	−18	+18	−18	+29	−28	+29	+4	+40	+4
355	400																
400	450	0	−630	+13.5	−13.5	+7	−20	+20	−20	+20	−20	+31	−32	+32	+5	+45	+5
450	500																

unit: μm

m5		m6		n5		n6		p6		Classification of diameter mm	
H	L	H	L	H	L	H	L	H	L	Above	Below
+6	+2	+8	+2	+8	+4	+10	+4	+12	+6	—	3
+9	+4	+12	+4	+13	+8	+16	+8	+20	+12	3	6
+12	+6	+15	+6	+16	+10	+19	+10	+24	+15	6	10
+15	+7	+18	+7	+20	+12	+23	+12	+29	+18	10	18
+17	+8	+21	+8	+24	+15	+28	+15	+35	+22	18	30
+20	+9	+25	+9	+28	+17	+33	+17	+42	+26	30	40
										40	50
+24	+11	+30	+11	+33	+20	+39	+20	+51	+32	50	65
										65	80
+28	+13	+35	+13	+38	+23	+45	+23	+59	+37	80	100
										100	120
+33	+15	+40	+15	+45	+27	+52	+27	+68	+43	120	140
										140	160
										160	180
+37	+17	+46	+17	+51	+31	+60	+31	+79	+50	180	200
										200	225
										225	250
+43	+20	+52	+20	+57	+34	+66	+34	+88	+56	250	280
										280	315
+46	+21	+57	+21	+62	+37	+73	+37	+98	+62	315	355
										355	400
+50	+23	+63	+23	+67	+40	+80	+40	+108	+68	400	450
										450	500

Tolerances of Housing Hole Dimensions

unit: μm

Classification of diameter mm		B12		E7		E11		E12		F6		F7		G6		G7	
Above	Below	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L
—	3	+240	+140	+24	+14	+74	+14	+114	+14	+12	+6	+16	+6	+8	+2	+12	+2
3	6	+260	+140	+32	+20	+95	+20	+140	+20	+18	+10	+22	+10	+12	+4	+16	+4
6	10	+300	+150	+40	+25	+115	+25	+175	+25	+22	+13	+28	+13	+14	+5	+20	+5
10	18	+330	+150	+50	+32	+142	+32	+212	+32	+27	+16	+34	+16	+17	+6	+24	+6
18	30	+370	+160	+61	+40	+170	+40	+250	+40	+33	+20	+41	+20	+20	+7	+28	+7
30	40	+420	+170	+75	+50	+210	+50	+300	+50	+41	+25	+50	+25	+25	+9	+34	+9
40	50	+430	+180														
50	65	+490	+190	+90	+60	+250	+60	+360	+60	+49	+30	+60	+30	+29	+10	+40	+10
65	80	+500	+200														
80	100	+570	+220	+107	+72	+292	+72	+422	+72	+58	+36	+71	+36	+34	+12	+47	+12
100	120	+590	+240														
120	140	+660	+260	+125	+85	+335	+85	+485	+85	+68	+43	+83	+43	+39	+14	+54	+14
140	160	+680	+280														
160	180	+710	+310														
180	200	+800	+340	+146	+100	+390	+100	+560	+100	+79	+50	+96	+50	+44	+15	+61	+15
200	225	+840	+380														
225	250	+880	+420														
250	280	+1000	+480	+162	+110	+430	+110	+630	+110	+88	+56	+108	+56	+49	+17	+69	+17
280	315	+1060	+540														
315	355	+1170	+600	+182	+125	+485	+125	+695	+125	+98	+62	+119	+62	+54	+18	+75	+18
355	400	+1250	+680														
400	450	+1390	+760	+198	+135	+535	+135	+765	+135	+108	+68	+131	+68	+60	+20	+83	+20
450	500	+1470	+840														

H6		H7		H8		H9		H10		H11		JS6		J6		Classification of diameter mm	
H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	Above	Below
+6	0	+10	0	+14	0	+25	0	+40	0	+60	0	+3	−3	+2	−4	—	3
+8	0	+12	0	+18	0	+30	0	+48	0	+75	0	+4	−4	+5	−3	3	6
+9	0	+15	0	+22	0	+36	0	+58	0	+90	0	+4.5	−4.5	+5	−4	6	10
+11	0	+18	0	+27	0	+43	0	+70	0	+110	0	+5.5	−5.5	+6	−5	10	18
+13	0	+21	0	+33	0	+52	0	+84	0	+130	0	+6.5	−6.5	+8	−5	18	30
+16	0	+25	0	+39	0	+62	0	+100	0	+160	0	+8	−8	+10	−6	30	40
																40	50
+19	0	+30	0	+46	0	+74	0	+120	0	+190	0	+9.5	−9.5	+13	−6	50	65
																65	80
+22	0	+35	0	+54	0	+87	0	+140	0	+220	0	+11	−11	+16	−6	80	100
																100	120
+25	0	+40	0	+63	0	+100	0	+160	0	+250	0	+12.5	−12.5	+18	−7	120	140
																140	160
																160	180
+29	0	+46	0	+72	0	+115	0	+185	0	+290	0	+14.5	−14.5	+22	−7	180	200
																200	225
																225	250
+32	0	+52	0	+81	0	+130	0	+210	0	+320	0	+16	−16	+25	−7	250	280
																280	315
+36	0	+57	0	+89	0	+140	0	+230	0	+360	0	+18	−18	+29	−7	315	355
																355	400
+40	0	+63	0	+97	0	+155	0	+250	0	+400	0	+20	−20	+33	−7	400	450
																450	500

Classification of diameter mm		JS7		J7		K5		K6		K7		M6		M7		N6	
Above	Below	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L
—	3	+5	−5	+4	−6	0	−4	0	−6	0	−10	−2	−8	−2	−12	−4	−10
3	6	+6	−6	+6	−6	0	−5	+2	−6	+3	−9	−1	−9	0	−12	−5	−13
6	10	+7	−7	+8	−7	+1	−5	+2	−7	+5	−10	−3	−12	0	−15	−7	−16
10	18	+9	−9	+10	−8	+2	−6	+2	−9	+6	−12	−4	−15	0	−18	−9	−20
18	30	+10	−10	+12	−9	+1	−8	+2	−11	+6	−15	−4	−17	0	−21	−11	−24
30	40	+12	−12	+14	−11	+2	−9	+3	−13	+7	−18	−4	−20	0	−25	−12	−28
40	50																
50	65	+15	−15	+18	−12	+3	−10	+4	−15	+9	−21	−5	−24	0	−30	−14	−33
65	80																
80	100	+17	−17	+22	−13	+2	−13	+4	−18	+10	−25	−6	−28	0	−35	−16	−38
100	120																
120	140	+20	−20	+26	−14	+3	−15	+4	−21	+12	−28	−8	−33	0	−40	−20	−45
140	160																
160	180																
180	200	+23	−23	+30	−16	+2	−18	+5	−24	+13	−33	−8	−37	0	−46	−22	−51
200	225																
225	250																
250	280	+26	−26	+36	−16	+3	−20	+5	−27	+16	−36	−9	−41	0	−52	−25	−57
280	315																
315	355	+28	−28	+39	−18	+3	−22	+7	−29	+17	−40	−10	−46	0	−57	−26	−62
355	400																
400	450	+31	−31	+43	−20	+2	−25	+8	−32	+18	−45	−10	−50	0	−63	−27	−67
450	500																

unit: μm

N7		P6		P7		R7		S7		Classification of diameter mm	
H	L	H	L	H	L	H	L	H	L	Above	Below
−4	−14	−6	−12	−6	−16	−10	−20	−14	−24	—	3
−4	−16	−9	−17	−8	−20	−11	−23	−15	−27	3	6
−4	−19	−12	−21	−9	−24	−13	−28	−17	−32	6	10
−5	−23	−15	−26	−11	−29	−16	−34	−21	−39	10	18
−7	−28	−18	−31	−14	−35	−20	−41	−27	−48	18	30
−8	−33	−21	−37	−17	−42	−25	−50	−34	−59	30	40
										40	50
−9	−39	−26	−45	−21	−51	−30	−60	−42	−72	50	65
						−32	−62	−48	−78	65	80
−10	−45	−30	−52	−24	−59	−38	−73	−58	−93	80	100
						−41	−76	−66	−101	100	120
−12	−52	−36	−61	−28	−68	−48	−88	−77	−117	120	140
						−50	−90	−85	−125	140	160
						−53	−93	−93	−133	160	180
−14	−60	−41	−70	−33	−79	−60	−106	−105	−151	180	200
						−63	−109	−113	−159	200	225
						−67	−113	−123	−169	225	250
−14	−66	−47	−79	−36	−88	−74	−126	−138	−190	250	280
						−78	−130	−150	−202	280	315
−16	−73	−51	−87	−41	−98	−87	−144	−169	−226	315	355
						−93	−150	−187	−244	355	400
−17	−80	−55	−95	−45	−108	−103	−166	−209	−272	400	450
						−109	−172	−229	−292	450	500

Model Code Index

Model code	Series name	Catalog name	Page
B			
BG	Stroke Rotary Cage	RED	Ⅱ-192
BK…A	Miniature Stroke Rotary Bushing	RED	Ⅱ-187
BSP…SL	Precision Linear Slide Unit	RED	Ⅱ- 89
BSPG…SL	Precision Linear Slide Unit	RED	Ⅱ- 91
BSR…SL	Precision Linear Slide Unit	RED	Ⅱ- 93
BSU…A	Linear Slide Unit	RED	Ⅱ- 99
BWU	High Rigidity Precision Linear Slide Unit	RED	Ⅱ- 81
C			
CRW	Crossed Roller Way	RED	Ⅱ- 33
CRW…SL	Crossed Roller Way	RED	Ⅱ- 33
CRWG	Anti-Creep Cage Crossed Roller Way	RED	Ⅱ- 27
CRWG…H	Anti-Creep Cage Crossed Roller Way H	RED	Ⅱ- 31
CRWM	Crossed Roller Way	RED	Ⅱ- 49
CRWU	Crossed Roller Way Unit	RED	Ⅱ- 63
CRWU…R	Crossed Roller Way Unit	RED	Ⅱ- 67
CRWU…RS	Crossed Roller Way Unit	RED	Ⅱ- 71
CRWUG	Anti-Creep Cage Crossed Roller Way Unit	RED	Ⅱ- 61
F			
FT	Flat Roller Cage	RED	Ⅱ-211
FT…N	Flat Roller Cage	RED	Ⅱ-211
FT…V	Flat Roller Cage	RED	Ⅱ-211
FTW…A	Flat Roller Cage	RED	Ⅱ-212
FTW…VA	Flat Roller Cage	RED	Ⅱ-212
G			
GSN	Roller Way	RED	Ⅱ-204
L			
LM	Linear Bushing	RED	Ⅱ-147
LM…AJ	Linear Bushing	RED	Ⅱ-147
LM…F	Linear Bushing	RED	Ⅱ-161
LM…F AJ	Linear Bushing	RED	Ⅱ-161
LM…F OP	Linear Bushing	RED	Ⅱ-161
LM…F UU	Linear Bushing	RED	Ⅱ-163
LM…F UU AJ	Linear Bushing	RED	Ⅱ-163
LM…F UU OP	Linear Bushing	RED	Ⅱ-163
LM…N	Linear Bushing	RED	Ⅱ-147
LM…N AJ	Linear Bushing	RED	Ⅱ-147
LM…N F	Linear Bushing	RED	Ⅱ-161
LM…N F AJ	Linear Bushing	RED	Ⅱ-161
LM…N F OP	Linear Bushing	RED	Ⅱ-161
LM…N F UU	Linear Bushing	RED	Ⅱ-163
LM…N F UU AJ	Linear Bushing	RED	Ⅱ-163
LM…N F UU OP	Linear Bushing	RED	Ⅱ-163
LM…N OP	Linear Bushing	RED	Ⅱ-147
LM…N UU	Linear Bushing	RED	Ⅱ-151
LM…N UU AJ	Linear Bushing	RED	Ⅱ-151
LM…N UU OP	Linear Bushing	RED	Ⅱ-151
LM…OP	Linear Bushing	RED	Ⅱ-147
LM…UU	Linear Bushing	RED	Ⅱ-151
LM…UU AJ	Linear Bushing	RED	Ⅱ-151
LM…UU OP	Linear Bushing	RED	Ⅱ-151
LMB	Linear Bushing	RED	Ⅱ-159
LMB…AJ	Linear Bushing	RED	Ⅱ-159
LMB…N	Linear Bushing	RED	Ⅱ-159
LMB…N AJ	Linear Bushing	RED	Ⅱ-159
LMB…N OP	Linear Bushing	RED	Ⅱ-159
LMB…OP	Linear Bushing	RED	Ⅱ-159
LME	Linear Bushing	RED	Ⅱ-155
LME…AJ	Linear Bushing	RED	Ⅱ-155
LME…F	Linear Bushing	RED	Ⅱ-165
LME…F AJ	Linear Bushing	RED	Ⅱ-165
LME…F OP	Linear Bushing	RED	Ⅱ-165
LME…F UU	Linear Bushing	RED	Ⅱ-167
LME…F UU AJ	Linear Bushing	RED	Ⅱ-167
LME…F UU OP	Linear Bushing	RED	Ⅱ-167
LME…N	Linear Bushing	RED	Ⅱ-155
LME…N AJ	Linear Bushing	RED	Ⅱ-155
LME…N F	Linear Bushing	RED	Ⅱ-165
LME…N F AJ	Linear Bushing	RED	Ⅱ-165

Note: BLUE denotes CAT-1591E, while RED denotes CAT-1592E.

Model Code Index

Model code	Series name	Catalog name	Page
LME…N F OP	Linear Bushing	RED	Ⅱ-165
LME…N F UU	Linear Bushing	RED	Ⅱ-167
LME…N F UU AJ	Linear Bushing	RED	Ⅱ-167
LME…N F UU OP	Linear Bushing	RED	Ⅱ-167
LME…N OP	Linear Bushing	RED	Ⅱ-155
LME…N UU	Linear Bushing	RED	Ⅱ-157
LME…N UU AJ	Linear Bushing	RED	Ⅱ-157
LME…N UU OP	Linear Bushing	RED	Ⅱ-157
LME…OP	Linear Bushing	RED	Ⅱ-155
LME…UU	Linear Bushing	RED	Ⅱ-157
LME…UU AJ	Linear Bushing	RED	Ⅱ-157
LME…UU OP	Linear Bushing	RED	Ⅱ-157
LMG	Linear Bushing G	RED	Ⅱ-139
LMGT	Linear Bushing G	RED	Ⅱ-139
LMS	Miniature Linear Bushing	RED	Ⅱ-172
LMS…F	Miniature Linear Bushing	RED	Ⅱ-172
LMS…F UU	Miniature Linear Bushing	RED	Ⅱ-172
LMS…UU	Miniature Linear Bushing	RED	Ⅱ-172
LMSL	Miniature Linear Bushing	RED	Ⅱ-172
LMSL…F	Miniature Linear Bushing	RED	Ⅱ-172
LMSL…F UU	Miniature Linear Bushing	RED	Ⅱ-172
LMSL…UU	Miniature Linear Bushing	RED	Ⅱ-172
LRWM	Linear Way Module	BLUE	Ⅱ-243
LRWX…B	Linear Roller Way X	BLUE	Ⅱ-227
LRWXH	Linear Roller Way X	BLUE	Ⅱ-229
LRX	Linear Roller Way Super X	BLUE	Ⅱ-191
LRXC	Linear Roller Way Super X	BLUE	Ⅱ-191
LRXD	Linear Roller Way Super X	BLUE	Ⅱ-199
LRXD…SL	Linear Roller Way Super X	BLUE	Ⅱ-199
LRXDC	Linear Roller Way Super X	BLUE	Ⅱ-199
LRXDC…SL	Linear Roller Way Super X	BLUE	Ⅱ-199
LRXDG	Linear Roller Way Super X	BLUE	Ⅱ-199
LRXDG…SL	Linear Roller Way Super X	BLUE	Ⅱ-199
LRXDL	Linear Roller Way Super X	BLUE	Ⅱ-207
LRXG	Linear Roller Way Super X	BLUE	Ⅱ-191
LRXH	Linear Roller Way Super X	BLUE	Ⅱ-191
LRXHC	Linear Roller Way Super X	BLUE	Ⅱ-191
LRXHG	Linear Roller Way Super X	BLUE	Ⅱ-191
LRXL	Linear Roller Way Super X	BLUE	Ⅱ-197
LRXS	Linear Roller Way Super X	BLUE	Ⅱ-209
LRXSC	Linear Roller Way Super X	BLUE	Ⅱ-209
LRXSG	Linear Roller Way Super X	BLUE	Ⅱ-209
LSAG	Linear Ball Spline G	RED	Ⅱ-123
LSAGF	Linear Ball Spline G	RED	Ⅱ-127
LSAGFL	Linear Ball Spline G	RED	Ⅱ-127
LSAGFLT	Linear Ball Spline G	RED	Ⅱ-127
LSAGFT	Linear Ball Spline G	RED	Ⅱ-127
LSAGL	Linear Ball Spline G	RED	Ⅱ-123
LSAGLT	Linear Ball Spline G	RED	Ⅱ-123
LSAGT	Linear Ball Spline G	RED	Ⅱ-123
LWE	Linear Way E	BLUE	Ⅱ- 75
LWE…Q	Low Decibel Linear Way E	BLUE	Ⅱ- 75
LWE…SL	Linear Way E	BLUE	Ⅱ- 75
LWEC	Linear Way E	BLUE	Ⅱ- 75
LWEC…SL	Linear Way E	BLUE	Ⅱ- 75
LWEG	Linear Way E	BLUE	Ⅱ- 75
LWEG…SL	Linear Way E	BLUE	Ⅱ- 75
LWES	Linear Way E	BLUE	Ⅱ- 83
LWES…Q	Low Decibel Linear Way E	BLUE	Ⅱ- 83
LWES…SL	Linear Way E	BLUE	Ⅱ- 83
LWESC	Linear Way E	BLUE	Ⅱ- 83
LWESC…SL	Linear Way E	BLUE	Ⅱ- 83
LWESG	Linear Way E	BLUE	Ⅱ- 83
LWESG…SL	Linear Way E	BLUE	Ⅱ- 83
LWET	Linear Way E	BLUE	Ⅱ- 79
LWET…Q	Low Decibel Linear Way E	BLUE	Ⅱ- 79
LWET…SL	Linear Way E	BLUE	Ⅱ- 79
LWETC	Linear Way E	BLUE	Ⅱ- 79
LWETC…SL	Linear Way E	BLUE	Ⅱ- 79
LWETG	Linear Way E	BLUE	Ⅱ- 79
LWETG…SL	Linear Way E	BLUE	Ⅱ- 79
LWFF	Linear Way F	BLUE	Ⅱ-151
LWFH	Linear Way F	BLUE	Ⅱ-149
LWFS	Linear Way F	BLUE	Ⅱ-153
LWFS…SL	Linear Way F	BLUE	Ⅱ-153
LWH…B	Linear Way H	BLUE	Ⅱ-107
LWH…M	Linear Way H	BLUE	Ⅱ-107
LWH…MU	Linear Way H	BLUE	Ⅱ-107

Note: BLUE denotes CAT-1591E, while RED denotes CAT-1592E.

Model Code Index

Model code	Series name	Catalog name	Page

L

Model code	Series name	Catalog name	Page
LWH···SL	Linear Way H	BLUE	Ⅱ-107
LWHD	Linear Way H	BLUE	Ⅱ-121
LWHD···B	Linear Way H	BLUE	Ⅱ-123
LWHD···M	Linear Way H	BLUE	Ⅱ-123
LWHD···MU	Linear Way H	BLUE	Ⅱ-123
LWHD···SL	Linear Way H	BLUE	Ⅱ-121
LWHDC···SL	Linear Way H	BLUE	Ⅱ-121
LWHDG	Linear Way H	BLUE	Ⅱ-123
LWHDG···SL	Linear Way H	BLUE	Ⅱ-121
LWHG	Linear Way H	BLUE	Ⅱ-107
LWHS···B	Linear Way H	BLUE	Ⅱ-127
LWHS···M	Linear Way H	BLUE	Ⅱ-127
LWHS···MU	Linear Way H	BLUE	Ⅱ-127
LWHS···SL	Linear Way H	BLUE	Ⅱ-127
LWHSG	Linear Way H	BLUE	Ⅱ-127
LWHT	Linear Way H	BLUE	Ⅱ-113
LWHT···B	Linear Way H	BLUE	Ⅱ-113
LWHT···M	Linear Way H	BLUE	Ⅱ-113
LWHT···MU	Linear Way H	BLUE	Ⅱ-113
LWHT···SL	Linear Way H	BLUE	Ⅱ-113
LWHTG	Linear Way H	BLUE	Ⅱ-115
LWHY	Linear Way H	BLUE	Ⅱ-131
LWL	Linear Way L	BLUE	Ⅱ-23
LWL···B	Linear Way L	BLUE	Ⅱ-25
LWL···B CS	Linear Way L	BLUE	Ⅱ-27
LWL···N	Linear Way L	BLUE	Ⅱ-25
LWL···Y	Linear Way L	BLUE	Ⅱ-23
LWLC	Linear Way L	BLUE	Ⅱ-23
LWLC···B	Linear Way L	BLUE	Ⅱ-25
LWLC···N	Linear Way L	BLUE	Ⅱ-25
LWLF	Linear Way L	BLUE	Ⅱ-31
LWLF···B	Linear Way L	BLUE	Ⅱ-31
LWLF···BCS	Linear Way L	BLUE	Ⅱ-35
LWLF···N	Linear Way L	BLUE	Ⅱ-31
LWLFC	Linear Way L	BLUE	Ⅱ-31
LWLFC···B	Linear Way L	BLUE	Ⅱ-31
LWLFC···N	Linear Way L	BLUE	Ⅱ-31
LWLFG···B	Linear Way L	BLUE	Ⅱ-33
LWLFG···N	Linear Way L	BLUE	Ⅱ-33
LWLG···B	Linear Way L	BLUE	Ⅱ-25
LWLG···N	Linear Way L	BLUE	Ⅱ-25
LWLM	Linear Way Module	BLUE	Ⅱ-241
LWU···B	Linear Way U	BLUE	Ⅱ-167

M

Model code	Series name	Catalog name	Page
MAG	C-Lube Linear Ball Spline MAG	RED	Ⅱ-123
MAGF	C-Lube Linear Ball Spline MAG	RED	Ⅱ-127
MAGFT	C-Lube Linear Ball Spline MAG	RED	Ⅱ-127
MAGL	C-Lube Linear Ball Spline MAG	RED	Ⅱ-123
MAGLT	C-Lube Linear Ball Spline MAG	RED	Ⅱ-123
MAGT	C-Lube Linear Ball Spline MAG	RED	Ⅱ-123
ME	C-Lube Linear Way ME	BLUE	Ⅱ-75
ME···SL	C-Lube Linear Way ME	BLUE	Ⅱ-75
MEC	C-Lube Linear Way ME	BLUE	Ⅱ-75
MEC···SL	C-Lube Linear Way ME	BLUE	Ⅱ-75
MEG	C-Lube Linear Way ME	BLUE	Ⅱ-75
MEG···SL	C-Lube Linear Way ME	BLUE	Ⅱ-75
MES	C-Lube Linear Way ME	BLUE	Ⅱ-83
MES···SL	C-Lube Linear Way ME	BLUE	Ⅱ-83
MESC	C-Lube Linear Way ME	BLUE	Ⅱ-83
MESC···SL	C-Lube Linear Way ME	BLUE	Ⅱ-83
MESG	C-Lube Linear Way ME	BLUE	Ⅱ-83
MESG···SL	C-Lube Linear Way ME	BLUE	Ⅱ-83
MET	C-Lube Linear Way ME	BLUE	Ⅱ-79
MET···SL	C-Lube Linear Way ME	BLUE	Ⅱ-79
METC	C-Lube Linear Way ME	BLUE	Ⅱ-79
METC···SL	C-Lube Linear Way ME	BLUE	Ⅱ-79
METG	C-Lube Linear Way ME	BLUE	Ⅱ-79
METG···SL	C-Lube Linear Way ME	BLUE	Ⅱ-79
MH	C-Lube Linear Way MH	BLUE	Ⅱ-107
MH···M	C-Lube Linear Way MH	BLUE	Ⅱ-107
MH···MU	C-Lube Linear Way MH	BLUE	Ⅱ-107
MHD	C-Lube Linear Way MH	BLUE	Ⅱ-121
MHD···M	C-Lube Linear Way MH	BLUE	Ⅱ-123
MHD···MU	C-Lube Linear Way MH	BLUE	Ⅱ-123

Note: BLUE denotes CAT-1591E, while RED denotes CAT-1592E.

Model Code Index

Model code	Series name	Catalog name	Page
MHD···SL	C-Lube Linear Way MH	BLUE	Ⅱ-121
MHDC···SL	C-Lube Linear Way MH	BLUE	Ⅱ-121
MHDG	C-Lube Linear Way MH	BLUE	Ⅱ-123
MHDG···SL	C-Lube Linear Way MH	BLUE	Ⅱ-121
MHG	C-Lube Linear Way MH	BLUE	Ⅱ-107
MHS	C-Lube Linear Way MH	BLUE	Ⅱ-127
MHS···M	C-Lube Linear Way MH	BLUE	Ⅱ-129
MHS···MU	C-Lube Linear Way MH	BLUE	Ⅱ-129
MHS···SL	C-Lube Linear Way MH	BLUE	Ⅱ-127
MHSG	C-Lube Linear Way MH	BLUE	Ⅱ-127
MHT	C-Lube Linear Way MH	BLUE	Ⅱ-113
MHT···M	C-Lube Linear Way MH	BLUE	Ⅱ-115
MHT···MU	C-Lube Linear Way MH	BLUE	Ⅱ-115
MHT···SL	C-Lube Linear Way MH	BLUE	Ⅱ-113
MHTG	C-Lube Linear Way MH	BLUE	Ⅱ-113
ML	C-Lube Linear Way ML	BLUE	Ⅱ-25
MLC	C-Lube Linear Way ML	BLUE	Ⅱ-25
MLF	C-Lube Linear Way ML	BLUE	Ⅱ-31
MLFC	C-Lube Linear Way ML	BLUE	Ⅱ-31
MLFG	C-Lube Linear Way ML	BLUE	Ⅱ-33
MLG	C-Lube Linear Way ML	BLUE	Ⅱ-25
MLL	C-Lube Linear Way ML	BLUE	Ⅱ-27
MLV	C-Lube Linear Way MLV	BLUE	Ⅱ-47
MUL	C-Lube Linear Way MUL	BLUE	Ⅱ-167
MV	C-Lube Linear Way MV	BLUE	Ⅱ-59
MX	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-191
MXC	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-191
MXD	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-199
MXD···SL	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-199
MXDC	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-199
MXDG	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-199
MXDL	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-201
MXG	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-191
MXH	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-191
MXHC	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-191
MXHG	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-191
MXHL	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-191
MXL	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-191
MXN	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-213
MXNG	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-213
MXNL	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-213
MXNS	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-215
MXNSG	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-215
MXNSL	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-215
MXS	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-209
MXSC	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-209
MXSG	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-209
MXSL	C-Lube Linear Roller Way Super MX	BLUE	Ⅱ-209

O

Model code	Series name	Catalog name	Page
OR···A	Miniature Stroke Rotary Bushing	RED	Ⅱ-187

R

Model code	Series name	Catalog name	Page
RW	Roller Way	RED	Ⅱ-201
RWB	Roller Way	RED	Ⅱ-202

S

Model code	Series name	Catalog name	Page
SF···A	Miniature Stroke Rotary Bushing	RED	Ⅱ-187
SR	Roller Way	RED	Ⅱ-203
ST	Stroke Rotary Bushing	RED	Ⅱ-179
ST···B	Stroke Rotary Bushing	RED	Ⅱ-179
ST···UU	Stroke Rotary Bushing	RED	Ⅱ-181
ST···UU B	Stroke Rotary Bushing	RED	Ⅱ-181
STS	Miniature Stroke Rotary Bushing	RED	Ⅱ-187
STSI	Miniature Stroke Rotary Bushing	RED	Ⅱ-187

Note: BLUE denotes CAT-1591E, while RED denotes CAT-1592E.

IKO Linear Motion Rolling Guide Series, Configuration of General Catalog

IKO Linear Motion Rolling Guide Series General Catalog Consists of **BLUE** (CAT-1591E) and **RED** (CAT-1592E), the two volumes.

BLUE

CAT-1591E

【Models】

- Rail Guide Type
  - Endless Linear Motion Type

RED

CAT-1592E

【Models】

- Rail Guide Type
  - Limited Linear Motion Type
- Shaft Guide Type
  - Endless Linear Motion Type
  - Limited Linear Motion Type + Rolling Motion Type
- Flat Guide Type
  - Endless Linear Motion Type
  - Limited Linear Motion Type

C-Lube Linear Way ML
Linear Way L

C-Lube Linear Way MLV

C-Lube Linear Way MV

C-Lube Linear Way ME
Linear Way E

C-Lube Linear Way MH
Linear Way H

Linear Way F

C-Lube Linear Way MUL
Linear Way U

C-Lube
Linear Roller Way Super MX
Linear Roller Way Super X

Linear Roller Way X

Linear Way Module

Rail Guide Type
Crossed Roller Way

Rail Guide Type
Linear Slide Unit

Shaft Guide Type
Linear Ball Spline

Shaft Guide Type
Linear Bushing

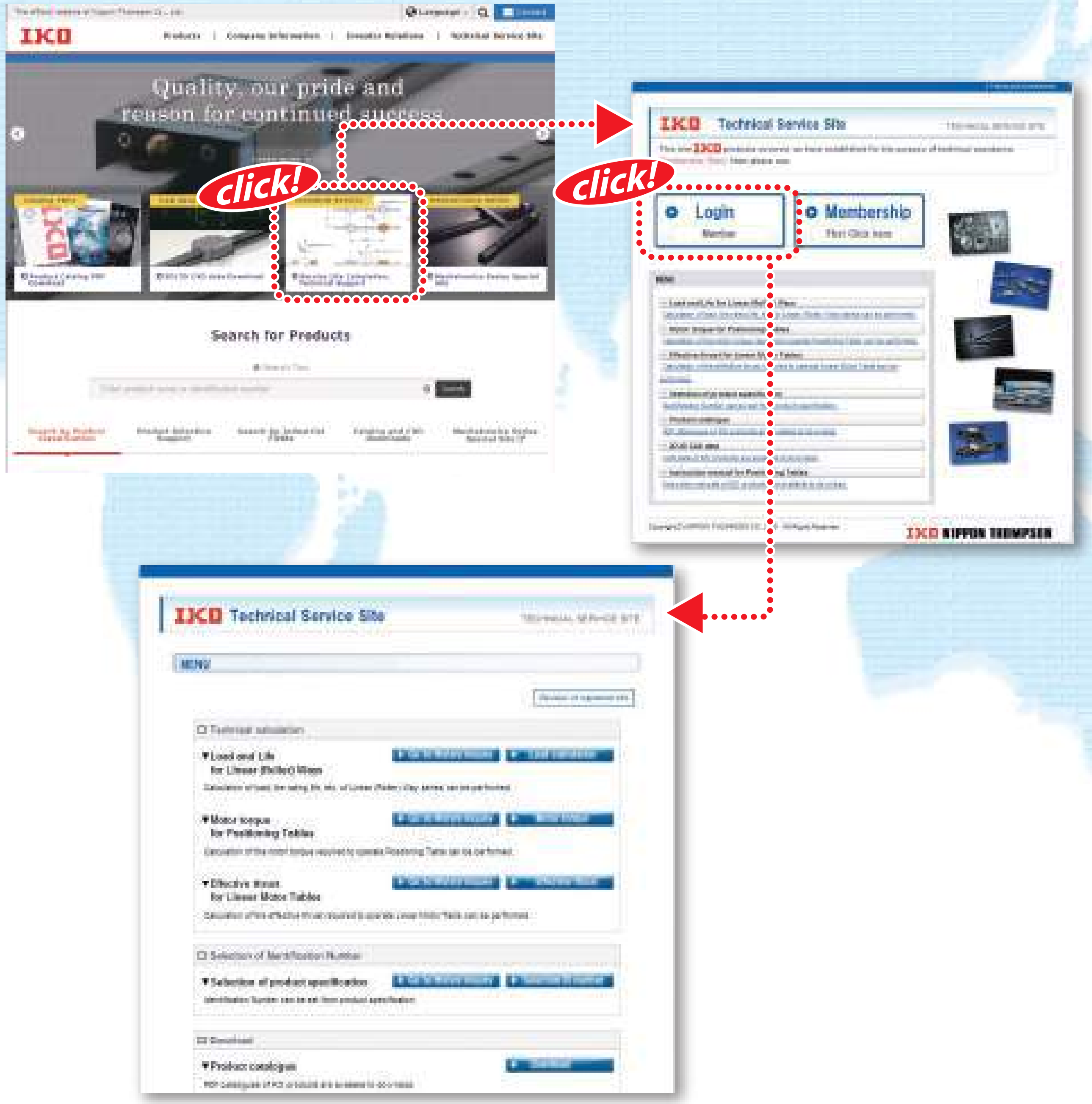
Shaft Guide Type
Stroke Rotary Bushing

Flat Guide Type
Roller Way & Flat Roller Cage

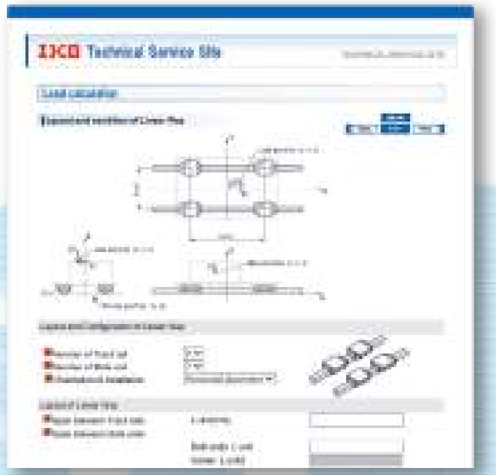
IKO Introduction of Technical Service Site

"IKO Technical Service Site" can be accessed from our home page. The site provides various tools for selecting Linear Ways and Linear Roller Ways. Please utilize these tools for assistance when selecting products. Additionally the site also provides CAD data and product catalogs for the Needle Series, Linear Motion Rolling Guide Series, and Mechatronics Series for download. Please utilize them to improve your design efficiency.

https://www.ikont.co.jp/eg/



1. Technical calculations



For Linear Way/Linear Roller Way load and life calculation, you can obtain the calculated load and the rating life by entering the operating conditions. Also you can derive the motor torque required for operation and the effective thrust force during operation in the sections of motor torque calculation and calculation of effective thrust force of linear motor tables respectively, and output the calculation results in PDF format, as well as save the histories.

2. Selection of Identification Number

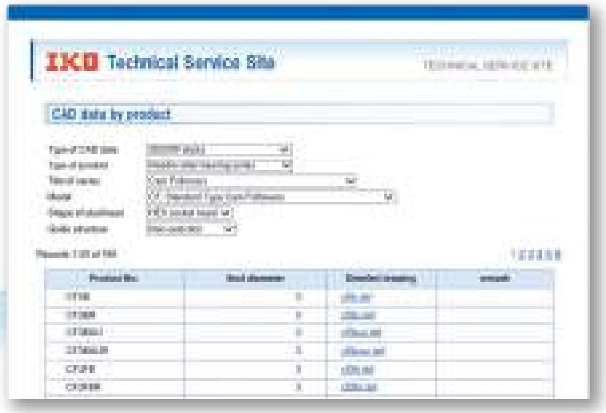
By selecting such specification as model code, dimensions, part code, material code, preload symbol, classification symbol, interchangeable code and supplemental code of Linear ways/Linear roller ways, you can easily specify the identification number used for ordering.

Also you can browse the CAD data of the selected products, calculate the load, and output the selection results in PDF format, as well as save the histories.

3. Downloading CAD data

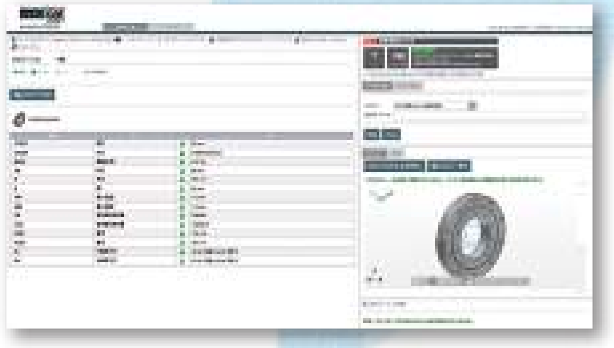
2-dimensional CAD data (DXF file)

There are two types of figures, brief figure and detailed figure. The brief figure shows only the external view lines, and the detailed figure shows the detailed lines. The drawing consists of three drawings: front view, side view and plain view. The scale shows only the original size (1:1), and it does not show dimension lines.



3-dimensional CAD data

It is linked to the mechanical parts CAD library "PART community". Entering the rail dimension and option contents to the detail, you can view the 2D/3D CAD data suitable for the specification for free of charge.



4. Downloading Catalog and Operation Manual

You can download product catalogs of needle series, linear motion rolling guide series and mechatronics series, operation manuals of precision positioning tables and various electrical components in PDF format, as well as support software for precision positioning tables. If you would like a copy of our catalog, please visit the IKO official website and apply for the catalog, or contact our regional office or sales office nearby.

Oil Minimum

IKO Gentle to The Earth

Nippon Thompson Co., Ltd. is working to develop global environment-friendly products. It is committed to developing products that make its customers' machinery and equipment more reliable, thereby contributing to preserving the global environment. This development stance manifests well in the keyword "**Oil Minimum.**" Our pursuit of Oil Minimum has led to the creation of IKO's proprietary family of lubricating parts as "C-Lube."

- IKO Linear Motion Rolling Guides are manufactured through a control system that alleviates their impact on the global environment to meet the quality requirements of ISO 14001 in compliance with the quality requirements level of ISO 9001 for quality improvement.
- The standard products listed in this catalog comply with the specifications of the ten hazardous materials cited in the European RoHS Directive.

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See you again at
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Dimensions Sheet

Inner Diameter	Outer Diameter	Length	IKO	THK	SAMICK	NB	MISUMI
mm(inch)							
6	12	19	LM-6UU	LM-6UU	LM-6UU	SM6GUU	LMU6
8S	15	17	LM-8SUU	LM-8SUU	LM-8SUU	SM8sGUU	-
8	15	24	LM-8UU	LM-8UU	LM-8UU	SM8GUU	LMU8
10	19	29	LM-10UU	LM-10UU	LM-10UU	SM10GUU	LMU10
13	23	32	LM-13UU	LM-13UU	LM-13UU	SM13GUU	LMU13
16	28	37	LM-16UU	LM-16UU	LM-16UU	SM16GUU	LMU16
20	32	42	LM-20UU	LM-20UU	LM-20UU	SM20GUU	LMU20
25	40	59	LM-25UU	LM-25UU	LM-25UU	SM25GUU	LMU25
5	12	22	LME-5UU	LME-5UU	LME-5UU	KB5GUU	-
8	16	25	LME-8UU	LME-8UU	LME-8UU	KB8GUU	-
12	22	32	LME-12UU	LME-12UU	LME-12UU	KB12GUU	-
16	26	36	LME-16UU	LME-16UU	LME-16UU	KB16GUU	-
20	32	45	LME-20UU	LME-20UU	LME-20UU	KB20GUU	-
25	40	58	LME-25UU	LME-25UU	LME-25UU	KB25GUU	-
6.350 (1/4)	12.700 (1/2)	19.050 (3/4)	LMB-4UU	LMB-4UU	-	SW4GUU	-
9.525 (3/8)	15.875 (5/8)	22.225 (7/8)	LMB-6UU	LMB-6UU	-	SW6GUU	-
12.700 (1/2)	22.225 (7/8)	31.750 (1_1/4)	LMB-8UU	LMB-8UU	-	SW8GUU	-
15.875 (5/8)	28.575 (1_1/8)	38.100 (1_1/2)	LMB-10UU	LMB-10UU	-	SW10GUU	-
19.050 (3/4)	31.750 (1_1/4)	41.275 1 5/8	LMB-12UU	LMB-12UU	-	SW12GUU	-
25.400 (1)	39.688 (1_9/16)	57.150 (2_1/4)	LMB-16UU	LMB-16UU	-	SW16GUU	-
31.750 (1_1/4)	50.800 (2)	66.675 (2_5/8)	LMB-20UU	LMB-20UU	-	SW20GUU	-

Some dimensions may vary. Please inquire to IKO when replacing.

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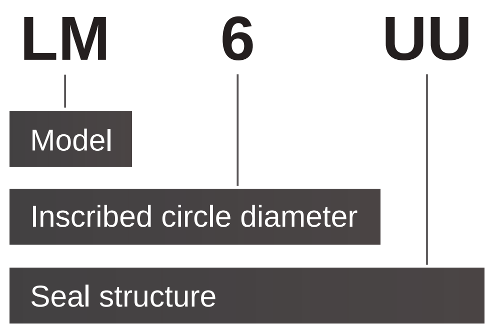
Linear Bushing
LM series

NIPPON THOMPSON CO., LTD.

Synthetic Resin Retainer Type Linear Bushing LM series

Reliable, high quality and affordable Japanese made is now offered!

Identification Number



Model

Linear Bushing (LM series)

Metric series : LM
LME(European specification(1))
Inch series : LMB

Inscribed circle diameter

For the metric series, is designated in mm.
For the inch series, is designated in units of 1/16 inch.

Seal structure

With two end seals : UU

End seals with superior dust protection performance for preventing intrusion of foreign substances are incorporated on the both side.

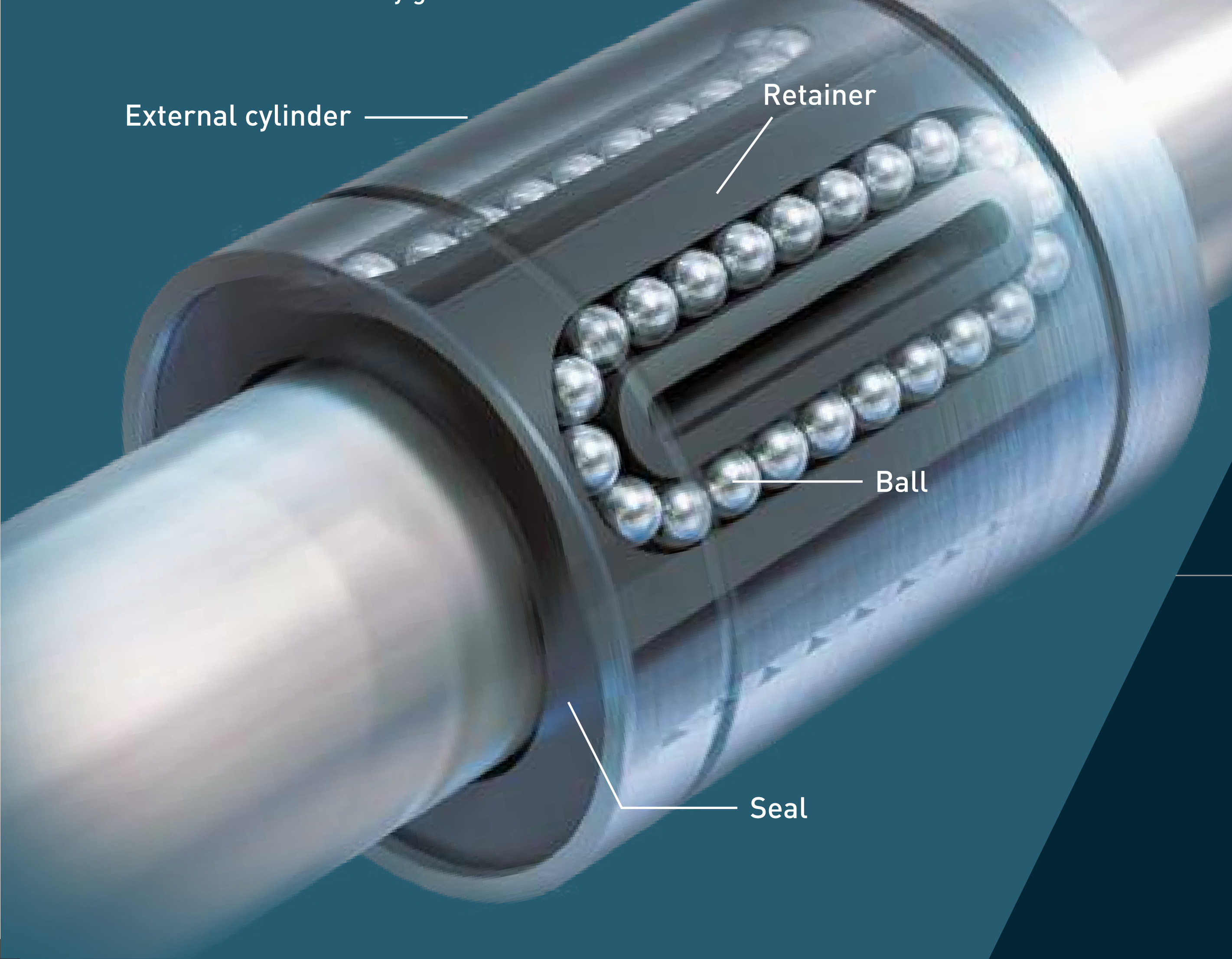
Note(1) It is specification with the dimensions and tolerances generally used in Europe.

Structure and Features

Synthetic Resin Retainer Type Linear Bushings are linear motion mechanisms that use balls for rolling motion. They can replace conventional sliding bushings without having to make major design changes.

Furthermore, coefficient of friction is extremely low. This reduces power consumption and lowers operating temperature. Also, Synthetic Resin Retainer helps reduce noise during operation.

IKO offers Metric (both Japanese and European) and Inch sizes to satisfy global market.



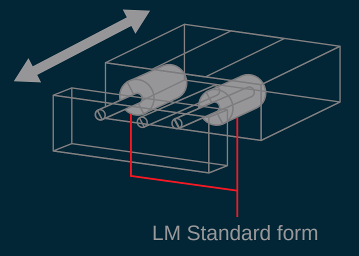
Advantages

1 By reassessing the whole manufacturing process and components, we can now provide a low-cost reliable Japanese made product.

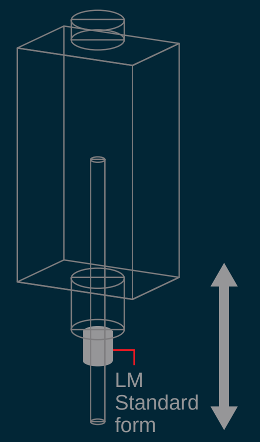
2 In addition to Metric sizes (both Japanese and European), we also offer Inch sizes as well to meet various customers' needs.

3 Thorough management of the manufacturing process achieves an exceptional level of quality and smooth motion.

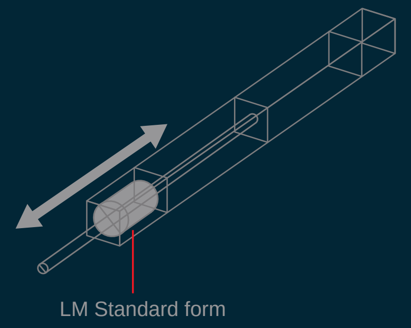
Applications



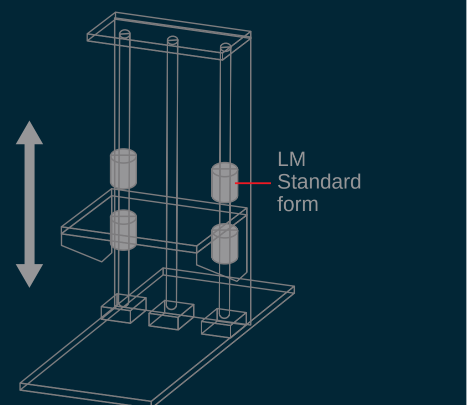
Air cylinder



Measuring instrument (Dial gauge)



Measuring instrument (Dial gauge)



Lifting stage

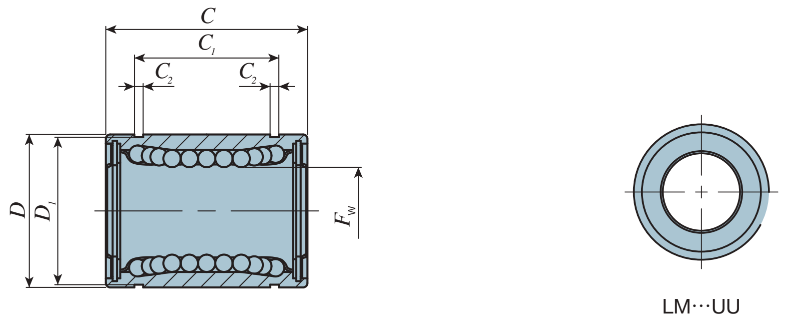
Uses

Cutting plotter

Air cylinder

Electric actuator

Dimension table



Metric series

Shaft diameter mm	Identification Number	Ball raceway	Mas (Ref.) g	Fw	Dim.Fw tolerance μm	D	Dim.D tolerance μm	C	Dim.C tolerance μm	C_1(1)	Dim.C_1 tolerance μm	C_2	D_1	Eccentricity Maximum μm	Basic dynamic load rating C Load direction A N	Basic dynamic load rating C Load direction B N	Basic static load rating C_0 Load direction A N	Basic static load rating C_0 Load direction B N
6	LM- 6 UU	4	8.0	6	0 -9	12	0 -11	19	0 -200	13.5	0 -200	1.1	11.5	12	67.3	77.3	146	206
8	LM- 8S UU	4	9.3	8		15		17		11.5		1.1	14.3		79.1	90.8	143	202
	LM- 8 UU	4	13.5	8		15		24		17.5		1.1	14.3		128	148	286	405
10	LM- 10 UU	4	25.0	10		19	0 -13	29		22		1.3	18		242	278	495	700
13	LM- 13 UU	4	38.0	13		23		32		23		1.3	22		292	336	578	818
16	LM- 16 UU	5	78.0	16		28		37		26.5		1.6	27		373	444	730	1070
20	LM- 20 UU	5	86.0	20	0 -10	32	0 -16	42		30.5		1.6	30.5	15	562	668	1010	1470
25	LM- 25 UU	6	210	25		40		59	0 -300	41	0 -300	1.85	38		1110	1170	2320	2970

Metric series (European specification)

Shaft diameter mm	Identification Number	Ball raceway	Mas (Ref.) g	Fw	Dim.Fw tolerance μm	D	Dim.D tolerance μm	C	Dim.C tolerance μm	C_1(1)	Dim.C_1 tolerance μm	C_2	D_1	Eccentricity Maximum μm	Basic dynamic load rating C Load direction A N	Basic dynamic load rating C Load direction B N	Basic static load rating C_0 Load direction A N	Basic static load rating C_0 Load direction B N
5	LME- 5 UU	4	11.4	5	+8 0	12	0 -8	22	0 -200	14.5	0 -200	1.1	11.5	12	78.5	90.2	197	279
8	LME- 8 UU	4	18.5	8		16		25		16.5		1.1	15.2		110	126	229	324
12	LME- 12 UU	4	37.0	12		22	0 -9	32		22.9		1.3	21		233	267	431	609
16	LME- 16 UU	5	52.0	16	+9 -1	26		36		24.9		1.3	24.9		343	408	649	950
20	LME- 20 UU	5	89.0	20		32	0 -11	45		31.5		1.6	30.3	15	562	668	1010	1470
25	LME- 25 UU	6	203	25	+11 -1	40		58	0 -300	44.1	0 -300	1.85	37.5		1050	1110	2140	2740

Inch series

Shaft diameter mm (inch)	Identification Number	Ball raceway	Mas (Ref.) g	Fw	Dim.Fw tolerance μm	D	Dim.D tolerance μm	C	Dim.C tolerance μm	C_1(1)	Dim.C_1 tolerance μm	C_2	D_1	Eccentricity Maximum μm	Basic dynamic load rating C Load direction A N	Basic dynamic load rating C Load direction B N	Basic static load rating C_0 Load direction A N	Basic static load rating C_0 Load direction B N
6.350 (1/4)	LMB- 4 UU	4	8.4	1/4 6.350	0 -8	1/2 12.700	0 -11	3/4 19.050	0 -200	1.3	0 -200	0.99	11.91	12	74.5	85.6	165	233
9.525 (3/8)	LMB- 6 UU	4	11.8	3/8 9.525		5/8 15.875	0 -14	7/8 22.225		16.15		0.99	14.94		116	133	232	328
12.700 (1/2)	LMB- 8 UU	4	34.2	1/2 12.700		7/8 22.225		1 1/4 31.750		24.46		1.17	20.85		264	303	505	714
15.875 (5/8)	LMB- 10 UU	4	71.2	5/8 15.875		1 1/8 28.575		1 1/2 38.100		28.04		1.42	26.90		424	488	766	1080
19.050 (3/4)	LMB- 12 UU	5	88.4	3/4 19.050	0 -10	1 1/4 31.750	0 -15	1 5/8 41.275		29.61		1.42	29.87	15	554	659	1000	1470
25.400 (1)	LMB- 16 UU	6	178	1 25.400		1 9/16 39.688		2 1/4 57.150	0 -300	44.57	0 -300	1.73	37.31		1050	1110	2140	2740
31.750 (1 1/4)	LMB- 20 UU	6	363	1 1/4 31.750	0 -12	2 50.800	0 -17	2 5/8 66.675		50.92		1.73	47.90	20	1580	1670	3070	3920

Note(1) the width of hub for fixing with circlip should be the value obtained by subtracting a circlip width value times two from the C_1.

Relationship between Load Rating and Ball Raceway

The load rating of LM series varies according to the loading direction and position of the ball raceways. The dimension table describes two types of values shown in Fig. 1.1 and Fig. 1.2 according to the loading direction and position of the ball raceways.
Fig. 1.1 shows the case where the loading direction and ball raceway position coincide with each other, representing the loading direction A in the dimension table. Generally, these load ratings are applied when the ball raceway position cannot be specified or the load direction is unknown.
Fig. 1.2 shows the case where the loading direction is positioned between two (2) ball raceways, representing the loading direction B in the dimension table. Generally, this can be subjected to high load than loading direction A.

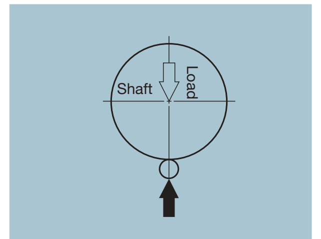


Fig. 1.1 Loading direction A

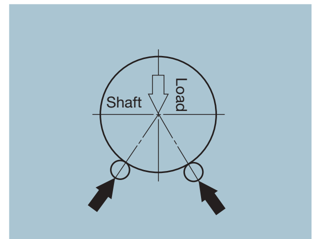
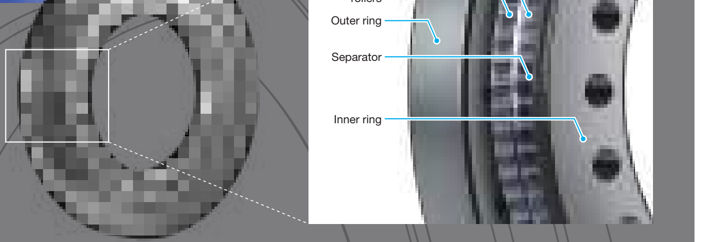


Fig. 1.2 Loading direction B

Double Row Angular Contact Roller Bearings
DRB/DRBF: An Introduction

Double Row Angular Contact Roller Bearings have a large number of cylindrical rollers with a large contact area with the raceway and an excellent load capacity, between the inner and outer rings arranged in two rows of raceways. This provides higher rigidity and lower torque than the High Rigidity Type Crossed Roller Bearings.

DRB/DRBF structure



1 Super high rigidity

Component rigidity is high because both the inner and outer rings have a solid one-piece construction, and the use of a double row raceway in the rear mating structure further increases rigidity.

2 High accuracy

The integrated structure (non split) constructed in both inner and outer rings helps avoid installation errors, yielding extra-high-rigidity and high-accuracy guiding performance without affecting the housing accuracy.

3 Smooth rotation

Since separators are incorporated between the cylindrical rollers for smooth rotation, these bearings are suitable for applications where rotational speed is comparatively high.

4 Contributing to miniaturization

The mounting holes in both inner and outer rings facilitate installation to your machines and equipment. Further, it is less subject to peripheral structures such as the housing or fixing plate and provides super high rigidity and high-accuracy guidance.

■Example of manufacturing dimensions

Boundary dimensions mm			Basic dynamic load rating C N	Basic static load rating C_0 N
Inner ring bore diameter	Outside dia. of outer ring	Width		
160	295	35	60 300	167 000
210	380	40	108 000	313 000
350	540	50	235 000	725 000

◎This is a special order product; if needed please contact IKO.

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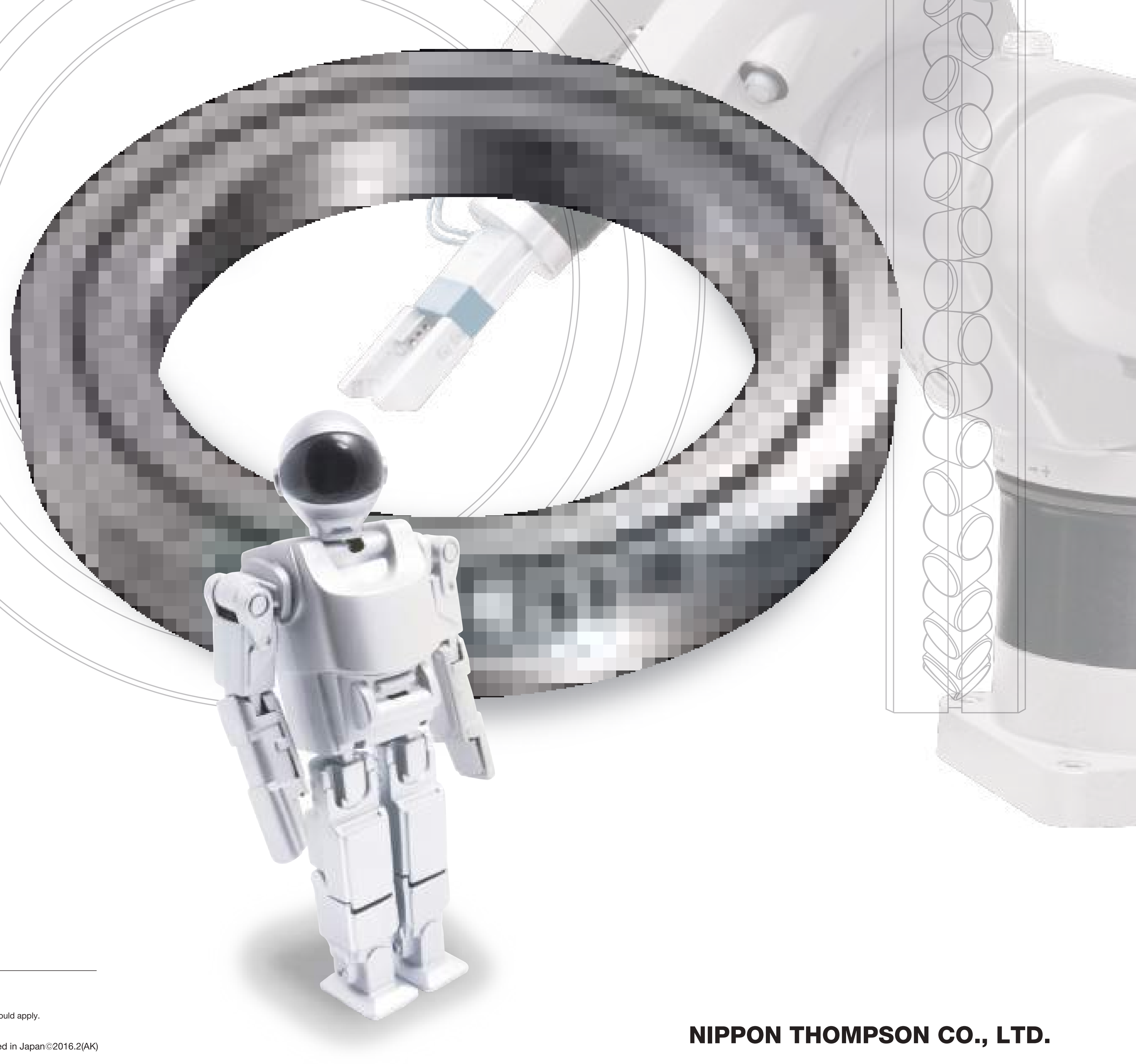
Innovation,Know-how & Originality

Constant Innovation For The Rotating World

IKO
Crossed Roller Bearings

Crossed Roller Bearings



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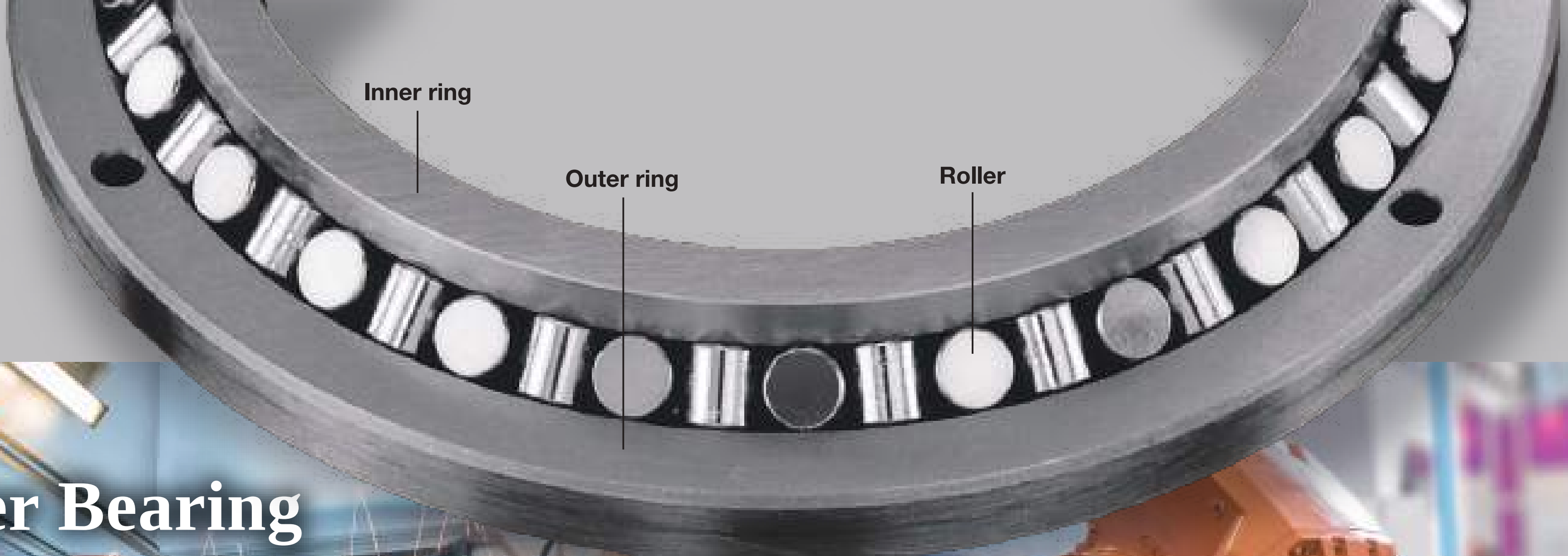


【What are Crossed Roller Bearings?】

Crossed Roller Bearings are compact bearings with their rollers alternately crossed at right angles to each other between inner and outer rings.

With their roller orthogonal array structure, they provide optimum performance when supporting a robot's wrist rotation.

The Crossed Roller Bearing
A necessity for advanced robots.

【What do robots have to do with Crossed Roller Bearings?】

Robots are currently working across a range of fields including medical robots and industrial robots for welding or part pickup.

These robots are evolving towards higher functions, higher performance, and higher quality,

which require high performance bearings to support their movement.

For example, the bearings supporting the swing of the arm-type robot in the figure at the right must withstand

the high load derived from high speed operation and complex motion.

Furthermore, they must not only stand up to this severe load, but also require high accuracy to enable precise motion.

Crossed Roller Bearings were created to be used in this demanding robot-specific environment.

CRB

Crossed Roller Bearings

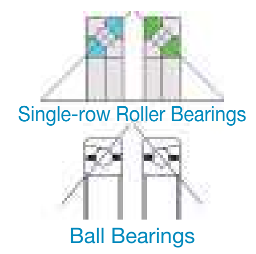
At this time, robots are working in diverse applications, including medicine, welding, component pickup and more.

Why are Crossed Roller Bearings the best choice for robots?

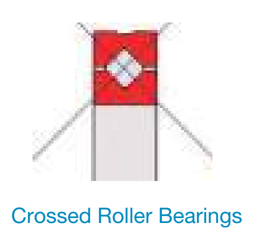
IKO's Crossed Roller Bearing's quality.

Compact

The orthogonal array of rollers reduces the cross sectional area of rear-mounted 45° contact angle roller bearings or single row ball bearings by half. This compact design allows you to more effectively utilize space in your application.

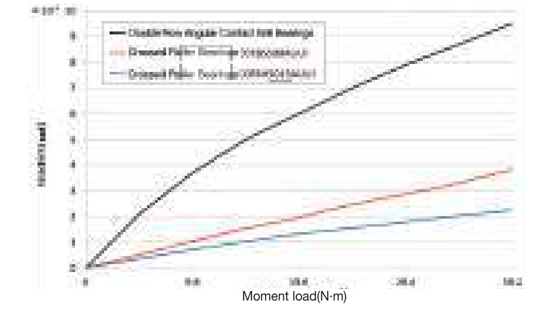

Single-row Roller Bearings

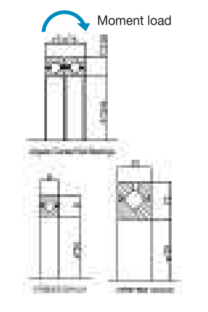
Ball Bearings

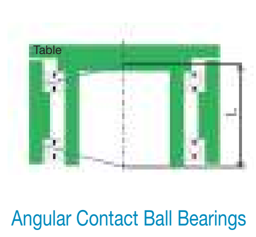

Crossed Roller Bearings

High Rigidity

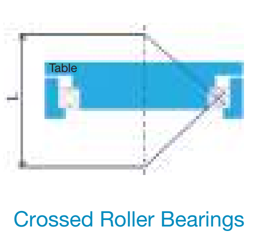
The figure at right is a cross-section of a rotating turntable. The application point distance from the time moment load is applied to the turntable is L, and the allowable moment load of the bearing is proportional to application point distance L. If increasing application point distance L to increase the moment rigidity of the turntable, two Angular Contact Ball Bearings are required. Because of the need for distance between the bearings, the equipment size increases as well. However, even a single Crossed Roller Bearing can increase application point distance L, keeping equipment compact and improving moment rigidity.







Angular Contact Ball Bearings

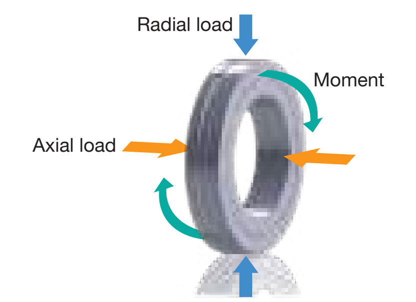


Crossed Roller Bearings

Because of the line contact structure, when using rollers for the bearing inner rolling elements, rigidity is greatly improved compared to ball type bearings. For example, rigidity is increased 3 to 4 times while achieving more compact cross-section dimensions compared to a double row Angular Contact Ball Bearing.

Usability

The orthogonal array of rollers allows the bearing to handle complex loads simultaneously from any direction, which makes assembly possible without needing to worry about load direction.



Quality

With IKO's manufacturing know-how and rigorous quality standards, supported by many years of experience with roller type bearings, highly accurate Crossed Roller Bearings can be produced.


Needle Roller Bearing manufacturing process
Grinding

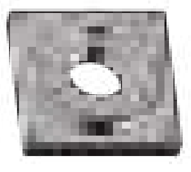

Needle Roller Bearing manufacturing process
Inspection

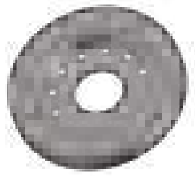
Diversity

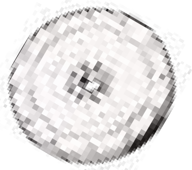
IKO Crossed Roller Bearings are available in a wide variety of types. For machine tools, large robots, and general industrial equipment, optimal types are CRBH, with its inner and outer ring combined integral structure, and CRB/CRBC, with outer rings split in two in the axial direction. For electric and electronic automated equipment such as small/medium robotic joints or semiconductors, the slim CRBS with its small cross-sectional dimension works best. For even smaller precision equipment, the Super Slim Type CRBT is optimal with its minimized cross-sectional area. The high rigidity CRBF is also available, with mounting holes to simplify the mating housing structure.

Flexibility

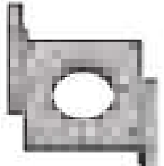
With the multi-model production enabled by IKO's unique flexibility, we offer Crossed Roller Bearings with individual specifications customized to customers' usage applications. We have a solid record of production for a wide variety of special products with shapes, sizes, surface treatments etc. that are not available in standard products; feel free to contact IKO when needing assistance with special applications that stock products can't handle.


Outer Ring Flange Type Specification


Inner Ring Stepped Type Specification


Inner Ring Mounting Hole Special Specification


Special Surface Treatment Specification


Linear Motion Rolling Guide Integrated Specification

Lineup

Offering superior performance for state-of-the-art devices, optimal for components requiring precision and smooth movement.

CRB
Crossed Roller Bearings

Standard Type Crossed Roller Bearings

The outer ring is made of two split pieces, which are bolted together to prevent separation during transportation or mounting. So handling is easy. A wide variety of sizes enables support for multiple applications. Because the outer ring is split, it is mainly used with a fixed outer ring and rotating inner ring.

CRB

Full Complement Split Outer Ring Crossed Roller Bearings. Optimal for heavy loads at low speeds since they have a large load capacity.

Variation					
Size	Shaft dia. 30-800 mm				
Seal	Yes		None		
Clearance	T1 (Preload)	C1 (Slight)	C2 (Medium)	No symbol (Normal)	
Accuracy class	Class 0	Class 6	Class 5	Class 4	Class 2

Accuracy → High

CRBC

Split Outer Ring Crossed Roller Bearings with Cage. Suited for applications with high rotational speed due to their low friction coefficient.

Variation					
Size	Shaft dia. 30-800 mm				
Seal	Yes		None		
Clearance	T1 (Preload)	C1 (Slight)	C2 (Medium)	No symbol (Normal)	
Accuracy class	Class 0	Class 6	Class 5	Class 4	Class 2

Accuracy → High

High Rigidity Type Crossed Roller Bearings

Both inner and outer rings have a solid one-piece construction (non-separable). Therefore, high accuracy and high rigidity are achieved, and mounting errors can be minimized. Separators are incorporated between cylindrical rollers for smooth rotation.

CRBH···A

The integrated structure of the inner and outer rings allow these Crossed Roller Bearings to provide both compactness and high rigidity. They are suited for applications with high rotational speed due to their smooth rotation.

Variation					
Size	Shaft dia. 20-300 mm				
Seal	Yes		None		
Clearance	T1 (Preload)	C1 (Slight)	C2 (Medium)	No symbol (Normal)	
Accuracy class	Class 0	Class 6	Class 5	Class 4	Class 2

Accuracy → High

CRBF···A

Crossed Roller Bearings with mounting holes on both the inner and outer rings facilitate installation into your machines and equipment. The mounting holes make them less dependent upon peripheral structures such as the housing or fixing plate, so surrounding parts of the bearing can be made compact.

Variation					
Size	Shaft dia. 10-115 mm				
Seal	Yes		None		
Clearance	T1 (Preload)	C1 (Slight)	C2 (Medium)	No symbol (Normal)	
Accuracy class	Class 0	Class 6	Class 5	Class 4	Class 2

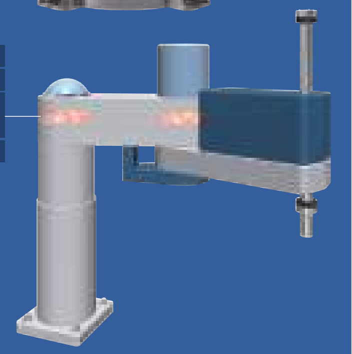
Accuracy → High

Examples of use

Heavy-duty transport robot

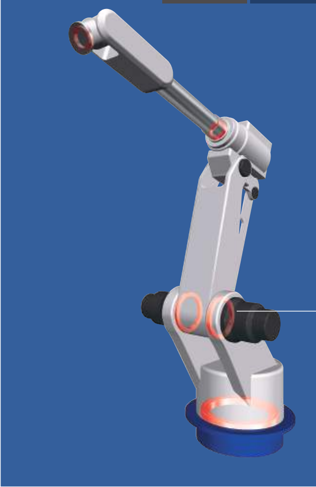
Structure	Vertical articulation
Location used	Base swivel part
Required performance	Used in the area receiving the highest load; this application requires not only high load capacity but also compactness.
Model used	Standard Type Crossed Roller Bearing CRB

Pick-up robot



Structure	Horizontal articulation
Location used	Joint swivel part
Required performance	Smooth, high speed movement is required to achieve high tact.
Model used	High Rigidity Type Crossed Roller Bearing CRBH···A

Welding robot



Structure	Vertical articulation
Location used	Joint swivel part
Required performance	Accurate positioning is a must, requiring high-rigidity bearings with high rotational accuracy and low deflection.
Model used	Mounting Holed Type High Rigidity Crossed Roller Bearing CRBF···A

Slim and Super Slim Type Crossed Roller Bearings

Slim Crossed Roller Bearings have integrated inner and outer rings (non-separable), a small outside diameter when compared to the bore diameter, and a narrow width. They help make machines or equipment more compact and lightweight.

CRBT···A

Super Slim Type Crossed Roller Bearings are extremely compact bearings with 5.5 mm sectional height and 5 mm width.

Variation					
Size	Shaft dia. 20-50 mm				
Seal	Yes		None		
Clearance	T1 (Preload)	C1 (Slight)	C2 (Medium)	No symbol (Normal)	
Accuracy class	Class 0	Class 6	Class 5	Class 4	Class 2

Accuracy → High

CRBS

Slim Type Crossed Roller Bearings offer a wide variety of sizes, with cage, separator, or full complement interior specifications that can be modified to suit a wide range of applications.

Variation					
Size	Shaft dia. 50-200 mm				
Seal	Yes		None		
Clearance	T1 (Preload)	C1 (Slight)	C2 (Medium)	No symbol (Normal)	
Accuracy class	Class 0	Class 6	Class 5	Class 4	Class 2

Accuracy → High

Examples of use

Transport robot

Structure	Horizontal articulation
Location used	Joint swivel part
Required performance	For high rigidity, compactness, and use avoiding oil, corrosion-resistance without the use of anti-rust oil was required.
Model used	Special Surface Treatment Specification Slim Type Crossed Roller Bearing CRBS

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IKO

DIMENSION and INTERCHANGE TABLE

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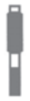

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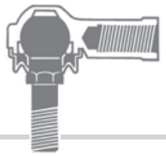

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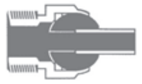

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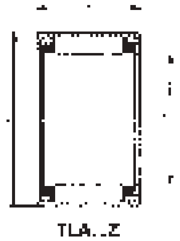
SHELL TYPE
NEEDLE ROLLER BEARINGS

Metric Dimension



DIMENSION TABLE **INTERCHANGE TABLE**

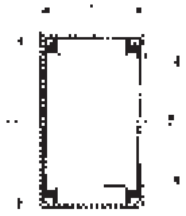
IKO NUMBER OPEN END	WEIGHT	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	USABLE INNER RING	INA	SKF	FAG	TORRINGTON
TLA..Z	(g)	Fw	D	C	(N)	(N)	**IRT**	HK	HK	HK	FJ
TLA 48 Z	1.54	4	8	8	1350	1010	—	HK 0408 TN	HK 0408 TN	HK 0408 TN	FJV-48
TLA 59 Z	1.9	5	9	9	1880	1600	—	HK 0509	HK 0509	HK 0509	FJV-59
TLA 69 Z	2.2	6	10	9	2100	1900	—	HK 0609	HK 0609	HK 0609	FJ-69
TLA 79 Z	2.5	7	11	9	2490	2450	—	HK 0709	HK 0709	HK 0709	FJV-79
TLA 810 Z	3.1	8	12	10	3320	3670	—	HK 0810	HK 0810	HK 0810	FJV-810
TLA 910 Z	3.4	9	13	10	3500	4040	—	HK 0910	HK 0910	HK 0910	FJV-910
TLA 912 Z	4	9	13	12	4460	5510	—	HK 0912	HK 0912	HK 0912	—
TLA 1010 Z	3.7	10	14	10	3870	4740	**IRT 710**	HK 1010	HK 1010	HK 1010	FJV-1010
TLA 1012 Z	4.4	10	14	12	4920	6460	**IRT 712**	HK 1012	HK 1012	HK 1012	FJV-1012
TLA 1015 Z	5.5	10	14	15	6390	9040	**IRT 715**	HK 1015	HK 1015	HK 1015	—
TLA 1210 Z	4.3	12	16	10	4350	5810	**IRT 810**	HK 1210	HK 1210	HK 1210	FJV-1210
TLA 1212 Z	8.6	12	18	12	6420	7490	**IRT 812**	HK 1212	HK 1212	HK 1212	FJHV-1212
TLA 1312 Z	9.2	13	19	12	6760	8170	**IRT 1012**	HK 1312	HK 1312	HK 1312	FJ-1312
TLA 1412 Z	9.8	14	20	12	7080	8840	**IRT 1012-2**	HK 1412	HK 1412	HK 1412	FJV-1412
TLA 1416 Z	13.2	14	20	16	8950	12000	**IRT 1016-2**	—	—	—	—
TLA 1512 Z	10.4	15	21	12	7380	9520	**IRT 1212**	HK 1512	HK 1512	HK 1512	FJV-1512
TLA 1516 Z	14	15	21	16	9330	12900	**IRT 1216**	HK 1516	HK 1516	HK 1516	FJ-1516
TLA 1522 Z	19.1	15	21	22	13600	20900	**IRT 1222**	HK 1522	HK 1522	HK 1522	FJV-1522
TLA 1612 Z	10.9	16	22	12	7670	10200	**IRT 1212-1**	HK 1612	HK 1612	HK 1612	FJV-1612
TLA 1616 Z	14.8	16	22	16	9700	13800	**IRT 1216-1**	HK 1616	HK 1616	HK 1616	FJV-1616
TLA 1622 Z	20	16	22	22	14200	22400	**IRT 1222-1**	HK 1622	HK 1622	HK 1622	—
TLA 1712 Z	11.5	17	23	12	7960	10900	—	HK 1712	HK 1712	HK 1712	FJV-1712
TLA 1812 Z	12	18	24	12	8230	11500	**IRT 1512**	HK 1812	HK 1812	HK 1812	FJV-1812
TLA 1816 Z	16.2	18	24	16	10400	15600	**IRT 1516**	HK 1816	HK 1816	HK 1816	FJV-1816
TLA 2012 Z	13.2	20	26	12	8740	12900	—	HK 2012	HK 2012	HK 2012	FJV-2012
TLA 2016 Z	17.8	20	26	16	11100	17500	**IRT 1716**	HK 2016	HK 2016	HK 2016	FJV-2016
TLA 2020 Z	22	20	26	20	14500	24700	**IRT 1720**	HK 2020	HK 2020	HK 2020	FJV-2020
TLA 2030 Z	33	20	26	30	22300	42900	**IRT 1730**	HK 2030	HK 2030	HK 2030	—
TLA 2212 Z	15.6	22	28	12	9230	14300	—	HK 2212	HK 2212	HK 2212	FJV-2212
TLA 2216 Z	21.5	22	28	16	11700	19300	**IRT 1716-2**	HK 2216	HK 2216	HK 2216	FJV-2216
TLA 2220 Z	26.5	22	28	20	15300	27300	**IRT 1720-2**	HK 2220	HK 2220	HK 2220	—
TLA 2512 Z	19.7	25	32	12	9440	13900	—	HK 2512	HK 2512	HK 2512	FJV-2512
TLA 2516 Z	26	25	32	16	12800	20500	—	HK 2516	HK 2516	HK 2516	FJV-2516
TLA 2520 Z	32	25	32	20	16900	29300	**IRT 2020-1**	HK 2520	HK 2520	HK 2520	FJV-2520
TLA 2526 Z	41.5	25	32	26	22600	42500	**IRT 2026-1**	HK 2526	HK 2526	HK 2526	—
TLAW 2538 Z	58.5	25	32	38	28900	58500	**IRT 2038-1**	HK 2538	HK 2538	HK 2538	—
TLA 2816 Z	28.5	28	35	16	13800	23500	—	HK 2816	HK 2816	HK 2816	FJV-2816
TLA 2820 Z	35.5	28	35	20	18300	33600	**IRT 2220-1**	HK 2820	HK 2820	HK 2820	FJV-2820
TLA 3012 Z	23.5	30	37	12	10400	16600	—	HK 3012	HK 3012	HK 3012	FJV-3012
TLA 3016 Z	30.5	30	37	16	14100	24500	—	HK 3016	HK 3016	HK 3016	FJV-3016

DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER OPEN END	WEIGHT	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	USABLE INNER RING	INA	SKF	FAG	TORRINGTON
TLA..Z	(g)	Fw	D	C	(N)	(N)	**IRT**	HK	HK	HK	FJ
TLA 3018 Z	34.5	30	37	18	16400	29800	—	—	—	—	—
TLA 3020 Z	38	30	37	20	18600	35100	**IRT 2520-1**	HK 3020	HK 3020	HK 3020	FJV-3020
TLA 3026 Z	49	30	37	26	24800	50900	**IRT 2526-1**	HK 3026	HK 3026	HK 3026	—
TLAW 3038 Z	69	30	37	38	31900	70200	**IRT 2538-1**	HK 3038	HK 3038	HK 3038	—
TLA 3512 Z	27	35	42	12	11600	20000	**IRT 3012**	HK 3512	HK 3512	HK 3512	—
TLA 3516 Z	35	35	42	16	15700	29600	—	HK 3516	HK 3516	HK 3516	FJV-3516
TLA 3520 Z	43.5	35	42	20	20700	42300	**IRT 3020**	HK 3520	HK 3520	HK 3520	FJV-3520
TLA 4012 Z	30	40	47	12	12400	22800	—	HK 4012	HK 4012	HK 4012	FJV-4012
TLA 4016 Z	39	40	47	16	16700	33700	—	HK 4016	HK 4016	HK 4016	—
TLA 4020 Z	49	40	47	20	22100	48200	**IRT 3520**	HK 4020	HK 4020	HK 4020	FJ-4020
TLA 4516 Z	43.5	45	52	16	17800	37800	—	HK 4516	HK 4516	HK 4516	FJ-4516
TLA 4520 Z	54.5	45	52	20	23400	54000	**IRT 4020**	HK 4520	HK 4520	HK 4520	FJV-4520
TLA 5020 Z	69	50	58	20	28800	64100	**IRT 4520**	HK 5020	HK 5020	HK 5020	FJ-5020
TLA 5025 Z	86	50	58	25	36900	88400	**IRT 4525**	HK 5025	HK 5025	HK 5025	—
TLA 5520 Z	75	55	63	20	29800	69400	**IRT 5020-1**	HK 5520	HK 5520	—	FJ-5520
TLA 5525 Z	98.5	55	63	25	38300	95700	**IRT 5025-1**	—	—	—	—

SHELL TYPE NEEDLE ROLLER BEARINGS

Metric Dimension



TLAM

DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER CLOSED END **TLAM**	WEIGHT (g)	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	USABLE INNER RING **IRT**	INA BK	SKF BK	FAG BK
		Fw	D	C						
TLAM 48	1.67	4	8	8	1350	1010	—	BK 0408 TN	BK 0408 TN	BK 0408 TN
TLAM 59	2	5	9	9	1880	1600	—	BK 0509	BK 0509	BK 0509
TLAM 69	2.3	6	10	9	2100	1900	—	BK 0609	BK 0609	BK 0609
TLAM 79	2.7	7	11	9	2490	2450	—	BK 0709	BK 0709	BK 0709
TLAM 810	3.3	8	12	10	3320	3670	—	BK 0810	BK 0810	BK 0810
TLAM 910	3.6	9	13	10	3500	4040	—	BK 0910	BK 0910	BK 0910
TLAM 912	4.3	9	13	12	4460	5510	—	BK 0912	BK 0912	BK 0912
TLAM 1010	4	10	14	10	3870	4740	**IRT 710**	BK 1010	BK 1010	BK 1010
TLAM 1012	4.8	10	14	12	4920	6460	**IRT 712**	BK 1012	BK 1012	BK 1012
TLAM 1015	5.9	10	14	15	6390	9040	**IRT 715**	BK 1015	BK 1015	BK 1015
TLAM 1210	4.7	12	16	10	4350	5810	**IRT 810**	BK 1210	BK 1210	BK 1210
TLAM 1212	9.4	12	18	12	6420	7490	**IRT 812**	BK 1212	BK 1212	BK 1212
TLAM 1312	10.1	13	19	12	6760	8170	**IRT 1012**	BK 1312	BK 1312	BK 1312
TLAM 1412	10.8	14	20	12	7080	8840	**IRT 1012-2**	BK 1412	BK 1412	BK 1412
TLAM 1416	14.3	14	20	16	8950	12000	**IRT 1016-2**	—	—	—
TLAM 1512	11.5	15	21	12	7380	9520	**IRT 1212**	BK 1512	BK 1512	BK 1512
TLAM 1516	15.2	15	21	16	9330	12900	**IRT 1216**	BK 1516	BK 1516	BK 1516
TLAM 1522	20.5	15	21	22	13600	20900	**IRT 1222**	BK 1522	BK 1522	BK 1522
TLAM 1612	12.2	16	22	12	7670	10200	**IRT 1212-1**	BK 1612	BK 1612	BK 1612
TLAM 1616	16.1	16	22	16	9700	13800	**IRT 1216-1**	BK 1616	BK 1616	BK 1616
TLAM 1622	21.5	16	22	22	14200	22400	**IRT 1222-1**	BK 1622	BK 1622	BK 1622
TLAM 1712	13	17	23	12	7960	10900	—	BK 1712	BK 1712	BK 1712
TLAM 1812	13.7	18	24	12	8230	11500	**IRT 1512**	BK 1812	BK 1812	BK 1812
TLAM 1816	17.9	18	24	16	10400	15600	**IRT 1516**	BK 1816	BK 1816	BK 1816
TLAM 2012	15.2	20	26	12	8740	12900	—	BK 2012	BK 2012	BK 2012
TLAM 2016	19.9	20	26	16	11100	17500	**IRT 1716**	BK 2016	BK 2016	BK 2016
TLAM 2020	24	20	26	20	14500	24700	**IRT 1720**	BK 2020	BK 2020	BK 2020
TLAM 2030	35	20	26	30	22300	42900	**IRT 1730**	BK 2030	BK 2030	BK 2030
TLAM 2212	18.1	22	28	12	9230	14300	—	BK 2212	BK 2212	BK 2212
TLAM 2216	24	22	28	16	11700	19300	**IRT 1716-2**	BK 2216	BK 2216	BK 2216
TLAM 2220	29	22	28	20	15300	27300	**IRT 1720-2**	BK 2220	BK 2220	BK 2220
TLAM 2512	23.5	25	32	12	9440	13900	—	BK 2512	BK 2512	BK 2512
TLAM 2516	29.5	25	32	16	12800	20500	—	BK 2516	BK 2516	BK 2516
TLAM 2520	36	25	32	20	16900	29300	**IRT 2020-1**	BK 2520	BK 2520	BK 2520
TLAM 2526	45.5	25	32	26	22600	42500	**IRT 2026-1**	BK 2526	BK 2526	BK 2526
TLAMW 2538	62	25	32	38	28900	58500	**IRT 2038-1**	BK 2538	BK 2538	BK 2538
TLAM 2816	33.5	28	35	16	13800	23500	—	BK 2816	BK 2816	BK 2816
TLAM 2820	40.5	28	35	20	18300	33600	**IRT 2220-1**	BK 2820	BK 2820	BK 2820
TLAM 3012	29	30	37	12	10400	16600	—	BK 3012	BK 3012	BK 3012
TLAM 3016	36	30	37	16	14100	24500	—	BK 3016	BK 3016	BK 3016

DIMENSION TABLE **INTERCHANGE TABLE**

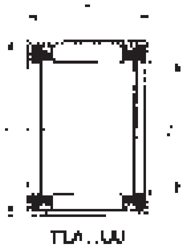
IKO NUMBER CLOSED END **TLAM**	WEIGHT (g)	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	USABLE INNER RING **IRT**	INA BK	SKF BK	FAG BK
		Fw	D	C						
TLAM 3018	40	30	37	18	16400	29800	—	—	—	—
TLAM 3020	43.5	30	37	20	18600	35100	**IRT 2520-1**	BK 3020	BK 3020	BK 3020
TLAM 3026	54.5	30	37	26	24800	50900	**IRT 2526-1**	BK 3026	BK 3026	BK 3026
TLAMW 3038	74.5	30	37	38	31900	70200	**IRT 2538-1**	BK 3038	BK 3038	BK 3038
TLAM 3512	34.5	35	42	12	11600	20000	**IRT 3012**	BK 3512	BK 3512	—
TLAM 3516	42.5	35	42	16	15700	29600	—	BK 3516	BK 3516	—
TLAM 3520	51	35	42	20	20700	42300	**IRT 3020**	BK 3520	BK 3520	—
TLAM 4012	40	40	47	12	12400	22800	—	BK 4012	BK 4012	—
TLAM 4016	49	40	47	16	16700	33700	—	BK 4016	BK 4016	—
TLAM 4020	58.5	40	47	20	22100	48200	**IRT 3520**	BK 4020	BK 4020	—
TLAM 4516	56	45	52	16	17800	37800	—	BK 4516	BK 4516	—
TLAM 4520	67	45	52	20	23400	54000	**IRT 4020**	BK 4520	BK 4520	—
TLAM 5020	84.5	50	58	20	28800	64100	**IRT 4520**	BK 5020	BK 5020	—
TLAM 5025	107	50	58	25	36900	88400	**IRT 4525**	BK 5025	BK 5025	—
TLAM 5520	98.5	55	63	20	29800	69400	**IRT 5020-1**	BK 5520	BK 5520	—
TLAM 5525	118	55	63	25	38300	95700	**IRT 5025-1**	—	—	—

IKO

TLA..UU

SHELL TYPE NEEDLE ROLLER BEARINGS

Metric Dimension



DIMENSION TABLE **INTERCHANGE TABLE**

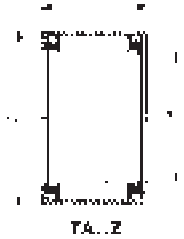
IKO NUMBER OPEN END TLA..UU	WEIGHT (g)	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	INA HK..2RS	SKF HK..2RS	FAG HK..2RS	TORRINGTON FJTT
		Fw	D	C						
TLA 1216 UU	11.7	12	18	16	6420	7490	HK 1216.2RS	HK 1216.2RS	HK 1216.2RS	FJHTT-1216
TLA 1416 UU	13.3	14	20	16	7080	8840	HK 1416.2RS	HK 1416.2RS	HK 1416.2RS	FJTT-1416
TLA 1516 UU	14	15	21	16	7380	9520	HK 1516.2RS	HK 1516.2RS	HK 1516.2RS	FJTT-1516
TLA 1616 UU	14.8	16	22	16	7670	10200	HK 1616.2RS	HK 1616.2RS	HK 1616.2RS	FJTT-1616
TLA 1816 UU	16.3	18	24	16	8230	11500	HK 1816.2RS	HK 1816.2RS	HK 1816.2RS	FJTT-1816
TLA 2016 UU	17.8	20	26	16	8740	12900	HK 2016.2RS	HK 2016.2RS	HK 2016.2RS	FJTT-2016
TLA 2020 UU	22.5	20	26	20	11100	17500	HK 2020.2RS	HK 2020.2RS	HK 2020.2RS	FJTT-2020
TLA 2216 UU	19.4	22	28	16	9230	14300	HK 2216.2RS	HK 2216.2RS	HK 2216.2RS	FJTT-2216
TLA 2220 UU	25	22	28	20	11700	19300	HK 2220.2RS	HK 2220.2RS	HK 2220.2RS	FJTT-2220
TLA 2516 UU	26	25	32	16	9440	13900	HK 2516.2RS	HK 2516.2RS	HK 2516.2RS	FJTT-2516
TLA 2520 UU	33	25	32	20	12800	20500	HK 2520.2RS	HK 2520.2RS	HK 2520.2RS	FJTT-2520
TLA 2820 UU	36.5	28	35	20	13800	23500	HK 2820.2RS	HK 2820.2RS	HK 2820.2RS	FJTT-2820
TLA 3016 UU	30.5	30	37	16	10400	16600	HK 3016.2RS	HK 3016.2RS	HK 3016.2RS	FJTT-3016
TLA 3020 UU	39	30	37	20	14100	24500	HK 3020.2RS	HK 3020.2RS	HK 3020.2RS	FJTT-3020
TLA 3516 UU	35	35	42	16	11600	20000	HK 3516.2RS	HK 3516.2RS	HK 3516.2RS	FJTT-3516
TLA 3520 UU	45	35	42	20	15700	29600	HK 3520.2RS	HK 3520.2RS	HK 3520.2RS	FJTT-3520
TLA 4016 UU	39.5	40	47	16	12400	22800	HK 4016.2RS	HK 4016.2RS	HK 4016.2RS	FJTT-4016
TLA 4020 UU	50.5	40	47	20	16700	33700	HK 4020.2RS	HK 4020.2RS	HK 4020.2RS	FJTT-4020
TLA 4520 UU	56	45	52	20	17800	37800	HK 4520.2RS	HK 4520.2RS	HK 4520.2RS	FJTT-4520
TLA 5026 UU	89	50	58	26	28800	64100	—	—	—	—

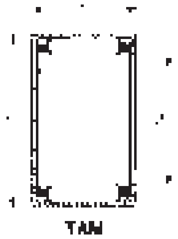
IKO

TA..Z•TAM

SHELL TYPE NEEDLE ROLLER BEARINGS

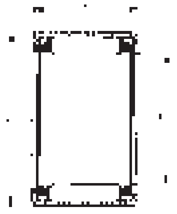
Metric Dimension



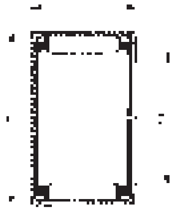


DIMENSION TABLE

IKO NUMBER OPEN END TA..Z	WEIGHT (g)	IKO NUMBER CLOSED END TAM	WEIGHT (g)	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	USABLE INNER RING IRT
				Fw	D	C			
TA 810 Z	6.7	**TAM 810**	7.1	8	15	10	3470	2880	—
TA 815 Z	9.7	**TAM 815**	10.1	8	15	15	5780	5570	—
TA 820 Z	12.9	**TAM 820**	13.3	8	15	20	8340	8920	—
TA 912 Z	8.7	**TAM 912**	9.2	9	16	12	5140	4880	—
TA 916 Z	11.4	**TAM 916**	11.9	9	16	16	6960	7210	—
TA 1010 Z	7.9	**TAM 1010**	8.5	10	17	10	4150	3780	**IRT 710**
TA 1012 Z	9.3	**TAM 1012**	10	10	17	12	5590	5540	**IRT 712**
TA 1015 Z	11.5	**TAM 1015**	12.2	10	17	15	6920	7300	**IRT 715**
TA 1020 Z	15.4	**TAM 1020**	16	10	17	20	9990	11700	—
TA 1212 Z	10.5	**TAM 1212**	11.5	12	19	12	6000	6310	**IRT 812**
TA 1215 Z	13.1	**TAM 1215**	14	12	19	15	7440	8320	**IRT 815**
TA 1220 Z	17.3	**TAM 1220**	18.3	12	19	20	10700	13300	—
TA 1225 Z	21.5	**TAM 1225**	22.5	12	19	25	13800	18300	—
TA 1416 Z	18.4	**TAM 1416**	19.6	14	22	16	10500	12000	**IRT 1016-2**
TA 1420 Z	23	**TAM 1420**	24	14	22	20	13900	17200	**IRT 1020-2**
TA 1510 Z	10.8	**TAM 1510**	12.3	15	22	10	5290	5680	**IRT 1010-1**
TA 1512 Z	12.9	**TAM 1512**	14.3	15	22	12	7120	8310	**IRT 1012-1**
TA 1515 Z	15.9	**TAM 1515**	17.3	15	22	15	8830	11000	**IRT 1015-1**
TA 1520 Z	21	**TAM 1520**	22.5	15	22	20	12700	17600	**IRT 1020-1**
TA 1525 Z	25	**TAM 1525**	26.5	15	22	25	16300	24200	**IRT 1025-1**
TA 1616 Z	20	**TAM 1616**	22	16	24	16	11100	13300	**IRT 1216-1**
TA 1620 Z	25	**TAM 1620**	27	16	24	20	14700	19100	**IRT 1220-1**
TA 1715 Z	17.6	**TAM 1715**	19.5	17	24	15	9660	12700	**IRT 1215-2**
TA 1720 Z	23.5	**TAM 1720**	25	17	24	20	13900	20400	**IRT 1220-2**
TA 1725 Z	29	**TAM 1725**	31	17	24	25	17900	28100	**IRT 1225-2**
TA 1813 Z	16.4	**TAM 1813**	18.5	18	25	13	9100	12000	**IRT 1513**
TA 1815 Z	18.5	**TAM 1815**	20.5	18	25	15	10100	13600	**IRT 1515**
TA 1817 Z	21	**TAM 1817**	23	18	25	17	11900	16900	**IRT 1517**
TA 1819 Z	23.5	**TAM 1819**	25.5	18	25	19	13700	20200	**IRT 1519**
TA 1820 Z	24.5	**TAM 1820**	26.5	18	25	20	14500	21800	**IRT 1520**
TA 1825 Z	30.5	**TAM 1825**	32.5	18	25	25	18600	30000	**IRT 1525**
TA 1916 Z	23	**TAM 1916**	25.5	19	27	16	12200	15700	**IRT 1516-1**
TA 1920 Z	29	**TAM 1920**	31	19	27	20	16100	22600	**IRT 1520-1**
TA 2015 Z	20	**TAM 2015**	22.5	20	27	15	10400	14600	**IRT 1515-2**
TA 2020 Z	26.5	**TAM 2020**	29	20	27	20	15000	23400	**IRT 1520-2**
TA 2025 Z	33	**TAM 2025**	35.5	20	27	25	19200	32200	**IRT 1525-2**
TA 2030 Z	39.5	**TAM 2030**	42	20	27	30	23100	41000	**IRT 1530-2**
TA 202820 Z	30	**TAM 202820**	32.5	20	28	20	16900	24300	**IRT 1520-2**
TA 2116 Z	25	**TAM 2116**	28	21	29	16	13300	18100	**IRT 1716-1**
TA 2120 Z	31.5	**TAM 2120**	34.5	21	29	20	17600	25900	**IRT 1720-1**



TA..Z



TAM

DIMENSION TABLE

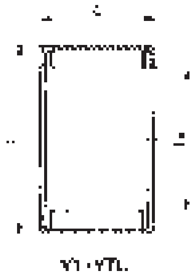
IKO NUMBER OPEN END **TA..Z**	WEIGHT (g)	IKO NUMBER CLOSED END **TAM**	WEIGHT (g)	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	USABLE INNER RING **IRT**
				Fw	D	C			
TA 2210 Z	15	**TAM 2210**	18.1	22	29	10	6650	8500	**IRT 1710-2**
TA 2215 Z	21.5	**TAM 2215**	24.5	22	29	15	11100	16400	**IRT 1715-2**
TA 2220 Z	29	**TAM 2220**	32	22	29	20	16000	26300	**IRT 1720-2**
TA 2225 Z	35.5	**TAM 2225**	38.5	22	29	25	19700	34300	**IRT 1725-2**
TA 2230 Z	42.5	**TAM 2230**	45.5	22	29	30	23800	43700	**IRT 1730-2**
TA 223016 Z	26	**TAM 223016**	29	22	30	16	13200	18200	**IRT 1716-2**
TA 223020 Z	32.5	**TAM 223020**	35.5	22	30	20	17500	26100	**IRT 1720-2**
TA 2420 Z	31	**TAM 2420**	35	24	31	20	17000	29200	**IRT 2020**
TA 2428 Z	43.5	**TAM 2428**	47	24	31	28	24500	46700	**IRT 2028**
TA 243216 Z	28	**TAM 243216**	32	24	32	16	14200	20500	**IRT 2016**
TA 243220 Z	35.5	**TAM 243220**	39	24	32	20	18800	29400	**IRT 2020**
TA 2510 Z	19.1	**TAM 2510**	23	25	33	10	7990	9900	**IRT 2010-1**
TA 2515 Z	28.5	**TAM 2515**	32.5	25	33	15	13400	19300	**IRT 2015-1**
TA 2520 Z	36.5	**TAM 2520**	40.5	25	33	20	19500	31100	**IRT 2020-1**
TA 2525 Z	45.5	**TAM 2525**	49	25	33	25	24100	40800	**IRT 2025-1**
TA 2530 Z	54.5	**TAM 2530**	58.5	25	33	30	29100	52000	**IRT 2030-1**
TA 2616 Z	30.5	**TAM 2616**	34.5	26	34	16	15200	22900	**IRT 2216**
TA 2620 Z	38	**TAM 2620**	42.5	26	34	20	20100	32800	**IRT 2220**
TA 2820 Z	45	**TAM 2820**	50	28	37	20	21200	32300	**IRT 2220-1**
TA 2830 Z	67.5	**TAM 2830**	72.5	28	37	30	33000	56900	**IRT 2230-1**
TA 2920 Z	47	**TAM 2920**	52	29	38	20	22000	34200	**IRT 2520**
TA 2930 Z	70	**TAM 2930**	75.5	29	38	30	34200	60300	**IRT 2530**
TA 3013 Z	36.5	**TAM 3013**	42.5	30	40	13	13500	16800	—
TA 3015 Z	42	**TAM 3015**	47.5	30	40	15	16800	22400	**IRT 2515-1**
TA 3020 Z	54.5	**TAM 3020**	60	30	40	20	24500	36300	**IRT 2520-1**
TA 3025 Z	68	**TAM 3025**	73.5	30	40	25	31600	50300	**IRT 2525-1**
TA 3030 Z	80	**TAM 3030**	85.5	30	40	30	36700	60700	**IRT 2530-1**
TA 3220 Z	57.5	**TAM 3220**	63.5	32	42	20	25400	38600	**IRT 2820**
TA 3230 Z	86	**TAM 3230**	97.5	32	42	30	39500	68400	**IRT 2830**
TA 3512 Z	38.5	**TAM 3512**	46	35	45	12	14800	19900	**IRT 3012**
TA 3515 Z	48	**TAM 3515**	56	35	45	15	18500	26500	**IRT 3015**
TA 3520 Z	62.5	**TAM 3520**	70	35	45	20	27000	43100	**IRT 3020**
TA 3525 Z	78	**TAM 3525**	85.5	35	45	25	34800	59700	**IRT 3025**
TA 3530 Z	97	**TAM 3530**	105	35	45	30	40600	72600	**IRT 3030**
TA 3720 Z	64.5	**TAM 3720**	73	37	47	20	27800	45400	**IRT 3220**
TA 3730 Z	101	**TAM 3730**	110	37	47	30	41800	76700	**IRT 3230**
TA 3815 Z	51	**TAM 3815**	60	38	48	15	19000	28000	**IRT 3215-1**
TA 3820 Z	65.5	**TAM 3820**	74.5	38	48	20	27700	45600	**IRT 3220-1**
TA 3825 Z	82.5	**TAM 3825**	96	38	48	25	35600	63100	**IRT 3225-1**
TA 3830 Z	104	**TAM 3830**	114	38	48	30	43100	80600	**IRT 3230-1**

DIMENSION TABLE

IKO NUMBER OPEN END **TA..Z**	WEIGHT (g)	IKO NUMBER CLOSED END **TAM**	WEIGHT (g)	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	USABLE INNER RING **IRT**
				Fw	D	C			
TAW 3845 Z	149	**TAMW 3845**	159	38	48	45	55700	112000	**IRT 3245-1**
TA 4015 Z	54	**TAM 4015**	63.5	40	50	15	19500	29400	**IRT 3515**
TA 4020 Z	69.5	**TAM 4020**	79	40	50	20	28400	47800	**IRT 3520**
TA 4025 Z	86.5	**TAM 4025**	102	40	50	25	36600	66200	**IRT 3525**
TA 4030 Z	110	**TAM 4030**	120	40	50	30	44300	84600	**IRT 3530**
TA 4040 Z	144	**TAM 4040**	154	40	50	40	56700	116000	**IRT 3540**
TA 4520 Z	77	**TAM 4520**	90	45	55	20	30600	54600	**IRT 4020**
TA 4525 Z	102	**TAM 4525**	115	45	55	25	39400	75600	**IRT 4025**
TA 4530 Z	122	**TAM 4530**	135	45	55	30	47700	96600	**IRT 4030**
TA 4540 Z	161	**TAM 4540**	174	45	55	40	61300	133000	**IRT 4040**
TA 5012 Z	62.5	**TAM 5012**	78	50	62	12	17700	24000	**IRT 4512**
TA 5015 Z	78	**TAM 5015**	98.5	50	62	15	25800	39000	**IRT 4515**
TA 5020 Z	107	**TAM 5020**	123	50	62	20	38000	64000	**IRT 4520**
TA 5025 Z	134	**TAM 5025**	150	50	62	25	49100	89000	**IRT 4525**
TA 5030 Z	161	**TAM 5030**	178	50	62	30	59500	114000	**IRT 4530**
TA 5040 Z	210	**TAM 5040**	230	50	62	40	76500	157000	**IRT 4540**
TAW 5045 Z	230	**TAMW 5045**	245	50	62	45	76700	158000	**IRT 4545**
TA 5520 Z	116	**TAM 5520**	136	55	67	20	39600	69700	**IRT 5020-1**
TA 5525 Z	145	**TAM 5525**	165	55	67	25	51200	97000	**IRT 5025-1**
TA 5530 Z	175	**TAM 5530**	195	55	67	30	62000	124000	**IRT 5030-1**
TA 5540 Z	230	**TAM 5540**	250	55	67	40	80000	172000	**IRT 5040-1**
TAW 5545 Z	250	**TAMW 5545**	270	55	67	45	79900	172000	**IRT 5045-1**
TAW 5550 Z	280	**TAMW 5550**	300	55	67	50	91500	205000	**IRT 5050-1**
TA 6025 Z	158	**TAM 6025**	182	60	72	25	54700	108000	**IRT 5025**
TA 6030 Z	191	**TAM 6030**	215	60	72	30	66300	139000	**IRT 5030**
TA 6040 Z	250	**TAM 6040**	275	60	72	40	85700	193000	**IRT 5040**
TAW 6045 Z	270	**TAMW 6045**	295	60	72	45	85400	193000	**IRT 5045**
TAW 6050 Z	305	**TAMW 6050**	330	60	72	50	97800	229000	**IRT 5050**
TA 6212 Z	78	**TAM 6212**	107	62	74	12	20100	30300	**IRT 5212**
TA 6525 Z	169	**TAM 6525**	197	65	77	25	56500	116000	**IRT 5525**
TA 6530 Z	205	**TAM 6530**	230	65	77	30	68500	149000	**IRT 5530**
TAW 6545 Z	290	**TAMW 6545**	315	65	77	45	88300	207000	**IRT 5545**
TAW 6550 Z	330	**TAMW 6550**	355	65	77	50	101000	246000	**IRT 5550**
TA 7025 Z	181	**TAM 7025**	215	70	82	25	58500	124000	**IRT 6025**
TA 7030 Z	220	**TAM 7030**	250	70	82	30	70900	159000	**IRT 6030**
TA 7040 Z	290	**TAM 7040**	320	70	82	40	92000	222000	**IRT 6040**
TAW 7050 Z	350	**TAMW 7050**	380	70	82	50	105000	262000	**IRT 6050**

SHELL TYPE NEEDLE ROLLER BEARINGS

Metric Dimension

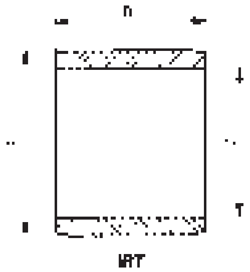


DIMENSION TABLE

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	USABLE INNER RING
YT•YTL	(g)	Fw	D	C	(N)	(N)	IRT
YTL 48	1.73	4	8	8	3010	2900	—
YTL 59	2.4	5	9	9	4320	4750	—
YT 810	7.7	8	15	10	7530	7950	—
YT 912	10.1	9	16	12	9690	11200	—
YTL 1210	5.1	12	16	10	7470	11800	**IRT 810**
YT 1212	12.8	12	19	12	11800	15200	**IRT 812**
YT 1715	20.5	17	24	15	16600	26000	**IRT 1215-2**
YT 1725	35.5	17	24	25	27200	49000	**IRT 1225-2**
YT 2015	23.5	20	27	15	18400	30900	**IRT 1515-2**
YT 2025	41	20	27	25	30000	58300	**IRT 1525-2**
YT 202820	37.5	20	28	20	26800	44600	**IRT 1520-2**
YT 2116	31	21	29	16	22100	35200	**IRT 1716-1**
YT 2120	39	21	29	20	27500	46800	**IRT 1720-1**
YT 223016	32	22	30	16	22600	36800	**IRT 1716-2**
YT 223020	40.5	22	30	20	28200	48900	**IRT 1720-2**
YT 2428	54	24	31	28	36800	79900	**IRT 2028**
YT 243216	34.5	24	32	16	23700	40100	**IRT 2016**
YT 243220	43.5	24	32	20	29500	53200	**IRT 2020**
YTL 2526	51.5	25	32	26	35000	75800	**IRT 2026-1**
YT 2510	22.5	25	33	10	15500	23600	**IRT 2010-1**
YT 2515	33	25	33	15	22700	38300	**IRT 2015-1**
YT 2520	45	25	33	20	30200	55400	**IRT 2020-1**
YT 2525	57	25	33	25	37200	72500	**IRT 2025-1**
YT 2616	37	26	34	16	24700	43300	**IRT 2216**
YT 2620	46.5	26	34	20	30800	57500	**IRT 2220**
YT 2820	56.5	28	37	20	34700	61700	**IRT 2220-1**
YT 2920	58.5	29	38	20	35500	64100	**IRT 2520**
YT 3220	71.5	32	42	20	39900	70100	**IRT 2820**
YT 3720	81	37	47	20	43300	81300	**IRT 3220**
YT 4015	63.5	40	50	15	33400	59800	**IRT 3515**
YT 4025	109	40	50	25	55300	114000	**IRT 3525**
YT 4520	96	45	55	20	47800	98200	**IRT 4020**
YT 4525	122	45	55	25	59100	129000	**IRT 4025**

INNER RACES FOR SHELL TYPE NEEDLE ROLLER BEARINGS

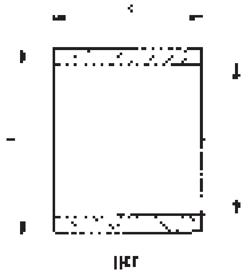
Metric Dimension



DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			USABLE BEARING NUMBER		INA	SKF	FAG
IRT	(g)	d	F	B	TA	TLA	IR	IR	JR
IRT 710	3.2	7	10	10.5	**TA 1010 Z**	**TLA 1010 Z**	IR 7×10×10.5	IR 7×10×10.5	JR 7×10×10.5
IRT 712	3.9	7	10	12.5	**TA 1012 Z**	**TLA 1012 Z**	—	—	—
IRT 715	4.8	7	10	15.5	**TA 1015 Z**	**TLA 1015 Z**	—	—	—
IRT 810	5.1	8	12	10.5	—	**TLA 1210 Z**	IR 8×12×10.5	IR 8×12×10.5	JR 8×12×10.5
IRT 812	6	8	12	12.5	**TA 1212 Z**	**TLA 1212 Z**	IR 8×12×12.5	IR 8×12×12.5	JR 8×12×12.5
IRT 815	7.5	8	12	15.5	**TA 1215 Z**	—	—	—	—
IRT 1012	5.2	10	13	12.5	—	**TLA 1312 Z**	IR 10×13×12.5	IR 10×13×12.5	JR 10×13×12.5
IRT 1012-2	7.2	10	14	12.5	—	**TLA 1412 Z**	—	—	—
IRT 1016-2	9.6	10	14	16.5	**TA 1416 Z**	**TLA 1416 Z**	—	—	—
IRT 1020-2	11.9	10	14	20.5	**TA 1420 Z**	—	—	—	—
IRT 1010-1	7.9	10	15	10.5	**TA 1510 Z**	—	—	—	—
IRT 1012-1	9.4	10	15	12.5	**TA 1512 Z**	**TLA 1512 Z**	—	—	—
IRT 1015-1	11.7	10	15	15.5	**TA 1515 Z**	—	—	—	—
IRT 1020-1	15.5	10	15	20.5	**TA 1520 Z**	—	—	—	—
IRT 1025-1	19.3	10	15	25.5	**TA 1525 Z**	—	—	—	—
IRT 1212	6.1	12	15	12.5	**TA 1512 Z**	**TLA 1512 Z**	IR 12×15×12.5	IR 12×15×12.5	JR 12×15×12.5
IRT 1216	8.1	12	15	16.5	—	**TLA 1516 Z**	IR 12×15×16.5	IR 12×15×16.5	JR 12×15×16.5
IRT 1222	11	12	15	22.5	—	**TLA 1522 Z**	IR 12×15×22.5	IR 12×15×22.5	JR 12×15×22.5
IRT 1212-1	8.5	12	16	12.5	—	**TLA 1612 Z**	—	—	—
IRT 1216-1	11.2	12	16	16.5	**TA 1616 Z**	**TLA 1616 Z**	—	—	—
IRT 1220-1	13.9	12	16	20.5	**TA 1620 Z**	—	—	—	—
IRT 1222-1	15.2	12	16	22.5	—	**TLA 1622 Z**	—	—	—
IRT 1215-2	13.6	12	17	15.5	**TA 1715 Z**	—	—	—	—
IRT 1220-2	18	12	17	20.5	**TA 1720 Z**	—	—	—	—
IRT 1225-2	22.5	12	17	25.5	**TA 1725 Z**	—	—	—	—
IRT 1512	7.5	15	18	12.5	—	**TLA 1812 Z**	—	—	—
IRT 1513	8.1	15	18	13.5	**TA 1813 Z**	—	—	—	—
IRT 1515	9.3	15	18	15.5	**TA 1815 Z**	—	—	—	—
IRT 1516	9.9	15	18	16.5	—	**TLA 1816 Z**	IR 15×18×16.5	IR 15×18×16.5	JR 15×18×16.5
IRT 1517	10.5	15	18	17.5	**TA 1817 Z**	—	—	—	—
IRT 1519	11.7	15	18	19.5	**TA 1819 Z**	—	—	—	—
IRT 1520	12.3	15	18	20.5	**TA 1820 Z**	—	—	—	—
IRT 1525	15.2	15	18	25.5	**TA 1825 Z**	—	—	—	—
IRT 1516-1	13.6	15	19	16.5	**TA 1916 Z**	—	—	—	—
IRT 1520-1	16.8	15	19	20.5	**TA 1920 Z**	—	—	—	—
IRT 1515-2	16.4	15	20	15.5	**TA 2015 Z**	—	—	—	—
IRT 1520-2	21.5	15	20	20.5	**TA 2020 Z** **TA 202820 Z**	**TLA 2020 Z**	—	—	—
IRT 1525-2	27	15	20	25.5	**TA 2025 Z**	—	—	—	—
IRT 1530-2	32	15	20	30.5	**TA 2030 Z**	**TLA 2030 Z**	—	—	—
IRT 1716	11.1	17	20	16.5	—	**TLA 2016 Z**	IR 17×20×16.5	IR 17×20×16.5	JR 17×20×16.5



DIMENSION TABLE **INTERCHANGE TABLE**

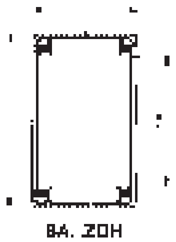
IKO NUMBER	WEIGHT	DIMENSIONS (mm)			USABLE BEARING NUMBER		INA	SKF	FAG
IRT	(g)	d	F	B	TA	TLA	IR	IR	JR
IRT 1720	13.7	17	20	20.5	**TA 2020 Z** **TA 202820 Z**	**TLA 2020 Z**	IR 17×20×20.5	IR 17×20×20.5	JR 17×20×20.5
IRT 1730	20.5	17	20	30.5	**TA 2030 Z**	**TLA 2030 Z**	IR 17×20×30.5	IR 17×20×30.5	JR 17×20×30.5
IRT 1716-1	15.1	17	21	16.5	**TA 2116 Z**	—	—	—	—
IRT 1720-1	18.8	17	21	20.5	**TA 2120 Z**	—	—	—	—
IRT 1710-2	12.4	17	22	10.5	**TA 2210 Z**	—	—	—	—
IRT 1715-2	18.3	17	22	15.5	**TA 2215 Z**	—	—	—	—
IRT 1716-2	19.4	17	22	16.5	**TA 223016 Z**	**TLA 2216 Z**	—	—	—
IRT 1720-2	24	17	22	20.5	**TA 2220 Z** **TA 223020 Z**	**TLA 2220 Z**	—	—	—
IRT 1725-2	30	17	22	25.5	**TA 2225 Z**	—	—	—	—
IRT 1730-2	36	17	22	30.5	**TA 2230 Z**	—	—	—	—
IRT 2016	17.5	20	24	16.5	**TA 243216 Z**	—	—	—	—
IRT 2020	22	20	24	20.5	**TA 2420 Z** **TA 243220 Z**	—	—	—	—
IRT 2028	30.5	20	24	28.5	**TA 2428 Z**	—	—	—	—
IRT 2010-1	14.3	20	25	10.5	**TA 2510 Z**	—	—	—	—
IRT 2015-1	21	20	25	15.5	**TA 2515 Z**	—	—	—	—
IRT 2020-1	28	20	25	20.5	**TA 2520 Z**	**TLA 2520 Z**	IR 20×25×20.5	IR 20×25×20.5	JR 20×25×20.5
IRT 2025-1	34.5	20	25	25.5	**TA 2525 Z**	—	—	—	—
IRT 2026-1	36	20	25	26.5	—	**TLA 2526 Z**	IR 20×25×26.5	IR 20×25×26.5	JR 20×25×26.5
IRT 2030-1	41.5	20	25	30.5	**TA 2530 Z**	—	—	—	—
IRT 2038-1	52.5	20	25	38.5	—	**TLAW 2538 Z**	IR 20×25×38.5	IR 20×25×38.5	JR 20×25×38.5
IRT 2216	19.1	22	26	16.5	**TA 2616 Z**	—	—	—	—
IRT 2220	24	22	26	20.5	**TA 2620 Z**	—	—	—	—
IRT 2220-1	37	22	28	20.5	**TA 2820 Z**	**TLA 2820 Z**	IR 22×28×20.5	IR 22×28×20.5	JR 22×28×20.5
IRT 2230-1	55.5	22	28	30.5	**TA 2830 Z**	—	—	—	—
IRT 2520	26.5	25	29	20.5	**TA 2920 Z**	—	—	—	—
IRT 2530	40	25	29	30.5	**TA 2930 Z**	—	—	—	—
IRT 2515-1	25.5	25	30	15.5	**TA 3015 Z**	—	—	—	—
IRT 2520-1	34	25	30	20.5	**TA 3020 Z**	**TLA 3020 Z**	IR 25×30×20.5	IR 25×30×20.5	JR 25×30×20.5
IRT 2525-1	42.5	25	30	25.5	**TA 3025 Z**	—	—	—	—
IRT 2526-1	44	25	30	26.5	—	**TLA 3026 Z**	IR 25×30×26.5	IR 25×30×26.5	JR 25×30×26.5
IRT 2530-1	50.5	25	30	30.5	**TA 3030 Z**	—	—	—	—
IRT 2538-1	64	25	30	38.5	—	**TLAW 3038 Z**	IR 25×30×38.5	IR 25×30×38.5	JR 25×30×38.5
IRT 2820	29.5	28	32	20.5	**TA 3220 Z**	—	—	—	—
IRT 2830	44	28	32	30.5	**TA 3230 Z**	—	—	—	—
IRT 3012	24.5	30	35	12.5	**TA 3512 Z**	**TLA 3512 Z**	—	—	—
IRT 3015	30.5	30	35	15.5	**TA 3515 Z**	—	—	—	—
IRT 3020	40	30	35	20.5	**TA 3520 Z**	**TLA 3520 Z**	IR 30×35×20.5	IR 30×35×20.5	JR 30×35×20.5
IRT 3025	50	30	35	25.5	**TA 3525 Z**	—	—	—	—
IRT 3030	60	30	35	30.5	**TA 3530 Z**	—	—	—	—
IRT 3220	42.5	32	37	20.5	**TA 3720 Z**	—	—	—	—

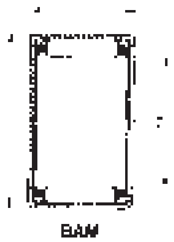
DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			USABLE BEARING NUMBER		INA	SKF	FAG
IRT	(g)	d	F	B	TA	TLA	IR	IR	JR
IRT 3230	63.5	32	37	30.5	**TA 3730 Z**	—	—	—	—
IRT 3215-1	39.5	32	38	15.5	**TA 3815 Z**	—	—	—	—
IRT 3220-1	52	32	38	20.5	**TA 3820 Z**	—	—	—	—
IRT 3225-1	64.5	32	38	25.5	**TA 3825 Z**	—	—	—	—
IRT 3230-1	77.5	32	38	30.5	**TA 3830 Z**	—	—	—	—
IRT 3245-1	115	32	38	45.5	**TAW 3845 Z**	—	—	—	—
IRT 3515	35	35	40	15.5	**TA 4015 Z**	—	—	—	—
IRT 3520	46.5	35	40	20.5	**TA 4020 Z**	**TLA 4020 Z**	IR 35×40×20.5	IR 35×40×20.5	JR 35×40×20.5
IRT 3525	58	35	40	25.5	**TA 4025 Z**	—	—	—	—
IRT 3530	69	35	40	30.5	**TA 4030 Z**	—	—	—	—
IRT 3540	91.5	35	40	40.5	**TA 4040 Z**	—	—	—	—
IRT 4020	52.5	40	45	20.5	**TA 4520 Z**	**TLA 4520 Z**	IR 40×45×20.5	IR 40×45×20.5	JR 40×45×20.5
IRT 4025	65.5	40	45	25.5	**TA 4525 Z**	—	—	—	—
IRT 4030	78.5	40	45	30.5	**TA 4530 Z**	—	—	—	—
IRT 4040	104	40	45	40.5	**TA 4540 Z**	—	—	—	—
IRT 4512	36	45	50	12.5	**TA 5012 Z**	—	—	—	—
IRT 4515	44.5	45	50	15.5	**TA 5015 Z**	—	—	—	—
IRT 4520	59	45	50	20.5	**TA 5020 Z**	**TLA 5020 Z**	—	—	—
IRT 4525	73	45	50	25.5	**TA 5025 Z**	**TLA 5025 Z**	IR 45×50×25.5	IR 45×50×25.5	JR 45×50×25.5
IRT 4530	87.5	45	50	30.5	**TA 5030 Z**	—	—	—	—
IRT 4540	116	45	50	40.5	**TA 5040 Z**	—	—	—	—
IRT 4545	131	45	50	45.5	**TAW 5045 Z**	—	—	—	—
IRT 5020-1	65	50	55	20.5	**TA 5520 Z**	**TLA 5520 Z**	—	—	—
IRT 5025-1	81	50	55	25.5	**TA 5525 Z**	**TLA 5525 Z**	—	—	—
IRT 5030-1	96.5	50	55	30.5	**TA 5530 Z**	—	—	—	—
IRT 5040-1	128	50	55	40.5	**TA 5540 Z**	—	—	—	—
IRT 5045-1	144	50	55	45.5	**TAW 5545 Z**	—	—	—	—
IRT 5050-1	160	50	55	50.5	**TAW 5550 Z**	—	—	—	—
IRT 5025	169	50	60	25.5	**TA 6025 Z**	—	—	—	—
IRT 5030	205	50	60	30.5	**TA 6030 Z**	—	—	—	—
IRT 5040	270	50	60	40.5	**TA 6040 Z**	—	—	—	—
IRT 5045	300	50	60	45.5	**TAW 6045 Z**	—	—	—	—
IRT 5050	335	50	60	50.5	**TAW 6050 Z**	—	—	—	—
IRT 5212	86	52	62	12.5	**TA 6212 Z**	—	—	—	—
IRT 5525	185	55	65	25.5	**TA 6525 Z**	—	—	—	—
IRT 5530	220	55	65	30.5	**TA 6530 Z**	—	—	—	—
IRT 5545	330	55	65	45.5	**TAW 6545 Z**	—	—	—	—
IRT 5550	365	55	65	50.5	**TAW 6550 Z**	—	—	—	—
IRT 6025	200	60	70	25.5	**TA 7025 Z**	—	—	—	—
IRT 6030	240	60	70	30.5	**TA 7030 Z**	—	—	—	—
IRT 6040	320	60	70	40.5	**TA 7040 Z**	—	—	—	—
IRT 6050	395	60	70	50.5	**TAW 7050 Z**	—	—	—	—

SHELL TYPE
NEEDLE ROLLER BEARINGS

Inch Dimension



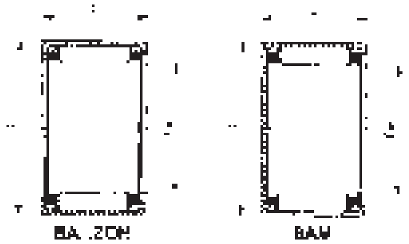


DIMENSION TABLE | **INTERCHANGE TABLE**

IKO NUMBER	WEIGHT	IKO NUMBER	WEIGHT	DIMENSIONS						BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	USABLE INNER RING	TORRINGTON		INA	
OPEN END		CLOSED END		Fw		D		C				INNER RING	OPEN END	CLOSED END	OPEN END	CLOSED END
BA..ZOH	(g)	**BAM**	(g)	inch	mm	inch	mm	inch	mm	(N)	(N)	**IRB**	J	MJ	SCE	BCE
BA 44 OH	2.1	—	2.3	¼	6.350	7/16	11.112	¼	6.35	1770	1390	—	JP-44-F	—	SCE 44	—
BA 45 ZOH	2.5	**BAM 45**	2.7	¼	6.350	7/16	11.112	5/16	7.92	1510	1120	—	J-45	MJ-451	SCE 45	BCE 45
BA 47 ZOH	3.5	**BAM 47**	3.7	¼	6.350	7/16	11.112	7/16	11.13	2650	2310	—	J-47	MJ-471	SCE 47	BCE 47
BA 55 ZOH	3	**BAM 55**	3.3	5/16	7.938	½	12.700	5/16	7.92	1880	1560	—	J-55	MJ-551	SCE 55	BCE 55
BA 56 ZOH	3.6	**BAM 56**	3.9	5/16	7.938	½	12.700	⅜	9.52	2620	2390	—	—	—	—	—
BA 57 ZOH	4.3	**BAM 57**	4.6	5/16	7.938	½	12.700	7/16	11.13	3310	3220	—	J-57	MJ-571	SCE 57	BCE 57
BA 59 ZOH	5.4	**BAM 59**	5.7	5/16	7.938	½	12.700	9/16	14.27	4190	4360	—	—	—	SCE 59	BCE 59
BA 65 ZOH	3.5	**BAM 65**	3.9	⅜	9.525	9/16	14.288	5/16	7.92	2220	2010	—	J-65	MJ-651	SCE 65	BCE 65
BA 66 ZOH	4.2	**BAM 66**	4.6	⅜	9.525	9/16	14.288	⅜	9.52	3090	3080	—	J-66	MJ-661	SCE 66	BCE 66
BA 68 ZOH	5.7	**BAM 68**	6.1	⅜	9.525	9/16	14.288	½	12.70	4190	4560	—	J-68	MJ-681	SCE 68	BCE 68
BA 69 ZOH	6.3	**BAM 69**	6.7	⅜	9.525	9/16	14.288	9/16	14.27	4940	5630	—	—	—	SCE 69	BCE 69
BA 610 ZOH	7	**BAM 610**	7.4	⅜	9.525	9/16	14.288	⅝	15.88	5660	6700	—	—	—	SCE 610	BCE 610
BA 76 ZOH	4.8	**BAM 76**	5.3	7/16	11.112	⅝	15.875	⅜	9.52	3290	3470	—	—	—	—	—
BA 77 ZOH	5.6	**BAM 77**	6.2	7/16	11.112	⅝	15.875	7/16	11.13	4150	4680	—	—	—	—	—
BA 78 ZOH	6.4	**BAM 78**	7	7/16	11.112	⅝	15.875	½	12.70	4460	5130	—	J-78	MJ-781	SCE 78	BCE 78
BA 710 ZOH	7.9	**BAM 710**	8.5	7/16	11.112	⅝	15.875	⅝	15.88	6020	7550	—	—	—	SCE 710	BCE 710
BA 85 ZOH	4.4	**BAM 85**	5.2	½	12.700	11/16	17.462	5/16	7.92	2490	2510	—	J-85	MJ-851	SCE 85	BCE 85
BA 86 ZOH	5.3	**BAM 86**	6.1	½	12.700	11/16	17.462	⅜	9.52	3470	3850	—	—	—	SCE 86	BCE 86
BA 87 ZOH	6.3	**BAM 87**	7	½	12.700	11/16	17.462	7/16	11.13	4380	5190	—	—	—	SCE 87	BCE 87
BA 88 ZOH	7.2	**BAM 88**	7.9	½	12.700	11/16	17.462	½	12.70	4710	5700	**IRB 58**	J-88	MJ-881	SCE 88	BCE 88
BA 810 ZOH	8.9	**BAM 810**	9.6	½	12.700	11/16	17.462	⅝	15.88	6350	8380	—	—	—	SCE 810	BCE 810
BA 812 ZOH	10.6	**BAM 812**	11.3	½	12.700	11/16	17.462	¾	19.05	7840	11000	—	J-812	—	SCE 812	BCE 812
BA 95 ZOH	4.9	**BAM 95**	5.8	9/16	14.288	¾	19.050	5/16	7.92	2760	2970	—	—	—	SCE 95	BCE 95
BA 96 ZOH	5.9	**BAM 96**	6.8	9/16	14.288	¾	19.050	⅜	9.52	3850	4560	—	—	—	SCE 96	BCE 96
BA 97 ZOH	6.9	**BAM 97**	7.8	9/16	14.288	¾	19.050	7/16	11.13	4860	6140	—	J-97	MJ-971	SCE 97	BCE 97
BA 98 ZOH	7.9	**BAM 98**	8.9	9/16	14.288	¾	19.050	½	12.70	5220	6740	**IRB 68**	J-98	MJ-981	SCE 98	BCE 98
BA 910 ZOH	9.9	**BAM 910**	10.8	9/16	14.288	¾	19.050	⅝	15.88	7050	9910	—	J-910-F	MJ-910-F	SCE 910	BCE 910
BA 912 ZOH	11.7	**BAM 912**	12.6	9/16	14.288	¾	19.050	¾	19.05	8690	13000	**IRB 612**	—	—	SCE 912	BCE 912
BA 105 ZOH	5.3	**BAM 105**	6.5	⅝	15.875	13/16	20.638	5/16	7.92	2870	3220	—	—	—	SCE 105	BCE 105
BA 107 ZOH	7.6	**BAM 107**	8.7	⅝	15.875	13/16	20.638	7/16	11.13	5040	6660	—	—	—	SCE 107	BCE 107
BA 108 ZOH	8.7	**BAM 108**	9.9	⅝	15.875	13/16	20.638	½	12.70	5420	7310	**IRB 68-1**	J-108	MJ-1081	SCE 108	BCE 108
BA 1010 ZOH	10.8	**BAM 1010**	12	⅝	15.875	13/16	20.638	⅝	15.88	7320	10700	—	J-1010	MJ-10101	SCE 1010	BCE 1010
BA 1012 ZOH	12.9	**BAM 1012**	14	⅝	15.875	13/16	20.638	¾	19.05	9020	14100	**IRB 612-1**	J-1012	MJ-10121	SCE 1012	BCE 1012
BA 1014 ZOH	15.1	**BAM 1014**	16.2	⅝	15.875	13/16	20.638	⅞	22.22	10700	17500	**IRB 714**	—	—	—	—
BA 1016 ZOH	17.3	**BAM 1016**	18.4	⅝	15.875	13/16	20.638	1	25.40	12300	20800	**IRB 716**	—	—	—	—
BA 116 ZOH	7	**BAM 116**	8.4	11/16	17.462	⅞	22.225	⅜	9.52	4530	5980	**IRB 86**	—	—	SCE 116	BCE 116
BA 118 ZOH	9.5	**BAM 118**	10.8	11/16	17.462	⅞	22.225	½	12.70	6140	8850	**IRB 88**	—	—	SCE 118	BCE 118
BA 1110 ZOH	11.8	**BAM 1110**	13.2	11/16	17.462	⅞	22.225	⅝	15.88	8280	13000	—	—	—	SCE 1110	BCE 1110
BA 1112 ZOH	14	**BAM 1112**	15.4	11/16	17.462	⅞	22.225	¾	19.05	10200	17000	**IRB 812**	J-1112	MJ-11121	SCE 1112	BCE 1112
BA 126 ZOH	10	**BAM 126**	11.7	¾	19.050	1	25.400	⅜	9.52	5040	5850	—	J-126	—	SCE 126	BCE 126

SHELL TYPE
NEEDLE ROLLER BEARINGS

Inch Dimension



DIMENSION TABLE

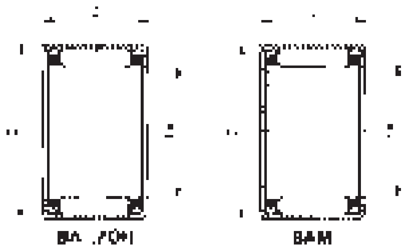
IKO NUMBER	WEIGHT	IKO NUMBER	WEIGHT	DIMENSIONS						BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	USABLE INNER RING
OPEN END		CLOSED END		Fw		D		C				
BA..ZOH	(g)	BAM	(g)	inch	mm	inch	mm	inch	mm	(N)	(N)	IRB
BA 128 ZOH	13.5	**BAM 128**	15.2	¾	19.050	1	25.400	½	12.70	6910	8780	**IRB 88-1**
BA 1210 ZOH	17	**BAM 1210**	18.6	¾	19.050	1	25.400	⅝	15.88	9500	13200	**IRB 810-1**
BA 1212 ZOH	20.5	**BAM 1212**	22	¾	19.050	1	25.400	¾	19.05	11900	17700	**IRB 812-1**
BA 1214 ZOH	23.5	**BAM 1214**	25	¾	19.050	1	25.400	⅞	22.22	14200	22200	**IRB 814-1**
BA 1216 ZOH	27	**BAM 1216**	28.5	¾	19.050	1	25.400	1	25.40	16300	26500	**IRB 816-1**
BA 136 ZOH	10.7	**BAM 136**	12.6	13/16	20.638	1 1/16	26.988	⅜	9.52	5230	6300	—
BA 138 ZOH	14.5	**BAM 138**	16.4	13/16	20.638	1 1/16	26.988	½	12.70	7170	9450	**IRB 98**
BA 1310 ZOH	18.2	**BAM 1310**	20	13/16	20.638	1 1/16	26.988	⅝	15.88	9870	14200	**IRB 910**
BA 1312 ZOH	22	**BAM 1312**	23.5	13/16	20.638	1 1/16	26.988	¾	19.05	12400	19000	**IRB 912**
BA 1314 ZOH	25	**BAM 1314**	27	13/16	20.638	1 1/16	26.988	⅞	22.22	14700	23800	**IRB 914**
BA 1316 ZOH	28.5	**BAM 1316**	30.5	13/16	20.638	1 1/16	26.988	1	25.40	16900	28500	**IRB 916**
BA 1320 ZOH	35.5	**BAM 1320**	37.5	13/16	20.638	1 1/16	26.988	1¼	31.75	21200	38100	**IRB 920**
BA 146 ZOH	11.5	**BAM 146**	13.8	⅞	22.225	1⅛	28.575	⅜	9.52	5430	6740	**IRB 106**
BA 148 ZOH	15.6	**BAM 148**	17.8	⅞	22.225	1⅛	28.575	½	12.70	7440	10100	**IRB 108**
BA 1412ZO H	23.5	**BAM 1412**	26	⅞	22.225	1⅛	28.575	¾	19.05	12800	20400	**IRB 1012**
BA 1414 ZOH	27	**BAM 1414**	29.5	⅞	22.225	1⅛	28.575	⅞	22.22	15300	25500	**IRB 1014**
BA 1416 ZOH	31	**BAM 1416**	33.5	⅞	22.225	1⅛	28.575	1	25.40	17600	30500	**IRB 1016**
BA 1418 ZOH	34.5	**BAM 1418**	37	⅞	22.225	1⅛	28.575	1⅛	28.58	19800	35600	—
BA 1422 ZOH	42.5	**BAM 1422**	44.5	⅞	22.225	1⅛	28.575	1⅜	34.92	24100	45700	**IRB 1022**
BA 158 ZOH	16.5	**BAM 158**	19	15/16	23.812	1 3/16	30.162	½	12.70	8000	11400	—
BA 1510 ZOH	20.5	**BAM 1510**	23	15/16	23.812	1 3/16	30.162	⅝	15.88	11000	17100	**IRB 1110**
BA 1516 ZOH	33	**BAM 1516**	35.5	15/16	23.812	1 3/16	30.162	1	25.40	18900	34300	**IRB 1116**
BA 166 ZOH	13.1	**BAM 166**	16	1	25.400	1¼	31.750	⅜	9.52	6010	8020	—
BA 167 ZOH	15.4	**BAM 167**	18.3	1	25.400	1¼	31.750	7/16	11.13	7720	11100	—
BA 168 ZOH	17.7	**BAM 168**	20.5	1	25.400	1¼	31.750	½	12.70	8240	12000	**IRB 128**
BA 1610 ZOH	22	**BAM 1610**	25	1	25.400	1¼	31.750	⅝	15.88	11300	18100	—
BA 1612 ZOH	26.5	**BAM 1612**	29.5	1	25.400	1¼	31.750	¾	19.05	14200	24300	**IRB 1212**
BA 1614 ZOH	31	**BAM 1614**	33.5	1	25.400	1¼	31.750	⅞	22.22	16900	30400	**IRB 1214**
BA 1616 ZOH	35.5	**BAM 1616**	38	1	25.400	1¼	31.750	1	25.40	19400	36300	**IRB 1216**
BA 1620 ZOH	44	**BAM 1620**	46.5	1	25.400	1¼	31.750	1¼	31.75	24400	48500	**IRB 1220**
BA 1710 ZOH	23.5	**BAM 1710**	26.5	1 1/16	26.988	1 5/16	33.338	⅝	15.88	11600	19200	—
BA 1716 ZOH	37	**BAM 1716**	40.5	1 1/16	26.988	1 5/16	33.338	1	25.40	20000	38300	—
BA 186 ZOH	14.5	**BAM 186**	18.1	1⅛	28.575	1⅜	34.925	⅜	9.52	6330	8910	—
BA 188 ZOH	19.5	**BAM 188**	23	1⅛	28.575	1⅜	34.925	½	12.70	8680	13400	**IRB 148**
BA 1812 ZOH	29.5	**BAM 1812**	33	1⅛	28.575	1⅜	34.925	¾	19.05	15000	26900	**IRB 1412**
BA 1816 ZOH	39	**BAM 1816**	42.5	1⅛	28.575	1⅜	34.925	1	25.40	20500	40300	**IRB 1416**
BA 1820 ZOH	48.5	**BAM 1820**	52	1⅛	28.575	1⅜	34.925	1¼	31.75	25700	53900	**IRB 1420**
BA 1910 ZOH	32.5	**BAM 1910**	37.5	1 3/16	30.162	1½	38.100	⅝	15.88	15000	22500	—
BA 1916 ZOH	52	**BAM 1916**	57	1 3/16	30.162	1½	38.100	1	25.40	25800	45300	—
BA 208 ZOH	21.5	**BAM 208**	26	1¼	31.750	1½	38.100	½	12.70	9100	14700	**IRB 168**

INTERCHANGE TABLE

IKO NUMBER	TORRINGTON		INA	
OPEN END	OPEN END	CLOSED END	OPEN END	CLOSED END
BA..ZOH	J	MJ	SCE	BCE
BA 128 ZOH	J-128	—	SCE 128	BCE 128
BA 1210 ZOH	J-1210	MJ-12101	SCE 1210	BCE 1210
BA 1212 ZOH	J-1212	MJ-12121	SCE 1212	BCE 1212
BA 1214 ZOH	—	—	—	—
BA 1216 ZOH	—	—	—	—
BA 136 ZOH	—	—	SCE 136	BCE 136
BA 138 ZOH	—	—	SCE 138	BCE 138
BA 1310 ZOH	—	—	—	—
BA 1312 ZOH	—	—	SCE 1312	BCE 1312
BA 1314 ZOH	J-1314	—	SCE 1314	BCE 1314
BA 1316 ZOH	—	—	—	—
BA 1320 ZOH	—	—	—	—
BA 146 ZOH	J-146	—	SCE 146	BCE 146
BA 148 ZOH	J-148	—	SCE 148	BCE 148
BA 1412ZO H	J-1412	—	SCE 1412	BCE 1412
BA 1414 ZOH	—	—	—	—
BA 1416 ZOH	J-1416	MJ-14161	SCE 1416	BCE 1416
BA 1418 ZOH	—	—	—	—
BA 1422 ZOH	—	—	—	—
BA 158 ZOH	—	—	—	—
BA 1510 ZOH	—	—	—	—
BA 1516 ZOH	—	—	SCE 1516	BCE 1516
BA 166 ZOH	—	—	—	—
BA 167 ZOH	—	—	SCE 167	BCE 167
BA 168 ZOH	—	—	SCE 168	BCE 168
BA 1610 ZOH	—	—	—	—
BA 1612 ZOH	J-1612	—	SCE 1612	BCE 1612
BA 1614 ZOH	—	—	—	—
BA 1616 ZOH	J-1616	MJ-16161	SCE 1616	BCE 1616
BA 1620 ZOH	—	—	—	—
BA 1710 ZOH	—	—	—	—
BA 1716 ZOH	—	—	—	—
BA 186 ZOH	—	—	SCE 186	BCE 186
BA 188 ZOH	J-188	MJ-1881	SCE 188	BCE 188
BA 1812 ZOH	J-1812	MJ-18121	SCE 1812	BCE 1812
BA 1816 ZOH	J-1816	MJ-18161	SCE 1816	BCE 1816
BA 1820 ZOH	—	—	—	—
BA 1910 ZOH	—	—	—	—
BA 1916 ZOH	—	—	SCE 1916	BCE 1916
BA 208 ZOH	—	—	SCE 208	BCE 208

SHELL TYPE
NEEDLE ROLLER BEARINGS

Inch Dimension

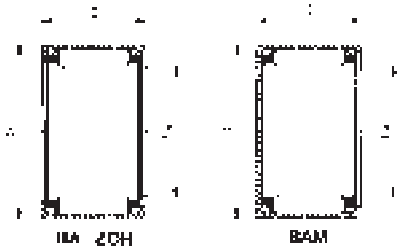


DIMENSION TABLE / **INTERCHANGE TABLE**

IKO NUMBER OPEN END	WEIGHT	IKO NUMBER CLOSED END	WEIGHT	DIMENSIONS						BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	USABLE INNER RING	TORRINGTON		INA	
				Fw		D		C					OPEN END	CLOSED END	OPEN END	CLOSED END
BA..ZOH	(g)	BAM	(g)	inch	mm	inch	mm	inch	mm	(N)	(N)	IRB	J	MJ	SCE	BCE
BA 2010 ZOH	27	**BAM 2010**	31.5	1¼	31.750	1½	38.100	⅝	15.88	12500	22200	**IRB 1610**	—	—	SCE 2010	BCE 2010
BA 2012 ZOH	32.5	**BAM 2012**	37	1¼	31.750	1½	38.100	¾	19.05	15700	29600	**IRB 1612**	J-2012	MJ-20121	SCE 2012	BCE 2012
BA 2016 ZOH	43	**BAM 2016**	47.5	1¼	31.750	1½	38.100	1	25.40	21500	44300	**IRB 1616**	J-2016	MJ-20161	SCE 2016	BCE 2016
BA 2020 ZOH	53.5	**BAM 2020**	58	1¼	31.750	1½	38.100	1¼	31.75	26900	59200	**IRB 1620**	—	—	SCE 2020	BCE 2020
BA 218 ZOH	28.5	**BAM 218**	35	1⁵⁄₁₆	33.338	1⅝	41.275	½	12.70	11100	15800	**IRB 168-1**	—	—	—	—
BA 2110 ZOH	35.5	**BAM 2110**	41.5	1⁵⁄₁₆	33.338	1⅝	41.275	⅝	15.88	15400	23900	**IRB 1610-1**	—	—	SCE 2110	BCE 2110
BA 2112 ZOH	43	**BAM 2112**	49	1⁵⁄₁₆	33.338	1⅝	41.275	¾	19.05	19300	32100	**IRB 1612-1**	—	—	—	—
BA 228 ZOH	23.5	**BAM 228**	29	1⅜	34.925	1⅝	41.275	½	12.70	9770	16600	**IRB 188**	J-228	MJ-2281	SCE 228	BCE 228
BA 2212 ZOH	35.5	**BAM 2212**	41	1⅜	34.925	1⅝	41.275	¾	19.05	16900	33500	**IRB 1812**	—	—	SCE 2212	BCE 2212
BA 2216 ZOH	47.5	**BAM 2216**	53	1⅜	34.925	1⅝	41.275	1	25.40	23100	50200	**IRB 1816**	—	—	SCE 2216	BCE 2216
BA 2220 ZOH	59	**BAM 2220**	64	1⅜	34.925	1⅝	41.275	1¼	31.75	28900	67100	**IRB 1820**	—	—	SCE 2220	BCE 2220
BA 248 ZOH	38.5	**BAM 248**	47.5	1½	38.100	1⅞	47.625	½	12.70	12900	17900	—	—	—	SCE 248	BCE 248
BA 2410 ZOH	48.5	**BAM 2410**	57.5	1½	38.100	1⅞	47.625	⅝	15.88	17800	27100	**IRB 2010**	—	—	SCE 2410	BCE 2410
BA 2412 ZOH	58.5	**BAM 2412**	67.5	1½	38.100	1⅞	47.625	¾	19.05	22500	36600	—	J-2412	MJ-24121	SCE 2412	BCE 2412
BA 2414 ZOH	69	**BAM 2414**	78	1½	38.100	1⅞	47.625	⅞	22.22	26700	45600	**IRB 2014**	—	—	SCE 2414	BCE 2414
BA 2416 ZOH	79	**BAM 2416**	88	1½	38.100	1⅞	47.625	1	25.40	31100	55400	**IRB 2016**	J-2416	MJ-24161	SCE 2416	BCE 2416
BA 2420 ZOH	97.5	**BAM 2420**	106	1½	38.100	1⅞	47.625	1¼	31.75	39000	74200	**IRB 2020**	J-2420	MJ-24201	SCE 2420	BCE 2420
BA 268 ZOH	41	**BAM 268**	51.5	1⅝	41.275	2	50.800	½	12.70	13700	19800	—	—	—	—	—
BA 2610 ZOH	52	**BAM 2610**	62.5	1⅝	41.275	2	50.800	⅝	15.88	18900	30000	**IRB 2210**	—	—	SCE 2610	BCE 2610
BA 2616 ZOH	85	**BAM 2616**	95.5	1⅝	41.275	2	50.800	1	25.40	33000	61400	—	J-2616	MJ-26161	—	—
BA 2620 ZOH	105	**BAM 2620**	115	1⅝	41.275	2	50.800	1¼	31.75	41400	82100	**IRB 2220**	—	—	SCE 2620	BCE 2620
BA 2812 ZOH	67.5	**BAM 2812**	79.5	1¾	44.450	2⅛	53.975	¾	19.05	25200	44500	**IRB 2412**	J-2812	MJ-28121	SCE 2812	BCE 2812
BA 2816 ZOH	91	**BAM 2816**	103	1¾	44.450	2⅛	53.975	1	25.40	34800	67400	**IRB 2416**	J-2816	MJ-28161	SCE 2816	BCE 2816
BA 2820 ZOH	112	**BAM 2820**	125	1¾	44.450	2⅛	53.975	1¼	31.75	43600	90200	—	—	—	—	—
BA 2824 ZOH	136	**BAM 2824**	148	1¾	44.450	2⅛	53.975	1½	38.10	52000	113000	**IRB 2424**	J-2824	MJ-28241	SCE 2824	BCE 2824
BA 308ZO H	47.5	**BAM 308**	61	1⅞	47.625	2¼	57.150	½	12.70	14700	22800	**IRB 248-1**	—	—	—	—
BA 3010 ZOH	60	**BAM 3010**	74	1⅞	47.625	2¼	57.150	⅝	15.88	20300	34500	**IRB 2410-1**	—	—	—	—
BA 3012 ZOH	72.5	**BAM 3012**	86.5	1⅞	47.625	2¼	57.150	¾	19.05	25700	46700	—	—	—	—	—
BA 3016 ZOH	97.5	**BAM 3016**	112	1⅞	47.625	2¼	57.150	1	25.40	35400	70600	—	J-3016	MJ-30161	—	—
BA 328 ZOH	50	**BAM 328**	66	2	50.800	2⅜	60.325	½	12.70	15400	24700	—	—	—	SCE 328	BCE 328
BA 3216 ZOH	104	**BAM 3216**	119	2	50.800	2⅜	60.325	1	25.40	37100	76500	**IRB 2616**	J-3216	MJ-32161	SCE 3216	BCE 3216
BA 3220 ZOH	128	**BAM 3220**	144	2	50.800	2⅜	60.325	1¼	31.75	46600	102000	**IRB 2720**	—	—	SCE 3220	BCE 3220
BA 3224 ZOH	155	**BAM 3224**	170	2	50.800	2⅜	60.325	1½	38.10	55500	128000	—	—	—	—	—
BAW 3228 ZOH	180	**BAMW 3228**	196	2	50.800	2⅜	60.325	1¾	44.45	57900	136000	**IRB 2628**	—	—	—	—
BA 348ZO H	53	**BAM 348**	70.5	2⅛	53.975	2½	63.500	½	12.70	16100	26600	—	—	—	—	—
BA 3416 ZOH	109	**BAM 3416**	127	2⅛	53.975	2½	63.500	1	25.40	38700	82500	**IRB 3016**	—	—	SCE 3416	BCE 3416
BA 3424 ZOH	162	**BAM 3424**	180	2⅛	53.975	2½	63.500	1½	38.10	57900	138000	**IRB 3024**	—	—	—	—
BA 3612 ZOH	85.5	**BAM 3612**	105	2¼	57.150	2⅝	66.675	¾	19.05	28500	56700	—	—	—	SCE 3612	BCE 3612
BA 3616 ZOH	115	**BAM 3616**	135	2¼	57.150	2⅝	66.675	1	25.40	39300	85700	—	J-3616	—	SCE 3616	BCE 3616
BA 3620 ZOH	143	**BAM 3620**	163	2¼	57.150	2⅝	66.675	1¼	31.75	49400	115000	—	—	—	—	—

SHELL TYPE
NEEDLE ROLLER BEARINGS

Inch Dimension



DIMENSION TABLE

IKO NUMBER	WEIGHT	IKO NUMBER	WEIGHT	DIMENSIONS						BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	USABLE
OPEN END		CLOSED END		Fw		D		C				INNER RING
BA..ZOH	(g)	**BAM**	(g)	inch	mm	inch	mm	inch	mm	(N)	(N)	**IRB**
BA 3624 ZOH	172	**BAM 3624**	192	2¼	57.150	2⅝	66.675	1½	38.10	58800	144000	—
BA 4216 ZOH	133	**BAM 4216**	161	2⅝	66.675	3	76.200	1	25.40	42000	97900	**IRB 3616**
BA 4410 ZOH	85.5	**BAM 4410**	115	2¾	69.850	3⅛	79.375	⅝	15.88	25000	50800	—
BA 4412 ZOH	103	**BAM 4412**	133	2¾	69.850	3⅛	79.375	¾	19.05	31500	68700	—
BA 4416 ZOH	139	**BAM 4416**	169	2¾	69.850	3⅛	79.375	1	25.40	43500	104000	**IRB 4016**
BA 4420 ZOH	173	**BAM 4420**	205	2¾	69.850	3⅛	79.375	1¼	31.75	54600	139000	**IRB 4020**

INTERCHANGE TABLE

IKO NUMBER	TORRINGTON		INA	
OPEN END	OPEN END	CLOSED END	OPEN END	CLOSED END
BA..ZOH	J	MJ	SCE	BCE
BA 3624 ZOH	—	—	—	—
BA 4216 ZOH	—	—	—	—
BA 4410 ZOH	—	—	—	—
BA 4412 ZOH	J-4412	—	SCE 4412	BCE 4412
BA 4416 ZOH	—	—		
BA 4420 ZOH	—	—		

SHELL TYPE
NEEDLE ROLLER BEARINGS

Inch Dimension

DIMENSION TABLE

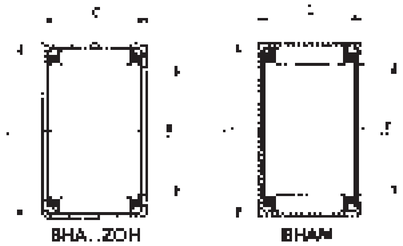
IKO NUMBER OPEN END BHA..ZOH	WEIGHT (g)	IKO NUMBER CLOSED END BHAM	WEIGHT (g)	DIMENSIONS Fw inch	Fw mm	D inch	D mm	C inch	C mm	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	USABLE INNER RING IRB
BHA 57 ZOH	6.3	**BHAM 57**	6.6	5/16	7.938	9/16	14.288	7/16	11.13	4150	3730	—
BHA 68 ZOH	8.2	**BHAM 68**	8.6	⅜	9.525	⅝	15.875	½	12.70	4880	4740	—
BHA 78 ZOH	9.3	**BHAM 78**	10	7/16	11.112	11/16	17.462	½	12.70	5680	5970	—
BHA 87 ZOH	9.1	**BHAM 87**	9.9	½	12.700	¾	19.050	7/16	11.13	5670	6120	—
BHA 88 ZOH	10.4	**BHAM 88**	11.3	½	12.700	¾	19.050	½	12.70	6040	6650	**IRB 58**
BHA 810 ZOH	12.5	**BHAM 810**	13.3	½	12.700	¾	19.050	⅝	15.88	8830	10900	—
BHA 812 ZOH	15	**BHAM 812**	15.8	½	12.700	¾	19.050	¾	19.05	11100	14500	—
BHA 98 ZOH	11.4	**BHAM 98**	12.5	9/16	14.288	13/16	20.638	½	12.70	6380	7330	**IRB 68**
BHA 910 ZOH	13.6	**BHAM 910**	14.7	9/16	14.288	13/16	20.638	⅝	15.88	9280	11900	—
BHA 912 ZOH	16.3	**BHAM 912**	17.4	9/16	14.288	13/16	20.638	¾	19.05	11600	15900	**IRB 612**
BHA 108 ZOH	12.6	**BHAM 108**	13.9	⅝	15.875	⅞	22.225	½	12.70	6680	8020	**IRB 68-1**
BHA 1010 ZOH	14.9	**BHAM 1010**	16.2	⅝	15.875	⅞	22.225	⅝	15.88	10200	13800	—
BHA 1012 ZOH	18	**BHAM 1012**	19.3	⅝	15.875	⅞	22.225	¾	19.05	12700	18500	**IRB 612-1**
BHA 1016 ZOH	24	**BHAM 1016**	25	⅝	15.875	⅞	22.225	1	25.40	17400	27600	**IRB 716**
BHA 117 ZOH	11.9	**BHAM 117**	13.5	11/16	17.462	15/16	23.812	7/16	11.13	6860	8530	—
BHA 118 ZOH	13.7	**BHAM 118**	15.3	11/16	17.462	15/16	23.812	½	12.70	7320	9270	**IRB 88**
BHA 1110 ZOH	16	**BHAM 1110**	17.6	11/16	17.462	15/16	23.812	⅝	15.88	10500	14900	—
BHA 1112 ZOH	19.3	**BHAM 1112**	21	11/16	17.462	15/16	23.812	¾	19.05	13200	19900	**IRB 812**
BHA 1212 ZOH	26.5	**BHAM 1212**	28.5	¾	19.050	1 1/16	26.988	¾	19.05	16600	22600	**IRB 812-1**
BHA 138 ZOH	20	**BHAM 138**	22.5	13/16	20.638	1⅛	28.575	½	12.70	9500	11200	**IRB 98**
BHA 1310 ZOH	23.5	**BHAM 1310**	25.5	13/16	20.638	1⅛	28.575	⅝	15.88	13800	18200	**IRB 910**
BHA 1312 ZOH	28.5	**BHAM 1312**	30.5	13/16	20.638	1⅛	28.575	¾	19.05	17300	24400	**IRB 912**
BHA 1410 ZOH	25	**BHAM 1410**	27.5	⅞	22.225	1 3/16	30.162	⅝	15.88	14300	19500	—
BHA 1412 ZOH	30	**BHAM 1412**	32.5	⅞	22.225	1 3/16	30.162	¾	19.05	18000	26100	**IRB 1012**
BHA 1416 ZOH	39.5	**BHAM 1416**	42	⅞	22.225	1 3/16	30.162	1	25.40	23600	36900	**IRB 1016**
BHA 168 ZOH	24	**BHAM 168**	27	1	25.400	1 5/16	33.338	½	12.70	10200	13100	**IRB 128**
BHA 1610 ZOH	28	**BHAM 1610**	31	1	25.400	1 5/16	33.338	⅝	15.88	15300	22100	—
BHA 1612 ZOH	33.5	**BHAM 1612**	37	1	25.400	1 5/16	33.338	¾	19.05	19300	29700	**IRB 1212**
BHA 1614 ZOH	39.5	**BHAM 1614**	42.5	1	25.400	1 5/16	33.338	⅞	22.22	23000	37200	**IRB 1214**
BHA 1616 ZOH	45	**BHAM 1616**	48	1	25.400	1 5/16	33.338	1	25.40	26400	44500	**IRB 1216**
BHA 1620 ZOH	56.5	**BHAM 1620**	59.5	1	25.400	1 5/16	33.338	1¼	31.75	33200	59600	**IRB 1220**
BHA 1624 ZOH	67.5	**BHAM 1624**	71	1	25.400	1 5/16	33.338	1½	38.10	39400	74400	—
BHA 1812 ZOH	45	**BHAM 1812**	49	1⅛	28.575	1½	38.100	¾	19.05	22500	32200	**IRB 1412**
BHA 1816 ZOH	60	**BHAM 1816**	64	1⅛	28.575	1½	38.100	1	25.40	30900	48600	**IRB 1416**
BHA 1818 ZOH	67.5	**BHAM 1818**	71.5	1⅛	28.575	1½	38.100	1⅛	28.58	34900	56600	—
BHA 1820 ZOH	73.5	**BHAM 1820**	78	1⅛	28.575	1½	38.100	1¼	31.75	37100	61100	**IRB 1420**
BHA 208 ZOH	34.5	**BHAM 208**	40	1¼	31.750	1⅝	41.275	½	12.70	13700	17600	**IRB 168**
BHA 2012 ZOH	49.5	**BHAM 2012**	54.5	1¼	31.750	1⅝	41.275	¾	19.05	24100	36400	**IRB 1612**
BHA 2016 ZOH	66	**BHAM 2016**	71	1¼	31.750	1⅝	41.275	1	25.40	33200	55000	**IRB 1616**
BHA 2020 ZOH	81.5	**BHAM 2020**	86.5	1¼	31.750	1⅝	41.275	1¼	31.75	40000	69600	**IRB 1620**

INTERCHANGE TABLE

TORRINGTON OPEN END JH	TORRINGTON CLOSED END MJH	INA OPEN END SCH	INA CLOSED END BCH
JH-57	MJH-571	SCH 57	BCH 57
JH-68	MJH-681	SCH 68	BCH 68
JH-78	MJH-781	SCH 78	BCH 78
JH-87	MJH-871	SCH 87	BCH 87
JH-88	MJH-881	SCH 88	BCH 88
—	—	SCH 810	BCH 810
JH-812	MJH-8121	SCH 812	BCH 812
JH-98	MJH-981	SCH 98	BCH 98
—	—	—	—
JH-912	MJH-9121	SCH 912	BCH 912
—	—	SCH 108	BCH 108
JH-1010	MJH-10101	SCH 1010	BCH 1010
—	—	SCH 1012	BCH 1012
JH-1016	MJH-10161	SCH 1016	BCH 1016
—	—	SCH 117	BCH 117
—	—	—	—
JH-1110	MJH-11101	SCH 1110	BCH 1110
JH-1112	MJH-11121	SCH 1112	BCH 1112
JH-1212	MJH-12121	SCH 1212	BCH 1212
—	—	—	—
—	—	—	—
JH-1312	MJH-13121	SCH 1312	BCH 1312
—	—	SCH 1410	BCH 1410
JH-1412	MJH-14121	SCH 1412	BCH 1412
JH-1416	MJH-14161	SCH 1416	BCH 1416
—	—	SCH 168	BCH 168
—	—	SCH 1610	BCH 1610
JH-1612	MJH-16121	SCH 1612	BCH 1612
—	—	—	—
JH-1616	MJH-16161	SCH 1616	BCH 1616
—	—	SCH 1620	BCH 1620
—	—	SCH 1624	BCH 1624
JH-1812	MJH-18121	SCH 1812	BCH 1812
JH-1816	MJH-18161	SCH 1816	BCH 1816
JH-1818	MJH-18181	SCH 1818	BCH 1818
—	—	SCH 1820	BCH 1820
—	—	SCH 208	BCH 208
JH-2012	—	SCH 2012	BCH 2012
JH-2016	MJH-20161	SCH 2016	BCH 2016
JH-2020	—	SCH 2020	BCH 2020

SHELL TYPE
NEEDLE ROLLER BEARINGS

Inch Dimension



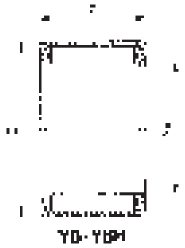
DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER OPEN END **BHA..ZOH**	WEIGHT (g)	IKO NUMBER CLOSED END **BHAM**	WEIGHT (g)	DIMENSIONS						BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	USABLE INNER RING **IRB**	TORRINGTON		INA	
				Fw		D		C					OPEN END JH	CLOSED END MJH	OPEN END SCH	CLOSED END BCH
				inch	mm	inch	mm	inch	mm							
BHA 228 ZOH	37	**BHAM 228**	43	1⅜	34.925	1¾	44.450	½	12.70	14100	18800	**IRB 188**	—	—	SCH 228	BCH 228
BHA 2210 ZOH	44	**BHAM 2210**	50	1⅜	34.925	1¾	44.450	⅝	15.88	19700	28800	—	—	—	—	—
BHA 2212 ZOH	53	**BHAM 2212**	59	1⅜	34.925	1¾	44.450	¾	19.05	24800	38800	**IRB 1812**	JH-2212	MJH-22121	SCH 2212	BCH 2212
BHA 2216 ZOH	71	**BHAM 2216**	77	1⅜	34.925	1¾	44.450	1	25.40	34100	58400	**IRB 1816**	JH-2216	MJH-22161	SCH 2216	BCH 2216
BHA 2220 ZOH	87	**BHAM 2220**	98.5	1⅜	34.925	1¾	44.450	1¼	31.75	41200	74200	**IRB 1820**	—	—	—	—
BHA 2824 ZOH	195	**BHAM 2824**	210	1¾	44.450	2¼	57.150	1½	38.10	72200	135000	**IRB 2424**	—	—	—	—
BHA 3312 ZOH	104	**BHAM 3312**	122	2 1/16	52.388	2 17/32	64.294	¾	19.05	36400	62100	—	—	—	—	—
BHA 3316 ZOH	139	**BHAM 3316**	157	2 1/16	52.388	2 17/32	64.294	1	25.40	50600	94700	—	—	—	—	—
BHA 3324 ZOH	205	**BHAM 3324**	225	2 1/16	52.388	2 17/32	64.294	1½	38.10	73900	154000	—	—	—	—	—

SHELL TYPE
NEEDLE ROLLER BEARINGS

Inch Dimension



DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER OPEN END YB, YBH	WEIGHT (g)	DIMENSIONS Fw inch	Fw mm	D inch	D mm	C inch	C mm	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	USABLE INNER RING IRB	TORRINGTON Y	INA SN	KAYDON KN
YB 2.5 2.5	0.64	5/32	3.969	9/32	7.144	5/32	3.96	1350	1220	—	Y-2½ 2½	—	—
YB 2.5 4	0.96	5/32	3.969	9/32	7.144	1/4	6.35	2320	2440	—	Y-2½ 4	—	—
YB 34	1.6	3/16	4.762	11/32	8.731	1/4	6.35	2770	2700	—	Y-34	—	KN-035504
YB 45	3.2	1/4	6.350	7/16	11.112	5/16	7.92	4450	4870	—	Y-45	—	KN-040705
YB 47	4.6	1/4	6.350	7/16	11.112	7/16	11.13	6320	7650	—	Y-47	—	—
YB 55	3.8	5/16	7.938	1/2	12.700	5/16	7.92	5110	6090	—	Y-55	SN 55	KN-050805
YB 64	3.4	3/8	9.525	9/16	14.288	1/4	6.35	4470	5360	—	Y-64	SN 64	KN-060904
YB 66	5.3	3/8	9.525	9/16	14.288	3/8	9.52	6920	9410	—	Y-66	SN 66	KN-060906
YB 68	7.2	3/8	9.525	9/16	14.288	1/2	12.70	9210	13600	—	Y-68	SN 68	KN-060908
YB 610	9.1	3/8	9.525	9/16	14.288	5/8	15.88	11300	17800	—	Y-610	SN 610	KN-060910
YB 78	8.2	7/16	11.112	5/8	15.875	1/2	12.70	10100	15900	—	Y-78	SN 78	KN-071008
YBH 78	10.5	7/16	11.112	11/16	17.462	1/2	12.70	12500	15800	—	YH-78	—	—
YB 84	4.3	1/2	12.700	11/16	17.462	1/4	6.35	5260	7150	—	Y-84	—	—
YB 86	6.7	1/2	12.700	11/16	17.462	3/8	9.52	8150	12600	—	Y-86	SN 86	KN-081106
YB 87	7.9	1/2	12.700	11/16	17.462	7/16	11.13	9530	15300	—	Y-87	—	KN-081107
YB 88	9.1	1/2	12.700	11/16	17.462	1/2	12.70	10800	18100	**IRB 58**	Y-88	SN 88	KN-081108
YB 810	11.5	1/2	12.700	11/16	17.462	5/8	15.88	13400	23700	—	Y-810	SN 810	KN-081110
YB 812	13.9	1/2	12.700	11/16	17.462	3/4	19.05	15800	29300	—	Y-812	SN 812	KN-081112
YBH 810	16	1/2	12.700	3/4	19.050	5/8	15.88	16300	23500	—	YH-810	—	—
YB 98	10.1	9/16	14.288	3/4	19.050	1/2	12.70	11600	20400	**IRB 68**	Y-98	SN 98	KN-091208
YB 910	12.7	9/16	14.288	3/4	19.050	5/8	15.88	14300	26700	—	Y-910	—	KN-091210
YB 912	15.4	9/16	14.288	3/4	19.050	3/4	19.05	16800	33000	**IRB 612**	Y-912	—	KN-091212
YB 105	6.7	5/8	15.875	13/16	20.638	5/16	7.92	7580	12200	—	Y-105	—	KN-101305
YB 108	11	5/8	15.875	13/16	20.638	1/2	12.70	12300	22700	**IRB 68-1**	Y-108	SN 108	KN-101308
YB 1012	16.9	5/8	15.875	13/16	20.638	3/4	19.05	17800	36600	**IRB 612-1**	Y-1012	—	KN-101312
YBH 108	15.3	5/8	15.875	7/8	22.225	1/2	12.70	15000	22400	**IRB 68-1**	YH-108	—	KN-101408
YB 1112	18.3	11/16	17.462	7/8	22.225	3/4	19.05	18700	40300	**IRB 812**	Y-1112	SN 1112	KN-111412
YB 124	8.5	3/4	19.050	1	25.400	1/4	6.35	7820	10200	—	Y-124	—	—
YB 128	17.8	3/4	19.050	1	25.400	1/2	12.70	16600	26900	**IRB 88-1**	Y-128	SN 128	KN-121608
YB 1210	22.5	3/4	19.050	1	25.400	5/8	15.88	20500	35300	**IRB 810-1**	Y-1210	SN 1210	KN-121610
YB 1212	27	3/4	19.050	1	25.400	3/4	19.05	24100	43400	**IRB 812-1**	Y-1212	SN 1212	KN-121612
YB 136	14.1	13/16	20.638	1 1/16	26.988	3/8	9.52	13000	20100	—	Y-136	—	—
YB 138	19.1	13/16	20.638	1 1/16	26.988	1/2	12.70	17400	29200	**IRB 98**	Y-138	—	—
YBH 1310	30.5	13/16	20.638	1 1/8	28.575	5/8	15.88	22900	36300	**IRB 910**	YH-1310	—	—
YBH 1312	37	13/16	20.638	1 1/8	28.575	3/4	19.05	27200	45300	**IRB 912**	YH-1312	—	—
YB 148	20.5	7/8	22.225	1 1/8	28.575	1/2	12.70	18100	31400	**IRB 108**	Y-148	SN 148	KN-141808
YB 1412	31	7/8	22.225	1 1/8	28.575	3/4	19.05	26300	50700	**IRB 1012**	Y-1412	SN 1412	—
YB 1416	41.5	7/8	22.225	1 1/8	28.575	1	25.40	33800	70200	**IRB 1016**	Y-1416	SN 1416	KN-141816
YBH 1412	39	7/8	22.225	1 3/16	30.162	3/4	19.05	28200	49000	**IRB 1012**	YH-1412	—	—
YB 168	23	1	25.400	1 1/4	31.750	1/2	12.70	19400	36000	**IRB 128**	Y-168	—	—

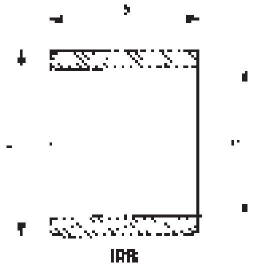
DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER OPEN END YB, YBH	WEIGHT (g)	DIMENSIONS Fw inch	 Fw mm	 D inch	 D mm	 C inch	 C mm	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	USABLE INNER RING IRB	TORRINGTON Y	INA SN	KAYDON KN
YB 1612	34.5	1	25.400	1¼	31.750	¾	19.05	28200	58000	**IRB 1212**	Y-1612	SN 1612	KN-162012
YB 1616	46.5	1	25.400	1¼	31.750	1	25.40	36300	80300	**IRB 1216**	Y-1616	SN 1616	KN-162016
YBH 168	29	1	25.400	1⁵⁄₁₆	33.338	½	12.70	20900	34100	**IRB 128**	YH-168	—	KN-162108
YBH 1612	44.5	1	25.400	1⁵⁄₁₆	33.338	¾	19.05	30700	56100	**IRB 1212**	YH-1612	—	—
YBH 1616	59.5	1	25.400	1⁵⁄₁₆	33.338	1	25.40	39900	78400	**IRB 1216**	YH-1616	—	—
YB 188	25.5	1⅛	28.575	1⅜	34.925	½	12.70	20700	40500	**IRB 148**	Y-188	SN 188	KN-182208
YB 1812	38.5	1⅛	28.575	1⅜	34.925	¾	19.05	30000	65300	**IRB 1412**	Y-1812	SN 1812	—
YB 1816	51.5	1⅛	28.575	1⅜	34.925	1	25.40	38700	90400	**IRB 1416**	Y-1816	SN 1816	KN-182216
YB 1910	42.5	1³⁄₁₆	30.162	1½	38.100	⅝	15.88	28400	53600	—	Y-1910	—	—
YB 2010	35	1¼	31.750	1½	38.100	⅝	15.88	27000	59000	**IRB 1610**	Y-2010	—	—
YB 2012	42.5	1¼	31.750	1½	38.100	¾	19.05	31800	72500	**IRB 1612**	Y-2012	SN 2012	KN-202412
YB 2016	57	1¼	31.750	1½	38.100	1	25.40	40900	100000	**IRB 1616**	Y-2016	SN 2016	KN-202416
YB 2018	64	1¼	31.750	1½	38.100	1⅛	28.58	45300	114000	—	Y-2018	—	KN-202418
YB 2020	68	1¼	31.750	1½	38.100	1¼	31.75	49400	128000	**IRB 1620**	Y-2020	—	KN-202420
YB 228	30.5	1⅜	34.925	1⅝	41.275	½	12.70	23000	49500	**IRB 188**	Y-228	SN 228	—
YB 2212	46	1⅜	34.925	1⅝	41.275	¾	19.05	33400	79800	**IRB 1812**	Y-2212	SN 2212	KN-222612
YB 2220	77.5	1⅜	34.925	1⅝	41.275	1¼	31.75	52000	141000	**IRB 1820**	Y-2220	—	—
YB 246	38	1½	38.100	1⅞	47.625	⅜	9.52	21000	34100	—	Y-246	—	—
YB 248	51.5	1½	38.100	1⅞	47.625	½	12.70	28700	50900	—	Y-248	—	—
YB 2414	91	1½	38.100	1⅞	47.625	⅞	22.22	48900	101000	**IRB 2014**	Y-2414	SN 2414	—
YB 2416	105	1½	38.100	1⅞	47.625	1	25.40	55100	118000	**IRB 2016**	Y-2416	SN 2416	—
YB 2420	131	1½	38.100	1⅞	47.625	1¼	31.75	66800	151000	**IRB 2020**	Y-2420	SN 2420	KN-243020
YB 2610	69	1⅝	41.275	2	50.800	⅝	15.88	37000	71700	**IRB 2210**	Y-2610	SN 2610	—
YB 2816	119	1¾	44.450	2⅛	53.975	1	25.40	59500	136000	**IRB 2416**	Y-2816	—	—
YB 3012	95	1⅞	47.625	2¼	57.150	¾	19.05	47800	105000	—	Y-3012	—	—
YB 3216	130	2	50.800	2⅜	60.325	1	25.40	64100	156000	**IRB 2616**	Y-3216	—	KN-323816

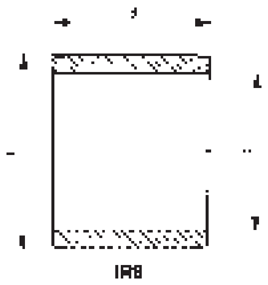
INNER RINGS FOR SHELL TYPE NEEDLE ROLLER BEARINGS

Inch Dimension



DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER IRB	WEIGHT (g)	DIMENSIONS d inch	d mm	F inch	F mm	B mm	USABLE BEARING NUMBER BA	BHA	YB	YBH	TORRINGTON IR	INA SI
IRB 58	8	5/16	7.938	1/2	12.7	12.95	**BA 88 ZOH**	**BHA 88 ZOH**	**YB 88**	—	—	SI 58
IRB 68	8.9	3/8	9.525	9/16	14.288	12.95	**BA 98 ZOH**	**BHA 98 ZOH**	**YB 98**	—	IR-68	SI 68
IRB 68-1	12.6	3/8	9.525	5/8	15.875	12.95	**BA 108 ZOH**	**BHA 108 ZOH**	**YB 108**	**YBH 108**	IR-68-1	SI 68-1
IRB 612	13.2	3/8	9.525	9/16	14.288	19.3	**BA 912 ZOH**	—	**YB 912**	—	IR-612	—
IRB 612-1	18.8	3/8	9.525	5/8	15.875	19.3	**BA 1012 ZOH**	**BHA 1012 ZOH**	**YB 1012**	—	IR-612-1	SI 612-1
IRB 78	10.1	7/16	11.112	5/8	15.875	12.95	**BA 108 ZOH**	**BHA 108 ZOH**	**YB 108**	**YBH 108**	—	—
IRB 712	15	7/16	11.112	5/8	15.875	19.3	**BA 1012 ZOH**	—	**YB 1012**	—	—	—
IRB 714	17.4	7/16	11.112	5/8	15.875	22.475	**BA 1014 ZOH**	—	—	—	—	—
IRB 716	19.9	7/16	11.112	5/8	15.875	25.65	**BA 1016 ZOH**	**BHA 1016 ZOH**	—	—	—	—
IRB 86	8.5	1/2	12.7	11/16	17.462	9.775	**BA 116 ZOH**	—	—	—	—	—
IRB 88	11.2	1/2	12.7	11/16	17.462	12.95	**BA 118 ZOH**	—	—	—	—	—
IRB 812	16.7	1/2	12.7	11/16	17.462	19.3	**BA 1112 ZOH**	—	**YB 1112**	—	—	—
IRB 88-1	15.8	1/2	12.7	3/4	19.05	12.95	**BA 128 ZOH**	—	**YB 128**	—	IR-88	SI 88
IRB 810-1	19.6	1/2	12.7	3/4	19.05	16.125	**BA 1210 ZOH**	—	**YB 1210**	—	—	SI 810
IRB 812-1	23.5	1/2	12.7	3/4	19.05	19.3	**BA 1212 ZOH**	—	**YB 1212**	—	IR-812	SI 812
IRB 814-1	27.5	1/2	12.7	3/4	19.05	22.475	**BA 1214 ZOH**	—	—	—	—	—
IRB 816-1	31	1/2	12.7	3/4	19.05	25.65	**BA 1216 ZOH**	—	—	—	—	—
IRB 98	17.3	9/16	14.288	13/16	20.638	12.95	**BA 138 ZOH**	—	**YB 138**	—	—	—
IRB 910	21.5	9/16	14.288	13/16	20.638	16.125	**BA 1310 ZOH**	—	—	**YBH 1310**	—	—
IRB 912	26	9/16	14.288	13/16	20.638	19.3	**BA 1312 ZOH**	**BHA 1312 ZOH**	—	**YBH 1312**	—	—
IRB 914	30	9/16	14.288	13/16	20.638	22.475	**BA 1314 ZOH**	—	—	—	—	—
IRB 916	34.5	9/16	14.288	13/16	20.638	25.65	**BA 1316 ZOH**	—	—	—	—	—
IRB 920	43	9/16	14.288	13/16	20.638	32	**BA 1320 ZOH**	—	—	—	—	—
IRB 106	14.5	5/8	15.875	7/8	22.225	9.775	**BA 146 ZOH**	—	—	—	—	SI 106
IRB 108	18.9	5/8	15.875	7/8	22.225	12.95	**BA 148 ZOH**	—	**YB 148**	—	—	SI 108
IRB 1012	28	5/8	15.875	7/8	22.225	19.3	**BA 1412 ZOH**	**BHA 1412 ZOH**	**YB 1412**	—	IR-1012	SI 1012
IRB 1014	33	5/8	15.875	7/8	22.225	22.475	**BA 1414 ZOH**	—	—	—	—	—
IRB 1016	37.5	5/8	15.875	7/8	22.225	25.65	**BA 1416 ZOH**	**BHA 1416 ZOH**	**YB 1416**	—	IR-1016	SI 1016
IRB 1022	51.5	5/8	15.875	7/8	22.225	35.175	**BA 1422 ZOH**	—	—	—	—	—
IRB 1110	25.5	11/16	17.462	15/16	23.812	16.125	**BA 1510 ZOH**	—	—	—	—	—
IRB 1116	40.5	11/16	17.462	15/16	23.812	25.65	**BA 1516 ZOH**	—	—	—	—	—
IRB 128	22	3/4	19.05	1	25.4	12.95	**BA 168 ZOH**	**BHA 168 ZOH**	**YB 168**	**YBH 168**	IR-128	SI 128
IRB 1212	33	3/4	19.05	1	25.4	19.3	**BA 1612 ZOH**	**BHA 1612 ZOH**	**YB 1612**	**YBH 1612**	IR-1212	SI 1212
IRB 1214	38.5	3/4	19.05	1	25.4	22.475	**BA 1614 ZOH**	—	—	—	—	—
IRB 1216	43.5	3/4	19.05	1	25.4	25.65	**BA 1616 ZOH**	**BHA 1616 ZOH**	**YB 1616**	**YBH 1616**	IR-1216	SI 1216
IRB 1220	54.5	3/4	19.05	1	25.4	32	**BA 1620 ZOH**	—	—	—	IR-1220	SI 1220
IRB 1316	34	13/16	20.638	1	25.4	25.65	**BA 1616 ZOH**	**BHA 1616 ZOH**	**YB 1616**	**YBH 1616**	IR-1316	—
IRB 148	25	7/8	22.225	1 1/8	28.575	12.95	**BA 188 ZOH**	—	**YB 188**	—	—	SI 148
IRB 1412	37.5	7/8	22.225	1 1/8	28.575	19.3	**BA 1812 ZOH**	**BHA 1812 ZOH**	**YB 1812**	—	—	SI 1412
IRB 1416	50	7/8	22.225	1 1/8	28.575	25.65	**BA 1816 ZOH**	**BHA 1816 ZOH**	**YB 1816**	—	IR-1416	SI 1416



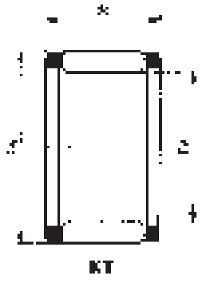
DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER	WEIGHT	DIMENSIONS					USABLE BEARING NUMBER				TORRINGTON	INA
		d		F		B						
IRB	(g)	inch	mm	inch	mm	mm	BA	BHA	YB	YBH	IR	SI
IRB 1420	62.5	⅞	22.225	1⅛	28.575	32	**BA 1820 ZOH**	**BHA 1820 ZOH**	—	—	—	SI 1420
IRB 168	28.5	1	25.4	1¼	31.75	12.95	**BA 208 ZOH**	—	—	—	—	—
IRB 1610	35.5	1	25.4	1¼	31.75	16.125	**BA 2010 ZOH**	—	**YB 2010**	—	—	—
IRB 1612	42.5	1	25.4	1¼	31.75	19.3	**BA 2012 ZOH**	—	**YB 2012**	—	IR-1612	SI 1612
IRB 1616	56	1	25.4	1¼	31.75	25.65	**BA 2016 ZOH**	**BHA 2016 ZOH**	**YB 2016**	—	IR-1616	SI 1616
IRB 1620	70	1	25.4	1¼	31.75	32	**BA 2020 ZOH**	—	—	—	—	SI 1620
IRB 168-1	36.5	1	25.4	1 5⁄16	33.338	12.95	**BA 218 ZOH**	—	—	—	—	—
IRB 1610-1	45.5	1	25.4	1 5⁄16	33.338	16.125	**BA 2110 ZOH**	—	—	—	—	—
IRB 1612-1	54.5	1	25.4	1 5⁄16	33.338	19.3	**BA 2112 ZOH**	—	—	—	—	—
IRB 188	31.5	1⅛	28.575	1⅜	34.925	12.95	**BA 228 ZOH**	—	**YB 228**	—	—	SI 188
IRB 1812	47	1⅛	28.575	1⅜	34.925	19.3	**BA 2212 ZOH**	**BHA 2212 ZOH**	**YB 2212**	—	IR-1812	SI 1812
IRB 1816	62.5	1⅛	28.575	1⅜	34.925	25.65	**BA 2216 ZOH**	**BHA 2216 ZOH**	—	—	IR-1816	SI 1816
IRB 1820	78	1⅛	28.575	1⅜	34.925	32	**BA 2220 ZOH**	—	**YB 2220**	—	IR-1820	SI 1820
IRB 2010	43	1¼	31.75	1½	38.1	16.125	**BA 2410 ZOH**	—	—	—	—	—
IRB 2014	60	1¼	31.75	1½	38.1	22.475	**BA 2414 ZOH**	—	**YB 2414**	—	—	—
IRB 2016	68.5	1¼	31.75	1½	38.1	25.65	**BA 2416 ZOH**	—	**YB 2416**	—	IR-2016	SI 2016
IRB 2020	85.5	1¼	31.75	1½	38.1	32	**BA 2420 ZOH**	—	**YB 2420**	—	IR-2020	SI 2020
IRB 2210	47	1⅜	34.925	1⅝	41.275	16.125	**BA 2610 ZOH**	—	**YB 2610**	—	—	SI 2210
IRB 2220	93.5	1⅜	34.925	1⅝	41.275	32	**BA 2620 ZOH**	—	—	—	IR-2220	SI 2220
IRB 2316	99	1 7⁄16	36.512	1¾	44.45	25.65	**BA 2816 ZOH**	—	—	—	IR-2316	—
IRB 2412	62	1½	38.1	1¾	44.45	19.3	**BA 2812 ZOH**	—	—	—	—	SI 2412
IRB 2416	81	1½	38.1	1¾	44.45	25.65	**BA 2816 ZOH**	—	**YB 2816**	—	IR-2416	SI 2416
IRB 2424	121	1½	38.1	1¾	44.45	38.35	**BA 2824 ZOH**	**BHA 2824 ZOH**	—	—	IR-2424	—
IRB 248-1	64	1½	38.1	1⅞	47.625	12.95	**BA 308 ZOH**	—	—	—	—	—
IRB 2410-1	79.5	1½	38.1	1⅞	47.625	16.125	**BA 3010 ZOH**	—	—	—	—	—
IRB 2616	136	1⅝	41.275	2	50.8	25.65	**BA 3216 ZOH**	—	—	—	—	—
IRB 2628	235	1⅝	41.275	2	50.8	44.7	**BAW 3228 ZOH**	—	—	—	—	—
IRB 2720	146	1 11⁄16	42.862	2	50.8	32	**BA 3220 ZOH**	—	—	—	—	SI 2720
IRB 3016	100	1⅞	47.625	2⅛	53.975	25.65	**BA 3416 ZOH**	—	—	—	—	—
IRB 3024	149	1⅞	47.625	2⅛	53.975	38.35	**BA 3424 ZOH**	—	—	—	IR-3024	—
IRB 3616	183	2¼	57.15	2⅝	66.675	25.65	**BA 4216 ZOH**	—	—	—	—	—
IRB 4016	131	2½	63.5	2¾	69.85	25.65	**BA 4416 ZOH**	—	—	—	IR-4016	—
IRB 4020	164	2½	63.5	2¾	69.85	32	**BA 4420 ZOH**	—	—	—	—	—

NEEDLE ROLLER CAGES

Metric Dimension

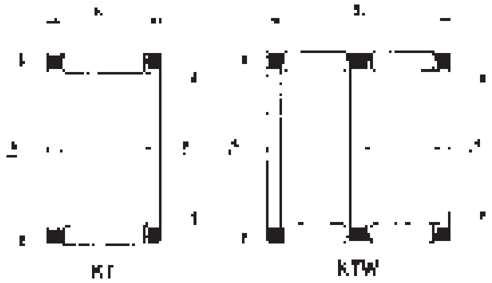


DIMENSION TABLE INTERCHANGE TABLE

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	INA	SKF	TORRINGTON	FAG
KT	(g)	Fw	Ew	Bc	(N)	(N)	K	K	FWJV	K
KT 367 N	0.39	3	6	7	1480	990	K 3×6×7 TN	K 3×6×7 TN	—	K 3×6×7 TN
KT 477 N	0.47	4	7	7	1800	1300	K 4×7×7 TN	K 4×7×7 TN	—	K 4×7×7 TN
KT 587	0.89	5	8	7	2070	1600	—	—	—	—
KT 588 N	0.66	5	8	8	2420	1950	K 5×8×8 TN	K 5×8×8 TN	—	K 5×8×8 TN
KT 697 N	0.63	6	9	7	2310	1900	—	—	—	—
KT 698 N	0.75	6	9	8	2700	2320	K 6×9×8 TN	K 6×9×8 TN	—	K 6×9×8
KT 6910	1.45	6	9	10	3010	2660	K 6×9×10 TN	K 6×9×10 TN	—	K 6×9×10 TN
KT 61013	2.7	6	10	13	4410	3720	K 6×10×13 TN	K 6×10×13 TN	—	—
KT 7108 N	0.86	7	10	8	2960	2690	K 7×10×8 TN	K 7×10×8 TN	—	K 7×10×8 TN
KT 71010	1.69	7	10	10	3340	3130	K 7×10×10 TN	K 7×10×10 TN	—	K 7×10×10 TN
KT 8118 N	0.96	8	11	8	3190	3060	K 8×11×8 TN	K 8×11×8 TN	—	K 8×11×8 FV
KT 81110	1.9	8	11	10	3630	3600	K 8×11×10 TN	K 8×11×10 TN	—	K 8×11×10 F
KT 81113	2.5	8	11	13	4500	4750	K 8×11×13 TN	K 8×11×13 TN	—	K 8×11×13 F
KT 8128	2.1	8	12	8	3630	3040	—	—	—	—
KT 81211	3	8	12	11	4630	4170	—	—	—	—
KT 91210	2.1	9	12	10	3900	4070	K 9×12×10 TN	K 9×12×10 TN	—	K 9×12×10 FV
KT 91213	2.8	9	12	13	4840	5370	K 9×12×13 TN	K 9×12×13 TN	—	K 9×12×13 F
KT 10138	1.9	10	13	8	3370	3470	—	—	—	—
KT 101310	2.3	10	13	10	4160	4550	K 10×13×10 TN	K 10×13×10 TN	—	K 10×13×10
KT 101313	3	10	13	13	5160	6000	K 10×13×13 TN	K 10×13×13 TN	—	K 10×13×13 F
KT 101410	3.2	10	14	10	4900	4680	K 10×14×10 TN	K 10×14×10 TN	—	K 10×14×10
KT 101412	3.8	10	14	12	5940	6000	—	—	—	—
KT 101413	4.2	10	14	13	6100	6200	K 10×14×13 TN	K 10×14×13 TN	—	K 10×14×13
KT 101415	4.8	10	14	15	7080	7520	—	—	—	—
KT 111410	2.5	11	14	10	4400	5020	—	K 11×14×10 TN	—	K 11×14×10 F
KT 12158	2.2	12	15	8	3750	4200	—	—	—	—
KT 121510	2.7	12	15	10	4620	5490	K 12×15×10 TN	K 12×15×10 TN	—	K 12×15×10
KT 121512	3.2	12	15	12	5590	7020	—	—	—	—
KT 121513	3.6	12	15	13	5730	7250	K 12×15×13 TN	K 12×15×13 TN	—	K 12×15×13
KT 121514	3.8	12	15	14	6200	8010	—	—	—	—
KT 121610	4	12	16	10	5650	5890	K 12×16×10	K 12×16×10	—	K 12×16×10
KT 121613	5.2	12	16	13	7020	7800	K 12×16×13 TN	K 12×16×13 TN	—	K 12×16×13 F
KT 121618	7	12	16	18	9790	11900	—	—	—	—
KT 121710	5.1	12	17	10	6170	5740	—	—	—	—
KT 121812	7.8	12	18	12	9030	8460	K 12×18×12 TN	K 12×18×12	—	K 12×18×12 F
KT 121820	13.2	12	18	20	13700	14400	—	—	—	—
KT 131710	4.3	13	17	10	5990	6500	—	—	—	K 13×17×10
KT 131815	8.2	13	18	15	9660	10400	—	K 13×18×15	—	K 13×18×15F
KT 131816	8.7	13	18	16	10300	11400	—	—	—	—
KT 14188	3.7	14	18	8	5110	5410	—	—	—	K 14×18×8 F

DIMENSION TABLE INTERCHANGE TABLE

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	INA	SKF	TORRINGTON	FAG
KT	(g)	Fw	Ew	Bc	(N)	(N)	K	K	FWJV	K
KT 141810	4.6	14	18	10	6320	7110	K 14×18×10	K 14×18×10	—	K 14×18×10
KT 141811	5.2	14	18	11	6520	7410	—	—	—	—
KT 141813	6	14	18	13	7860	9410	K 14×18×13	K 14×18×13	—	K 14×18×13
KT 141816	7.3	14	18	16	9750	12400	—	—	—	K 14×18×16 CH
KT 141910	5.9	14	19	10	7130	7180	—	—	—	—
KT 141916	9.4	14	19	16	11100	12600	—	—	—	—
KT 141918	10.5	14	19	18	12400	14700	—	—	—	K 14×19×18 F
KT 142012	8.7	14	20	12	9790	9680	K 14×20×12	K 14×20×12	—	K 14×20×12
KT 142017	12.4	14	20	17	13300	14400	—	—	—	—
KT 15199	4.4	15	19	9	6120	6950	—	—	—	—
KT 151910	4.9	15	19	10	6630	7720	K 15×19×10	K 15×19×10	—	K 15×19×10
KT 151911	5.5	15	19	11	6850	8040	—	—	—	K 15×19×11
KT 151913	6.4	15	19	13	8250	10200	K 15×19×13	K 15×19×13	—	K 15×19×13
KT 151917	8.2	15	19	17	10900	14600	K 15×19×17	K 15×19×17	—	K 15×19×17
KT 151918	8.7	15	19	18	11500	15600	—	—	—	—
KT 152010	6.3	15	20	10	7580	7920	—	—	—	—
KT 152115	11.9	15	21	15	12600	13500	K 15×21×15	K 15×21×15	—	K 15×21×15 F
KT 162010	5.2	16	20	10	6930	8330	K 16×20×10	K 16×20×10	—	K 16×20×10
KT 162013	6.8	16	20	13	8620	11000	K 16×20×13	K 16×20×13	FWJV-162013	K 16×20×13
KT 162016	8.3	16	20	16	10700	14600	—	—	—	—
KT 162017	8.7	16	20	17	11400	15700	K 16×20×17	K 16×20×17	—	K 16×20×17 F
KT 162118	12	16	21	18	14000	17700	—	—	—	—
KT 162120	13.6	16	21	20	14700	18900	—	—	—	—
KT 162125	16.6	16	21	25	18300	25100	—	—	—	—
KT 162212	9.7	16	22	12	10500	10900	K 16×22×12	K 16×22×12	—	K 16×22×12 F
KT 162214	11.5	16	22	14	11600	12500	—	—	—	—
KT 162217	13.8	16	22	17	14200	16100	—	—	—	—
KT 162220	16.5	16	22	20	15900	18600	K 16×22×20	K 16×22×20	—	K 16×22×20 F
KT 162420	23.5	16	24	20	18500	19000	K 16×24×20	K 16×24×20	—	K 16×24×20 F
KT 172110	5.5	17	21	10	7220	8950	K 17×21×10	K 17×21×10	—	K 17×21×10
KT 172113	7.2	17	21	13	8980	11800	K 17×21×13	K 17×21×13	—	K 17×21×13
KT 172115	8.2	17	21	15	10400	14400	—	K 17×21×15	—	K 17×21×15
KT 172117	9.3	17	21	17	11800	16900	K 17×21×17	K 17×21×17	—	K 17×21×17 F
KT 172220	14	17	22	20	15500	20500	—	K 17×21×20	—	K 17×21×20 F
KT 172311	9.6	17	23	11	10100	10500	—	—	—	—
KT 172315	13.1	17	23	15	13300	15100	—	K 17×23×15	—	K 17×23×15 F
KT 172418	18.6	17	24	18	16500	18000	—	—	—	—
KT 18228	4.7	18	22	8	6060	7270	—	—	—	K 18×22×8 F
KT 182210	5.8	18	22	10	7500	9560	K 18×22×10	K 18×22×10	—	K 18×22×10
KT 182213	7.6	18	22	13	9330	12700	K 18×22×13	K 18×22×13	FWJV-182213	K 18×22×13 H



DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	INA	SKF	TORRINGTON	FAG
KT	(g)	Fw	Ew	Bc	(N)	(N)	K	K	FWJV	K
KT 182216	9.2	18	22	16	11600	16700	—	—	—	—
KT 182412	11	18	24	12	11800	13100	K 18×24×12	K 18×24×12	—	K 18×24×12
KT 182416	14.8	18	24	16	15100	17900	—	—	—	—
KT 182417	15.7	18	24	17	16000	19400	—	—	—	—
KT 182420	18.7	18	24	20	17900	22400	K 18×24×20	K 18×24×20	—	K 18×24×20
KT 182517	18.8	18	25	17	16700	18600	—	—	—	—
KT 182519	21	18	25	19	18700	21400	—	—	—	—
KT 182522	24.5	18	25	22	20600	24200	K 18×25×22	K 18×25×22	—	K 18×25×22 H
KT 182614	18.1	18	26	14	14600	14400	—	—	—	—
KT 182620	26	18	26	20	20000	21600	—	K 18×26×20	—	K 18×26×20 F.ZB2
KT 202410	6.3	20	24	10	7710	10200	K 20×24×10	K 20×24×10	—	K 20×24×10
KT 202413	8.3	20	24	13	9590	13500	K 20×24×13	K 20×24×13	FWJV-202413	K 20×24×13
KT 202417	10.6	20	24	17	12600	19300	K 20×24×17	K 20×24×17	FWJV-202417	K 20×24×17
KTW 202422	14.6	20	24	22	13700	21300	—	—	—	—
KT 202525	19.7	20	25	25	19900	29800	—	—	—	—
KTW 202531.6	26.5	20	25	31.6	21700	33200	—	—	—	—
KTW 202540	32.5	20	25	40	27500	44900	—	K 20×25×40 ZW	—	K 20×25×40 FZW
KT 202611	11.1	20	26	11	11200	12500	—	—	—	—
KT 202612	12	20	26	12	12400	14300	K 20×26×12	K 20×26×12	—	K 20×26×12
KT 202614	14.2	20	26	14	13700	16400	—	—	—	—
KT 202617	17	20	26	17	16800	21200	K 20×26×17	K 20×26×17	FWJV-202617	K 20×26×17
KT 202620	20.5	20	26	20	18700	24400	K 20×26×20	K 20×26×20	—	K 20×26×20
KT 202624	24	20	26	24	22500	30900	—	—	—	—
KT 202627	26.5	20	26	27	26000	37300	—	—	—	—
KT 202814	20	20	28	14	15700	16100	—	—	—	—
KT 202820	29	20	28	20	21500	24200	K 20×28×20	K 20×28×20	—	K 20×28×20
KT 203225	49.5	20	32	25	30800	30500	—	—	—	—
KT 212610	8.5	21	26	10	9090	11000	—	—	—	—
KT 212611	9.6	21	26	11	9390	11500	—	—	—	—
KT 222610	6.9	22	26	10	8220	11500	K 22×26×10	K 22×26×10	—	K 22×26×10 H
KT 222613	9.1	22	26	13	10200	15200	K 22×26×13	K 22×26×13	FWJV-222613	K 22×26×13
KT 222617	11.6	22	26	17	13500	21600	K 22×26×17	K 22×26×17	FWJV-222617	K 22×26×17
KTW 222625	17.7	22	26	25	17100	29400	—	—	—	—
KT 222720	17.9	22	27	20	17400	25700	—	—	—	—
KT 222726	22.5	22	27	26	22500	35800	—	—	—	—
KT 222817	18.4	22	28	17	17500	23000	K 22×28×17	K 22×28×17	—	K 22×28×17 H
KT 222912	16.1	22	29	12	12900	14000	—	—	—	—
KT 222916	21	22	29	16	17600	20900	K 22×29×16	K 22×29×16	—	K 22×29×16
KT 222917	22.5	22	29	17	18700	22600	—	—	—	—
KT 222918	23.5	22	29	18	19800	24400	—	—	—	—

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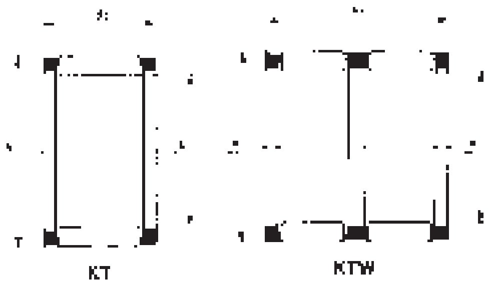
KT	(g)	Fw	Ew	Bc	(N)	(N)	K	K	FWJV	K
KT 222920	26.5	22	29	20	20900	26100	—	—	—	—
KT 223015	23.5	22	30	15	17900	19700	K 22×30×15 TN	K 22×30×15 TN	—	K 22×30×15 H
KT 223230	52.5	22	32	30	36400	42700	—	—	—	K 22×32×30 H
KT 223232	56	22	32	32	38800	46300	—	—	—	—
KT 232824	22	23	28	24	21600	34500	—	K 23×28×24	—	K 23×28×24 F
KT 232913	15.1	23	29	13	13800	17200	—	—	—	—
KT 233015	21	23	30	15	17300	20800	—	—	—	—
KT 233016	22	23	30	16	18600	22600	—	—	—	—
KT 242813	9.9	24	28	13	10800	16800	K 24×28×13	K 24×28×13	—	K 24×28×13 H
KT 242816	12	24	28	16	13400	22200	—	K 24×28×16	—	K 24×28×16 F
KTW 242834	27	24	28	34	21600	40700	—	—	—	—
KT 242913	12.8	24	29	13	12700	17600	K 24×29×13	—	—	—
KT 243020	23.5	24	30	20	20300	28500	—	—	—	—
KT 252910	7.9	25	29	10	8940	13300	K 25×29×10	K 25×29×10	—	K 25×29×10 H
KT 252913	10.3	25	29	13	11100	17600	K 25×29×13	K 25×29×13	FWJV-252913	K 25×29×13 F
KT 253013	13.3	25	30	13	13100	18600	K 25×30×13	K 25×30×13	—	K 25×30×13
KT 253016	16.2	25	30	16	16300	24600	—	—	—	—
KT 253017	17.1	25	30	17	17300	26600	—	K 25×30×17	—	K 25×30×17 H
KT 253020	20	25	30	20	18600	29100	K 25×30×20	K 25×30×20	FWJV-253020	K 25×30×20 F
KT 253113	16.2	25	31	13	14300	18400	—	—	—	—
KT 253116	19.6	25	31	16	17800	24400	—	—	—	—
KT 253117	20.5	25	31	17	19000	26500	K 25×31×17	K 25×31×17	—	K 25×31×17
KT 253120	25	25	31	20	21200	30500	—	K 25×31×20	—	K 25×31×20 H
KT 253216	23.5	25	32	16	19400	24500	K 25×32×16	K 25×32×16	—	K 25×32×16
KT 253224	35	25	32	24	27700	38700	—	—	—	—
KT 253515	33	25	35	15	22600	23800	—	—	—	—
KT 253525	48	25	35	25	32500	37900	—	—	—	K 25×35×25 H
KT 253530	58	25	35	30	39100	48000	K 25×35×30	K 25×35×30	—	K 25×35×30
KT 263013	10.7	26	30	13	11400	18400	K 26×30×13	K 26×30×13	—	K 26×30×13 F
KT 263832	79.5	26	38	32	47200	55300	—	—	—	—
KT 283313	14.8	28	33	13	13800	20700	K 28×33×13	K 28×33×13	—	K 28×33×13 F
KT 283317	18.9	28	33	17	18300	29500	K 28×33×17	K 28×33×17	FWJV-283317	K 28×33×17
KT 283327	29	28	33	27	26300	47300	K 28×33×27 TN	K 28×33×27 TN	FWJV-283327	K 28×33×27 H
KT 283417	23	28	34	17	20300	29900	K 28×34×17	K 28×34×17	—	K 28×34×17
KT 283516	26	28	35	16	20100	26500	K 28×35×16	K 28×35×16	—	K 28×35×16 F
KT 283528	44.5	28	35	28	33200	50600	—	—	—	—
KT 283620	38.5	28	36	20	26500	34700	—	K 28×36×20	—	K 28×36×20 FV
KT 284138	110	28	41	38	58700	71100	—	—	—	—
KT 303513	15.6	30	35	13	14100	21700	K 30×15×13	K 30×15×13	—	K 30×15×13 H
KT 303516	18.9	30	35	16	17500	28700	—	—	—	—



DIMENSION TABLE

INTERCHANGE TABLE

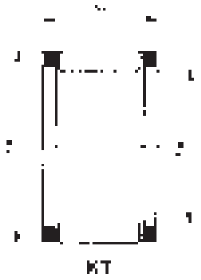
IKO NUMBER	WEIGHT	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	INA	SKF	TORRINGTON	FAG
KT	(g)	Fw	Ew	Bc	(N)	(N)	K	K	FWJV	K
KT 303517	20	30	35	17	18700	31100	K 30×35×17	K 30×35×17	FWJV-303517	K 30×35×17 H
KT 303524	28.5	30	35	24	24900	45100	—	—	—	K 30×35×24
KT 303527	31.5	30	35	27	27900	52100	K 30×35×27	K 30×35×27	FWJV-303527	K 30×35×27
KT 303613	19.1	30	36	13	15800	22100	—	—	—	—
KT 303620	29.5	30	36	20	23300	36500	—	—	—	—
KT 303630	41.5	30	36	30	33200	57500	—	—	—	—
KT 303715	26	30	37	15	19500	26000	—	—	—	—
KT 303716	27.5	30	37	16	20800	28400	K 30×37×16	K 30×37×16	—	K 30×37×16
KT 303720	35	30	37	20	24700	35400	—	—	—	—
KT 303723	39.5	30	37	23	28500	42500	—	—	—	—
KT 303818	36.5	30	38	18	26200	34800	—	—	—	—
KT 303824	48.5	30	38	24	33200	47200	—	—	—	—
KT 304232	93	30	42	32	54000	68100	—	—	—	—
KTW 304237	117	30	42	37	55900	71300	—	—	—	—
KT 323713	16.7	32	37	13	14900	23700	K 32×37×13	K 32×37×13	—	K 32×37×13 F
KT 323717	21.5	32	37	17	19600	33900	K 32×37×17	K 32×37×17	FWJV-323717	K 32×37×17 F
KT 323723	28.5	32	37	23	24400	44800	—	—	—	—
KT 323813	20.5	32	38	13	16800	24400	—	—	—	—
KT 323820	31.5	32	38	20	24800	40300	K 32×38×20	K 32×38×20	—	K 32×38×20 F
KT 323916	29	32	39	16	21600	30200	K 32×39×16	K 32×39×16	—	—
KT 323920	37	32	39	20	25600	37700	—	—	—	—
KT 324519	63.5	32	45	19	33700	35900	—	—	—	—
KT 324525	84.5	32	45	25	45600	53000	—	—	—	—
KT 324532	109	32	45	32	58500	73000	—	—	—	—
KT 324550	162	32	45	50	81500	111000	—	—	—	—
KT 354013	18.1	35	40	13	15500	25800	K 35×40×13	K 35×40×13	FWJV-354013	K 35×40×13 H
KT 354017	23	35	40	17	20500	36900	K 35×40×17	K 35×40×17	FWJV-354017	K 35×40×17 H
KT 354026	34.5	35	40	26	28700	56800	—	K 35×40×26 ZW	—	K 35×40×26 FZW
KT 354113	22.5	35	41	13	17700	26800	—	—	—	—
KT 354216	32	35	42	16	23100	33900	K 35×42×16	K 35×42×16	—	K 35×42×16
KT 354218	35.5	35	42	18	26000	39500	K 35×42×18	K 35×42×18	—	K 35×42×18
KT 354220	40.5	35	42	20	27400	42300	K 35×42×20	K 35×42×20	—	K 35×42×20 F
KT 354230	59	35	42	30	40600	70300	K 35×42×30	K 35×42×30	—	K 35×42×30 FH.ZB 2
KT 354525	68.5	35	45	25	42100	57900	—	—	—	—
KT 364216	27.5	36	42	16	21900	35700	K 36×42×16	K 36×42×16	—	K 36×42×16
KT 384417	30.5	38	44	17	23800	40400	—	—	—	—
KT 384620	50	38	46	20	30500	45400	K 38×46×20	K 38×46×20	—	K 38×46×20
KT 384632	80	38	46	32	45400	75700	K 38×46×32	K 38×46×32	—	K 38×46×32 H
KT 404513	20.5	40	45	13	16800	29800	K 40×45×13	K 40×45×13	—	K 40×45×13 F
KT 404517	26.5	40	45	17	22200	42700	K 40×45×17	K 40×45×17	FWJV-404517	K 40×45×17 H

DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	INA	SKF	TORRINGTON	FAG
KT	(g)	Fw	Ew	Bc	(N)	(N)	K	K	FWJV	K
KT 404527	41	40	45	27	32400	69200	K 40×45×27	K 40×45×27	FWJV-404527	K 40×45×27 H
KT 404817	44	40	48	17	28100	41600	—	—	—	—
KT 404820	52.5	40	48	20	31400	48000	K 40×48×20	K 40×48×20	FWJV-404820	K 40×48×20 F
KT 404825	64.5	40	48	25	39300	64000	—	—	—	—
KT 404834	87.5	40	48	34	51100	89600	—	—	—	—
KT 405015	48.5	40	50	15	28200	35900	—	—	—	—
KT 405017	56.5	40	50	17	30200	39200	—	—	—	—
KT 405020	61	40	50	20	35700	48600	—	—	—	—
KTW 405238	158	40	52	38	65000	93000	—	—	—	—
KT 405432	144	40	54	32	66800	87200	—	—	—	—
KT 405450	215	40	54	50	93600	134000	—	—	—	—
KT 405463	270	40	54	63	115000	175000	—	—	—	—
KT 414835	78.5	41	48	35	47800	90800	—	—	—	—
KT 424717	27.5	42	47	17	22500	44200	K 42×27×17	K 42×27×17	FWJV-424717	K 42×27×17 F
KT 424815	30	42	48	15	22400	38600	—	—	—	—
KT 424816	32	42	48	16	24000	42100	—	—	—	—
KT 425020	55	42	50	20	32400	50600	K 42×50×20	K 42×50×20	—	K 42×50×20 F
KT 425030	80.5	42	50	30	48200	84400	—	—	—	—
KT 455017	29.5	45	50	17	23300	47100	K 45×50×17	K 45×50×17	FWJV-455017	K 45×50×17 H
KT 455027	46	45	50	27	34800	79000	K 45×50×27	K 45×50×27	FWJV-455027	K 45×50×27 F
KT 455320	58	45	53	20	33200	53300	K 45×53×20	K 45×53×20	—	K 45×53×20 H
KT 455325	71.5	45	53	25	41500	71100	—	—	—	K 45×53×25 F
KT 455330	86	45	53	30	47800	85300	—	—	—	—
KT 455335	101	45	53	35	53900	99500	—	—	—	—
KT 455527	90.5	45	55	27	50300	78200	—	—	—	—
KT 485320	37	48	53	20	26800	57600	—	—	—	—
KT 485420	46	48	54	20	30600	60400	—	—	—	—
KT 505520	38.5	50	55	20	27100	59300	K 50×55×20	K 50×55×20	FWJV-505520	K 50×55×20 H
KT 505527	50.5	50	55	27	35600	84100	—	—	—	—
KT 505820	65	50	58	20	35900	61100	K 50×58×20	K 50×58×20	—	K 50×58×20 H
KT 505825	80	50	58	25	44900	81500	K 50×58×25	K 50×58×25	—	K 50×58×25 H
KT 505830	96.5	50	58	30	51700	97800	—	—	—	—
KT 505835	113	50	58	35	58300	114000	—	K 50×58×35	—	K 50×58×35 H
KT 525817	41	52	58	17	28300	56000	—	—	—	—
KT 526024	80	52	60	24	44000	80800	—	K 52×60×24	—	K 52×60×24
KT 556020	42.5	55	60	20	28600	66000	K 55×60×20	K 55×60×20	FWJV-556020	K 55×60×20 H
KT 556027	55.5	55	60	27	37600	93900	K 55×60×27	—	—	—
KT 556120	52	55	61	20	32600	68500	—	—	—	—
KT 556315	52.5	55	63	15	29400	48700	K 55×63×15	K 55×63×15	—	K 55×63×15 F
KT 556320	71	55	63	20	37400	66400	K 55×63×20	K 55×63×20	—	K 55×63×20

KT



DIMENSION TABLE INTERCHANGE TABLE

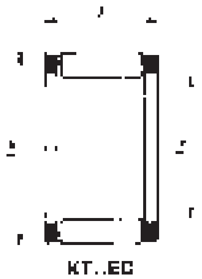
IKO NUMBER	WEIGHT	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	INA	SKF	TORRINGTON	FAG
KT	(g)	Fw	Ew	Bc			K	K	FWJV	K
KT 556325	87	55	63	25	46800	88600	K 55×63×25	K 55×63×25	—	K 55×63×25
KT 586320	44.5	58	63	20	29300	69400	—	—	—	—
KT 586420	54.5	58	64	20	33600	72500	—	—	—	—
KT 606520	45.5	60	65	20	29700	71100	K 60×65×20	K 60×65×20	—	K 60×65×20 H
KT 606820	76.5	60	68	20	38900	71700	K 60×68×20	K 60×68×20	—	K 60×68×20
KT 606825	94	60	68	25	48600	95600	K 60×68×25	K 60×68×25	—	K 60×68×25
KT 606827	101	60	68	27	52400	105000	K 60×68×27	—	—	—
KT 607236	205	60	72	36	86700	152000	—	—	—	—
KT 637120	79.5	63	71	20	39500	74400	—	K 63×71×20	—	K 63×71×20
KT 657320	83.5	65	73	20	41200	79600	—	—	—	—
KT 657330	124	65	73	30	59300	127000	K 65×73×30	K 65×73×30	—	K 65×73×30 H
KT 687620	86.5	68	76	20	41800	82200	—	—	—	K 68×76×20
KT 707820	89	70	78	20	42500	84900	—	—	—	K 70×78×20
KT 707830	132	70	78	30	61200	136000	K 70×78×30	K 70×78×30	—	K 70×78×30
KT 728020	91.5	72	80	20	43200	87500	K 72×80×20	K 72×80×20	—	K 72×80×20
KT 758320	94.5	75	83	20	43800	90200	—	—	—	K 75×83×20 F
KT 758325	116	75	83	25	54800	120000	—	—	—	—
KT 758330	141	75	83	30	63100	144000	K 72×83×30	K 72×83×30	—	K 72×83×30 F
KT 758335	164	75	83	35	71200	168000	K 75×83×35 ZW	—	—	—
KT 808822	110	80	88	22	49700	108000	—	—	—	K 80×88×22 F
KT 808825	123	80	88	25	56400	127000	—	—	—	K 80×88×25 F
KT 808830	149	80	88	30	65000	153000	K 80×88×30	K 80×88×30	—	K 80×88×30
KT 859112	44.5	85	91	12	25200	56700	—	—	—	—
KT 859325	130	85	93	25	57800	134000	—	K 85×93×25	—	K 85×93×25 F
KT 859330	157	85	93	30	66600	161000	—	—	—	K 85×93×30
KT 909825	138	90	98	25	60400	145000	—	K 90×98×25	—	K 90×98×25 F
KT 909830	167	90	98	30	69600	174000	K 90×98×30	K 90×98×30	—	K 90×98×30 F
KT 9510330	175	95	103	30	70900	182000	K 95×103×30	K 95×103×30	—	K 95×103×30 F
KT 10010830	184	100	108	30	72500	191000	K 100×108×30	K 100×108×30	—	K 100×108×30 F

IKO

KT..EG

NEEDLE ROLLER CAGES FOR CONNECTING ROD OF ENGINE

Metric Dimension

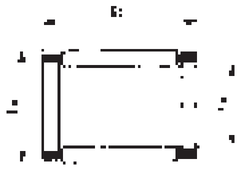


DIMENSION TABLE INTERCHANGE TABLE

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	INA	SKF	FAG
KT..EG	(g)	Fw	Ew	Bc			KZK	KZK	K..FV
KT 8128 EG	2.1	8	12	8	3280	2660	—	—	—
KT 101410 EG	3.2	10	14	10	4900	4680	—	—	—
KT 121610 EG	3.8	12	16	10	5650	5890	KZK 12×16×10	KZK 12×16×10	K 12×16×10 FV
KT 121710 EG	5.3	12	17	10	6670	6380	KZK 12×17×10	—	K 12×17×10 FV
KT 14199.7 EG	5.7	14	19	9.7	6120	5880	—	—	—
KT 141910 EG	5.7	14	19	10	6640	6530	—	—	—
KT 15199 EG	4.2	15	19	9	5790	6460	—	—	—
KT 152010 EG	6.1	15	20	10	7100	7260	—	—	—
KT 162211.5 EG	9.5	16	22	11.5	9550	9660	—	—	—
KT 162212 EG	9.7	16	22	12	10500	10900	KZK 16×22×12	KZK 16×22×12	K 16×22×12 FV
KT 182210 EG	5.7	18	22	10	7500	9560	—	—	—
KT 182411.6 EG	11	18	24	11.6	10600	11500	—	—	—
KT 182412 EG	11	18	24	12	11800	13100	KZK 18×24×12	KZK 18×24×12	K 18×24×12 JPSV.ZB 2
KT 202612 EG	12	20	26	12	12400	14300	KZK 20×26×12	KZK 20×26×12	K 20×26×12 FV
KT 202614 EG	13.8	20	26	14	13000	15200	—	—	—
KT 202814 EG	20	20	28	14	15700	16100	—	—	—
KT 222814 EG	14.9	22	28	14	13600	16600	—	—	—
KT 222816 EG	17.5	22	28	16	15700	19800	KZK 22×28×16	—	WK 22×28×16 FVCZ61
KT 222912 EG	15.2	22	29	12	12900	14000	—	—	—
KT 223215 EG	30	22	32	15	21300	21500	—	—	—
KT 232913 EG	14.9	23	29	13	12800	15600	—	—	—
KT 243015 EG	17.9	24	30	15	14200	18000	—	—	—
KT 243016 EG	18.2	24	30	16	16300	21500	—	—	—
KT 243120 EG	28	24	31	20	20800	26400	—	—	—
KT 303818 EG	35.5	30	38	18	24900	32600	—	—	—
KT 324220 EG	54	32	42	20	31900	39400	—	—	—

NEEDLE ROLLER CAGES FOR CONNECTING ROD OF ENGINE

Metric Dimension



KTV..EG

DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	INA	SKF	FAG
KTV..EG	(g)	Fw	Ew	Bc	(N)	(N)	KBK	KBK	K..FKIV
KTV 91211.5 EG	2.8	9	12	11.5	3900	4070	—	—	—
KTV 91214 EG	3.5	9	12	14	4440	4810	—	—	—
KTV 101316 EG	4.5	10	13	16	4400	4880	—	—	—
KTV 101410 EG	3.8	10	14	10	4520	4220	—	—	—
KTV 101411 EG	4.1	10	14	11	5060	4880	—	—	—
KTV 101412.5 EG	4.8	10	14	12.5	5590	5540	—	—	—
KTV 10.51415 EG	5.1	10.5	14	15	5710	6270	—	—	—
KTV 121514.3 EG	4.3	12	15	14.3	5840	7390	—	—	—
KTV 121613 EG	5.6	12	16	13	7020	7800	KBK 12×16×13	KBK 12×16×13	K 12×16×13 FKIV1
KTV 121615.5 EG	6.8	12	16	15.5	7600	8600	—	—	—
KTV 141812 EG	6	14	18	12	6780	7760	—	—	—
KTV 141816.5 EG	8.2	14	18	16.5	9180	11500	—	—	—
KTV 141822 EG	10.8	14	18	22	9950	12600	—	—	—
KTV 162019 EG	10.6	16	20	19	10800	14600	—	—	—
KTV 162022 EG	12.7	16	20	22	11400	15700	—	—	—
KTV 182223.5 EG	14.9	18	22	23.5	13000	19300	—	—	—
KTV 182321 EG	16.4	18	23	21	14400	18900	—	—	—

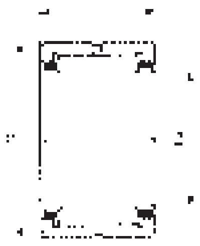
IKO

NA49•RNA49

MACHINED TYPE NEEDLE ROLLER BEARINGS

Metric Dimension

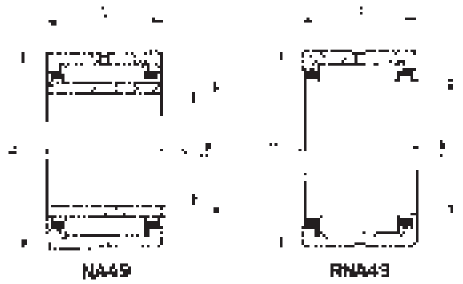
NA49



RNA49

DIMENSION TABLE | **INTERCHANGE TABLE**

IKO NUMBER WITH INNER RING **NA49**	WEIGHT (g)	IKO NUMBER WITHOUT INNER RING **RNA49**	WEIGHT (g)	DIMENSIONS (mm)				BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	INA		SKF		FAG	
				d	Fw	D	C			WITH INNER RING NA	WITHOUT INNER RING RNA	WITH INNER RING NA	WITHOUT INNER RING RNA	WITH INNER RING NA	WITHOUT INNER RING RNA
—	—	**RNA 493**	4.6	—	5	11	10	2420	1950	—	—	—	—	—	—
—	—	**RNA 494**	5.3	—	6	12	10	2700	2320	—	NK 6/10 TN	—	NK 6/10 TN	—	NK 6/10
NA 495	7.3	**RNA 495**	5.9	5	7	13	10	2960	2690	—	—	—	—	—	—
NA 496	9.1	**RNA 496**	7.4	6	8	15	10	3960	3420	—	—	—	—	—	—
NA 497	11.2	**RNA 497**	9.3	7	9	17	10	4530	3650	—	—	—	—	—	—
NA 498	15	**RNA 498**	12.6	8	10	19	11	6180	5030	—	—	—	—	—	—
NA 499	16.7	**RNA 499**	13.6	9	12	20	11	6600	6310	—	—	—	—	—	—
NA 4900	24	**RNA 4900**	16.5	10	14	22	13	9230	10100	NA 4900	RNA 4900	NA 4900	RNA 4900	NA 4900	RNA 4900
NA 4901	26.5	**RNA 4901**	18.1	12	16	24	13	9660	11100	NA 4901	RNA 4901	NA 4901	RNA 4901	NA 4901	RNA 4901
—	—	**RNA 49/14**	19.9	—	18	26	13	10600	12800	—	—	—	—	—	—
NA 4902	35	**RNA 4902**	21.5	15	20	28	13	10900	13800	NA 4902	RNA 4902	NA 4902	RNA 4902	NA 4902	RNA 4902
NA 4903	39	**RNA 4903**	23.5	17	22	30	13	11700	15600	NA 4903	RNA 4903	NA 4903	RNA 4903	NA 4903	RNA 4903
NA 4904	78.5	**RNA 4904**	55.5	20	25	37	17	21000	25000	NA 4904	RNA 4904	NA 4904	RNA 4904	NA 4904	RNA 4904
NA 49/22	87	**RNA 49/22**	56.5	22	28	39	17	21400	28900	NA 49/22	RNA 49/22	NA 49/22	RNA 49/22	NA 49/22	RNA 49/22
NA 4905	92.5	**RNA 4905**	64	25	30	42	17	23700	30700	NA 4905	RNA 4905	NA 4905	RNA 4905	NA 4905	RNA 4905
NA 49/28	101	**RNA 49/28**	76.5	28	32	45	17	24500	32700	NA 49/28	RNA 49/28	NA 49/28	RNA 49/28	NA 49/28	RNA 49/28
NA 4906	106	**RNA 4906**	72.5	30	35	47	17	25200	34700	NA 4906	RNA 4906	NA 4906	RNA 4906	NA 4906	RNA 4906
NA 49/32	165	**RNA 49/32**	96	32	40	52	20	31200	47800	NA 49/32	RNA 49/32	NA 49/32	RNA 49/32	NA 49/32	RNA 49/32
NA 4907	178	**RNA 4907**	113	35	42	55	20	32000	50100	NA 4907	RNA 4907	NA 4907	RNA 4907	NA 4907	RNA 4907
—	—	**RNA 49/38**	120	—	45	58	20	33600	54600	—	—	—	—	—	—
NA 4908	245	**RNA 4908**	152	40	48	62	22	41600	67400	NA 4908	RNA 4908	NA 4908	RNA 4908	NA 4908	RNA 4908
—	—	**RNA 49/42**	174	—	50	65	22	42500	70300	—	NKS 50	—	NKS 50	—	NKS 50 A
NA 4909	285	**RNA 4909**	197	45	52	68	22	43500	73300	NA 4909	RNA 4909	NA 4909	RNA 4909	NA 4909	RNA 4909
—	—	**RNA 49/48**	188	—	55	70	22	44300	76300	—	—	—	—	—	—
NA 4910	295	**RNA 4910**	179	50	58	72	22	46200	82100	NA 4910	RNA 4910	NA 4910	RNA 4910	NA 4910	RNA 4910
—	—	**RNA 49/52**	205	—	60	75	22	47100	85100	—	—	—	—	—	—
NA 4911	410	**RNA 4911**	265	55	63	80	25	57600	97200	NA 4911	RNA 4911	NA 4911	RNA 4911	NA 4911	RNA 4911
—	—	**RNA 49/58**	275	—	65	82	25	58900	101000	—	—	—	—	—	—
NA 4912	440	**RNA 4912**	285	60	68	85	25	60200	105000	NA 4912	RNA 4912	NA 4912	RNA 4912	NA 4912	RNA 4912
—	—	**RNA 49/62**	320	—	70	88	25	61500	109000	—	—	—	—	—	—
NA 4913	470	**RNA 4913**	325	65	72	90	25	62700	113000	NA 4913	RNA 4913	NA 4913	RNA 4913	NA 4913	RNA 4913
—	—	**RNA 49/68**	470	—	75	95	30	79900	147000	—	—	—	—	—	—
NA 4914	765	**RNA 4914**	495	70	80	100	30	83200	158000	NA 4914	RNA 4914	NA 4914	RNA 4914	NA 4914	RNA 4914
NA 4915	810	**RNA 4915**	525	75	85	105	30	86200	169000	NA 4915	RNA 4915	NA 4915	RNA 4915	NA 4915	RNA 4915
NA 4916	855	**RNA 4916**	550	80	90	110	30	87300	175000	NA 4916	RNA 4916	NA 4916	RNA 4916	NA 4916	RNA 4916
—	—	**RNA 49/82**	575	—	95	115	30	90000	186000	—	—	—	—	—	—
NA 4917	1280	**RNA 4917**	705	85	100	120	35	110000	244000	NA 4917	RNA 4917	NA 4917	RNA 4917	NA 4917	RNA 4917
NA 4918	1350	**RNA 4918**	740	90	105	125	35	113000	258000	NA 4918	RNA 4918	NA 4918	RNA 4918	NA 4918	RNA 4918
NA 4919	1420	**RNA 4919**	770	95	110	130	35	116000	271000	NA 4919	RNA 4919	NA 4919	RNA 4919	NA 4919	RNA 4919
NA 4920	1960	**RNA 4920**	1190	100	115	140	40	145000	329000	NA 4920	RNA 4920	NA 4920	RNA 4920	NA 4920	RNA 4920



DIMENSION TABLE

IKO NUMBER WITH INNER RING NA49	WEIGHT (g)	IKO NUMBER WITHOUT INNER RING RNA49	WEIGHT (g)	DIMENSIONS (mm)				BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
				d	Fw	D	C		
NA 4922	2120	**RNA 4922**	1280	110	125	150	40	152000	357000
NA 4924	2960	**RNA 4924**	1930	120	135	165	45	187000	435000
NA 4926	4030	**RNA 4926**	2360	130	150	180	50	215000	540000
NA 4928	4290	**RNA 4928**	2500	140	160	190	50	224000	580000
NA 4930	6380	**RNA 4930**	4090	150	170	210	60	324000	712000
NA 4932	6750	**RNA 4932**	4310	160	180	220	60	337000	761000
NA 4934	7110	**RNA 4934**	4530	170	190	230	60	347000	810000
NA 4936	10200	**RNA 4936**	6250	180	205	250	69	434000	989000
NA 4938	10700	**RNA 4938**	6500	190	215	260	69	440000	1020000
NA 4940	15400	**RNA 4940**	10400	200	225	280	80	518000	1120000
NA 4944	16700	**RNA 4944**	11200	220	245	300	80	536000	1200000
NA 4948	18000	**RNA 4948**	12000	240	265	320	80	565000	1320000
NA 4952	31100	**RNA 4952**	21200	260	290	360	100	847000	1900000
NA 4956	33100	**RNA 4956**	22500	280	310	380	100	877000	2040000
NA 4960	51400	**RNA 4960**	33400	300	340	420	118	1130000	2650000
NA 4964	54400	**RNA 4964**	35200	320	360	440	118	1170000	2830000
NA 4968	57300	**RNA 4968**	37000	340	380	460	118	1220000	3020000
NA 4972	60200	**RNA 4972**	38700	360	400	480	118	1260000	3200000
NA 4976	90300	**RNA 4976**	56400	380	430	520	140	1540000	4030000
NA 4980	94400	**RNA 4980**	58800	400	450	540	140	1590000	4270000
NA 4984	98500	**RNA 4984**	61200	420	470	560	140	1640000	4510000
NA 4988	131000	**RNA 4988**	86900	440	490	600	160	1910000	5140000

INTERCHANGE TABLE

INA		SKF		FAG	
WITH INNER RING NA	WITHOUT INNER RING RNA	WITH INNER RING NA	WITHOUT INNER RING RNA	WITH INNER RING NA	WITHOUT INNER RING RNA
NA 4922	RNA 4922	NA 4922	RNA 4922	NA 4922	RNA 4922
NA 4924	RNA 4924	NA 4924	RNA 4924	NA 4924	RNA 4924
NA 4926	RNA 4926	NA 4926	RNA 4926	NA 4926	RNA 4926
NA 4928	RNA 4928	NA 4928	RNA 4928	NA 4928	RNA 4928
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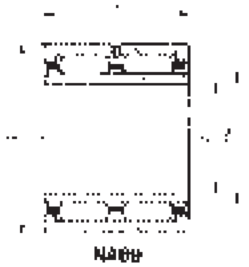
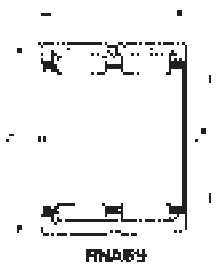
MACHINED TYPE NEEDLE ROLLER BEARINGS

Metric Dimension





DIMENSION TABLE

IKO NUMBER WITH INNER RING NA69	WEIGHT (g)	IKO NUMBER WITHOUT INNER RING RNA69	WEIGHT (g)	DIMENSIONS (mm)				BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
				d	Fw	D	C		
NA 6901	44.5	**RNA 6901**	30	12	16	24	22	17100	23000
NA 6902	61	**RNA 6902**	37	15	20	28	23	19300	28800
NA 6903	67	**RNA 6903**	40.5	17	22	30	23	20800	32500
NA 6904	136	**RNA 6904**	95.5	20	25	37	30	35400	48900
NA 69/22	152	**RNA 69/22**	97.5	22	28	39	30	36300	56900
NA 6905	160	**RNA 6905**	111	25	30	42	30	42100	64300
NA 69/28	176	**RNA 69/28**	133	28	32	45	30	41800	64800
NA 6906	184	**RNA 6906**	125	30	35	47	30	43000	69000
NA 69/32	295	**RNA 69/32**	172	32	40	52	36	53500	95700
NA 6907	320	**RNA 6907**	200	35	42	55	36	54900	100000
NA 6908	440	**RNA 6908**	275	40	48	62	40	71300	135000
NA 6909	520	**RNA 6909**	355	45	52	68	40	74600	147000
NA 6910	530	**RNA 6910**	320	50	58	72	40	79200	164000
NA 6911	730	**RNA 6911**	475	55	63	80	45	98700	194000
NA 6912	785	**RNA 6912**	510	60	68	85	45	103000	211000
NA 6913	840	**RNA 6913**	585	65	72	90	45	108000	227000
NA 6914	1400	**RNA 6914**	910	70	80	100	54	134000	311000
NA 6915	1480	**RNA 6915**	960	75	85	105	54	138000	331000
NA 6916	1560	**RNA 6916**	1010	80	90	110	54	143000	351000
NA 6917	2340	**RNA 6917**	1300	85	100	120	63	173000	467000
NA 6918	2460	**RNA 6918**	1360	90	105	125	63	178000	490000
NA 6919	2580	**RNA 6919**	1420	95	110	130	63	182000	514000

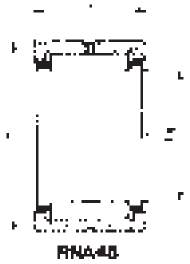
INTERCHANGE TABLE

INA		SKF		FAG	
WITH INNER RING NA	WITHOUT INNER RING RNA	WITH INNER RING NA	WITHOUT INNER RING RNA	WITH INNER RING NA	WITHOUT INNER RING RNA
NA 6901	RNA 6901	NA 6901	RNA 6901	NA 6901 A	RNA 6901 A
NA 6902	RNA 6902	NA 6902	RNA 6902	NA 6902 A	RNA 6902 A
NA 6903	RNA 6903	NA 6903	RNA 6903	NA 6903 A	RNA 6903 A
NA 6904	RNA 6904	NA 6904	RNA 6904	NA 6904 A	RNA 6904 A
NA 69/22	RNA 69/22	NA 69/22	RNA 69/22	NA 69/22	RNA 69/22
NA 6905	RNA 6905	NA 6905	RNA 6905	NA 6905 A	RNA 6905 A
NA 69/28	RNA 69/28	NA 69/28	RNA 69/28	NA 69/28 A	—
NA 6906	RNA 6906	NA 6906	RNA 6906	NA 6906 A	RNA 6906 A
NA 69/32	RNA 69/32	NA 69/32	RNA 69/32	NA 69/32 A	RNA 69/32 A
NA 6907	RNA 6907	NA 6907	RNA 6907	NA 6907 A	RNA 6907 A
NA 6908	RNA 6908	NA 6908	RNA 6908	NA 6908 A	RNA 6908 A
NA 6909	RNA 6909	NA 6909	RNA 6909	NA 6909 A	RNA 6909 A
NA 6910	RNA 6910	NA 6910	RNA 6910	NA 6910 A	RNA 6910 A
NA 6911	RNA 6911	NA 6911	RNA 6911	NA 6911 A	RNA 6911 A
NA 6912	RNA 6912	NA 6912	RNA 6912	NA 6912	RNA 6912
NA 6913	RNA 6913	NA 6913	RNA 6913	NA 6913 A	RNA 6913 A
NA 6914	RNA 6914	NA 6914	RNA 6914	NA 6914 A	RNA 6914 A
NA 6915	RNA 6915	NA 6915	RNA 6915	NA 6915 A	RNA 6915 A
NA 6916	RNA 6916	NA 6916	RNA 6916	NA 6916	RNA 6916
NA 6917	RNA 6917	NA 6917	RNA 6917	NA 6917	RNA 6917
NA 6918	RNA 6918	NA 6918	RNA 6918	NA 6918	RNA 6918
NA 6919	RNA 6919	NA 6919	RNA 6919	NA 6919	RNA 6919

MACHINED TYPE NEEDLE ROLLER BEARINGS

Metric Dimension


NA48


RNA48

DIMENSION TABLE

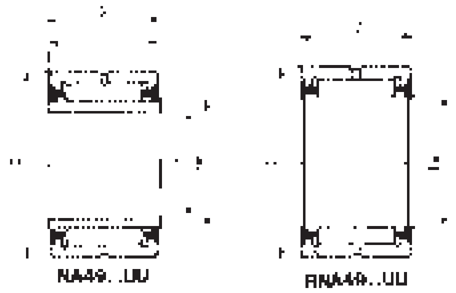
IKO NUMBER WITH INNER RING NA48	WEIGHT (g)	IKO NUMBER WITHOUT INNER RING RNA48	WEIGHT (g)	DIMENSIONS (mm) d	Fw	D	C	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
NA 4822	1200	**RNA 4822**	790	110	120	140	30	93200	239000
NA 4824	1300	**RNA 4824**	850	120	130	150	30	96900	259000
NA 4826	1960	**RNA 4826**	1100	130	145	165	35	116000	340000
NA 4828	2100	**RNA 4828**	1170	140	155	175	35	120000	363000
NA 4830	2880	**RNA 4830**	1750	150	165	190	40	168000	446000
NA 4832	3050	**RNA 4832**	1850	160	175	200	40	173000	474000
NA 4834	4120	**RNA 4834**	2700	170	185	215	45	211000	567000
NA 4836	4340	**RNA 4836**	2840	180	195	225	45	218000	602000
NA 4838	5760	**RNA 4838**	3380	190	210	240	50	249000	726000
NA 4840	6040	**RNA 4840**	3520	200	220	250	50	255000	766000
NA 4844	6570	**RNA 4844**	3820	220	240	270	50	266000	833000
NA 4848	10200	**RNA 4848**	5670	240	265	300	60	345000	1150000
NA 4852	11000	**RNA 4852**	6070	260	285	320	60	354000	1220000
NA 4856	15800	**RNA 4856**	9750	280	305	350	69	486000	1550000
NA 4860	22300	**RNA 4860**	13200	300	330	380	80	610000	1900000
NA 4864	23700	**RNA 4864**	14000	320	350	400	80	635000	2040000
NA 4868	25000	**RNA 4868**	14800	340	370	420	80	651000	2140000
NA 4872	26400	**RNA 4872**	15600	360	390	440	80	680000	2320000
NA 4876	44600	**RNA 4876**	27900	380	415	480	100	951000	2860000

INTERCHANGE TABLE

INA WITH INNER RING NA	WITHOUT INNER RING RNA	SKF WITH INNER RING NA	WITHOUT INNER RING RNA	FAG WITH INNER RING NA	WITHOUT INNER RING RNA
NA 4822	RNA 4822	NA 4822	RNA 4822	NA 4822	RNA 4822
NA 4824	RNA 4824	NA 4824	RNA 4824	NA 4824	RNA 4824
NA 4826	RNA 4826	NA 4826	RNA 4826	NA 4826	RNA 4826
NA 4828	RNA 4828	NA 4828	RNA 4828	NA 4828	RNA 4828
NA 4830	RNA 4830	NA 4830	RNA 4830	NA 4830	RNA 4830
NA 4832	RNA 4832	NA 4832	RNA 4832	NA 4832	RNA 4832
NA 4834	RNA 4834	NA 4834	RNA 4834	NA 4834	RNA 4834
NA 4836	RNA 4836	NA 4836	RNA 4836	NA 4836	RNA 4836
NA 4838	RNA 4838	NA 4838	RNA 4838	NA 4838	RNA 4838
NA 4840	RNA 4840	NA 4840	RNA 4840	NA 4840	RNA 4840
NA 4844	RNA 4844	NA 4844	RNA 4844	NA 4844	RNA 4844
NA 4848	RNA 4848	NA 4848	RNA 4848	NA 4848	RNA 4848
NA 4852	RNA 4852	NA 4852	RNA 4852	NA 4852	RNA 4852
NA 4856	RNA 4856	NA 4856	RNA 4856	NA 4856	RNA 4856
NA 4860	RNA 4860	NA 4860	RNA 4860	NA 4860	RNA 4860
NA 4864	RNA 4864	NA 4864	RNA 4864	NA 4864	RNA 4864
NA 4868	RNA 4868	NA 4868	RNA 4868	NA 4868	RNA 4868
NA 4872	RNA 4872	NA 4872	RNA 4872	NA 4872	RNA 4872
NA 4876	RNA 4876	NA 4876	RNA 4876	NA 4876	RNA 4876

MACHINED TYPE
NEEDLE ROLLER BEARINGS (with seals)

Metric Dimension



DIMENSION TABLE

IKO NUMBER WITH INNER RING **NA49..UU**	WEIGHT (g)	IKO NUMBER WITHOUT INNER RING **RNA49..UU**	WEIGHT (g)	DIMENSIONS (mm) d	Fw	D	C	B	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
NA 4900 UU	24.5	**RNA 4900 UU**	16.3	10	14	22	13	14	8080	8490
NA 4901 UU	27.5	**RNA 4901 UU**	17.9	12	16	24	13	14	8470	9320
—	—	**RNA 49/14 UU**	19.7	—	18	26	13	—	9260	10800
NA 4902 UU	36	**RNA 4902 UU**	21.5	15	20	28	13	14	9570	11600
NA 4903 UU	39.5	**RNA 4903 UU**	23	17	22	30	13	14	10300	13100
NA 4904 UU	78.5	**RNA 4904 UU**	54.5	20	25	37	17	18	18000	20500
NA 49/22 UU	87.5	**RNA 49/22 UU**	55.5	22	28	39	17	18	18300	23700
NA 4905 UU	92.5	**RNA 4905 UU**	63	25	30	42	17	18	20300	25100
NA 49/28 UU	101	**RNA 49/28 UU**	75.5	28	32	45	17	18	21000	26800
NA 4906 UU	106	**RNA 4906 UU**	71	30	35	47	17	18	21500	28400
NA 49/32 UU	167	**RNA 49/32 UU**	94.5	32	40	52	20	21	29400	44200
NA 4907 UU	179	**RNA 4907 UU**	112	35	42	55	20	21	30100	46300
—	—	**RNA 49/38 UU**	119	—	45	58	20	—	31600	50400
NA 4908 UU	245	**RNA 4908 UU**	150	40	48	62	22	23	37200	58400
—	—	**RNA 49/42 UU**	173	—	50	65	22	—	38000	60900
NA 4909 UU	290	**RNA 4909 UU**	197	45	52	68	22	23	38900	63400
—	—	**RNA 49/48 UU**	187	—	55	70	22	—	39600	66100
NA 4910 UU	295	**RNA 4910 UU**	177	50	58	72	22	23	41300	71100
—	—	**RNA 49/52 UU**	200	—	60	75	22	—	42100	73600
NA 4911 UU	415	**RNA 4911 UU**	265	55	63	80	25	26	52200	85700
—	—	**RNA 49/58 UU**	275	—	65	82	25	—	53400	89200
NA 4912 UU	445	**RNA 4912 UU**	285	60	68	85	25	26	54500	92800
—	—	**RNA 49/62 UU**	320	—	70	88	25	—	55700	96300
NA 4913 UU	475	**RNA 4913 UU**	325	65	72	90	25	26	56800	99800
—	—	**RNA 49/68 UU**	465	—	75	95	30	—	73900	133000
NA 4914 UU	770	**RNA 4914 UU**	495	70	80	100	30	31	76900	143000
NA 4915 UU	815	**RNA 4915 UU**	520	75	85	105	30	31	79600	153000
NA 4916 UU	860	**RNA 4916 UU**	545	80	90	110	30	31	80700	158000
—	—	**RNA 49/82 UU**	570	—	95	115	30	—	83200	168000
NA 4917 UU	1300	**RNA 4917 UU**	695	85	100	120	35	36	103000	225000
NA 4918 UU	1360	**RNA 4918 UU**	730	90	105	125	35	36	106000	238000
NA 4919 UU	1420	**RNA 4919 UU**	760	95	110	130	35	36	109000	250000
NA 4920 UU	1980	**RNA 4920 UU**	1200	100	115	140	40	41	134000	297000
NA 4922 UU	2150	**RNA 4922 UU**	1280	110	125	150	40	41	140000	322000
NA 4924 UU	2990	**RNA 4924 UU**	1940	120	135	165	45	46	178000	410000
NA 4926 UU	4080	**RNA 4926 UU**	2360	130	150	180	50	51	206000	511000
NA 4928 UU	4340	**RNA 4928 UU**	2510	140	160	190	50	51	214000	549000

INTERCHANGE TABLE

INA WITH INNER RING NA..2RS	INA WITHOUT INNER RING RNA..2RS	SKF WITH INNER RING NA..2RS	SKF WITHOUT INNER RING RNA..2RS	FAG WITH INNER RING NA..2RS	FAG WITHOUT INNER RING RNA..2RS
NA 4900 .2RS	RNA 4900 .2RS	NA 4900 .2RS	RNA 4900 .2RS	NA 4900A .2RS	RNA 4900A .2RS
NA 4901 .2RS	RNA 4901 .2RS	NA 4901 .2RS	RNA 4901 .2RS	NA 4901A .2RS	RNA 4901A .2RS
—	—	—	—	—	—
NA 4902 .2RS	RNA 4902 .2RS	NA 4902 .2RS	RNA 4902 .2RS	NA 4902A .2RS	RNA 4902A .2RS
NA 4903 .2RS	RNA 4903 .2RS	NA 4903 .2RS	RNA 4903 .2RS	NA 4903A .2RS	RNA 4903A .2RS
NA 4904 .2RS	RNA 4904 .2RS	NA 4904 .2RS	RNA 4904 .2RS	NA 4904A .2RS	RNA 4904A .2RS
—	—	—	—	—	—
NA 4905 .2RS	RNA 4905 .2RS	NA 4905 .2RS	RNA 4905 .2RS	NA 4905A .2RS	RNA 4905A .2RS
—	—	—	—	—	—
NA 4906 .2RS	RNA 4906 .2RS	NA 4906 .2RS	RNA 4906 .2RS	NA 4906A .2RS	RNA 4906A .2RS
—	—	—	—	—	—
NA 4907 .2RS	RNA 4907 .2RS	NA 4907 .2RS	RNA 4907 .2RS	NA 4907A .2RS	RNA 4907A .2RS
—	—	—	—	—	—
NA 4908 .2RS	RNA 4908 .2RS	NA 4908 .2RS	RNA 4908 .2RS	NA 4908A .2RS	RNA 4908A .2RS
—	—	—	—	—	—
NA 4909 .2RS	RNA 4909 .2RS	NA 4909 .2RS	RNA 4909 .2RS	NA 4909A .2RS	RNA 4909A .2RS
—	—	—	—	—	—
NA 4910 .2RS	RNA 4910 .2RS	NA 4910 .2RS	RNA 4910 .2RS	NA 4910A .2RS	RNA 4910A .2RS
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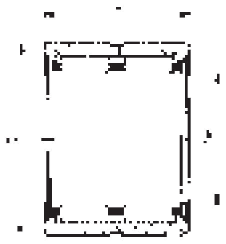
MACHINED TYPE NEEDLE ROLLER BEARINGS (with seals)

Metric Dimension

NA69..UU



RNA69..UU

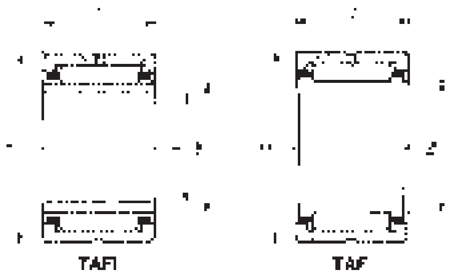
DIMENSION TABLE

IKO NUMBER WITH INNER RING NA69..UU	WEIGHT (g)	IKO NUMBER WITHOUT INNER RING RNA69..UU	WEIGHT (g)	DIMENSIONS (mm) d	Fw	D	C	B	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
NA 6901 UU	45.5	**RNA 6901 UU**	30	12	16	24	22	23	15500	20400
NA 6902 UU	62.5	**RNA 6902 UU**	37.5	15	20	28	23	24	18500	27100
NA 6903 UU	68.5	**RNA 6903 UU**	40.5	17	22	30	23	24	19800	30600
NA 6904 UU	137	**RNA 6904 UU**	95.5	20	25	37	30	31	33000	44600
NA 69/22 UU	153	**RNA 69/22 UU**	97.5	22	28	39	30	31	33800	52000
NA 6905 UU	162	**RNA 6905 UU**	111	25	30	42	30	31	39200	58700
NA 69/28 UU	177	**RNA 69/28 UU**	133	28	32	45	30	31	38900	59100
NA 6906 UU	185	**RNA 6906 UU**	125	30	35	47	30	31	40100	63000
NA 69/32 UU	300	**RNA 69/32 UU**	170	32	40	52	36	37	50300	88300
NA 6907 UU	320	**RNA 6907 UU**	200	35	42	55	36	37	51600	92600
NA 6908 UU	440	**RNA 6908 UU**	270	40	48	62	40	41	63700	117000
NA 6909 UU	520	**RNA 6909 UU**	355	45	52	68	40	41	66600	127000
NA 6910 UU	530	**RNA 6910 UU**	320	50	58	72	40	41	70800	142000
NA 6911 UU	730	**RNA 6911 UU**	470	55	63	80	45	46	89400	171000
NA 6912 UU	785	**RNA 6912 UU**	505	60	68	85	45	46	93400	186000
NA 6913 UU	845	**RNA 6913 UU**	580	65	72	90	45	46	97400	200000
NA 6914 UU	1400	**RNA 6914 UU**	910	70	80	100	54	55	124000	281000
NA 6915 UU	1480	**RNA 6915 UU**	960	75	85	105	54	55	128000	299000
NA 6916 UU	1570	**RNA 6916 UU**	1010	80	90	110	54	55	132000	317000
NA 6917 UU	2360	**RNA 6917 UU**	1300	85	100	120	63	64	168000	448000
NA 6918 UU	2480	**RNA 6918 UU**	1360	90	105	125	63	64	172000	471000
NA 6919 UU	2600	**RNA 6919 UU**	1420	95	110	130	63	64	177000	493000

Remark: When Fw is 35 or less, single row roller cage is assembled.

MACHINED TYPE NEEDLE ROLLER BEARINGS

Metric Dimension



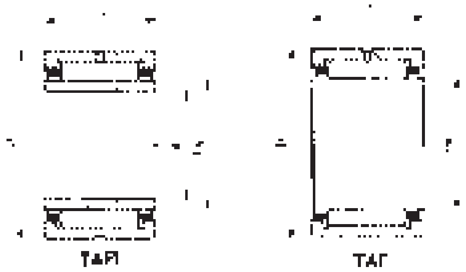
DIMENSION TABLE

IKO NUMBER WITH INNER RING TAFI	WEIGHT (g)	IKO NUMBER WITHOUT INNER RING TAF	WEIGHT (g)	DIMENSIONS (mm)				BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
				d	Fw	D	C		
—	—	**TAF 51010**	3.4	—	5	10	10	2420	1950
—	—	**TAF 51012**	4.2	—	5	10	12	3080	2660
—	—	**TAF 61212**	6.4	—	6	12	12	3440	3170
—	—	**TAF 71410**	6.9	—	7	14	10	3600	2960
—	—	**TAF 71412**	8.3	—	7	14	12	4610	4050
TAFI 51512	11.9	**TAF 81512**	9.1	5	8	15	12	5060	4690
TAFI 51516	16.7	**TAF 81516**	12.9	5	8	15	16	7080	7220
TAFI 61612	13	**TAF 91612**	9.8	6	9	16	12	5490	5330
TAFI 61616	17.5	**TAF 91616**	13.2	6	9	16	16	7680	8210
TAFI 71712	14.3	**TAF 101712**	10.7	7	10	17	12	5880	5970
TAFI 71716	19.2	**TAF 101716**	14.3	7	10	17	16	8230	9190
TAFI 91912	16.7	**TAF 121912**	12.2	9	12	19	12	6610	7260
TAFI 91916	22.5	**TAF 121916**	16.3	9	12	19	16	9250	11200
TAFI 102216	30	**TAF 142216**	21	10	14	22	16	11700	13700
TAFI 102220	38	**TAF 142220**	26.5	10	14	22	20	14800	18600
—	—	**TAF 152316**	22.5	—	15	23	16	12300	14900
—	—	**TAF 152320**	28	—	15	23	20	15600	20200
TAFI 122416	33.5	**TAF 162416**	23	12	16	24	16	12300	15100
TAFI 122420	42.5	**TAF 162420**	29	12	16	24	20	15500	20400
—	—	**TAF 172516**	24.5	—	17	25	16	12900	16300
—	—	**TAF 172520**	30.5	—	17	25	20	16300	22000
—	—	**TAF 182616**	25.5	—	18	26	16	13400	17500
—	—	**TAF 182620**	32	—	18	26	20	17000	23600
TAFI 152716	39.5	**TAF 192716**	27	15	19	27	16	14000	18700
TAFI 152720	50	**TAF 192720**	34	15	19	27	20	17700	25300
—	—	**TAF 202816**	27.5	—	20	28	16	13900	18800
—	—	**TAF 202820**	35.5	—	20	28	20	17600	25400
TAFI 172916	43.5	**TAF 212916**	29	17	21	29	16	14400	20000
TAFI 172920	54	**TAF 212920**	36	17	21	29	20	18200	27100
—	—	**TAF 223016**	30	—	22	30	16	14900	21200
—	—	**TAF 223020**	37.5	—	22	30	20	18900	28700
TAFI 203216	48.5	**TAF 243216**	32	20	24	32	16	15300	22500
TAFI 203220	61	**TAF 243220**	40.5	20	24	32	20	19400	30500
—	—	**TAF 253316**	33.5	—	25	33	16	15800	23700
—	—	**TAF 253320**	42	—	25	33	20	20000	32100
TAFI 223416	52	**TAF 263416**	34.5	22	26	34	16	16300	24900
TAFI 223420	67.5	**TAF 263420**	43.5	22	26	34	20	20600	33800
—	—	**TAF 283720**	51.5	—	28	37	20	21700	37100
—	—	**TAF 283730**	83.5	—	28	37	30	31100	58900
TAFI 253820	82	**TAF 293820**	57	25	29	38	20	21600	37200

INTERCHANGE TABLE

INA		SKF		FAG	
WITH INNER RING NKI	WITHOUT INNER RING NK	WITH INNER RING NKI	WITHOUT INNER RING NK	WITH INNER RING NKJ	WITHOUT INNER RING NK
—	NK 5/10 TN	—	NK 5/10 TN	—	NK 5/10 B.TN
—	NK 5/12 TN	—	NK 5/12	—	NK 5/12 TN
—	NK 6/12 TN	—	NK 6/12 TN	—	NK 6/12 TN
—	NK 7/10 TN	—	NK 7/10 TN	—	NK 7/10 TN
—	NK 7/12 TN	—	NK 7/12 TN	—	NK 7/12 TN
NKI 5/12 TN	NK 8/12 TN	NKI 5/12	NK 8/12	NKJ 5/12	NK 8/12
NKI 5/16 TN	NK 8/16 TN	NKI 5/16 TN	NK 8/16 TN	NKJ 5/16	NK 8/16
NKI 6/12 TN	NK 9/12 TN	NKI 6/12 TN	NK 9/12 TN	NKJ 6/12	NK 9/12
NKI 6/16 TN	NK 9/16 TN	NKI 6/16 TN	NK 9/16 TN	NKJ 6/16	NK 9/16
NKI 7/12 TN	NK 10/12 TN	NKI 7/12	NK 10/12	NKJ 7/12	NK 10/12
NKI 7/16 TN	NK 10/16 TN	NKI 7/16 TN	NK 10/16 TN	NKJ 7/16	NK 10/16
NKI 9/12	NK 12/12	NKI 9/12	NK 12/12	NKJ 9/12	NK 12/12
NKI 9/16	NK 12/16	NKI 9/16 TN	NK 12/16 TN	NKJ 9/16	NK 12/16
NKI 10/16	NK 14/16	NKI 10/16	NK 14/16	NKJ 10/16 A	NK 14/16 A
NKI 10/20	NK 14/20	NKI 10/20	NK 14/20	NKJ 10/20 A	NK 14/20 A
—	NK 15/16	—	NK 15/16	—	NK 15/16 A
—	NK 15/20	—	NK 15/20	—	NK 15/20 A
NKI 12/16	NK 16/16	NKI 12/16	NK 16/16	NKJ 12/16 A	NK 16/16 A
NKI 12/20	NK 16/20	NKI 12/20	NK 16/20	NKJ 12/20 A	NK 16/20 A
—	NK 17/16	—	NK 17/16	—	NK 17/16 A
—	NK 17/20	—	NK 17/20	—	NK 17/20 A
—	NK 18/16	—	NK 18/16	—	NK 18/16 A
—	NK 18/20	—	NK 18/20	—	NK 18/20 A
NKI 15/16	NK 19/16	NKI 15/16	NK 19/16	NKJ 15/16 A	NK 19/16 A
NKI 15/20	NK 19/20	NKI 15/20	NK 19/20	NKJ 15/20 A	NK 19/20 A
—	NK 20/16	—	NK 20/16	—	NK 20/16 A
—	NK 20/20	—	NK 20/20	—	NK 20/20 A
NKI 17/16	NK 21/16	NKI 17/16	NK 21/16	NKJ 17/16 A	NK 21/16 A
NKI 17/20	NK 21/20	NKI 17/20	NK 21/20	NKJ 17/20 A	NK 21/20 A
—	NK 22/16	—	NK 22/16	—	NK 22/16 A
—	NK 22/20	—	NK 22/20	—	NK 22/20 A
NKI 20/16	NK 24/16	NKI 20/16	NK 24/16	NKJ 20/16 A	NK 24/16 A
NKI 20/20	NK 24/20	NKI 20/20	NK 24/20	NKJ 20/20 A	NK 24/20 A
—	NK 25/16	—	NK 25/16	—	NK 25/16 A
—	NK 25/20	—	NK 25/20	—	NK 25/20 A
NKI 22/16	NK 26/16	NKI 22/16	NK 26/16	NKJ 22/16 A	NK 26/16 A
NKI 22/20	NK 26/20	NKI 22/20	NK 26/20	NKJ 22/20 A	NK 26/20 A
—	NK 28/20	—	NK 28/20	—	NK 28/20 A
—	NK 28/30	—	NK 28/30	—	NK 28/30 ASR 1
NKI 25/20	NK 29/20	NKI 25/20	NK 29/20	NKJ 25/20 A	NK 29/20 A

Remark: When Fw is 26 or less, an oil hole is optionally available.



DIMENSION TABLE

IKO NUMBER WITH INNER RING **TAFI**	WEIGHT (g)	IKO NUMBER WITHOUT INNER RING **TAF**	WEIGHT (g)	DIMENSIONS (mm)				BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
				d	Fw	D	C		
TAFI 253830	123	**TAF 293830**	85	25	29	38	30	30900	59100
—	—	**TAF 304020**	64.5	—	30	40	20	25100	40100
—	—	**TAF 304030**	97.5	—	30	40	30	36000	63900
TAFI 284220	96.5	**TAF 324220**	68	28	32	42	20	25700	42200
TAFI 284230	145	**TAF 324230**	102	28	32	42	30	36800	67200
TAFI 304520	112	**TAF 354520**	73.5	30	35	45	20	26900	46200
TAFI 304530	171	**TAF 354530**	112	30	35	45	30	38600	73600
TAFI 324720	121	**TAF 374720**	77.5	32	37	47	20	28200	50100
TAFI 324730	180	**TAF 374730**	117	32	37	47	30	40500	79800
—	—	**TAF 384820**	79	—	38	48	20	28100	50200
—	—	**TAF 384830**	119	—	38	48	30	40300	80000
TAFI 355020	129	**TAF 405020**	83	35	40	50	20	29400	54100
TAFI 355030	192	**TAF 405030**	125	35	40	50	30	42300	86200
—	—	**TAF 425220**	86.5	—	42	52	20	29900	56200
—	—	**TAF 425230**	130	—	42	52	30	43000	89400
TAFI 385320	136	**TAF 435320**	88.5	38	43	53	20	30500	58200
TAFI 385330	205	**TAF 435330**	133	38	43	53	30	43800	92600
TAFI 405520	143	**TAF 455520**	92	40	45	55	20	31000	60200
TAFI 405530	215	**TAF 455530**	138	40	45	55	30	44600	95800
TAFI 425720	149	**TAF 475720**	95	42	47	57	20	31500	62200
TAFI 425730	225	**TAF 475730**	144	42	47	57	30	45200	99100
TAFI 456225	230	**TAF 506225**	159	45	50	62	25	43000	85300
TAFI 456235	320	**TAF 506235**	225	45	50	62	35	58000	125000
TAFI 506825	270	**TAF 556825**	193	50	55	68	25	45400	94000
TAFI 506835	365	**TAF 556835**	255	50	55	68	35	61200	138000
TAFI 557225	275	**TAF 607225**	187	55	60	72	25	47500	103000
TAFI 557235	380	**TAF 607235**	260	55	60	72	35	64100	151000
—	—	**TAF 657825**	225	—	65	78	25	49600	112000
—	—	**TAF 657835**	315	—	65	78	35	67000	164000
TAFI 608225	395	**TAF 688225**	250	60	68	82	25	54800	117000
TAFI 608235	560	**TAF 688235**	350	60	68	82	35	72000	166000
—	—	**TAF 708525**	280	—	70	85	25	55500	120000
—	—	**TAF 708535**	395	—	70	85	35	73000	171000
—	—	**TAF 739025**	335	—	73	90	25	61100	127000
TAFI 659035	710	**TAF 739035**	475	65	73	90	35	80400	181000
—	—	**TAF 759225**	345	—	75	92	25	62100	131000
—	—	**TAF 759235**	485	—	75	92	35	81700	186000
TAFI 709525	540	**TAF 809525**	315	70	80	95	25	59400	137000
TAFI 709535	755	**TAF 809535**	445	70	80	95	35	78100	195000
TAFI 7510525	675	**TAF 8510525**	435	75	85	105	25	76300	145000

INTERCHANGE TABLE

INA		SKF		FAG	
WITH INNER RING NKI	WITHOUT INNER RING NK	WITH INNER RING NKI	WITHOUT INNER RING NK	WITH INNER RING NKJ	WITHOUT INNER RING NK
NKI 25/30	NK 29/30	NKI 25/30	NK 29/30	NKJ 25/30 A	NK 29/30 A
—	NK 30/20	—	NK 30/20	—	NK 30/20 A
—	NK 30/30	—	NK 30/30	—	NK 30/30 A
NKI 28/20	NK 32/20	NKI 28/20	NK 32/20	NKJ 28/20 A	NK 32/20 A
NKI 28/30	NK 32/30	NKI 28/30	NK 32/30	NKJ 28/30 A	NK 32/30 A
NKI 30/20	NK 35/20	NKI 30/20	NK 35/20	NKJ 30/20 A	NK 35/20 A
NKI 30/30	NK 35/30	NKI 30/30	NK 35/30	NKJ 30/30 A	NK 35/30 A
NKI 32/20	NK 37/20	NKI 32/20	NK 37/20	NKJ 32/20 A	NK 37/20 A
NKI 32/30	NK 37/30	NKI 32/30	NK 37/30	NKJ 32/30 A	NK 37/30 A
—	NK 38/20	—	NK 38/20	—	NK 38/20 B.ASR 1
—	NK 38/30	—	NK 38/30	—	NK 38/30 ASR 1
NKI 35/20	NK 40/20	NKI 35/20	NK 40/20	NKJ 35/20 A	NK 40/20 A
NKI 35/30	NK 40/30	NKI 35/30	NK 40/30	NKJ 35/30 A	NK 40/30 A
—	NK 42/20	—	NK 42/20	—	NK 42/20 A
—	NK 42/30	—	NK 42/30	—	NK 42/30 A
NKI 38/20	NK 43/20	NKI 38/20	NK 43/20	NKJ 38/20 A	NK 43/20 A
NKI 38/30	NK 43/30	NKI 38/30	NK 43/30	NKJ 38/30 A	NK 43/30 A
NKI 40/20	NK 45/20	NKI 40/20	NK 45/20	NKJ 40/20 A	NK 45/20 A
NKI 40/30	NK 45/30	NKI 40/30	NK 45/30	NKJ 40/30 A	NK 45/30 A
NKI 42/20	NK 47/20	NKI 42/20	NK 47/20	NKJ 42/20 A	NK 47/20 A
NKI 42/30	NK 47/30	NKI 42/30	NK 47/30	NKJ 42/30 A	NK 47/30 A
NKI 45/25	NK 50/25	NKI 45/25	NK 50/25	NKJ 45/25 A	NK 50/25 A
NKI 45/35	NK 50/35	NKI 45/35	NK 50/35	NKJ 45/35 A	NK 50/35 A
NKI 50/25	NK 55/25	NKI 50/25	NK 55/25	NKJ 50/25 A	NK 55/25 A
NKI 50/35	NK 55/35	NKI 50/35	NK 55/35	NKJ 50/35 A	NK 55/35 A
NKI 55/25	NK 60/25	NKI 55/25	NK 60/25	NKJ 55/25 A	NK 60/25 A
NKI 55/35	NK 60/35	NKI 55/35	NK 60/35	NKJ 55/35 A	NK 60/35 A
—	NK 65/25	—	NK 65/25	—	NK 65/25 A
—	NK 65/35	—	NK 65/35	—	NK 65/35 A
NKI 60/25	NK 68/25	NKI 60/25	NK 68/25	NKJ 60/25 A	NK 68/25 A
NKI 60/35	NK 68/35	NKI 60/35	NK 68/35	NKJ 60/35 A	NK 68/35 A
—	NK 70/25	—	NK 70/25	—	NK 70/25 ASR 1
—	NK 70/35	—	NK 70/35	—	NK 70/35 ASR 1
—	NK 73/25	—	NK 73/25	—	NK 73/25 A
NKI 65/35	NK 73/35	NKI 65/35	NK 73/35	NKJ 65/35 A	NK 73/35 A
—	NK 75/25	—	NK 75/25	—	NK 75/25 ASR 1
—	NK 75/35	—	NK 75/35	—	NK 75/35 ASR 1
NKI 70/25	NK 80/25	NKI 70/25	NK 80/25	NKJ 70/25 A	NK 80/25 A
NKI 70/35	NK 80/35	NKI 70/35	NK 80/35	NKJ 70/35 ASR 1	NK 80/35 ASR 1
NKI 75/25	NK 85/25	NKI 75/25	NK 85/25	NKJ 75/25 A	NK 85/25 A

DIMENSION TABLE

IKO NUMBER WITH INNER RING **TAFI**	WEIGHT (g)	IKO NUMBER WITHOUT INNER RING **TAF**	WEIGHT (g)	DIMENSIONS (mm)				BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
				d	Fw	D	C		
TAFI 7510535	945	**TAF 8510535**	610	75	85	105	35	102000	210000
TAFI 8011025	710	**TAF 9011025**	456	80	90	110	25	77300	150000
TAFI 8011035	995	**TAF 9011035**	640	80	90	110	35	103000	217000
TAFI 8511526	775	**TAF 9511526**	495	85	95	115	26	79700	159000
TAFI 8511536	1080	**TAF 9511536**	690	85	95	115	36	106000	231000
TAFI 9012026	820	**TAF 10012026**	525	90	100	120	26	82400	168000
TAFI 9012036	1140	**TAF 10012036**	725	90	100	120	36	110000	244000
TAFI 9512526	860	**TAF 10512526**	545	95	105	125	26	84700	178000
TAFI 9512536	1190	**TAF 10512536**	760	95	105	125	36	113000	258000
TAFI 10013030	1040	**TAF 11013030**	660	100	110	130	30	106000	240000
TAFI 10013040	1380	**TAF 11013040**	880	100	110	130	40	134000	324000

INTERCHANGE TABLE

INA		SKF		FAG	
WITH INNER RING NKI	WITHOUT INNER RING NK	WITH INNER RING NKI	WITHOUT INNER RING NK	WITH INNER RING NKJ	WITHOUT INNER RING NK
NKI 75/35	NK 85/35	NKI 75/35	NK 85/35	NKJ 75/35 A	NK 85/35 A
NKI 80/25	NK 90/25	NKI 80/25	NK 90/25	NKJ 80/25 A	NK 90/25 A
NKI 80/35	NK 90/35	NKI 80/35	NK 90/35	NKJ 80/35 A	NK 90/35 A
NKI 85/26	NK 95/26	NKI 85/26	NK 95/26	NKJ 85/26 ASR 1	NK 95/26 ASR 1
NKI 85/36	NK 95/36	NKI 85/36	NK 95/36	NKJ 85/36 A	NK 95/36 A
NKI 90/26	NK 100/26	NKI 90/26	NK 100/26	NKJ 90/26 A	NK 100/26 A
NKI 90/36	NK 100/36	NKI 90/36	NK 100/36	NKJ 90/36 A	NK 100/36 A
NKI 95/26	NK 105/26	NKI 95/26	NK 105/26	NKJ 95/26 ASR 1	NK 105/26 ASR 1
NKI 95/36	NK 105/36	NKI 95/36	NK 105/36	NKJ 95/36 ASR 1	NK 105/36 ASR 1
NKI 100/30	NK 110/30	NKI 100/30	NK 110/30	NKJ 100/30 A	NK 110/30 A
NKI 100/40	NK 110/40	NKI 100/40	NK 110/40	NKJ 100/40 A	NK 110/40 A

MACHINED TYPE NEEDLE ROLLER BEARINGS

Metric Dimension

DIMENSION TABLE

IKO NUMBER WITH INNER RING **TRI**	WEIGHT (g)	IKO NUMBER WITHOUT INNER RING **TR**	WEIGHT (g)	DIMENSIONS (mm)					BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
				d	Fw	D	C	B		
TRI 153320	81	**TR 203320**	59.5	15	20	33	20	20.5	24300	26500
TRI 173425	104	**TR 223425**	73.5	17	22	34	25	25.5	29100	36800
TRI 203820	99	**TR 253820**	71	20	25	38	20	20.5	28900	35000
TRI 203825	124	**TR 253825**	89	20	25	38	25	25.5	34800	44400
TRI 254425	157	**TR 304425**	115	25	30	44	25	25.5	37900	52100
TRI 304830	199	**TR 354830**	139	30	35	48	30	30.5	47400	72300
TRI 325230	245	**TR 385230**	168	32	38	52	30	30.5	50800	81100
—	—	**TR 405520**	129	—	40	55	20	—	37400	55700
TRI 355630	280	**TR 425630**	183	35	42	56	30	30.5	53800	90100
TRI 405930	270	**TR 455930**	193	40	45	59	30	30.5	55100	94800
TRI 426230	305	**TR 486230**	205	42	48	62	30	30.5	56300	99500
TRI 456430	300	**TR 506430**	210	45	50	64	30	30.5	57700	104000
TRI 507745	755	**TR 587745**	515	50	58	77	45	45.5	10400	191000
TRI 558138	650	**TR 628138**	460	55	62	81	38	38.5	92000	166000
TRI 608945	960	**TR 708945**	605	60	70	89	45	45.5	114000	228000
TRI 7510845	1340	**TR 8310845**	995	75	83	108	45	45.5	146000	270000
TRI 8511850	1640	**TR 9311850**	1210	85	93	118	50	50.5	165000	329000
TRI 8512045	1610	**TR 9512045**	1120	85	95	120	45	45.5	155000	305000
TRI 9012550	1870	**TR 10012550**	1290	90	100	125	50	50.5	172000	355000
TRI 10013550	2040	**TR 11013550**	1400	100	110	135	50	50.5	183000	395000
TRI 10515350	3020	**TR 11515350**	2350	105	115	153	50	50.5	233000	414000
TRI 12517860	4780	**TR 14017860**	3320	125	140	178	60	60.5	307000	625000
TRI 13518860	5100	**TR 15018860**	3540	135	150	188	60	60.5	320000	675000

MACHINED TYPE
NEEDLE ROLLER BEARINGS

Metric Dimension

DIMENSION TABLE

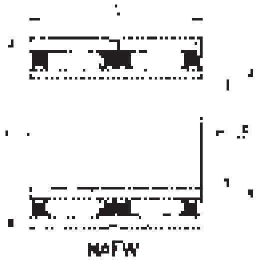
IKO NUMBER WITH INNER RING	WEIGHT	IKO NUMBER WITHOUT INNER RING	WEIGHT	DIMENSIONS (mm)				BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING
NAF(W)	(g)	RNAF(W)	(g)	d	Fw	D	C	(N)	(N)
—	—	RNAF 5108 N	2.8	—	5	10	8	2420	1950
—	—	RNAF 6138 N	5.5	—	6	13	8	2700	2320
—	—	RNAF 7148 N	6.1	—	7	14	8	2960	2690
—	—	RNAF 81510	8.2	—	8	15	10	3630	3600
—	—	RNAFW 81620	20.5	—	8	16	20	6220	7200
NAF 61710	13.5	RNAF 101710	9.6	6	10	17	10	4160	4550
NAF 72012	22.5	RNAF 102012	18.7	7	10	20	12	5940	6000
NAF 92212	24	RNAF 122212	19.5	9	12	22	12	9030	8460
NAF 102213	26	RNAF 142213	18.7	10	14	22	13	7860	9410
NAFW 102220	40	RNAFW 142220	28.5	10	14	22	20	10800	14200
NAF 102612	36	RNAF 142612	29	10	14	26	12	9790	9680
—	—	RNAF 152313	19.7	—	15	23	13	8250	10200
—	—	RNAFW 152320	30.5	—	15	23	20	11400	15400
NAF 122413	29.5	RNAF 162413	21	12	16	24	13	8620	11000
NAFW 122420	45.5	RNAFW 162420	32	12	16	24	20	11900	16700
NAF 122812	40	RNAF 162812	31.5	12	16	28	12	10500	10900
—	—	RNAF 172513	22	—	17	25	13	8980	11800
—	—	RNAFW 172520	33.5	—	17	25	20	12400	17900
—	—	RNAF 182613	23	—	18	26	13	9330	12700
—	—	RNAFW 182620	35	—	18	26	20	12900	19100
—	—	RNAF 183012	34.5	—	18	30	12	11800	13100
—	—	RNAFW 183024	69.5	—	18	30	24	20200	26200
NAF 152813	38.5	RNAF 202813	25	15	20	28	13	9590	13500
NAFW 152826	77.5	RNAFW 202826	49.5	15	20	28	26	16400	27100
NAF 153212	50.5	RNAF 203212	37.5	15	20	32	12	12400	14300
—	—	RNAFW 203224	75	—	20	32	24	21200	28600
NAF 173013	42.5	RNAF 223013	27	17	22	30	13	10200	15200
NAFW 173026	84.5	RNAFW 223026	53.5	17	22	30	26	17500	30300
NAF 173516	77.5	RNAF 223516	58.5	17	22	35	16	17600	20900
NAFW 173532	155	RNAFW 223532	117	17	22	35	32	30200	41800
NAF 203517	74	RNAF 253517	51	20	25	35	17	17300	26600
NAFW 203526	114	RNAFW 253526	78	20	25	35	26	22400	37200
NAF 203716	79	RNAF 253716	57	20	25	37	16	19400	24500
NAFW 203732	158	RNAFW 253732	114	20	25	37	32	33200	49000
—	—	RNAF 284016	62.5	—	28	40	16	20100	26500
—	—	RNAFW 284032	125	—	28	40	32	34400	53000
NAF 254017	87.5	RNAF 304017	59	25	30	40	17	18700	31100
NAFW 254026	135	RNAFW 304026	90.5	25	30	40	26	24200	43400
NAF 254216	94	RNAF 304216	66	25	30	42	16	20800	28400
NAFW 254232	186	RNAFW 304232	132	25	30	42	32	35700	56800

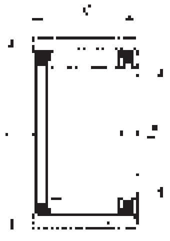
Remark: When Fw is 26 or less, an oil hole is optionally available.

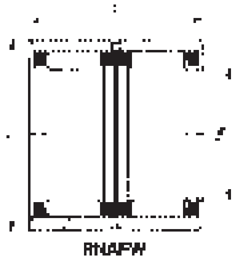
INTERCHANGE TABLE

INA		SKF		FAG	
WITH INNER RING NAO	WITHOUT INNER RING RNAO	WITH INNER RING NAO	WITHOUT INNER RING RNAO	WITH INNER RING NAO	WITHOUT INNER RING RNAO
—	RNAO 5×10×8 TN	—	RNAO 5×10×8 TN	—	—
—	RNAO 6×13×8 TN	—	RNAO 6×13×8 TN	—	—
—	RNAO 7×14×8 TN	—	RNAO 7×14×8 TN	—	—
—	RNAO 8×15×10 TN	—	RNAO 8×15×10 TN	—	—
—	—	—	—	—	—
NAO 6×17×10 TN	RNAO 10×17×10 TN	NAO 6×17×10 TN	RNAO 10×17×10 TN	NAO 6×17×10	RNAO 10×17×10
—	—	—	—	—	—
NAO 9×22×12 TN	RNAO 12×22×12 TN	—	RNAO 12×22×12	—	—
—	—	NAO 10×22×13	RNAO 14×22×13	NAO 10×22×13	RNAO 14×22×13
—	—	NAO 10×22×20	RNAO 14×22×20	NAO 10×22×20	RNAO 14×22×20
—	—	NAO 10×26×12	RNAO 14×26×12	NAO 10×26×12	RNAO 14×26×12
—	RNAO 15×23×13	—	RNAO 15×23×13	—	—
—	—	—	RNAO 15×23×20	—	—
NAO 12×24×13	RNAO 16×24×13	NAO 12×24×13	RNAO 16×24×13	NAO 12×24×13	RNAO 16×24×13
NAO 12×24×20	RNAO 16×24×20	NAO 12×24×20	RNAO 16×24×20	NAO 12×24×20	RNAO 16×24×20
NAO 12×28×12	RNAO 16×28×12	NAO 12×28×12	RNAO 16×28×12	NAO 12×28×12	RNAO 16×28×12
—	RNAO 17×25×13	—	RNAO 17×25×13	—	—
—	—	—	RNAO 17×25×20	—	—
—	—	—	RNAO 18×26×13	—	—
—	—	—	RNAO 18×26×20	—	—
—	—	—	RNAO 18×30×12	—	—
—	RNAO 18×30×24	—	RNAO 18×30×24	—	—
NAO 15×28×13	RNAO 20×28×13	NAO 15×28×13	RNAO 20×28×13	NAO 15×28×13	RNAO 20×28×13
—	RNAO 20×28×26	NAO 15×28×26	RNAO 20×28×26	NAO 15×28×26	RNAO 20×28×26
NAO 15×32×12	RNAO 20×32×12	NAO 15×32×12	RNAO 20×32×12	NAO 15×32×12	RNAO 20×32×12
—	—	—	RNAO 20×32×24	—	—
NAO 17×30×13	RNAO 22×30×13	NAO 17×30×13	RNAO 22×30×13	NAO 17×30×13	RNAO 22×30×13
—	—	NAO 17×30×26	RNAO 22×30×26	NAO 17×30×26	RNAO 22×30×26
NAO 17×35×16	RNAO 22×35×16	NAO 17×35×16	RNAO 22×35×16	NAO 17×35×16	RNAO 22×35×16
—	—	NAO 17×35×32	RNAO 22×35×32	NAO 17×35×32	RNAO 22×35×32
—	RNAO 25×35×17	—	RNAO 25×35×17	—	RNAO 25×35×17
—	RNAO 25×35×26	NAO 20×35×26	RNAO 25×35×26	NAO 20×35×26	RNAO 25×35×26
NAO 20×37×16	RNAO 25×37×16	NAO 20×37×16	RNAO 25×37×16	NAO 20×37×16	RNAO 25×37×16
—	RNAO 25×37×32	NAO 20×37×32	RNAO 25×37×32	NAO 20×37×32	RNAO 25×37×32
—	—	—	RNAO 28×40×16	—	—
—	—	—	RNAO 28×40×32	—	—
NAO 25×40×17	RNAO 30×40×17	NAO 25×40×17	RNAO 30×40×17	NAO 25×40×17	RNAO 30×40×17
—	RNAO 30×40×26	NAO 25×40×26	RNAO 30×40×26	NAO 25×40×26	RNAO 30×40×26
NAO 25×42×16	RNAO 30×42×16	NAO 25×42×16	RNAO 30×42×16	NAO 25×42×16	RNAO 30×42×16
NAO 25×42×32	RNAO 30×42×32	NAO 25×42×32	RNAO 30×42×32	NAO 25×42×32	RNAO 30×42×32


NAF


NAFW


RNAF


RNAFW

DIMENSION TABLE

IKO NUMBER WITH INNER RING **NAF(W)**	WEIGHT (g)	IKO NUMBER WITHOUT INNER RING **RNAF(W)**	WEIGHT (g)	DIMENSIONS (mm)				BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
				d	Fw	D	C		
NAF 304517	101	**RNAF 354517**	67.5	30	35	45	17	20500	36900
NAFW 304526	155	**RNAFW 354526**	103	30	35	45	26	26600	51500
NAF 304716	107	**RNAF 354716**	75.5	30	35	47	16	23100	33900
NAFW 304732	215	**RNAFW 354732**	151	30	35	47	32	39500	67800
NAF 355017	115	**RNAF 405017**	76	35	40	50	17	22200	42700
NAFW 355034	230	**RNAFW 405034**	152	35	40	50	34	38000	85400
NAF 355520	186	**RNAF 405520**	140	35	40	55	20	31400	48000
NAFW 355540	375	**RNAFW 405540**	280	35	40	55	40	53900	96000
NAF 405517	128	**RNAF 455517**	83.5	40	45	55	17	23300	47100
NAFW 405534	255	**RNAFW 455534**	167	40	45	55	34	39900	94200
NAF 406220	235	**RNAF 456220**	184	40	45	62	20	33200	53300
NAFW 406240	475	**RNAFW 456240**	370	40	45	62	40	56900	107000
NAF 456220	196	**RNAF 506220**	138	45	50	62	20	27100	59300
NAFW 456240	390	**RNAFW 506240**	275	45	50	62	40	46400	119000
—	—	**RNAF 506520**	170	—	50	65	20	35900	61100
—	—	**RNAFW 506540**	340	—	50	65	40	61500	122000
NAF 506820	230	**RNAF 556820**	167	50	55	68	20	28600	66000
NAFW 506840	465	**RNAFW 556840**	335	50	55	68	40	49000	132000
NAF 457220	340	**RNAF 557220**	220	45	55	72	20	37400	66400
NAFW 457240	685	**RNAFW 557240**	440	45	55	72	40	64100	133000
NAF 507820	390	**RNAF 607820**	255	50	60	78	20	38900	71700
NAFW 507840	775	**RNAFW 607840**	510	50	60	78	40	66700	143000
NAF 558530	690	**RNAF 658530**	470	55	65	85	30	59300	127000
NAFW 558560	1380	**RNAFW 658560**	945	55	65	85	60	102000	255000
NAF 609030	740	**RNAF 709030**	500	60	70	90	30	61200	136000
NAFW 609060	1480	**RNAFW 709060**	1000	60	70	90	60	105000	272000
NAF 659530	790	**RNAF 759530**	530	65	75	95	30	63100	144000
NAFW 659560	1580	**RNAFW 759560**	1060	65	75	95	60	108000	289000
NAF 7010030	835	**RNAF 8010030**	560	70	80	100	30	65000	153000
NAFW 7010060	1680	**RNAFW 8010060**	1120	70	80	100	60	111000	306000
NAF 7510530	885	**RNAF 8510530**	590	75	85	105	30	66600	161000
NAF 8011030	935	**RNAF 9011030**	625	80	90	110	30	69600	174000
NAF 8511530	985	**RNAF 9511530**	655	85	95	115	30	70900	182000
NAF 9012030	1040	**RNAF 10012030**	685	90	100	120	30	72500	191000

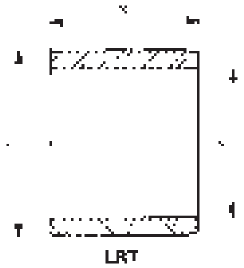
INTERCHANGE TABLE

INA		SKF		FAG	
WITH INNER RING NAO	WITHOUT INNER RING RNAO	WITH INNER RING NAO	WITHOUT INNER RING RNAO	WITH INNER RING NAO	WITHOUT INNER RING RNAO
NAO 30×45×17	RNAO 35×45×17	NAO 30×45×17	RNAO 35×45×17	NAO 30×45×17	RNAO 35×45×17
NAO 30×45×26	RNAO 35×45×26	NAO 30×45×26	RNAO 35×45×26	NAO 30×45×26	RNAO 35×45×26
NAO 30×47×16	RNAO 35×47×16	NAO 30×47×16	RNAO 35×47×16	NAO 30×47×16	RNAO 35×47×16
—	RNAO 35×47×32	NAO 30×47×32	RNAO 35×47×32	NAO 30×47×32	RNAO 35×47×32
NAO 35×50×17	RNAO 40×50×17	NAO 35×50×17	RNAO 40×50×17	NAO 35×50×17	RNAO 40×50×17
—	RNAO 40×50×34	NAO 35×50×34	RNAO 40×50×34	NAO 35×50×34	RNAO 40×50×34
NAO 35×55×20	RNAO 40×55×20	NAO 35×55×20	RNAO 40×55×20	NAO 35×55×20	RNAO 40×55×20
—	RNAO 40×55×40	NAO 35×55×40	RNAO 40×55×40	NAO 35×55×40	RNAO 40×55×40
NAO 40×55×17	RNAO 45×55×17	NAO 40×55×17	RNAO 45×55×17	NAO 40×55×17	RNAO 45×55×17
—	—	NAO 40×55×34	RNAO 45×55×34	NAO 40×55×34	RNAO 45×55×34
—	—	NAO 40×62×20	RNAO 45×62×20	NAO 40×62×20	RNAO 45×62×20
—	RNAO 45×62×40	NAO 40×62×40	RNAO 45×62×40	NAO 40×62×40	RNAO 45×62×40
—	RNAO 50×62×20	NAO 45×62×20	RNAO 50×62×20	NAO 45×62×20	RNAO 50×62×20
—	—	NAO 45×62×40	RNAO 50×62×40	NAO 45×62×40	RNAO 50×62×40
—	RNAO 50×65×20	—	RNAO 50×65×20	—	—
—	RNAO 50×65×40	—	RNAO 50×65×40	—	—
NAO 50×68×20	RNAO 55×68×20	NAO 50×68×20	RNAO 55×68×20	NAO 50×68×20	RNAO 55×68×20
—	—	NAO 50×68×40	RNAO 55×68×40	NAO 50×68×40	RNAO 55×68×40
—	—	NAO 45×72×20	RNAO 55×72×20	NAO 45×72×20	RNAO 55×72×20
—	—	NAO 45×72×40	RNAO 55×72×40	NAO 45×72×40	RNAO 55×72×40
NAO 50×78×20	RNAO 60×78×20	NAO 50×78×20	RNAO 60×78×20	NAO 50×78×20	RNAO 60×78×20
—	RNAO 60×78×40	NAO 50×78×40	RNAO 60×78×40	NAO 50×78×40	RNAO 60×78×40
—	RNAO 65×85×30	NAO 55×85×30	RNAO 65×85×30	NAO 55×85×30	RNAO 65×85×30
—	—	NAO 55×85×60	RNAO 65×85×60	NAO 55×85×60	RNAO 65×85×60
—	RNAO 70×90×30	NAO 60×90×30	RNAO 70×90×30	NAO 60×90×30	RNAO 70×90×30
—	—	NAO 60×90×60	RNAO 70×90×60	NAO 60×90×60	RNAO 70×90×60
—	—	NAO 65×95×30	RNAO 75×95×30	NAO 65×95×30	RNAO 75×95×30
—	—	NAO 65×95×60	RNAO 75×95×60	NAO 65×95×60	RNAO 75×95×60
NAO 70×100×30	RNAO 80×100×30	NAO 70×100×30	RNAO 80×100×30	NAO 70×100×30	RNAO 80×100×30
—	—	NAO 70×100×60	RNAO 80×100×60	NAO 70×100×60	RNAO 80×100×60
—	—	NAO 75×105×30	RNAO 85×105×30	NAO 75×105×30	RNAO 85×105×30
NAO 80×110×30	RNAO 90×110×30	NAO 80×110×30	RNAO 90×110×30	NAO 80×110×30	RNAO 90×110×30
—	—	NAO 85×115×30	RNAO 95×115×30	NAO 95×115×30	RNAO 95×115×30
NAO 90×120×30	RNAO 100×120×30	NAO 90×120×30	RNAO 100×120×30	NAO 90×120×30	RNAO 100×120×30

Remark: When Fw is 26 or less, an oil hole is optionally available.

INNER RACES FOR MACHINED TYPE NEEDLE ROLLER BEARINGS

Metric Dimension

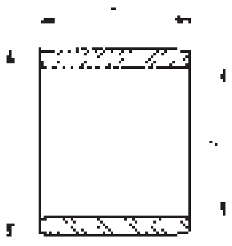


DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			USABLE BEARING NUMBER	INA	SKF	FAG
LRT	(g)	d	F	B		IR	IR	JR
LRT 5710	1.4	5	7	10	**RNA 495**	—	—	—
LRT 5812	2.8	5	8	12	**TAF 81512**	IR 5×8×12	IR 5×8×12	JR 5×8×12
LRT 5816	3.8	5	8	16	**TAF 81516**	IR 5×8×16	IR 5×8×16	JR 5×8×16
LRT 6810	1.7	6	8	10	**RNA 496**	—	—	—
LRT 6912	3.2	6	9	12	**TAF 91612**	IR 6×9×12	IR 6×9×12	JR 6×9×12
LRT 6916	4.3	6	9	16	**TAF 91616**	IR 6×9×16	IR 6×9×16	JR 6×9×16
LRT 61010	3.9	6	10	10	**RNAF 101710**	IR 6×10×10	IR 6×10×10	JR 6×10×10
LRT 7910	1.9	7	9	10	**RNA 497**	—	—	—
LRT 71012	3.6	7	10	12	**TAF 101712**	IR 7×10×12	IR 7×10×12	JR 7×10×12
LRT 71012-1	3.6	7	10	12	**RNAF 102012**	IR 7×10×12	IR 7×10×12	JR 7×10×12
LRT 71016	4.9	7	10	16	**TAF 101716 NAX 1023**	IR 7×10×16	IR 7×10×16	JR 7×10×16
LRT 81011	2.4	8	10	11	**RNA 498**	—	—	—
LRT 91211	3.1	9	12	11	**RNA 499**	—	—	—
LRT 91212	4.5	9	12	12	**TAF 121912 RNAF 122212**	IR 9×12×12	IR 9×12×12	JR 9×12×12
LRT 91216	6	9	12	16	**TAF 121916 NAX 1223**	IR 9×12×16	IR 9×12×16	JR 9×12×16
LRT 101412	7	10	14	12	**RNAF 142612**	IR 10×14×12	IR 10×14×12	JR 10×14×12
LRT 101413	7.5	10	14	13	**RNA 4900 RNAF 142213**	IR 10×14×13	IR 10×14×13	JR 10×14×13
LRT 101416	9	10	14	16	**TAF 142216**	IR 10×14×16	IR 10×14×16	JR 10×14×16
LRT 101420	11.5	10	14	20	**TAF 142220 RNAFW 142220**	IR 10×14×20	IR 10×14×20	JR 10×14×20
LRT 101513	10	10	15	13	**NAX 15**	—	—	—
LRT 121516	8	12	15	16.5	**NAX 1523 NBX 1523**	IR 12×15×16.5	IR 12×15×16.5	JR 12×15×16.5
LRT 121612	8.5	12	16	12	**RNAF 162812**	IR 12×16×12	IR 12×16×12	JR 12×16×12
LRT 121613	8.5	12	16	13	**RNA 4901 RNAF 162413**	IR 12×16×13	IR 12×16×13	JR 12×16×13
LRT 121616	10.5	12	16	16	**TAF 162416**	IR 12×16×16	IR 12×16×16	JR 12×16×16
LRT 121620	13.5	12	16	20	**TAF 162420 RNAFW 162420**	IR 12×16×20	IR 12×16×20	JR 12×16×20
LRT 121622	14.5	12	16	22	**RNA 6901**	IR 12×16×22	IR 12×16×22	JR 12×16×22
LRT 121713	11.5	12	17	13	**NAX 17**	—	—	—
LRT 141717	9.5	14	17	17	**NAX 1725 NBX 1725**	IR 14×17×17	IR 14×17×17	JR 14×17×17
LRT 151916	12.5	15	19	16	**TAF 192716**	IR 15×19×16	IR 15×19×16	JR 15×19×16
LRT 151920	16	15	19	20	**TAF 192720**	IR 15×19×20	IR 15×19×20	JR 15×19×20
LRT 152012	12	15	20	12	**RNAF 203212**	IR 15×20×12	IR 15×20×12	JR 15×20×12
LRT 152013	13.5	15	20	13	**RNA 4902 RNAF 202813 NAX 20 NBX 20**	IR 15×20×13	IR 15×20×13	JR 15×20×13
LRT 152020	21.5	15	20	20.5	**TR 203320**	—	—	—
LRT 152023	24	15	20	23	**RNA 6902**	IR 15×20×23	IR 15×20×23	JR 15×20×23
LRT 152026	28	15	20	26	**RNAFW 202826**	—	IR 15×20×26	JR 15×20×26
LRT 172020	13.5	17	20	20.5	**NAX 2030 NBX 2030**	IR 17×20×20.5	IR 17×20×20.5	JR 17×20×20.5
LRT 172116	14.5	17	21	16	**TAF 212916**	IR 17×21×16	IR 17×21×16	JR 17×21×16
LRT 172120	18	17	21	20	**TAF 212920**	IR 17×21×20	IR 17×21×20	JR 17×21×20
LRT 172213	15.5	17	22	13	**RNA 4903 RNAF 223013**	IR 17×22×13	IR 17×22×13	JR 17×22×13
LRT 172216	19	17	22	16	**RNAF 223516**	IR 17×22×16	IR 17×22×16	JR 17×22×16

DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			USABLE BEARING NUMBER	INA	SKF	FAG
LRT	(g)	d	F	B		IR	IR	JR
LRT 172223	26.5	17	22	23	**RNA 6903**	IR 17×22×23	IR 17×22×23	JR 17×22×23
LRT 172225	30	17	22	25.5	**TR 223425**	—	—	—
LRT 172226	31	17	22	26	**RNAFW 223026**	—	IR 17×22×26	JR 17×22×26
LRT 172232	38	17	22	32	**RNAFW 223532**	—	IR 17×22×32	JR 17×22×32
LRT 202416	16.5	20	24	16	**TAF 243216**	IR 20×24×16	IR 20×24×16	JR 20×24×16
LRT 202420	20.5	20	24	20	**TAF 243220**	IR 20×24×20	IR 20×24×20	JR 20×24×20
LRT 202516	22	20	25	16	**RNAF 253716**	IR 20×25×16	IR 20×25×16	JR 20×25×16
LRT 202517	23	20	25	17	**RNA 4904 RNAF 253517 NAX 25 NBX 25**	IR 20×25×17	IR 20×25×17	JR 20×25×17
LRT 202520	28	20	25	20.5	**TR 253820 NAX 2530 NBX 2530**	IR 20×25×20.5	IR 20×25×20.5	JR 20×25×20.5
LRT 202525	35	20	25	25.5	**TR 253825**	—	—	—
LRT 202526	36	20	25	26	**RNAFW 253526**	—	IR 20×25×26	JR 20×25×26
LRT 202530	40.5	20	25	30	**RNA 6904**	IR 20×25×30	IR 20×25×30	JR 20×25×30
LRT 202532	44	20	25	32	**RNAFW 253732**	—	IR 20×25×32	JR 20×25×32
LRT 222616	17.5	22	26	16	**TAF 263416**	IR 22×26×16	IR 22×26×16	JR 22×26×16
LRT 222620	24	22	26	20	**TAF 263420**	IR 22×26×20	IR 22×26×20	JR 22×26×20
LRT 222817	30.5	22	28	17	**RNA 49/22**	IR 22×28×17	IR 22×28×17	JR 22×28×17
LRT 222830	55	22	28	30	**RNA 69/22**	IR 22×28×30	IR 22×28×30	JR 22×28×30
LRT 252920	25	25	29	20	**TAF 293820**	IR 25×29×20	IR 25×29×20	JR 25×29×20
LRT 252930	38	25	29	30	**TAF 293830**	IR 25×29×30	IR 25×29×30	JR 25×29×30
LRT 253016	28	25	30	16	**RNAF 304216**	IR 25×30×16	IR 25×30×16	JR 25×30×16
LRT 253017	28.5	25	30	17	**RNA 4905 RNAF 304017 NAX 30 NBX 30**	IR 25×30×17	IR 25×30×17	JR 25×30×17
LRT 253020	34	25	30	20.5	**NAX 3030 NBX 3030**	IR 25×30×20.5	IR 25×30×20.5	JR 25×30×20.5
LRT 253025	42	25	30	25.5	**TR 304425**	—	—	—
LRT 253026	44.5	25	30	26	**RNAFW 304026**	—	IR 25×30×26	JR 25×30×26
LRT 253030	49	25	30	30	**RNA 6905**	IR 25×30×30	IR 25×30×30	JR 25×30×30
LRT 253032	54	25	30	32	**RNAFW 304232**	IR 25×30×32	IR 25×30×32	JR 25×30×32
LRT 283217	24.5	28	32	17	**RNA 49/28**	IR 28×32×17	IR 28×32×17	JR 28×32×17
LRT 283220	28.5	28	32	20	**TAF 324220**	IR 28×32×20	IR 28×32×20	JR 28×32×20
LRT 283230	43	28	32	30	**RNA 69/28 TAF 324230**	IR 28×32×30	IR 28×32×30	JR 28×32×30
LRT 303516	31.5	30	35	16	**RNAF 354716**	IR 30×35×16	IR 30×35×16	JR 30×35×16
LRT 303517	33.5	30	35	17	**RNA 4906 RNAF 354517 NAX 35 NBX 35**	IR 30×35×17	IR 30×35×17	JR 30×35×17
LRT 303520	38.5	30	35	20	**TAF 354520 NAX 3530 NBX 3530**	IR 30×35×20	IR 30×35×20	JR 30×35×20
LRT 303526	52	30	35	26	**RNAFW 354526**	IR 30×35×26	IR 30×35×26	JR 30×35×26
LRT 303530	59	30	35	30	**RNA 6906 TAF 354530**	IR 30×35×30	IR 30×35×30	JR 30×35×30
LRT 303530-1	59	30	35	30.5	**TR 354830**	—	—	—



LRT

DIMENSION TABLE

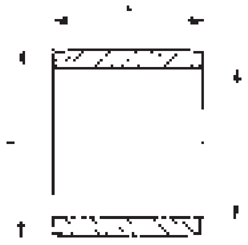
INTERCHANGE TABLE

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			USABLE BEARING NUMBER	INA	SKF	FAG
LRT	(g)	d	F	B		IR	IR	JR
LRT 303532	64	30	35	32	**RNAFW 354732**	—	IR 30×35×32	JR 30×35×32
LRT 323720	43.5	32	37	20	**TAF 374720**	IR 32×37×20	IR 32×37×20	JR 32×37×20
LRT 323730	63	32	37	30	**TAF 374730**	IR 32×37×30	IR 32×37×30	JR 32×37×30
LRT 323830	77	32	38	30.5	**TR 385230**	—	—	—
LRT 324020	69	32	40	20	**RNA 49/32**	IR 32×40×20	IR 32×40×20	JR 32×40×20
LRT 324036	123	32	40	36	**RNA 69/32**	IR 32×40×36	IR 32×40×36	JR 32×40×36
LRT 354017	39	35	40	17	**RNAF 405017**	IR 35×40×17	IR 35×40×17	JR 35×40×17
LRT 354020	46	35	40	20	**TAF 405020 RNAF 405520 NAX 4032 NBX 4032**	IR 35×40×20	IR 35×40×20	JR 35×40×20
LRT 354030	67	35	40	30	**TAF 405030**	IR 35×40×30	IR 35×40×30	JR 35×40×30
LRT 354034	78	35	40	34	**RNAFW 405034 NAX 40 NBX 40**	—	IR 35×40×34	JR 35×40×34
LRT 354040	95	35	40	40	**RNAFW 405540**	—	IR 35×40×40	JR 35×40×40
LRT 354220	65	35	42	20	**RNA 4907**	IR 35×42×20	IR 35×42×20	JR 35×42×20
LRT 354230	97	35	42	30.5	**TR 425630**	—	—	—
LRT 354236	120	35	42	36	**RNA 6907**	IR 35×42×36	IR 35×42×36	JR 35×42×36
LRT 384320	47.5	38	43	20	**TAF 435320**	IR 38×43×20	IR 38×43×20	JR 38×43×20
LRT 384330	72	38	43	30	**TAF 435330**	IR 38×43×30	IR 38×43×30	JR 38×43×30
LRT 404517	44.5	40	45	17	**RNAF 455517**	IR 40×45×17	IR 40×45×17	JR 40×45×17
LRT 404520	51	40	45	20	**TAF 455520 RNAF 456220 NAX 4532 NBX 4532**	IR 40×45×20	IR 40×45×20	JR 40×45×20
LRT 404530	77	40	45	30	**TAF 455530**	IR 40×45×30	IR 40×45×30	JR 40×45×30
LRT 404530-1	77	40	45	30.5	**TR 455930**	—	—	—
LRT 404534	88	40	45	34	**RNAFW 455534 NAX 45 NBX 45**	—	IR 40×45×34	JR 40×45×34
LRT 404540	105	40	45	40	**RNAFW 456240**	—	IR 40×45×40	JR 40×45×40
LRT 404822	93	40	48	22	**RNA 4908**	IR 40×48×22	IR 40×48×22	JR 40×48×22
LRT 404840	165	40	48	40	**RNA 6908**	IR 40×48×40	IR 40×48×40	JR 40×48×40
LRT 424720	54	42	47	20	**TAF 475720**	IR 42×47×20	IR 42×47×20	JR 42×47×20
LRT 424730	81	45	47	30	**TAF 475730**	IR 42×47×30	IR 42×47×30	JR 42×47×30
LRT 424830	100	42	48	30.5	**TR 486230**	—	—	—
LRT 455020	58	45	50	20	**RNAF 506220**	—	IR 45×50×20	JR 45×50×20
LRT 455025	71	45	50	25	**TAF 506225 NAX 5035 NBX 5035**	IR 45×50×25	IR 45×50×25	JR 45×50×25
LRT 455030	90	45	50	30.5	**TR 506430**	—	—	—
LRT 455035	95	45	50	35	**TAF 506235**	IR 45×50×35	IR 45×50×35	JR 45×50×35
LRT 455040	115	45	50	40	**RNAFW 506240 NAX 50 NBX 50**	—	IR 45×50×40	JR 45×50×40
LRT 455222	88	45	52	22	**RNA 4909**	IR 45×52×22	IR 45×52×22	JR 45×52×22
LRT 455240	165	45	52	40	**RNA 6909**	IR 45×52×40	IR 45×52×40	JR 45×52×40
LRT 455520	120	45	55	20	**RNAF 557220**	IR 45×55×20	IR 45×55×20	JR 45×55×20

DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			USABLE BEARING NUMBER	INA	SKF	FAG
LRT	(g)	d	F	B		IR	IR	JR
LRT 455540	245	45	55	40	**RNAFW 557240**	—	IR 45×55×40	JR 45×55×40
LRT 505520	63	50	55	20	**RNAF 556820**	IR 50×55×20	IR 50×55×20	JR 50×55×20
LRT 505525	77	50	55	25	**TAF 556825**	IR 50×55×25	IR 50×55×25	JR 50×55×25
LRT 505535	110	50	55	35	**TAF 556835**	IR 50×55×35	IR 50×55×35	JR 50×55×35
LRT 505540	130	50	55	40	**RNAFW 556840**	—	IR 50×55×40	JR 50×55×40
LRT 505822	116	50	58	22	**RNA 4910**	IR 50×58×22	IR 50×58×22	JR 50×58×22
LRT 505840	210	50	58	40	**RNA 6910**	IR 50×58×40	IR 50×58×40	JR 50×58×40
LRT 505845	235	50	58	45.5	**TR 587745**	—	—	—
LRT 506020	135	50	60	20	**RNAF 607820**	IR 50×60×20	IR 50×60×20	JR 50×60×20
LRT 506025	165	50	60	25.5	**NAX 6040 NBX 6040**	—	—	—
LRT 506040	265	50	60	40	**RNAFW 607840 NAX 60**	—	IR 50×60×40	JR 50×60×40
LRT 556025	88	55	60	25	**TAF 607225**	IR 55×60×25	IR 55×60×25	JR 55×60×25
LRT 556035	120	55	60	35	**TAF 607235**	IR 55×60×35	IR 55×60×35	JR 55×60×35
LRT 556238	190	55	62	38.5	**TR 628138**	—	—	—
LRT 556325	145	55	63	25	**RNA 4911**	IR 55×63×25	IR 55×63×25	JR 55×63×25
LRT 556345	255	55	63	45	**RNA 6911**	IR 55×63×45	IR 55×63×45	JR 55×63×45
LRT 556530	220	55	65	30	**RNAF 658530**	—	IR 55×65×30	JR 55×65×30
LRT 556560	435	55	65	60	**RNAFW 658560**	—	IR 55×65×60	JR 55×65×60
LRT 606825	150	60	68	25	**TAF 688225**	IR 60×68×25	IR 60×68×25	JR 60×68×25
LRT 606825-1	150	60	68	25	**RNA 4912**	IR 60×68×25	IR 60×68×25	JR 60×68×25
LRT 606835	210	60	68	35	**TAF 688235**	IR 60×68×35	IR 60×68×35	JR 60×68×35
LRT 606845	275	60	68	45	**RNA 6912**	IR 60×68×45	IR 60×68×45	JR 60×68×45
LRT 607025	195	60	70	25.5	**NAX 7040**	—	—	—
LRT 607030	240	60	70	30	**RNAF 709030**	—	IR 60×70×30	JR 60×70×30
LRT 607040	310	60	70	40	**NAX 70**	—	—	—
LRT 607045	355	60	70	45.5	**TR 708945**	—	—	—
LRT 607060	480	60	70	60	**RNAFW 709060**	—	IR 60×70×60	JR 60×70×60
LRT 657225	145	65	72	25	**RNA 4913**	IR 65×72×25	IR 65×72×25	JR 65×72×25
LRT 657245	255	65	72	45	**RNA 6913**	IR 65×72×45	IR 65×72×45	JR 65×72×45
LRT 657335	235	65	73	35	**TAF 739035**	IR 65×73×35	IR 65×73×35	JR 65×73×35
LRT 657530	260	65	75	30	**RNAF 759530**	—	IR 65×75×30	JR 65×75×30
LRT 657560	520	65	75	60	**RNAFW 759560**	—	IR 65×75×60	JR 65×75×60
LRT 708025	225	70	80	25	**TAF 809525**	IR 70×80×25	IR 70×80×25	JR 70×80×25
LRT 708030	275	70	80	30	**RNA 4914**	IR 70×80×30	IR 70×80×30	JR 70×80×30
LRT 708030-1	275	70	80	30	**RNAF 8010030**	IR 70×80×30	IR 70×80×30	JR 70×80×30
LRT 708035	310	70	80	35	**TAF 809535**	IR 70×80×35	IR 70×80×35	JR 70×80×35
LRT 708054	490	70	80	54	**RNA 6914**	IR 70×80×54	IR 70×80×54	JR 70×80×54
LRT 708060	560	70	80	60	**RNAFW 8010060**	—	IR 70×80×60	JR 70×80×60
LRT 758345	350	75	83	45.5	**TR 8310845**	—	—	—
LRT 758525	240	75	85	25	**TAF 8510525**	IR 75×85×25	IR 75×85×25	JR 75×85×25


LRT

DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			USABLE BEARING NUMBER	INA	SKF	FAG
LRT	(g)	d	F	B		IR	IR	JR
LRT 758530	290	75	85	30	**RNA 4915**	IR 75×85×30	IR 75×85×30	JR 75×85×30
LRT 758530-1	290	75	85	30	**RNAF 8510530**	IR 75×85×30	IR 75×85×30	JR 75×85×30
LRT 758535	335	75	85	35	**TAF 8510535**	IR 75×85×35	IR 75×85×35	JR 75×85×35
LRT 758554	520	75	85	54	**RNA 6915**	IR 75×85×54	IR 75×85×54	JR 75×85×54
LRT 809025	255	80	90	25	**TAF 9011025**	IR 80×90×25	IR 80×90×25	JR 80×90×25
LRT 809030	310	80	90	30	**RNA 4916**	IR 80×90×30	IR 80×90×30	JR 80×90×30
LRT 809030-1	310	80	90	30	**RNAF 9011030**	IR 80×90×30	IR 80×90×30	JR 80×90×30
LRT 809035	355	80	90	35	**TAF 9011035**	IR 80×90×35	IR 80×90×35	JR 80×90×35
LRT 809054	550	80	90	54	**RNA 6916**	IR 80×90×54	IR 80×90×54	JR 80×90×54
LRT 859350	440	85	93	50.5	**TR 9311850**	—	—	—
LRT 859526	280	85	95	26	**TAF 9511526**	IR 85×95×26	IR 85×95×26	JR 85×95×26
LRT 859530	330	85	95	30	**RNAF 9511530**	—	IR 85×95×30	JR 85×95×30
LRT 859536	390	85	95	36	**TAF 9511536**	IR 85×95×36	IR 85×95×36	JR 85×95×36
LRT 859545	490	85	95	45.5	**TR 9512045**	—	—	—
LRT 8510035	575	85	100	35	**RNA 4917**	IR 85×100×35	IR 85×100×35	JR 85×100×35
LRT 8510063	1040	85	100	63	**RNA 6917**	IR 85×100×63	IR 85×100×63	JR 85×100×63
LRT 9010026	295	90	100	26	**TAF 10012026**	IR 90×100×26	IR 90×100×26	JR 90×100×26
LRT 9010030	355	90	100	30	**RNAF 10012030**	IR 90×100×30	IR 90×100×30	JR 90×100×30
LRT 9010036	415	90	100	36	**TAF 10012036**	IR 90×100×36	IR 90×100×36	JR 90×100×36
LRT 9010050	580	90	100	50.5	**TR 10012550**	—	—	—
LRT 9010535	610	90	105	35	**RNA 4918**	IR 90×105×35	IR 90×105×35	JR 90×105×35
LRT 9010563	1100	90	105	63	**RNA 6918**	IR 90×105×63	IR 90×105×63	JR 90×105×63
LRT 9510526	315	95	105	26	**TAF 10512526**	IR 95×105×26	IR 95×105×26	JR 95×105×26
LRT 9510536	430	95	105	36	**TAF 10512536**	IR 95×105×36	IR 95×105×36	JR 95×105×36
LRT 9511035	650	95	110	35	**RNA 4919**	IR 95×110×35	IR 95×110×35	JR 95×110×35
LRT 9511063	1160	95	110	63	**RNA 6919**	IR 95×110×63	IR 95×110×63	JR 95×110×63
LRT 10011030	380	100	110	30	**TAF 11013030**	IR 100×110×30	IR 100×110×30	JR 100×110×30
LRT 10011040	500	100	110	40	**TAF 11013040**	IR 100×110×40	IR 100×110×40	JR 100×110×40
LRT 10011050	640	100	110	50.5	**TR 11013550**	—	—	—
LRT 10011540	770	100	115	40	**RNA 4920**	IR 100×115×40	IR 100×115×40	JR 100×115×40
LRT 10511550	670	105	115	50.5	**TR 11515350**	—	—	—
LRT 11012030	410	110	120	30	**RNA 4822**	IR 110×120×30	IR 110×120×30	JR 110×120×30
LRT 11012540	840	110	125	40	**RNA 4922**	IR 110×125×40	IR 110×125×40	JR 110×125×40
LRT 12013030	450	120	130	30	**RNA 4824**	IR 120×130×30	IR 120×130×30	JR 120×130×30
LRT 12013545	1030	120	135	45	**RNA 4924**	IR 120×135×45	IR 120×135×45	JR 120×135×45
LRT 12514060	1460	125	140	60.5	**TR 14017860**	—	—	—
LRT 13014535	860	130	145	35	**RNA 4826**	IR 130×145×35	IR 130×145×35	JR 130×145×35
LRT 13015050	1670	130	150	50	**RNA 4926**	IR 130×150×50	IR 130×150×50	JR 130×150×50
LRT 13515060	1560	135	150	60.5	**TR 15018860**	—	—	—
LRT 14015535	930	140	155	35	**RNA 4828**	IR 140×155×35	IR 140×155×35	JR 140×155×35

DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			USABLE BEARING NUMBER	INA	SKF	FAG
LRT	(g)	d	F	B		IR	IR	JR
LRT 14016050	1790	140	160	50	**RNA 4928**	IR 140×160×50	IR 140×160×50	JR 140×160×50
LRT 15016540	1130	150	165	40	**RNA 4830**	IR 150×165×40	IR 150×165×40	JR 150×165×40
LRT 15017060	2290	150	170	60	**RNA 4930**	—	—	—
LRT 16017540	1200	160	175	40	**RNA 4832**	IR 160×175×40	IR 160×175×40	JR 160×175×40
LRT 16018060	2440	160	180	60	**RNA 4932**	—	—	—
LRT 17018545	1420	170	185	45	**RNA 4834**	IR 170×185×45	IR 170×185×45	JR 170×185×45
LRT 17019060	2580	170	190	60	**RNA 4934**	—	—	—
LRT 18019545	1500	180	195	45	**RNA 4836**	IR 180×195×45	IR 180×195×45	JR 180×195×45
LRT 18020569	3950	180	205	69	**RNA 4936**	—	—	—
LRT 19021050	2380	190	210	50	**RNA 4838**	IR 190×210×50	IR 190×210×50	JR 190×210×50
LRT 19021569	4200	190	215	69	**RNA 4938**	—	—	—
LRT 20022050	2520	200	220	50	**RNA 4840**	IR 200×220×50	IR 200×220×50	JR 200×220×50
LRT 20022580	5000	200	225	80	**RNA 4940**	—	—	—
LRT 22024050	2750	220	240	50	**RNA 4844**	IR 220×240×50	IR 220×240×50	JR 220×240×50
LRT 22024580	5500	220	245	80	**RNA 4944**	—	—	—
LRT 24026560	4530	240	265	60	**RNA 4848**	IR 240×265×60	IR 240×265×60	JR 240×265×60
LRT 24026580	6000	240	265	80	**RNA 4948**	—	—	—
LRT 26028560	4930	260	285	60	**RNA 4852**	IR 260×285×60	IR 260×285×60	JR 260×285×60
LRT 260290100	9900	260	290	100	**RNA 4952**	—	—	—
LRT 28030569	6050	280	305	69	**RNA 4856**	IR 280×305×69	IR 280×305×69	JR 280×305×69
LRT 280310100	10600	280	310	100	**RNA 4956**	—	—	—
LRT 30033080	9100	300	330	80	**RNA 4860**	IR 300×330×80	IR 300×330×80	JR 300×330×80
LRT 300340118	18000	300	340	118	**RNA 4960**	—	—	—
LRT 32035080	9600	320	350	80	**RNA 4864**	IR 320×350×80	IR 320×350×80	JR 320×350×80
LRT 320360118	19200	320	360	118	**RNA 4964**	—	—	—
LRT 34037080	10200	340	370	80	**RNA 4868**	IR 340×370×80	IR 340×370×80	JR 340×370×80
LRT 340380118	20300	340	380	118	**RNA 4968**	—	—	—
LRT 36039080	10800	360	390	80	**RNA 4872**	IR 360×390×80	IR 360×390×80	JR 360×390×80
LRT 360400118	21500	360	400	118	**RNA 4972**	—	—	—
LRT 380415100	16700	380	415	100	**RNA 4876**	IR 380×415×100	IR 380×415×100	JR 380×415×100
LRT 380430140	33900	380	430	140	**RNA 4976**	—	—	—
LRT 400450140	35600	400	450	140	**RNA 4980**	—	—	—
LRT 420470140	37300	420	470	140	**RNA 4984**	—	—	—
LRT 440490160	44100	440	490	160	**RNA 4988**	—	—	—

MACHINED TYPE NEEDLE ROLLER BEARINGS

Inch Dimension

DIMENSION TABLE

INTERCHANGE TABLE

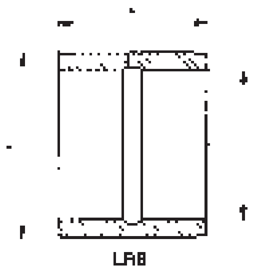
IKO NUMBER	WEIGHT	DIMENSIONS						BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	USABLE INNER RING	TORRINGTON	MCGILL	R.B.C.	INA
		Fw		D		C								
BR	(g)	inch	mm	inch	mm	inch	mm	(N)	(N)	LRB	HJ	MR	SJ	NCS
BR 101812	49	⅝	15.875	1⅛	28.575	¾	19.050	18900	19700	**LRB 61012**	HJ-101812	MR-10-N	SJ 7133	NCS 1012
BR 122012	56	¾	19.050	1¼	31.750	¾	19.050	21700	24400	**LRB 81212**	HJ-122012	MR-12-N	SJ 7153	NCS 1212
BR 122016	75	¾	19.050	1¼	31.750	1	25.400	27600	33100	**LRB 81216**	HJ-122016	MR-12	SJ 7154	NCS 1216
BR 142212	63	⅞	22.225	1⅜	34.925	¾	19.050	23000	27100	**LRB 101412**	HJ-142212	MR-14-N	SJ 7173	NCS 1412
BR 142216	84.5	⅞	22.225	1⅜	34.925	1	25.400	29100	36800	**LRB 101416**	HJ-142216	MR-14	SJ 7174	NCS 1416
BR 162412	69	1	25.400	1½	38.100	¾	19.050	25300	31900	**LRB 121612**	HJ-162412	MR-16-N	SJ 7193	NCS 1612
BR 162416	92.5	1	25.400	1½	38.100	1	25.400	32100	43300	**LRB 121616**	HJ-162416	MR-16	SJ 7194	NCS 1616
BR 182616	102	1⅛	28.575	1⅝	41.275	1	25.400	34900	49900	**LRB 141816**	HJ-182616	MR-18-N	SJ 7214	NCS 1816
BR 182620	128	1⅛	28.575	1⅝	41.275	1¼	31.750	43200	65600	**LRB 141820**	HJ-182620	MR-18	SJ 7215	NCS 1820
BR 202816	110	1¼	31.750	1¾	44.450	1	25.400	36000	53500	**LRB 162016**	HJ-202816	MR-20-N	SJ 7234	NCS 2016
BR 202820	138	1¼	31.750	1¾	44.450	1¼	31.750	44600	70300	**LRB 162020**	HJ-202820	MR-20	SJ 7235	NCS 2020
BR 223016	119	1⅜	34.925	1⅞	47.625	1	25.400	38500	60000	**LRB 182216**	HJ-223016	MR-22-N	SJ 7254	NCS 2216
BR 223020	149	1⅜	34.925	1⅞	47.625	1¼	31.750	47700	78900	**LRB 182220**	HJ-223020	MR-22	SJ 7255	NCS 2220
BR 243316	149	1½	38.100	2 1/16	52.388	1	25.400	43700	66900	**LRB 202416**	HJ-243316	MR-24-N	SJ 7274	NCS 2416
BR 243320	187	1½	38.100	2 1/16	52.388	1¼	31.750	54200	88200	**LRB 202420**	HJ-243320	MR-24	SJ 7275	NCS 2420
BR 263516	158	1⅝	41.275	2 3/16	55.562	1	25.400	44800	70900	**LRB 222616**	HJ-263516	MR-26-N	SJ 7294	NCS 2616
BR 263520	199	1⅝	41.275	2 3/16	55.562	1¼	31.750	55600	93400	**LRB 222620**	HJ-263520	MR-26	SJ 7295	NCS 2620
BR 283716	170	1¾	44.450	2 5/16	58.738	1	25.400	47500	78200	**LRB 242816**	HJ-283716	MR-28-N	SJ 7314	NCS 2816
BR 283720	215	1¾	44.450	2 5/16	58.738	1¼	31.750	58900	103000	**LRB 242820**	HJ-283720	MR-28	SJ 7315	NCS 2820
BR 283820	250	1¾	44.450	2⅜	60.325	1¼	31.750	58900	103000	**LRB 242820**	—	—	—	—
BR 303920	225	1⅞	47.625	2 7/16	61.912	1¼	31.750	60100	108000	**LRB 243020**	HJ-303920	MR-30	SJ 7335	NCS 3020
BR 324116	190	2	50.800	2 9/16	65.088	1	25.400	51000	89400	**LRB 263216**	HJ-324116	MR-32-N	SJ 7354	NCS 3216
BR 324120	240	2	50.800	2 9/16	65.088	1¼	31.750	63200	118000	**LRB 263220**	HJ-324120	MR-32	SJ 7355	NCS 3220
BR 364824	435	2¼	57.150	3	76.200	1½	38.100	90300	158000	**LRB 283624**	HJ-364824	MR-36-N	SJ 8406	NCS 3624
BR 364828	510	2¼	57.150	3	76.200	1¾	44.450	105000	191000	**LRB 283628**	HJ-364828	MR-36	SJ 8407	—
BR 405224	475	2½	63.500	3¼	82.550	1½	38.100	94600	174000	**LRB 324024**	HJ-405224	MR-40-N	SJ 8446	NCS 4024
BR 405228	555	2½	63.500	3¼	82.550	1¾	44.450	110000	210000	**LRB 324028**	HJ-405228	MR-40	SJ 8447	—
BR 445624	510	2¾	69.850	3½	88.900	1½	38.100	98700	189000	**LRB 364424**	HJ-445624	MR-44-N	SJ 8476	NCS 4424
BR 445628	600	2¾	69.850	3½	88.900	1¾	44.450	114000	228000	**LRB 364428**	HJ-445628	MR-44	SJ 8477	—
BR 486024	555	3	76.200	3¾	92.250	1½	38.100	105000	211000	**LRB 404824**	HJ-486024	MR-48-N	SJ 8516	NCS 4824
BR 486028	650	3	76.200	3¾	92.250	1¾	44.450	122000	255000	**LRB 404828**	HJ-486028	MR-48	SJ 8517	—
BR 526828	990	3¼	82.550	4¼	107.950	1¾	44.450	141000	259000	**LRB 445228**	HJ-526828	MR-52	SJ 9567	NCS 5228
BR 526832	1140	3¼	82.550	4¼	107.950	2	50.800	154000	290000	**LRB 445232**	HJ-526832	—	SJ 9568	NCS 5232
BR 567232	1220	3½	88.900	4½	114.300	2	50.800	162000	316000	**LRB 485632**	HJ-567232	MR-56	SJ 9608	NCS 5632
BR 607632	1290	3¾	92.250	4¾	120.650	2	50.800	169000	342000	**LRB 526032**	HJ-607632	MR-60	SJ 9648	—
BR 648032	1370	4	101.600	5	127.000	2	50.800	176000	368000	**LRB 566432**	HJ-648032	MR-64	SJ 9688	—

IKO

LRB

INNER RACES FOR MACHINED TYPE NEEDLE ROLLER BEARINGS

Inch Dimension



DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER	WEIGHT	DIMENSIONS					USABLE BEARING NUMBER	TORRINGTON	MCGILL	R.B.C.	INA
		d		F		B					
LRB	(g)	inch	mm	inch	mm	mm	BR	IR	MI	IR	PI
LRB 61012	18.5	⅜	9.525	⅝	15.875	19.300	**BR 101812**	IR-061012	MI-6-N	—	PI 061012
LRB 81212	23.5	½	12.700	¾	19.050	19.300	**BR 122012**	IR-081212	MI-8-N	IR-7153	PI 081212
LRB 81216	31	½	12.700	¾	19.050	25.650	**BR 122016**	IR-081216	MI-8	IR-7154	PI 081216
LRB 101412	28	⅝	15.875	⅞	22.225	19.300	**BR 142212**	IR-101412	MI-10-N	IR-7173	PI 101412
LRB 101416	37.5	⅝	15.875	⅞	22.225	25.650	**BR 142216**	IR-101416	MI-10	IR-7174	PI 101416
LRB 121612	33	¾	19.050	1	25.400	19.300	**BR 162412**	IR-121612	MI-12-N	IR-7193	PI 121612
LRB 121616	44	¾	19.050	1	25.400	25.650	**BR 162416**	IR-121616	MI-12	IR-7194	PI 121616
LRB 141816	50	⅞	22.225	1⅛	28.575	25.650	**BR 182616**	IR-141816	MI-14-N	IR-7214	PI 141816
LRB 141820	62	⅞	22.225	1⅛	28.575	32.000	**BR 182620**	IR-141820	MI-14	IR-7215	PI 141820
LRB 162016	56	1	25.400	1¼	31.750	25.650	**BR 202816**	IR-162016	MI-16-N	IR-7234	PI 162016
LRB 162020	72	1	25.400	1¼	31.750	32.000	**BR 202820**	IR-162020	MI-16	IR-7235	PI 162020
LRB 182216	63	1⅛	28.575	1⅜	34.925	25.650	**BR 223016**	IR-182216	MI-18-N	IR-7254	PI 182216
LRB 182220	77	1⅛	28.575	1⅜	34.925	32.000	**BR 223020**	IR-182220	MI-18	IR-7255	PI 182220
LRB 202416	71	1¼	31.750	1½	38.100	25.650	**BR 243316**	IR-202416	MI-20-N	—	PI 202416
LRB 202420	86	1¼	31.750	1½	38.100	32.000	**BR 243320**	IR-202420	MI-20	IR-7275-C	PI 202420
LRB 222616	77	1⅜	34.925	1⅝	41.275	25.650	**BR 263516**	—	—	—	—
LRB 222620	96	1⅜	34.925	1⅝	41.275	32.000	**BR 263520**	IR-222620	MI-22-4S	IR-7295-C	PI 222620
LRB 242816	80	1½	38.100	1¾	44.450	25.650	**BR 283716**	IR-242816	MI-24-N	—	PI 242816
LRB 242820	100	1½	38.100	1¾	44.450	32.000	**BR 283720**	IR-242820	MI-24	IR-7315-C	PI 242820
LRB 243020	155	1½	38.100	1⅞	47.625	32.000	**BR 303920**	—	—	—	—
LRB 263216	135	1⅝	41.275	2	50.800	25.650	**BR 324116**	—	MI-26-N	—	PI 263216
LRB 263220	170	1⅝	41.275	2	50.800	32.000	**BR 324120**	IR-263220	MI-26	IR-7355-D	—
LRB 283624	300	1¾	44.450	2¼	57.150	38.350	**BR 364824**	IR-283624	MI-28-N	IR-8406	PI 283624
LRB 283628	345	1¾	44.450	2¼	57.150	44.700	**BR 364828**	IR-283628	MI-28	IR-8407	—
LRB 324024	335	2	50.800	2½	63.500	38.350	**BR 405224**	IR-324024	MI-32-N	IR-8446-C	PI 324024
LRB 324028	390	2	50.800	2½	63.500	44.700	**BR 405228**	IR-324028	MI-32	IR-8447-C	—
LRB 364424	375	2¼	57.150	2¾	69.850	38.350	**BR 445624**	IR-364424	MI-36-N	IR-8476-C	PI 364424
LRB 364428	440	2¼	57.150	2¾	69.850	44.700	**BR 445628**	IR-364428	MI-36	IR-8477-C	—
LRB 404824	410	2½	63.500	3	76.200	38.350	**BR 486024**	IR-404824	MI-40-N	IR-8516-C	PI 404824
LRB 404828	480	2½	63.500	3	76.200	44.700	**BR 486028**	IR-404828	MI-40	IR-8517-C	—
LRB 445228	530	2¾	69.850	3¼	82.550	44.700	**BR 526828**	IR-445228	MI-44	IR-9567	PI 445228
LRB 445232	600	2¾	69.850	3¼	82.550	51.050	**BR 526832**	IR-445232	—	IR-9568	PI 445232
LRB 485632	640	3	76.200	3½	88.900	51.050	**BR 567232**	IR-485632	MI-48	IR-9608-C	PI 485632
LRB 526032	690	3¼	82.550	3¾	92.250	51.050	**BR 607632**	IR-526032	MI-52	IR-9648-C	—
LRB 566432	750	3½	88.900	4	101.600	51.050	**BR 648032**	IR-566432	MI-56	IR-9688-C	—

IKO

GTRI•GTR

MACHINED TYPE NEEDLE ROLLER BEARINGS

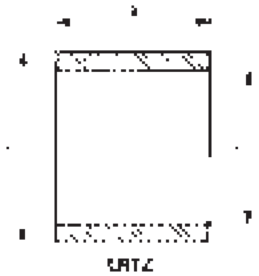
Metric Dimension

DIMENSION TABLE

IKO NUMBER WITH INNER RING GTRI	WEIGHT (g)	IKO NUMBER WITHOUT INNER RING GTR	WEIGHT (g)	DIMENSIONS (mm)					BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
				d	D	C	B	Fw		
GTRI 153320	90.5	**GTR 203320**	69	15	33	20	20.5	20	29200	37200
GTRI 173425	117	**GTR 223425**	87	17	34	25	25.5	22	37900	57800
GTRI 203820	110	**GTR 253820**	81.5	20	38	20	20.5	25	33300	46500
GTRI 203825	138	**GTR 253825**	104	20	38	25	25.5	25	42400	63700
GTRI 254425	175	**GTR 304425**	133	25	44	25	25.5	30	47000	76500
GTRI 284530	196	**GTR 324530**	152	28	45	30	30.5	32	58000	101000
GTRI 304830	225	**GTR 354830**	163	30	48	30	30.5	35	61100	110000
GTRI 325230	270	**GTR 385230**	195	32	52	30	30.5	38	64200	121000
GTRI 355520	191	**GTR 405520**	144	35	55	20	20.5	40	44300	73600
GTRI 355630	310	**GTR 425630**	210	35	56	30	30.5	42	67500	133000
GTRI 405930	300	**GTR 455930**	225	40	59	30	30.5	45	70300	142000
GTRI 426230	340	**GTR 486230**	240	42	62	30	30.5	48	72700	154000
GTRI 456430	335	**GTR 506430**	245	45	64	30	30.5	50	74600	158000
GTRI 507745	825	**GTR 587745**	590	50	77	45	45.5	58	135000	280000
GTRI 558138	710	**GTR 628138**	520	55	81	38	38.5	62	118000	241000
GTRI 608945	1050	**GTR 708945**	690	60	89	45	45.5	70	147000	336000
GTRI 7510845	1440	**GTR 8310845**	1090	75	108	45	45.5	83	190000	396000
GTRI 8511850	1780	**GTR 9311850**	1340	82	118	50	50.5	93	224000	509000
GTRI 8512045	1720	**GTR 9512045**	1230	85	120	45	45.5	95	204000	455000
GTRI 9012550	2020	**GTR 10012550**	1440	90	125	50	50.5	100	234000	549000
GTRI 10013550	2200	**GTR 11013550**	1560	100	135	50	50.5	110	245000	603000
GTRI 10515350	3270	**GTR 11515350**	2600	105	153	50	50.5	115	315000	614000
GTRI 12517860	5180	**GTR 14017860**	3730	125	178	60	60.5	140	409000	923000
GTRI 13518860	5530	**GTR 15018860**	3970	135	188	60	60.5	150	423000	989000

INNER RACES FOR MACHINED TYPE NEEDLE ROLLER BEARINGS

Metric Dimension



DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			USABLE BEARING NUMBER	INA	SKF	FAG
LRTZ	(g)	d	F	B		IR	IRZ	JRZ
LRTZ 101414	8.2	10	14	14	**RNA 4900 UU**	IR 10×14×14	IRZ 10×14×14	JRZ 10×14×14
LRTZ 121614	9.6	12	16	14	**RNA 4901 UU**	IR 12×16×14	IRZ 12×16×14	JRZ 12×16×14
LRTZ 121623	15.5	12	16	23	**RNA 6901 UU**	—	—	—
LRTZ 152014	14.5	15	20	14	**RNA 4902 UU**	IR 15×20×14	IRZ 15×20×14	JRZ 15×20×14
LRTZ 152020	21.5	15	20	20.5	**GTR 203320**	—	—	—
LRTZ 152024	25	15	20	24	**RNA 6902 UU**	—	—	—
LRTZ 172214	16.5	17	22	14	**RNA 4903 UU**	IR 17×22×14	IRZ 17×22×14	—
LRTZ 172224	28	17	22	24	**RNA 6903 UU**	—	—	—
LRTZ 172225	30	17	22	25.5	**GTR 223425**	—	—	—
LRTZ 202518	24	20	25	18	**RNA 4904 UU**	IR 20×25×18	IRZ 20×25×18	JRZ 20×25×18
LRTZ 202520	28	20	25	20.5	**GTR 253820**	—	—	—
LRTZ 202525	35	20	25	25.5	**GTR 253825**	—	—	—
LRTZ 202531	41.5	20	25	31	**RNA 6904 UU**	—	—	—
LRTZ 222818	32	22	28	18	**RNA 49/22 UU**	—	—	—
LRTZ 222831	55	22	28	31	**RNA 69/22 UU**	—	—	—
LRTZ 253018	29.5	25	30	18	**RNA 4905 UU**	IR 25×30×18	IRZ 25×30×18	JRZ 25×30×18
LRTZ 253025	42	25	30	25.5	**GTR 304425**	—	—	—
LRTZ 253031	51	25	30	31	**RNA 6905 UU**	—	—	—
LRTZ 283218	25.5	28	32	18	**RNA 49/28 UU**	—	—	—
LRTZ 283230	43	28	32	30.5	**GTR 324530**	—	—	—
LRTZ 283231	44	28	32	31	**RNA 69/28 UU**	—	—	—
LRTZ 303518	35	30	35	18	**RNA 4906 UU**	IR 30×35×18	IRZ 30×35×18	JRZ 30×35×18
LRTZ 303530	59	30	35	30.5	**GTR 354830**	—	—	—
LRTZ 303531	61	30	35	31	**RNA 6906 UU**	—	—	—
LRTZ 323830	77	32	38	30.5	**GTR 385230**	—	—	—
LRTZ 324021	72.5	32	40	21	**RNA 49/32 UU**	—	—	—
LRTZ 324037	130	32	40	37	**RNA 69/32 UU**	—	—	—
LRTZ 354020	46	35	40	20.5	**GTR 405520**	—	—	—
LRTZ 354221	67	35	42	21	**RNA 4907 UU**	IR 35×42×21	IRZ 35×42×21	—
LRTZ 354230	100	35	42	30.5	**GTR 425630**	—	—	—
LRTZ 354237	120	35	42	37	**RNA 6907 UU**	—	—	—
LRTZ 404530	77	40	45	30.5	**GTR 455930**	—	—	—
LRTZ 404823	95	40	48	23	**RNA 4908 UU**	IR 40×48×23	IRZ 40×48×23	JRZ 40×48×23
LRTZ 404841	170	40	48	41	**RNA 6908 UU**	—	—	—
LRTZ 424830	100	42	48	30.5	**GTR 486230**	—	—	—
LRTZ 455030	90	45	50	30.5	**GTR 506430**	—	—	—
LRTZ 455223	93	45	52	23	**RNA 4909 UU**	IR 45×52×23	IRZ 45×52×23	JRZ 45×52×23
LRTZ 455241	170	45	52	41	**RNA 6909 UU**	—	—	—
LRTZ 505823	118	50	58	23	**RNA 4910 UU**	IR 50×58×23	IRZ 50×58×23	JRZ 50×58×23
LRTZ 505841	215	50	58	41	**RNA 6910 UU**	—	—	—

DIMENSION TABLE **INTERCHANGE TABLE**

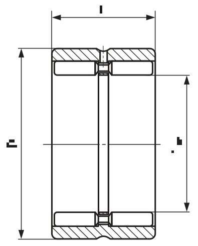
IKO NUMBER	WEIGHT	DIMENSIONS (mm)			USABLE BEARING NUMBER	INA	SKF	FAG
LRTZ	(g)	d	F	B		IR	IRZ	JRZ
LRTZ 505845	235	50	58	44.5	**GTR 587745**	—	—	—
LRTZ 556238	190	55	62	38.5	**GTR 628138**	—	—	—
LRTZ 556326	150	55	63	26	**RNA 4911 UU**	—	—	—
LRTZ 556346	260	55	63	46	**RNA 6911 UU**	—	—	—
LRTZ 606826	160	60	68	26	**RNA 4912 UU**	—	—	—
LRTZ 606846	280	60	68	46	**RNA 6912 UU**	—	—	—
LRTZ 607045	360	60	70	45.5	**GTR 708945**	—	—	—
LRTZ 657226	150	65	72	26	**RNA 4913 UU**	—	—	—
LRTZ 657246	265	65	72	46	**RNA 6913 UU**	—	—	—
LRTZ 708031	275	70	80	31	**RNA 4914 UU**	—	—	—
LRTZ 708055	500	70	80	55	**RNA 6914 UU**	—	—	—
LRTZ 758345	350	75	83	45.5	**GTR 8310845**	—	—	—
LRTZ 758531	300	75	85	31	**RNA 4915 UU**	—	—	—
LRTZ 758555	530	75	85	55	**RNA 6915 UU**	—	—	—
LRTZ 809031	315	80	90	31	**RNA 4916 UU**	—	—	—
LRTZ 809055	560	80	90	55	**RNA 6916 UU**	—	—	—
LRTZ 859350	440	85	93	50.5	**GTR 9311850**	—	—	—
LRTZ 859545	490	85	95	45.5	**GTR 9512045**	—	—	—
LRTZ 8510036	605	85	100	36	**RNA 4917 UU**	—	—	—
LRTZ 8510064	1060	85	100	64	**RNA 6917 UU**	—	—	—
LRTZ 9010050	580	90	100	50.5	**GTR 10012550**	—	—	—
LRTZ 9010536	630	90	105	36	**RNA 4918 UU**	—	—	—
LRTZ 9010564	1120	90	105	64	**RNA 6918 UU**	—	—	—
LRTZ 9511036	660	95	110	36	**RNA 4919 UU**	—	—	—
LRTZ 9511064	1180	95	110	64	**RNA 6919 UU**	—	—	—
LRTZ 10011050	640	100	110	50.5	**GTR 11013550**	—	—	—
LRTZ 10011541	780	100	115	41	**RNA 4920 UU**	—	—	—
LRTZ 10511550	670	105	115	50.5	**GTR 11515350**	—	—	—
LRTZ 11012541	870	110	125	41	**RNA 4922 UU**	—	—	—
LRTZ 12013546	1050	120	135	46	**RNA 4924 UU**	—	—	—
LRTZ 12514060	1460	125	140	60.5	**GTR 14017860**	—	—	—
LRTZ 13015051	1720	130	150	51	**RNA 4926 UU**	—	—	—
LRTZ 13515060	1560	135	150	60.5	**GTR 15018860**	—	—	—
LRTZ 14016051	1830	140	160	51	**RNA 4928 UU**	—	—	—

IKO

GBR

MACHINED TYPE NEEDLE ROLLER BEARINGS

Inch Dimension



GBR

DIMENSION TABLE **INTERCHANGE TABLE**

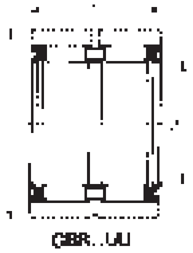
IKO NUMBER	WEIGHT	DIMENSIONS						BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	USABLE INNER RING	MCGILL
		Fw		D		C					
GBR	(g)	inch	mm	inch	mm	inch	mm	(N)	(N)	**LRBZ**	GR
GBR 101812	55.5	⅝	15.875	1⅛	28.575	¾	19.050	23500	28500	**LRBZ 61012**	GR-10-N
GBR 122012	63	¾	19.050	1¼	31.750	¾	19.050	26400	34500	**LRBZ 81212**	GR-12-N
GBR 142212	71	⅞	22.225	1⅜	34.925	¾	19.050	28600	40100	**LRBZ 101412**	GR-14-N
GBR 142216	95.5	⅞	22.225	1⅜	34.925	1	25.400	38300	58300	**LRBZ 101416**	GR-14
GBR 162412	79	1	25.400	1½	38.100	¾	19.050	31000	46100	**LRBZ 121612**	GR-16-N
GBR 162416	106	1	25.400	1½	38.100	1	25.400	41400	67100	**LRBZ 121616**	GR-16
GBR 182616	117	1⅛	28.575	1⅝	41.275	1	25.400	43900	75300	**LRBZ 141816**	GR-18-N
GBR 202816	128	1¼	31.750	1¾	44.450	1	25.400	46600	83900	**LRBZ 162016**	GR-20-N
GBR 223016	137	1⅜	34.925	1⅞	47.625	1	25.400	49500	91800	**LRBZ 182216**	GR-22-N
GBR 243316	168	1½	38.100	2 1/16	52.388	1	25.400	54200	97700	**LRBZ 202416**	GR-24-N
GBR 243320	205	1½	38.100	2 1/16	52.388	1¼	31.750	64100	121000	**LRBZ 202420**	GR-24
GBR 263516	180	1⅝	41.275	2 3/16	55.562	1	25.400	56600	105000	**LRBZ 222616**	GR-26-N
GBR 263520	220	1⅝	41.275	2 3/16	55.562	1¼	31.750	67000	130000	**LRBZ 222620**	GR-26
GBR 283720	235	1¾	44.450	2 5/16	58.738	1¼	31.750	69700	141000	**LRBZ 242820**	GR-28
GBR 283820	275	1¾	44.450	2⅜	60.325	1¼	31.750	69700	141000	**LRBZ 242820**	—
GBR 303920	250	1⅞	47.625	2 7/16	61.912	1¼	31.750	72400	150000	**LRBZ 243020**	GR-30
GBR 324116	215	2	50.800	2 9/16	65.088	1	25.400	63100	130000	**LRBZ 263216**	GR-32-N
GBR 324120	265	2	50.800	2 9/16	65.088	1¼	31.750	74600	162000	**LRBZ 263220**	GR-32
GBR 364824	490	2¼	57.150	3	76.200	1½	38.100	113000	224000	**LRBZ 283624**	GR-36-N
GBR 364828	580	2¼	57.150	3	76.200	1¾	44.450	133000	276000	**LRBZ 283628**	GR-36
GBR 405224	535	2½	63.500	3¼	82.550	1½	38.100	120000	248000	**LRBZ 324024**	GR-40-N
GBR 405228	635	2½	63.500	3¼	82.550	1¾	44.450	141000	306000	**LRBZ 324028**	GR-40
GBR 445624	585	2¾	69.850	3½	88.900	1½	38.100	125000	273000	**LRBZ 364424**	GR-44-N
GBR 445628	690	2¾	69.850	3½	88.900	1¾	44.450	147000	336000	**LRBZ 364428**	GR-44
GBR 486024	630	3	76.200	3¾	92.250	1½	38.100	131000	298000	**LRBZ 404824**	GR-48-N
GBR 486028	745	3	76.200	3¾	92.250	1¾	44.450	154000	368000	**LRBZ 404828**	GR-48
GBR 526828	1100	3¼	82.550	4¼	107.950	1¾	44.450	193000	396000	**LRBZ 445228**	GR-52
GBR 526832	1240	3¼	82.550	4¼	107.950	2	50.800	214000	452000	**LRBZ 445232**	—
GBR 567232	1330	3½	88.900	4½	114.300	2	50.800	221000	488000	**LRBZ 485632**	GR-56
GBR 607632	1420	3¾	92.250	4¾	120.650	2	50.800	228000	522000	**LRBZ 526032**	GR-60
GBR 648032	1500	4	101.600	5	127.000	2	50.800	237000	556000	**LRBZ 566432**	GR-64
GBR 688432	1580	4¼	107.950	5¼	133.350	2	50.800	242000	590000	**LRBZ 606832**	GR-68

IKO

GBR..UU

MACHINED TYPE NEEDLE ROLLER BEARINGS

Inch Dimension



DIMENSION TABLE **INTERCHANGE TABLE**

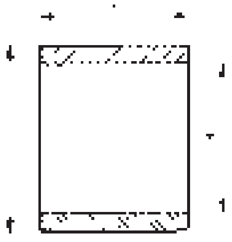
IKO NUMBER	WEIGHT	DIMENSIONS						BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	USABLE INNER RING	MCGILL
		Fw		D		C					
GBR..UU	(g)	inch	mm	inch	mm	inch	mm	(N)	(N)	**LRBZ**	GR..SS
GBR 101816 UU	69.5	⅝	15.875	1⅛	28.575	1	25.400	23500	28500	**LRBZ 61016**	GR-10-SS
GBR 122016 UU	79	¾	19.050	1¼	31.750	1	25.400	26400	34500	**LRBZ 81216**	GR-12-SS
GBR 142216 UU	89.5	⅞	22.225	1⅜	34.925	1	25.400	28600	40100	**LRBZ 101416**	GR-14-SS
GBR 162416 UU	99	1	25.400	1½	38.100	1	25.400	31000	46100	**LRBZ 121616**	GR-16-SS
GBR 182620 UU	139	1⅛	28.575	1⅝	41.275	1¼	31.750	43900	75300	**LRBZ 141820**	GR-18-SS
GBR 202820 UU	152	1¼	31.750	1¾	44.450	1¼	31.750	46600	83900	**LRBZ 162020**	GR-20-SS
GBR 223020 UU	163	1⅜	34.925	1⅞	47.625	1¼	31.750	49500	91800	**LRBZ 182220**	GR-22-SS
GBR 243320 UU	200	1½	38.100	2 1/16	52.388	1¼	31.750	54200	97700	**LRBZ 202420**	GR-24-SS
GBR 263520 UU	215	1⅝	41.275	2 3/16	55.562	1¼	31.750	56600	105000	**LRBZ 222620**	GR-26-SS
GBR 283720 UU	230	1¾	44.450	2 5/16	58.738	1¼	31.750	58900	114000	**LRBZ 242820**	GR-28-SS
GBR 303920 UU	240	1⅞	47.625	2 7/16	61.912	1¼	31.750	61100	121000	**LRBZ 243020**	GR-30-SS
GBR 324120 UU	255	2	50.800	2 9/16	65.088	1¼	31.750	63100	130000	**LRBZ 263220**	GR-32-SS
GBR 364828 UU	515	2¼	57.150	3	76.200	1¾	44.450	87500	161000	**LRBZ 283628**	GR-36-SS
GBR 405228 UU	560	2½	63.500	3¼	82.550	1¾	44.450	93300	179000	**LRBZ 324028**	GR-40-SS
GBR 445628 UU	610	2¾	69.850	3½	88.900	1¾	44.450	97200	197000	**LRBZ 364428**	GR-44-SS
GBR 486028 UU	660	3	76.200	3¾	92.250	1¾	44.450	101000	215000	**LRBZ 404828**	GR-48-SS
GBR 526828 UU	960	3¼	82.550	4¼	107.950	1¾	44.450	127000	231000	**LRBZ 445228**	GR-52-SS
GBR 567232 UU	1240	3½	88.900	4½	114.300	2	50.800	170000	347000	**LRBZ 485632**	GR-56-SS
GBR 607632 UU	1320	3¾	92.250	4¾	120.650	2	50.800	175000	371000	**LRBZ 526032**	GR-60-SS
GBR 648032 UU	1380	4	101.600	5	127.000	2	50.800	182000	395000	**LRBZ 566432**	GR-64-SS
GBR 688432 UU	1460	4¼	107.950	5¼	133.350	2	50.800	186000	419000	**LRBZ 606832**	GR-68-SS

IKO

LRBZ

INNER RACES FOR MACHINED TYPE NEEDLE ROLLER BEARINGS

Inch Dimension



LRBZ

DIMENSION TABLE **INTERCHANGE TABLE**

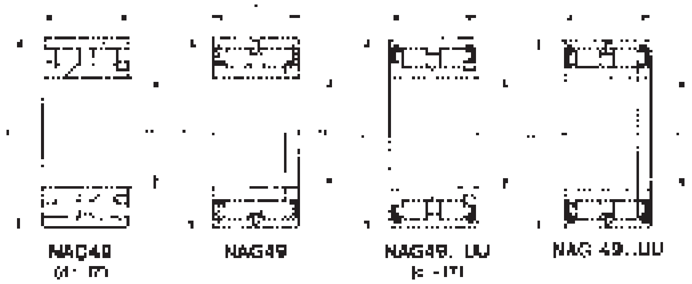
IKO NUMBER LRBZ	WEIGHT (g)	DIMENSIONS d inch	d mm	F inch	F mm	B mm	USABLE BEARING NUMBER	TORRINGTON IR	MCGILL MI
LRBZ 61012	18.5	⅜	9.525	⅝	15.875	19.300	**GBR 101812**	IR-061012	MI-6-N
LRBZ 61016	25	⅜	9.525	⅝	15.875	25.650	**GBR 101816 UU**	—	MI-6
LRBZ 81212	23.5	½	12.700	¾	19.050	19.300	**GBR 122012**	IR-081212	MI-8-N
LRBZ 81216	31	½	12.700	¾	19.050	25.650	**GBR 122016 UU**	IR-081216	MI-8
LRBZ 101412	28	⅝	15.875	⅞	22.225	19.300	**GBR 142212**	IR-101412	MI-10-N
LRBZ 101416	37.5	⅝	15.875	⅞	22.225	25.650	**GBR 142216 GBR 142216 UU**	IR-101416	MI-10
LRBZ 121612	33	¾	19.050	1	25.400	19.300	**GBR 162412**	IR-121612	MI-12-N
LRBZ 121616	44	¾	19.050	1	25.400	25.650	**GBR 162416 GBR 162416 UU**	IR-121616	MI-12
LRBZ 141816	50	⅞	22.225	1⅛	28.575	25.650	**GBR 182616**	IR-141816	MI-14-N
LRBZ 141820	62	⅞	22.225	1⅛	28.575	32.000	**GBR 182620 UU**	IR-141820	MI-14
LRBZ 162016	56	1	25.400	1¼	31.750	25.650	**GBR 202816**	IR-162016	MI-16-N
LRBZ 162020	72	1	25.400	1¼	31.750	32.000	**GBR 202820 UU**	IR-162020	MI-16
LRBZ 182216	63	1⅛	28.575	1⅜	34.925	25.650	**GBR 223016**	IR-182216	MI-18-N
LRBZ 182220	77	1⅛	28.575	1⅜	34.925	32.000	**GBR 223020 UU**	IR-182220	MI-18
LRBZ 202416	71	1¼	31.750	1½	38.100	25.650	**GBR 243316**	IR-202416	MI-20-N
LRBZ 202420	86	1¼	31.750	1½	38.100	32.000	**GBR 243320 GBR 243320 UU**	IR-202420	MI-20
LRBZ 222616	77	1⅜	34.925	1⅝	41.275	25.650	**GBR 263516**	—	—
LRBZ 222620	96	1⅜	34.925	1⅝	41.275	32.000	**GBR 263520 GBR 263520 UU**	IR-222620	MI-22-4S
LRBZ 242820	100	1½	38.100	1¾	44.450	32.000	**GBR 283720 GBR 283820** **GBR 283720 UU**	IR-242820	MI-24
LRBZ 243020	160	1½	38.100	1⅞	47.625	32.000	**GBR 303920 GBR 303920 UU**	—	—
LRBZ 263216	135	1⅝	41.275	2	50.800	25.650	**GBR 324116**	—	MI-26-N
LRBZ 263220	170	1⅝	41.275	2	50.800	32.000	**GBR 324120 GBR 324120 UU**	IR-263220	MI-26
LRBZ 283624	300	1¾	44.450	2¼	57.150	38.350	**GBR 364824**	IR-283624	MI-28-N
LRBZ 283628	345	1¾	44.450	2¼	57.150	44.700	**GBR 364828 GBR 364828 UU**	IR-283628	MI-28
LRBZ 324024	335	2	50.800	2½	63.500	38.350	**GBR 405224**	IR-324024	MI-32-N
LRBZ 324028	390	2	50.800	2½	63.500	44.700	**GBR 405228 GBR 405228 UU**	IR-324028	MI-32
LRBZ 364424	375	2¼	57.150	2¾	69.850	38.350	**GBR 445624**	IR-364424	MI-36-N
LRBZ 364428	440	2¼	57.150	2¾	69.850	44.700	**GBR 445628 GBR 445628 UU**	IR-364428	MI-36
LRBZ 404824	410	2½	63.500	3	76.200	38.350	**GBR 486024**	IR-404824	MI-40-N
LRBZ 404828	480	2½	63.500	3	76.200	44.700	**GBR 486028 GBR 486028 UU**	IR-404828	MI-40
LRBZ 445228	530	2¾	69.850	3¼	82.550	44.700	**GBR 526828 GBR 526828 UU**	IR-445228	MI-44
LRBZ 445232	600	2¾	69.850	3¼	82.550	51.050	**GBR 526832**	IR-445232	—
LRBZ 485632	640	3	76.200	3½	88.900	51.050	**GBR 567232 GBR 567232 UU**	IR-485632	MI-48
LRBZ 526032	690	3¼	82.550	3¾	92.250	51.050	**GBR 607632 GBR 607632 UU**	IR-526032	MI-52
LRBZ 566432	750	3½	88.900	4	101.600	51.050	**GBR 648032 GBR 648032 UU**	IR-566432	MI-56
LRBZ 606832	800	3¾	92.250	4¼	107.950	51.050	**GBR 688432 GBR 688432 UU**	IR-606832	MI-60

IKO

NAG•NAG..UU

ROLLER BEARINGS

Metric Dimension

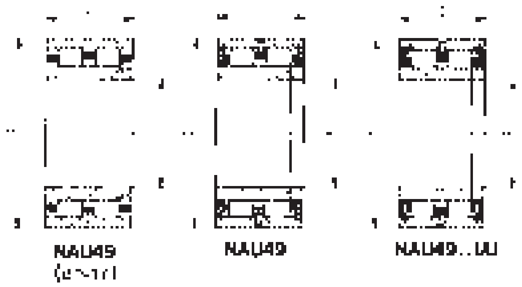


DIMENSION TABLE

IKO NUMBER OPEN TYPE NAG 49	WEIGHT (g)	IKO NUMBER SEALED TYPE NAG 49..UU	WEIGHT (g)	DIMENSIONS (mm) d	D	C	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
NAG 4900	25.5	**NAG 4900 UU**	25.5	10	22	13	9650	10800
NAG 4901	28.5	**NAG 4901 UU**	28.5	12	24	13	10300	12000
NAG 4902	38	**NAG 4902 UU**	38	15	28	13	11800	15200
NAG 4903	41	**NAG 4903 UU**	41	17	30	13	12300	16500
NAG 4904	76.5	**NAG 4904 UU**	76.5	20	37	17	15600	18900
NAG 4905	89.5	**NAG 4905 UU**	89.5	25	42	17	17500	23200
NAG 4906	103	**NAG 4906 UU**	103	30	47	17	19400	27600
NAG 4907	172	**NAG 4907 UU**	172	35	55	20	28700	43800
NAG 4908	225	**NAG 4908 UU**	225	40	62	22	34600	49500
NAG 4909	265	**NAG 4909 UU**	265	45	68	22	36400	54700
NAG 4910	270	**NAG 4910 UU**	270	50	72	22	38200	59900
NAG 4911	395	**NAG 4911 UU**	395	55	80	25	48100	77700
NAG 4912	425	**NAG 4912 UU**	425	60	85	25	50300	84300
NAG 4913	455	**NAG 4913 UU**	455	65	90	25	53200	93000
NAG 4914	725	**NAG 4914 UU**	725	70	100	30	77700	139000
NAG 4915	775	**NAG 4915 UU**	775	75	105	30	80000	146000
NAG 4916	815	**NAG 4916 UU**	815	80	110	30	83000	157000
NAG 4917	1190	**NAG 4917 UU**	1190	85	120	35	111000	200000
NAG 4918	1250	**NAG 4918 UU**	1250	90	125	35	114000	211000
NAG 4919	1300	**NAG 4919 UU**	1300	95	130	35	117000	222000
NAG 4920	1850	**NAG 4920 UU**	1850	100	140	40	152000	292000
NAG 4922	2010	**NAG 4922 UU**	2010	110	150	40	161000	322000
NAG 4924	2780	**NAG 4924 UU**	2780	120	165	45	208000	431000
NAG 4926	3750	**NAG 4926 UU**	3750	130	180	50	240000	495000
NAG 4928	3990	**NAG 4928 UU**	3990	140	190	50	249000	531000

ROLLER BEARINGS

Metric Dimension

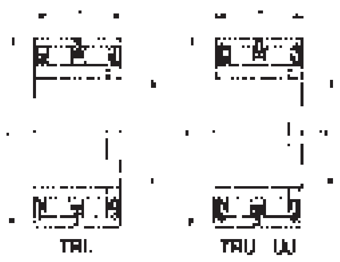


DIMENSION TABLE

IKO NUMBER NAU 49	WEIGHT (g)	IKO NUMBER SEALED TYPE NAU 49..UU	WEIGHT (g)	DIMENSIONS (mm) d	 D	 C	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
NAU 4900	24.5	—	—	10	22	13	6580	6470
NAU 4901	27.5	—	—	12	24	13	6950	7120
NAU 4902	36.5	—	—	15	28	13	7950	9020
NAU 4903	39.5	—	—	17	30	13	8240	9670
NAU 4904	76	**NAU 4904 UU**	76	20	37	17	10700	11300
NAU 4905	89	**NAU 4905 UU**	89	25	42	17	11900	13900
NAU 4906	102	**NAU 4906 UU**	102	30	47	17	13000	16200
NAU 4907	168	**NAU 4907 UU**	168	35	55	20	19500	26300
NAU 4908	220	**NAU 4908 UU**	220	40	62	22	23400	29400
NAU 4909	260	**NAU 4909 UU**	260	45	68	22	24800	32800
NAU 4910	265	**NAU 4910 UU**	265	50	72	22	26200	36200
NAU 4911	385	**NAU 4911 UU**	385	55	80	25	33000	47000
NAU 4912	415	**NAU 4912 UU**	415	60	85	25	34700	51400
NAU 4913	440	**NAU 4913 UU**	440	65	90	25	36900	57100
NAU 4914	705	**NAU 4914 UU**	705	70	100	30	53700	84600
NAU 4915	750	**NAU 4915 UU**	750	75	105	30	54800	88200
NAU 4916	790	**NAU 4916 UU**	790	80	110	30	57200	95500
NAU 4917	1150	**NAU 4917 UU**	1150	85	120	35	75400	120000
NAU 4918	1210	**NAU 4918 UU**	1210	90	125	35	79500	130000
NAU 4919	1270	**NAU 4919 UU**	1270	95	130	35	81000	136000
NAU 4920	1770	**NAU 4920 UU**	1770	100	140	40	106000	181000
NAU 4922	1930	**NAU 4922 UU**	1930	110	150	40	113000	200000
NAU 4924	2680	**NAU 4924 UU**	2680	120	165	45	146000	268000
NAU 4926	3610	**NAU 4926 UU**	3610	130	180	50	166000	304000
NAU 4928	3840	**NAU 4928 UU**	3840	140	190	50	174000	327000

ROLLER BEARINGS

Metric Dimension



DIMENSION TABLE

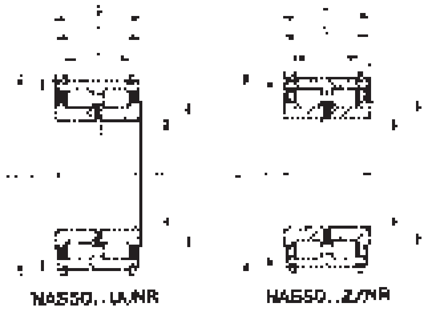
IKO NUMBER TRU	WEIGHT (g)	IKO NUMBER SEALED TYPE TRU..UU	WEIGHT (g)	DIMENSIONS (mm) d	 D	 C	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
TRU 153320	80.5	**TRU 153320 UU**	80.5	15	33	20	10400	10400
TRU 173425	100	**TRU 173425 UU**	100	17	34	25	18000	21600
TRU 203820	96.5	**TRU 203820 UU**	96.5	20	38	20	12100	13400
TRU 203825	122	**TRU 203825 UU**	122	20	38	25	18700	23600
TRU 254425	154	**TRU 254425 UU**	154	25	44	25	21000	28900
TRU 284530	173	**TRU 284530 UU**	173	28	45	30	28700	43800
TRU 304830	197	**TRU 304830 UU**	197	30	48	30	29400	46600
TRU 325230	260	**TRU 325230 UU**	260	32	52	30	29800	44200
TRU 355630	270	**TRU 355630 UU**	270	35	56	30	32200	49800
TRU 405930	265	**TRU 405930 UU**	265	40	59	30	34700	62500
TRU 426230	290	**TRU 426230 UU**	290	42	62	30	34600	57800
TRU 456430	295	**TRU 456430 UU**	295	45	64	30	32600	59700
TRU 507745	710	**TRU 507745 UU**	710	50	77	45	75700	134000
TRU 558138	615	**TRU 558138 UU**	615	55	81	38	61400	104000
TRU 608945	880	**TRU 608945 UU**	880	60	89	45	88100	152000
TRU 7510845	1240	**TRU 7510845 UU**	1240	75	108	45	103000	190000
TRU 8511850	1530	**TRU 8511850 UU**	1530	85	118	50	114000	222000
TRU 8512045	1500	**TRU 8512045 UU**	1500	85	120	45	110000	215000
TRU 9012550	1740	**TRU 9012550 UU**	1740	90	125	50	119000	240000
TRU 10013550	1900	**TRU 10013550 UU**	1900	100	135	50	124000	264000
TRU 10515350	2890	**TRU 10515350 UU**	2890	105	153	50	159000	286000
TRU 12517860	4490	**TRU 12517860 UU**	4490	125	178	60	211000	408000
TRU 13518860	4790	**TRU 13518860 UU**	4790	135	188	60	220000	442000

IKO

NAS..UUNR•NAS..ZZNR

ROLLER BEARINGS FOR SHEAVES

Metric Dimension



DIMENSION TABLE

IKO NUMBER SEALED TYPE	IKO NUMBER SHIELD TYPE	WEIGHT	DIMENSIONS (mm)							BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	INA 1), 2)		FAG 2)	SKF 2)
NAS 50..UUNR	NAS 50..ZZNR	(kg)	d	D	E	C	B	L 1)	J	(N)	(N)	OPEN TYPE SL 04..X	SEALED TYPE SL 04..PPX	SEALED TYPE NNF..DA.2LS.V	SEALED TYPE NNF..ADA-2LSV
NAS 50 08 UUNR	**NAS 50 08 ZZNR**	0.55	40	68	71.8	37	38	28	50	79500	116000	SL 04 5008 X	SL 04 5008 PPX	NNF 5008 ADA.2LS.V	NNF 5008 ADA-2LSV
NAS 50 09 UUNR	**NAS 50 09 ZZNR**	0.70	45	75	78.8	39	40	30	56	95500	144000	SL 04 5009 X	SL 04 5009 PPX	NNF 5009 ADA.2LS.V	NNF 5009 ADA-2LSV
NAS 50 10 UUNR	**NAS 50 10 ZZNR**	0.75	50	80	83.8	39	40	30	61	100000	158000	SL 04 5010 X	SL 04 5010 PPX	NNF 5010 EDA.2LS.V	NNF 5010 ADA-2LSV
NAS 50 11 UUNR	**NAS 50 11 ZZNR**	1.15	55	90	94.8	45	46	34	68	118000	193000	SL 04 5011 X	SL 04 5011 PPX	NNF 5011 ADA.2LS.V	NNF 5011 ADA-2LSV
NAS 50 12 UUNR	**NAS 50 12 ZZNR**	1.20	60	95	99.8	45	46	34	73	123000	208000	SL 04 5012 X	SL 04 5012 PPX	NNF 5012 EDA.2LS.V	NNF 5012 ADA-2LSV
NAS 50 13 UUNR	**NAS 50 13 ZZNR**	1.30	65	100	104.8	45	46	34	78	128000	224000	SL 04 5013 X	SL 04 5013 PPX	NNF 5013 ADA.2LS.V	NNF 5013 ADA-2LSV
NAS 50 14 UUNR	**NAS 50 14 ZZNR**	1.90	70	110	114.5	53	54	42	84	171000	284000	SL 04 5014 X	SL 04 5014 PPX	NNF 5014 ADA.2LS.V	NNF 5014 ADA-2LSV
NAS 50 15 UUNR	**NAS 50 15 ZZNR**	2.00	75	115	119.5	53	54	42	91	179000	308000	SL 04 5015 X	SL 04 5015 PPX	NNF 5015 EDA.2LS.V	NNF 5015 ADA-2LSV
NAS 50 16 UUNR	**NAS 50 16 ZZNR**	2.65	80	125	129.5	59	60	48	97	251000	428000	SL 04 5016 X	SL 04 5016 PPX	NNF 5016 ADA.2LS.V	NNF 5016 ADA-2LSV
NAS 50 17 UUNR	**NAS 50 17 ZZNR**	2.80	85	130	134.5	59	60	48	101	257000	446000	SL 04 5017 X	SL 04 5017 PPX	—	NNF 5017 ADA-2LSV
NAS 50 18 UUNR	**NAS 50 18 ZZNR**	3.70	90	140	145.4	66	67	54	110	305000	540000	SL 04 5018 X	SL 04 5018 PPX	NNF 5018 ADA.2LS.V	NNF 5018 ADA-2LSV
NAS 50 19 UUNR	**NAS 50 19 ZZNR**	3.90	95	145	150.4	66	67	54	114	312000	562000	SL 04 5019 X	SL 04 5019 PPX	—	NNF 5019 ADA-2LSV
NAS 50 20 UUNR	**NAS 50 20 ZZNR**	4.05	100	150	155.4	66	67	54	118	318000	584000	SL 04 5020 X	SL 04 5020 PPX	NNF 5020 EDA.2LS.V	NNF 5020 ADA-2LSV
NAS 50 22 UUNR	**NAS 50 22 ZZNR**	6.50	110	170	175.4	79	80	65	130	384000	697000	SL 04 5022 X	SL 04 5022 PPX	NNF 5022 EDA.2LS.V	NNF 5022 ADA-2LSV
NAS 50 24 UUNR	**NAS 50 24 ZZNR**	6.95	120	180	188.4	79	80	65	139.5	400000	750000	SL 04 5024 X	SL 04 5024 PPX	NNF 5024 ADA.2LS.V	NNF 5024 ADA-2LSV
NAS 50 26 UUNR	**NAS 50 26 ZZNR**	10.5	130	200	208.4	94	95	77	156	537000	1000000	SL 04 5026 X	SL 04 5026 PPX	NNF 5026 EDA.2LS.V	NNF 5026 ADA-2LSV
NAS 50 28 UUNR	**NAS 50 28 ZZNR**	11.0	140	210	218.4	94	95	77	167	543000	1070000	SL 04 5028 X	SL 04 5028 PPX	NNF 5028 ADA.2LS.V	NNF 5028 ADA-2LSV
NAS 50 30 UUNR	**NAS 50 30 ZZNR**	13.5	150	225	233.4	99	100	81	176.5	623000	1210000	SL 04 5030 X	SL 04 5030 PPX	NNF 5030 ADA.2LS.V	NNF 5030 ADA-2LSV
NAS 50 32 UUNR	**NAS 50 32 ZZNR**	16.5	160	240	248.4	108	109	89	188.5	720000	1390000	SL 04 5032 X	SL 04 5032 PPX	NNF 5032 ADA.2LS.V	NNF 5032 ADA-2LSV
NAS 50 34 UUNR	**NAS 50 34 ZZNR**	22.5	170	260	270	121	122	99	204.5	857000	1730000	SL 04 5034 X	SL 04 5034 PPX	NNF 5034 ADA.2LS.V	NNF 5034 ADA-2LSV
NAS 50 36 UUNR	**NAS 50 36 ZZNR**	30.0	180	280	294	135	136	110	217	1070000	2140000	SL 04 5036 X	SL 04 5036 PPX	NNF 5036 EDA.2LS.V	NNF 5036 ADA-2LSV
NAS 50 38 UUNR	**NAS 50 38 ZZNR**	31.5	190	290	306	135	136	110	225	1120000	2230000	SL 04 5038 X	SL 04 5038 PPX	—	NNF 5038 ADA-2LSV
NAS 50 40 UUNR	**NAS 50 40 ZZNR**	40.5	200	310	326	149	150	120	242	1310000	2650000	SL 04 5040 X	SL 04 5040 PPX	—	NNF 5040 ADA-2LSV
NAS 50 44 UUNR	**NAS 50 44 ZZNR**	52.0	220	340	356	159	160	130	260	1510000	3110000	SL 04 5044 X	SL 04 5044 PPX	—	NNF 5044 ADA-2LSV
NAS 50 48 UUNR	**NAS 50 48 ZZNR**	55.5	240	360	376	159	160	130	278.5	1570000	3350000	SL 04 5048 X	SL 04 5048 PPX	—	NNF 5048 ADA-2LSV
NAS 50 52 UUNR	**NAS 50 52 ZZNR**	85.0	260	400	416	189	190	154	312	2130000	4510000	SL 04 5052 X	SL 04 5052 PPX	—	—
NAS 50 56 UUNR	**NAS 50 56 ZZNR**	90.9	280	420	440	189	190	154	335	2210000	4860000	SL 04 5056 X	SL 04 5056 PPX	—	—
NAS 50 60 UU	**NAS 50 60 ZZ**	130	300	460	—	216	218	—	359	2670000	5870000	SL 04 5060 X	SL 04 5060 PPX	—	—
NAS 50 64 UU	**NAS 50 64 ZZ**	135	320	480	—	216	218	—	375	2700000	6140000	—	—	—	—
NAS 50 68 UU	**NAS 50 68 ZZ**	180	340	520	—	241	243	—	404	3370000	7560000	—	—	—	—
NAS 50 72 UU	**NAS 50 72 ZZ**	190	360	540	—	241	243	—	423	3420000	7940000	—	—	—	—
NAS 50 76 UU	**NAS 50 76 ZZ**	200	380	560	—	241	243	—	442	3580000	8300000	—	—	—	—
NAS 50 80 UU	**NAS 50 80 ZZ**	265	400	600	—	270	272	—	471	4250000	10100000	—	—	—	—
NAS 50 84 UU	**NAS 50 84 ZZ**	275	420	620	—	270	272	—	490	4390000	10400000	—	—	—	—
NAS 50 88 UU	**NAS 50 88 ZZ**	310	440	650	—	278	280	—	516	4570000	10900000	—	—	—	—

Note 1): Some of dimension L are not interchangeable.

Note 2): With lubrication hole and groove on outer ring.

IKO

NTB

THRUST NEEDLE ROLLER BEARINGS

Metric Dimension

DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	INA	SKF	FAG	TORRINGTON
NTB	(g)	d	D	Dw	(N)	(N)	AXK	AXK	AXK	FNT(A)
NTB 1024	3.3	10	24	2	7820	23900	AXK 1024	AXK 1024	AXK 1024	FNT-1024
NTB 1226	3.8	12	26	2	8340	26900	AXK 1226	AXK 1226	AXK 1226	FNT-1226
NTB 1528	4.1	15	28	2	8830	29900	AXK 1528	AXK 1528	AXK 1528	FNT-1528
NTB 1629	4.3	16	29	2	9070	31400	—	—	—	—
NTB 1730	4.5	17	30	2	9320	32900	AXK 1730	AXK 1730	AXK 1730	FNT-1730
NTB 1831	4.7	18	31	2	9550	34400	—	—	—	—
NTB 2035	6.1	20	35	2	11700	46500	AXK 2035	AXK 2035	AXK 2035	FNTA-2035
NTB 2542	8.2	25	42	2	14400	64700	AXK 2542	AXK 2542	AXK 2542	FNT-2542
NTB 3047	9.4	30	47	2	15400	73300	AXK 3047	AXK 3047	AXK 3047	FNTA-3047
NTB 3552	10.6	35	52	2	16300	81900	AXK 3552	AXK 3552	AXK 3552	FNT-3552
NTB 40603	22	40	60	3	24200	108000	AXK 4060	AXK 4060	AXK 4060	FNT-4060
NTB 4565	24.5	45	65	3	25900	121000	AXK 4565	AXK 4565	AXK 4565	FNT-4565
NTB 5070	26.5	50	70	3	27600	135000	AXK 5070	AXK 5070	AXK 5070	FNT-5070
NTB 5578	33.5	55	78	3	32400	171000	AXK 5578	AXK 5578	AXK 5578	FNT-5578
NTB 6085	38.5	60	85	3	38200	219000	AXK 6085	AXK 6085	AXK 6085	FNTA-6085
NTB 6590	41.5	65	90	3	40100	237000	AXK 6590	AXK 6590	AXK 6590	FNTA-6590
NTB 7095	61	70	95	4	47400	244000	AXK 7095	AXK 7095	AXK 7095	FNTA-7095
NTB 75100	65	75	100	4	48400	256000	AXK 75100	AXK 75100	AXK 75100	FNT-75100
NTB 80105	68.5	80	105	4	49500	267000	AXK 80105	AXK 80105	AXK 80105	FNTA-80105
NTB 75110	72	85	110	4	50300	279000	AXK 75110	AXK 75110	AXK 75110	FNTA-75110
NTB 90120	92	90	120	4	64500	394000	AXK 90120	AXK 90120	AXK 90120	FNTA-90120
NTB 100135	119	100	135	4	80300	541000	AXK 100135	AXK 100135	AXK 100135	FNTA-100135
NTB 110145	129	110	145	4	83200	578000	AXK 110145	AXK 110145	AXK 110145	—
NTB 120155	139	120	155	4	87900	634000	AXK 120155	AXK 120155	AXK 120155	—
NTB 130170	225	130	170	5	120000	839000	AXK 130170	AXK 130170	AXK 130170	—

IKO

AS

THRUST WASHERS FOR NTB SERIES

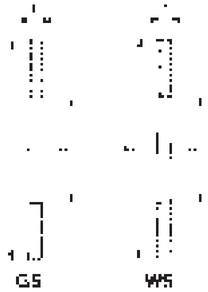
Metric Dimension

DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			INA	SKF	FAG	TORRINGTON
AS	(g)	d	D	S	AS	AS	AS	FTRA
AS 1024	2.9	10	24	1	AS 1024	AS 1024	AS 1024	FTRA-1024
AS 1226	3.2	12	26	1	AS 1226	AS 1226	AS 1226	FTRA-1226
AS 1528	3.4	15	28	1	AS 1528	AS 1528	AS 1528	FTRA-1528
AS 1629	3.6	16	29	1	—	—	—	—
AS 1730	3.7	17	30	1	AS 1730	AS 1730	AS 1730	FTRA-1730
AS 1831	3.9	18	31	1	—	—	—	—
AS 2035	5	20	35	1	AS 2035	AS 2035	AS 2035	FTRA-2035
AS 2542	6.9	25	42	1	AS 2542	AS 2542	AS 2542	FTRA-2542
AS 3047	7.9	30	47	1	AS 3047	AS 3047	AS 3047	FTRA-3047
AS 3552	8.9	35	52	1	AS 3552	AS 3552	AS 3552	FTRA-3552
AS 4060	12.1	40	60	1	AS 4060	AS 4060	AS 4060	FTRA-4060
AS 4565	13.3	45	65	1	AS 4565	AS 4565	AS 4565	FTRA-4565
AS 5070	14.5	50	70	1	AS 5070	AS 5070	AS 5070	FTRA-5070
AS 5578	18.5	55	78	1	AS 5578	AS 5578	AS 5578	FTRA-5578
AS 6085	22	60	85	1	AS 6085	AS 6085	AS 6085	FTRA-6085
AS 6590	23.5	65	90	1	AS 6590	AS 6590	AS 6590	FTRA-6590
AS 7095	25	70	95	1	AS 7095	AS 7095	AS 7095	FTRA-7095
AS 75100	26.5	75	100	1	AS 75100	AS 75100	AS 75100	FTRA-75100
AS 80105	28	80	105	1	AS 80105	AS 80105	AS 80105	FTRA-80105
AS 85110	29.5	85	110	1	AS 85110	AS 85110	AS 85110	FTRA-85110
AS 90120	38	90	120	1	AS 90120	AS 90120	AS 90120	FTRA-90120
AS 100135	50	100	135	1	AS 100135	AS 100135	AS 100135	FTRA-100135

THRUST RACES
FOR THRUST BEARINGS

Metric Dimension



DIMENSION TABLE INTERCHANGE TABLE

IKO NUMBER		WEIGHT	DIMENSIONS			INA		SKF		FAG	
OUTER RING	INNER RING		(mm)			OUTER RING	INNER RING	OUTER RING	INNER RING	OUTER RING	INNER RING
GS	**WS**	(g)	d	D	h	GS	WS	GS	WS	GS.	WS.
GS 1024	**WS 1024**	8	10	24	2.75	—	—	—	—	—	—
GS 1226	**WS 1226**	8.9	12	26	2.75	—	—	—	—	—	—
GS 1528	**WS 1528**	9.3	15	28	2.75	GS 81102	WS 81102	GS 81102	WS 81102	GS.81102	WS.81102
GS 1629	**WS 1629**	9.8	16	29	2.75	—	—	—	—	—	—
GS 1730	**WS 1730**	10.2	17	30	2.75	GS 81103	WS 81103	GS 81103	WS 81103	GS.81103	WS.81103
GS 1831	**WS 1831**	10.7	18	31	2.75	—	—	—	—	—	—
GS 2035	**WS 2035**	13.8	20	35	2.75	GS 81104	WS 81104	GS 81104	WS 81104	GS.81104	WS.81104
GS 2542	**WS 2542**	21	25	42	3	GS 81105	WS 81105	GS 81105	WS 81105	GS.81105	WS.81105
GS 3047	**WS 3047**	24	30	47	3	GS 81106	WS 81106	GS 81106	WS 81106	GS.81106	WS.81106
GS 3052	**WS 3052**	45	30	52	4.25	GS 81206	WS 81206	GS 81206	WS 81206	GS.81206	WS.81206
GS 3552	**WS 3552**	31.5	35	52	3.5	GS 81107	WS 81107	GS 81107	WS 81107	GS.81107	WS.81107
GS 3562	**WS 3562**	81	35	62	5.25	GS 81207	WS 81207	GS 81207	WS 81207	GS.81207	WS.81207
GS 4060	**WS 4060**	42.5	40	60	3.5	GS 81108	WS 81108	GS 81108	WS 81108	GS.81108	WS.81108
GS 4068	**WS 4068**	89	40	68	5	GS 81208	WS 81208	GS 81208	WS 81208	GS.81208	WS.81208
GS 4565	**WS 4565**	53.5	45	65	4	GS 81109	WS 81109	GS 81109	WS 81109	GS.81109	WS.81109
GS 4573	**WS 4573**	108	45	73	5.5	GS 81209	WS 81209	GS 81209	WS 81209	GS.81209	WS.81209
GS 5070	**WS 5070**	58.5	50	70	4	GS 81110	WS 81110	GS 81110	WS 81110	GS.81110	WS.81110
GS 5078	**WS 5078**	118	50	78	5.5	—	—	—	—	—	—
GS 5578	**WS 5578**	93	55	78	5	GS 81111	WS 81111	GS 81111	WS 81111	GS.81111	WS.81111
GS 5590	**WS 5590**	225	55	90	7	GS 81211	WS 81211	GS 81211	WS 81211	GS.81211	WS.81211
GS 6085	**WS 6085**	105	60	85	4.75	GS 81112	WS 81112	GS 81112	WS 81112	GS.81112	WS.81112
GS 6095	**WS 6095**	240	60	95	7.5	GS 81212	WS 81212	GS 81212	WS 81212	GS.81212	WS.81212
GS 60130	**WS 60130**	650	60	130	8	—	—	—	—	—	—
GS 6590	**WS 6590**	124	65	90	5.25	GS 81113	WS 81113	GS 81113	WS 81113	GS.81113	WS.81113
GS 65100	**WS 65100**	275	65	100	8	GS 81213	WS 81213	GS 81213	WS 81213	GS.81213	WS.81213
GS 7095	**WS 7095**	132	70	95	5.25	GS 81114	WS 81114	GS 81114	WS 81114	GS.81114	WS.81114
GS 70105	**WS 70105**	290	70	105	8	GS 81214	WS 81214	GS 81214	WS 81214	GS.81214	WS.81214
GS 70140	**WS 70140**	680	70	140	8	—	—	—	—	—	—
GS 75100	**WS 75100**	153	75	100	5.75	GS 81115	WS 81115	GS 81115	WS 81115	GS.81115	WS.81115
GS 75110	**WS 75110**	310	75	110	8	GS 81215	WS 81215	GS 81215	WS 81215	GS.81215	WS.81215
GS 80105	**WS 80105**	162	80	105	5.75	GS 81116	WS 81116	GS 81116	WS 81116	GS.81116	WS.81116
GS 80115	**WS 80115**	345	80	115	8.5	GS 81216	WS 81216	GS 81216	WS 81216	GS.81216	WS.81216
GS 80150	**WS 80150**	790	80	150	8	—	—	—	—	—	—
GS 85110	**WS 85110**	170	85	110	5.75	GS 81117	WS 81117	GS 81117	WS 81117	GS.81117	WS.81117
GS 85125	**WS 85125**	475	85	125	9.5	GS 81217	WS 81217	GS 81217	WS 81217	GS.81217	WS.81217
GS 90120	**WS 90120**	250	90	120	6.5	GS 81118	WS 81118	GS 81118	WS 81118	GS.81118	WS.81118
GS 90135	**WS 90135**	645	90	135	10.5	GS 81218	WS 81218	GS 81218	WS 81218	GS.81218	WS.81218
GS 90160	**WS 90160**	855	90	160	8	—	—	—	—	—	—
GS 100135	**WS 100135**	350	100	135	7	GS 81120	WS 81120	GS 81120	WS 81120	GS.81120	WS.81120
GS 100150	**WS 100150**	870	100	150	11.5	GS 81220	WS 81220	GS 81220	WS 81220	GS.81220	WS.81220

Note 1): Some of dimension d are not interchangeable.

DIMENSION TABLE INTERCHANGE TABLE

IKO NUMBER		WEIGHT	DIMENSIONS			INA		SKF		FAG	
OUTER RING	INNER RING		(mm)			OUTER RING	INNER RING	OUTER RING	INNER RING	OUTER RING	INNER RING
GS	**WS**	(g)	d	D	h	GS	WS	GS	WS	GS.	WS.
GS 100190	**WS 100190**	1920	100	190	12	—	—	—	—	—	—
GS 110145	**WS 110145**	380	110	145	7	GS 81122	WS 81122	GS 81122	WS 81122	GS.81122	WS.81122
GS 110160	**WS 110160**	950	110	160	11.5	GS 81222	WS 81222	GS 81222	WS 81222	GS.81222	WS.81222
GS 110200	**WS 110200**	2060	110	200	12	—	—	—	—	—	—
GS 120155	**WS 120155**	410	120	155	7	GS 81124	WS 81124	GS 81124	WS 81124	GS.81124	WS.81124
GS 120175	**WS 120175**	1190	120	175	12	—	—	—	—	—	—
GS 120220	**WS 120220**	2500	120	220	12	—	—	—	—	—	—
GS 130170	**WS 130170**	660	130	170	9	GS 81126	WS 81126	GS 81126	WS 81126	GS.81126	WS.81126
GS 130185	**WS 130185**	1270	130	185	12	—	—	—	—	—	—
GS 130230	**WS 130230**	2650	130	230	12	—	—	—	—	—	—
GS 140180	**WS 140180**	745	140	180	9.5	GS 81128	WS 81128	—	—	GS.81128	WS.81128
GS 140195	**WS 140195**	1350	140	195	12	—	—	—	—	—	—
GS 140240	**WS 140240**	2790	140	240	12	—	—	—	—	—	—
GS 150190	**WS 150190**	790	150	190	9.5	GS 81130	WS 81130	—	—	GS.81130	WS.81130
GS 150205	**WS 150205**	1430	150	205	12	—	—	—	—	—	—
GS 150250	**WS 150250**	2940	150	250	12	—	—	—	—	—	—
GS 160200	**WS 160200**	840	160	200	9.5	GS 81132	WS 81132	—	—	GS.81132	WS.81132
GS 160270	**WS 160270**	3480	160	270	12	—	—	—	—	—	—
GS 170230	**WS 170230**	1900	170	230	13	—	—	—	—	—	—
GS 170280	**WS 170280**	3640	170	280	12	—	—	—	—	—	—
GS 180240	**WS 180240**	2000	180	240	13	—	—	—	—	—	—
GS 180310	**WS 180310**	4700	180	310	12	—	—	—	—	—	—
GS 190255	**WS 190255**	2480	190	255	14	—	—	—	—	—	—
GS 190320	**WS 190320**	4860	190	320	12	—	—	—	—	—	—
GS 200265	**WS 200265**	2590	200	265	14	—	—	—	—	—	—
GS 200340	**WS 200340**	5540	200	340	12	—	—	—	—	—	—
GS 220290	**WS 220290**	3060	220	290	14	—	—	—	—	—	—
GS 220360	**WS 220360**	8000	220	360	16	—	—	—	—	—	—
GS 240315	**WS 240315**	3840	240	315	15	—	—	—	—	—	—
GS 240380	**WS 240380**	8530	240	380	16	—	—	—	—	—	—
GS 260340	**WS 260340**	4400	260	340	15	—	—	—	—	—	—
GS 260420	**WS 260420**	16700	260	420	25	—	—	—	—	—	—
GS 280440	**WS 280440**	17700	280	440	25	—	—	—	—	—	—
GS 300480	**WS 300480**	22900	300	480	30	—	—	—	—	—	—
GS 320500	**WS 320500**	27200	320	500	30	—	—	—	—	—	—

THRUST ROLLER BEARINGS

Metric Dimension

DIMENSION TABLE **INTERCHANGE TABLE**

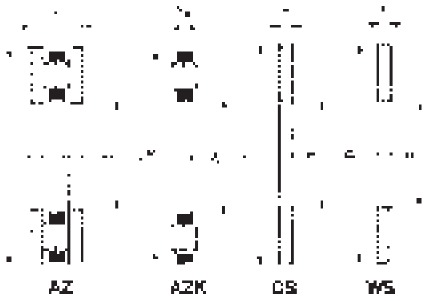
IKO NUMBER	WEIGHT	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	INA	SKF	FAG
AZK	(g)	d	D	Dw	(N)	(N)	K	K	K.
AZK 10243.5	8.6	10	24	3.5	8990	19100	—	—	—
AZK 12263.5	8.7	12	26	3.5	10400	23900	—	—	—
AZK 15283.5	9.4	15	28	3.5	10200	23900	K 81102 TN	K 81102	K.81102 LPB
AZK 17303.5	10.1	17	30	3.5	11400	28600	K 81103 TN	K 81103	K.81103 LPB
AZK 20354.5	17.9	20	35	4.5	19000	48700	K 81104 TN	K 81104	K.81104 TVPB
AZK 25425	28	25	42	5	22700	60700	K 81105 TN	K 81105	K.81105 TVPB
AZK 30475	31	30	47	5	27400	81000	K 81106 TN	K 81106	K.81106 TVPB-1
AZK 30527.5	70	30	52	7.5	38400	95700	K 81206 TN	K 81206	K.81206 LPB
AZK 35525	36	35	52	5	29100	91100	K 81107 TN	K 81107	K.81107 LPB
AZK 35627.5	98	35	62	7.5	47900	135000	K 81207 TN	K 81207	K.81207 LPB
AZK 40606	54	40	60	6	41700	133000	K 81108 TN	K 81108	K.81108 LPB
AZK 40689	132	40	68	9	68700	195000	K 81208 TN	K 81208	K.81208 TVPB
AZK 45656	62	45	65	6	40800	133000	K 81109 TN	K 81109	K.81109 TVPB
AZK 45739	144	45	73	9	75700	227000	K 81209 TN	K 81209	K.81209 TVPB
AZK 50706	68	50	70	6	43300	148000	K 81110 TN	K 81110	K.81110 LPB
AZK 507811	194	50	78	11	84300	232000	—	—	—
AZK 55786	89	55	78	6	51700	192000	K 81111 TN	K 81111	K.81111 TVPB
AZK 559011	275	55	90	11	108000	332000	K 81211 TN	K 81211	K.81211 TVPB
AZK 60857.5	135	60	85	7.5	64600	224000	K 81112 TN	K 81112	K.81112 LPB
AZK 609511	290	60	95	11	106000	332000	K 81212 TN	K 81212	K.81212 LPB
AZK 6013010	790	60	130	10	158000	634000	—	—	—
AZK 65907.5	132	65	90	7.5	68300	247000	K 81113 TN	K 81113	K.81113 LPB
AZK 6510011	310	65	100	11	116000	379000	K 81213 TN	K 81213	K.81213 LPB
AZK 70957.5	156	70	95	7.5	72000	269000	K 81114 TN	K 81114	K.81114 LPB
AZK 7010511	325	70	105	11	114000	379000	K 81214 TN	K 81214	K.81214 LPB
AZK 7014010	890	70	140	10	169000	713000	—	—	—
AZK 751007.5	159	75	100	7.5	71100	269000	K 81115	K 81115	K.81115 LPB
AZK 7511011	340	75	110	11	123000	427000	K 81215	K 81215	K.81215 LPB
AZK 801057.5	171	80	105	7.5	74500	292000	K 81116	K 81116	K.81116 LPB
AZK 8011511	370	80	115	11	122000	427000	K 81216 TN	K 81216	K.81216 LPB
AZK 8015010	920	80	150	10	180000	792000	—	—	—
AZK 851107.5	190	85	110	7.5	77800	314000	K 81117 TN	K 81117	K.81117 LPB
AZK 8512512	510	85	125	12	145000	513000	K 81217	K 81217	K.81217 LPB
AZK 901209	290	90	120	9	99700	390000	K 81118	K 81118	K.81118 LPB
AZK 9013514	750	90	135	14	181000	626000	K 81218 TN	K 81218	K.81218 LPB
AZK 9016010	1000	90	160	10	189000	871000	—	—	—
AZK 10013511	490	100	135	11	136000	522000	K 81120	K 81120	K.81120 LPB
AZK 10015015	980	100	150	15	219000	796000	K 81220	K 81220	K.81220 LPB
AZK 10019015	2120	100	190	15	333000	1420000	—	—	—
AZK 11014511	590	110	145	11	142000	569000	K 81122	K 81122	K.81122 LPB

DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	INA	SKF	FAG
AZK	(g)	d	D	S	(N)	(N)	K	K	K.
AZK 11016017	1320	110	160	17	282000	1030000	—	—	—
AZK 11020015	2280	110	200	15	388000	1770000	—	—	—
AZK 12015511	630	120	155	11	149000	617000	K 81124	K 81124	K.81124 MPB
AZK 12017518	1640	120	175	18	313000	1160000	—	—	—
AZK 12022015	2730	120	220	15	415000	1980000	—	—	—
AZK 13017012	860	130	170	12	176000	741000	K 81126	K 81126	K.81126 LPB
AZK 13018518	1760	130	185	18	333000	1290000	—	—	—
AZK 13023015	2940	130	230	15	440000	2180000	—	—	—
AZK 14018012	920	140	180	12	184000	798000	K 81128	K 81128	K.81128 MPB
AZK 14019518	1860	140	195	18	353000	1420000	—	—	—
AZK 14024015	3100	140	240	15	435000	2180000	—	—	—
AZK 15019012	980	150	190	12	181000	798000	K 81130	K 81130	K.81130 MPB
AZK 15020518	1980	150	205	18	349000	1420000	—	—	—
AZK 15025015	3260	150	250	15	459000	2380000	—	—	—
AZK 16020012	1030	160	200	12	189000	855000	K 81132	K 81132	K.81132 MPB
AZK 16027015	3840	160	270	15	519000	2850000	—	—	—
AZK 17023019	2420	170	230	19	406000	1730000	—	—	—
AZK 17028015	4020	170	280	15	543000	3070000	—	—	—
AZK 18024019	2540	180	240	19	426000	1870000	—	—	—
AZK 18031015	5200	180	310	15	619000	3710000	—	—	—
AZK 19025520	3100	190	255	20	470000	2080000	—	—	—
AZK 19032015	5280	190	320	15	647000	3980000	—	—	—
AZK 20026520	3250	200	265	20	465000	2080000	—	—	—
AZK 20034015	6120	200	340	15	710000	4580000	—	—	—
AZK 22029022	4280	220	290	22	557000	2530000	—	—	—
AZK 22036020	8000	220	360	20	943000	5520000	—	—	—
AZK 24031524	5520	240	315	24	695000	3250000	—	—	—
AZK 24038020	9440	240	380	20	977000	5910000	—	—	—
AZK 26034025	6600	260	340	25	739000	3510000	—	—	—
AZK 26042030	18200	260	420	30	1430000	7490000	—	—	—
AZK 28044030	19200	280	440	30	1420000	7490000	—	—	—

THRUST ROLLER BEARINGS

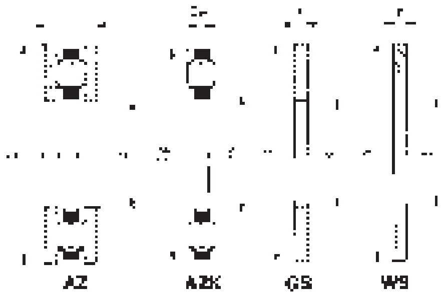
Metric Dimension



DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER	WEIGHT	DIMENSIONS (mm)							BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	ROLLER AND CAGE ASSEMBLY	OUTER RING	INNER RING	WITH RINGS	
AZ	(g)	d	D	T	dw	Dg	Dw	h			**AZK**	**GS**	**WS**	INA 811.812	SKF 811.812
AZ 10249	24.6	10	24	9	10.04	23.6	3.5	2.75	8990	19100	**AZK 10243.5**	**GS 1024**	**WS 1024**	—	—
AZ 12269	26.5	12	26	9	12.04	25.6	3.5	2.75	10400	23900	**AZK 12263.5**	**GS 1226**	**WS 1226**	—	—
AZ 15289	28	15	28	9	15.04	27.6	3.5	2.75	10200	23900	**AZK 15283.5**	**GS 1528**	**WS 1528**	81102 TN	81102
AZ 17309	30.5	17	30	9	17.04	29.6	3.5	2.75	11400	28600	**AZK 17303.5**	**GS 1730**	**WS 1730**	81103 TN	81103
AZ 203510	45.5	20	35	10	20.04	34.6	4.5	2.75	19000	48700	**AZK 20354.5**	**GS 2035**	**WS 2035**	81104 TN	81104
AZ 254211	70	25	42	11	25.05	41.6	5	3	22700	60700	**AZK 25425**	**GS 2542**	**WS 2542**	81105 TN	81105
AZ 304711	79	30	47	11	30.05	46.5	5	3	27400	81000	**AZK 30475**	**GS 3047**	**WS 3047**	81106 TN	81106
AZ 305216	160	30	52	16	30.05	51.5	7.5	4.25	38400	95700	**AZK 30527.5**	**GS 3052**	**WS 3052**	81206 TN	81206
AZ 355212	99	35	52	12	35.05	51.5	5	3.5	29100	91100	**AZK 35525**	**GS 3552**	**WS 3552**	81107 TN	81107
AZ 356218	260	35	62	18	35.05	61.5	7.5	5.25	47900	135000	**AZK 35627.5**	**GS 3562**	**WS 3562**	81207 TN	81207
AZ 406013	139	40	60	13	40.05	59.5	6	3.5	41700	133000	**AZK 40606**	**GS 4060**	**WS 4060**	81108 TN	81108
AZ 406819	310	40	68	19	40.05	67.5	9	5	68700	195000	**AZK 40689**	**GS 4068**	**WS 4068**	81208 TN	81208
AZ 456514	169	45	65	14	45.05	64.5	6	4	40800	133000	**AZK 45656**	**GS 4565**	**WS 4565**	81109 TN	81109
AZ 457320	360	45	73	20	45.05	72.5	9	5.5	75700	227000	**AZK 45739**	**GS 4573**	**WS 4573**	81209 TN	81209
AZ 507014	185	50	70	14	50.05	69.5	6	4	43300	148000	**AZK 50706**	**GS 5070**	**WS 5070**	81110 TN	81110
AZ 507822	430	50	78	22	50.05	77.5	11	5.5	84300	232000	**AZK 507811**	**GS 5078**	**WS 5078**	81210 TN	81210
AZ 557816	275	55	78	16	55.05	77.5	6	5	51700	192000	**AZK 55786**	**GS 5578**	**WS 5578**	81111 TN	81111
AZ 559025	725	55	90	25	55.05	89.5	11	7	108000	332000	**AZK 559011**	**GS 5590**	**WS 5590**	81211 TN	81211
AZ 608517	345	60	85	17	60.05	84.5	7.5	4.75	64600	224000	**AZK 60857.5**	**GS 6085**	**WS 6085**	81112 TN	81112
AZ 609526	770	60	95	26	60.05	94.5	11	7.5	106000	332000	**AZK 609511**	**GS 6095**	**WS 6095**	81212 TN	81212
AZ 6013026	2090	60	130	26	60.05	129.5	10	8	158000	634000	**AZK 6013010**	**GS 60130**	**WS 60130**	—	—
AZ 659018	380	65	90	18	65.05	89.5	7.5	5.25	68300	247000	**AZK 65907.5**	**GS 6590**	**WS 6590**	81113 TN	81113
AZ 6510027	860	65	100	27	65.05	99.5	11	8	116000	379000	**AZK 6510011**	**GS 65100**	**WS 65100**	81213 TN	81213
AZ 709518	420	70	95	18	70.05	94.5	7.5	5.25	72000	269000	**AZK 70957.5**	**GS 7095**	**WS 7095**	81114 TN	81114
AZ 7010527	905	70	105	27	70.05	104.5	11	8	114000	379000	**AZK 7010511**	**GS 70105**	**WS 70105**	81214 TN	81214
AZ 7014026	2250	70	140	26	70.05	139.5	10	8	169000	713000	**AZK 7014010**	**GS 70140**	**WS 70140**	—	—
AZ 7510019	465	75	100	19	75.05	99.5	7.5	5.75	71100	269000	**AZK 751007.5**	**GS 75100**	**WS 75100**	81115	81115
AZ 7511027	960	75	110	27	75.05	109.5	11	8	123000	427000	**AZK 7511011**	**GS 75110**	**WS 75110**	81215	81215
AZ 8010519	495	80	105	19	80.05	104.5	7.5	5.75	74500	292000	**AZK 801057.5**	**GS 80105**	**WS 80105**	81116	81116
AZ 8011528	1060	80	115	28	80.05	114.5	11	8.5	122000	427000	**AZK 8011511**	**GS 80115**	**WS 80115**	81216 TN	81216
AZ 8015026	2500	80	150	26	80.05	149.5	10	8	180000	792000	**AZK 8015010**	**GS 80150**	**WS 80150**	—	—
AZ 8511019	530	85	110	19	85.05	109.5	7.5	5.75	77800	314000	**AZK 851107.5**	**GS 85110**	**WS 85110**	81117 TN	81117
AZ 8512531	1460	85	125	31	85.05	124.5	12	9.5	145000	513000	**AZK 8512512**	**GS 85125**	**WS 85125**	81217	81217
AZ 9012022	790	90	120	22	90.05	119.5	9	6.5	99700	390000	**AZK 901209**	**GS 90120**	**WS 90120**	81118	81118
AZ 9013535	2040	90	135	35	90.05	134.5	14	10.5	181000	626000	**AZK 9013514**	**GS 90135**	**WS 90135**	81218 TN	81218
AZ 9016026	2710	90	160	26	90.05	159.5	10	8	189000	871000	**AZK 9016010**	**GS 90160**	**WS 90160**	—	—
AZ 10013525	1190	100	135	25	100.05	134.5	11	7	136000	522000	**AZK 10013511**	**GS 100135**	**WS 100135**	81120	81120
AZ 10015038	2720	100	150	38	100.05	149.5	15	11.5	219000	796000	**AZK 10015015**	**GS 100150**	**WS 100150**	81220	81220
AZ 10019039	5960	100	190	39	100.1	189.3	15	12	333000	1420000	**AZK 10019015**	**GS 100190**	**WS 100190**	—	—
AZ 11014525	1350	110	145	25	110.1	144.5	11	7	142000	569000	**AZK 11014511**	**GS 110145**	**WS 110145**	81122	81122



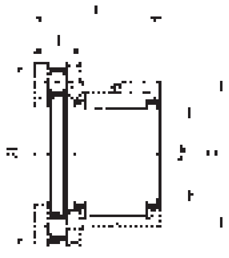
DIMENSION TABLE

INTERCHANGE TABLE

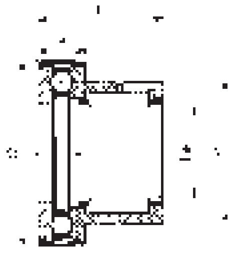
IKO NUMBER	WEIGHT	DIMENSIONS (mm)							BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	ROLLER AND CAGE ASSEMBLY	OUTER RING	INNER RING	WITH RINGS	
AZ	(g)	d	D	T	dw	Dg	Dw	h			AZK	GS	WS	INA 811.812	SKF 811.812
AZ 11016040	3220	110	160	40	110.1	159.5	17	11.5	282000	1030000	**AZK 11016017**	**GS 110160**	**WS 110160**	—	—
AZ 11020039	6400	110	200	39	110.1	199.3	15	12	388000	1770000	**AZK 11020015**	**GS 110200**	**WS 110200**	—	—
AZ 12015525	1450	120	155	25	120.1	154.5	11	7	149000	617000	**AZK 12015511**	**GS 120155**	**WS 120155**	81124	81124
AZ 12017542	4020	120	175	42	120.1	174.5	18	12	313000	1160000	**AZK 12017518**	**GS 120175**	**WS 120175**	—	—
AZ 12022039	7730	120	220	39	120.1	219	15	12	415000	1980000	**AZK 12022015**	**GS 120220**	**WS 120220**	—	—
AZ 13017030	2180	130	170	30	130.1	169.5	12	9	176000	741000	**AZK 13017012**	**GS 130170**	**WS 130170**	81126	81126
AZ 13018542	4300	130	185	42	130.1	184.5	18	12	333000	1290000	**AZK 13018518**	**GS 130185**	**WS 130185**	—	—
AZ 13023039	8240	130	230	39	130.1	229	15	12	440000	2180000	**AZK 13023015**	**GS 130230**	**WS 130230**	—	—
AZ 14018031	2410	140	180	31	140.1	179.5	12	9.5	184000	798000	**AZK 14018012**	**GS 140180**	**WS 140180**	81128	81128
AZ 14019542	4560	140	195	42	140.1	194.5	18	12	353000	1420000	**AZK 14019518**	**GS 140195**	**WS 140195**	—	—
AZ 14024039	8680	140	240	39	140.1	239	15	12	435000	2180000	**AZK 14024015**	**GS 140240**	**WS 140240**	—	—
AZ 15019031	2560	150	190	31	150.1	189.5	12	9.5	181000	798000	**AZK 15019012**	**GS 150190**	**WS 150190**	81130	81130
AZ 15020542	4840	150	205	42	150.1	204.5	18	12	349000	1420000	**AZK 15020518**	**GS 150205**	**WS 150205**	—	—
AZ 15025039	9140	150	250	39	150.1	249	15	12	459000	2380000	**AZK 15025015**	**GS 150250**	**WS 150250**	—	—
AZ 16020031	2710	160	200	31	160.1	199.5	12	9.5	189000	855000	**AZK 16020012**	**GS 160200**	**WS 160200**	81132	81132
AZ 16027039	10800	160	270	39	160.1	269	15	12	519000	2850000	**AZK 16027015**	**GS 160270**	**WS 160270**	—	—
AZ 17023045	6220	170	230	45	170.1	229	19	13	406000	1730000	**AZK 17023019**	**GS 170230**	**WS 170230**	—	—
AZ 17028039	11300	170	280	39	170.1	279	15	12	543000	3070000	**AZK 17028015**	**GS 170280**	**WS 170280**	—	—
AZ 18024045	6540	180	240	45	180.1	239	19	13	426000	1870000	**AZK 18024019**	**GS 180240**	**WS 180240**	—	—
AZ 18031039	14600	180	310	39	180.1	308	15	12	619000	3710000	**AZK 18031015**	**GS 180310**	**WS 180310**	—	—
AZ 19025548	8060	190	255	48	190.1	254	20	14	470000	2080000	**AZK 19025520**	**GS 190255**	**WS 190255**	—	—
AZ 19032039	15000	190	320	39	190.1	318	15	12	647000	3980000	**AZK 19032015**	**GS 190320**	**WS 190320**	—	—
AZ 20026548	8430	200	265	48	200.15	264	20	14	465000	2080000	**AZK 20026520**	**GS 200265**	**WS 200265**	—	—
AZ 20034039	17200	200	340	39	200.15	338	15	12	710000	4580000	**AZK 20034015**	**GS 200340**	**WS 200340**	—	—
AZ 22029050	10400	220	290	50	220.15	289	22	14	557000	2530000	**AZK 22029022**	**GS 220290**	**WS 220290**	—	—
AZ 22036052	24000	220	360	52	220.15	358	20	16	943000	5520000	**AZK 22036020**	**GS 220360**	**WS 220360**	—	—
AZ 24031554	13200	240	315	54	240.15	314	24	15	695000	3250000	**AZK 24031524**	**GS 240315**	**WS 240315**	—	—
AZ 24038052	26500	240	380	52	240.15	378	20	16	977000	5910000	**AZK 24038020**	**GS 240380**	**WS 240380**	—	—
AZ 26034055	15400	260	340	55	260.15	339	25	15	739000	3510000	**AZK 26034025**	**GS 260340**	**WS 260340**	—	—
AZ 26042080	51600	260	420	80	260.15	418	30	25	1430000	7490000	**AZK 26042030**	**GS 260420**	**WS 260420**	—	—
AZ 28044080	54600	280	440	80	280.15	438	30	25	1420000	7490000	**AZK 28044030**	**GS 280440**	**WS 280440**	—	—

NEEDLE ROLLER BEARINGS WITH THRUST BALL BEARINGS

Metric Dimension



NAX



NAX..Z

DIMENSION TABLE

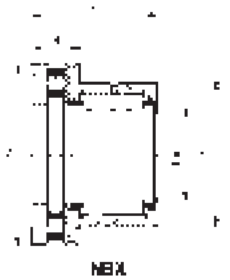
IKO NUMBER WITHOUT COVER NAX	WEIGHT (g)	IKO NUMBER WITH COVER NAX..Z	WEIGHT (g)	DIMENSIONS (mm) Fw	D	D1	D2	L	H	BASIC DYNAMIC LOAD RATING (N) RADIAL	AXIAL	BASIC STATIC LOAD RATING (N) RADIAL	AXIAL
NAX 1023	38.5	**NAX 1023 Z**	40	10	19	24	25	23	9	8230	10000	9190	11100
NAX 1223	43.5	**NAX 1223 Z**	45.5	12	21	26	27	23	9	9250	9670	11200	11100
NAX 1523	47.5	**NAX 1523 Z**	48.5	15	24	28	29	23	9	12300	9930	14900	12200
NAX 1725	54	**NAX 1725 Z**	56	17	26	30	31	25	9	12900	10800	16300	14500
NAX 2030	85.5	**NAX 2030 Z**	89	20	30	35	36	30	10	17600	14200	25400	19700
NAX 2530	131	**NAX 2530 Z**	135	25	37	42	43	30	11	20000	19600	32100	29700
NAX 3030	145	**NAX 3030 Z**	151	30	42	47	48	30	11	25100	20400	40100	33600
NAX 3530	169	**NAX 3530 Z**	176	35	47	52	53	30	12	26900	21200	46200	37600
NAX 4032	219	**NAX 4032 Z**	227	40	52	60	61	32	13	29400	26900	54100	50000
NAX 4532	264	**NAX 4532 Z**	273	45	58	65	66.5	32	14	31000	27900	60200	55100
NAX 5035	287	**NAX 5035 Z**	297	50	62	70	71.5	35	14	42200	28800	83400	60100
NAX 6040	417	—	—	60	72	85	—	40	17	47500	41400	103000	89700
NAX 7040	555	—	—	70	85	95	—	40	18	55500	43100	120000	101000

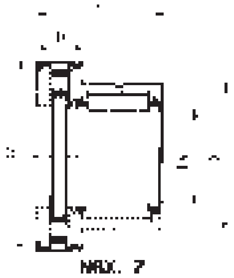
INTERCHANGE TABLE

INA WITHOUT COVER NKX	INA WITH COVER NKX..Z	SKF WITHOUT COVER NKX	SKF WITH COVER NKX..Z	FAG WITHOUT COVER NKX	FAG WITH COVER NKX..Z
NKX 10 TN	NKX 10 ZTN	NKX 10 TN	NKX 10 ZTN	NAXK 10	NAXK 10 Z
NKX 12	NKX 12 Z	NKX 12 TN	NKX 12 ZTN	NAXK 12	NAXK 12 Z
NKX 15	NKX 15 Z	NKX 15	NKX 15 Z	NAXK 15	NAXK 15 Z
NKX 17	NKX 17 Z	NKX 17	NKX 17 Z	NAXK 17	NAXK 17 Z
NKX 20	NKX 20 Z	NKX 20	NKX 20 Z	NAXK 20	NAXK 20 Z
NKX 25	NKX 25 Z	NKX 25	NKX 25 Z	NAXK 25	NAXK 25 Z
NKX 30	NKX 30 Z	NKX 30	NKX 30 Z	NAXK 30	NAXK 30 Z
NKX 35	NKX 35 Z	NKX 35	NKX 35 Z	NAXK 35	NAXK 35 Z
NKX 40	NKX 40 Z	NKX 40	NKX 40 Z	NAXK 40	NAXK 40 Z
NKX 45	NKX 45 Z	NKX 45	NKX 45 Z	NAXK 45	NAXK 45 Z
NKX 50	NKX 50 Z	NKX 50	NKX 50 Z	NAXK 50	NAXK 50 Z
NKX 60	—	NKX 60	—	NAXK 60	—
NKX 70	—	NKX 70	—	NAXK 70	—

NEEDLE ROLLER BEARINGS WITH THRUST ROLLER BEARINGS

Metric Dimension





DIMENSION TABLE

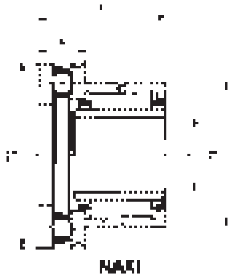
IKO NUMBER WITHOUT COVER	WEIGHT	IKO NUMBER WITH COVER	WEIGHT	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)	
NBX	(g)	NBX..Z	(g)	Fw	D	D1	D2	L	H	RADIAL	AXIAL	RADIAL	AXIAL
NBX 1523	54	**NBX 1523 Z**	55	15	24	28	29	23	9	12300	10200	14900	23900
NBX 1725	61	**NBX 1725 Z**	63	17	26	30	31	25	9	12900	11400	16300	28600
NBX 2030	94	**NBX 2030 Z**	97.5	20	30	35	36	30	10	17600	19000	25400	48700
NBX 2530	143	**NBX 2530 Z**	147	25	37	42	43	30	11	20000	22700	32100	60700
NBX 3030	160	**NBX 3030 Z**	166	30	42	47	48	30	11	25100	27400	40100	81000
NBX 3530	186	**NBX 3530 Z**	193	35	47	52	53	30	12	26900	29100	46200	91100
NBX 4032	240	**NBX 4032 Z**	248	40	52	60	61	32	13	29400	41700	54100	133000
NBX 4532	293	**NBX 4532 Z**	302	45	58	65	66.5	32	14	31000	40800	60200	133000
NBX 5035	315	**NBX 5035 Z**	325	50	62	70	71.5	35	14	42200	43300	83400	148000
NBX 6040	501	—	—	60	72	85	—	40	17	47500	64600	103000	224000

INTERCHANGE TABLE

INA		SKF		FAG	
WITHOUT COVER	WITH COVER	WITHOUT COVER	WITH COVER	WITHOUT COVER	WITH COVER
NKXR	NKXR..Z	NKXR	NKXR..Z	NAXR	NAXR..Z
NKXR 15	NKXR 15 Z	NKXR 15	NKXR 15 Z	NAXR 15	NAXR 15 Z
NKXR 17	NKXR 17 Z	NKXR 17	NKXR 17 Z	NAXR 17	NAXR 17 Z
NKXR 20	NKXR 20 Z	NKXR 20	NKXR 20 Z	NAXR 20	NAXR 20 Z
NKXR 25	NKXR 25 Z	NKXR 25	NKXR 25 Z	NAXR 25	NAXR 25 Z
NKXR 30	NKXR 30 Z	NKXR 30	NKXR 30 Z	NAXR 30	NAXR 30 Z
NKXR 35	NKXR 35 Z	NKXR 35	NKXR 35 Z	NAXR 35	NAXR 35 Z
NKXR 40	NKXR 40 Z	NKXR 40	NKXR 40 Z	NAXR 40 X	NAXR 40 X.Z
NKXR 45	NKXR 45 Z	NKXR 45	NKXR 45 Z	NAXR 45 X	NAXR 45 X.Z
NKXR 50	NKXR 50 Z	NKXR 50	NKXR 50 Z	NAXR 50 X	NAXR 50 X.Z
—	—	—	—	—	—

NEEDLE ROLLER BEARINGS WITH THRUST BALL BEARINGS

Metric Dimension



DIMENSION TABLE

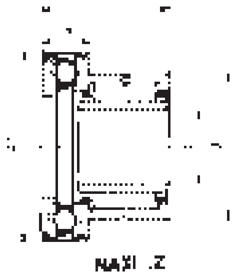
IKO NUMBER	WEIGHT	DIMENSIONS (mm)					BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)	
NAXI	(g)	d	D	D1	L	H	RADIAL	AXIAL	RADIAL	AXIAL
NAXI 723	43.5	7	19	24	23	9	8230	10000	9190	11100
NAXI 923	49.5	9	21	26	23	9	9250	9670	11200	11100
NAXI 1223	55.5	12	24	28	23	9	12300	9930	14900	12200
NAXI 1425	63.5	14	26	30	25	9	12900	10800	16300	14500
NAXI 1730	99	17	30	35	30	10	17600	14200	25400	19700
NAXI 2030	159	20	37	42	30	11	20000	19600	32100	29700
NAXI 2530	179	25	42	47	30	11	25100	20400	40100	33600
NAXI 3030	208	30	47	52	30	12	26900	21200	46200	37600
NAXI 3532	265	35	52	60	32	13	29400	26900	54100	50000
NAXI 4032	315	40	58	65	32	14	31000	27900	60200	55100
NAXI 4535	358	45	62	70	35	14	42200	28800	83400	60100
NAXI 5040	582	50	72	85	40	17	47500	41400	103000	89700
NAXI 6040	750	60	85	95	40	18	55500	43100	120000	101000

INTERCHANGE TABLE

INA	SKF	FAG
NKX..+IR	NKX..+IR	NAXK..+JR
NKX 10 TN +IR 7×10×16	NKX 10 TN +IR 7×10×16	NAXK 10 +JR 7×10×16
NKX 12 +IR 9×12×16	NKX 12 TN +IR 9×12×16	NAXK 12 +JR 9×12×16
NKX 15 +IR 12×15×16	NKX 15 +IR 12×15×16	NAXK 15 +JR 12×15×16
NKX 17 +IR 14×17×17	NKX 17 +IR 14×17×17	NAXK 17 +JR 14×17×17
NKX 20 +IR 17×20×20	NKX 20 +IR 17×20×20	NAXK 20 +JR 17×20×20
NKX 25 +IR 20×25×20	NKX 25 +IR 20×25×20	NAXK 25 +JR 20×25×20
NKX 30 +IR 25×30×20	NKX 30 +IR 25×30×20	NAXK 30 +JR 25×30×20
NKX 35 +IR 30×35×20	NKX 35 +IR 30×35×20	NAXK 35 +JR 30×35×20
NKX 40 +IR 35×40×20	NKX 40 +IR 35×40×20	NAXK 40 +JR 35×40×20
NKX 45 +IR 40×45×20	NKX 45 +IR 40×45×20	NAXK 45 +JR 40×45×20
NKX 50 +IR 45×50×25	NKX 50 +IR 45×50×25	NAXK 50 +JR 45×50×25
NKX 60 +IR 50×60×25	NKX 60 +IR 50×60×25	NAXK 60 +JR 50×60×25
NKX 70 +IR 60×70×25	NKX 70 +IR 60×70×25	NAXK 70 +JR 60×70×25

NEEDLE ROLLER BEARINGS WITH THRUST BALL BEARINGS

Metric Dimension



DIMENSION TABLE

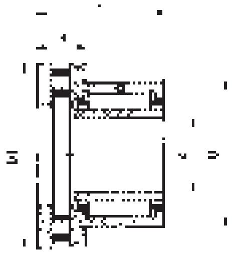
IKO NUMBER	WEIGHT	DIMENSIONS (mm)					BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)	
NAXI..Z	(g)	d	D	D2	L	H	RADIAL	AXIAL	RADIAL	AXIAL
NAXI 723 Z	45	7	19	25	23	9	8230	10000	9190	11100
NAXI 923 Z	51.5	9	21	27	23	9	9250	9670	11200	11100
NAXI 1223 Z	56.5	12	24	29	23	9	12300	9930	14900	12200
NAXI 1425 Z	65.5	14	26	31	25	9	12900	10800	16300	14500
NAXI 1730 Z	103	17	30	36	30	10	17600	14200	25400	19700
NAXI 2030 Z	163	20	37	43	30	11	20000	19600	32100	29700
NAXI 2530 Z	185	25	42	48	30	11	25100	20400	40100	33600
NAXI 3030 Z	215	30	47	53	30	12	26900	21200	46200	37600
NAXI 3532 Z	273	35	52	61	32	13	29400	26900	54100	50000
NAXI 4032 Z	324	40	58	66.5	32	14	31000	27900	60200	55100
NAXI 4535 Z	368	45	62	71.5	35	14	42200	28800	83400	60100
NAXI 5040 Z	619	50	72	86.5	40	17	47500	41400	103000	89700
NAXI 6040 Z	801	60	85	96.5	40	18	55500	43100	120000	101000

INTERCHANGE TABLE

INA	SKF	FAG
NKX..Z+IR	NKX..Z+IR	NAXK..Z+JR
NKX 10 ZTN +IR 7×10×16	NKX 10 ZTN +IR 7×10×16	NAXK 10 Z +JR 7×10×16
NKX 12 Z +IR 9×12×16	NKX 12 ZTN +IR 9×12×16	NAXK 12 Z +JR 9×12×16
NKX 15 Z +IR 12×15×16	NKX 15 Z +IR 12×15×16	NAXK 15 Z +JR 12×15×16
NKX 17 Z +IR 14×17×17	NKX 17 Z +IR 14×17×17	NAXK 17 Z +JR 14×17×17
NKX 20 Z +IR 17×20×20	NKX 20 Z +IR 17×20×20	NAXK 20 Z +JR 17×20×20
NKX 25 Z +IR 20×25×20	NKX 25 Z +IR 20×25×20	NAXK 25 Z +JR 20×25×20
NKX 30 Z +IR 25×30×20	NKX 30 Z +IR 25×30×20	NAXK 30 Z +JR 25×30×20
NKX 35 Z +IR 30×35×20	NKX 35 Z +IR 30×35×20	NAXK 35 Z +JR 30×35×20
NKX 40 Z +IR 35×40×20	NKX 40 Z +IR 35×40×20	NAXK 40 Z +JR 35×40×20
NKX 45 Z +IR 40×45×20	NKX 45 Z +IR 40×45×20	NAXK 45 Z +JR 40×45×20
NKX 50 Z +IR 45×50×25	NKX 50 Z +IR 45×50×25	NAXK 50 Z +JR 45×50×25
—	—	—
—	—	—

NEEDLE ROLLER BEARINGS WITH THRUST ROLLER BEARINGS

Metric Dimension



NBXI

DIMENSION TABLE

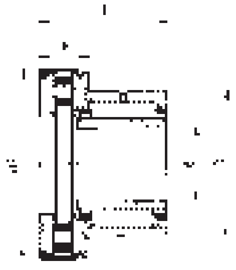
IKO NUMBER	WEIGHT	DIMENSIONS (mm)					BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)	
NBXI	(g)	d	D	D1	L	H	RADIAL	AXIAL	RADIAL	AXIAL
NBXI 1223	62	12	24	28	23	9	12300	10200	14900	23900
NBXI 1425	70.5	14	26	30	25	9	12900	11400	16300	28600
NBXI 1730	108	17	30	35	30	10	17600	19000	25400	48700
NBXI 2030	171	20	37	42	30	11	20000	22700	32100	60700
NBXI 2530	194	25	42	47	30	11	25100	27400	40100	81000
NBXI 3030	225	30	47	52	30	12	26900	29100	46200	91100
NBXI 3532	286	35	52	60	32	13	29400	41700	54100	133000
NBXI 4032	344	40	58	65	32	14	31000	40800	60200	133000
NBXI 4535	386	45	62	70	35	14	42200	43300	83400	148000
NBXI 5040	666	50	72	85	40	17	47500	64600	10300	224000

INTERCHANGE TABLE

IKO NUMBER	INA	SKF	FAG
NBXI	NKXR..+IR	NKXR..+IR	NAXR..+JR
NBXI 1223	NKXR 15 +IR 12×15×16	NKXR 15 +IR 12×15×16	NAXR 15 +JR 12×15×16
NBXI 1425	NKXR 17 +IR 14×17×17	NKXR 17 +IR 14×17×17	NAXR 17 +JR 14×17×17
NBXI 1730	NKXR 20 +IR 17×20×20	NKXR 20 +IR 17×20×20	NAXR 20 +JR 17×20×20
NBXI 2030	NKXR 25 +IR 20×25×20	NKXR 25 +IR 20×25×20	NAXR 25 +JR 20×25×20
NBXI 2530	NKXR 30 +IR 25×30×20	NKXR 30 +IR 25×30×20	NAXR 30 +JR 25×30×20
NBXI 3030	NKXR 35 +IR 30×35×20	NKXR 35 +IR 30×35×20	NAXR 35 +JR 30×35×20
NBXI 3532	NKXR 40 +IR 35×40×20	NKXR 40 +IR 35×40×20	NAXR 40X +JR 35×40×20
NBXI 4032	NKXR 45 +IR 40×45×20	NKXR 45 +IR 40×45×20	NAXR 45X +JR 40×45×20
NBXI 4535	NKXR 50 +IR 45×50×25	NKXR 50 +IR 45×50×25	NAXR 50X +JR 45×50×25
NBXI 5040	—	—	—

NEEDLE ROLLER BEARINGS WITH THRUST ROLLER BEARINGS

Metric Dimension



NBXI..Z

DIMENSION TABLE

IKO NUMBER NBXI..Z	WEIGHT (g)	DIMENSIONS (mm) d	D	D2	L	H	BASIC DYNAMIC LOAD RATING (N) RADIAL	AXIAL	BASIC STATIC LOAD RATING (N) RADIAL	AXIAL
NBXI 1223 Z	63	12	24	29	23	9	12300	10200	14900	23900
NBXI 1425 Z	72.5	14	26	31	25	9	12900	11400	16300	28600
NBXI 1730 Z	111	17	30	36	30	10	17600	19000	25400	48700
NBXI 2030 Z	175	20	37	43	30	11	20000	22700	32100	60700
NBXI 2530 Z	200	25	42	48	30	11	25100	27400	40100	81000
NBXI 3030 Z	232	30	47	53	30	12	26900	29100	46200	91100
NBXI 3532 Z	294	35	52	61	32	13	29400	41700	54100	133000
NBXI 4032 Z	353	40	58	66.5	32	14	31000	40800	60200	133000
NBXI 4535 Z	396	45	62	71.5	35	14	42200	43300	83400	148000
NBXI 5040 Z	703	50	72	86.5	40	17	47500	64600	103000	224000

INTERCHANGE TABLE

INA NKXR..Z+IR	SKF NKXR..Z+IR	FAG NAXR..Z+JR
NKXR 15 Z +IR 12×15×16	NKXR 15 Z +IR 12×15×16	NAXR 15 Z +JR 12×15×16
NKXR 17 Z +IR 14×17×17	NKXR 17 Z +IR 14×17×17	NAXR 17 Z +JR 14×17×17
NKXR 20 Z +IR 17×20×20	NKXR 20 Z +IR 17×20×20	NAXR 20 Z +JR 17×20×20
NKXR 25 Z +IR 20×25×20	NKXR 25 Z +IR 20×25×20	NAXR 25 Z +JR 20×25×20
NKXR 30 Z +IR 25×30×20	NKXR 30 Z +IR 25×30×20	NAXR 30 Z +JR 25×30×20
NKXR 35 Z +IR 30×35×20	NKXR 35 Z +IR 30×35×20	NAXR 35 Z +JR 30×35×20
NKXR 40 Z +IR 35×40×20	NKXR 40 Z +IR 35×40×20	NAXR 40X. Z +JR 35×40×20
NKXR 45 Z +IR 40×45×20	NKXR 45 Z +IR 40×45×20	NAXR 45X. Z +JR 40×45×20
NKXR 50 Z +IR 45×50×25	NKXR 50 Z +IR 45×50×25	NAXR 50X. Z +JR 45×50×25
—	—	—

NEEDLE ROLLER BEARINGS WITH ANGULAR CONTACT THRUST BEARINGS

Metric Dimension

NATA

DIMENSION TABLE | **INTERCHANGE TABLE**

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)		INA	SKF	FAG
NATA	(g)	d	D	C	RADIAL	AXIAL	RADIAL	AXIAL	NKIA	NKIA	NKJA
NATA 5902	50.5	15	28	18	7710	1900	10200	2920	NKIA 5902	NKIA 5902	—
NATA 5903	55.5	17	30	18	8220	2050	11500	3340	NKIA 5903	NKIA 5903	NKJA 5903
NATA 5904	111	20	37	23	14300	3810	18400	6110	NKIA 5904	NKIA 5904	NKJA 5904
NATA 5905	131	25	42	23	15800	4300	22100	7520	NKIA 5905	NKIA 5905	—
NATA 5906	151	30	47	23	17700	4550	26800	8460	NKIA 5906	NKIA 5906	—
NATA 5907	250	35	55	27	24000	4890	42100	9870	NKIA 5907	NKIA 5907	NKJA 5907
NATA 5908	355	40	62	30	30600	5350	60400	11800	NKIA 5908	NKIA 5908	—
NATA 5909	410	45	68	30	32600	5450	68500	12700	NKIA 5909 X	NKIA 5909	—
NATA 5910	420	50	72	30	33600	5660	72500	13600	NKIA 5910 X	NKIA 5910	—
NATA 5911	585	55	80	34	39500	10400	74400	24700	NKIA 5911	NKIA 5911	—
NATA 5912	625	60	85	34	41800	10700	82200	26700	NKIA 5912	NKIA 5912	—
NATA 5913	665	65	90	34	43800	11000	90200	28700	NKIA 5913 X	NKIA 5913	—
NATA 5914	1070	70	100	40	56400	13500	127000	35000	NKIA 5914	NKIA 5914	—

NEEDLE ROLLER BEARINGS WITH 3-POINT CONTACT BALL BEARINGS

Metric Dimension

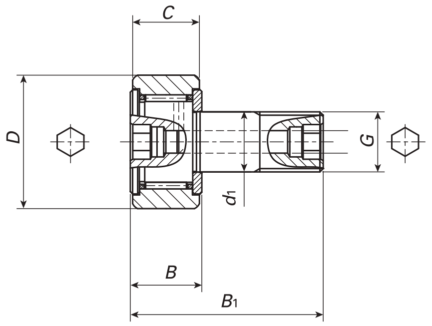
NATB

DIMENSION TABLE | **INTERCHANGE TABLE**

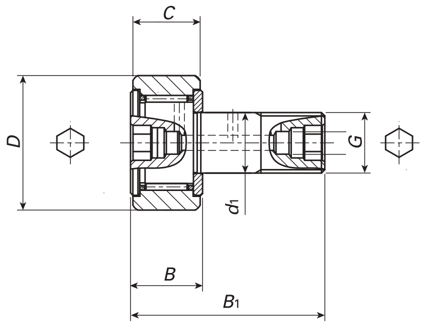
IKO NUMBER	WEIGHT	DIMENSIONS (mm)				BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)		INA	SKF	FAG
NATB	(g)	d	D	C	B	RADIAL	AXIAL	RADIAL	AXIAL	NKIB	NKIB	NKJB
NATB 5902	53	15	28	18	20	7710	1900	10200	2920	NKIB 5902	NKIB 5902	—
NATB 5903	58.5	17	30	18	20	8220	2050	11500	3340	NKIB 5903	NKIB 5903	NKJB 5903
NATB 5904	115	20	37	23	25	14300	3810	18400	6110	NKIB 5904	NKIB 5904	NKJB 5904
NATB 5905	136	25	42	23	25	15800	4300	22100	7520	NKIB 5905	NKIB 5905	—
NATB 5906	157	30	47	23	25	17700	4550	26800	8460	NKIB 5906	NKIB 5906	—
NATB 5907	260	35	55	27	30	24000	4890	42100	9870	NKIB 5907	NKIB 5907	NKJB 5907
NATB 5908	375	40	62	30	34	30600	5350	60400	11800	NKIB 5908	NKIB 5908	—
NATB 5909	435	45	68	30	34	32600	5450	68500	12700	NKIB 5909 X	NKIB 5909	—
NATB 5910	445	50	72	30	34	33600	5660	72500	13600	NKIB 5910 X	NKIB 5910	—
NATB 5911	615	55	80	34	38	39500	10400	74400	24700	NKIB 5911	NKIB 5911	—
NATB 5912	660	60	85	34	38	41800	10700	82200	26700	NKIB 5912	NKIB 5912	—
NATB 5913	710	65	90	34	38	43800	11000	90200	28700	NKIB 5913 X	NKIB 5913	—
NATB 5914	1130	70	100	40	45	56400	13500	127000	35000	NKIB 5914	NKIB 5914	—

CAM FOLLOWERS

Metric Dimension



Outside diameter of outer ring D 22, 26mm



Outside diameter of outer ring D 30 to 90mm

DIMENSION TABLE

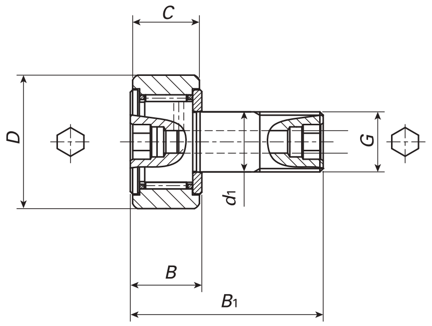
IKO NUMBER SHIELD TYPE		WEIGHT	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING
IKO NUMBER CYLINDRICAL OUTER RING CFKR	IKO NUMBER CROWNED OUTER RING CFKR..R	(g)	d1	D	G	C	MAX. B	MAX. B1	(N)	(N)
CFKR 22	**CFKR 22 R**	43	10	22	M10×1.0	12	13.2	36.2	5430	6890
CFKR 26	**CFKR 26 R**	58	10	26	M10×1.0	12	13.2	36.2	5430	6890
CFKR 30	**CFKR 30 R**	94	12	30	M12×1.5	14	15.2	40.2	7910	9790
CFKR 32	**CFKR 32 R**	104	12	32	M12×1.5	14	15.2	40.2	7910	9790
CFKR 35	**CFKR 35 R**	165	16	35	M16×1.5	18	19.6	52.1	12000	18300
CFKR 40	**CFKR 40 R**	248	18	40	M18×1.5	20	21.6	58.1	14800	25200
CFKR 47	**CFKR 47 R**	378	20	47	M20×1.5	24	25.6	66.1	20700	34600
CFKR 52	**CFKR 52 R**	453	20	52	M20×1.5	24	25.6	66.1	20700	34600
CFKR 62	**CFKR 62 R**	795	24	62	M24×1.5	29	30.6	80.1	30500	52600
CFKR 72	**CFKR 72 R**	1120	24	72	M24×1.5	29	30.6	80.1	30500	52600
CFKR 80	**CFKR 80 R**	1860	30	80	M30×1.5	35	37	100	45400	85100
CFKR 85	**CFKR 85 R**	2020	30	85	M30×1.5	35	37	100	45400	85100
CFKR 90	**CFKR 90 R**	2210	30	90	M30×1.5	35	37	100	45400	85100

INTERCHANGE TABLE

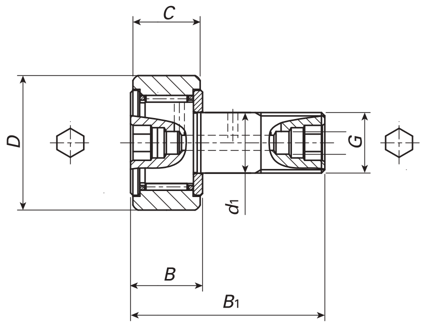
INA		JNS / THK	
CYLINDRICAL OUTER RING KR...X	CROWNED OUTER RING KR	CYLINDRICAL OUTER RING CF...AB	CROWNED OUTER RING CF...R-AB
KR 22 X	KR 22	—	—
KR 26 X	KR 26	—	—
KR 30 X	KR 30	CF 12-AB	CF 12 R-AB
KR 32 X	KR 32	CF 12-1-AB	CF 12 R-1-AB
KR 35 X	KR 35	CF 16-AB	CF 16 R-AB
KR 40 X	KR 40	CF 18-AB	CF 18 R-AB
KR 47 X	KR 47	CF 20-1-AB	CF 20-1 R-AB
KR 52 X	KR 52	CF 20-AB	CF 20 R-AB
KR 62 X	KR 62	CF 24-AB	CF 24 R-AB
KR 72 X	KR 72	CF 24-1-AB	CF 24-1 R-AB
KR 80 X	KR 80	CF 30-AB	CF 30 R-AB
KR 85 X	KR 85	CF 30-1-AB	CF 30-1 R-AB
KR 90 X	KR 90	CF 30-2-AB	CF 30-2 R-AB

CAM FOLLOWERS

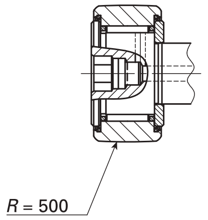
Metric Dimension



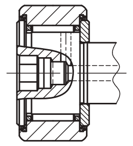
Outside diameter of outer ring D 22, 26mm



Outside diameter of outer ring D 30 to 90mm



CFKR...UUR



CFKR...UU

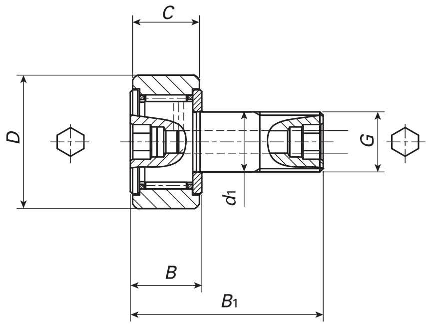
DIMENSION TABLE

INTERCHANGE TABLE

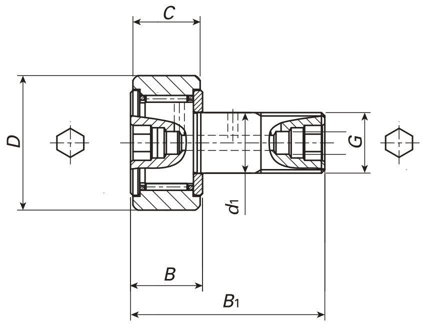
IKO NUMBER SEALED TYPE		WEIGHT	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	INA		JNS / THK	
IKO NUMBER CYLINDRICAL OUTER RING CFKR..UU	IKO NUMBER CROWNED OUTER RING CFKR..UUR	(g)	d1	D	G	C	MAX. B	MAX. B1	(N)	(N)	CYLINDRICAL OUTER RING KR...PPX	CROWNED OUTER RING KR...PP	CYLINDRICAL OUTER RING CF...UUAB	CROWNED OUTER RING CF...UUR-AB
CFKR 22 UU	**CFKR 22 UUR**	43	10	22	M10×1.0	12	13.2	36.2	5430	6890	KR 22 PPX	KR 22 PP	—	—
CFKR 26 UU	**CFKR 26 UUR**	58	10	26	M10×1.0	12	13.2	36.2	5430	6890	KR 26 PPX	KR 26 PP	—	—
CFKR 30 UU	**CFKR 30 UUR**	94	12	30	M12×1.5	14	15.2	40.2	7910	9790	KR 30 PPX	KR 30 PP	CF 12 UU-AB	CF 12 UUR-AB
CFKR 32 UU	**CFKR 32 UUR**	104	12	32	M12×1.5	14	15.2	40.2	7910	9790	KR 32 PPX	KR 32 PP	CF 12-1UU-AB	CF 12-1 UUR-AB
CFKR 35 UU	**CFKR 35 UUR**	165	16	35	M16×1.5	18	19.6	52.1	12000	18300	KR 35 PPX	KR 35 PP	CF 16 UU-AB	CF 16 UUR-AB
CFKR 40 UU	**CFKR 40 UUR**	248	18	40	M18×1.5	20	21.6	58.1	14800	25200	KR 40 PPX	KR 40 PP	CF 18 UU-AB	CF 18 UUR-AB
CFKR 47 UU	**CFKR 47 UUR**	378	20	47	M20×1.5	24	25.6	66.1	20700	34600	KR 47 PPX	KR 47 PP	CF 20-1 UU-AB	CF 20-1 UUR-AB
CFKR 52 UU	**CFKR 52 UUR**	453	20	52	M20×1.5	24	25.6	66.1	20700	34600	KR 52 PPX	KR 52 PP	CF 20 UU-AB	CF 20 UUR-AB
CFKR 62 UU	**CFKR 62 UUR**	795	24	62	M24×1.5	29	30.6	80.1	30500	52600	KR 62 PPX	KR 62 PP	CF 24 UU-AB	CF 24 UUR-AB
CFKR 72 UU	**CFKR 72 UUR**	1120	24	72	M24×1.5	29	30.6	80.1	30500	52600	KR 72 PPX	KR 72 PP	CF 24-1 UU-AB	CF 24-1 UUR-AB
CFKR 80 UU	**CFKR 80 UUR**	1860	30	80	M30×1.5	35	37	100	45400	85100	KR 80 PPX	KR 80 PP	CF 30 UU-AB	CF 30 UUR-AB
CFKR 85 UU	**CFKR 85 UUR**	2020	30	85	M30×1.5	35	37	100	45400	85100	KR 85 PPX	KR 85 PP	CF 30-1 UU-AB	CF 30-1 UUR-AB
CFKR 90 UU	**CFKR 90 UUR**	2210	30	90	M30×1.5	35	37	100	45400	85100	KR 90 PPX	KR 90 PP	CF 30-2 UU-AB	CF 30-2 UUR-AB

CAM FOLLOWERS

Metric Dimension



Outside diameter of outer ring D 22, 26mm



Outside diameter of outer ring D 30 to 90mm

DIMENSION TABLE

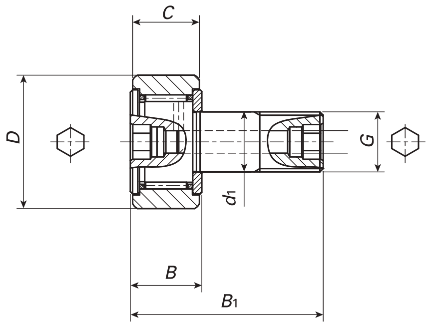
IKO NUMBER SHIELD TYPE		WEIGHT	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING
IKO NUMBER CYLINDRICAL OUTER RING **CFKR..V**	IKO NUMBER CROWNED OUTER RING **CFKR..VR**	(g)	d1	D	G	C	MAX. B	MAX. B1	(N)	(N)
CFKR 22 V	**CFKR 22 VR**	44	10	22	M10×1.0	12	13.2	36.2	9570	14500
CFKR 26 V	**CFKR 26 VR**	59	10	26	M10×1.0	12	13.2	36.2	9570	14500
CFKR 30 V	**CFKR 30 VR**	96	12	30	M12×1.5	14	15.2	40.2	13500	19700
CFKR 32 V	**CFKR 32 VR**	106	12	32	M12×1.5	14	15.2	40.2	13500	19700
CFKR 35 V	**CFKR 35 VR**	168	16	35	M16×1.5	18	19.6	52.1	20700	37600
CFKR 40 V	**CFKR 40 VR**	253	18	40	M18×1.5	20	21.6	58.1	25300	51300
CFKR 47 V	**CFKR 47 VR**	383	20	47	M20×1.5	24	25.6	66.1	33200	64500
CFKR 52 V	**CFKR 52 VR**	458	20	52	M20×1.5	24	25.6	66.1	33200	64500
CFKR 62 V	**CFKR 62 VR**	800	24	62	M24×1.5	29	30.6	80.1	46600	92000
CFKR 72 V	**CFKR 72 VR**	1120	24	72	M24×1.5	29	30.6	80.1	46600	92000
CFKR 80 V	**CFKR 80 VR**	1860	30	80	M30×1.5	35	37	100	67700	144000
CFKR 85 V	**CFKR 85 VR**	2020	30	85	M30×1.5	35	37	100	67700	144000
CFKR 90 V	**CFKR 90 VR**	2210	30	90	M30×1.5	35	37	100	67700	144000

INTERCHANGE TABLE

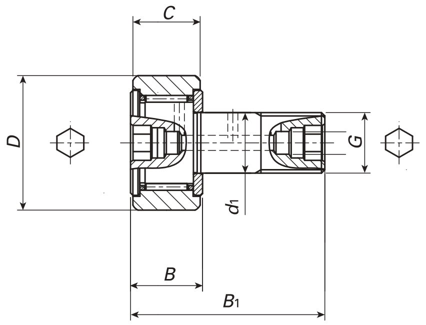
INA		JNS / THK	
CYLINDRICAL OUTER RTING KRV...X	CROWNED OUTER RTING KRV	CYLINDRICAL OUTER RING CF...VAB	CROWNED OUTER RING CF...VRAB
KRV 22 X	KRV 22	—	—
KRV 26 X	KRV 26	—	—
KRV 30 X	KRV 30	CF 12 V-AB	CF 12 VR-AB
KRV 32 X	KRV 32	CF 12-1 V-AB	CF 12 VR-1-AB
KRV 35 X	KRV 35	CF 16 V-AB	CF 16 VR-AB
KRV 40 X	KRV 40	CF 18 V-AB	CF 18 VR-AB
KRV 47 X	KRV 47	CF 20-1 V-AB	CF 20-1 VR-AB
KRV 52 X	KRV 52	CF 20 V-AB	CF 20 VR-AB
KRV 62 X	KRV 62	CF 24 V-AB	CF 24 VR-AB
KRV 72 X	KRV 72	CF 24-1 V-AB	CF 24-1 VR-AB
KRV 80 X	KRV 80	CF 30 V-AB	CF 30 VR-AB
KRV 85 X	KRV 85	CF 30-1 V-AB	CF 30-1 VR-AB
KRV 90 X	KRV 90	CF 30-2 V-AB	CF 30-2 VR-AB

CAM FOLLOWERS

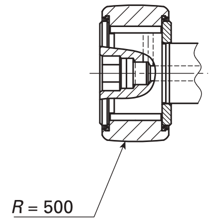
Metric Dimension



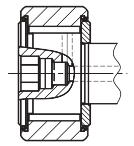
Outside diameter of outer ring D 22, 26mm



Outside diameter of outer ring D 30 to 90mm



CFKR...VUUR



CFKR...VUU

DIMENSION TABLE

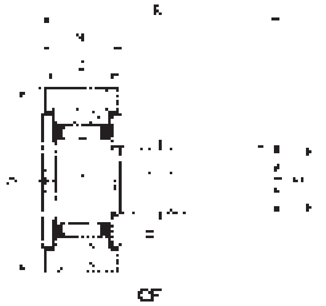
IKO NUMBER SEALED TYPE IKO NUMBER CYLINDRICAL OUTER RING CFKR..VUU	IKO NUMBER CROWNED OUTER RING CFKR..VUUR	WEIGHT (g)	DIMENSIONS (mm) d1	D	G	C	MAX. B	MAX. B1	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
CFKR 22 VUU	**CFKR 22 VUUR**	44	10	22	M10×1.0	12	13.2	36.2	9570	14500
CFKR 26 VUU	**CFKR 26 VUUR**	59	10	26	M10×1.0	12	13.2	36.2	9570	14500
CFKR 30 VUU	**CFKR 30 VUUR**	96	12	30	M12×1.5	14	15.2	40.2	13500	19700
CFKR 32 VUU	**CFKR 32 VUUR**	106	12	32	M12×1.5	14	15.2	40.2	13500	19700
CFKR 35 VUU	**CFKR 35 VUUR**	168	16	35	M16×1.5	18	19.6	52.1	20700	37600
CFKR 40 VUU	**CFKR 40 VUUR**	253	18	40	M18×1.5	20	21.6	58.1	25300	51300
CFKR 47 VUU	**CFKR 47 VUUR**	383	20	47	M20×1.5	24	25.6	66.1	33200	64500
CFKR 52 VUU	**CFKR 52 VUUR**	458	20	52	M20×1.5	24	25.6	66.1	33200	64500
CFKR 62 VUU	**CFKR 62 VUUR**	800	24	62	M24×1.5	29	30.6	80.1	46600	92000
CFKR 72 VUU	**CFKR 72 VUUR**	1120	24	72	M24×1.5	29	30.6	80.1	46600	92000
CFKR 80 VUU	**CFKR 80 VUUR**	1860	30	80	M30×1.5	35	37	100	67700	144000
CFKR 85 VUU	**CFKR 85 VUUR**	2020	30	85	M30×1.5	35	37	100	67700	144000
CFKR 90 VUU	**CFKR 90 VUUR**	2210	30	90	M30×1.5	35	37	100	67700	144000

INTERCHANGE TABLE

INA CYLINDRICAL OUTER RING KRV...PPX	INA CROWNED OUTER RING KRV...PP	JNS / THK CYLINDRICAL OUTER RING CF...VUUAB	JNS / THK CROWNED OUTER RING CF...VUUR-AB
KRV 22 PPX	KRV 22 PP	—	—
KRV 26 PPX	KRV 26 PP	—	—
KRV 30 PPX	KRV 30 PP	CF 12 VUU-AB	CF 12 VUUR-AB
KRV 32 PPX	KRV 32 PP	CF 12-1VUU-AB	CF 12-1 VUUR-AB
KRV 35 PPX	KRV 35 PP	CF 16 VUU-AB	CF 16 VUUR-AB
KRV 40 PPX	KRV 40 PP	CF 18 VUU-AB	CF 18 VUUR-AB
KRV 47 PPX	KRV 47 PP	CF 20-1 VUU-AB	CF 20-1 VUUR-AB
KRV 52 PPX	KRV 52 PP	CF 20 VUU-AB	CF 20 VUUR-AB
KRV 62 PPX	KRV 62 PP	CF 24 VUU-AB	CF 24 VUUR-AB
KRV 72 PPX	KRV 72 PP	CF 24-1 VUU-AB	CF 24-1 VUUR-AB
KRV 80 PPX	KRV 80 PP	CF 30 VUU-AB	CF 30 VUUR-AB
KRV 85 PPX	KRV 85 PP	CF 30-1 VUU-AB	CF 30-1 VUUR-AB
KRV 90 PPX	KRV 90 PP	CF 30-2 VUU-AB	CF 30-2 VUUR-AB

CAM FOLLOWERS

Metric Dimension


CF


CF..R

DIMENSION TABLE

IKO NUMBER CYLINDRICAL OUTER RING CF	IKO NUMBER CROWNED OUTER RING CF..R	WEIGHT (g)	DIMENSIONS (mm) d1	D	G	C	MAX. B	MAX. B1	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
CF 3	—	4.3	3	10	M3×0.5	7	8	17	1500	1020
CF 4	—	7.4	4	12	M4×0.7	8	9	20	2070	1590
CF 5	—	10.3	5	13	M5×0.8	9	10	23	2520	2140
CF 6	**CF 6 R**	18.5	6	16	M6×1	11	12.2	28.2	3660	3650
CF 8	**CF 8 R**	28.5	8	19	M8×1.25	11	12.2	32.2	4250	4740
CF 10	**CF 10 R**	45	10	22	M10×1.25	12	13.2	36.2	5430	6890
CF 10 M	**CF 10 RM**	45	10	22	M10×1	12	13.2	36.2	5430	6890
CF 10-1	**CF 10-1 R**	60	10	26	M10×1.25	12	13.2	36.2	5430	6890
CF 10-1 M	**CF 10-1 RM**	60	10	26	M10×1	12	13.2	36.2	5430	6890
CF 12	**CF 12 R**	95	12	30	M12×1.5	14	15.2	40.2	7910	9790
CF 12-1	**CF 12-1 R**	105	12	32	M12×1.5	14	15.2	40.2	7910	9790
CF 16	**CF 16 R**	170	16	35	M16×1.5	18	19.6	52.1	12000	18300
CF 18	**CF 18 R**	250	18	40	M18×1.5	20	21.6	58.1	14800	25200
CF 20	**CF 20 R**	460	20	52	M20×1.5	24	25.6	66.1	20700	34600
CF 20-1	**CF 20-1 R**	385	20	47	M20×1.5	24	25.6	66.1	20700	34600
CF 24	**CF 24 R**	815	24	62	M24×1.5	29	30.6	80.1	30500	52600
CF 24-1	**CF 24-1 R**	1140	24	72	M24×1.5	29	30.6	80.1	30500	52600
CF 30	**CF 30 R**	1870	30	80	M30×1.5	35	37	100	45400	85100
CF 30-1	**CF 30-1 R**	2030	30	85	M30×1.5	35	37	100	45400	85100
CF 30-2	**CF 30-2 R**	2220	30	90	M30×1.5	35	37	100	45400	85100

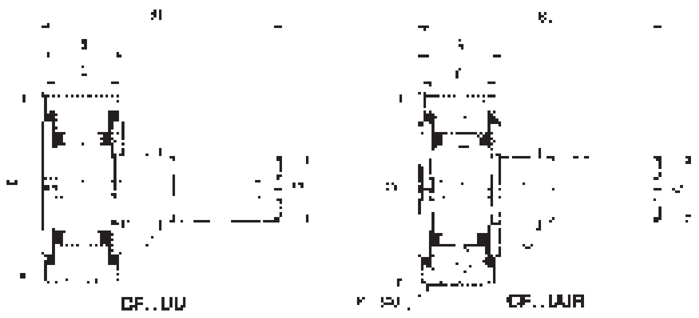
INTERCHANGE TABLE

IKO NUMBER CYLINDRICAL OUTER RING CF	INA CYLINDRICAL OUTER RING KR..X	INA CROWNED OUTER RING KR	SKF CYLINDRICAL OUTER RING KR..X	SKF CROWNED OUTER RING KR	FAG CYLINDRICAL OUTER RING KR..DZ	FAG CROWNED OUTER RING KR	MCGILL CYLINDRICAL OUTER RING MCFR..X	MCGILL CROWNED OUTER RING MCFR
CF 3	—	—	—	—	—	—	MCFR-10-X	MCFR-10
CF 4	—	—	—	—	—	—	MCFR-12-X	MCFR-12
CF 5	—	—	—	—	—	—	MCFR-13-X	MCFR-13
CF 6	KR 16 X	KR 16	KR 16 X	KR 16	KR 16 DZ	KR 16	MCFR-16-X	MCFR-16
CF 8	KR 19 X	KR 19	KR 19 X	KR 19	KR 19 DZ	KR 19	MCFR-19-X	MCFR-19
CF 10	—	—	—	—	—	—	MCFR-22A-X	MCFR-22A
CF 10 M	KR 22 X	KR 22	KR 22 X	KR 22	KR 22 DZ	KR 22	MCFR-22-X	MCFR-22
CF 10-1	—	—	—	—	—	—	MCFR-26A-X	MCFR-26A
CF 10-1 M	KR 26 X	KR 26	KR 26 X	KR 26	KR 26 DZ	KR 26	MCFR-26-X	MCFR-26
CF 12	KR 30 X	KR 30	KR 30 X	KR 30	KR 30 DZ	KR 30	MCFR-30-X	MCFR-30
CF 12-1	KR 32 X	KR 32	KR 32 X	KR 32	KR 32 DZ	KR 32	MCFR-32-X	MCFR-32
CF 16	KR 35 X	KR 35	KR 35 X	KR 35	—	—	MCFR-35-X	MCFR-35
CF 18	KR 40 X	KR 40	KR 40 X	KR 40	—	—	MCFR-40-X	MCFR-40
CF 20	KR 52 X	KR 52	KR 52 X	KR 52	—	—	MCFR-52-X	MCFR-52
CF 20-1	KR 47 X	KR 47	KR 47 X	KR 47	—	—	MCFR-47-X	MCFR-47
CF 24	—	—	—	—	—	—	MCFR-62-X	MCFR-62
CF 24-1	—	—	—	—	—	—	MCFR-72-X	MCFR-72
CF 30	—	—	—	—	—	—	MCFR-80-X	MCFR-80
CF 30-1	—	—	—	—	—	—	MCFR-85-X	MCFR-85
CF 30-2	—	—	—	—	—	—	MCFR-90-X	MCFR-90

Remarks : Stud dia. 3 and 4mm : No oil holes
Stud dia. 5 to 10mm : No oil holes in the threaded end

CAM FOLLOWERS

Metric Dimension



DIMENSION TABLE

IKO NUMBER CYLINDRICAL OUTER RING CF..UU	IKO NUMBER CROWNED OUTER RING CF..UUR	WEIGHT	DIMENSIONS (mm)							BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING
		(g)	d1	D	G	C	MAX. B	MAX. B1	(N)	(N)
CF 3 UU	—	4.3	3	10	M3×0.5	7	8	17	1500	1020
CF 4 UU	—	7.4	4	12	M4×0.7	8	9	20	2070	1590
CF 5 UU	—	10.3	5	13	M5×0.8	9	10	23	2520	2140
CF 6 UU	**CF 6 UUR**	18.5	6	16	M6×1	11	12.2	28.2	3660	3650
CF 8 UU	**CF 8 UUR**	28.5	8	19	M8×1.25	11	12.2	32.2	4250	4740
CF 10 UU	**CF 10 UUR**	45	10	22	M10×1.25	12	13.2	36.2	5430	6890
CF 10 UUM	**CF 10 UURM**	45	10	22	M10×1	12	13.2	36.2	5430	6890
CF 10-1 UU	**CF 10-1 UUR**	60	10	26	M10×1.25	12	13.2	36.2	5430	6890
CF 10-1 UUM	**CF 10-1 UURM**	60	10	26	M10×1	12	13.2	36.2	5430	6890
CF 12 UU	**CF 12 UUR**	95	12	30	M12×1.5	14	15.2	40.2	7910	9790
CF 12-1 UU	**CF 12-1 UUR**	105	12	32	M12×1.5	14	15.2	40.2	7910	9790
CF 16 UU	**CF 16 UUR**	170	16	35	M16×1.5	18	19.6	52.1	12000	18300
CF 18 UU	**CF 18 UUR**	250	18	40	M18×1.5	20	21.6	58.1	14800	25200
CF 20 UU	**CF 20 UUR**	460	20	52	M20×1.5	24	25.6	66.1	20700	34600
CF 20-1 UU	**CF 20-1 UUR**	385	20	47	M20×1.5	24	25.6	66.1	20700	34600
CF 24 UU	**CF 24 UUR**	815	24	62	M24×1.5	29	30.6	80.1	30500	52600
CF 24-1 UU	**CF 24-1 UUR**	1140	24	72	M24×1.5	29	30.6	80.1	30500	52600
CF 30 UU	**CF 30 UUR**	1870	30	80	M30×1.5	35	37	100	45400	85100
CF 30-1 UU	**CF 30-1 UUR**	2030	30	85	M30×1.5	35	37	100	45400	85100
CF 30-2 UU	**CF 30-2 UUR**	2220	30	90	M30×1.5	35	37	100	45400	85100

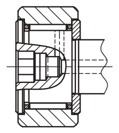
INTERCHANGE TABLE

IKO NUMBER CYLINDRICAL OUTER RING CF..UU	INA		SKF		FAG		MCGILL	
	CYLINDRICAL OUTER RING KR..PPX	CROWNED OUTER RING KR..PP	CYLINDRICAL OUTER RING KR..PPX	CROWNED OUTER RING KR..PP	CYLINDRICAL OUTER RING KR..2RSDZ	CROWNED OUTER RING KR..2RS	CYLINDRICAL OUTER RING MCFR..SX	CROWNED OUTER RING MCFR..S
CF 3 UU	—	—	—	—	—	—	MCFR-10-SX	MCFR-10-S
CF 4 UU	—	—	—	—	—	—	MCFR-12-SX	MCFR-12-S
CF 5 UU	—	—	—	—	—	—	MCFR-13-SX	MCFR-13-S
CF 6 UU	KR 16 PPX	KR 16 PP	KR 16 PPX	KR 16 PP	KR 16.2RSDZ	KR 16.2RS	MCFR-16-SX	MCFR-16-S
CF 8 UU	KR 19 PPX	KR 19 PP	KR 19 PPX	KR 19 PP	KR 19.2RSDZ	KR 19.2RS	MCFR-19-SX	MCFR-19-S
CF 10 UU	—	—	—	—	—	—	MCFR-22A-SX	MCFR-22A-S
CF 10 UUM	KR 22 PPX	KR 22 PP	KR 22 PPX	KR 22 PP	KR 22.2RSDZ	KR 22.2RS	MCFR-22-SX	MCFR-22-S
CF 10-1 UU	—	—	—	—	—	—	MCFR-26A-SX	MCFR-26A-S
CF 10-1 UUM	KR 26 PPX	KR 26 PP	KR 26 PPX	KR 26 PP	KR 26.2RSDZ	KR 26.2RS	MCFR-26-SX	MCFR-26-S
CF 12 UU	KR 30 PPX	KR 30 PP	KR 30 PPX	KR 30 PP	KR 30.2RSDZ	KR 30.2RS	MCFR-30-SX	MCFR-30-S
CF 12-1 UU	KR 32 PPX	KR 32 PP	KR 32 PPX	KR 32 PP	KR 32.2RSDZ	KR 32.2RS	MCFR-32-SX	MCFR-32-S
CF 16 UU	KR 35 PPX	KR 35 PP	KR 35 PPX	KR 35 PP	—	—	MCFR-35-SX	MCFR-35-S
CF 18 UU	KR 40 PPX	KR 40 PP	KR 40 PPX	KR 40 PP	—	—	MCFR-40-SX	MCFR-40-S
CF 20 UU	KR 52 PPX	KR 52 PP	KR 52 PPX	KR 52 PP	—	—	MCFR-52-SX	MCFR-52-S
CF 20-1 UU	KR 47 PPX	KR 47 PP	KR 47 PPX	KR 47 PP	—	—	MCFR-47-SX	MCFR-47-S
CF 24 UU	—	—	—	—	—	—	MCFR-62-SX	MCFR-62-S
CF 24-1 UU	—	—	—	—	—	—	MCFR-72-SX	MCFR-72-S
CF 30 UU	—	—	—	—	—	—	MCFR-80-SX	MCFR-80-S
CF 30-1 UU	—	—	—	—	—	—	MCFR-85-SX	MCFR-85-S
CF 30-2 UU	—	—	—	—	—	—	MCFR-90-SX	MCFR-90-S

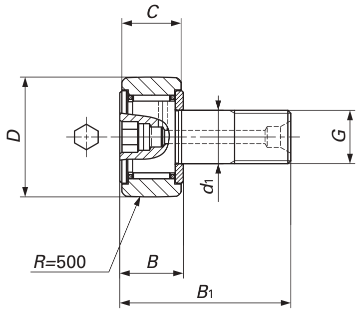
Remarks : Stud dia. 3 and 4mm : No oil holes
Stud dia. 5 to 10mm : No oil holes in the threaded end

CAM FOLLOWERS

Metric Dimension



CF..B



CF..BR

DIMENSION TABLE

IKO NUMBER CYLINDRICAL OUTER RING	IKO NUMBER CROWNED OUTER RING	WEIGHT	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING
CF..B	CF..BR	(g)	d1	D	G	C	MAX. B	MAX. B1	(N)	(N)
CF 3 B	**CF 3 BR**	4.3	3	10	M3×0.5	7	8	17	1500	1020
CF 4 B	**CF 4 BR**	7.4	4	12	M4×0.7	8	9	20	2070	1590
CF 5 B	**CF 5 BR**	10.3	5	13	M5×0.8	9	10	23	2520	2140
CF 6 B	**CF 6 BR**	18.5	6	16	M6×1	11	12.2	28.2	3660	3650
CF 8 B	**CF 8 BR**	28.5	8	19	M8×1.25	11	12.2	32.2	4250	4740
CF 10 B	**CF 10 BR**	45	10	22	M10×1.25	12	13.2	36.2	5430	6890
CF 10 BM	**CF 10 BRM**	45	10	22	M10×1	12	13.2	36.2	5430	6890
CF 10-1 B	**CF 10-1 BR**	60	10	26	M10×1.25	12	13.2	36.2	5430	6890
CF 10-1 BM	**CF 10-1 BRM**	60	10	26	M10×1	12	13.2	36.2	5430	6890
CF 12 B	**CF 12 BR**	95	12	30	M12×1.5	14	15.2	40.2	7910	9790
CF 12-1 B	**CF 12-1 BR**	105	12	32	M12×1.5	14	15.2	40.2	7910	9790
CF 16 B	**CF 16 BR**	170	16	35	M16×1.5	18	19.6	52.1	12000	18300
CF 18 B	**CF 18 BR**	250	18	40	M18×1.5	20	21.6	58.1	14800	25200
CF 20 B	**CF 20 BR**	460	20	52	M20×1.5	24	25.6	66.1	20700	34600
CF 20-1 B	**CF 20-1 BR**	385	20	47	M20×1.5	24	25.6	66.1	20700	34600
CF 24 B	**CF 24 BR**	815	24	62	M24×1.5	29	30.6	80.1	30500	52600
CF 24-1 B	**CF 24-1 BR**	1140	24	72	M24×1.5	29	30.6	80.1	30500	52600
CF 30 B	**CF 30 BR**	1870	30	80	M30×1.5	35	37	100	45400	85100
CF 30-1 B	**CF 30-1 BR**	2030	30	85	M30×1.5	35	37	100	45400	85100
CF 30-2 B	**CF 30-2 BR**	2220	30	90	M30×1.5	35	37	100	45400	85100

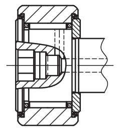
INTERCHANGE TABLE

IKO NUMBER CYLINDRICAL OUTER RING	INA		SKF		MCGILL	
CF..B	CYLINDRICAL OUTER RING KR..XSK	CROWNED OUTER RING KR..SK	CYLINDRICAL OUTER RING KR..XSK	CROWNED OUTER RING KR..SK	CYLINDRICAL OUTER RING MCFR..BX	CROWNED OUTER RING MCFR..B
CF 3 B	—	—	—	—	—	—
CF 4 B	—	—	—	—	—	—
CF 5 B	—	—	—	—	MCFR-13-BX	MCFR-13-B
CF 6 B	KR 16 XSK	KR 16 SK	KR 16 XSK	KR 16 SK	MCFR-16-BX	MCFR-16-B
CF 8 B	KR 19 XSK	KR 19 SK	KR 19 XSK	KR 19 SK	MCFR-19-BX	MCFR-19-B
CF 10 B	—	—	—	—	MCFR-22A-BX	MCFR-22A-B
CF 10 BM	KR 22 XSK	KR 22 SK	KR 22 XSK	KR 22 SK	MCFR-22-BX	MCFR-22-B
CF 10-1 B	—	—	—	—	MCFR-26A-BX	MCFR-26A-B
CF 10-1 BM	KR 26 XSK	KR 26 SK	KR 26 XSK	KR 26 SK	MCFR-26-BX	MCFR-26-B
CF 12 B	KR 30 XSK	KR 30 SK	KR 30 XSK	KR 30 SK	MCFR-30-BX	MCFR-30-B
CF 12-1 B	KR 32 XSK	KR 32 SK	KR 32 XSK	KR 32 SK	MCFR-32-BX	MCFR-32-B
CF 16 B	KR 35 XSK	KR 35 SK	KR 35 XSK	KR 35 SK	MCFR-35-BX	MCFR-35-B
CF 18 B	KR 40 XSK	KR 40 SK	KR 40 XSK	KR 40 SK	MCFR-40-BX	MCFR-40-B
CF 20 B	KR 52 XSK	KR 52 SK	KR 52 XSK	KR 52 SK	MCFR-52-BX	MCFR-52-B
CF 20-1 B	KR 47 XSK	KR 47 SK	KR 47 XSK	KR 47 SK	MCFR-47-BX	MCFR-47-B
CF 24 B	KR 62 X	KR 62	KR 62 X	KR 62	MCFR-62-BX	MCFR-62-B
CF 24-1 B	KR 72 X	KR 72	KR 72 X	KR 72	MCFR-72-BX	MCFR-72-B
CF 30 B	KR 80 X	KR 80	KR 80 X	KR 80	MCFR-80-BX	MCFR-80-B
CF 30-1 B	KR 85 X	KR 85	KR 85 X	KR 85	MCFR-85-BX	MCFR-85-B
CF 30-2 B	KR 90 X	KR 90	KR 90 X	KR 90	MCFR-90-BX	MCFR-90-B

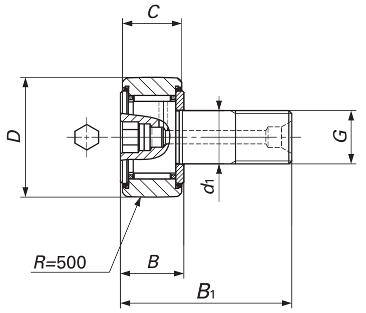
Remarks : Stud dia. 6 to 10mm : No oil holes

CAM FOLLOWERS

Metric Dimension



CF..BUU



CF..BUUR

DIMENSION TABLE

IKO NUMBER CYLINDRICAL OUTER RING **CF..BUU**	IKO NUMBER CROWNED OUTER RING **CF..BUUR**	WEIGHT	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING
		(g)	d1	D	G	C	MAX. B	MAX. B1	(N)	(N)
CF 3 BUU	**CF 3 BUUR**	4.3	3	10	M3×0.5	7	8	17	1500	1020
CF 4 BUU	**CF 4 BUUR**	7.4	4	12	M4×0.7	8	9	20	2070	1590
CF 5 BUU	**CF 5 BUUR**	10.3	5	13	M5×0.8	9	10	23	2520	2140
CF 6 BUU	**CF 6 BUUR**	18.5	6	16	M6×1	11	12.2	28.2	3660	3650
CF 8 BUU	**CF 8 BUUR**	28.5	8	19	M8×1.25	11	12.2	32.2	4250	4740
CF 10 BUU	**CF 10 BUUR**	45	10	22	M10×1.25	12	13.2	36.2	5430	6890
CF 10 BUUM	**CF 10 BUURM**	45	10	22	M10×1	12	13.2	36.2	5430	6890
CF 10-1 BUU	**CF 10-1 BUUR**	60	10	26	M10×1.25	12	13.2	36.2	5430	6890
CF 10-1 BUUM	**CF 10-1 BUURM**	60	10	26	M10×1	12	13.2	36.2	5430	6890
CF 12 BUU	**CF 12 BUUR**	95	12	30	M12×1.5	14	15.2	40.2	7910	9790
CF 12-1 BUU	**CF 12-1 BUUR**	105	12	32	M12×1.5	14	15.2	40.2	7910	9790
CF 16 BUU	**CF 16 BUUR**	170	16	35	M16×1.5	18	19.6	52.1	12000	18300
CF 18 BUU	**CF 18 BUUR**	250	18	40	M18×1.5	20	21.6	58.1	14800	25200
CF 20 BUU	**CF 20 BUUR**	460	20	52	M20×1.5	24	25.6	66.1	20700	34600
CF 20-1 BUU	**CF 20-1 BUUR**	385	20	47	M20×1.5	24	25.6	66.1	20700	34600
CF 24 BUU	**CF 24 BUUR**	815	24	62	M24×1.5	29	30.6	80.1	30500	52600
CF 24-1 BUU	**CF 24-1 BUUR**	1140	24	72	M24×1.5	29	30.6	80.1	30500	52600
CF 30 BUU	**CF 30 BUUR**	1870	30	80	M30×1.5	35	37	100	45400	85100
CF 30-1 BUU	**CF 30-1 BUUR**	2030	30	85	M30×1.5	35	37	100	45400	85100
CF 30-2 BUU	**CF 30-2 BUUR**	2220	30	90	M30×1.5	35	37	100	45400	85100

INTERCHANGE TABLE

IKO NUMBER CYLINDRICAL OUTER RING **CF..BUU**	INA		SKF		MCGILL	
	CYLINDRICAL OUTER RING KR..PPXSK	CROWNED OUTER RING KR..PPSK	CYLINDRICAL OUTER RING KR..PPXSK	CROWNED OUTER RING KR..PPSK	CYLINDRICAL OUTER RING MCFR..SBX	CROWNED OUTER RING MCFR..SB
CF 3 BUU	—	—	—	—	—	—
CF 4 BUU	—	—	—	—	—	—
CF 5 BUU	—	—	—	—	MCFR-13-SBX	MCFR-13-SB
CF 6 BUU	KR 16 PPXSK	KR 16 PPSK	KR 16 PPXSK	KR 16 PPSK	MCFR-16-SBX	MCFR-16-SB
CF 8 BUU	KR 19 PPXSK	KR 19 PPSK	KR 19 PPXSK	KR 19 PPSK	MCFR-19-SBX	MCFR-19-SB
CF 10 BUU	—	—	—	—	MCFR-22A-SBX	MCFR-22A-SB
CF 10 BUUM	KR 22 PPXSK	KR 22 PPSK	KR 22 PPXSK	KR 22 PPSK	MCFR-22-SBX	MCFR-22-SB
CF 10-1 BUU	—	—	—	—	MCFR-26A-SBX	MCFR-26A-SB
CF 10-1 BUUM	KR 26 PPXSK	KR 26 PPSK	KR 26 PPXSK	KR 26 PPSK	MCFR-26-SBX	MCFR-26-SB
CF 12 BUU	KR 30 PPXSK	KR 30 PPSK	KR 30 PPXSK	KR 30 PPSK	MCFR-30-SBX	MCFR-30-SB
CF 12-1 BUU	KR 32 PPXSK	KR 32 PPSK	KR 32 PPXSK	KR 32 PPSK	MCFR-32-SBX	MCFR-32-SB
CF 16 BUU	KR 35 PPXSK	KR 35 PPSK	KR 35 PPXSK	KR 35 PPSK	MCFR-35-SBX	MCFR-35-SB
CF 18 BUU	KR 40 PPXSK	KR 40 PPSK	KR 40 PPXSK	KR 40 PPSK	MCFR-40-SBX	MCFR-40-SB
CF 20 BUU	KR 52 PPXSK	KR 52 PPSK	KR 52 PPXSK	KR 52 PPSK	MCFR-52-SBX	MCFR-52-SB
CF 20-1 BUU	KR 47 PPXSK	KR 47 PPSK	KR 47 PPXSK	KR 47 PPSK	MCFR-47-SBX	MCFR-47-SB
CF 24 BUU	KR 62 PPX	KR 62 PP	KR 62 PPX	KR 62 PP	MCFR-62-SBX	MCFR-62-SB
CF 24-1 BUU	KR 72 PPX	KR 72 PP	KR 72 PPX	KR 72 PP	MCFR-72-SBX	MCFR-72-SB
CF 30 BUU	KR 80 PPX	KR 80 PP	KR 80 PPX	KR 80 PP	MCFR-80-SBX	MCFR-80-SB
CF 30-1 BUU	KR 85 PPX	KR 85 PP	KR 85 PPX	KR 85 PP	MCFR-85-SBX	MCFR-85-SB
CF 30-2 BUU	KR 90 PPX	KR 90 PP	KR 90 PPX	KR 90 PP	MCFR-90-SBX	MCFR-90-SB

Remarks : Stud dia. 6 to 10mm : No oil holes

CAM FOLLOWERS

Metric Dimension

DIMENSION TABLE

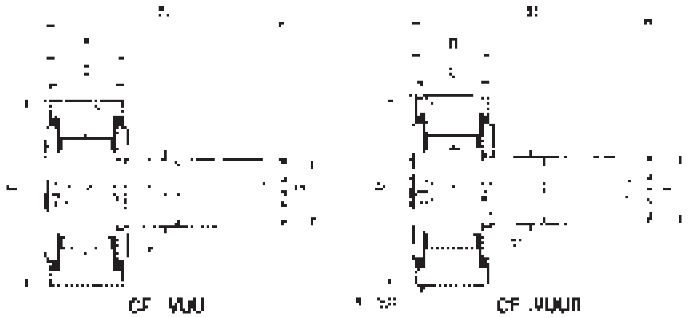
INTERCHANGE TABLE

IKO NUMBER CYLINDRICAL OUTER RING CF..V	IKO NUMBER CROWNED OUTER RING CF..VR	WEIGHT (g)	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	INA		SKF		MCGILL	
			d1	D	G	C	MAX. B	MAX. B1			CYLINDRICAL OUTER RING KRV..X	CROWNED OUTER RING KRV	CYLINDRICAL OUTER RING KRV..X	CROWNED OUTER RING KRV	CYLINDRICAL OUTER RING MCF..X	CROWNED OUTER RING MCF
CF 6 V	**CF 6 VR**	19	6	16	M6×1	11	12.2	28.2	6980	8500	KRV 16 X	KRV 16	KRV 16 X	KRV 16	MCF-16-X	MCF-16
CF 8 V	**CF 8 VR**	29	8	19	M8×1.25	11	12.2	32.2	8170	11200	KRV 19 X	KRV 19	KRV 19 X	KRV 19	MCF-19-X	MCF-19
CF 10 V	**CF 10 VR**	46	10	22	M10×1.25	12	13.2	36.2	9570	14500	—	—	—	—	MCF-22A-X	MCF-22A
CF 10 VM	**CF 10 VRM**	46	10	22	M10×1	12	13.2	36.2	9570	14500	KRV 22 X	KRV 22	KRV 22 X	KRV 22	MCF-22-X	MCF-22
CF 10-1 V	**CF 10-1 VR**	61	10	26	M10×1.25	12	13.2	36.2	9570	14500	—	—	—	—	MCF-26A-X	MCF-26A
CF 10-1 VM	**CF 10-1 VRM**	61	10	26	M10×1	12	13.2	36.2	9570	14500	KRV 26 X	KRV 26	KRV 26 X	KRV 26	MCF-26-X	MCF-26
CF 12 V	**CF 12 VR**	97	12	30	M12×1.5	14	15.2	40.2	13500	19700	KRV 30 X	KRV 30	KRV 30 X	KRV 30	MCF-30-X	MCF-30
CF 12-1 V	**CF 12-1 VR**	107	12	32	M12×1.5	14	15.2	40.2	13500	19700	KRV 32 X	KRV 32	KRV 32 X	KRV 32	MCF-32-X	MCF-32
CF 16 V	**CF 16 VR**	173	16	35	M16×1.5	18	19.6	52.1	20700	37600	KRV 35 X	KRV 35	KRV 35 X	KRV 35	MCF-35-X	MCF-35
CF 18 V	**CF 18 VR**	255	18	40	M18×1.5	20	21.6	58.1	25300	51300	KRV 40 X	KRV 40	KRV 40 X	KRV 40	MCF-40-X	MCF-40
CF 20 V	**CF 20 VR**	465	20	52	M20×1.5	24	25.6	66.1	33200	64500	KRV 52 X	KRV 52	KRV 52 X	KRV 52	MCF-52-X	MCF-52
CF 20-1 V	**CF 20-1 VR**	390	20	47	M20×1.5	24	25.6	66.1	33200	64500	KRV 47 X	KRV 47	KRV 47 X	KRV 47	MCF-47-X	MCF-47
CF 24 V	**CF 24 VR**	820	24	62	M24×1.5	29	30.6	80.1	46600	92000	—	—	—	—	MCF-62-X	MCF-62
CF 24-1 V	**CF 24-1 VR**	1140	24	72	M24×1.5	29	30.6	80.1	46600	92000	—	—	—	—	MCF-72-X	MCF-72
CF 30 V	**CF 30 VR**	1870	30	80	M30×1.5	35	37	100	67700	144000	—	—	—	—	MCF-80-X	MCF-80
CF 30-1 V	**CF 30-1 VR**	2030	30	85	M30×1.5	35	37	100	67700	144000	—	—	—	—	MCF-85-X	MCF-85
CF 30-2 V	**CF 30-2 VR**	2220	30	90	M30×1.5	35	37	100	67700	144000	—	—	—	—	MCF-90-X	MCF-90

Remarks : Stud dia. 6 to 10mm : No oil holes in the threaded end

CAM FOLLOWERS

Metric Dimension



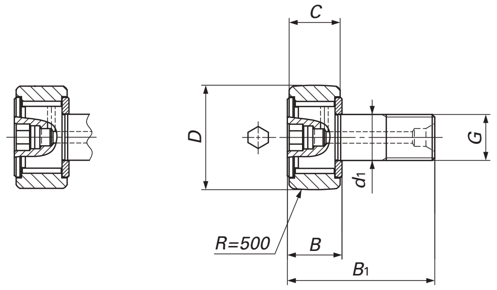
DIMENSION TABLE / **INTERCHANGE TABLE**

IKO NUMBER CYLINDRICAL OUTER RING **CF..VUU**	IKO NUMBER CROWNED OUTER RING **CF..VUUR**	WEIGHT (g)	DIMENSIONS (mm) d1	D	G	C	MAX. B	MAX. B1	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	INA CYLINDRICAL OUTER RING KRV..PPX	INA CROWNED OUTER RING KRV..PP	SKF CYLINDRICAL OUTER RING KRV..PPX	SKF CROWNED OUTER RING KRV..PP	MCGILL CYLINDRICAL OUTER RING MCF..SX	MCGILL CROWNED OUTER RING MCF..S
CF 6 VUU	**CF 6 VUUR**	19	6	16	M6×1	11	12.2	28.2	6980	8500	KRV 16 PPX	KRV 16 PP	KRV 16 PPX	KRV 16 PP	MCF-16-SX	MCF-16-S
CF 8 VUU	**CF 8 VUUR**	29	8	19	M8×1.25	11	12.2	32.2	8170	11200	KRV 19 PPX	KRV 19 PP	KRV 19 PPX	KRV 19 PP	MCF-19-SX	MCF-19-S
CF 10 VUU	**CF 10 VUUR**	46	10	22	M10×1.25	12	13.2	36.2	9570	14500	—	—	—	—	MCF-22A-SX	MCF-22A-S
CF 10 VUUM	**CF 10 VUURM**	46	10	22	M10×1	12	13.2	36.2	9570	14500	KRV 22 PPX	KRV 22 PP	KRV 22 PPX	KRV 22 PP	MCF-22-SX	MCF-22-S
CF 10-1 VUU	**CF 10-1 VUUR**	61	10	26	M10×1.25	12	13.2	36.2	9570	14500	—	—	—	—	MCF-26A-SX	MCF-26A-S
CF 10-1 VUUM	**CF 10-1 VUURM**	61	10	26	M10×1	12	13.2	36.2	9570	14500	KRV 26 PPX	KRV 26 PP	KRV 26 PPX	KRV 26 PP	MCF-26-SX	MCF-26-S
CF 12 VUU	**CF 12 VUUR**	97	12	30	M12×1.5	14	15.2	40.2	13500	19700	KRV 30 PPX	KRV 30 PP	KRV 30 PPX	KRV 30 PP	MCF-30-SX	MCF-30-S
CF 12-1 VUU	**CF 12-1 VUUR**	107	12	32	M12×1.5	14	15.2	40.2	13500	19700	KRV 32 PPX	KRV 32 PP	KRV 32 PPX	KRV 32 PP	MCF-32-SX	MCF-32-S
CF 16 VUU	**CF 16 VUUR**	173	16	35	M16×1.5	18	19.6	52.1	20700	37600	KRV 35 PPX	KRV 35 PP	KRV 35 PPX	KRV 35 PP	MCF-35-SX	MCF-35-S
CF 18 VUU	**CF 18 VUUR**	255	18	40	M18×1.5	20	21.6	58.1	25300	51300	KRV 40 PPX	KRV 40 PP	KRV 40 PPX	KRV 40 PP	MCF-40-SX	MCF-40-S
CF 20 VUU	**CF 20 VUUR**	465	20	52	M20×1.5	24	25.6	66.1	33200	64500	KRV 52 PPX	KRV 52 PP	KRV 52 PPX	KRV 52 PP	MCF-52-SX	MCF-52-S
CF 20-1 VUU	**CF 20-1 VUUR**	390	20	47	M20×1.5	24	25.6	66.1	33200	64500	KRV 47 PPX	KRV 47 PP	KRV 47 PPX	KRV 47 PP	MCF-47-SX	MCF-47-S
CF 24 VUU	**CF 24 VUUR**	820	24	62	M24×1.5	29	30.6	80.1	46600	92000	—	—	—	—	MCF-62-SX	MCF-62-S
CF 24-1 VUU	**CF 24-1 VUUR**	1140	24	72	M24×1.5	29	30.6	80.1	46600	92000	—	—	—	—	MCF-72-SX	MCF-72-S
CF 30 VUU	**CF 30 VUUR**	1870	30	80	M30×1.5	35	37	100	67700	144000	—	—	—	—	MCF-80-SX	MCF-80-S
CF 30-1 VUU	**CF 30-1 VUUR**	2030	30	85	M30×1.5	35	37	100	67700	144000	—	—	—	—	MCF-85-SX	MCF-85-S
CF 30-2 VUU	**CF 30-2 VUUR**	2220	30	90	M30×1.5	35	37	100	67700	144000	—	—	—	—	MCF-90-SX	MCF-90-S

Remark : Stud dia. 6 to 10mm : No oil holes in the threaded end

CAM FOLLOWERS

Metric Dimension



CF..VB CF..VBR

DIMENSION TABLE

IKO NUMBER CYLINDRICAL OUTER RING CF..VB	IKO NUMBER CROWNED OUTER RING CF..VBR	WEIGHT (g)	DIMENSIONS (mm) d1	D	G	C	MAX. B	MAX. B1	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
CF 6 VB	**CF 6 VBR**	19	6	16	M6×1	11	12.2	28.2	6980	8500
CF 8 VB	**CF 8 VBR**	29	8	19	M8×1.25	11	12.2	32.2	8170	11200
CF 10 VB	**CF 10 VBR**	46	10	22	M10×1.25	12	13.2	36.2	9570	14500
CF 10 VBM	**CF 10 VBRM**	46	10	22	M10×1	12	13.2	36.2	9570	14500
CF 10-1 VB	**CF 10-1 VBR**	61	10	26	M10×1.25	12	13.2	36.2	9570	14500
CF 10-1 VBM	**CF 10-1 VBRM**	61	10	26	M10×1	12	13.2	36.2	9570	14500
CF 12 VB	**CF 12 VBR**	97	12	30	M12×1.5	14	15.2	40.2	13500	19700
CF 12-1 VB	**CF 12-1 VBR**	107	12	32	M12×1.5	14	15.2	40.2	13500	19700
CF 16 VB	**CF 16 VBR**	173	16	35	M16×1.5	18	19.6	52.1	20700	37600
CF 18 VB	**CF 18 VBR**	255	18	40	M18×1.5	20	21.6	58.1	25300	51300
CF 20 VB	**CF 20 VBR**	465	20	52	M20×1.5	24	25.6	66.1	33200	64500
CF 20-1 VB	**CF 20-1 VBR**	390	20	47	M20×1.5	24	25.6	66.1	33200	64500
CF 24 VB	**CF 24 VBR**	820	24	62	M24×1.5	29	30.6	80.1	46600	92000
CF 24-1 VB	**CF 24-1 VBR**	1140	24	72	M24×1.5	29	30.6	80.1	46600	92000
CF 30 VB	**CF 30 VBR**	1870	30	80	M30×1.5	35	37	100	67700	144000
CF 30-1 VB	**CF 30-1 VBR**	2030	30	85	M30×1.5	35	37	100	67700	144000
CF 30-2 VB	**CF 30-2 VBR**	2220	30	90	M30×1.5	35	37	100	67700	144000

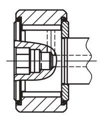
INTERCHANGE TABLE

INA CYLINDRICAL OUTER RING KRV..XSK	INA CROWNED OUTER RING KRV..SK	SKF CYLINDRICAL OUTER RING KRV..XSK	SKF CROWNED OUTER RING KRV..SK	MCGILL CYLINDRICAL OUTER RING MCF..BX	MCGILL CROWNED OUTER RING MCF..B
KRV 16 XSK	KRV 16 SK	KRV 16 XSK	KRV 16 SK	MCF-16-BX	MCF-16-B
KRV 19 XSK	KRV 19 SK	KRV 19 XSK	KRV 19 SK	MCF-19-BX	MCF-19-B
—	—	—	—	MCF-22A-BX	MCF-22A-B
KRV 22 XSK	KRV 22 SK	KRV 22 XSK	KRV 22 SK	MCF-22-BX	MCF-22-B
—	—	—	—	MCF-26A-BX	MCF-26A-B
KRV 26 XSK	KRV 26 SK	KRV 26 XSK	KRV 26 SK	MCF-26-BX	MCF-26-B
KRV 30 XSK	KRV 30 SK	KRV 30 XSK	KRV 30 SK	MCF-30-BX	MCF-30-B
KRV 32 XSK	KRV 32 SK	KRV 32 XSK	KRV 32 SK	MCF-32-BX	MCF-32-B
KRV 35 XSK	KRV 35 SK	KRV 35 XSK	KRV 35 SK	MCF-35-BX	MCF-35-B
KRV 40 XSK	KRV 40 SK	KRV 40 XSK	KRV 40 SK	MCF-40-BX	MCF-40-B
KRV 52 XSK	KRV 52 SK	KRV 52 XSK	KRV 52 SK	MCF-52-BX	MCF-52-B
KRV 47 XSK	KRV 47 SK	KRV 47 XSK	KRV 47 SK	MCF-47-BX	MCF-47-B
KRV 62 X	KRV 62	KRV 62 X	KRV 62	MCF-62-BX	MCF-62-B
KRV 72 X	KRV 72	KRV 72 X	KRV 72	MCF-72-BX	MCF-72-B
KRV 80 X	KRV 80	KRV 80 X	KRV 80	MCF-80-BX	MCF-80-B
—	—	—	—	MCF-85-BX	MCF-85-B
KRV 90 X	KRV 90	KRV 90 X	KRV 90	MCF-90-BX	MCF-90-B

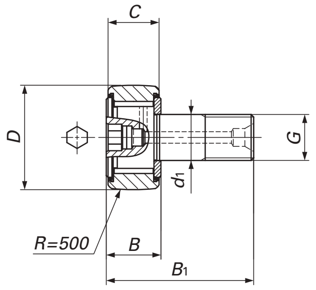
Remark : Stud dia. 6 to 10mm : No oil holes

CAM FOLLOWERS

Metric Dimension



CF..VBUU



CF..VBUUR

DIMENSION TABLE

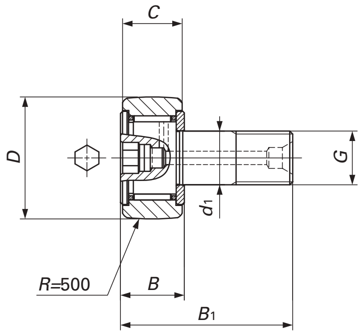
INTERCHANGE TABLE

IKO NUMBER CYLINDRICAL OUTER RING CF..VBUU	IKO NUMBER CROWNED OUTER RING CF..VBUUR	WEIGHT (g)	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	INA		SKF		MCGILL	
			d1	D	G	C	MAX. B	MAX. B1			CYLINDRICAL OUTER RING KRV..PPXSK	CROWNED OUTER RING KRV..PPSK	CYLINDRICAL OUTER RING KRV..PPXSK	CROWNED OUTER RING KRV..PPSK	CYLINDRICAL OUTER RING MCF..SBX	CROWNED OUTER RING MCF..SB
CF 6 VBUU	**CF 6 VBUUR**	19	6	16	M6×1	11	12.2	28.2	6980	8500	KRV 16 PPXSK	KRV 16 PPSK	KRV 16 PPXSK	KRV 16 PPSK	MCF-16-SBX	MCF-16-SB
CF 8 VBUU	**CF 8 VBUUR**	29	8	19	M8×1.25	11	12.2	32.2	8170	11200	KRV 19 PPXSK	KRV 19 PPSK	KRV 19 PPXSK	KRV 19 PPSK	MCF-19-SBX	MCF-19-SB
CF 10 VBUU	**CF 10 VBUUR**	46	10	22	M10×1.25	12	13.2	36.2	9570	14500	—	—	—	—	MCF-22A-SBX	MCF-22A-SB
CF 10 VBUUM	**CF 10 VBUURM**	46	10	22	M10×1	12	13.2	36.2	9570	14500	KRV 22 PPXSK	KRV 22 PPSK	KRV 22 PPXSK	KRV 22 PPSK	MCF-22-SBX	MCF-22-SB
CF 10-1 VBUU	**CF 10-1 VBUUR**	61	10	26	M10×1.25	12	13.2	36.2	9570	14500	—	—	—	—	MCF-26A-SBX	MCF-26A-SB
CF 10-1 VBUUM	**CF 10-1 VBUURM**	61	10	26	M10×1	12	13.2	36.2	9570	14500	KRV 26 PPXSK	KRV 26 PPSK	KRV 26 PPXSK	KRV 26 PPSK	MCF-26-SBX	MCF-26-SB
CF 12 VBUU	**CF 12 VBUUR**	97	12	30	M12×1.5	14	15.2	40.2	13500	19700	KRV 30 PPXSK	KRV 30 PPSK	KRV 30 PPXSK	KRV 30 PPSK	MCF-30-SBX	MCF-30-SB
CF 12-1 VBUU	**CF 12-1 VBUUR**	107	12	32	M12×1.5	14	15.2	40.2	13500	19700	KRV 32 PPXSK	KRV 32 PPSK	KRV 32 PPXSK	KRV 32 PPSK	MCF-32-SBX	MCF-32-SB
CF 16 VBUU	**CF 16 VBUUR**	173	16	35	M16×1.5	18	19.6	52.1	20700	37600	KRV 35 PPXSK	KRV 35 PPSK	KRV 35 PPXSK	KRV 35 PPSK	MCF-35-SBX	MCF-35-SB
CF 18 VBUU	**CF 18 VBUUR**	255	18	40	M18×1.5	20	21.6	58.1	25300	51300	KRV 40 PPXSK	KRV 40 PPSK	KRV 40 PPXSK	KRV 40 PPSK	MCF-40-SBX	MCF-40-SB
CF 20 VBUU	**CF 20 VBUUR**	465	20	52	M20×1.5	24	25.6	66.1	33200	64500	KRV 52 PPXSK	KRV 52 PPSK	KRV 52 PPXSK	KRV 52 PPSK	MCF-52-SBX	MCF-52-SB
CF 20-1 VBUU	**CF 20-1 VBUUR**	390	20	47	M20×1.5	24	25.6	66.1	33200	64500	KRV 47 PPXSK	KRV 47 PPSK	KRV 47 PPXSK	KRV 47 PPSK	MCF-47-SBX	MCF-47-SB
CF 24 VBUU	**CF 24 VBUUR**	820	24	62	M24×1.5	29	30.6	80.1	46600	92000	KRV 62 PPX	KRV 62 PP	KRV 62 PPX	KRV 62 PP	MCF-62-SBX	MCF-62-SB
CF 24-1 VBUU	**CF 24-1 VBUUR**	1140	24	72	M24×1.5	29	30.6	80.1	46600	92000	KRV 72 PPX	KRV 72 PP	KRV 72 PPX	KRV 72 PP	MCF-72-SBX	MCF-72-SB
CF 30 VBUU	**CF 30 VBUUR**	1870	30	80	M30×1.5	35	37	100	67700	144000	KRV 80 PPX	KRV 80 PP	KRV 80 PPX	KRV 80 PP	MCF-80-SBX	MCF-80-SB
CF 30-1 VBUU	**CF 30-1 VBUUR**	2030	30	85	M30×1.5	35	37	100	67700	144000	—	—	—	—	MCF-85-SBX	MCF-85-SB
CF 30-2 VBUU	**CF 30-2 VBUUR**	2220	30	90	M30×1.5	35	37	100	67700	144000	KRV 90 PPX	KRV 90 PP	KRV 90 PPX	KRV 90 PP	MCF-90-SBX	MCF-90-SB

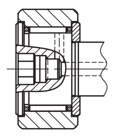
Remark : Stud dia. 6 to 10mm : No oil holes

CAM FOLLOWERS STAINLESS STEEL MADE

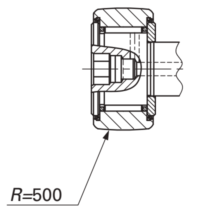
Metric Dimension



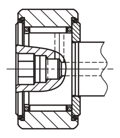
CF...FBR



CF...FB



CF...FBUUR



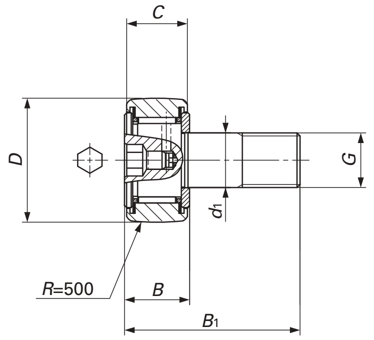
CF...FBUU

DIMENSION TABLE

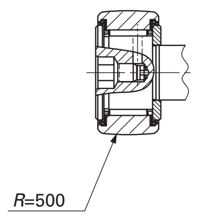
IKO NUMBER SHIELD TYPE CROWNED OUTER RING	IKO NUMBER SHIELD TYPE CYLINDRICAL OUTER RING	IKO NUMBER SEALED TYPE CROWNED OUTER RING	IKO NUMBER SEALED TYPE CYLINDRICAL OUTER RING	WEIGHT (g)	DIMENSIONS (mm) d1	D	G	C	MAX.B	MAX.B1	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
CF 3FBR	**CF 3FB**	**CF 3FBUUR**	**CF 3FBUU**	4.3	3	10	M 3×0.5	7	8	17	1200	813
CF 4FBR	**CF 4FB**	**CF 4FBUUR**	**CF 4FBUU**	7.4	4	12	M 4×0.7	8	9	20	1650	1270
CF 5FBR	**CF 5FB**	**CF 5FBUUR**	**CF 5FBUU**	10.3	5	13	M 5×0.8	9	10	23	1930	1730
CF 6FBR	—	**CF 6FBUUR**	—	18.5	6	16	M 6×1	11	12.2	28.2	2930	2920
CF 8FBR	—	**CF 8FBUUR**	—	28.5	8	19	M 8×1.25	11	12.2	32.2	3400	3790
CF 10FBR	—	**CF 10FBUUR**	—	45	10	22	M 10×1.25	12	13.2	36.2	4340	5510
CF 12FBR	—	**CF 12FBUUR**	—	95	12	30	M 12×1.5	14	15.2	40.2	6330	7830
CF 16FBR	—	**CF 16FBUUR**	—	170	16	35	M 16×1.5	18	19.6	52.1	9620	14700
CF 18FBR	—	**CF 18FBUUR**	—	250	18	40	M 18×1.5	20	21.6	58.1	11800	20200
CF 20FBR	—	**CF 20FBUUR**	—	460	20	52	M 20×1.5	24	25.6	66.1	16500	27700

CAM FOLLOWERS STAINLESS THRUST DISK TYPE

Metric Dimension



CF...FWBR



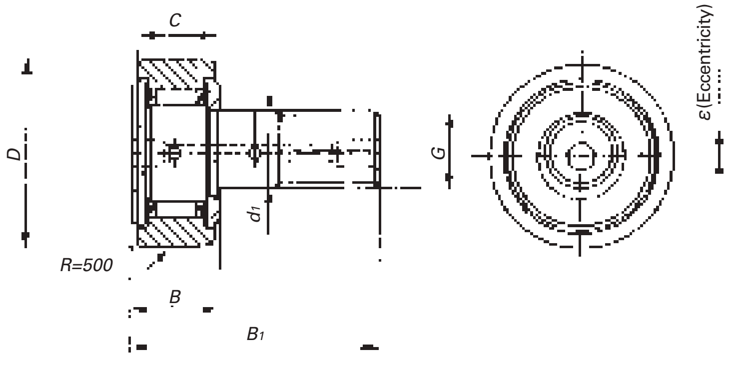
CF...FWBUUR

DIMENSION TABLE

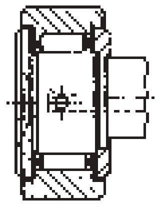
IKO NUMBER		WEIGHT	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING
SHIELD TYPE	SEALED TYPE	(g)	d1	D	G	C	MAX.B	MAX.B1	(N)	(N)
CF 3 FWBR	**CF 3 FWBUUR**	4.3	3	10	M 3×0.5	7	8	17	1200	813
CF 4 FWBR	**CF 4 FWBUUR**	7.4	4	12	M 4×0.7	8	9	20	1650	1270
CF 5 FWBR	**CF 5 FWBUUR**	10.3	5	13	M 5×0.8	9	10	23	1930	1730

CAM FOLLOWERS
SOLID ECCENTRIC STUD TYPE

Metric Dimension



CFES...R



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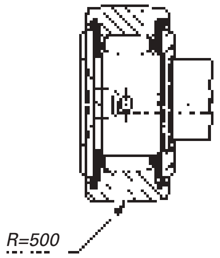
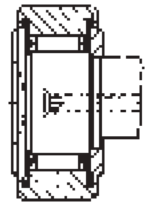


CFES...UUR



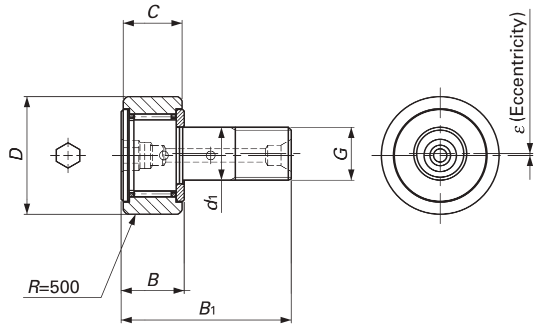
CFES...UU

DIMENSION TABLE

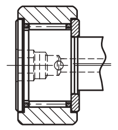
IKO NUMBER SHIELD TYPE		IKO NUMBER SEALED TYPE		WEIGHT	DIMENSIONS (mm)							BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
CROWNED OUTER RING	CYLINDRICAL OUTER RING	CROWNED OUTER RING	CYLINDRICAL OUTER RING	(g)	d1	D	G	C	MAX.B	MAX.B1	ε		
CFES 6R	**CFES 6**	**CFES 6UUR**	**CFES 6UU**	18.5	6	16	M 6×1	11	12.2	28.2	0.25	3660	3650
CFES 8R	**CFES 8**	**CFES 8UUR**	**CFES 8UU**	28.5	8	19	M 8×1.25	11	12.2	32.2	0.25	4250	4740
CFES 10R	**CFES 10**	**CFES 10UUR**	**CFES 10UU**	45	10	22	M 10×1.25	12	13.2	36.2	0.3	5430	6890
CFES 10-1R	**CFES 10-1**	**CFES 10-1UUR**	**CFES 10-1UU**	60	10	26	M 10×1.25	12	13.2	36.2	0.3	5430	6890
CFES 12R	**CFES 12**	**CFES 12UUR**	**CFES 12UU**	95	12	30	M 12×1.5	14	15.2	40.2	0.4	7910	9790
CFES 12-1R	**CFES 12-1**	**CFES 12-1UUR**	**CFES 12-1UU**	105	12	32	M 12×1.5	14	15.2	40.2	0.4	7910	9790
CFES 16R	**CFES 16**	**CFES 16UUR**	**CFES 16UU**	170	16	35	M 16×1.5	18	19.6	52.1	0.5	12000	18300
CFES 18R	**CFES 18**	**CFES 18UUR**	**CFES 18UU**	250	18	40	M 18×1.5	20	21.6	58.1	0.6	14800	25200

CAM FOLLOWERS
SOLID ECCENTRIC STUD TYPE

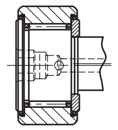
Metric Dimension



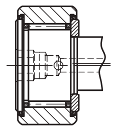
CFES...BR



CFES...B



CFES...BUUR



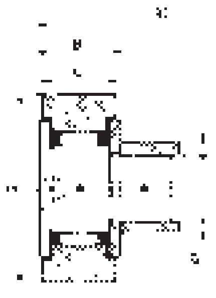
CFES...BUU

DIMENSION TABLE

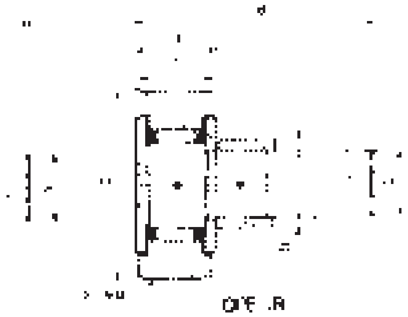
IKO NUMBER SHIELD TYPE		IKO NUMBER SEALED TYPE		WEIGHT	DIMENSIONS (mm)							BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
CROWNED OUTER RING	CYLINDRICAL OUTER RING	CROWNED OUTER RING	CYLINDRICAL OUTER RING	(g)	d1	D	G	C	MAX.B	MAX.B1	ε		
CFES 6BR	**CFES 6B**	**CFES 6BUUR**	**CFES 6BUU**	18.5	6	16	M 6×1	11	12.2	28.2	0.25	3660	3650
CFES 8BR	**CFES 8B**	**CFES 8BUUR**	**CFES 8BUU**	28.5	8	19	M 8×1.25	11	12.2	32.2	0.25	4250	4740
CFES 10BR	**CFES 10B**	**CFES 10BUUR**	**CFES 10BUU**	45	10	22	M 10×1.25	12	13.2	36.2	0.3	5430	6890
CFES 10-1BR	**CFES 10-1B**	**CFES 10-1BUUR**	**CFES 10-1BUU**	60	10	26	M 10×1.25	12	13.2	36.2	0.3	5430	6890
CFES 12BR	**CFES 12B**	**CFES 12BUUR**	**CFES 12BUU**	95	12	30	M 12×1.5	14	15.2	40.2	0.4	7910	9790
CFES 12-1BR	**CFES 12-1B**	**CFES 12-1BUUR**	**CFES 12-1BUU**	105	12	32	M 12×1.5	14	15.2	40.2	0.4	7910	9790
CFES 16BR	**CFES 16B**	**CFES 16BUUR**	**CFES 16BUU**	170	16	35	M 16×1.5	18	19.2	52.1	0.5	12000	18300
CFES 18BR	**CFES 18B**	**CFES 18BUUR**	**CFES 18BUU**	250	18	40	M 18×1.5	20	21.6	58.1	0.6	14800	25200

CAM FOLLOWERS

Metric Dimension



CFE



CFE..R

DIMENSION TABLE

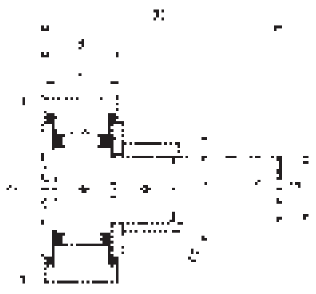
INTERCHANGE TABLE

IKO NUMBER CYLINDRICAL OUTER RING **CFE**	IKO NUMBER CROWNED OUTER RING **CFE..R**	WEIGHT (g)	DIMENSIONS (mm) de	D	G	C	MAX. B	MAX. B1	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	INA CYLINDRICAL OUTER RING KRE..X	INA CROWNED OUTER RING KRE
CFE 6	**CFE 6 R**	20.5	9	16	M6×1	11	12.2	28.2	3660	3650	KRE 16 X	KRE 16
CFE 8	**CFE 8 R**	32	11	19	M8×1.25	11	12.2	32.2	4250	4740	KRE 19 X	KRE 19
CFE 10	**CFE 10 R**	49.5	13	22	M10×1.25	12	13.2	36.2	5430	6890	—	—
CFE 10 M	**CFE 10 RM**	49.5	13	22	M10×1	12	13.2	36.2	5430	6890	KRE 22 X	KRE 22
CFE 10-1	**CFE 10-1 R**	65	13	26	M10×1.25	12	13.2	36.2	5430	6890	—	—
CFE 10-1 M	**CFE 10-1 RM**	65	13	26	M10×1	12	13.2	36.2	5430	6890	KRE 26 X	KRE 26
CFE 12	**CFE 12 R**	105	16	30	M12×1.5	14	15.2	40.2	7910	9790	—	—
CFE 12-1	**CFE 12-1 R**	115	16	32	M12×1.5	14	15.2	40.2	7910	9790	—	—
CFE 16	**CFE 16 R**	190	22	35	M16×1.5	18	19.6	52.1	12000	18300	—	—
CFE 18	**CFE 18 R**	280	24	40	M18×1.5	20	21.6	58.1	14800	25200	—	—
CFE 20	**CFE 20 R**	500	27	52	M20×1.5	24	25.6	66.1	20700	34600	—	—
CFE 20-1	**CFE 20-1 R**	425	27	47	M20×1.5	24	25.6	66.1	20700	34600	—	—
CFE 24	**CFE 24 R**	895	33	62	M24×1.5	29	30.6	80.1	30500	52600	—	—
CFE 24-1	**CFE 24-1 R**	1220	33	72	M24×1.5	29	30.6	80.1	30500	52600	—	—
CFE 30	**CFE 30 R**	2030	41	80	M30×1.5	35	37	100	45400	85100	—	—
CFE 30-1	**CFE 30-1 R**	2190	41	85	M30×1.5	35	37	100	45400	85100	—	—
CFE 30-2	**CFE 30-2 R**	2380	41	90	M30×1.5	35	37	100	45400	85100	—	—

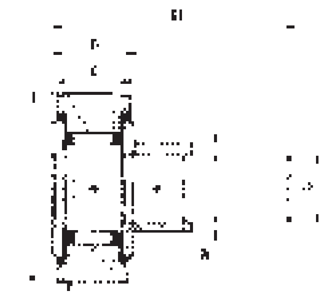
Remark : Stud dia. 6 to 10mm : No oil holes in the threaded end

CAM FOLLOWERS

Metric Dimension



CFE..UU



CFE..UUR

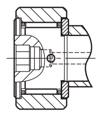
DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER CYLINDRICAL OUTER RING **CFE..UU**	IKO NUMBER CROWNED OUTER RING **CFE..UUR**	WEIGHT (g)	DIMENSIONS (mm) de	D	G	C	MAX. B	MAX. B1	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	INA CYLINDRICAL OUTER RING KRE..PPX	CROWNED OUTER RING KRE..PP
CFE 6 UU	**CFE 6 UUR**	20.5	9	16	M6×1	11	12.2	28.2	3660	3650	KRE 16 PPX	KRE 16 PP
CFE 8 UU	**CFE 8 UUR**	32	11	19	M8×1.25	11	12.2	32.2	4250	4740	KRE 19 PPX	KRE 19 PP
CFE 10 UU	**CFE 10 UUR**	49.5	13	22	M10×1.25	12	13.2	36.2	5430	6890	—	—
CFE 10 UUM	**CFE 10 UURM**	49.5	13	22	M10×1	12	13.2	36.2	5430	6890	KRE 22 PPX	KRE 22 PP
CFE 10-1 UU	**CFE 10-1 UUR**	65	13	26	M10×1.25	12	13.2	36.2	5430	6890	—	—
CFE 10-1 UUM	**CFE 10-1 UURM**	65	13	26	M10×1	12	13.2	36.2	5430	6890	KRE 26 PPX	KRE 26 PP
CFE 12 UU	**CFE 12 UUR**	105	16	30	M12×1.5	14	15.2	40.2	7910	9790	—	—
CFE 12-1 UU	**CFE 12-1 UUR**	115	16	32	M12×1.5	14	15.2	40.2	7910	9790	—	—
CFE 16 UU	**CFE 16 UUR**	190	22	35	M16×1.5	18	19.6	52.1	12000	18300	—	—
CFE 18 UU	**CFE 18 UUR**	280	24	40	M18×1.5	20	21.6	58.1	14800	25200	—	—
CFE 20 UU	**CFE 20 UUR**	500	27	52	M20×1.5	24	25.6	66.1	20700	34600	—	—
CFE 20-1 UU	**CFE 20-1 UUR**	425	27	47	M20×1.5	24	25.6	66.1	20700	34600	—	—
CFE 24 UU	**CFE 24 UUR**	895	33	62	M24×1.5	29	30.6	80.1	30500	52600	—	—
CFE 24-1 UU	**CFE 24-1 UUR**	1220	33	72	M24×1.5	29	30.6	80.1	30500	52600	—	—
CFE 30 UU	**CFE 30 UUR**	2030	41	80	M30×1.5	35	37	100	45400	85100	—	—
CFE 30-1 UU	**CFE 30-1 UUR**	2190	41	85	M30×1.5	35	37	100	45400	85100	—	—
CFE 30-2 UU	**CFE 30-2 UUR**	2380	41	90	M30×1.5	35	37	100	45400	85100	—	—

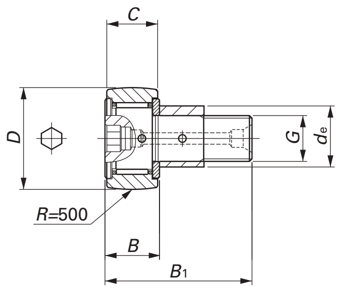
Remark : Stud dia. 6 to 10mm : No oil holes in the threaded end

CAM FOLLOWERS

Metric Dimension



CFE..B



CFE..BR

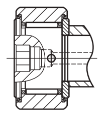
DIMENSION TABLE | **INTERCHANGE TABLE**

IKO NUMBER CYLINDRICAL OUTER RING **CFE..B**	IKO NUMBER CROWNED OUTER RING **CFE..BR**	WEIGHT (g)	DIMENSIONS (mm) de	D	G	C	MAX. B	MAX. B1	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	INA CYLINDRICAL OUTER RING KRE..XSK	INA CROWNED OUTER RING KRE..SK
CFE 6 B	**CFE 6 BR**	20.5	9	16	M6×1	11	12.2	28.2	3660	3650	KRE 16 XSK	KRE 16 SK
CFE 8 B	**CFE 8 BR**	32	11	19	M8×1.25	11	12.2	32.2	4250	4740	KRE 19 XSK	KRE 19 SK
CFE 10 B	**CFE 10 BR**	49.5	13	22	M10×1.25	12	13.2	36.2	5430	6890	—	—
CFE 10 BM	**CFE 10 BRM**	49.5	13	22	M10×1	12	13.2	36.2	5430	6890	KRE 22 XSK	KRE 22 SK
CFE 10-1 B	**CFE 10-1 BR**	65	13	26	M10×1.25	12	13.2	36.2	5430	6890	—	—
CFE 10-1 BM	**CFE 10-1 BRM**	65	13	26	M10×1	12	13.2	36.2	5430	6890	KRE 26 XSK	KRE 26 SK
CFE 12 B	**CFE 12 BR**	105	16	30	M12×1.5	14	15.2	40.2	7910	9790	—	—
CFE 12-1 B	**CFE 12-1 BR**	115	16	32	M12×1.5	14	15.2	40.2	7910	9790	—	—
CFE 16 B	**CFE 16 BR**	190	22	35	M16×1.5	18	19.6	52.1	12000	18300	—	—
CFE 18 B	**CFE 18 BR**	280	24	40	M18×1.5	20	21.6	58.1	14800	25200	—	—
CFE 20 B	**CFE 20 BR**	500	27	52	M20×1.5	24	25.6	66.1	20700	34600	—	—
CFE 20-1 B	**CFE 20-1 BR**	425	27	47	M20×1.5	24	25.6	66.1	20700	34600	—	—
CFE 24 B	**CFE 24 BR**	895	33	62	M24×1.5	29	30.6	80.1	30500	52600	—	—
CFE 24-1 B	**CFE 24-1 BR**	1220	33	72	M24×1.5	29	30.6	80.1	30500	52600	—	—
CFE 30 B	**CFE 30 BR**	2030	41	80	M30×1.5	35	37	100	45400	85100	—	—
CFE 30-1 B	**CFE 30-1 BR**	2190	41	85	M30×1.5	35	37	100	45400	85100	—	—
CFE 30-2 B	**CFE 30-2 BR**	2380	41	90	M30×1.5	35	37	100	45400	85100	—	—

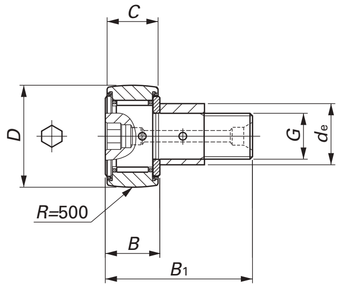
Remark : Collar dia. 9 to 13mm : No oil holes

CAM FOLLOWERS

Metric Dimension



CFE..BUU



CFE..BUUR

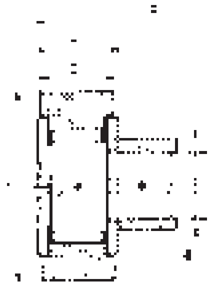
DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER CYLINDRICAL OUTER RING **CFE..BUU**	IKO NUMBER CROWNED OUTER RING **CFE..BUUR**	WEIGHT (g)	DIMENSIONS (mm)							BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	INA CYLINDRICAL OUTER RING KRE..PPXSK	INA CROWNED OUTER RING KRE..PPSK
			de	D	G	C	MAX. B	MAX. B1					
CFE 6 BUU	**CFE 6 BUUR**	20.5	9	16	M6×1	11	12.2	28.2		3660	3650	KRE 16 PPXSK	KRE 16 PPSK
CFE 8 BUU	**CFE 8 BUUR**	32	11	19	M8×1.25	11	12.2	32.2		4250	4740	KRE 19 PPXSK	KRE 19 PPSK
CFE 10 BUU	**CFE 10 BUUR**	49.5	13	22	M10×1.25	12	13.2	36.2		5430	6890	—	—
CFE 10 BUUM	**CFE 10 BUURM**	49.5	13	22	M10×1	12	13.2	36.2		5430	6890	KRE 22 PPXSK	KRE 22 PPSK
CFE 10-1 BUU	**CFE 10-1 BUUR**	65	13	26	M10×1.25	12	13.2	36.2		5430	6890	—	—
CFE 10-1 BUUM	**CFE 10-1 BUURM**	65	13	26	M10×1	12	13.2	36.2		5430	6890	KRE 26 PPXSK	KRE 26 PPSK
CFE 12 BUU	**CFE 12 BUUR**	105	16	30	M12×1.5	14	15.2	40.2		7910	9790	—	—
CFE 12-1 BUU	**CFE 12-1 BUUR**	115	16	32	M12×1.5	14	15.2	40.2		7910	9790	—	—
CFE 16 BUU	**CFE 16 BUUR**	190	22	35	M16×1.5	18	19.6	52.1		12000	18300	—	—
CFE 18 BUU	**CFE 18 BUUR**	280	24	40	M18×1.5	20	21.6	58.1		14800	25200	—	—
CFE 20 BUU	**CFE 20 BUUR**	500	27	52	M20×1.5	24	25.6	66.1		20700	34600	—	—
CFE 20-1 BUU	**CFE 20-1 BUUR**	425	27	47	M20×1.5	24	25.6	66.1		20700	34600	—	—
CFE 24 BUU	**CFE 24 BUUR**	895	33	62	M24×1.5	29	30.6	80.1		30500	52600	—	—
CFE 24-1 BUU	**CFE 24-1 BUUR**	1220	33	72	M24×1.5	29	30.6	80.1		30500	52600	—	—
CFE 30 BUU	**CFE 30 BUUR**	2030	41	80	M30×1.5	35	37	100		45400	85100	—	—
CFE 30-1 BUU	**CFE 30-1 BUUR**	2190	41	85	M30×1.5	35	37	100		45400	85100	—	—
CFE 30-2 BUU	**CFE 30-2 BUUR**	2380	41	90	M30×1.5	35	37	100		45400	85100	—	—

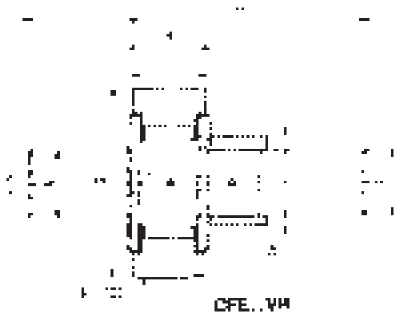
Remark : Collar dia. 9 to 13mm : No oil holes

CAM FOLLOWERS

Metric Dimension



CFE..V



CFE..VM

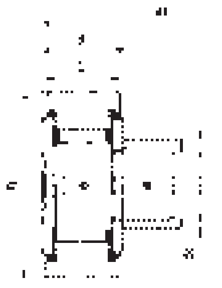
DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER CYLINDRICAL OUTER RING **CFE..V**	IKO NUMBER CROWNED OUTER RING **CFE..VR**	WEIGHT (g)	DIMENSIONS (mm) de	D	G	C	MAX. B	MAX. B1	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	INA CYLINDRICAL OUTER RING KRVE..X	INA CROWNED OUTER RING KRVE
CFE 6 V	**CFE 6 VR**	21	9	16	M6×1	11	12.2	28.2	6980	8500	KRVE 16 X	KRVE 16
CFE 8 V	**CFE 8 VR**	32.5	11	19	M8×1.25	11	12.2	32.2	8170	11200	KRVE 19 X	KRVE 19
CFE 10 V	**CFE 10 VR**	50.5	13	22	M10×1.25	12	13.2	36.2	9570	14500	—	—
CFE 10 VM	**CFE 10 VRM**	50.5	13	22	M10×1	12	13.2	36.2	9570	14500	KRVE 22 X	KRVE 22
CFE 10-1 V	**CFE 10-1 VR**	66	13	26	M10×1.25	12	13.2	36.2	9570	14500	—	—
CFE 10-1 VM	**CFE 10-1 VRM**	66	13	26	M10×1	12	13.2	36.2	9570	14500	KRVE 26 X	KRVE 26
CFE 12 V	**CFE 12 VR**	107	16	30	M12×1.5	14	15.2	40.2	13500	19700	—	—
CFE 12-1 V	**CFE 12-1 VR**	117	16	32	M12×1.5	14	15.2	40.2	13500	19700	—	—
CFE 16 V	**CFE 16 VR**	193	22	35	M16×1.5	18	19.6	52.1	20700	37600	—	—
CFE 18 V	**CFE 18 VR**	285	24	40	M18×1.5	20	21.6	58.1	25300	51300	—	—
CFE 20 V	**CFE 20 VR**	505	27	52	M20×1.5	24	25.6	66.1	33200	64500	—	—
CFE 20-1 V	**CFE 20-1 VR**	430	27	47	M20×1.5	24	25.6	66.1	33200	64500	—	—
CFE 24 V	**CFE 24 VR**	900	33	62	M24×1.5	29	30.6	80.1	46600	92000	—	—
CFE 24-1 V	**CFE 24-1 VR**	1220	33	72	M24×1.5	29	30.6	80.1	46600	92000	—	—
CFE 30 V	**CFE 30 VR**	2030	41	80	M30×1.5	35	37	100	67700	144000	—	—
CFE 30-1 V	**CFE 30-1 VR**	2190	41	85	M30×1.5	35	37	100	67700	144000	—	—
CFE 30-2 V	**CFE 30-2 VR**	2380	41	90	M30×1.5	35	37	100	67700	144000	—	—

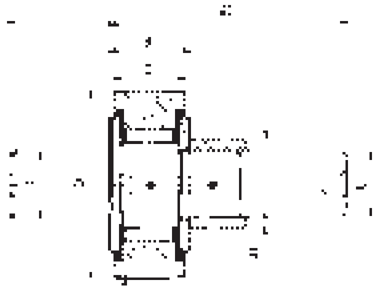
Remark : Collar dia. 9 to 13mm : No oil holes in the threaded end

CAM FOLLOWERS

Metric Dimension



CFE. VUU



CFE. VUUR

DIMENSION TABLE

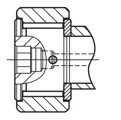
INTERCHANGE TABLE

IKO NUMBER CYLINDRICAL OUTER RING CFE..VUU	IKO NUMBER CROWNED OUTER RING CFE..VUUR	WEIGHT	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	INA CYLINDRICAL OUTER RING KRVE..PPX	INA CROWNED OUTER RING KRVE..PP
		(g)	de	D	G	C	MAX. B	MAX. B1	(N)	(N)		
CFE 6 VUU	**CFE 6 VUUR**	21	9	16	M6×1	11	12.2	28.2	6980	8500	KRVE 16 PPX	KRVE 16 PP
CFE 8 VUU	**CFE 8 VUUR**	32.5	11	19	M8×1.25	11	12.2	32.2	8170	11200	KRVE 19 PPX	KRVE 19 PP
CFE 10 VUU	**CFE 10 VUUR**	50.5	13	22	M10×1.25	12	13.2	36.2	9570	14500	—	—
CFE 10 VUUM	**CFE 10 VUURM**	50.5	13	22	M10×1	12	13.2	36.2	9570	14500	KRVE 22 PPX	KRVE 22 PP
CFE 10-1 VUU	**CFE 10-1 VUUR**	66	13	26	M10×1.25	12	13.2	36.2	9570	14500	—	—
CFE 10-1 VUUM	**CFE 10-1 VUURM**	66	13	26	M10×1	12	13.2	36.2	9570	14500	KRVE 26 PPX	KRVE 26 PP
CFE 12 VUU	**CFE 12 VUUR**	107	16	30	M12×1.5	14	15.2	40.2	13500	19700	—	—
CFE 12-1 VUU	**CFE 12-1 VUUR**	117	16	32	M12×1.5	14	15.2	40.2	13500	19700	—	—
CFE 16 VUU	**CFE 16 VUUR**	193	22	35	M16×1.5	18	19.6	52.1	20700	37600	—	—
CFE 18 VUU	**CFE 18 VUUR**	285	24	40	M18×1.5	20	21.6	58.1	25300	51300	—	—
CFE 20 VUU	**CFE 20 VUUR**	505	27	52	M20×1.5	24	25.6	66.1	33200	64500	—	—
CFE 20-1 VUU	**CFE 20-1 VUUR**	430	27	47	M20×1.5	24	25.6	66.1	33200	64500	—	—
CFE 24 VUU	**CFE 24 VUUR**	900	33	62	M24×1.5	29	30.6	80.1	46600	92000	—	—
CFE 24-1 VUU	**CFE 24-1 VUUR**	1220	33	72	M24×1.5	29	30.6	80.1	46600	92000	—	—
CFE 30 VUU	**CFE 30 VUUR**	2030	41	80	M30×1.5	35	37	100	67700	144000	—	—
CFE 30-1 VUU	**CFE 30-1 VUUR**	2190	41	85	M30×1.5	35	37	100	67700	144000	—	—
CFE 30-2 VUU	**CFE 30-2 VUUR**	2380	41	90	M30×1.5	35	37	100	67700	144000	—	—

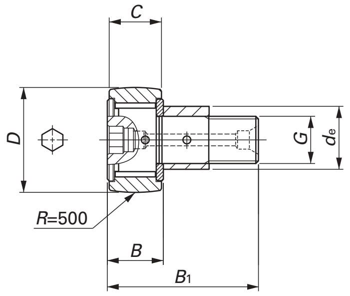
Remark : Collar dia. 9 to 13mm : No oil holes in the threaded end

CAM FOLLOWERS

Metric Dimension



CFE..VB



CFE..VBR

DIMENSION TABLE

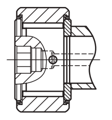
INTERCHANGE TABLE

IKO NUMBER CYLINDRICAL OUTER RING CFE..VB	IKO NUMBER CROWNED OUTER RING CFE..VBR	WEIGHT	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	INA	
		(g)	de	D	G	C	MAX. B	MAX. B1	(N)	(N)	CYLINDRICAL OUTER RING KRVE..XSK	CROWNED OUTER RING KRVE..SK
CFE 6 VB	**CFE 6 VBR**	21	9	16	M6×1	11	12.2	28.2	6980	8500	KRVE 16 XSK	KRVE 16 SK
CFE 8 VB	**CFE 8 VBR**	32.5	11	19	M8×1.25	11	12.2	32.2	8170	11200	KRVE 19 XSK	KRVE 19 SK
CFE 10 VB	**CFE 10 VBR**	50.5	13	22	M10×1.25	12	13.2	36.2	9570	14500	—	—
CFE 10 VBM	**CFE 10 VBRM**	50.5	13	22	M10×1	12	13.2	36.2	9570	14500	KRVE 22 XSK	KRVE 22 SK
CFE 10-1 VB	**CFE 10-1 VBR**	66	13	26	M10×1.25	12	13.2	36.2	9570	14500	—	—
CFE 10-1 VBM	**CFE 10-1 VBRM**	66	13	26	M10×1	12	13.2	36.2	9570	14500	KRVE 26 XSK	KRVE 26 SK
CFE 12 VB	**CFE 12 VBR**	107	16	30	M12×1.5	14	15.2	40.2	13500	19700	—	—
CFE 12-1 VB	**CFE 12-1 VBR**	117	16	32	M12×1.5	14	15.2	40.2	13500	19700	—	—
CFE 16 VB	**CFE 16 VBR**	193	22	35	M16×1.5	18	19.6	52.1	20700	37600	—	—
CFE 18 VB	**CFE 18 VBR**	285	24	40	M18×1.5	20	21.6	58.1	25300	51300	—	—
CFE 20 VB	**CFE 20 VBR**	505	27	52	M20×1.5	24	25.6	66.1	33200	64500	—	—
CFE 20-1 VB	**CFE 20-1 VBR**	430	27	47	M20×1.5	24	25.6	66.1	33200	64500	—	—
CFE 24 VB	**CFE 24 VBR**	900	33	62	M24×1.5	29	30.6	80.1	46600	92000	—	—
CFE 24-1 VB	**CFE 24-1 VBR**	1220	33	72	M24×1.5	29	30.6	80.1	46600	92000	—	—
CFE 30 VB	**CFE 30 VBR**	2030	41	80	M30×1.5	35	37	100	67700	144000	—	—
CFE 30-1 VB	**CFE 30-1 VBR**	2190	41	85	M30×1.5	35	37	100	67700	144000	—	—
CFE 30-2 VB	**CFE 30-2 VBR**	2380	41	90	M30×1.5	35	37	100	67700	144000	—	—

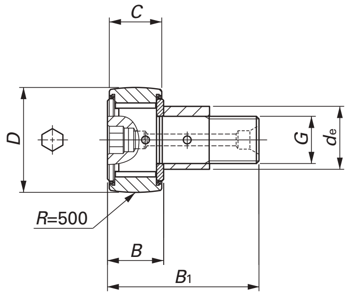
Remark : Collar dia. 9 to 13mm : No oil holes

CAM FOLLOWERS

Metric Dimension



CFE..VBUU



CFE..VBUUR

DIMENSION TABLE

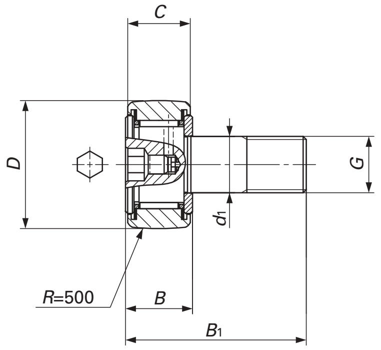
INTERCHANGE TABLE

IKO NUMBER CYLINDRICAL OUTER RING **CFE..VBUU**	**IKO** NUMBER CROWNED OUTER RING **CFE..VBUUR**	WEIGHT (g)	DIMENSIONS (mm) de	D	G	C	MAX. B	MAX. B1	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	INA CYLINDRICAL OUTER RING KRVE..PPXSK	INA CROWNED OUTER RING KRVE..PPSK
CFE 6 VBUU	**CFE 6 VBUUR**	21	9	16	M6×1	11	12.2	28.2	6980	8500	KRVE 16 PPXSK	KRVE 16 PPSK
CFE 8 VBUU	**CFE 8 VBUUR**	32.5	11	19	M8×1.25	11	12.2	32.2	8170	11200	KRVE 19 PPXSK	KRVE 19 PPSK
CFE 10 VBUU	**CFE 10 VBUUR**	50.5	13	22	M10×1.25	12	13.2	36.2	9570	14500	—	—
CFE 10 VBUUM	**CFE 10 VBUURM**	50.5	13	22	M10×1	12	13.2	36.2	9570	14500	KRVE 22 PPXSK	KRVE 22 PPSK
CFE 10-1 VBUU	**CFE 10-1 VBUUR**	66	13	26	M10×1.25	12	13.2	36.2	9570	14500	—	—
CFE 10-1 VBUUM	**CFE 10-1 VBUURM**	66	13	26	M10×1	12	13.2	36.2	9570	14500	KRVE 26 PPXSK	KRVE 26 PPSK
CFE 12 VBUU	**CFE 12 VBUUR**	107	16	30	M12×1.5	14	15.2	40.2	13500	19700	—	—
CFE 12-1 VBUU	**CFE 12-1 VBUUR**	117	16	32	M12×1.5	14	15.2	40.2	13500	19700	—	—
CFE 16 VBUU	**CFE 16 VBUUR**	193	22	35	M16×1.5	18	19.6	52.1	20700	37600	—	—
CFE 18 VBUU	**CFE 18 VBUUR**	285	24	40	M18×1.5	20	21.6	58.1	25300	51300	—	—
CFE 20 VBUU	**CFE 20 VBUUR**	505	27	52	M20×1.5	24	25.6	66.1	33200	64500	—	—
CFE 20-1 VBUU	**CFE 20-1 VBUUR**	430	27	47	M20×1.5	24	25.6	66.1	33200	64500	—	—
CFE 24 VBUU	**CFE 24 VBUUR**	900	33	62	M24×1.5	29	30.6	80.1	46600	92000	—	—
CFE 24-1 VBUU	**CFE 24-1 VBUUR**	1220	33	72	M24×1.5	29	30.6	80.1	46600	92000	—	—
CFE 30 VBUU	**CFE 30 VBUUR**	2030	41	80	M30×1.5	35	37	100	67700	144000	—	—
CFE 30-1 VBUU	**CFE 30-1 VBUUR**	2190	41	85	M30×1.5	35	37	100	67700	144000	—	—
CFE 30-2 VBUU	**CFE 30-2 VBUUR**	2380	41	90	M30×1.5	35	37	100	67700	144000	—	—

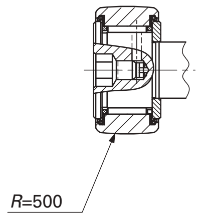
Remark : Collar dia. 9 to 13mm : No oil holes

CAM FOLLOWERS THRUST DISK TYPE

Metric Dimension



CF...WBR



CF...WBUUR

DIMENSION TABLE

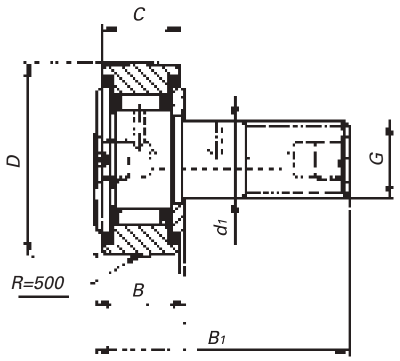
IKO NUMBER		WEIGHT	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING
SHIELD TYPE	SEALED TYPE	(g)	d1	D	G	C	MAX.B	MAX.B1	(N)	(N)
CF 3WBR	**CF 3WBUUR**	4.3	3	10	M 3×0.5	7	8	17	1500	1020
CF 4WBR	**CF 4WBUUR**	7.4	4	12	M 4×0.7	8	9	20	2070	1590
CF 5WBR	**CF 5WBUUR**	10.3	5	13	M 5×0.8	9	10	23	2520	2140
CF 6WBR	**CF 6WBUUR**	18.5	6	16	M 6×1	11	12.2	28.2	3660	3650
CF 8WBR	**CF 8WBUUR**	28.5	8	19	M 8×1.25	11	12.2	32.2	4250	4740
CF 10WBR	**CF 10WBUUR**	45	10	22	M 10×1.25	12	13.2	36.2	5430	6890
CF 10-1WBR	**CF 10-1WBUUR**	60	10	26	M 10×1.25	12	13.2	36.2	5430	6890
CF 12WBR	**CF 12WBUUR**	95	12	30	M 12×1.5	14	15.2	40.2	7910	9790
CF 12-1WBR	**CF 12-1WBUUR**	105	12	32	M 12×1.5	14	15.2	40.2	7910	9790
CF 16WBR	**CF 16WBUUR**	170	16	35	M 16×1.5	18	19.6	52.1	12000	18300
CF 18WBR	**CF 18WBUUR**	250	18	40	M 18×1.5	20	21.6	58.1	14800	25200
CF 20WBR	**CF 20WBUUR**	460	20	52	M 20×1.5	24	25.6	66.1	20700	34600
CF 20-1WBR	**CF 20-1WBUUR**	385	20	47	M 20×1.5	24	25.6	66.1	20700	34600

IKO

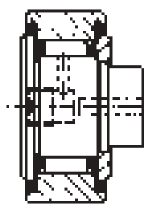
CF-RU1,CF-FU1

CAM FOLLOWERS
CENTRALIZED LUBRICATION TYPE

Metric Dimension



CF-RU1



CF-FU1

DIMENSION TABLE

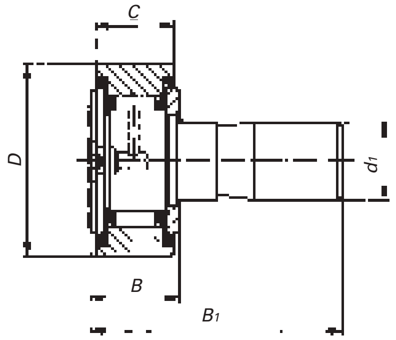
IKO NUMBER		WEIGHT	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
CROWNED OUTER RING	CYLINDRCAL OUTER RING	(g)	d1	D	G	C	MAX.B	MAX.B1		
CF-RU1-6	**CF-FU1-6**	18.5	6	16	M 6×1	11	12.2	28.2	3660	3650
CF-RU1-8	**CF-FU1-8**	28.5	8	19	M 8×1.25	11	12.2	32.2	4250	4740
CF-RU1-10	**CF-FU1-10**	45	10	22	M 10×1.25	12	13.2	36.2	5430	6890
CF-RU1-10-1	**CF-FU1-10-1**	60	10	26	M 10×1.25	12	13.2	36.2	5430	6890
CF-RU1-12	**CF-FU1-12**	95	12	30	M 12×1.5	14	15.2	40.2	7910	9790
CF-RU1-12-1	**CF-FU1-12-1**	105	12	32	M 12×1.5	14	15.2	40.2	7910	9790
CF-RU1-16	**CF-FU1-16**	170	16	35	M 16×1.5	18	19.6	52.1	12000	18300
CF-RU1-18	**CF-FU1-18**	250	18	40	M 18×1.5	20	21.6	58.1	14800	25200
CF-RU1-20	**CF-FU1-20**	460	20	52	M 20×1.5	24	25.6	66.1	20700	34600
CF-RU1-20-1	**CF-FU1-20-1**	385	20	47	M 20×1.5	24	25.6	66.1	20700	34600
CF-RU1-24	**CF-FU1-24**	815	24	62	M 24×1.5	29	30.6	80.1	30500	52000
CF-RU1-24-1	**CF-FU1-24-1**	1140	24	72	M 24×1.5	29	30.6	80.1	30500	52000
CF-RU1-30	**CF-FU1-30**	1870	30	80	M 30×1.5	35	37	100	45400	85100
CF-RU1-30-1	**CF-FU1-30-1**	2030	30	85	M 30×1.5	35	37	100	45400	85100
CF-RU1-30-2	**CF-FU1-30-2**	2220	30	90	M 30×1.5	35	37	100	45400	85100

IKO

CF-SFU

CAM FOLLOWERS
EASY MOUNTING TYPE

Metric Dimension



CF–SFU

DIMENSION TABLE

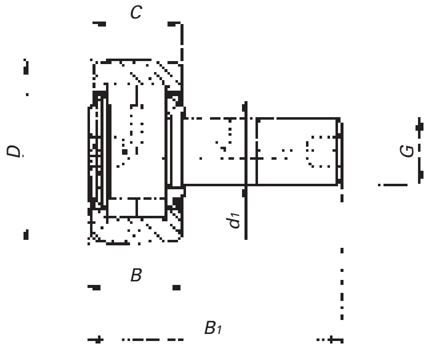
IKO NUMBER	WEIGHT	DIMENSIONS (mm)					BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING
	(g)	d1	D	C	MAX.B	MAX.B1	(N)	(N)
CF-SFU-6	19.5	6	16	11	12.2	32	3660	3650
CF-SFU-8	29	8	19	11	12.2	32	4250	4740
CF-SFU-10	44	10	22	12	13.2	33	5430	6890
CF-SFU-10-1	59	10	26	12	13.2	33	5430	6890
CF-SFU-12	94	12	30	14	15.2	35	7910	9790
CF-SFU-12-1	104	12	32	14	15.2	35	7910	9790
CF-SFU-16	164	16	35	18	19.6	44.5	12000	18300
CF-SFU-18	235	18	40	20	21.6	46.5	14800	25200
CF-SFU-20	435	20	52	24	25.6	50.5	20700	34600
CF-SFU-20-1	360	20	47	24	25.6	50.5	20700	34600

IKO

NUCF

CYLINDRICAL ROLLER CAM FOLLOWERS

Metric Dimension



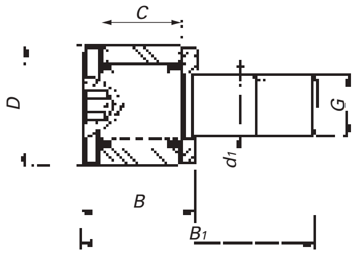
NUCF...R

DIMENSION TABLE

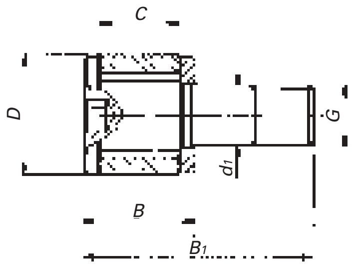
IKO NUMBER	WEIGHT	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	INA		MCGILL	
	(g)	d1	D	G	C	MAX.B	MAX.B1			CYLINDRICAL OUTER RING NUKR..X	CROWNED OUTER RING NUKR	CYLINDRICAL OUTER RING MCFD..X	CROWNED OUTER RING MCFD
NUCF10R	44	10	22	M 10×1.25	12	13.2	36.2	10400	11500	—	—	—	—
NUCF10-1R	58	10	26	M 10×1.25	12	13.2	36.2	10400	11500	—	—	—	—
NUCF12R	86	12	30	M 12×1.5	14	15.2	40.2	14000	13400	—	—	—	—
NUCF12-1R	97	12	32	M 12×1.5	14	15.2	40.2	14000	13400	—	—	—	—
NUCF16R	167	16	35	M 16×1.5	18	19.6	52.1	23400	27300	NUKR 35 X	NUKR 35	MCFD 35 X	MCFD 35
NUCF18R	244	18	40	M 18×1.5	20	21.6	58.1	25200	30900	NUKR 40 X	NUKR 40	MCFD 40 X	MCFD 40
NUCF20R	457	20	52	M 20×1.5	24	25.6	66.1	43100	58100	NUKR 52 X	NUKR 52	MCFD 52 X	MCFD 52
NUCF20-1R	384	20	47	M 20×1.5	24	25.6	66.1	38900	49000	NUKR 47 X	NUKR 47	MCFD 47 X	MCFD 47
NUCF24R	789	24	62	M 24×1.5	29	30.6	80.1	58200	75300	NUKR 62 X	NUKR 62	MCFD 62 X	MCFD 62
NUCF24-1R	1020	24	72	M 24×1.5	29	30.6	80.1	63900	88800	NUKR 72 X	NUKR 72	MCFD 72 X	MCFD 72
NUCF30R	1600	30	80	M 30×1.5	35	37	100	90300	121000	NUKR 80 X	NUKR 80	MCFD 80 X	MCFD 80
NUCF30-2R	1970	30	90	M 30×1.5	35	37	100	90300	121000	NUKR 90 X	NUKR 90	MCFD 90 X	MCFD 90

CAM FOLLOWERS MINIATURE TYPE

Metric Dimension



CFS



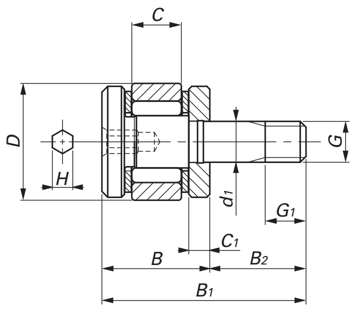
CFS...V

DIMENSION TABLE

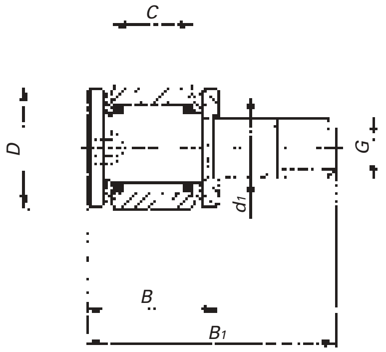
IKO NUMBER		WEIGHT	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
CAGED TYPE	FULL.COMP	(g)	d1	D	G	C	MAX.B	MAX.B1		
CFS 2		0.6	2	4.5	M 2×0.4	2.5	4	8	288	202
—	**CFS 2 V**	0.6	2	4.5	M 2×0.4	2.5	4	8	768	734
CFS 2.5		1	2.5	5	M 2.5×0.45	3	4.5	9.5	428	351
—	**CFS 2.5 V**	1	2.5	5	M 2.5×0.45	3	4.5	9.5	1000	1080
CFS 3		2	3	6	M 3×0.5	4	5.5	11.5	629	611
—	**CFS 3 V**	2	3	6	M 3×0.5	4	5.5	11.5	1420	1790
CFS 4		4	4	8	M 4×0.7	5	7	15	1120	1120
—	**CFS 4 V**	4	4	8	M 4×0.7	5	7	15	2370	3000
CFS 5		7	5	10	M 5×0.8	6	8	18	1570	1850
—	**CFS 5 V**	7	5	10	M 5×0.8	6	8	18	3180	4700
CFS 6		13	6	12	M 6×1	7	9.5	21.5	2090	2200
—	**CFS 6 V**	13	6	12	M 6×1	7	9.5	21.5	4610	6250

CAM FOLLOWERS MINIATURE THRUST DISK TYPE

Metric Dimension



CFS1.4...WV



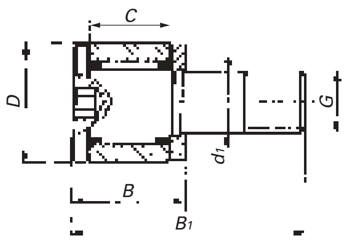
CFS...W

DIMENSION TABLE

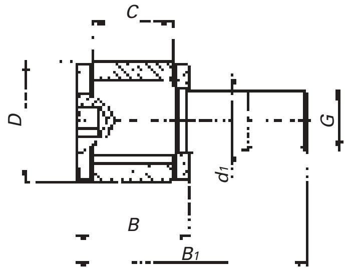
IKO NUMBER		WEIGHT	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING
CAGED TYPE	FULL.COMP	(g)	d1	D	G	C	MAX.B	MAX.B1	(N)	(N)
—	**CFS 1.4WV**	0.35	1.4	4	M 1.4×0.3	1.7	3.7	7	481	385
CFS 2W	—	0.6	2	4.5	M 2×0.4	2.5	4.5	8.5	288	202
CFS 2.5W	—	1	2.5	5	M 2.5×0.45	3	5	10	428	351
CFS 3W	—	2	3	6	M 3×0.5	4	6.5	12.5	629	611
CFS 4W	—	4	4	8	M 4×0.7	5	8	16	1120	1120
CFS 5W	—	7	5	10	M 5×0.8	6	9	19	1570	1850
CFS 6W	—	13	6	12	M 6×1	7	10.5	22.5	2090	2200

CAM FOLLOWERS
STAINLESS MINIATURE TYPE

Metric Dimension



CFS...F



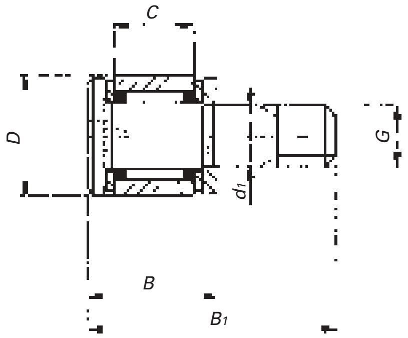
CFS...FV

DIMENSION TABLE

IKO NUMBER		WEIGHT	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
CAGED TYPE	FULL. COMP	(g)	d1	D	G	C	MAX.B	MAX.B1		
CFS 2 F		0.6	2	4.5	M 2×0.4	2.5	4	8	288	202
—	**CFS 2 FV**	0.6	2	4.5	M 2×0.4	2.5	4	8	768	734
CFS 2.5 F		1	2.5	5	M 2.5×0.45	3	4.5	9.5	342	281
—	**CFS 2.5 FV**	1	2.5	5	M 2.5×0.45	3	4.5	9.5	800	862
CFS 3 F		2	3	6	M 3×0.5	4	5.5	11.5	504	488
—	**CFS 3 FV**	2	3	6	M 3×0.5	4	5.5	11.5	1140	1430
CFS 4 F		4	4	8	M 4×0.7	5	7	15	897	894
—	**CFS 4 FV**	4	4	8	M 4×0.7	5	7	15	1900	2400
CFS 5 F		7	5	10	M 5×0.8	6	8	18	1250	1480
—	**CFS 5 FV**	7	5	10	M 5×0.8	6	8	18	2540	3760
CFS 6 F		13	6	12	M 6×1	7	9.5	21.5	1670	1760
—	**CFS 6 FV**	13	6	12	M 6×1	7	9.5	21.5	3690	5000

CAM FOLLOWERS
STAINLESS MINIATURE THRUST DISK TYPE

Metric Dimension



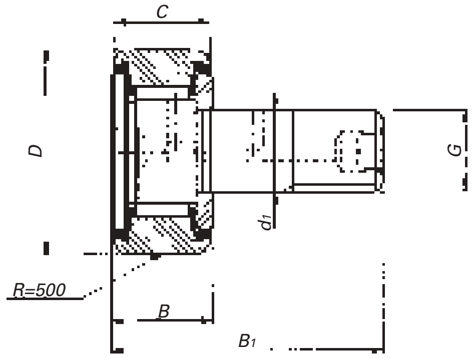
CFS...FW

DIMENSION TABLE

IKO NUMBER	WEIGHT	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING
	(g)	d1	D	G	C	MAX.B	MAX.B1	(N)	(N)
CFS 2FW	0.6	2	4.5	M 2×0.4	2.5	4.5	8.5	230	161
CFS 2.5FW	1	2.5	5	M 2.5×0.45	3	5	10	342	281
CFS 3FW	2	3	6	M 3×0.5	4	6.5	12.5	504	488
CFS 4FW	4	4	8	M 4×0.7	5	8	16	897	894
CFS 5FW	7	5	10	M 5×0.8	6	9	19	1250	1480
CFS 6FW	13	6	12	M 6×1	7	10.5	22.5	1670	1760

C-LUBE CAM FOLLOWERS

Metric Dimension



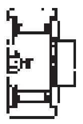
CF...WBUUR/SG

DIMENSION TABLE

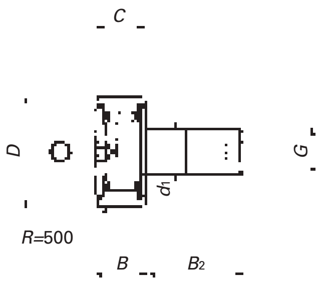
IKO NUMBER	WEIGHT	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING
	(g)	d1	D	G	C	MAX.B	MAX.B1	(N)	(N)
CF 5WBUUR/SG	10.3	5	13	M 5×0.8	9	10	23	2520	2140
CF 6WBUUR/SG	18.5	6	16	M 6×1	11	12.2	28.2	3660	3650
CF 8WBUUR/SG	28.5	8	19	M 8×1.25	11	12.2	32.2	4250	4740
CF 10WBUUR/SG	45	10	22	M 10×1.25	12	13.2	36.2	5430	6890
CF 10-1WBUUR/SG	60	10	26	M 10×1.25	12	13.2	36.2	5430	6890
CF 12WBUUR/SG	95	12	30	M 12×1.5	14	15.2	40.2	7910	9790
CF 12WBUUR/SG	105	12	32	M 12×1.5	14	15.2	40.2	7910	9790
CF 16WBUUR/SG	170	16	35	M 16×1.5	18	19.6	52.1	12000	18300
CF 18WBUUR/SG	250	18	40	M 18×1.5	20	21.6	58.1	14800	25200
CF 20WBUUR/SG	460	20	52	M 20×1.5	24	25.6	66.1	20700	34600
CF 20-1WBUUR/SG	385	20	47	M 20×1.5	24	25.6	66.1	20700	34600

CAM FOLLOWERS

Inch Dimension



CR..B



CR..BR

DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER	IKO NUMBER	WEIGHT	DIMENSIONS									BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	INA	
CYLINDRICAL OUTER RING **CR..B**	CROWNED OUTER RING **CR..BR**	(g)	d1		D		THREAD G UNF	B		B2		(N)	(N)	CYLINDRICAL OUTER RING CFC..SK	CROWNED OUTER RING CFC..YSK
			inch	mm	inch	mm		inch	mm	inch	mm				
CR 8 B	**CR 8 BR**	9	—	4.826	½	12.700	NO. 10-32	⅜	9.525	½	12.700	2520	2140	—	—
CR 8-1 B	**CR 8-1 BR**	10	—	4.826	½	12.700	NO. 10-32	13/32	10.319	⅝	15.875	2520	2140	CFC 8-1 SK	CFC 8-1 YSK
CR 10 B	**CR 10 BR**	19	¼	6.350	⅝	15.875	¼-28	7/16	11.112	⅝	15.875	3650	3670	—	—
CR 10-1 B	**CR 10-1 BR**	21	¼	6.350	⅝	15.875	¼-28	15/32	11.906	¾	19.050	3650	3670	CFC 10-1 SK	CFC 10-1 YSK
CR 12 B	**CR 12 BR**	35	⅜	9.525	¾	19.050	⅜-24	17/32	13.494	⅞	22.225	4420	5110	CFC 12 SK	CFC 12 YSK
CR 14 B	**CR 14 BR**	46	⅜	9.525	⅞	22.225	⅜-24	17/32	13.494	⅞	22.225	4790	5810	CFC 14 SK	CFC 14 YSK
CR 16 B	**CR 16 BR**	73	7/16	11.112	1	25.400	7/16-20	21/32	16.669	1	25.400	8810	10800	CFC 16 SK	CFC 16 YSK
CR 18 B	**CR 18 BR**	88	7/16	11.112	1⅛	28.575	7/16-20	21/32	16.669	1	25.400	9180	11600	CFC 18 SK	CFC 18 YSK
CR 20 B	**CR 20 BR**	132	½	12.700	1¼	31.750	½-20	25/32	19.844	1¼	31.750	14200	16000	CFC 20 SK	CFC 20 YSK
CR 22 B	**CR 22 BR**	157	½	12.700	1⅜	34.925	½-20	25/32	19.844	1¼	31.750	14200	16000	CFC 22 SK	CFC 22 YSK
CR 24 B	**CR 24 BR**	225	⅝	15.875	1½	38.100	⅝-18	29/32	23.019	1½	38.100	18600	24300	CFC 24 SK	CFC 24 YSK
CR 26 B	**CR 26 BR**	260	⅝	15.875	1⅝	41.275	⅝-18	29/32	23.019	1½	38.100	18600	24300	CFC 26 SK	CFC 26 YSK
CR 28 B	**CR 28 BR**	365	¾	19.050	1¾	44.450	¾-16	1 1/32	26.194	1¾	44.450	25100	38200	CFC 28 SK	CFC 28 YSK
CR 30 B	**CR 30 BR**	410	¾	19.050	1⅞	47.625	¾-16	1 1/32	26.194	1¾	44.450	25100	38200	CFC 30 SK	CFC 30 YSK
CR 32 B	**CR 32 BR**	615	⅞	22.225	2	50.800	⅞-14	1 9/32	32.544	2	50.800	32500	63900	CFC 32 SK	CFC 32 YSK
CR 36 B	**CR 36 BR**	750	⅞	22.225	2¼	57.150	⅞-14	1 9/32	32.544	2	50.800	32500	63900	CFC 36 SK	CFC 36 YSK

Remark : Outside dia. 1/2" and 5/8" : No oil holes in the threaded end

CAM FOLLOWERS

Inch Dimension

DIMENSION TABLE

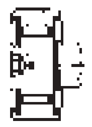
INTERCHANGE TABLE

IKO NUMBER CYLINDRICAL OUTER RING **CR**	IKO NUMBER CROWNED OUTER RING **CR..R**	WEIGHT	DIMENSIONS										BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	INA	
			d1		D		THREAD	B		B1				CYLINDRICAL OUTER RING CFC	CROWNED OUTER RING CFC..Y
		(g)	inch	mm	inch	mm	UNF	inch	mm	inch	mm	(N)	(N)		
CR 8	**CR 8 R**	9	—	4.826	1/2	12.700	NO. 10-32	3/8	9.525	7/8	22.225	2520	2140	—	—
CR 8-1	**CR 8-1 R**	10	—	4.826	1/2	12.700	NO. 10-32	13/32	10.319	1 1/32	26.194	2520	2140	CFC 8-1	CFC 8-1 Y
CR 10	**CR 10 R**	19	1/4	6.350	5/8	15.875	1/4-28	7/16	11.112	1 1/16	26.988	3650	3670	—	—
CR 10-1	**CR 10-1 R**	21	1/4	6.350	5/8	15.875	1/4-28	15/32	11.906	1 7/32	30.956	3650	3670	CFC 10-1	CFC 10-1 Y
CR 12	**CR 12 R**	35	3/8	9.525	3/4	19.050	3/8-24	17/32	13.494	1 13/32	35.719	4420	5110	CFC 12	CFC 12 Y
CR 14	**CR 14 R**	46	3/8	9.525	7/8	22.225	3/8-24	17/32	13.494	1 13/32	35.719	4790	5810	CFC 14	CFC 14 Y
CR 16	**CR 16 R**	73	7/16	11.112	1	25.400	7/16-20	21/32	16.669	1 21/32	42.069	8810	10800	CFC 16	CFC 16 Y
CR 18	**CR 18 R**	88	7/16	11.112	1 1/8	28.575	7/16-20	21/32	16.669	1 21/32	42.069	9180	11600	CFC 18	CFC 18 Y
CR 20	**CR 20 R**	132	1/2	12.700	1 1/4	31.750	1/2-20	25/32	19.844	2 1/32	51.594	14200	16000	CFC 20	CFC 20 Y
CR 22	**CR 22 R**	157	1/2	12.700	1 3/8	34.925	1/2-20	25/32	19.844	2 1/32	51.594	14200	16000	CFC 22	CFC 22 Y
CR 24	**CR 24 R**	225	5/8	15.875	1 1/2	38.100	5/8-18	29/32	23.019	2 13/32	61.119	18600	24300	CFC 24	CFC 24 Y
CR 26	**CR 26 R**	260	5/8	15.875	1 5/8	41.275	5/8-18	29/32	23.019	2 13/32	61.119	18600	24300	CFC 26	CFC 26 Y
CR 28	**CR 28 R**	365	3/4	19.050	1 3/4	44.450	3/4-16	1 1/32	26.194	2 25/32	70.644	25100	38200	CFC 28	CFC 28 Y
CR 30	**CR 30 R**	410	3/4	19.050	1 7/8	47.625	3/4-16	1 1/32	26.194	2 25/32	70.644	25100	38200	CFC 30	CFC 30 Y
CR 32	**CR 32 R**	615	7/8	22.225	2	50.800	7/8-14	1 9/32	32.544	3 9/32	83.344	32500	63900	CFC 32	CFC 32 Y
CR 36	**CR 36 R**	750	7/8	22.225	2 1/4	57.150	7/8-14	1 9/32	32.544	3 9/32	83.344	32500	63900	CFC 36	CFC 36 Y

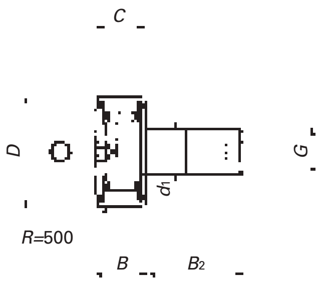
Remark : Outside dia. 1/2" and 5/8" : No oil holes in the threaded end

CAM FOLLOWERS

Inch Dimension



CR..BUU



CR..BUUR

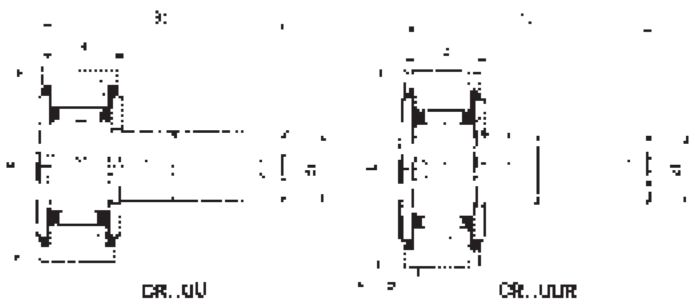
DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER CYLINDRICAL OUTER RING **CR..BUU**	IKO NUMBER CROWNED OUTER RING **CR..BUUR**	WEIGHT (g)	DIMENSIONS d1 inch	d1 mm	D inch	D mm	THREAD G UNF	B inch	B mm	B2 inch	B2 mm	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	INA CYLINDRICAL OUTER RING CFC..PPSK	INA CROWNED OUTER RING CFC..PPYSK
CR 8 BUU	**CR 8 BUUR**	9	—	4.826	½	12.700	NO. 10-32	⅜	9.525	½	12.700	2520	2140	—	—
CR 8-1 BUU	**CR 8-1 BUUR**	10	—	4.826	½	12.700	NO. 10-32	13/32	10.319	⅝	15.875	2520	2140	CFC 8-1 PPSK	CFC 8-1 PPYSK
CR 10 BUU	**CR 10 BUUR**	19	¼	6.350	⅝	15.875	¼-28	7/16	11.112	⅝	15.875	3650	3670	—	—
CR 10-1 BUU	**CR 10-1 BUUR**	21	¼	6.350	⅝	15.875	¼-28	15/32	11.906	¾	19.050	3650	3670	CFC 10-1 PPSK	CFC 10-1 PPYSK
CR 12 BUU	**CR 12 BUUR**	35	⅜	9.525	¾	19.050	⅜-24	17/32	13.494	⅞	22.225	4420	5110	CFC 12 PPSK	CFC 12 PPYSK
CR 14 BUU	**CR 14 BUUR**	46	⅜	9.525	⅞	22.225	⅜-24	17/32	13.494	⅞	22.225	4790	5810	CFC 14 PPSK	CFC 14 PPYSK
CR 16 BUU	**CR 16 BUUR**	73	7/16	11.112	1	25.400	7/16-20	21/32	16.669	1	25.400	8810	10800	CFC 16 PPSK	CFC 16 PPYSK
CR 18 BUU	**CR 18 BUUR**	88	7/16	11.112	1⅛	28.575	7/16-20	21/32	16.669	1	25.400	9180	11600	CFC 18 PPSK	CFC 18 PPYSK
CR 20 BUU	**CR 20 BUUR**	132	½	12.700	1¼	31.750	½-20	25/32	19.844	1¼	31.750	14200	16000	CFC 20 PPSK	CFC 20 PPYSK
CR 22 BUU	**CR 22 BUUR**	157	½	12.700	1⅜	34.925	½-20	25/32	19.844	1¼	31.750	14200	16000	CFC 22 PPSK	CFC 22 PPYSK
CR 24 BUU	**CR 24 BUUR**	225	⅝	15.875	1½	38.100	⅝-18	29/32	23.019	1½	38.100	18600	24300	CFC 24 PPSK	CFC 24 PPYSK
CR 26 BUU	**CR 26 BUUR**	260	⅝	15.875	1⅝	41.275	⅝-18	29/32	23.019	1½	38.100	18600	24300	CFC 26 PPSK	CFC 26 PPYSK
CR 28 BUU	**CR 28 BUUR**	365	¾	19.050	1¾	44.450	¾-16	1 1/32	26.194	1¾	44.450	25100	38200	CFC 28 PPSK	CFC 28 PPYSK
CR 30 BUU	**CR 30 BUUR**	410	¾	19.050	1⅞	47.625	¾-16	1 1/32	26.194	1¾	44.450	25100	38200	CFC 30 PPSK	CFC 30 PPYSK
CR 32 BUU	**CR 32 BUUR**	615	⅞	22.225	2	50.800	⅞-14	1 9/32	32.544	2	50.800	32500	63900	CFC 32 PPSK	CFC 32 PPYSK
CR 36 BUU	**CR 36 BUUR**	750	⅞	22.225	2¼	57.150	⅞-14	1 9/32	32.544	2	50.800	32500	63900	CFC 36 PPSK	CFC 36 PPYSK

Remark : Outside dia. 1/2" and 5/8" : No oil holes in the threaded end

CAM FOLLOWERS

Inch Dimension



DIMENSION TABLE

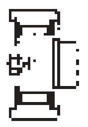
INTERCHANGE TABLE

IKO NUMBER CYLINDRICAL OUTER RING CR..UU	IKO NUMBER CROWNED OUTER RING CR..UUR	WEIGHT	DIMENSIONS										BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	INA	
			d1		D		THREAD	B		B1					CYLINDRICAL OUTER RING CFC..PP	CROWNED OUTER RING CFC..PPY
		(g)	inch	mm	inch	mm	UNF	inch	mm	inch	mm					
CR 8 UU	**CR 8 UUR**	9	—	4.826	1/2	12.700	NO. 10-32	3/8	9.525	7/8	22.225		2520	2140	—	—
CR 8-1 UU	**CR 8-1 UUR**	10	—	4.826	1/2	12.700	NO. 10-32	13/32	10.319	1 1/32	26.194		2520	2140	CFC 8-1 PP	CFC 8-1 PPY
CR 10 UU	**CR 10 UUR**	19	1/4	6.350	5/8	15.875	1/4-28	7/16	11.112	1 1/16	26.988		3650	3670	—	—
CR 10-1 UU	**CR 10-1 UUR**	21	1/4	6.350	5/8	15.875	1/4-28	15/32	11.906	1 7/32	30.956		3650	3670	CFC 10-1 PP	CFC 10-1 PPY
CR 12 UU	**CR 12 UUR**	35	3/8	9.525	3/4	19.050	3/8-24	17/32	13.494	1 13/32	35.719		4420	5110	CFC 12 PP	CFC 12 PPY
CR 14 UU	**CR 14 UUR**	46	3/8	9.525	7/8	22.225	3/8-24	17/32	13.494	1 13/32	35.719		4790	5810	CFC 14 PP	CFC 14 PPY
CR 16 UU	**CR 16 UUR**	73	7/16	11.112	1	25.400	7/16-20	21/32	16.669	1 21/32	42.069		8810	10800	CFC 16 PP	CFC 16 PPY
CR 18 UU	**CR 18 UUR**	88	7/16	11.112	1 1/8	28.575	7/16-20	21/32	16.669	1 21/32	42.069		9180	11600	CFC 18 PP	CFC 18 PPY
CR 20 UU	**CR 20 UUR**	132	1/2	12.700	1 1/4	31.750	1/2-20	25/32	19.844	2 1/32	51.594		14200	16000	CFC 20 PP	CFC 20 PPY
CR 22 UU	**CR 22 UUR**	157	1/2	12.700	1 3/8	34.925	1/2-20	25/32	19.844	2 1/32	51.594		14200	16000	CFC 22 PP	CFC 22 PPY
CR 24 UU	**CR 24 UUR**	225	5/8	15.875	1 1/2	38.100	5/8-18	29/32	23.019	2 13/32	61.119		18600	24300	CFC 24 PP	CFC 24 PPY
CR 26 UU	**CR 26 UUR**	260	5/8	15.875	1 5/8	41.275	5/8-18	29/32	23.019	2 13/32	61.119		18600	24300	CFC 26 PP	CFC 26 PPY
CR 28 UU	**CR 28 UUR**	365	3/4	19.050	1 3/4	44.450	3/4-16	1 1/32	26.194	2 25/32	70.644		25100	38200	CFC 28 PP	CFC 28 PPY
CR 30 UU	**CR 30 UUR**	410	3/4	19.050	1 7/8	47.625	3/4-16	1 1/32	26.194	2 25/32	70.644		25100	38200	CFC 30 PP	CFC 30 PPY
CR 32 UU	**CR 32 UUR**	615	7/8	22.225	2	50.800	7/8-14	1 9/32	32.544	3 9/32	83.344		32500	63900	CFC 32 PP	CFC 32 PPY
CR 36 UU	**CR 36 UUR**	750	7/8	22.225	2 1/4	57.150	7/8-14	1 9/32	32.544	3 9/32	83.344		32500	63900	CFC 36 PP	CFC 36 PPY

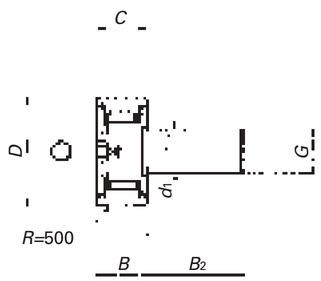
Remark : Outside dia. 1/2" and 5/8" : No oil holes in the threaded end

CAM FOLLOWERS

Inch Dimension



CR..VB



CR..VBR

DIMENSION TABLE

IKO NUMBER CYLINDRICAL OUTER RING CR..VB	IKO NUMBER CROWNED OUTER RING CR..VBR	WEIGHT (g)	DIMENSIONS									BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
			d1		D		THREAD G UNF	B		B2			
			inch	mm	inch	mm		inch	mm	inch	mm		
CR 8 VB	**CR 8 VBR**	9	—	4.826	½	12.700	NO. 10-32	⅜	9.525	½	12.700	4260	4750
CR 8-1 VB	**CR 8-1 VBR**	10	—	4.826	½	12.700	NO. 10-32	13/32	10.319	⅝	15.875	4710	5410
CR 10 VB	**CR 10 VBR**	19	¼	6.350	⅝	15.875	¼-28	7/16	11.112	⅝	15.875	5830	7660
CR 10-1 VB	**CR 10-1 VBR**	21	¼	6.350	⅝	15.875	¼-28	15/32	11.906	¾	19.050	6340	8530
CR 12 VB	**CR 12 VBR**	35	⅜	9.525	¾	19.050	⅜-24	17/32	13.494	⅞	22.225	8710	12300
CR 14 VB	**CR 14 VBR**	46	⅜	9.525	⅞	22.225	⅜-24	17/32	13.494	⅞	22.225	8710	12300
CR 16 VB	**CR 16 VBR**	73	7/16	11.112	1	25.400	7/16-20	21/32	16.669	1	25.400	13100	22700
CR 18 VB	**CR 18 VBR**	88	7/16	11.112	1⅛	28.575	7/16-20	21/32	16.669	1	25.400	13100	22700
CR 20 VB	**CR 20 VBR**	132	½	12.700	1¼	31.750	½-20	25/32	19.844	1¼	31.750	23600	31700
CR 22 VB	**CR 22 VBR**	157	½	12.700	1⅜	34.925	½-20	25/32	19.844	1¼	31.750	23600	31700
CR 24 VB	**CR 24 VBR**	225	⅝	15.875	1½	38.100	⅝-18	29/32	23.019	1½	38.100	28200	40100
CR 26 VB	**CR 26 VBR**	260	⅝	15.875	1⅝	41.275	⅝-18	29/32	23.019	1½	38.100	28200	40100
CR 28 VB	**CR 28 VBR**	365	¾	19.050	1¾	44.450	¾-16	1 1/32	26.194	1¾	44.450	35300	55600
CR 30 VB	**CR 30 VBR**	410	¾	19.050	1⅞	47.625	¾-16	1 1/32	26.194	1¾	44.450	35300	55600
CR 32 VB	**CR 32 VBR**	615	⅞	22.225	2	50.800	⅞-14	1 9/32	32.544	2	50.800	45700	80600
CR 36 VB	**CR 36 VBR**	750	⅞	22.225	2¼	57.150	⅞-14	1 9/32	32.544	2	50.800	45700	80600

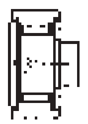
INTERCHANGE TABLE

TORRINGTON		INA		MCGILL	
CYLINDRICAL OUTER RING CRB	CROWNED OUTER RING CRBC	CYLINDRICAL OUTER RING CF..SK	CROWNED OUTER RING CF..YSK	CYLINDRICAL OUTER RING CF..B	CROWNED OUTER RING CCF..B
CRB-8	CRBC-8	—	—	CF-½-N-B	CCF-½-N-B
CRB-8-1	CRBC-8-1	CF 8-1 SK	CF 8-1 YSK	CF-½-B	CCF-½-B
CRB-10	CRBC-10	—	—	CF-⅝-N-B	CCF-⅝-N-B
CRB-10-1	CRBC-10-1	CF 10-1 SK	CF 10-1 YSK	CF-⅝-B	CCF-⅝-B
CRB-12	CRBC-12	CF 12 SK	CF 12 YSK	CF-¾-B	CCF-¾-B
CRB-14	CRBC-14	CF 14 SK	CF 14 YSK	CF-⅞-B	CCF-⅞-B
CRB-16	CRBC-16	CF 16 SK	CF 16 YSK	CF-1-B	CCF-1-B
CRB-18	CRBC-18	CF 18 SK	CF 18 YSK	CF-1⅛-B	CCF-1⅛-B
CRB-20	CRBC-20	CF 20 SK	CF 20 YSK	CF-1¼-B	CCF-1¼-B
CRB-22	CRBC-22	CF 22 SK	CF 22 YSK	CF-1⅜-B	CCF-1⅜-B
CRB-24	CRBC-24	CF 24 SK	CF 24 YSK	CF-1½-B	CCF-1½-B
CRB-26	CRBC-26	CF 26 SK	CF 26 YSK	CF-1⅝-B	CCF-1⅝-B
CRB-28	CRBC-28	CF 28 SK	CF 28 YSK	CF-1¾-B	CCF-1¾-B
CRB-30	CRBC-30	CF 30 SK	CF 30 YSK	CF-1⅞-B	CCF-1⅞-B
CRB-32	CRBC-32	CF 32 SK	CF 32 YSK	CF-2-B	CCF-2-B
CRB-36	CRBC-36	CF 36 SK	CF 36 YSK	CF-2¼-B	CCF-2¼-B

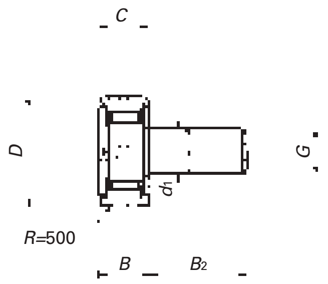
Remark : Outside dia. 1/2" and 5/8" : No oil holes in the threaded end

CAM FOLLOWERS

Inch Dimension



CR..V



CR..VR

DIMENSION TABLE

IKO NUMBER CYLINDRICAL OUTER RING CR..V	IKO NUMBER CROWNED OUTER RING CR..VR	WEIGHT (g)	DIMENSIONS d1 inch	d1 mm	D inch	D mm	THREAD G UNF	B inch	B mm	B2 inch	B2 mm	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
CR 8 V	**CR 8 VR**	9	—	4.826	½	12.700	NO. 10-32	⅜	9.525	½	12.700	4260	4750
CR 8-1 V	**CR 8-1 VR**	10	—	4.826	½	12.700	NO. 10-32	13⁄32	10.319	⅝	15.875	4710	5410
CR 10 V	**CR 10 VR**	19	¼	6.350	⅝	15.875	¼-28	7⁄16	11.112	⅝	15.875	5830	7660
CR 10-1 V	**CR 10-1 VR**	21	¼	6.350	⅝	15.875	¼-28	15⁄32	11.906	¾	19.050	6340	8530
CR 12 V	**CR 12 VR**	35	⅜	9.525	¾	19.050	⅜-24	17⁄32	13.494	⅞	22.225	8710	12300
CR 14 V	**CR 14 VR**	46	⅜	9.525	⅞	22.225	⅜-24	17⁄32	13.494	⅞	22.225	8710	12300
CR 16 V	**CR 16 VR**	73	7⁄16	11.112	1	25.400	7⁄16-20	21⁄32	16.669	1	25.400	13100	22700
CR 18 V	**CR 18 VR**	88	7⁄16	11.112	1⅛	28.575	7⁄16-20	21⁄32	16.669	1	25.400	13100	22700
CR 20 V	**CR 20 VR**	132	½	12.700	1¼	31.750	½-20	25⁄32	19.844	1¼	31.750	23600	31700
CR 22 V	**CR 22 VR**	157	½	12.700	1⅜	34.925	½-20	25⁄32	19.844	1¼	31.750	23600	31700
CR 24 V	**CR 24 VR**	225	⅝	15.875	1½	38.100	⅝-18	29⁄32	23.019	1½	38.100	28200	40100
CR 26 V	**CR 26 VR**	260	⅝	15.875	1⅝	41.275	⅝-18	29⁄32	23.019	1½	38.100	28200	40100
CR 28 V	**CR 28 VR**	365	¾	19.050	1¾	44.450	¾-16	1 1⁄32	26.194	1¾	44.450	35300	55600
CR 30 V	**CR 30 VR**	410	¾	19.050	1⅞	47.625	¾-16	1 1⁄32	26.194	1¾	44.450	35300	55600
CR 32 V	**CR 32 VR**	615	⅞	22.225	2	50.800	⅞-14	1 9⁄32	32.544	2	50.800	45700	80600
CR 36 V	**CR 36 VR**	750	⅞	22.225	2¼	57.150	⅞-14	1 9⁄32	32.544	2	50.800	45700	80600

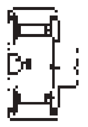
INTERCHANGE TABLE

TORRINGTON CYLINDRICAL OUTER RING CR	TORRINGTON CROWNED OUTER RING CRC	INA CYLINDRICAL OUTER RING CF	INA CROWNED OUTER RING CF..Y	MCGILL CYLINDRICAL OUTER RING CF	MCGILL CROWNED OUTER RING CCF
CR-8	CRC-8	—	—	CF-½-N	CCF-½-N
CR-8-1	CRC-8-1	CF 8-1	CF 8-1 Y	CF-½	CCF-½
CR-10	CRC-10	—	—	CF-⅝-N	CCF-⅝-N
CR-10-1	CRC-10-1	CF 10-1	CF 10-1 Y	CF-⅝	CCF-⅝
CR-12	CRC-12	CF 12	CF 12 Y	CF-¾	CCF-¾
CR-14	CRC-14	CF 14	CF 14 Y	CF-⅞	CCF-⅞
CR-16	CRC-16	CF 16	CF 16 Y	CF-1	CCF-1
CR-18	CRC-18	CF 18	CF 18 Y	CF-1⅛	CCF-1⅛
CR-20	CRC-20	CF 20	CF 20 Y	CF-1¼	CCF-1¼
CR-22	CRC-22	CF 22	CF 22 Y	CF-1⅜	CCF-1⅜
CR-24	CRC-24	CF 24	CF 24 Y	CF-1½	CCF-1½
CR-26	CRC-26	CF 26	CF 26 Y	CF-1⅝	CCF-1⅝
CR-28	CRC-28	CF 28	CF 28 Y	CF-1¾	CCF-1¾
CR-30	CRC-30	CF 30	CF 30 Y	CF-1⅞	CCF-1⅞
CR-32	CRC-32	CF 32	CF 32 Y	CF-2	CCF-2
CR-36	CRC-36	CF 36	CF 36 Y	CF-2¼	CCF-2¼

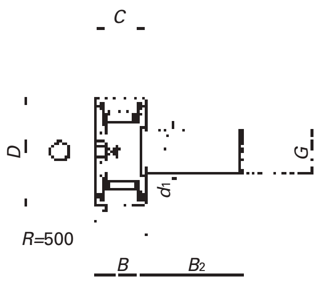
Remark : Outside dia. 1/2" and 5/8" : No oil holes in the threaded end

CAM FOLLOWERS

Inch Dimension



CR..VBUU



CR..VBUUR

DIMENSION TABLE

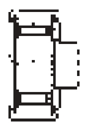
INTERCHANGE TABLE

IKO NUMBER CYLINDRICAL OUTER RING **CR..VBUU**	IKO NUMBER CROWNED OUTER RING **CR..VBUUR**	WEIGHT	DIMENSIONS									BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	TORRINGTON		INA		MCGILL	
			d1		D		THREAD G UNF	B		B2				CYLINDRICAL OUTER RING CRSB	CROWNED OUTER RING CRSBC	CYLINDRICAL OUTER RING CF..PPSK	CROWNED OUTER RING CF..PPYSK	CYLINDRICAL OUTER RING CF..SB	CROWNED OUTER RING CCF..SB
		(g)	inch	mm	inch	mm		inch	mm	inch	mm								
CR 8 VBUU	**CR 8 VBUUR**	9	—	4.826	½	12.700	NO. 10-32	⅜	9.525	½	12.700	4260	4750	CRSB-8	CRSBC-8	—	—	CF-½-N-SB	CCF-½-N-SB
CR 8-1 VBUU	**CR 8-1 VBUUR**	10	—	4.826	½	12.700	NO. 10-32	13⁄32	10.319	⅝	15.875	4710	5410	CRSB-8-1	CRSBC-8-1	CF 8-1 PPSK	CF 8-1 PPYSK	CF-½-SB	CCF-½-SB
CR 10 VBUU	**CR 10 VBUUR**	19	¼	6.350	⅝	15.875	¼-28	7⁄16	11.112	⅝	15.875	5830	7660	CRSB-10	CRSBC-10	—	—	CF-⅝-N-SB	CCF-⅝-N-SB
CR 10-1 VBUU	**CR 10-1 VBUUR**	21	¼	6.350	⅝	15.875	¼-28	15⁄32	11.906	¾	19.050	6340	8530	CRSB-10-1	CRSBC-10-1	CF 10-1 PPSK	CF 10-1 PPYSK	CF-⅝-SB	CCF-⅝-SB
CR 12 VBUU	**CR 12 VBUUR**	35	⅜	9.525	¾	19.050	⅜-24	17⁄32	13.494	⅞	22.225	8710	12300	CRSB-12	CRSBC-12	CF 12 PPSK	CF 12 PPYSK	CF-¾-SB	CCF-¾-SB
CR 14 VBUU	**CR 14 VBUUR**	46	⅜	9.525	⅞	22.225	⅜-24	17⁄32	13.494	⅞	22.225	8710	12300	CRSB-14	CRSBC-14	CF 14 PPSK	CF 14 PPYSK	CF-⅞-SB	CCF-⅞-SB
CR 16 VBUU	**CR 16 VBUUR**	73	7⁄16	11.112	1	25.400	7⁄16-20	21⁄32	16.669	1	25.400	13100	22700	CRSB-16	CRSBC-16	CF 16 PPSK	CF 16 PPYSK	CF-1-SB	CCF-1-SB
CR 18 VBUU	**CR 18 VBUUR**	88	7⁄16	11.112	1⅛	28.575	7⁄16-20	21⁄32	16.669	1	25.400	13100	22700	CRSB-18	CRSBC-18	CF 18 PPSK	CF 18 PPYSK	CF-1⅛-SB	CCF-1⅛-SB
CR 20 VBUU	**CR 20 VBUUR**	132	½	12.700	1¼	31.750	½-20	25⁄32	19.844	1¼	31.750	23600	31700	CRSB-20	CRSBC-20	CF 20 PPSK	CF 20 PPYSK	CF-1¼-SB	CCF-1¼-SB
CR 22 VBUU	**CR 22 VBUUR**	157	½	12.700	1⅜	34.925	½-20	25⁄32	19.844	1¼	31.750	23600	31700	CRSB-22	CRSBC-22	CF 22 PPSK	CF 22 PPYSK	CF-1⅜-SB	CCF-1⅜-SB
CR 24 VBUU	**CR 24 VBUUR**	225	⅝	15.875	1½	38.100	⅝-18	29⁄32	23.019	1½	38.100	28200	40100	CRSB-24	CRSBC-24	CF 24 PPSK	CF 24 PPYSK	CF-1½-SB	CCF-1½-SB
CR 26 VBUU	**CR 26 VBUUR**	260	⅝	15.875	1⅝	41.275	⅝-18	29⁄32	23.019	1½	38.100	28200	40100	CRSB-26	CRSBC-26	CF 26 PPSK	CF 26 PPYSK	CF-1⅝-SB	CCF-1⅝-SB
CR 28 VBUU	**CR 28 VBUUR**	365	¾	19.050	1¾	44.450	¾-16	1 1⁄32	26.194	1¾	44.450	35300	55600	CRSB-28	CRSBC-28	CF 28 PPSK	CF 28 PPYSK	CF-1¾-SB	CCF-1¾-SB
CR 30 VBUU	**CR 30 VBUUR**	410	¾	19.050	1⅞	47.625	¾-16	1 1⁄32	26.194	1¾	44.450	35300	55600	CRSB-30	CRSBC-30	CF 30 PPSK	CF 30 PPYSK	CF-1⅞-SB	CCF-1⅞-SB
CR 32 VBUU	**CR 32 VBUUR**	615	⅞	22.225	2	50.800	⅞-14	1 9⁄32	32.544	2	50.800	45700	80600	CRSB-32	CRSBC-32	CF 32 PPSK	CF 32 PPYSK	CF-2-SB	CCF-2-SB
CR 36 VBUU	**CR 36 VBUUR**	750	⅞	22.225	2¼	57.150	⅞-14	1 9⁄32	32.544	2	50.800	45700	80600	CRSB-36	CRSBC-36	CF 36 PPSK	CF 36 PPYSK	CF-2¼-SB	CCF-2¼-SB

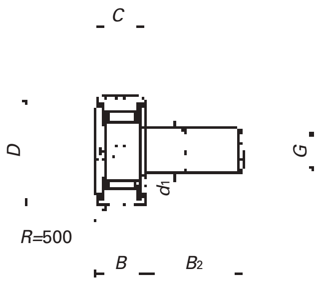
Remark : Outside dia. 1/2" and 5/8" : No oil holes in the threaded end

CAM FOLLOWERS

Inch Dimension



CR..VUU



CR..VUUR

DIMENSION TABLE

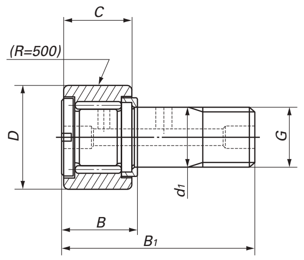
INTERCHANGE TABLE

IKO NUMBER CYLINDRICAL OUTER RING	IKO NUMBER CROWNED OUTER RING	WEIGHT	DIMENSIONS									BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	TORRINGTON		INA		MCGILL	
			d1		D		THREAD G UNF	B		B2				CYLINDRICAL OUTER RING	CROWNED OUTER RING	CYLINDRICAL OUTER RING	CROWNED OUTER RING	CYLINDRICAL OUTER RING	CROWNED OUTER RING
CR..VUU	**CR..VUUR**	(g)	inch	mm	inch	mm		inch	mm	inch	mm			CRS	CRSC	CF..PP	CF..PPY	CF..S	CCF..S
CR 8 VUU	**CR 8 VUUR**	9	—	4.826	½	12.700	NO. 10-32	⅜	9.525	½	12.700	4260	4750	CRS-8	CRSC-8	—	—	CF-½-N-S	CCF-½-N-S
CR 8-1 VUU	**CR 8-1 VUUR**	10	—	4.826	½	12.700	NO. 10-32	13/32	10.319	⅝	15.875	4710	5410	CRS-8-1	CRSC-8-1	CF 8-1 PP	CF 8-1 PPY	CF-½-S	CCF-½-S
CR 10 VUU	**CR 10 VUUR**	19	¼	6.350	⅝	15.875	¼-28	7/16	11.112	⅝	15.875	5830	7660	CRS-10	CRSC-10	—	—	CF-⅝-N-S	CCF-⅝-N-S
CR 10-1 VUU	**CR 10-1 VUUR**	21	¼	6.350	⅝	15.875	¼-28	15/32	11.906	¾	19.050	6340	8530	CRS-10-1	CRSC-10-1	CF 10-1 PP	CF 10-1 PPY	CF-⅝-S	CCF-⅝-S
CR 12 VUU	**CR 12 VUUR**	35	⅜	9.525	¾	19.050	⅜-24	17/32	13.494	⅞	22.225	8710	12300	CRS-12	CRSC-12	CF 12 PP	CF 12 PPY	CF-¾-S	CCF-¾-S
CR 14 VUU	**CR 14 VUUR**	46	⅜	9.525	⅞	22.225	⅜-24	17/32	13.494	⅞	22.225	8710	12300	CRS-14	CRSC-14	CF 14 PP	CF 14 PPY	CF-⅞-S	CCF-⅞-S
CR 16 VUU	**CR 16 VUUR**	73	7/16	11.112	1	25.400	7/16-20	21/32	16.669	1	25.400	13100	22700	CRS-16	CRSC-16	CF 16 PP	CF 16 PPY	CF-1-S	CCF-1-S
CR 18 VUU	**CR 18 VUUR**	88	7/16	11.112	1⅛	28.575	7/16-20	21/32	16.669	1	25.400	13100	22700	CRS-18	CRSC-18	CF 18 PP	CF 18 PPY	CF-1⅛-S	CCF-1⅛-S
CR 20 VUU	**CR 20 VUUR**	132	½	12.700	1¼	31.750	½-20	25/32	19.844	1¼	31.750	23600	31700	CRS-20	CRSC-20	CF 20 PP	CF 20 PPY	CF-1¼-S	CCF-1¼-S
CR 22 VUU	**CR 22 VUUR**	157	½	12.700	1⅜	34.925	½-20	25/32	19.844	1¼	31.750	23600	31700	CRS-22	CRSC-22	CF 22 PP	CF 22 PPY	CF-1⅜-S	CCF-1⅜-S
CR 24 VUU	**CR 24 VUUR**	225	⅝	15.875	1½	38.100	⅝-18	29/32	23.019	1½	38.100	28200	40100	CRS-24	CRSC-24	CF 24 PP	CF 24 PPY	CF-1½-S	CCF-1½-S
CR 26 VUU	**CR 26 VUUR**	260	⅝	15.875	1⅝	41.275	⅝-18	29/32	23.019	1½	38.100	28200	40100	CRS-26	CRSC-26	CF 26 PP	CF 26 PPY	CF-1⅝-S	CCF-1⅝-S
CR 28 VUU	**CR 28 VUUR**	365	¾	19.050	1¾	44.450	¾-16	1 1/32	26.194	1¾	44.450	35300	55600	CRS-28	CRSC-28	CF 28 PP	CF 28 PPY	CF-1¾-S	CCF-1¾-S
CR 30 VUU	**CR 30 VUUR**	410	¾	19.050	1⅞	47.625	¾-16	1 1/32	26.194	1¾	44.450	35300	55600	CRS-30	CRSC-30	CF 30 PP	CF 30 PPY	CF-1⅞-S	CCF-1⅞-S
CR 32 VUU	**CR 32 VUUR**	615	⅞	22.225	2	50.800	⅞-14	1 9/32	32.544	2	50.800	45700	80600	CRS-32	CRSC-32	CF 32 PP	CF 32 PPY	CF-2-S	CCF-2-S
CR 36 VUU	**CR 36 VUUR**	750	⅞	22.225	2¼	57.150	⅞-14	1 9/32	32.544	2	50.800	45700	80600	CRS-36	CRSC-36	CF 36 PP	CF 36 PPY	CF-2¼-S	CCF-2¼-S
CR 48 VUU	—	1960	1¼	31.750	3	76.200	1¼-12	1.83	46.400	2½	63.500	77600	172000	CRS-48	—	CF 48 PP	—	CF-3-S	—

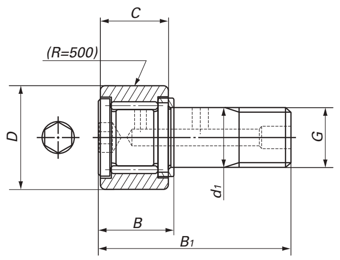
Remark : Outside dia. 1/2" and 5/8" : No oil holes in the threaded end

CAM FOLLOWERS

Inch series Super Duty Cam Followers



CRH-V(R)



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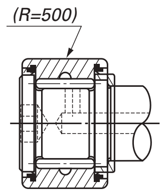


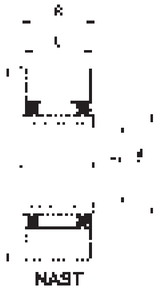
CRH-VBUU(R)

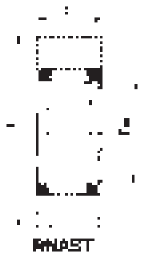
DIMENSION TABLE

IKO NUMBER SHIELD TYPE CYLINDRICAL OUTER RING CRH..V(B)	IKO NUMBER SHIELD TYPE CROWNED OUTER RING CRH..V(B)R	IKO NUMBER SEALED TYPE CYLINDRICAL OUTER RING CRH..V(B)UU	IKO NUMBER SEALED TYPE CROWNED OUTER RING CRH..V(B)UUR	WEIGHT	DIMENSIONS					DIMENSIONS						BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	MCGILL SHIELD TYPE		MCGILL SEALED TYPE	
					d1		D		G	C		MAX. B		MAX. B1				CYLINDRICAL OUTER RING CFH	CROWNED OUTER RING CCFH	CYLINDRICAL OUTER RING CFH..S(B)	CROWNED OUTER RING CCFH..S(B)
				(g)	inch	mm	inch	mm	UNF	inch	mm	inch	mm	inch	mm						
CRH 8-1 V(B)	**CRH 8-1 V(B)R**	**CRH 8-1 V(B)UU**	**CRH 8-1 V(B)UUR**	12	¼	6.350	½	12.700	¼-28	⅜	9.525	0.44	11.1	1.065	27.05	4710	5410	CFH ½(B)	CCFH ½(B)	CFH ½S(B)	CCFH ½S(B)
CRH 9 V(B)	**CRH 9 V(B)R**	**CRH 9 V(B)UU**	**CRH 9 V(B)UUR**	15	¼	6.350	9⁄16	14.288	¼-28	⅜	9.525	0.44	11.1	1.065	27.05	4710	5410	CFH 9⁄16(B)	CCFH 9⁄16(B)	CFH 9⁄16S(B)	CCFH 9⁄16S(B)
CRH 10-1 V(B)	**CRH 10-1 V(B)R**	**CRH 10-1 V(B)UU**	**CRH 10-1 V(B)UUR**	23	5⁄16	7.938	⅝	15.875	5⁄16-24	7⁄16	11.112	0.50	12.8	1.250	31.75	6340	8530	CFH ⅝(B)	CCFH ⅝(B)	CFH ⅝S(B)	CCFH ⅝S(B)
CRH 11 V(B)	**CRH 11 V(B)R**	**CRH 11 V(B)UU**	**CRH 11 V(B)UUR**	27	5⁄16	7.938	11⁄16	17.462	5⁄16-24	7⁄16	11.112	0.50	12.8	1.250	31.75	6340	8530	CFH 11⁄16(B)	CCFH 11⁄16(B)	CFH 11⁄16S(B)	CCFH 11⁄16S(B)
CRH 12 V(B)	**CRH 12 V(B)R**	**CRH 12 V(B)UU**	**CRH 12 V(B)UUR**	39	7⁄16	11.112	¾	19.050	7⁄16-20	½	12.700	0.57	14.6	1.445	36.70	8710	12300	CFH ¾(B)	CCFH ¾(B)	CFH ¾S(B)	CCFH ¾S(B)
CRH 14 V(B)	**CRH 14 V(B)R**	**CRH 14 V(B)UU**	**CRH 14 V(B)UUR**	49	7⁄16	11.112	⅞	22.225	7⁄16-20	½	12.700	0.57	14.6	1.445	36.70	8710	12300	CFH ⅞(B)	CCFH ⅞(B)	CFH ⅞S(B)	CCFH ⅞S(B)
CRH 16 V(B)	**CRH 16 V(B)R**	**CRH 16 V(B)UU**	**CRH 16 V(B)UUR**	93	⅝	15.875	1	25.400	⅝-18	⅝	15.875	0.70	17.9	1.700	43.18	13100	22700	CFH 1(B)	CCFH 1(B)	CFH 1S(B)	CCFH 1 S(B)
CRH 18 V(B)	**CRH 18 V(B)R**	**CRH 18 V(B)UU**	**CRH 18 V(B)UUR**	109	⅝	15.875	1⅛	28.575	⅝-18	⅝	15.875	0.70	17.9	1.700	43.18	13100	22700	CFH 1⅛(B)	CCFH 1⅛(B)	CFH 1⅛S(B)	CCFH 1⅛S(B)
CRH 20 V(B)	**CRH 20 V(B)R**	**CRH 20 V(B)UU**	**CRH 20 V(B)UUR**	176	¾	19.050	1¼	31.750	¾-16	¾	19.050	0.83	21.0	1.955	49.66	23600	31700	CFH 1¼(B)	CCFH 1¼(B)	CFH 1¼S(B)	CCFH 1¼S(B)
CRH 22 V(B)	**CRH 22 V(B)R**	**CRH 22 V(B)UU**	**CRH 22 V(B)UUR**	200	¾	19.050	1⅜	34.925	¾-16	¾	19.050	0.83	21.0	1.955	49.66	23600	31700	CFH 1⅜(B)	CCFH 1⅜(B)	CFH 1⅜S(B)	CCFH 1⅜S(B)
CRH 24 V(B)	**CRH 24 V(B)R**	**CRH 24 V(B)UU**	**CRH 24 V(B)UUR**	296	⅞	22.225	1½	38.100	⅞-14	⅞	22.225	0.96	24.3	2.460	62.48	28200	40100	CFH 1½(B)	CCFH 1½(B)	CFH 1½S(B)	CCFH 1½S(B)
CRH 26 V(B)	**CRH 26 V(B)R**	**CRH 26 V(B)UU**	**CRH 26 V(B)UUR**	329	⅞	22.225	1⅝	41.275	⅞-14	⅞	22.225	0.96	24.3	2.460	62.48	28200	40100	CFH 1⅝(B)	CCFH 1⅝(B)	CFH 1⅝S(B)	CCFH 1⅝S(B)
CRH 28 V(B)	**CRH 28 V(B)R**	**CRH 28 V(B)UU**	**CRH 28 V(B)UUR**	463	1	25.400	1¾	44.450	1-14UNS	1	25.400	1.08	27.4	2.830	71.88	35300	55600	CFH 1¾(B)	CCFH 1¾(B)	CFH 1¾S(B)	CCFH 1¾S(B)
CRH 30 V(B)	**CRH 30 V(B)R**	**CRH 30 V(B)UU**	**CRH 30 V(B)UUR**	508	1	25.400	1⅞	47.625	1-14UNS	1	25.400	1.08	27.4	2.830	71.88	35300	55600	CFH 1⅞(B)	CCFH 1⅞(B)	CFH 1⅞S(B)	CCFH 1⅞S(B)
CRH 32 V(B)	**CRH 32 V(B)R**	**CRH 32 V(B)UU**	**CRH 32 V(B)UUR**	722	1⅛	28.575	2	50.800	1⅛-12	1¼	31.750	1.35	34.2	3.350	85.09	45700	80600	CFH 2 (B)	CCFH 2 (B)	CFH 2 S(B)	CCFH 2 S(B)
CRH 36 V(B)	**CRH 36 V(B)R**	**CRH 36 V(B)UU**	**CRH 36 V(B)UUR**	858	1⅛	28.575	2¼	57.150	1⅛-12	1¼	31.750	1.35	34.2	3.350	85.09	45700	80600	CFH 2¼(B)	CCFH 2¼(B)	CFH 2¼S(B)	CCFH 2¼S(B)
CRH 40 V(B)	**CRH 40 V(B)R**	**CRH 40 V(B)UU**	**CRH 40 V(B)UUR**	1260	1¼	31.750	2½	63.500	1¼-12	1½	38.100	1.57	40.0	3.820	97.03	61400	116000	CFH 2½(B)	CCFH 2½(B)	CFH 2½S(B)	CCFH 2½S(B)
CRH 44 V(B)	**CRH 44 V(B)R**	**CRH 44 V(B)UU**	**CRH 44 V(B)UUR**	1460	1¼	31.750	2¾	69.850	1¼-12	1½	38.100	1.57	40.0	3.820	97.03	61400	116000	CFH 2¾(B)	CCFH 2¾(B)	CFH 2¾S(B)	CCFH 2¾S(B)
CRH 48 V(B)	**CRH 48 V(B)R**	**CRH 48 V(B)UU**	**CRH 48 V(B)UUR**	2100	1½	38.100	3	76.200	1½-12	1¾	44.450	1.83	46.4	4.330	109.98	77600	172000	CFH 3(B)	CCFH 3(B)	CFH 3S(B)	CCFH 3 S(B)
CRH 52 V(B)	**CRH 52 V(B)R**	**CRH 52 V(B)UU**	**CRH 52 V(B)UUR**	2380	1½	38.100	3¼	82.550	1½-12	1¾	44.450	1.83	46.4	4.330	109.98	77600	172000	CFH 3¼(B)	CCFH 3¼(B)	CFH 3¼S(B)	CCFH 3¼S(B)
CRH 56 V(B)	**CRH 56 V(B)R**	**CRH 56 V(B)UU**	**CRH 56 V(B)UUR**	3240	1¾	44.450	3½	88.900	1¾-12UN	2	50.800	2.08	52.8	4.830	122.68	111000	239000	CFH 3½(B)	CCFH 3½(B)	CFH 3½S(B)	CCFH 3½S(B)
CRH 64 V(B)	**CRH 64 V(B)R**	**CRH 64 V(B)UU**	**CRH 64 V(B)UUR**	4960	2	50.800	4	101.600	2-12UN	2¼	57.150	2.34	59.4	5.840	148.34	142000	317000	CFH 4(B)	CCFH 4(B)	CFH 4S(B)	CCFH 4 S(B)

ROLLER FOLLOWERS

Metric Dimension





DIMENSION TABLE

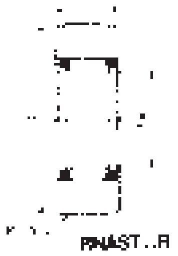
IKO NUMBER WITH INNER RING **NAST**	WEIGHT (g)	IKO NUMBER WITHOUT INNER RING **RNAST**	WEIGHT (g)	DIMENSIONS (mm)					BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
				d	Fw	D	C	B		
—	—	**RNAST 5**	8.9	—	7	16	7.8	—	2710	2390
NAST 6	17.8	**RNAST 6**	13.9	6	10	19	9.8	10	4160	4550
NAST 8	28	**RNAST 8**	23.5	8	12	24	9.8	10	5650	5890
NAST 10	49.5	**RNAST 10**	42.5	10	14	30	11.8	12	9790	9680
NAST 12	58	**RNAST 12**	49.5	12	16	32	11.8	12	10500	10900
NAST 15	62	**RNAST 15**	50	15	20	35	11.8	12	12400	14300
NAST 17	109	**RNAST 17**	90	17	22	40	15.8	16	17600	20900
NAST 20	157	**RNAST 20**	135	20	25	47	15.8	16	19400	24500
NAST 25	180	**RNAST 25**	152	25	30	52	15.8	16	20800	28400
NAST 30	320	**RNAST 30**	255	30	38	62	19.8	20	30500	45400
NAST 35	440	**RNAST 35**	375	35	42	72	19.8	20	32400	50600
NAST 40	530	**RNAST 40**	420	40	50	80	19.8	20	35900	61100
NAST 45	580	**RNAST 45**	460	45	55	85	19.8	20	37400	66400
NAST 50	635	**RNAST 50**	500	50	60	90	19.8	20	38900	71700

INTERCHANGE TABLE

INA		SKF		FAG	
WITH INNER RING STO..X	WITHOUT INNER RING RSTO..X	WITH INNER RING STO..X	WITHOUT INNER RING RSTO..X	WITH INNER RING STO..DZ	WITHOUT INNER RING RSTO..DZ
—	RSTO 5 TNX	—	RSTO 5 XTN	—	RSTO 5 DZ.TN
STO 6 TNX	RSTO 6 TNX	STO 6 XTN	RSTO 6 XTN	STO 6 DZ	RSTO 6 DZ
STO 8 TNX	RSTO 8 TNX	STO 8 XTN	RSTO 8 XTN	STO 8 DZ	RSTO 8 DZ
STO 10 X	RSTO 10 X	STO 10 X	RSTO 10 X	STO 10 DZ	RSTO 10 DZ
STO 12 X	RSTO 12 X	STO 12 X	RSTO 12 X	STO 12 DZ	RSTO 12 DZ
STO 15 X	RSTO 15 X	STO 15 X	RSTO 15 X	STO 15 DZ	RSTO 15 DZ
STO 17 X	RSTO 17 X	STO 17 X	RSTO 17 X	STO 17 DZ	RSTO 17 DZ
STO 20 X	RSTO 20 X	STO 20 X	RSTO 20 X	STO 20 DZ	RSTO 20 DZ
STO 25 X	RSTO 25 X	STO 25 X	RSTO 25 X	STO 25 DZ	RSTO 25 DZ
STO 30 X	RSTO 30 X	STO 30 X	RSTO 30 X	STO 30 DZ	RSTO 30 DZ
STO 35 X	RSTO 35 X	STO 35 X	RSTO 35 X	STO 35 DZ	RSTO 35 DZ
STO 40 X	RSTO 40 X	STO 40 X	RSTO 40 X	STO 40 DZ	RSTO 40 DZ
STO 45 X	RSTO 45 X	STO 45 X	RSTO 45 X	STO 45 DZ	RSTO 45 DZ
STO 50 X	RSTO 50 X	STO 50 X	RSTO 50 X	STO 50 DZ	RSTO 50 DZ

ROLLER FOLLOWERS

Metric Dimension



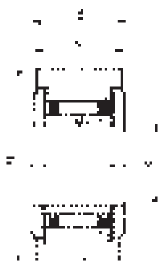
DIMENSION TABLE

INTERCHANGE TABLE

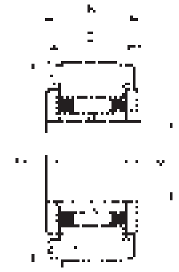
IKO NUMBER WITH INNER RING	WEIGHT	IKO NUMBER WITHOUT INNER RING	WEIGHT	DIMENSIONS (mm)					BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	INA		SKF		FAG	
NAST..R	(g)	RNAST..R	(g)	d	Fw	D	C	B	(N)	(N)	WITH INNER RING STO	WITHOUT INNER RING RSTO	WITH INNER RING STO	WITHOUT INNER RING RSTO	WITH INNER RING STO	WITHOUT INNER RING RSTO
—	—	**RNAST 5 R**	8.9	—	7	16	7.8	—	2710	2390	—	RSTO 5 TN	—	RSTO 5 TN	—	RSTO 5 TN
NAST 6 R	17.8	**RNAST 6 R**	13.9	6	10	19	9.8	10	4160	4550	STO 6 TN	RSTO 6 TN	STO 6 TN	RSTO 6 TN	STO 6	RSTO 6
NAST 8 R	28	**RNAST 8 R**	23.5	8	12	24	9.8	10	5650	5890	STO 8 TN	RSTO 8 TN	STO 8 TN	RSTO 8 TN	STO 8	RSTO 8
NAST 10 R	49.5	**RNAST 10 R**	42.5	10	14	30	11.8	12	9790	9680	STO 10	RSTO 10	STO 10	RSTO 10	STO 10	RSTO 10
NAST 12 R	58	**RNAST 12 R**	49.5	12	16	32	11.8	12	10500	10900	STO 12	RSTO 12	STO 12	RSTO 12	STO 12	RSTO 12
NAST 15 R	62	**RNAST 15 R**	50	15	20	35	11.8	12	12400	14300	STO 15	RSTO 15	STO 15	RSTO 15	STO 15	RSTO 15
NAST 17 R	109	**RNAST 17 R**	90	17	22	40	15.8	16	17600	20900	STO 17	RSTO 17	STO 17	RSTO 17	STO 17	RSTO 17
NAST 20 R	157	**RNAST 20 R**	135	20	25	47	15.8	16	19400	24500	STO 20	RSTO 20	STO 20	RSTO 20	STO 20	RSTO 20
NAST 25 R	180	**RNAST 25 R**	152	25	30	52	15.8	16	20800	28400	STO 25	RSTO 25	STO 25	RSTO 25	STO 25	RSTO 25
NAST 30 R	320	**RNAST 30 R**	255	30	38	62	19.8	20	30500	45400	STO 30	RSTO 30	STO 30	RSTO 30	STO 30	RSTO 30
NAST 35 R	440	**RNAST 35 R**	375	35	42	72	19.8	20	32400	50600	STO 35	RSTO 35	STO 35	RSTO 35	STO 35	RSTO 35
NAST 40 R	530	**RNAST 40 R**	420	40	50	80	19.8	20	35900	61100	STO 40	RSTO 40	STO 40	RSTO 40	STO 40	RSTO 40
NAST 45 R	580	**RNAST 45 R**	460	45	55	85	19.8	20	37400	66400	STO 45	RSTO 45	STO 45	RSTO 45	STO 45	RSTO 45
NAST 50 R	635	**RNAST 50 R**	500	50	60	90	19.8	20	38900	71700	STO 50	RSTO 50	STO 50	RSTO 50	STO 50	RSTO 50

ROLLER FOLLOWERS

Metric Dimension



NAST ZZ



NAST..ZZR

DIMENSION TABLE

IKO NUMBER CYLINDRICAL OUTER RING NAST..ZZ	IKO NUMBER CROWNED OUTER RING NAST..ZZR	WEIGHT	DIMENSIONS (mm)				BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING
		(g)	d	D	C	B	(N)	(N)
NAST 6 ZZ	**NAST 6 ZZR**	24.5	6	19	13.8	14	4160	4550
NAST 8 ZZ	**NAST 8 ZZR**	39	8	24	13.8	14	5650	5890
NAST 10 ZZ	**NAST 10 ZZR**	65	10	30	15.8	16	9790	9680
NAST 12 ZZ	**NAST 12 ZZR**	75	12	32	15.8	16	10500	10900
NAST 15 ZZ	**NAST 15 ZZR**	83	15	35	15.8	16	12400	14300
NAST 17 ZZ	**NAST 17 ZZR**	135	17	40	19.8	20	17600	20900
NAST 20 ZZ	**NAST 20 ZZR**	195	20	47	19.8	20	19400	24500
NAST 25 ZZ	**NAST 25 ZZR**	225	25	52	19.8	20	20800	28400
NAST 30 ZZ	**NAST 30 ZZR**	400	30	62	24.8	25	30500	45400
NAST 35 ZZ	**NAST 35 ZZR**	550	35	72	24.8	25	32400	50600
NAST 40 ZZ	**NAST 40 ZZR**	710	40	80	25.8	26	35900	61100
NAST 45 ZZ	**NAST 45 ZZR**	760	45	85	25.8	26	37400	66400
NAST 50 ZZ	**NAST 50 ZZR**	830	50	90	25.8	26	38900	71700

INTERCHANGE TABLE

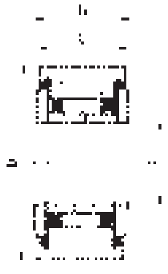
INA		FAG	
CYLINDRICAL OUTER RING NAST..P-2Z	CROWNED OUTER RING NAST..2Z	CYLINDRICAL OUTER RING STO..ZZ.DZ	CROWNED OUTER RING STO..ZZ
NAST 6 P-2Z	NAST 6-2Z	STO 6 ZZ.DZ	STO 6 ZZ
NAST 8 P-2Z	NAST 8-2Z	STO 8 ZZ.DZ	STO 8 ZZ
NAST 10 P-2Z	NAST 10-2Z	STO 10 ZZ.DZ	STO 10 ZZ
NAST 12 P-2Z	NAST 12-2Z	STO 12 ZZ.DZ	STO 12 ZZ
NAST 15 P-2Z	NAST 15-2Z	STO 15 ZZ.DZ	STO 15 ZZ
NAST 17 P-2Z	NAST 17-2Z	STO 17 ZZ.DZ	STO 17 ZZ
NAST 20 P-2Z	NAST 20-2Z	STO 20 ZZ.DZ	STO 20 ZZ
NAST 25 P-2Z	NAST 25-2Z	STO 25 ZZ.DZ	STO 25 ZZ
NAST 30 P-2Z	NAST 30-2Z	STO 30 ZZ.DZ	STO 30 ZZ
NAST 35 P-2Z	NAST 35-2Z	STO 35 ZZ.DZ	STO 35 ZZ
NAST 40 P-2Z	NAST 40-2Z	STO 40 ZZ.DZ	STO 40 ZZ
NAST 45 P-2Z	NAST 45-2Z	STO 45 ZZ.DZ	STO 45 ZZ
—	—	—	—

IKO

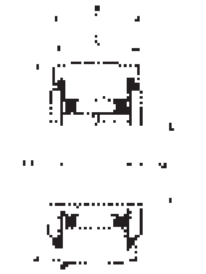
NAST..ZZUU

ROLLER FOLLOWERS

Metric Dimension



NAST ZZUU



NAST. ZZUUR

DIMENSION TABLE

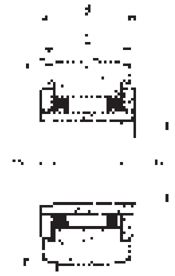
IKO NUMBER CYLINDRICAL OUTER RING **NAST..ZZUU**	IKO NUMBER CROWNED OUTER RING **NAST..ZZUUR**	WEIGHT (g)	DIMENSIONS (mm) d	D	C	B	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
NAST 6 ZZUU	**NAST 6 ZZUUR**	24.5	6	19	13.8	14	4160	4550
NAST 8 ZZUU	**NAST 8 ZZUUR**	39	8	24	13.8	14	5650	5890
NAST 10 ZZUU	**NAST 10 ZZUUR**	65	10	30	15.8	16	9790	9680
NAST 12 ZZUU	**NAST 12 ZZUUR**	75	12	32	15.8	16	10500	10900
NAST 15 ZZUU	**NAST 15 ZZUUR**	83	15	35	15.8	16	12400	14300
NAST 17 ZZUU	**NAST 17 ZZUUR**	135	17	40	19.8	20	17600	20900
NAST 20 ZZUU	**NAST 20 ZZUUR**	195	20	47	19.8	20	19400	24500
NAST 25 ZZUU	**NAST 25 ZZUUR**	225	25	52	19.8	20	20800	28400
NAST 30 ZZUU	**NAST 30 ZZUUR**	400	30	62	24.8	25	30500	45400
NAST 35 ZZUU	**NAST 35 ZZUUR**	550	35	72	24.8	25	32400	50600
NAST 40 ZZUU	**NAST 40 ZZUUR**	710	40	80	25.8	26	35900	61100
NAST 45 ZZUU	**NAST 45 ZZUUR**	760	45	85	25.8	26	37400	66400
NAST 50 ZZUU	**NAST 50 ZZUUR**	830	50	90	25.8	26	38900	71700

IKO

NART..R

ROLLER FOLLOWERS

Metric Dimension



NART. R

DIMENSION TABLE **INTERCHANGE TABLE**

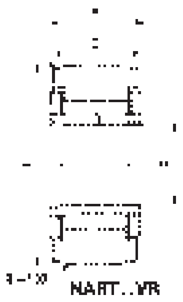
IKO NUMBER WITH NEEDLE CAGE **NART..R**	WEIGHT (g)	DIMENSIONS (mm) d	D	E	C	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	INA NATR	SKF NATR	FAG NATR	MCGILL MCYRR
NART 5 R	14.5	5	16	11	12	3650	3680	NATR 5	NATR 5	NATR 5	MCYRR-5
NART 6 R	20.5	6	19	11	12	4250	4740	NATR 6	NATR 6	NATR 6	MCYRR-6
NART 8 R	41.5	8	24	14	15	5640	5900	NATR 8	NATR 8	NATR 8	MCYRR-8
NART 10 R	64.5	10	30	14	15	8030	7540	NATR 10	NATR 10	NATR 10	MCYRR-10
NART 12 R	71	12	32	14	15	8580	8470	NATR 12	NATR 12	NATR 12	MCYRR-12
NART 15 R	102	15	35	18	19	13700	16400	NATR 15	NATR 15	—	MCYRR-15
NART 17 R	149	17	40	20	21	17600	21000	NATR 17	NATR 17	—	MCYRR-17
NART 20 R	250	20	47	24	25	23000	30700	NATR 20	NATR 20	—	MCYRR-20
NART 25 R	285	25	52	24	25	24700	35400	NATR 25	NATR 25	—	MCYRR-25
NART 30 R	470	30	62	28	29	33600	51400	NATR 30	NATR 30	—	MCYRR-30
NART 35 R	640	35	72	28	29	35700	57400	NATR 35	NATR 35	—	MCYRR-35
NART 40 R	845	40	80	30	32	44900	81500	NATR 40	NATR 40	—	MCYRR-40
NART 45 R	915	45	85	30	32	46800	88600	NATR 45	NATR 45	—	MCYRR-45
NART 50 R	980	50	90	30	32	48600	95600	NATR 50	NATR 50	—	MCYRR-50

IKO

NART..VR

ROLLER FOLLOWERS

Metric Dimension



DIMENSION TABLE **INTERCHANGE TABLE**

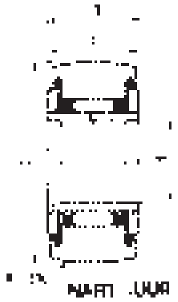
IKO NUMBER FULL COMP NART..VR	WEIGHT (g)	DIMENSIONS (mm) d	D	C	B	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	INA NATV	SKF NATV	MCGILL MCYR
NART 5 VR	15.1	5	16	11	12	6810	8370	NATV 5	NATV 5	MCYR-5
NART 6 VR	21.5	6	19	11	12	7690	10300	NATV 6	NATV 6	MCYR-6
NART 8 VR	42.1	8	24	14	15	11800	15600	NATV 8	NATV 8	MCYR-8
NART 10 VR	66.5	10	30	14	15	15600	18100	NATV 10	NATV 10	MCYR-10
NART 12 VR	73	12	32	14	15	16800	20500	NATV 12	NATV 12	MCYR-12
NART 15 VR	106	15	35	18	19	25200	36400	NATV 15	NATV 15	MCYR-15
NART 17 VR	155	17	40	20	21	32000	46300	NATV 17	NATV 17	MCYR-17
NART 20 VR	255	20	47	24	25	41600	67300	NATV 20	NATV 20	MCYR-20
NART 25 VR	295	25	52	24	25	45500	79100	NATV 25	NATV 25	MCYR-25
NART 30 VR	485	30	62	28	29	59900	110000	NATV 30	NATV 30	MCYR-30
NART 35 VR	655	35	72	28	29	63100	121000	NATV 35	NATV 35	MCYR-35
NART 40 VR	865	40	80	30	32	76300	164000	NATV 40	NATV 40	MCYR-40
NART 45 VR	935	45	85	30	32	80300	181000	—	—	MCYR-45
NART 50 VR	1010	50	90	30	32	84300	198000	NATV 50	NATV 50	MCYR-50

IKO

NART..UUR

ROLLER FOLLOWERS

Metric Dimension

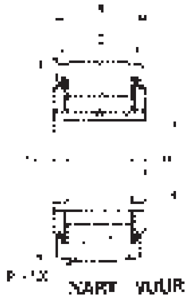


DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER NEEDLE CAGE NART..UUR	WEIGHT (g)	DIMENSIONS (mm) d	D	C	B	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	INA NATR..PP	SKF NATR..PP	MCGILL MCYRR..S
NART 5 UUR	14.5	5	16	11	12	3650	3680	NATR 5 PP	NATR 5 PP	MCYRR-5-S
NART 6 UUR	20.5	6	19	11	12	4250	4740	NATR 6 PP	NATR 6 PP	MCYRR-6-S
NART 8 UUR	41.5	8	24	14	15	5640	5900	NATR 8 PP	NATR 8 PP	MCYRR-8-S
NART 10 UUR	64.5	10	30	14	15	8030	7540	NATR 10 PP	NATR 10 PP	MCYRR-10-S
NART 12 UUR	71	12	32	14	15	8580	8470	NATR 12 PP	NATR 12 PP	MCYRR-12-S
NART 15 UUR	102	15	35	18	19	13700	16400	NATR 15 PP	NATR 15 PP	MCYRR-15-S
NART 17 UUR	149	17	40	20	21	17600	21000	NATR 17 PP	NATR 17 PP	MCYRR-17-S
NART 20 UUR	250	20	47	24	25	23000	30700	NATR 20 PP	NATR 20 PP	MCYRR-20-S
NART 25 UUR	285	25	52	24	25	24700	35400	NATR 25 PP	NATR 25 PP	MCYRR-25-S
NART 30 UUR	470	30	62	28	29	33600	51400	NATR 30 PP	NATR 30 PP	MCYRR-30-S
NART 35 UUR	640	35	72	28	29	35700	57400	NATR 35 PP	NATR 35 PP	MCYRR-35-S
NART 40 UUR	845	40	80	30	32	44900	81500	NATR 40 PP	NATR 40 PP	MCYRR-40-S
NART 45 UUR	915	45	85	30	32	46800	88600	NATR 45 PP	NATR 45 PP	MCYRR-45-S
NART 50 UUR	980	50	90	30	32	48600	95600	NATR 50 PP	NATR 50 PP	MCYRR-50-S

ROLLER FOLLOWERS

Metric Dimension



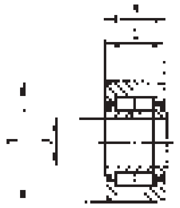
DIMENSION TABLE

INTERCHANGE TABLE

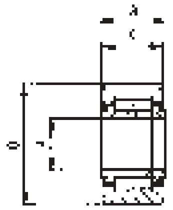
IKO NUMBER FULL COMP	WEIGHT	DIMENSIONS (mm)				BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING	INA	SKF	MCGILL
NART..VUUR	(g)	d	D	C	B	(N)	(N)	NATV..PP	NATV..PP	MCYR..S
NART 5 VUUR	15.1	5	16	11	12	6810	8370	NATV 5 PP	NATV 5 PP	MCYR-5-S
NART 6 VUUR	21.5	6	19	11	12	7690	10300	NATV 6 PP	NATV 6 PP	MCYR-6-S
NART 8 VUUR	42.5	8	24	14	15	11800	15600	NATV 8 PP	NATV 8 PP	MCYR-8-S
NART 10 VUUR	66.5	10	30	14	15	15600	18100	NATV 10 PP	NATV 10 PP	MCYR-10-S
NART 12 VUUR	73	12	32	14	15	16800	20500	NATV 12 PP	NATV 12 PP	MCYR-12-S
NART 15 VUUR	106	15	35	18	19	25200	36400	NATV 15 PP	NATV 15 PP	MCYR-15-S
NART 17 VUUR	155	17	40	20	21	32000	46300	NATV 17 PP	NATV 17 PP	MCYR-17-S
NART 20 VUUR	255	20	47	24	25	41600	67300	NATV 20 PP	NATV 20 PP	MCYR-20-S
NART 25 VUUR	295	25	52	24	25	45500	79100	NATV 25 PP	NATV 25 PP	MCYR-25-S
NART 30 VUUR	485	30	62	28	29	59900	110000	NATV 30 PP	NATV 30 PP	MCYR-30-S
NART 35 VUUR	655	35	72	28	29	63100	121000	NATV 35 PP	NATV 35 PP	MCYR-35-S
NART 40 VUUR	865	40	80	30	32	76300	164000	NATV 40 PP	NATV 40 PP	MCYR-40-S
NART 45 VUUR	935	45	85	30	32	80300	181000	—	—	MCYR-45-S
NART 50 VUUR	1010	50	90	30	32	84300	198000	NATV 50 PP	NATV 50 PP	MCYR-50-S

CYLINDRICAL ROLLER FOLLOWERS

Metric Dimension



NURT...R



NURT

DIMENSION TABLE

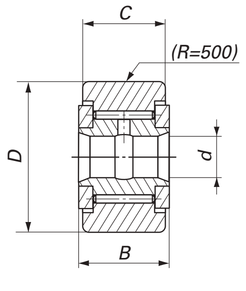
IKO NUMBER CYLINDRICAL OUTER RING	 CROWNED OUTER RING	WEIGHT (g)	DIMENSIONS (mm) d	 D	 C	 B	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
NURT 15	**NURT 15 R**	100	15	35	18	19	23400	27300
NURT 15-1	**NURT 15-1 R**	160	15	42	18	19	23400	27300
NURT 17	**NURT 17 R**	147	17	40	20	21	25200	30900
NURT 17-1	**NURT 17-1 R**	222	17	47	20	21	25200	30900
NURT 20	**NURT 20 R**	245	20	47	24	25	38900	49000
NURT 20-1	**NURT 20-1 R**	321	20	52	24	25	38900	49000
NURT 25	**NURT 25 R**	281	25	52	24	25	43100	58100
NURT 25-1	**NURT 25-1 R**	450	25	62	24	25	43100	58100
NURT 30	**NURT 30 R**	466	30	62	28	29	58200	75300
NURT 30-1	**NURT 30-1 R**	697	30	72	28	29	58200	75300
NURT 35	**NURT 35 R**	630	35	72	28	29	63900	88800
NURT 35-1	**NURT 35-1 R**	840	35	80	28	29	63900	88800
NURT 40	**NURT 40 R**	817	40	80	30	32	86500	122000
NURT 40-1	**NURT 40-1 R**	1130	40	90	30	32	86500	122000
NURT 45	**NURT 45 R**	883	45	85	30	32	91500	135000
NURT 45-1	**NURT 45-1 R**	1400	45	100	30	32	91500	135000
NURT 50	**NURT 50 R**	950	50	90	30	32	96300	148000
NURT 50-1	**NURT 50-1 R**	1690	50	110	30	32	96300	148000

INTERCHANGE TABLE

INA CYLINDRICAL OUTER RING NUTR..X	 CROWNED OUTER RING NUTR	MCGILL CYLINDRICAL OUTER RING MCYRD..X	 CROWNED OUTER RING MCYRD
NUTR 15 X	NUTR 15	MCYRD-15 X	MCYRD-15
NUTR 1542 X	NUTR 1542	—	—
NUTR 17 X	NUTR 17	MCYRD-17 X	MCYRD-17
NUTR 1747 X	NUTR 1747	—	—
NUTR 20 X	NUTR 20	MCYRD-20 X	MCYRD-20
NUTR 2052 X	NUTR 2052	—	—
NUTR 25 X	NUTR 25	MCYRD-25 X	MCYRD-25
NUTR 2562 X	NUTR 2562	—	—
NUTR 30 X	NUTR 30	MCYRD-30 X	MCYRD-30
NUTR 3072 X	NUTR 3072	—	—
NUTR 35 X	NUTR 35	MCYRD-35 X	MCYRD-35
NUTR 3580 X	NUTR 3580	—	—
NUTR 40 X	NUTR 40	MCYRD-40 X	MCYRD-40
NUTR 4090 X	NUTR 4090	—	—
NUTR 45 X	NUTR 45	MCYRD-45 X	MCYRD-45
NUTR 45100 X	NUTR 45100	—	—
NUTR 50 X	NUTR 50	MCYRD-50 X	MCYRD-50
NUTR 50110 X	NUTR 50110	—	—

ROLLER FOLLOWERS

Inch series Heavy Duty Roller Followers



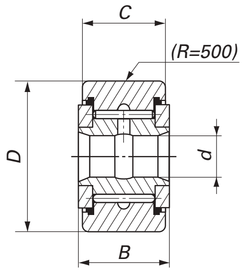
CRY-V(R)

DIMENSION TABLE

IKO NUMBER CYLINDRICAL OUTER RING CRY..V	IKO NUMBER CROWNED OUTER RING CRY..VR	WEIGHT (g)	DIMENSIONS								BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	MCGILL	
			d		D		C		B				CYLINDRICAL OUTER RING CYR	CROWNED OUTER RING CCYR
			inch	mm	inch	mm	inch	mm	inch	mm				
CRY 12 V	**CRY 12 VR**	27	¼	6.350	¾	19.050	½	12.700	0.5625	14.288	8710	12300	CYR ¾	CCYR ¾
CRY 14 V	**CRY 14 VR**	36	¼	6.350	⅞	22.225	½	12.700	0.5625	14.288	8710	12300	CYR ⅞	CCYR ⅞
CRY 16 V	**CRY 16 VR**	68	5⁄16	7.938	1	25.400	⅝	15.875	0.6875	17.463	13100	22700	CYR 1	CCYR 1
CRY 18 V	**CRY 18 VR**	77	5⁄16	9.938	1⅛	28.575	⅝	15.875	0.6875	17.463	13100	22700	CYR 1⅛	CCYR 1⅛
CRY 20 V	**CRY 20 VR**	109	⅜	9.525	1¼	31.750	¾	19.050	0.8125	20.638	23600	31700	CYR 1¼	CCYR 1¼
CRY 22 V	**CRY 22 VR**	136	⅜	9.525	1⅜	34.925	¾	19.050	0.8125	20.638	23600	31700	CYR 1⅜	CCYR 1⅜
CRY 24 V	**CRY 24 VR**	186	7⁄16	11.112	1½	38.100	⅞	22.225	0.9375	23.813	28200	40100	CYR 1½	CCYR 1½
CRY 26 V	**CRY 26 VR**	227	7⁄16	11.112	1⅝	41.275	⅞	22.225	0.9375	23.813	28200	40100	CYR 1⅝	CCYR 1⅝
CRY 28 V	**CRY 28 VR**	290	½	12.700	1¾	44.450	1	25.400	1.0625	26.988	35300	55600	CYR 1¾	CCYR 1¾
CRY 30 V	**CRY 30 VR**	363	½	12.700	1⅞	47.625	1	25.400	1.0625	26.988	35300	55600	CYR 1⅞	CCYR 1⅞
CRY 32 V	**CRY 32 VR**	476	⅝	15.875	2	50.800	1¼	31.750	1.3125	33.338	45700	80600	CYR 2	CCYR 2
CRY 36 V	**CRY 36 VR**	599	⅝	15.875	2¼	57.150	1¼	31.750	1.3125	33.338	45700	80600	CYR 2¼	CCYR 2¼
CRY 40 V	**CRY 40 VR**	816	¾	19.050	2½	63.500	1½	38.100	1.5625	39.688	61400	116000	CYR 2½	CCYR 2½
CRY 44 V	**CRY 44 VR**	1020	¾	19.050	2¾	69.850	1½	38.100	1.5625	39.688	61400	116000	CYR 2¾	CCYR 2¾
CRY 48 V	**CRY 48 VR**	1410	1	25.400	3	76.200	1¾	44.450	1.8125	46.038	77600	172000	CYR 3	CCYR 3
CRY 52 V	**CRY 52 VR**	1640	1	25.400	3¼	82.550	1¾	44.450	1.8125	46.038	77600	172000	CYR 3¼	CCYR 3¼
CRY 56 V	**CRY 56 VR**	2250	1⅛	28.575	3½	88.900	2	50.800	2.0625	52.388	111000	239000	CYR 3½	CCYR 3½
CRY 64 V	**CRY 64 VR**	3200	1¼	31.750	4	101.600	2¼	57.150	2.3125	58.738	142000	317000	CYR 4	CCYR 4

ROLLER FOLLOWERS

Inch series Heavy Duty Roller Followers



CRY-VUU(R)

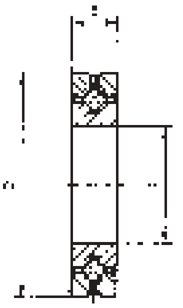
DIMENSION TABLE

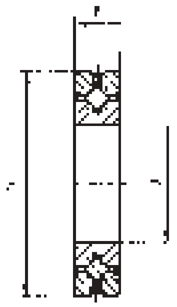
IKO NUMBER CYLINDRICAL OUTER RING CRY..VUU	IKO NUMBER CROWNED OUTER RING CRY..VUUR	WEIGHT	DIMENSIONS								BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)	MCGILL	
			d		D		C		B				CYLINDRICAL OUTER RING CYR..S	CROWNED OUTER RING CCYR..S
		(g)	inch	mm	inch	mm	inch	mm	inch	mm				
CRY 12 VUU	**CRY 12 VUUR**	27	¼	6.350	¾	19.050	½	12.700	0.5625	14.288	8710	12300	CYR ¾ S	CCYR ¾ S
CRY 14 VUU	**CRY 14 VUUR**	36	¼	6.350	⅞	22.225	½	12.700	0.5625	14.288	8710	12300	CYR ⅞ S	CCYR ⅞ S
CRY 16 VUU	**CRY 16 VUUR**	68	5⁄16	7.938	1	25.400	⅝	15.875	0.6875	17.463	13100	22700	CYR 1 S	CCYR 1 S
CRY 18 VUU	**CRY 18 VUUR**	77	5⁄16	7.938	1⅛	28.575	⅝	15.875	0.6875	17.463	13100	22700	CYR 1⅛ S	CCYR 1⅛ S
CRY 20 VUU	**CRY 20 VUUR**	109	⅜	9.525	1¼	31.750	¾	19.050	0.8125	20.638	23600	31700	CYR 1¼ S	CCYR 1¼ S
CRY 22 VUU	**CRY 22 VUUR**	136	⅜	9.525	1⅜	34.925	¾	19.050	0.8125	20.638	23600	31700	CYR 1⅜ S	CCYR 1⅜ S
CRY 24 VUU	**CRY 24 VUUR**	186	7⁄16	11.112	1½	38.100	⅞	22.225	0.9375	23.813	28200	40100	CYR 1½ S	CCYR 1½ S
CRY 26 VUU	**CRY 26 VUUR**	227	7⁄16	11.112	1⅝	41.275	⅞	22.225	0.9375	23.813	28200	40100	CYR 1⅝ S	CCYR 1⅝ S
CRY 28 VUU	**CRY 28 VUUR**	290	½	12.700	1¾	44.450	1	25.400	1.0625	26.988	35300	55600	CYR 1¾ S	CCYR 1¾ S
CRY 30 VUU	**CRY 30 VUUR**	363	½	12.700	1⅞	47.625	1	25.400	1.0625	26.988	35300	55600	CYR 1⅞ S	CCYR 1⅞ S
CRY 32 VUU	**CRY 32 VUUR**	476	⅝	15.875	2	50.800	1¼	31.750	1.3125	33.338	45700	80600	CYR 2 S	CCYR 2 S
CRY 36 VUU	**CRY 36 VUUR**	599	⅝	15.875	2¼	57.150	1¼	31.750	1.3125	33.338	45700	80600	CYR 2¼ S	CCYR 2¼ S
CRY 40 VUU	**CRY 40 VUUR**	816	¾	19.050	2½	63.500	1½	38.100	1.5625	39.688	61400	116000	CYR 2½ S	CCYR 2½ S
CRY 44 VUU	**CRY 44 VUUR**	1020	¾	19.050	2¾	69.850	1½	38.100	1.5625	39.688	61400	116000	CYR 2¾ S	CCYR 2¾ S
CRY 48 VUU	**CRY 48 VUUR**	1410	1	25.400	3	76.200	1¾	44.450	1.8125	46.038	77600	172000	CYR 3 S	CCYR 3 S
CRY 52 VUU	**CRY 52 VUUR**	1640	1	25.400	3¼	82.550	1¾	44.450	1.8125	46.038	77600	172000	CYR 3¼ S	CCYR 3¼ S
CRY 56 VUU	**CRY 56 VUUR**	2250	1⅛	28.575	3½	88.900	2	50.800	2.0625	52.388	111000	239000	CYR 3½ S	CCYR 3½ S
CRY 64 VUU	**CRY 64 VUUR**	3200	1¼	31.750	4	101.600	2¼	57.150	2.3125	58.738	142000	317000	CYR 4 S	CCYR 4 S

CRBH...A

HIGH RIGIDITY TYPE CROSSED ROLLER BEARINGS WITH SEPARATOR

Metric Dimension


CRBH...A


CRBH...AUU

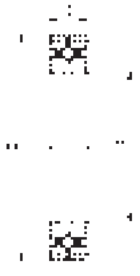
DIMENSION TABLE

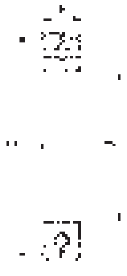
IKO NUMBER OPEN TYPE	IKO NUMBER SEALED TYPE	WEIGHT (kg)	DIMENSIONS (mm) d	D	B	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
CRBH 208 A	**CRBH 208 AUU**	0.04	20	36	8	2910	2430
CRBH 258 A	**CRBH 258 AUU**	0.05	25	41	8	3120	2810
CRBH 3010 A	**CRBH 3010 AUU**	0.12	30	55	10	7600	8370
CRBH 3510 A	**CRBH 3510 AUU**	0.13	35	60	10	7900	9130
CRBH 4010 A	**CRBH 4010 AUU**	0.15	40	65	10	8610	10600
CRBH 4510 A	**CRBH 4510 AUU**	0.16	45	70	13	8860	11300
CRBH 5013 A	**CRBH 5013 AUU**	0.29	50	80	13	17300	20900
CRBH 6013 A	**CRBH 6013 AUU**	0.33	60	90	13	18800	24300
CRBH 7013 A	**CRBH 7013 AUU**	0.38	70	100	16	20100	27700
CRBH 8016 A	**CRBH 8016 AUU**	0.74	80	120	16	32100	43400
CRBH 9016 A	**CRBH 9016 AUU**	0.81	90	130	20	33100	46800
CRBH 10020 A	**CRBH 10020 AUU**	1.45	100	150	20	50900	72200
CRBH 11020 A	**CRBH 11020 AUU**	1.56	110	160	25	52400	77400
CRBH 12025 A	**CRBH 12025 AUU**	2.62	120	180	25	73400	108000
CRBH 13025 A	**CRBH 13025 AUU**	2.82	130	190	25	75900	115000
CRBH 14025 A	**CRBH 14025 AUU**	2.96	140	200	25	81900	130000
CRBH 15025 A	**CRBH 15025 AUU**	3.16	150	210	25	84300	138000
CRBH 20025 A	**CRBH 20025 AUU**	4.0	200	260	25	92300	169000
CRBH 25025 A	**CRBH 25025 AUU**	4.97	250	310	25	102000	207000

CRBC•CRB

CROSSED ROLLER BEARINGS

Metric Dimension


CRBC


CRB

DIMENSION TABLE

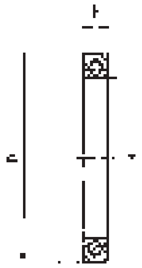
IKO NUMBER WITH RETAINER CRBC	IKO NUMBER FULL COMP. CRB	WEIGHT (kg)	DIMENSIONS (mm) d	D	B	BASIC DYNAMIC LOAD RATING (N) CRBC	CRB	BASIC STATIC LOAD RATING (N) CRBC	CRB
CRBC 3010	**CRB 3010**	0.12	30	55	10	3830	5290	4130	6350
CRBC 4010	**CRB 4010**	0.15	40	65	10	4280	5980	5140	8040
CRBC 5013	**CRB 5013**	0.29	50	80	13	10700	14200	12600	18400
CRBC 6013	**CRB 6013**	0.33	60	90	13	11600	15400	14600	21500
CRBC 7013	**CRB 7013**	0.38	70	100	13	12300	17000	16700	25500
CRBC 8016	**CRB 8016**	0.74	80	120	16	18200	24300	25500	37500
CRBC 9016	**CRB 9016**	0.81	90	130	16	19400	25900	28600	42100
CRBC 10020	**CRB 10020**	1.45	100	150	20	31500	39400	45100	61100
CRBC 11020	**CRB 11020**	1.56	110	160	20	33500	41200	50700	66700
CRBC 12025	**CRB 12025**	2.62	120	180	25	47700	59900	70500	95400
CRBC 13025	**CRB 13025**	2.82	130	190	25	49200	61000	74800	99800
CRBC 14025	**CRB 14025**	2.96	140	200	25	50700	64100	79200	108000
CRBC 15025	**CRB 15025**	3.16	150	210	25	53800	65000	87700	113000
CRBC 15030	**CRB 15030**	5.3	150	230	30	69200	85900	108000	114000
CRBC 20025	**CRB 20025**	4	200	260	25	60200	75300	110000	148000
CRBC 20030	**CRB 20030**	6.7	200	280	30	108000	133000	178000	234000
CRBC 20035	**CRB 20035**	9.58	200	295	35	137000	168000	215000	282000
CRBC 25025	**CRB 25025**	4.97	250	310	25	67200	83900	136000	183000
CRBC 25030	**CRB 25030**	8.1	250	330	30	116000	146000	208000	283000
CRBC 25040	**CRB 25040**	14.8	250	355	40	179000	215000	299000	382000
CRBC 30025	**CRB 30025**	5.88	300	360	25	73800	91900	162000	217000
CRBC 30035	**CRB 30035**	13.4	300	395	35	163000	205000	299000	408000
CRBC 30040	**CRB 30040**	17.2	300	405	40	194000	235000	351000	451000
CRBC 40035	**CRB 40035**	14.5	400	480	35	133000	165000	300000	400000
CRBC 40040	**CRB 40040**	23.5	400	510	40	222000	270000	455000	590000
CRBC 40070	**CRB 40070**	72.4	400	580	70	470000	576000	811000	1060000
CRBC 50040	**CRB 50040**	26	500	600	40	212000	259000	497000	648000
CRBC 50050	**CRB 50050**	41.7	500	625	50	247000	306000	561000	747000
CRBC 50070	**CRB 50070**	86.1	500	680	70	536000	653000	1020000	1330000
CRBC 60040	**CRB 60040**	30.6	600	700	40	231000	287000	581000	774000
CRBC 60070	**CRB 60070**	102	600	780	70	591000	700000	1230000	1540000
CRBC 600120	**CRB 600120**	274	600	870	120	1250000	1490000	2210000	2800000
CRBC 70045	**CRB 70045**	46.5	700	815	45	250000	313000	681000	917000
CRBC 70070	**CRB 70070**	115	700	880	70	630000	766000	1390000	1810000
CRBC 700150	**CRB 700150**	478	700	1020	150	1660000	1980000	3010000	3820000
CRBC 80070	**CRB 80070**	109	800	950	70	417000	513000	1090000	1440000
CRBC 800100	**CRB 80010**	247	800	1030	100	936000	1140000	2040000	2640000

IKO

CRBS

SLIM TYPE CROSSED ROLLER BEARINGS

Metric Dimension



DIMENSION TABLE

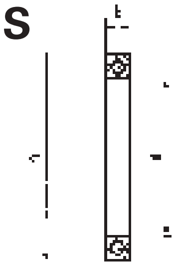
IKO NUMBER WITH RETAINER CRBS	WEIGHT (g)	DIMENSIONS (mm) d	D	B	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
CRBS 508	84	50	66	8	4900	6170
CRBS 608	94	60	76	8	5350	7310
CRBS 708	108	70	86	8	5740	8440
CRBS 808	122	80	96	8	6130	9590
CRBS 908	135	90	106	8	6490	10700
CRBS 1008	152	100	116	8	6850	11900
CRBS 1108	163	110	126	8	7160	13000
CRBS 1208	184	120	136	8	7530	14100
CRBS 1308	199	130	146	8	7860	15300
CRBS 1408	205	140	156	8	8060	16400
CRBS 1508	220	150	166	8	8350	17500
CRBS 16013	620	160	186	13	20300	39900
CRBS 17013	675	170	196	13	20900	42200
CRBS 18013	710	180	206	13	21500	44600
CRBS 19013	740	190	216	13	22100	46900
CRBS 20013	780	200	226	13	22500	49300

IKO

CRBS..V

SLIM TYPE CROSSED ROLLER BEARINGS

Metric Dimension



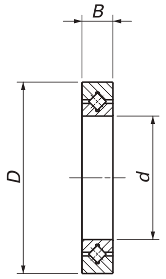
CRBS...V

DIMENSION TABLE

IKO NUMBER WITH RETAINER CRBS..V	WEIGHT (g)	DIMENSIONS (mm) d	D	B	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
CRBS 508 V	84	50	66	8	6930	9800
CRBS 608 V	94	60	76	8	7600	11700
CRBS 708 V	108	70	86	8	8190	13600
CRBS 808 V	122	80	96	8	8790	15500
CRBS 908 V	135	90	106	8	9310	17400
CRBS 1008 V	152	100	116	8	9850	19300
CRBS 1108 V	163	110	126	8	10300	21200
CRBS 1208 V	184	120	136	8	10900	23000
CRBS 1308 V	199	130	146	8	11200	24600
CRBS 1408 V	205	140	156	8	11700	26800
CRBS 1508 V	220	150	166	8	12100	28700
CRBS 16013 V	620	160	186	13	26900	58200
CRBS 17013 V	675	170	196	13	27800	61600
CRBS 18013 V	710	180	206	13	28600	65200
CRBS 19013 V	740	190	216	13	29300	68600
CRBS 20013 V	780	200	226	13	30000	72200

SUPER SLIM TYPE CROSSED ROLLER BEARINGS

Metric Dimension



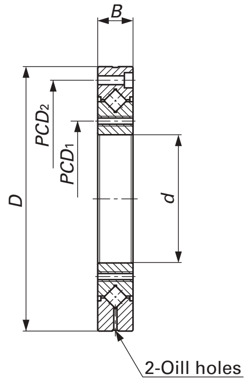
CRBT..A

DIMENSION TABLE

IKO NUMBER WITH RETAINER **CRBT**	DIMENSIONS (mm) d	D	B	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
CRBT 205 A	20	31	5	1400	1290
CRBT 305 A	30	41	5	1770	1970
CRBT 405 A	40	51	5	2000	2520
CRBT 505 A	50	61	5	2280	3200

MOUNTING HOLED TYPE HIGH RIGIDITY CROSSED ROLLER BEARINGS

Metric Dimension



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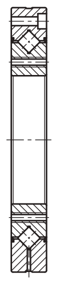
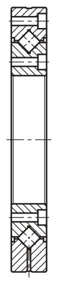
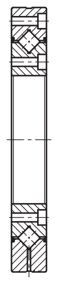


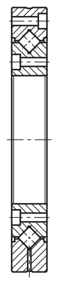
CRBF..ATUU



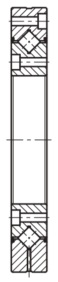
CRBF..A



CRBF..AUU



CRBF..AD



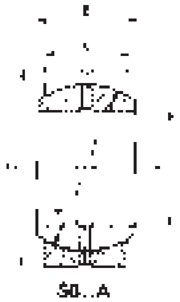
CRBF..ADUU

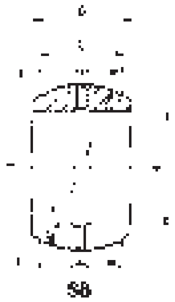
DIMENSION TABLE

IKO NUMBER OPEN TYPE **CRBF..AT**	IKO NUMBER TWO SIDE SEALED TYPE **CRBF..ATUU**	WEIGHT (kg)	DIMENSIONS (mm) d	D	B	DIMENSIONS (mm) PCD1	Inner ring Mounting holes	PCD2	Outer ring Mounting holes	BASIC DYNAMIC LOAD RATING C (N)	BASIC STATIC LOAD RATING C0 (N)
CRBF 108 AT	**CRBF 108 AT UU**	0.12	10	52	8	16	4-M3 through	42	6-φ3.4 through φ6.5 counter bore depth 3.3	2910	2430
CRBF 2012 AT	**CRBF 2012 AT UU**	0.31	20	70	12	28	6-M3 through	57	6-φ3.4 through φ6.5 counter bore depth 3.3	7600	8370
CRBF 2512 AT	**CRBF 2512 AT UU**	0.40	25	80	12	35	6-M3 through	67	6-φ3.4 through φ6.5 counter bore depth 3.3	8610	10600
CRBF 3515 AT	**CRBF 3515 AT UU**	0.66	35	95	15	45	8-M4 through	83	8-φ4.5 through φ8 counter bore depth 4.4	17300	20900
CRBF 5515 AT	**CRBF 5515 AT UU**	0.96	55	120	15	65	8-M5 through	105	8-φ5.5 through φ9.5 counter bore depth 5.4	20100	27700
CRBF 8022 AT	**CRBF 8022 AT UU**	2.63	80	165	22	97	10-M5 through	148	10-φ5.5 through φ9.5 counter bore depth 5.4	51100	72000
CRBF 8022 A	**CRBF 8022 A UU**	2.60					10-φ5.5 through φ9.5 counter bore depth 5.4				
CRBF 8022 AD	**CRBF 8022 AD UU**										

SPHERICAL BUSHINGS

Metric Dimension


SB..A

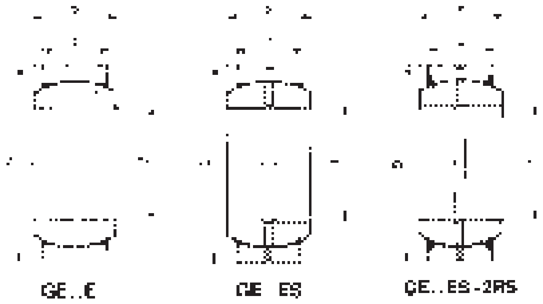

SB

DIMENSION TABLE

IKO NUMBER	IKO NUMBER	WEIGHT	DIMENSIONS (mm)					DYNAMIC LOAD CAPACITY	STATIC LOAD CAPACITY
SB..A	SB	(kg)	d	D	B	C	K	(N)	(N)
SB 12 A	**SB 122211**	0.019	12	22	11	9	18	15900	95300
SB 15 A	**SB 152613**	0.028	15	26	13	11	22	23700	142000
SB 20 A	**SB 203216**	0.053	20	32	16	14	28	38400	231000
SB 22 A	**SB 223719**	0.085	22	37	19	16	32	50200	301000
SB 25 A	**SB 254221**	0.116	25	42	21	18	36	63500	381000
SB 30 A	**SB 305027**	0.225	30	50	27	23	45	101000	609000
SB 35 A	**SB 355530**	0.3	35	55	30	26	50	127000	765000
SB 40 A	**SB 406233**	0.375	40	62	33	28	55	151000	906000
SB 45 A	**SB 457236**	0.6	45	72	36	31	62	188000	1130000
SB 50 A	**SB 508042**	0.87	50	80	42	36	72	254000	1530000
SB 55 A	**SB 559047**	1.26	55	90	47	40	80	314000	1880000
SB 60 A	**SB 6010053**	1.7	60	100	53	45	90	397000	2380000
SB 65 A	**SB 6510555**	2.05	65	105	55	47	94	433000	2600000
SB 70 A	**SB 7011058**	2.22	70	110	58	50	100	490000	2940000
SB 75 A	**SB 7512064**	3.02	75	120	64	55	110	593000	3560000
SB 80 A	**SB 8013070**	3.98	80	130	70	60	120	706000	4240000
SB 85 A	**SB 8513574**	4.29	85	135	74	63	125	772000	4630000
SB 90 A	**SB 9014076**	4.71	90	140	76	65	130	829000	4970000
SB 95 A	**SB 9515082**	6.05	95	150	82	70	140	961000	5770000
SB 100 A	**SB 10016088**	7.42	100	160	88	75	150	1100000	6620000
SB 110 A	**SB 11017093**	8.55	110	170	93	80	160	1260000	7530000
SB 115 A	**SB 11518098**	10.3	115	180	98	85	165	1380000	8250000
SB 120 A	**SB 120190105**	12.4	120	190	105	90	175	1540000	9270000
SB 130 A	**SB 130200110**	13.8	130	200	110	95	185	1720000	10300000
SB 150 A	**SB 150220120**	17	150	220	120	105	205	2110000	12700000

SPHERICAL BUSHINGS

Metric Dimension



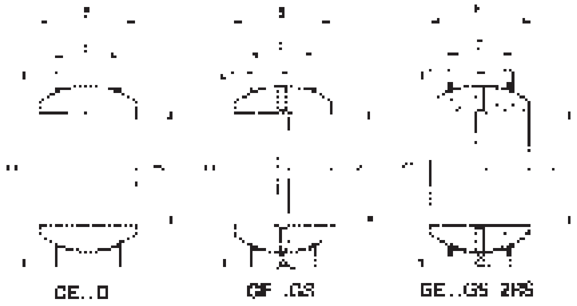
DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER WITHOUT SEAL GE..E(S)	IKO NUMBER WITH SEALS GE..ES-2RS	WEIGHT (kg)	DIMENSIONS (mm) d	D	B	C	DYNAMIC LOAD CAPACITY (N)	STATIC LOAD CAPACITY (N)	INA·ELGES WITHOUT SEAL GE..DO	INA·ELGES WITH SEALS GE..DO-2RS	SKF WITHOUT SEAL GE..E(S)	SKF WITH SEALS GE..ES-2RS	FAG WITHOUT SEAL GE..E(S)	FAG WITH SEALS GE..ES.2RS
GE 4 E	—	0.003	4	12	5	3	2350	14100	—	—	GE 4 E	—	GE 4 E	
GE 5 E	—	0.004	5	14	6	4	3920	23500	—	—	GE 5 E	—	—	—
GE 6 E	—	0.004	6	14	6	4	3920	23500	GE 6 DO	—	GE 6 E	—	GE 6 E	—
GE 8 E	—	0.008	8	16	8	5	6370	38200	GE 8 DO	—	GE 8 E	—	GE 8 E	—
GE 10 E	—	0.012	10	19	9	6	9410	56500	GE 10 DO	—	GE 10 E	—	GE 10 E	—
GE 12 E	—	0.017	12	22	10	7	12400	74100	GE 12 DO	—	GE 12 E	—	GE 12 E	—
GE 15 ES	**GE 15 ES-2RS**	0.032	15	26	12	9	19400	117000	GE 15 DO	—	GE 15 ES	—	GE 15 ES	GE 15 ES.2RS
GE 17 ES	**GE 17 ES-2RS**	0.049	17	30	14	10	24500	147000	GE 17 DO	GE 17 DO-2RS	GE 17 ES	—	GE 17 ES	GE 17 ES.2RS
GE 20 ES	**GE 20 ES-2RS**	0.065	20	35	16	12	34100	205000	GE 20 DO	GE 20 DO-2RS	GE 20 ES	GE 20 ES-2RS	GE 20 ES	GE 20 ES.2RS
GE 25 ES	**GE 25 ES-2RS**	0.115	25	42	20	16	55700	334000	GE 25 DO	GE 25 DO-2RS	GE 25 ES	GE 25 ES-2RS	GE 25 ES	GE 25 ES.2RS
GE 30 ES	**GE 30 ES-2RS**	0.16	30	47	22	18	71800	431000	GE 30 DO	GE 30 DO-2RS	GE 30 ES	GE 30 ES-2RS	GE 30 ES	GE 30 ES.2RS
GE 35 ES	**GE 35 ES-2RS**	0.258	35	55	25	20	92200	553000	GE 35 DO	GE 35 DO-2RS	GE 35 ES	GE 35 ES-2RS	GE 35 ES	GE 35 ES.2RS
GE 40 ES	**GE 40 ES-2RS**	0.315	40	62	28	22	114000	686000	GE 40 DO	GE 40 DO-2RS	GE 40 ES	GE 40 ES-2RS	GE 40 ES	GE 40 ES.2RS
GE 45 ES	**GE 45 ES-2RS**	0.413	45	68	32	25	147000	883000	GE 45 DO	GE 45 DO-2RS	GE 45 ES	GE 45 ES-2RS	GE 45 ES	GE 45 ES.2RS
GE 50 ES	**GE 50 ES-2RS**	0.56	50	75	35	28	181000	1090000	GE 50 DO	GE 50 DO-2RS	GE 50 ES	GE 50 ES-2RS	GE 50 ES	GE 50 ES.2RS
GE 60 ES	**GE 60 ES-2RS**	1.1	60	90	44	36	282000	1690000	GE 60 DO	GE 60 DO-2RS	GE 60 ES	GE 60 ES-2RS	GE 60 ES	GE 60 ES.2RS
GE 70 ES	**GE 70 ES-2RS**	1.54	70	105	49	40	361000	2170000	GE 70 DO	GE 70 DO-2RS	GE 70 ES	GE 70 ES-2RS	GE 70 ES	GE 70 ES.2RS
GE 80 ES	**GE 80 ES-2RS**	2.29	80	120	55	45	463000	2780000	GE 80 DO	GE 80 DO-2RS	GE 80 ES	GE 80 ES-2RS	GE 80 ES	GE 80 ES.2RS
GE 90 ES	**GE 90 ES-2RS**	2.82	90	130	60	50	564000	3380000	GE 90 DO	GE 90 DO-2RS	GE 90 ES	GE 90 ES-2RS	GE 90 ES	GE 90 ES.2RS
GE 100 ES	**GE 100 ES-2RS**	4.43	100	150	70	55	701000	4210000	GE 100 DO	GE 100 DO-2RS	GE 100 ES	GE 100 ES-2RS	GE 100 ES	GE 100 ES.2RS
GE 110 ES	**GE 110 ES-2RS**	4.94	110	160	70	55	755000	4530000	GE 110 DO	GE 110 DO-2RS	GE 110 ES	GE 110 ES-2RS	GE 110 ES	GE 110 ES.2RS
GE 120 ES	**GE 120 ES-2RS**	8.12	120	180	85	70	1100000	6590000	GE 120 DO	GE 120 DO-2RS	GE 120 ES	GE 120 ES-2RS	GE 120 ES	GE 120 ES.2RS
GE 140 ES	**GE 140 ES-2RS**	11.4	140	210	90	70	1240000	7410000	GE 140 DO	GE 140 DO-2RS	GE 140 ES	GE 140 ES-2RS	GE 140 ES	GE 140 ES.2RS
GE 160 ES	**GE 160 ES-2RS**	14.4	160	230	105	80	1570000	9410000	GE 160 DO	GE 160 DO-2RS	GE 160 ES	GE 160 ES-2RS	GE 160 ES	GE 160 ES.2RS
GE 180 ES	**GE 180 ES-2RS**	18.9	180	260	105	80	1770000	10600000	GE 180 DO	GE 180 DO-2RS	GE 180 ES	GE 180 ES-2RS	GE 180 ES	GE 180 ES.2RS
GE 200 ES	**GE 200 ES-2RS**	28.1	200	290	130	100	2450000	14700000	GE 200 DO	GE 200 DO-2RS	GE 200 ES	GE 200 ES-2RS	GE 200 ES	GE 200 ES.2RS
GE 220 ES	**GE 220 ES-2RS**	36.1	220	320	135	100	2700000	16200000	—	GE 220 DO-2RS	—	GE 220 ES-2RS	—	GE 220 ES.2RS
GE 240 ES	**GE 240 ES-2RS**	40.4	240	340	140	100	2940000	17700000	—	GE 240 DO-2RS	—	GE 240 ES-2RS	—	GE 240 ES.2RS
GE 260 ES	**GE 260 ES-2RS**	52	260	370	150	110	3510000	21000000	—	GE 260 DO-2RS	—	GE 260 ES-2RS	—	GE 260 ES.2RS
GE 280 ES	**GE 280 ES-2RS**	66	280	400	155	120	4120000	24700000	—	GE 280 DO-2RS	—	GE 280 ES-2RS	—	GE 280 ES.2RS
GE 300 ES	**GE 300 ES-2RS**	76	300	430	165	120	4410000	26500000	—	GE 300 DO-2RS	—	GE 300 ES-2RS	—	GE 300 ES.2RS

SPHERICAL BUSHINGS

Metric Dimension



DIMENSION TABLE

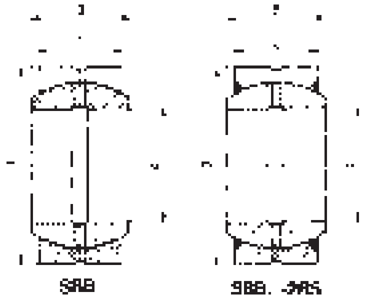
IKO NUMBER WITHOUT SEAL **GE..G(S)**	IKO NUMBER WITH SEALS **GE..GS-2RS**	WEIGHT (kg)	DIMENSIONS (mm) d	D	B	C	DYNAMIC LOAD CAPACITY (N)	STATIC LOAD CAPACITY (N)
GE 6 G	—	0.01	6	16	9	5	6370	38200
GE 8 G	—	0.015	8	19	11	6	9410	56500
GE 10 G	—	0.022	10	22	12	7	12400	74100
GE 12 G	—	0.041	12	26	15	9	19400	117000
GE 15 GS	**GE 15 GS-2RS**	0.059	15	30	16	10	24500	147000
GE 17 GS	**GE 17 GS-2RS**	0.083	17	35	20	12	34100	205000
GE 20 GS	**GE 20 GS-2RS**	0.155	20	42	25	16	55700	334000
GE 25 GS	**GE 25 GS-2RS**	0.215	25	47	28	18	71800	431000
GE 30 GS	**GE 30 GS-2RS**	0.33	30	55	32	20	92200	553000
GE 35 GS	**GE 35 GS-2RS**	0.4	35	62	35	22	114000	686000
GE 40 GS	**GE 40 GS-2RS**	0.515	40	68	40	25	147000	883000
GE 45 GS	**GE 45 GS-2RS**	0.66	45	75	43	28	181000	1090000
GE 50 GS	**GE 50 GS-2RS**	1.5	50	90	56	36	282000	1690000
GE 60 GS	**GE 60 GS-2RS**	2.05	60	105	63	40	361000	2170000
GE 70 GS	**GE 70 GS-2RS**	3	70	120	70	45	463000	2780000
GE 80 GS	**GE 80 GS-2RS**	3.6	80	130	75	50	564000	3380000
GE 90 GS	**GE 90 GS-2RS**	5.41	90	150	85	55	701000	4210000
GE 100 GS	**GE 100 GS-2RS**	6.15	100	160	85	55	755000	4530000
GE 110 GS	**GE 110 GS-2RS**	9.7	110	180	100	70	1100000	6590000
GE 120 GS	**GE 120 GS-2RS**	15.5	120	210	115	70	1240000	7410000
GE 140 GS	**GE 140 GS-2RS**	19.2	140	230	130	80	1570000	9410000
GE 160 GS	**GE 160 GS-2RS**	25.4	160	260	135	80	1770000	10600000
GE 180 GS	**GE 180 GS-2RS**	34.7	180	290	155	100	2450000	14700000
GE 200 GS	**GE 200 GS-2RS**	43.8	200	320	165	100	2700000	16200000
GE 220 GS	**GE 220 GS-2RS**	51.3	220	340	175	100	2940000	17700000
GE 240 GS	**GE 240 GS-2RS**	66.1	240	370	190	110	3510000	21000000
GE 260 GS	**GE 260 GS-2RS**	81.8	260	400	205	120	4120000	24700000
GE 280 GS	**GE 280 GS-2RS**	97.4	280	430	210	120	4410000	26500000

INTERCHANGE TABLE

INA·ELGES WITHOUT SEAL GE..FO	INA·ELGES WITH SEALS GE..FO-2RS	SKF WITHOUT SEAL GEH..ES	SKF WITH SEALS GEH..ES-2RS	FAG WITH SEALS GEH..ES.2RS
GE 6 FO	—	—	—	—
GE 8 FO	—	—	—	—
GE 10 FO	—	—	—	—
GE 12 FO	—	—	—	—
GE 15 FO	GE 15 FO-2RS	—	—	—
GE 17 FO	GE 17 FO-2RS	—	—	—
GE 20 FO	GE 20 FO-2RS	—	GEH 20 ES-2RS	—
GE 25 FO	GE 25 FO-2RS	—	GEH 25 ES-2RS	—
GE 30 FO	GE 30 FO-2RS	—	GEH 30 ES-2RS	GEH 30 ES.2RS
GE 35 FO	GE 35 FO-2RS	—	GEH 35 ES-2RS	GEH 35 ES.2RS
GE 40 FO	GE 40 FO-2RS	—	GEH 40 ES-2RS	GEH 40 ES.2RS
GE 45 FO	GE 45 FO-2RS	—	GEH 45 ES-2RS	GEH 45 ES.2RS
GE 50 FO	GE 50 FO-2RS	—	GEH 50 ES-2RS	GEH 50 ES.2RS
GE 60 FO	GE 60 FO-2RS	—	GEH 60 ES-2RS	GEH 60 ES.2RS
GE 70 FO	GE 70 FO-2RS	GEH 70 ES	GEH 70 ES-2RS	GEH 70 ES.2RS
GE 80 FO	GE 80 FO-2RS	—	GEH 80 ES-2RS	GEH 80 ES.2RS
GE 90 FO	GE 90 FO-2RS	GEH 90 ES	GEH 90 ES-2RS	GEH 90 ES.2RS
GE 100 FO	GE 100 FO-2RS	—	GEH 100 ES-2RS	GEH 100 ES.2RS
GE 110 FO	GE 110 FO-2RS	—	GEH 110 ES-2RS	GEH 110 ES.2RS
GE 120 FO	GE 120 FO-2RS	GEH 120 ES	—	—
GE 140 FO	GE 140 FO-2RS	—	—	—
GE 160 FO	GE 160 FO-2RS	—	—	—
GE 180 FO	GE 180 FO-2RS	—	—	—
—	GE 200 FO-2RS	—	—	—
—	GE 220 FO-2RS	—	—	—
—	GE 240 FO-2RS	—	—	—
—	GE 260 FO-2RS	—	—	—
—	GE 280 FO-2RS	—	—	—

SPHERICAL BUSHINGS

Inch Dimension



DIMENSION TABLE

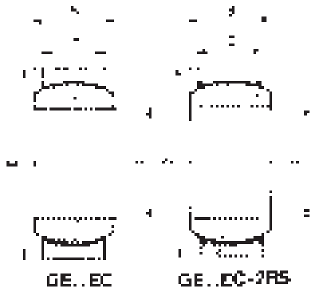
IKO NUMBER WITHOUT SEAL SBB	WEIGHT (kg)	IKO NUMBER WITH SEALS SBB..-2RS	WEIGHT (kg)	DIMENSIONS								DYNAMIC LOAD CAPACITY (N)	STATIC LOAD CAPACITY (N)
				d		D		B		C			
				inch	mm	inch	mm	inch	mm	inch	mm		
SBB 8	0.02	—	0.02	½	12.700	⅞	22.225	0.437	11.100	0.375	9.52	16800	101000
SBB 10	0.036	—	0.036	⅝	15.875	1 1/16	26.988	0.547	13.890	0.469	11.91	26900	161000
SBB 12	0.057	**SBB 12-2RS**	0.057	¾	19.050	1¼	31.750	0.656	16.660	0.562	14.27	38500	231000
SBB 14	0.088	**SBB 14-2RS**	0.088	⅞	22.225	1 7/16	36.512	0.765	19.430	0.656	16.66	52300	314000
SBB 16	0.125	**SBB 16-2RS**	0.125	1	25.400	1⅝	41.275	0.875	22.220	0.750	19.05	67300	404000
SBB 20	0.234	**SBB 20-2RS**	0.234	1¼	31.750	2	50.800	1.093	27.760	0.937	23.80	105000	630000
SBB 22	0.349	**SBB 22-2RS**	0.349	1⅜	34.925	2 3/16	55.562	1.187	30.150	1.031	26.19	126000	755000
SBB 24	0.424	**SBB 24-2RS**	0.424	1½	38.100	2 7/16	61.912	1.312	33.320	1.125	28.58	154000	925000
SBB 28	0.649	**SBB 28-2RS**	0.649	1¾	44.450	2 13/16	71.438	1.531	38.890	1.312	33.32	209000	1250000
SBB 32	0.939	**SBB 32-2RS**	0.939	2	50.800	3 3/16	80.962	1.750	44.450	1.500	38.10	273000	1640000
SBB 36	1.32	**SBB 36-2RS**	1.32	2¼	57.150	3 9/16	90.488	1.969	50.010	1.687	42.85	345000	2070000
SBB 40	1.85	**SBB 40-2RS**	1.85	2½	63.500	3 15/16	100.012	2.187	55.550	1.875	47.62	425000	2550000
SBB 44	2.44	**SBB 44-2RS**	2.44	2¾	69.850	4⅜	111.125	2.406	61.110	2.062	52.37	514000	3080000
SBB 48	3.12	**SBB 48-2RS**	3.12	3	76.200	4¾	120.650	2.625	66.680	2.250	57.15	616000	3700000
SBB 52	3.92	**SBB 52-2RS**	3.92	3¼	82.550	5⅛	130.175	2.844	72.240	2.437	61.90	722000	4330000
SBB 56	4.83	**SBB 56-2RS**	4.83	3½	88.900	5½	139.700	3.062	77.770	2.625	66.68	837000	5020000
SBB 60	5.87	**SBB 60-2RS**	5.87	3¾	95.250	5⅞	149.225	3.281	83.340	2.812	71.42	960000	5760000
SBB 64	7.07	**SBB 64-2RS**	7.07	4	101.600	6¼	158.750	3.500	88.900	3.000	76.20	1090000	6550000
SBB 68	8.46	**SBB 68-2RS**	8.46	4¼	107.950	6⅝	168.275	3.719	94.460	3.187	80.95	1230000	7380000
SBB 72	9.94	**SBB 72-2RS**	9.94	4½	114.300	7	177.800	3.937	100.000	3.375	85.72	1380000	8270000
SBB 76	11.6	**SBB 76-2RS**	11.6	4¾	120.650	7⅜	187.325	4.156	105.560	3.562	90.47	1530000	9210000
SBB 80	13.5	**SBB 80-2RS**	13.5	5	127.000	7¾	196.850	4.375	111.120	3.750	95.25	1710000	10300000
SBB 96	17.6	**SBB 96-2RS**	17.6	6	152.400	8¾	222.250	4.750	120.650	4.125	104.78	2130000	12800000

INTERCHANGE TABLE

IKO NUMBER WITHOUT SEAL SBB	TORRINGTON		R.B.C.		INA·ELGES		SKF	
	WITHOUT SEAL ..SF..	WITH SEALS ..SF..TT(SS)	WITHOUT SEAL B..L	WITH SEALS B..LSS	WITHOUT SEAL GE..ZO	WITH SEALS GE..ZO-2RS	WITHOUT SEAL GEZ..ES	WITH SEALS GEZ..ES-2RS
SBB 8	5 SF 8	—	B 8-L	—	GE 12 ZO	—	GEZ 008 ES	—
SBB 10	6 SF 10	—	B 10-L	—	GE 15 ZO	—	GEZ 010 ES	—
SBB 12	7 SF 12	7 SF 12-TT	B 12-L	B 12-LSS	GE 19 ZO	GE 19 ZO-2RS	GEZ 012 ES	—
SBB 14	8 SF 14	8 SF 14-TT	B 14-L	B 14-LSS	GE 22 ZO	GE 22 ZO-2RS	GEZ 014 ES	—
SBB 16	10 SF 16	10 SF 16-TT	B 16-L	B 16-LSS	GE 25 ZO	GE 25 ZO-2RS	GEZ 100 ES	GEZ 100 ES-2RS
SBB 20	12 SF 20	12 SF 20-TT	B 20-L	B 20-LSS	GE 31 ZO	GE 31 ZO-2RS	GEZ 104 ES	GEZ 104 ES-2RS
SBB 22	13 SF 22	13 SF 22-TT	B 22-L	B 22-LSS	GE 34 ZO	GE 34 ZO-2RS	GEZ 106 ES	—
SBB 24	15 SF 24	15 SF 24-TT	B 24-L	B 24-LSS	GE 38 ZO	GE 38 ZO-2RS	GEZ 108 ES	GEZ 108 ES-2RS
SBB 28	17 SF 28	17 SF 28-TT	B 28-L	B 28-LSS	GE 44 ZO	GE 44 ZO-2RS	GEZ 112 ES	GEZ 112 ES-2RS
SBB 32	20 SF 32	20 SF 32-TT	B 32-L	B 32-LSS	GE 50 ZO	GE 50 ZO-2RS	GEZ 200 ES	GEZ 200 ES-2RS
SBB 36	22 SF 36	22 SF 36-TT	B 36-L	B 36-LSS	GE 57 ZO	GE 57 ZO-2RS	GEZ 204 ES	GEZ 204 ES-2RS
SBB 40	25 SF 40	25 SF 40-TT	B 40-L	B 40-LSS	GE 63 ZO	GE 63 ZO-2RS	GEZ 208 ES	GEZ 208 ES-2RS
SBB 44	27 SF 44	27 SF 44-SS	B 44-L	B 44-LSS	GE 69 ZO	GE 69 ZO-2RS	GEZ 212 ES	GEZ 212 ES-2RS
SBB 48	30 SF 48	30 SF 48-SS	B 48-L	B 48-LSS	GE 76 ZO	GE 76 ZO-2RS	GEZ 300 ES	GEZ 300 ES-2RS
SBB 52	32 SF 52	32 SF 52-SS	B 52-L	B 52-LSS	GE 82 ZO	GE 82 ZO-2RS	GEZ 304 ES	GEZ 304 ES-2RS
SBB 56	35 SF 56	35 SF 56-SS	B 56-L	B 56-LSS	GE 88 ZO	—	GEZ 308 ES	GEZ 308 ES-2RS
SBB 60	37 SF 60	37 SF 60-SS	B 60-L	B 60-LSS	GE 95 ZO	—	GEZ 312 ES	GEZ 312 ES-2RS
SBB 64	40 SF 64	40 SF 64-SS	B 64-L	B 64-LSS	GE 101 ZO	—	GEZ 400 ES	GEZ 400 ES-2RS
SBB 68	42 SF 68	42 SF 68-SS	—	—	GE 107 ZO	—	—	—
SBB 72	45 SF 72	45 SF 72-SS	B 72-9L	B 72-9LSS	GE 114 ZO	—	GEZ 408 ES	GEZ 408 ES-2RS
SBB 76	47 SF 76	47 SF 76-SS	—	—	GE 120 ZO	—	GEZ 412 ES	GEZ 412 ES-2RS
SBB 80	50 SF 80	50 SF 80-SS	B 80-9L	B 80-9LSS	GE 127 ZO	—	GEZ 500 ES	GEZ 500 ES-2RS
SBB 96	60 SF 96	60 SF 96-SS	B 96-9L	B 96-9LSS	GE 152 ZO	—	GEZ 600 ES	GEZ 600 ES-2RS

SPHERICAL BUSHINGS

Metric Dimension



DIMENSION TABLE

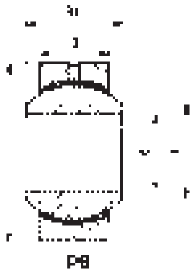
IKO NUMBER WITHOUT SEAL **GE..EC**	WEIGHT (kg)	IKO NUMBER WITH SEALS **GE..EC-2RS**	WEIGHT (kg)	DIMENSIONS (mm)				DYNAMIC LOAD CAPACITY (N)	STATIC LOAD CAPACITY (N)
				d	D	B	C		
GE 15 EC	0.032	—	—	15	26	12	9	19400	48500
GE 17 EC	0.049	—	—	17	30	14	10	24500	61300
GE 20 EC	0.065	—	—	20	35	16	12	34100	85300
GE 25 EC	0.115	—	—	25	42	20	16	55700	139000
GE 30 EC	0.16	**GE 30 EC-2RS**	0.16	30	47	22	18	71800	180000
—	—	**GE 35 EC-2RS**	0.258	35	55	25	20	92200	230000
—	—	**GE 40 EC-2RS**	0.315	40	62	28	22	114000	286000
—	—	**GE 45 EC-2RS**	0.413	45	68	32	25	147000	368000
—	—	**GE 50 EC-2RS**	0.56	50	75	35	28	181000	453000
—	—	**GE 60 EC-2RS**	1.1	60	90	44	36	282000	706000
—	—	**GE 70 EC-2RS**	1.54	70	105	49	40	361000	902000

INTERCHANGE TABLE

INA·ELGES		SKF	FAG	TORRINGTON
WITHOUT SEAL GE..UK	WITH SEALS GE..UK-2RS	WITH SEALS GE..TE-2RS	WITH SEALS GE..UA.2RS	WITH SEALS ..FSL..
GE 15 UK	—	—	—	—
GE 17 UK	—	—	—	—
GE 20 UK	—	—	—	—
GE 25 UK	—	—	—	—
GE 30 UK	GE 30 UK-2RS	—	—	30 FSL 47
—	GE 35 UK-2RS	GE 35 TE-2RS	GE 35 UA.2RS	35 FSL 55
—	GE 40 UK-2RS	GE 40 TE-2RS	GE 40 UA.2RS	40 FSL 62
—	GE 45 UK-2RS	GE 45 TE-2RS	GE 45 UA.2RS	45 FSL 68
—	GE 50 UK-2RS	GE 50 TE-2RS	GE 50 UA.2RS	50 FSL 75
—	GE 60 UK-2RS	GE 60 TE-2RS	GE 60 UA.2RS	60 FSL 90
—	GE 70 UK-2RS	GE 70 TE-2RS	GE 70 UA.2RS	70 FSL 105

“PILLO-BALL”

Metric Dimension

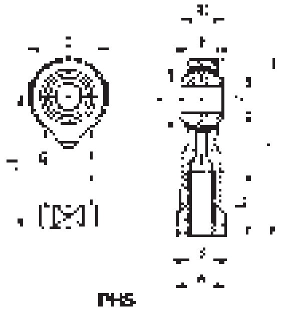


DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER PB	WEIGHT (g)	DIMENSIONS (mm) d	D	B	B1	d1	DYNAMIC LOAD CAPACITY (N)	STATIC LOAD CAPACITY (N)	HIRSCHMANN SS
PB 5	8.5	5	16	6	8	7.7	3270	7850	SS 5
PB 6	13	6	18	6.75	9	9	4200	10100	SS 6
PB 8	24	8	22	9	12	10.4	7010	16800	SS 8
PB 10	39	10	26	10.5	14	12.9	9810	23500	SS 10
PB 12	58	12	30	12	16	15.4	13100	31400	SS 12
PB 14	84	14	34	13.5	19	16.9	16800	40400	SS 14
PB 16	111	16	38	15	21	19.4	21000	50400	SS 16
PB 18	160	18	42	16.5	23	21.9	25700	61600	SS 18
PB 20	210	20	46	18	25	24.4	30800	74000	SS 20
PB 22	265	22	50	20	28	25.8	37400	89700	SS 22
PB 25	390	25	56	22	31	29.6	46200	111000	SS 25
PB 28	410	28	62	25	35	32.3	58400	140000	—
PB 30	610	30	66	25	37	34.8	62300	149000	SS 30

“PILLO-BALL” ROD ENDS

Metric Dimension



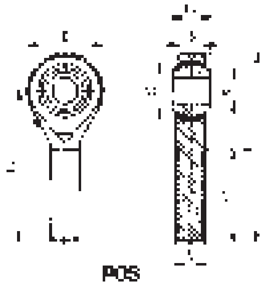
DIMENSION TABLE

IKO NUMBER	WEIGHT	DIMENSIONS (mm)										DYNAMIC LOAD CAPACITY	STATIC LOAD CAPACITY	ELGES	SKF	HIRSCHMANN
PHS	(g)	d	THREAD S	D	B	B1	d1	L	L1	L2	W	(N)	(N)	GIKFR..PB	SIKAC..M	SF
PHS 3	5.7	3	M3×0.5	12	4.5	6	5.2	27	21	10	5.5	1750	3670	—	—	SF 3
PHS 4	11.9	4	M4×0.7	14	5.3	7	6.5	31	24	12	8	2480	4680	—	—	—
PHS 5	16.5	5	M5×0.8	16	6	8	7.7	35	27	14	9	3270	5730	GIKFR 5 PB	SIKAC 5 M	SF 5
PHS 6	25	6	M6×1	18	6.75	9	9	39	30	14	11	4200	6910	GIKFR 6 PB	SIKAC 6 M	SF 6
PHS 8	43	8	M8×1.25	22	9	12	10.4	47	36	17	14	7010	10200	GIKFR 8 PB	SIKAC 8 M	SF 8
PHS 10	72	10	M10×1.5	26	10.5	14	12.9	56	43	21	17	9810	13300	GIKFR 10 PB	SIKAC 10 M	SF 10
PHS 12	107	12	M12×1.75	30	12	16	15.4	65	50	24	19	13100	16900	GIKFR 12 PB	SIKAC 12 M	SF 12
PHS 14	160	14	M14×2	34	13.5	19	16.9	74	57	27	22	16800	20900	GIKFR 14 PB	SIKAC 14 M	SF 14
PHS 16	210	16	M16×2	38	15	21	19.4	83	64	33	22	21000	25400	GIKFR 16 PB	SIKAC 16 M	SF 16
PHS 18	295	18	M18×1.5	42	16.5	23	21.9	92	71	36	27	25700	30200	GIKFR 18 PB	SIKAC 18 M	SF 18
PHS 20	380	20	M20×1.5	46	18	25	24.4	100	77	40	30	30800	35500	GIKFR 20 PB	SIKAC 20 M	SF 20
PHS 22	490	22	M22×1.5	50	20	28	25.8	109	84	43	32	37400	41700	GIKFR 22 PB	SIKAC 22 M	SF 22
PHS 25	750	25	M24×2	60	22	31	29.6	124	94	48	36	46200	72700	GIKFR 25 PB	SIKAC 25 M	SF 25
PHS 28	950	28	M27×2	66	25	35	32.3	136	103	53	41	58400	87000	—	—	—
PHS 30	1130	30	M30×2	70	25	37	34.8	145	110	56	41	62300	92200	GIKFR 30 PB	SIKAC 30 M	SF 30

Remark : Left hand thread is indicated with supplemental code “L”. Ex. PHS 8 L

“PILLO-BALL” ROD ENDS

Metric Dimension



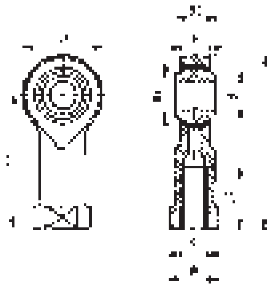
DIMENSION TABLE

IKO NUMBER	WEIGHT	DIMENSIONS (mm)									DYNAMIC LOAD CAPACITY	STATIC LOAD CAPACITY	ELGES	SKF	HIRSCHMANN
POS	(g)	d	THREAD S	D	B	B1	d1	L	L1	L2	(N)	(N)	GAKFR..PB	SAKAC..M	SM
POS 3	5	3	M3×0.5	12	4.5	6	5.2	33	27	15	1750	1220	—	—	SM 3
POS 4	8.1	4	M4×0.7	14	5.3	7	6.5	37	30	17	2480	2060	—	—	—
POS 5	12.5	5	M5×0.8	16	6	8	7.7	41	33	20	3270	3340	GAKFR 5 PB	SAKAC 5 M	SM 5
POS 6	19	6	M6×1	18	6.75	9	9	45	36	22	4200	4730	GAKFR 6 PB	SAKAC 6 M	SM 6
POS 8	32	8	M8×1.25	22	9	12	10.4	53	42	25	7010	8640	GAKFR 8 PB	SAKAC 8 M	SM 8
POS 10	54	10	M10×1.5	26	10.5	14	12.9	61	48	29	9810	13300	GAKFR 10 PB	SAKAC 10 M	SM 10
POS 12	85	12	M12×1.75	30	12	16	15.4	69	54	33	13100	16900	GAKFR 12 PB	SAKAC 12 M	SM 12
POS 14	126	14	M14×2	34	13.5	19	16.9	77	60	36	16800	20900	GAKFR 14 PB	SAKAC 14 M	SM 14
POS 16	185	16	M16×2	38	15	21	19.4	85	66	40	21000	25400	GAKFR 16 PB	SAKAC 16 M	SM 16
POS 18	260	18	M18×1.5	42	16.5	23	21.9	93	72	44	25700	30200	GAKFR 18 PB	SAKAC 18 M	SM 18
POS 20	340	20	M20×1.5	46	18	25	24.4	101	78	47	30800	35500	GAKFR 20 PB	SAKAC 20 M	SM 20
POS 22	435	22	M22×1.5	50	20	28	25.8	109	84	51	37400	41700	GAKFR 22 PB	SAKAC 22 M	SM 22
POS 25	650	25	M24×2	60	22	31	29.6	124	94	57	46200	72700	GAKFR 25 PB	SAKAC 25 M	SM 25
POS 28	875	28	M27×2	66	25	35	32.3	136	103	62	58400	87000	—	—	—
POS 30	1070	30	M30×2	70	25	37	34.8	145	110	66	62300	92200	GAKFR 30 PB	SAKAC 30 M	SM 30

Remark : Left hand thread is indicated with supplemental code “L”. Ex. POS 8 L

"PILLO-BALL" ROD ENDS

Inch Dimension



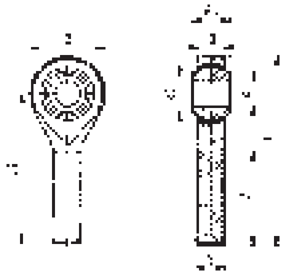
DIMENSION TABLE | **INTERCHANGE TABLE**

IKO NUMBER	WEIGHT	DIMENSIONS																			DYNAMIC LOAD CAPACITY	STATIC LOAD CAPACITY	HEIM	ALINABAL	AURORA	SPHERCO	ROSE
		d		THREAD S	D		B		B1		d1		L		L1		L2		W								
PHSB	(g)	inch	mm	CLASS 3B	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	(N)	(N)	HF..(A)	VF	MW	TR	RF..(A)
PHSB 2	7	.1250	3.175	.1380-32UNC	.469	11.91	.187	4.75	.250	6.35	.187	4.75	1.046	26.57	.812	20.62	.375	9.53	.250	6.35	1850	5840	HF 2	—	—	—	RF 2
PHSB 2.5	11	.1562	3.967	.1640-32UNC	.562	14.27	.219	5.56	.281	7.14	.249	6.32	1.156	29.36	.875	22.23	.375	9.53	.281	7.14	2600	8210	HF 2A	—	—	—	RF 2A
PHSB 3	15	.1900	4.826	.1900-32UNF	.625	15.88	.250	6.35	.312	7.92	.306	7.77	1.375	34.93	1.062	26.97	.562	14.27	.312	7.92	3460	9090	HF 3	VF 3	MW 3	TR 3	RF 3
PHSB 4	25	.2500	6.350	.2500-28UNF	.750	19.05	.281	7.14	.375	9.53	.355	9.02	1.687	42.85	1.312	33.32	.750	19.05	.375	9.53	4590	13200	HF 4	VF 4	MW 4	TR 4	RF 4
PHSB 5	36	.3125	7.938	.3125-24UNF	.875	22.23	.344	8.74	.437	11.10	.447	11.35	1.812	46.02	1.375	34.93	.750	19.05	.437	11.10	6800	16500	HF 5	VF 5	MW 5	TR 5	RF 5
PHSB 6	61	.3750	9.525	.3750-24UNF	1.000	25.40	.406	10.31	.500	12.70	.517	13.13	2.125	53.98	1.625	41.28	.937	23.80	.562	14.27	9230	21600	HF 6	VF 6	MW 6	TR 6	RF 6
PHSB 7	81	.4375	11.112	.4375-20UNF	1.125	28.58	.437	11.10	.562	14.27	.586	14.88	2.375	60.33	1.812	46.02	1.062	26.97	.625	15.88	11200	26100	HF 7	VF 7	MW 7	TR 7	RF 7
PHSB 8	133	.5000	12.700	.5000-20UNF	1.312	33.32	.500	12.70	.625	15.88	.698	17.73	2.781	70.64	2.125	53.98	1.187	30.15	.750	19.05	14800	36200	HF 8	VF 8	MW 8	TR 8	RF 8
PHSB 10	190	.6250	15.875	.6250-18UNF	1.500	38.10	.562	14.27	.750	19.05	.839	21.31	3.250	82.55	2.500	63.50	1.500	38.10	.875	22.23	20000	39300	HF 10	VF 10	MW 10	TR 10	RF 10
PHSB 12	285	.7500	19.050	.7500-16UNF	1.750	44.45	.687	17.45	.875	22.23	.978	24.84	3.750	95.25	2.875	73.03	1.750	44.45	1.000	25.40	28500	55000	HF 12	VF 12	MW 12	TR 12	RF 12
PHSB 16	1000	1.0000	25.400	1.2500-12UNF	2.750	69.85	1.000	25.40	1.375	34.925	1.269	32.23	5.500	139.70	4.125	104.78	2.125	53.98	1.500	38.10	59300	86800	HF 16	—	MW 16	TR 16	—

Remark : Left hand thread is indicated with supplemental code "L". Ex. PHSB 8 L

“PILLO-BALL” ROD ENDS

Inch Dimension



POSB

DIMENSION TABLE

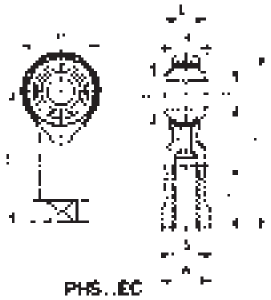
INTERCHANGE TABLE

IKO NUMBER	WEIGHT	DIMENSIONS																		DYNAMIC LOAD CAPACITY	STATIC LOAD CAPACITY	HEIM	ALINABAL	AURORA	SPHERCO	ROSE
		d		THREAD S	D		B		B1		d1		L		L1		L2									
POSB	(g)	inch	mm	CLASS 3A	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	(N)	(N)	HM..(A)	VM	MM	TRE	RM..(A)
POSB 2	5.5	.1250	3.175	.1380-32UNC	.469	11.91	.187	4.75	.250	6.35	.187	4.75	1.172	29.77	.937	23.80	.500	12.70	1850	2160	HM 2	—	—	—	RM 2
POSB 2.5	9	.1562	3.967	.1640-32UNC	.562	14.27	.219	5.56	.281	7.14	.249	6.32	1.406	35.71	1.125	28.58	.625	15.88	2600	3370	HM 2A	—	—	—	RM 2A
POSB 3	12.5	.1900	4.826	.1900-32UNF	.625	15.88	.250	6.35	.312	7.92	.306	7.77	1.563	39.70	1.250	31.75	.750	19.05	3460	4850	HM 3	VM 3	MM 3	TRE 3	RM 3
POSB 4	22	.2500	6.350	.2500-28UNF	.750	19.05	.281	7.14	.375	9.53	.355	9.02	1.937	49.20	1.562	39.67	1.000	25.40	4590	8870	HM 4	VM 4	MM 4	TRE 4	RM 4
POSB 5	37	.3125	7.938	.3125-24UNF	.875	22.23	.344	8.74	.437	11.10	.447	11.35	2.312	58.72	1.875	47.63	1.250	31.75	6800	14200	HM 5	VM 5	MM 5	TRE 5	RM 5
POSB 6	55	.3750	9.525	.3750-24UNF	1.000	25.40	.406	10.31	.500	12.70	.517	13.13	2.438	61.93	1.938	49.23	1.250	31.75	9230	21600	HM 6	VM 6	MM 6	TRE 6	RM 6
POSB 7	78	.4375	11.112	.4375-20UNF	1.125	28.58	.437	11.10	.562	14.27	.586	14.88	2.688	68.28	2.125	53.98	1.375	34.93	11200	26100	HM 7	VM 7	MM 7	TRE 7	RM 7
POSB 8	120	.5000	12.700	.5000-20UNF	1.312	33.32	.500	12.70	.625	15.88	.698	17.73	3.094	78.59	2.438	61.93	1.500	38.10	14800	36200	HM 8	VM 8	MM 8	TRE 8	RM 8
POSB 10	184	.6250	15.875	.6250-18UNF	1.500	38.10	.562	14.27	.750	19.05	.839	21.31	3.375	85.73	2.625	66.68	1.625	41.28	20000	39300	HM 10	VM 10	MM 10	TRE 10	RM 10
POSB 12	293	.7500	19.050	.7500-16UNF	1.750	44.45	.687	17.45	.875	22.23	.978	24.84	3.750	95.25	2.875	73.03	1.750	44.45	28500	55000	HM 12	VM 12	MM 12	TRE 12	RM 12
POSB 16	1100	1.0000	25.400	1.2500-12UNF	2.750	69.85	1.000	25.40	1.375	34.925	1.269	32.23	5.500	139.70	4.125	104.78	2.125	53.98	59300	112000	HM 16	—	MM 16	TRE 16	—

Remark : Left hand thread is indicated with supplemental code “L”. Ex. POSB 8 L

“PILLO-BALL” ROD ENDS

Metric Dimension



DIMENSION TABLE

IKO NUMBER	WEIGHT	DIMENSIONS (mm)										DYNAMIC LOAD CAPACITY	STATIC LOAD CAPACITY
PHS..EC	(g)	d	THREAD S	D	B	B1	d1	L	L1	L2	W	(N)	(N)
PHS 3 EC	5.7	3	M3×0.5	12	4.5	6	5.2	27	21	10	5.5	3500	2480
PHS 4 EC	11.9	4	M4×0.7	14	5.3	7	6.5	31	24	12	8	4950	3260
PHS 5 EC	16.5	5	M5×0.8	16	6	8	7.7	35	27	12.5	9	6540	4010
PHS 6 EC	25	6	M6×1	18	6.75	9	9	39	30	13.5	11	8410	4940
PHS 8 EC	43	8	M8×1.25	22	9	12	10.4	47	36	16	14	14000	7760
PHS 10 EC	72	10	M10×1.5	26	10.5	14	12.9	56	43	19.5	17	19600	10500
PHS 12 EC	107	12	M12×1.75	30	12	16	15.4	65	50	24	19	26200	13700
PHS 14 EC	160	14	M14×2	34	13.5	19	16.9	74	57	27	22	33600	17200
PHS 16 EC	210	16	M16×2	38	15	21	19.4	83	64	33	22	42000	21100
PHS 18 EC	295	18	M18×1.5	42	16.5	23	21.9	92	71	36	27	51400	25100
PHS 20 EC	380	20	M20×1.5	46	18	25	24.4	100	77	40	30	61600	30000
PHS 22 EC	490	22	M22×1.5	50	20	28	25.8	109	84	41	32	74700	36400

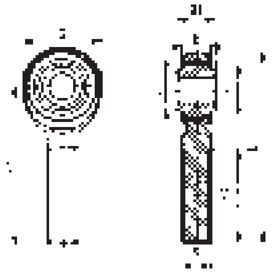
INTERCHANGE TABLE

IKO NUMBER	ELGES	SKF	HIRSCHMANN
PHS..EC	GIKFR..PW	SIKB..F	SFCV
PHS 3 EC	—	—	—
PHS 4 EC	—	—	—
PHS 5 EC	GIKFR 5 PW	SIKB 5 F	SFCV 5
PHS 6 EC	GIKFR 6 PW	SIKB 6 F	SFCV 6
PHS 8 EC	GIKFR 8 PW	SIKB 8 F	SFCV 8
PHS 10 EC	GIKFR 10 PW	SIKB 10 F	SFCV 10
PHS 12 EC	GIKFR 12 PW	SIKB 12 F	SFCV 12
PHS 14 EC	GIKFR 14 PW	SIKB 14 F	SFCV 14
PHS 16 EC	GIKFR 16 PW	SIKB 16 F	SFCV 16
PHS 18 EC	GIKFR 18 PW	SIKB 18 F	SFCV 18
PHS 20 EC	GIKFR 20 PW	SIKB 20 F	SFCV 20
PHS 22 EC	GIKFR 22 PW	SIKB 22 F	SFCV 22

Remark : Left hand thread is indicated with supplemental code “L”. Ex. PHS 8 ECL

"PILLO-BALL" ROD ENDS

Metric Dimension



POS..EC

DIMENSION TABLE

IKO NUMBER	WEIGHT	DIMENSIONS (mm)									DYNAMIC LOAD CAPACITY	STATIC LOAD CAPACITY
POS..EC	(g)	d	THREAD S	D	B	B1	d1	L	L1	L2	(N)	(N)
POS 3 EC	5.0	3	M3×0.5	12	4.5	6	5.2	33	27	15	3500	1220
POS 4 EC	8.1	4	M4×0.7	14	5.3	7	6.5	37	30	17	4950	2060
POS 5 EC	12.5	5	M5×0.8	16	6	8	7.7	41	33	20	6540	3340
POS 6 EC	19	6	M6×1	18	6.75	9	9	45	36	22	8410	4730
POS 8 EC	32	8	M8×1.25	22	9	12	10.4	53	42	25	14000	7760
POS 10 EC	54	10	M10×1.5	26	10.5	14	12.9	61	48	29	19600	10500
POS 12 EC	85	12	M12×1.75	30	12	16	15.4	69	54	33	26200	13700
POS 14 EC	126	14	M14×2	34	13.5	19	16.9	77	60	36	33600	17200
POS 16 EC	185	16	M16×2	38	15	21	19.4	85	66	40	42000	21100
POS 18 EC	260	18	M18×1.5	42	16.5	23	21.9	93	72	44	51400	25100
POS 20 EC	340	20	M20×1.5	46	18	25	24.4	101	78	47	61600	30000
POS 22 EC	435	22	M22×1.5	50	20	28	25.8	109	84	51	74700	36400

INTERCHANGE TABLE

IKO NUMBER	ELGES	SKF	HIRSCHMANN
POS..EC	GAKFR..PW	SAKB..F	SMCV
POS 3 EC	—	—	—
POS 4 EC	—	—	—
POS 5 EC	GAKFR 5 PW	SAKB 5 F	SMCV 5
POS 6 EC	GAKFR 6 PW	SAKB 6 F	SMCV 6
POS 8 EC	GAKFR 8 PW	SAKB 8 F	SMCV 8
POS 10 EC	GAKFR 10 PW	SAKB 10 F	SMCV 10
POS 12 EC	GAKFR 12 PW	SAKB 12 F	SMCV 12
POS 14 EC	GAKFR 14 PW	SAKB 14 F	SMCV 14
POS 16 EC	GAKFR 16 PW	SAKB 16 F	SMCV 16
POS 18 EC	GAKFR 18 PW	SAKB 18 F	SMCV 18
POS 20 EC	GAKFR 20 PW	SAKB 20 F	SMCV 20
POS 22 EC	GAKFR 22 PW	SAKB 22 F	SMCV 22

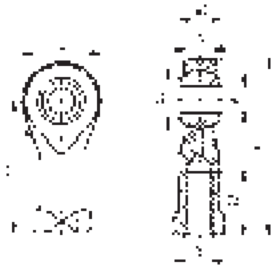
Remark : Left hand thread is indicated with supplemental code "L". Ex. PHS 8 ECL

IKO

PHSA

"PILLO-BALL" ROD ENDS

Metric Dimension



DIMENSION TABLE

IKO NUMBER	WEIGHT	DIMENSIONS (mm)									STATIC LOAD CAPACITY
PHSA	(g)	d	THREAD S	D	B	B1	d1	L	L1	L2	(N)
PHSA 5	17	5	M5×0.8	17	6	8	7.7	35.5	27	16	5470
PHSA 6	25	6	M6×1	19.5	6.75	9	9	39.7	30	16	6760
PHSA 8	45	8	M8×1.25	24	9	12	10.4	48	36	19	10200
PHSA 10	70	10	M10×1.5	28	10.5	14	12.9	57	43	23	13100
PHSA 12	105	12	M12×1.75	32	12	16	15.4	66	50	27	16400
PHSA 14	155	14	M14×2	36	13.5	19	16.9	75	57	30	20000
PHSA 16	190	16	M16×2	40	15	21	19.4	84	64	36	23900
PHSA 18	290	18	M18×1.5	45	16.5	23	21.9	93.5	71	40	28800
PHSA 20	400	20	M20×1.5	49	18	25	24.4	101.5	77	43	33400
PHSA 22	500	22	M22×1.5	54	20	28	25.8	111	84	47	40400

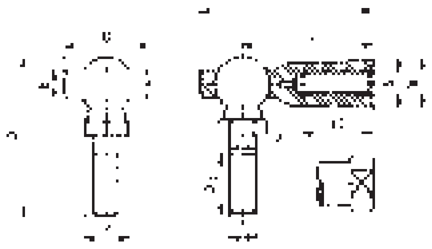
Remark : Left hand thread is indicated with supplemental code "L". Ex. PHSA 8 L

IKO

LHS

"L-BALL" ROD ENDS

Metric Dimension



DIMENSION TABLE

IKO NUMBER	WEIGHT	DIMENSIONS (mm)										STATIC LOAD CAPACITY
LHS	(g)	THREAD S	V	D	B	L	L1	L2	W	ℓ	P	ℓ3	(N)
LHS 5	22	M5×0.8	5	17	6	35.5	27	16	9	30.5	8	11	2080
LHS 6	32	M6×1	6	19.5	6.75	39.7	30	16	11	36.5	10	14	3290
LHS 8	60	M8×1.25	8	24	9	48	36	19	14	44	11	15	4900
LHS 10	102	M10×1.5	10	28	10.5	57	43	23	17	52.5	13	18	7640
LHS 12	160	M12×1.75	12	32	12	66	50	27	19	61	17	20	12400
LHS 14	227	M14×2	14	36	13.5	75	57	30	22	69	17	22	14600
LHS 16	300	M16×2	16	40	15	84	64	36	22	74	19	23	19500
LHS 18	445	M18×1.5	18	45	16.5	93.5	71	40	27	84	22	25	25600
LHS 20	580	M20×1.5	20	49	18	101.5	77	43	30	90.5	24	27	31600
LHS 22	765	M22×1.5	22	54	20	111	84	47	32	99	27	30	39800

Remark : Left hand thread is indicated with supplemental code "L". Ex.LHS 8 L

DUST COVERS FOR “LHS”

Metric Dimension

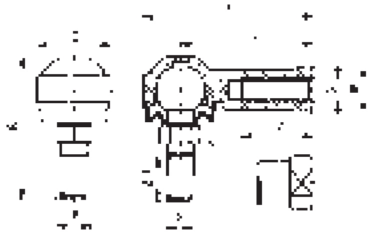
PRC

DIMENSION TABLE

IKO NUMBER	DIMENSIONS (mm)						
PRC	X	Y	E	F	Z	G	H
PRC 5	20	29	10	19	16	8	8
PRC 6	22	31	11	20	19	9.5	9.5
PRC 8	27	38.5	13.5	25	24	12	12
PRC 10	31	45.5	15.5	30	27	14	13
PRC 12	36	53	18	35	32	16.5	15.5
PRC 14	40	60	20	40	36.5	19	17.5
PRC 16	44	68	22	46	40	20.5	19.5
PRC 18	49	74.5	24.5	50	46	23.5	22.5
PRC 20	54	82	27	55	50	25.5	24.5
PRC 22	59	89.5	29.5	60	53.5	27.5	26

“L-BALL” ROD ENDS

Metric Dimension



LHSA

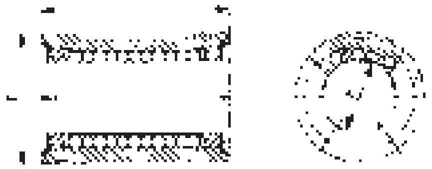
DIMENSION TABLE

IKO NUMBER	WEIGHT	DIMENSIONS (mm)										BALL DIA.	STATIC LOAD CAPACITY
LHSA	(g)	THREAD S	V	D	L	L1	L2	W	ℓ	P	ℓ3	(mm)	(N)
LHSA 4	11	M4×0.7	4	14	25.5	18	8	8	19.5	5.5	5	8	880
LHSA 5	27	M5×0.8	5	17	38.5	30	16	10	32.5	8	10	11.112	1180
LHSA 6	27	M6×1	6	19	39.5	30	16	10	32.5	8	10	11.112	1670
LHSA 8	64	M8×1.25	8	24	48	36	19	14	41.5	10	12.5	15	4380
LHSA 10	106	M10×1.25	10	28	57	43	23	17	49	12	17	19.05	7400
LHSA 10 M	106	M10×1.5	10	28	57	43	23	17	49	12	17	19.05	7400
LHSA 12	180	M12×1.75	12	34	67	50	27	19	64	14	20	22.225	9900
LHSA 14	260	M14×2	14	38	76	57	30	22	72	17	22	25.4	14600

Remark : Left hand thread is indicated with supplemental code “L”. Ex. LHSA 8 L

LINEAR BUSHINGS

Metric Dimension



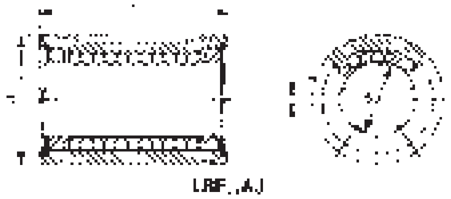
DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER STANDARD TYPE	NUMBER OF BALL CIRCUIT	WEIGHT	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)		STAR	THOMSON	INA	SKF	FAG
LBE	CIRCUIT	(g)	dr	D	L	USUAL	MAX.	USUAL	MAX.	0600..	0600..	KB	LBA(C)R	LAA
LBE 5	3	8.6	5	12	22	90.6	73.6	213	213	0600-305-00	—	—	LBAR 5	LAA 5×12×22
LBE 8	3	16.9	8	16	25	121	98.6	255	255	0600-308-00	0600-308-00	—	LBAR 8	LAA 8×16×25
LBE 12	4	36.5	12	22	32	284	327	575	813	0600-012-00	0600-012-00	KB 1232	LBCR 12	LAA 12×22×32
LBE 16	4	47	16	26	36	311	357	587	830	0600-016-00	0600-016-00	KB 1636	LBCR 16	LAA 16×26×36
LBE 20	5	84.5	20	32	45	617	734	1150	1680	0600-020-00	0600-020-00	KB 2045	LBCR 20	LAA 20×32×45
LBE 25	5	161	25	40	58	1070	1270	2020	2960	0600-025-00	0600-025-00	KB 2558	LBCR 25	LAA 25×40×58
LBE 30	6	305	30	47	68	1560	1650	3060	3910	0600-030-00	0600-030-00	KB 3068	LBCR 30	LAA 30×47×68
LBE 40	6	555	40	62	80	2710	2870	4890	6250	0600-040-00	0600-040-00	KB 4080	LBCR 40	LAA 40×62×80
LBE 50	6	935	50	75	100	3940	4180	7130	9120	0600-050-00	0600-050-00	KB 50100	LBCR 50	LAA 50×75×100

LINEAR BUSHINGS

Metric Dimension



DIMENSION TABLE

IKO NUMBER ADJUSTABLE TYPE LBE..AJ	NUMBER OF BALL CIRCUIT	WEIGHT (g)	DIMENSIONS (mm)				BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)	
			dr	D	L	h	USUAL	MAX.	USUAL	MAX.
LBE 5 AJ	3	8.4	5	12	22	1.5	90.6	73.6	213	213
LBE 8 AJ	3	16.6	8	16	25	1.5	121	98.6	255	255
LBE 12 AJ	4	35.5	12	22	32	1.5	284	327	575	813
LBE 16 AJ	4	46.5	16	26	36	1.5	311	357	587	830
LBE 20 AJ	5	83	20	32	45	2.0	617	734	1150	1680
LBE 25 AJ	5	159	25	40	58	2.0	1070	1270	2020	2960
LBE 30 AJ	6	300	30	47	68	2.0	1560	1650	3060	3910
LBE 40 AJ	6	545	40	62	80	2.0	2710	2870	4890	6250
LBE 50 AJ	6	925	50	75	100	2.0	3940	4180	7130	9120

INTERCHANGE TABLE

STAR 0610..	THOMSON 0610..	INA KBS	SKF LBAS	FAG LAG
0610-305-00	—	—	LBAS 5	—
0610-308-00	—	—	LBAS 8	LAG 8×16×25
0610-012-00	0610-012-00	KBS 1232	—	LAG 12×22×32
0610-016-00	0610-016-00	KBS 1636	—	LAG 16×26×36
0610-020-00	0610-020-00	KBS 2045	—	LAG 20×32×45
0610-025-00	0610-025-00	KBS 2558	—	LAG 25×40×58
0610-030-00	0610-030-00	KBS 3068	—	LAG 30×47×68
0610-040-00	0610-040-00	KBS 4080	—	LAG 40×62×80
0610-050-00	0610-050-00	KBS 50100	—	LAG 50×75×100

LINEAR BUSHINGS

Metric Dimension

DIMENSION TABLE

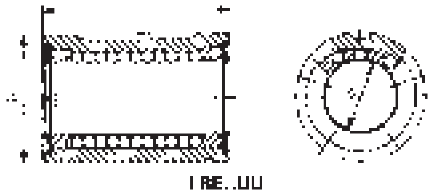
IKO NUMBER OPEN TYPE **LBE..OP**	NUMBER OF BALL CIRCUIT	WEIGHT (g)	DIMENSIONS (mm)					BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)	
			dr	D	L	h1	θ	USUAL	MAX.	USUAL	MAX.
LBE 12 OP	3	29.5	12	22	32	7.5	78°	284	327	575	813
LBE 16 OP	3	37.5	16	26	36	10	78°	311	357	587	830
LBE 20 OP	4	72	20	32	45	10	60°	617	734	1150	1680
LBE 25 OP	4	141	25	40	58	12.5	60°	1070	1270	2020	2960
LBE 30 OP	5	265	30	47	68	12.5	50°	1560	1650	3060	3910
LBE 40 OP	5	480	40	62	80	16.8	50°	2710	2870	4890	6250
LBE 50 OP	5	815	50	75	100	21	50°	3940	4180	7130	9120

INTERCHANGE TABLE

STAR 0630..	THOMSON 0630..	INA KBO	SKF LBCT	FAG LAN
0630-012-00	0630-012-00	KBO 1232	LBCT 12	LAN 12×22×32
0630-016-00	0630-016-00	KBO 1636	LBCT 16	LAN 16×26×36
0630-020-00	0630-020-00	KBO 2045	LBCT 20	LAN 20×32×45
0630-025-00	0630-025-00	KBO 2558	LBCT 25	LAN 25×40×58
0630-030-00	0630-030-00	KBO 3068	LBCT 30	LAN 30×47×68
0630-040-00	0630-040-00	KBO 4080	LBCT 40	LAN 40×62×80
0630-050-00	0630-050-00	KBO 50100	LBCT 50	LAN 50×75×100

LINEAR BUSHINGS

Metric Dimension



DIMENSION TABLE

IKO NUMBER STANDARD TYPE LBE..UU	NUMBER OF BALL CIRCUIT	WEIGHT (g)	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)	
			dr	D	L	USUAL	MAX.	USUAL	MAX.
LBE 5 UU	3	8.6	5	12	22	90.6	73.6	213	213
LBE 8 UU	3	17	8	16	25	121	98.6	255	255
LBE 12 UU	4	36.5	12	22	32	284	327	575	813
LBE 16 UU	4	47.5	16	26	36	311	357	587	830
LBE 20 UU	5	85	20	32	45	617	734	1150	1680
LBE 25 UU	5	162	25	40	58	1070	1270	2020	2960
LBE 30 UU	6	305	30	47	68	1560	1650	3060	3910
LBE 40 UU	6	555	40	62	80	2710	2870	4890	6250
LBE 50 UU	6	940	50	75	100	3940	4180	7130	9120

INTERCHANGE TABLE

IKO NUMBER STANDARD TYPE LBE..UU	STAR 0602..	THOMSON 0602..	INA KB..PP	SKF LBA(C)R..2LS	FAG LAA..2RS
LBE 5 UU	0602-305-10	—	—	LBAR 5-2LS	LAA 5×12×22.2RS
LBE 8 UU	0602-308-10	0602-308-10	—	LBAR 8-2LS	LAA 8×16×25.2RS
LBE 12 UU	0602-012-10	0602-012-10	KB 1232 PP	LBCR 12-2LS	LAA 12×22×32.2RS
LBE 16 UU	0602-016-10	0602-016-10	KB 1636 PP	LBCR 16-2LS	LAA 16×26×36.2RS
LBE 20 UU	0602-020-10	0602-020-10	KB 2045 PP	LBCR 20-2LS	LAA 20×32×45.2RS
LBE 25 UU	0602-025-10	0602-025-10	KB 2558 PP	LBCR 25-2LS	LAA 25×40×58.2RS
LBE 30 UU	0602-030-10	0602-030-10	KB 3068 PP	LBCR 30-2LS	LAA 30×47×68.2RS
LBE 40 UU	0602-040-10	0602-040-10	KB 4080 PP	LBCR 40-2LS	LAA 40×62×80.2RS
LBE 50 UU	0602-050-10	0602-050-10	KB 50100 PP	LBCR 50-2LS	LAA 50×75×100.2RS

LINEAR BUSHINGS

Metric Dimension

LBE..UU AJ

DIMENSION TABLE

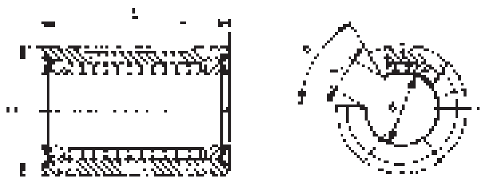
IKO NUMBER ADJUSTABLE TYPE	NUMBER OF BALL	WEIGHT	DIMENSIONS (mm)				BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)	
LBE..UU AJ	CIRCUIT	(g)	dr	D	L	h	USUAL	MAX.	USUAL	MAX.
LBE 5 UU AJ	3	8.4	5	12	22	1.5	90.6	73.6	213	213
LBE 8 UU AJ	3	16.7	8	16	25	1.5	121	98.6	255	255
LBE 12 UU AJ	4	36	12	22	32	1.5	284	327	575	813
LBE 16 UU AJ	4	47	16	26	36	1.5	311	357	587	830
LBE 20 UU AJ	5	83.5	20	32	45	2.0	617	734	1150	1680
LBE 25 UU AJ	5	160	25	40	58	2.0	1070	1270	2020	2960
LBE 30 UU AJ	6	305	30	47	68	2.0	1560	1650	3060	3910
LBE 40 UU AJ	6	555	40	62	80	2.0	2710	2870	4890	6250
LBE 50 UU AJ	6	930	50	75	100	2.0	3940	4180	7130	9120

INTERCHANGE TABLE

STAR	THOMSON	INA	SKF	FAG
0612..	0612..	KBS..PP	LBAS..2LS	LAG..2RS
0612-305-10	—	—	LBAS 5-2LS	—
0612-308-10	—	—	LBAS 8-2LS	LAG 8×16×25.2RS
0612-012-10	0612-012-10	KBS 1232 PP	—	LAG 12×22×32.2RS
0612-016-10	0612-016-10	KBS 1636 PP	—	LAG 16×26×36.2RS
0612-020-10	0612-020-10	KBS 2045 PP	—	LAG 20×32×45.2RS
0612-025-10	0612-025-10	KBS 2558 PP	—	LAG 25×40×58.2RS
0612-030-10	0612-030-10	KBS 3068 PP	—	LAG 30×47×68.2RS
0612-040-10	0612-040-10	KBS 4080 PP	—	LAG 40×62×80.2RS
0612-050-10	0612-050-10	KBS 50100 PP	—	LAG 50×75×100.2RS

LINEAR BUSHINGS

Metric Dimension



LBE..UU OP

DIMENSION TABLE

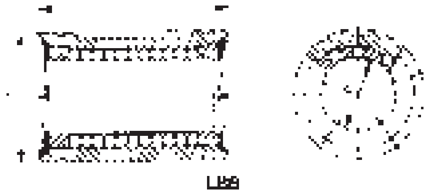
IKO NUMBER OPEN TYPE **LBE..UU OP**	NUMBER OF BALL CIRCUIT	WEIGHT (g)	DIMENSIONS (mm)					BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)	
			dr	D	L	h1	θ	USUAL	MAX.	USUAL	MAX.
LBE 12 UU OP	3	29.5	12	22	32	7.5	78°	284	327	575	813
LBE 16 UU OP	3	38	16	26	36	10	78°	311	357	587	830
LBE 20 UU OP	4	72.5	20	32	45	10	60°	617	734	1150	1680
LBE 25 UU OP	4	142	25	40	58	12.5	60°	1070	1270	2020	2960
LBE 30 UU OP	5	265	30	47	68	12.5	50°	1560	1650	3060	3910
LBE 40 UU OP	5	485	40	62	80	16.8	50°	2710	2870	4890	6250
LBE 50 UU OP	5	815	50	75	100	21.0	50°	3940	4180	7130	9120

INTERCHANGE TABLE

STAR	THOMSON	INA	SKF	FAG
0632..	0632..	KBO..PP	LBCT..2LS	LAN..2RS
0632-012-00	0632-012-00	KBO 1232 PP	LBCT 12-2LS	LAN 12×22×32.2RS
0632-016-00	0632-016-00	KBO 1636 PP	LBCT 16-2LS	LAN 16×26×36.2RS
0632-020-00	0632-020-00	KBO 2045 PP	LBCT 20-2LS	LAN 20×32×45.2RS
0632-025-00	0632-025-00	KBO 2558 PP	LBCT 25-2LS	LAN 25×40×58.2RS
0632-030-00	0632-030-00	KBO 3068 PP	LBCT 30-2LS	LAN 30×47×68.2RS
0632-040-00	0632-040-00	KBO 4080 PP	LBCT 40-2LS	LAN 40×62×80.2RS
0632-050-00	0632-050-00	KBO 50100 PP	LBCT 50-2LS	LAN 50×75×100.2RS

LINEAR BUSHINGS

Inch Dimension



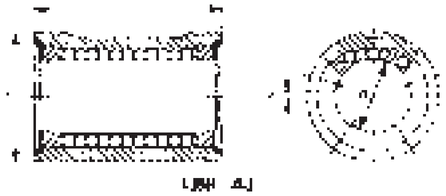
DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER STANDARD TYPE LBB	NUMBER OF BALL CIRCUIT	WEIGHT (g)	DIMENSIONS dr INCH	dr mm	D INCH	D mm	L INCH	L mm	BASIC DYNAMIC LOAD RATING (N) USUAL	MAX.	BASIC STATIC LOAD RATING (N) USUAL	MAX.	THOMSON A	HEIM LBB
LBB 4	3	7.1	¼	6.350	½	12.700	¾	19.050	80.0	64.9	156	156	A-4812	LBB-250
LBB 6	4	10.3	⅜	9.525	⅝	15.875	⅞	22.225	117	134	227	320	A-61014	LBB-375
LBB 8	4	32	½	12.700	⅞	22.225	1¼	31.750	290	333	577	816	A-81420	LBB-500
LBB 10	4	65	⅝	15.875	1⅛	28.575	1½	38.100	424	488	766	1080	A-101824	LBB-625
LBB 12	5	79.5	¾	19.050	1¼	31.750	1⅝	41.275	608	724	1150	1680	A-122026	LBB-750
LBB 16	5	147	1	25.400	1⁹⁄₁₆	39.688	2¼	57.150	1070	1280	2020	2960	A-162536	LBB-1000
LBB 20	6	325	1¼	31.750	2	50.800	2⅝	66.675	1920	2030	3570	4570	A-203242	LBB-1250
LBB 24	6	535	1½	38.100	2⅜	60.325	3	76.200	2460	2610	4330	5540	A-243848	LBB-1500
LBB 32	6	1040	2	50.800	3	76.200	4	101.600	3960	4190	7140	9130	A-324864	LBB-2000

LINEAR BUSHINGS

Inch Dimension



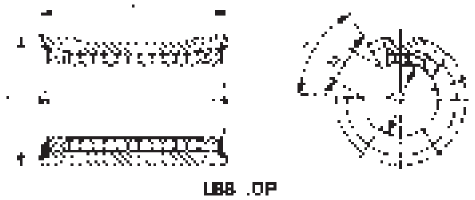
DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER ADJUSTABLE TYPE **LBB..AJ**	NUMBER OF RACE CIRCUIT	WEIGHT (g)	DIMENSIONS dr INCH	dr mm	D INCH	D mm	L INCH	L mm	h Min. INCH	h Min. mm	BASIC DYNAMIC LOAD RATING (N) USUAL	BASIC DYNAMIC LOAD RATING (N) MAX.	BASIC STATIC LOAD RATING (N) USUAL	BASIC STATIC LOAD RATING (N) MAX.	THOMSON ADJ	HEIM ADJ
LBB 8 AJ	4	31.5	½	12.700	⅞	22.225	1¼	31.750	1⁄16	1.588	290	333	577	816	ADJ-81420	ADJ-500
LBB 10 AJ	4	64	⅝	15.875	1⅛	28.575	1½	38.100	3⁄32	2.381	424	488	766	1080	ADJ-101824	ADJ-625
LBB 12 AJ	5	78.5	¾	19.050	1¼	31.750	1⅝	41.275	3⁄32	2.381	608	724	1150	1680	ADJ-122026	ADJ-750
LBB 16 AJ	5	145	1	25.400	1 9⁄16	39.688	2¼	57.150	3⁄32	2.381	1070	1280	2020	2960	ADJ-162536	ADJ-1000
LBB 20 AJ	6	320	1¼	31.750	2	50.800	2⅝	66.675	3⁄32	2.381	1920	2030	3570	4570	ADJ-203242	ADJ-1250
LBB 24 AJ	6	530	1½	38.100	2⅜	60.325	3	76.200	⅛	3.175	2460	2610	4330	5540	ADJ-243848	ADJ-1500
LBB 32 AJ	6	1030	2	50.800	3	76.200	4	101.600	⅛	3.175	3960	4190	7140	9130	ADJ-324864	ADJ-2000

LINEAR BUSHINGS

Inch Dimension



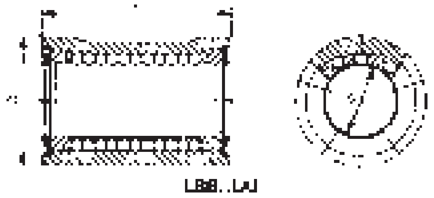
DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER OPEN TYPE LBB..OP	NUMBER OF RACE CIRCUIT	WEIGHT (g)	DIMENSIONS dr INCH	dr mm	D INCH	D mm	L INCH	L mm	h1 Min. INCH	h1 Min. mm	θ	BASIC DYNAMIC LOAD RATING (N) USUAL	MAX.	BASIC STATIC LOAD RATING (N) USUAL	MAX.	THOMSON OPN	HEIM OPN
LBB 8 OP	3	28	½	12.700	⅞	22.225	1¼	31.750	5⁄16	7.938	50°	290	333	577	816	OPN-81420	OPN-500
LBB 10 OP	3	54	⅝	15.875	1⅛	28.575	1½	38.100	⅜	9.525	60°	424	488	766	1080	OPN-101824	OPN-625
LBB 12 OP	4	68.5	¾	19.050	1¼	31.750	1⅝	41.275	7⁄16	11.112	60°	608	724	1150	1680	OPN-122026	OPN-750
LBB 16 OP	4	127	1	25.400	1 9⁄16	39.688	2¼	57.150	9⁄16	14.288	60°	1070	1280	2020	2960	OPN-162536	OPN-1000
LBB 20 OP	5	285	1¼	31.750	2	50.800	2⅝	66.675	⅝	15.875	50°	1920	2030	3570	4570	OPN-203242	OPN-1250
LBB 24 OP	5	470	1½	38.100	2⅜	60.325	3	76.200	¾	19.050	50°	2460	2610	4330	5540	OPN-243848	OPN-1500
LBB 32 OP	5	915	2	50.800	3	76.200	4	101.600	1	25.400	50°	3960	4190	7140	9130	OPN-324864	OPN-2000

LINEAR BUSHINGS

Inch Dimension

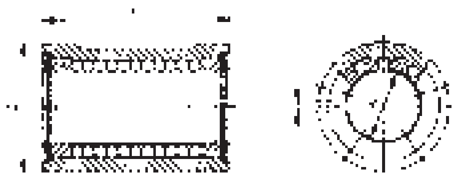


DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER STANDARD TYPE LBB..UU	NUMBER OF BALL CIRCUIT	WEIGHT (g)	DIMENSIONS dr		DIMENSIONS D		DIMENSIONS L		BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)		HEIM LBB..PP
			INCH	mm	INCH	mm	INCH	mm	USUAL	MAX.	USUAL	MAX.	
LBB 4 UU	3	7.1	¼	6.350	½	12.700	¾	19.050	80.0	64.9	156	156	LBB-250 PP
LBB 6 UU	4	10.4	⅜	9.525	⅝	15.875	⅞	22.225	117	134	227	320	LBB-375 PP
LBB 8 UU	4	32	½	12.700	⅞	22.225	1¼	31.750	290	333	557	816	LBB-500 PP
LBB 10 UU	4	65	⅝	15.875	1⅛	28.575	1½	38.100	424	488	766	1080	LBB-625 PP
LBB 12 UU	5	80	¾	19.050	1¼	31.750	1⅝	41.275	608	724	1150	1680	LBB-750 PP
LBB 16 UU	5	148	1	25.400	1 9/16	39.688	2¼	57.150	1070	1280	2020	2960	LBB-1000 PP
LBB 20 UU	6	325	1¼	31.750	2	50.800	2⅝	66.675	1920	2030	3570	4570	LBB-1250 PP
LBB 24 UU	6	535	1½	38.100	2⅜	60.325	3	76.200	2460	2610	4330	5540	LBB-1500 PP
LBB 32 UU	6	1040	2	50.800	3	76.200	4	101.600	3960	4190	7140	9130	LBB-2000 PP

LINEAR BUSHINGS

Inch Dimension



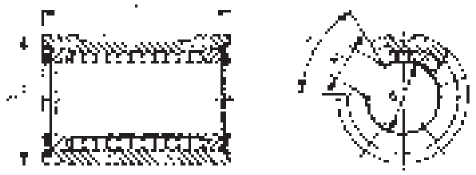
LBB..UU AJ

DIMENSION TABLE | **INTERCHANGE TABLE**

IKO NUMBER ADJUSTABLE TYPE **LBB..UU AJ**	NUMBER OF RACE CIRCUIT	WEIGHT (g)	DIMENSIONS dr INCH	dr mm	D INCH	D mm	L INCH	L mm	h Min. INCH	h Min. mm	BASIC DYNAMIC LOAD RATING (N) USUAL	MAX.	BASIC STATIC LOAD RATING (N) USUAL	MAX.	HEIM ADJ..PP
LBB 8 UU AJ	4	31.5	½	12.700	⅞	22.225	1¼	31.750	1⁄16	1.588	290	333	577	816	ADJ-500 PP
LBB 10 UU AJ	4	64	⅝	15.875	1⅛	28.575	1½	38.100	3⁄32	2.381	424	488	766	1080	ADJ-625 PP
LBB 12 UU AJ	5	79	¾	19.050	1¼	31.750	1⅝	41.275	3⁄32	2.381	608	724	1150	1680	ADJ-750 PP
LBB 16 UU AJ	5	145	1	25.400	1 9⁄16	39.688	2¼	57.150	3⁄32	2.381	1070	1280	2020	2960	ADJ-1000 PP
LBB 20 UU AJ	6	320	1¼	31.750	2	50.800	2⅝	66.675	3⁄32	2.381	1920	2030	3570	4570	ADJ-1250 PP
LBB 24 UU AJ	6	530	1½	38.100	2⅜	60.325	3	76.200	⅛	3.175	2460	2610	4330	5540	ADJ-1500 PP
LBB 32 UU AJ	6	1030	2	50.800	3	76.200	4	101.600	⅛	3.175	3960	4190	7140	9130	ADJ-2000 PP

LINEAR BUSHINGS

Inch Dimension



LBB. UU OP

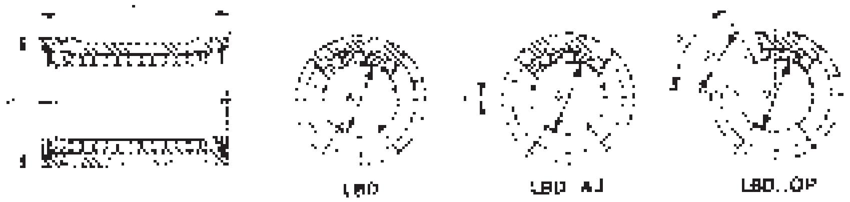
DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER OPEN TYPE **LBB..UU OP**	NUMBER OF RACE CIRCUIT	WEIGHT	DIMENSIONS dr		D		L		h1 Min.			BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)		HEIM
		(g)	INCH	mm	INCH	mm	INCH	mm	INCH	mm	θ	USUAL	MAX.	USUAL	MAX.	OPN..PP
LBB 8 UU OP	3	28	½	12.700	⅞	22.225	1¼	31.750	5⁄16	7.938	50°	290	333	577	816	OPN-500 PP
LBB 10 UU OP	3	54	⅝	15.875	1⅛	28.575	1½	38.100	⅜	9.525	60°	424	488	766	1080	OPN-625 PP
LBB 12 UU OP	4	69	¾	19.050	1¼	31.750	1⅝	41.275	7⁄16	11.112	60°	608	724	1150	1680	OPN-750 PP
LBB 16 UU OP	4	128	1	25.400	1 9⁄16	39.688	2¼	57.150	9⁄16	14.288	60°	1070	1280	2020	2960	OPN-1000 PP
LBB 20 UU OP	5	290	1¼	31.750	2	50.800	2⅝	66.675	⅝	15.875	50°	1920	2030	3570	4570	OPN-1250 PP
LBB 24 UU OP	5	475	1½	38.100	2⅜	60.325	3	76.200	¾	19.050	50°	2460	2610	4330	5540	OPN-1500 PP
LBB 32 UU OP	5	920	2	50.800	3	76.200	4	101.600	1	25.400	50°	3960	4190	7140	9130	OPN-2000 PP

LINEAR BUSHINGS

Metric Dimension

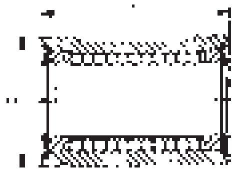


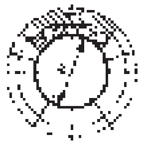
DIMENSION TABLE

IKO NUMBER STANDARD TYPE **LBD**	NUMBER OF RACE CIRCUIT	WEIGHT (g)	IKO NUMBER ADJUSTABLE TYPE **LBD..AJ**	NUMBER OF RACE CIRCUIT	WEIGHT (g)	IKO NUMBER OPEN TYPE **LBD..OP**	NUMBER OF RACE CIRCUIT	WEIGHT (g)	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)	
									dr	D	L	h	h1	θ	USUAL	MAX.	USUAL	MAX.
LBD 6	3	5.1	**LBD 6 AJ**	3	5.0	—	—	—	6	12	19	1.5	—	—	78.0	63.4	155	155
LBD 8S	3	8.3	**LBD 8S AJ**	3	8.1	—	—	—	8	15	17	1.5	—	—	74.7	60.7	128	128
LBD 8	3	11.8	**LBD 8 AJ**	3	11.5	—	—	—	8	15	24	1.5	—	—	121	98.6	255	255
LBD 10	4	25.5	**LBD 10 AJ**	4	25	**LBD 10 OP**	3	20.5	10	19	29	1.5	7	80°	197	226	405	573
LBD 13	4	41.5	**LBD 13 AJ**	4	40.5	**LBD 13 OP**	3	33	13	23	32	1.5	9	80°	292	336	578	818
LBD 16	4	58	**LBD 16 AJ**	4	57	**LBD 16 OP**	3	47	16	28	37	1.5	11	80°	426	489	766	1080
LBD 20	5	80	**LBD 20 AJ**	5	79	**LBD 20 OP**	4	69	20	32	42	2.0	11	60°	617	734	1150	1680
LBD 25	5	160	**LBD 25 AJ**	5	158	**LBD 25 OP**	4	142	25	40	59	2.0	12	50°	1070	1270	2020	2960
LBD 30	6	220	**LBD 30 AJ**	6	215	**LBD 30 OP**	5	196	30	45	64	2.0	15	50°	1460	1540	2780	3560
LBD 35	6	320	**LBD 35 AJ**	6	315	**LBD 35 OP**	5	280	35	52	70	2.0	17	50°	1610	1710	3080	3940
LBD 40	6	440	**LBD 40 AJ**	6	435	**LBD 40 OP**	5	390	40	60	80	2.0	20	50°	2710	2870	4890	6250
LBD 50	6	1390	**LBD 50 AJ**	6	1380	**LBD 50 OP**	5	1220	50	80	100	2.0	25	50°	3940	4180	7130	9120

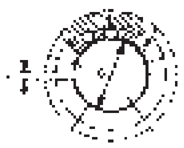
LINEAR BUSHINGS

Metric Dimension

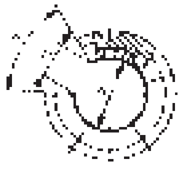




LBD..UU



LBD..UU AJ



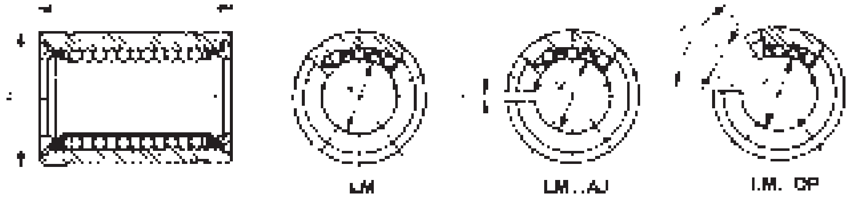
LBD..UU OP

DIMENSION TABLE

IKO NUMBER STANDARD TYPE **LBD..UU**	NUMBER OF RACE CIRCUIT	WEIGHT (g)	IKO NUMBER ADJUSTABLE TYPE **LBD..UU AJ**	NUMBER OF RACE CIRCUIT	WEIGHT (g)	IKO NUMBER OPEN TYPE **LBD..UU OP**	NUMBER OF RACE CIRCUIT	WEIGHT (g)	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)	
									dr	D	L	h	h1	θ	USUAL	MAX.	USUAL	MAX.
LBD 6 UU	3	5.2	**LBD 6 UU AJ**	3	5.1	—	—	—	6	12	19	1.5	—	—	78.0	63.4	155	155
LBD 8S UU	3	8.4	**LBD 8S UU AJ**	3	8.2	—	—	—	8	15	17	1.5	—	—	74.7	60.7	128	128
LBD 8 UU	3	11.8	**LBD 8 UU AJ**	3	11.6	—	—	—	8	15	24	1.5	—	—	121	98.6	255	255
LBD 10 UU	4	25.5	**LBD 10 UU AJ**	4	25.5	**LBD 10 UU OP**	3	20.5	10	19	29	1.5	7	80°	197	226	405	573
LBD 13 UU	4	41.5	**LBD 13 UU AJ**	4	40.5	**LBD 13 UU OP**	3	33.5	13	23	32	1.5	9	80°	292	336	578	818
LBD 16 UU	4	58	**LBD 16 UU AJ**	4	57	**LBD 16 UU OP**	3	47.5	16	28	37	1.5	11	80°	426	489	766	1080
LBD 20 UU	5	80.5	**LBD 20 UU AJ**	5	79.5	**LBD 20 UU OP**	4	69.5	20	32	42	2	11	60°	617	734	1150	1680
LBD 25 UU	5	161	**LBD 25 UU AJ**	5	159	**LBD 25 UU OP**	4	143	25	40	59	2	12	50°	1070	1270	2020	2960
LBD 30 UU	6	220	**LBD 30 UU AJ**	6	220	**LBD 30 UU OP**	5	197	30	45	64	2	15	50°	1460	1540	2780	3560
LBD 35 UU	6	320	**LBD 35 UU AJ**	6	320	**LBD 35 UU OP**	5	280	35	52	70	2	17	50°	1610	1710	3080	3940
LBD 40 UU	6	440	**LBD 40 UU AJ**	6	435	**LBD 40 UU OP**	5	390	40	60	80	2	20	50°	2710	2870	4890	6250
LBD 50 UU	6	1400	**LBD 50 UU AJ**	6	1380	**LBD 50 UU OP**	5	1220	50	80	100	2	25	50°	3940	4180	7130	9120

LINEAR BUSHINGS

Metric Dimension

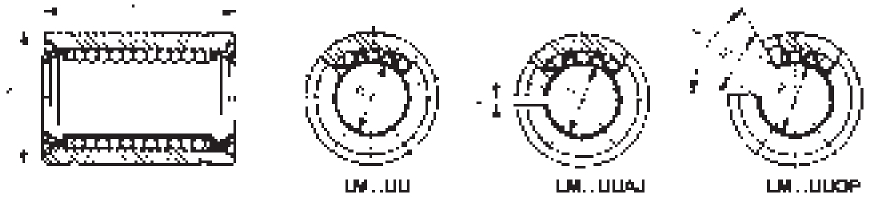


DIMENSION TABLE

IKO NUMBER STANDARD TYPE **LM**	NUMBER OF BALL CIRCUIT	WEIGHT (g)	IKO NUMBER ADJUSTABLE TYPE **LM..AJ**	NUMBER OF BALL CIRCUIT	WEIGHT (g)	IKO NUMBER OPEN TYPE **LM..OP**	NUMBER OF BALL CIRCUIT	WEIGHT (g)		DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)	
										dr	D	L	h	h1	θ	USUAL	MAX.	USUAL	MAX.
LM 61219	3	8.5	—	—	—	—	—	—		6	12	19	—	—	—	80.7	92.7	167	237
LM 61219 N	4	7.6	**LM 61219 N AJ**	4	7.5	—	—	—		6	12	19	1	—	—	80.7	92.7	167	237
LM 81517	3	11	—	—	—	—	—	—		8	15	17	—	—	—	87.4	100	160	226
LM 81517 N	4	10.4	**LM 81517 N AJ**	4	10	—	—	—		8	15	17	1	—	—	87.4	100	160	226
LM 81524	4	17	—	—	—	—	—	—		8	15	24	—	—	—	121	139	255	361
LM 81524 N	4	15	**LM 81524 N AJ**	4	14.7	—	—	—		8	15	24	1	—	—	121	139	255	361
LM 101929	4	36	—	—	—	—	—	—		10	19	29	—	—	—	179	206	354	501
LM 101929 N	4	29.5	**LM 101929 N AJ**	4	29	**LM 101929 N OP**	3	23		10	19	29	1	6.8	80°	179	206	354	501
LM 122130	4	42	**LM 122130 AJ**	4	41	**LM 122130 OP**	3	32		12	21	30	1.5	8	80°	259	298	503	711
LM 122130 N	4	31.5	**LM 122130 N AJ**	4	31	**LM 122130 N OP**	3	25		12	21	30	1.5	8	80°	259	298	503	711
LM 132332	4	49	**LM 132332 AJ**	4	48	**LM 132332 OP**	3	37.5		13	23	32	1.5	9	80°	266	306	506	716
LM 132332 N	4	43	**LM 132332 N AJ**	4	42	**LM 132332 N OP**	3	34		13	23	32	1.5	9	80°	266	306	506	716
LM 162837	4	78	**LM 162837 AJ**	4	77	**LM 162837 OP**	3	60		16	28	37	1.5	11	80°	426	489	766	1080
LM 162837 N	4	69.5	**LM 162837 N AJ**	4	68	**LM 162837 N OP**	3	52		16	28	37	1.5	11	80°	426	489	766	1080
LM 203242	5	100	**LM 203242 AJ**	5	98	**LM 203242 OP**	4	85		20	32	42	1.5	11	60°	562	668	1010	1470
LM 203242 N	5	98	**LM 203242 N AJ**	5	95	**LM 203242 N OP**	4	69		20	32	42	1.5	11	60°	562	668	1010	1470
LM 254059	6	260	**LM 254059 AJ**	6	255	**LM 254059 OP**	5	220		25	40	59	2	12	50°	920	974	1780	2280
LM 254059 N	6	220	**LM 254059 N AJ**	6	216	**LM 254059 N OP**	5	188		25	40	59	2	12	50°	920	974	1780	2280
LM 304564	6	290	**LM 304564 AJ**	6	285	**LM 304564 OP**	5	245		30	45	64	2.5	15	50°	1350	1430	2500	3200
LM 304564 N	6	250	**LM 304564 N AJ**	6	245	**LM 304564 N OP**	5	210		30	45	64	2.5	15	50°	1350	1430	2500	3200
LM 355270	6	425	**LM 355270 AJ**	6	420	**LM 355270 OP**	5	355		35	52	70	2.5	17	50°	1610	1710	3080	3940
LM 355270 N	6	390	**LM 355270 N AJ**	6	384	**LM 355270 N OP**	5	335		35	52	70	2.5	17	50°	1610	1710	3080	3940
LM 406080	6	675	**LM 406080 AJ**	6	665	**LM 406080 OP**	5	575		40	60	80	3	20	50°	2030	2150	3620	4640
LM 406080 N	6	585	**LM 406080 N AJ**	6	579	**LM 406080 N OP**	5	500		40	60	80	3	20	50°	2030	2150	3620	4640
LM 5080100	6	1740	**LM 5080100 AJ**	6	1720	**LM 5080100 OP**	5	1480		50	80	100	3	25	50°	3940	4180	7130	9120
LM 5080100 N	6	1580	**LM 5080100 N AJ**	6	1560	**LM 5080100 N OP**	5	1340		50	80	100	3	25	50°	3940	4180	7130	9120
LM 6090110	6	2000	**LM 6090110 AJ**	6	1980	**LM 6090110 OP**	5	1700		60	90	110	3	30	50°	4760	5040	8150	10400
LM 6090110 N	6	1860	**LM 6090110 N AJ**	6	1820	**LM 6090110 N OP**	5	1610		60	90	110	3	30	50°	4760	5040	8150	10400
LM 80120140	6	4480	**LM 80120140 AJ**	6	4440	**LM 80120140 OP**	5	3810		80	120	140	3	40	50°	8710	9220	14500	18500
LM 100150175	6	8600	**LM 100150175 AJ**	6	8540	**LM 100150175 OP**	5	7200		100	150	175	3	50	50°	14500	15300	22800	29200
LM 120180200	8	15000	**LM 120180200 AJ**	8	14900	**LM 120180200 OP**	6	11600		120	180	200	4	85	80°	25800	25500	44300	49400
LM 150210240	8	20300	**LM 150210240 AJ**	8	20200	**LM 150210240 OP**	6	15700		150	210	240	4	105	80°	35600	35100	61200	68200

LINEAR BUSHINGS

Metric Dimension

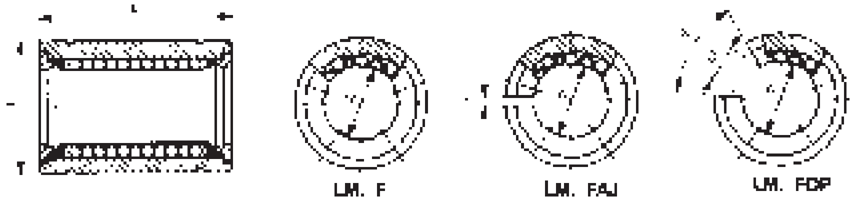


DIMENSION TABLE

IKO NUMBER STANDARD TYPE **LM..UU**	NUMBER OF BALL CIRCUIT	WEIGHT (g)	IKO NUMBER ADJUSTABLE TYPE **LM..UU AJ**	NUMBER OF BALL CIRCUIT	WEIGHT (g)	IKO NUMBER OPEN TYPE **LM..UU OP**	NUMBER OF BALL CIRCUIT	WEIGHT (g)	DIMENSIONS (mm) dr	D	L	h	h1	θ	BASIC DYNAMIC LOAD RATING (N) USUAL	MAX.	BASIC STATIC LOAD RATING (N) USUAL	MAX.
LM 61219 UU	3	8.5	—	—	—	—	—	—	6	12	19	—	—	—	80.7	92.7	167	237
LM 61219 N UU	4	7.6	**LM 61219 N UU AJ**	4	7.5	—	—	—	6	12	19	1	—	—	80.7	92.7	167	237
LM 81517 UU	3	11	—	—	—	—	—	—	8	15	17	—	—	—	87.4	100	160	226
LM 81517 N UU	4	10.4	**LM 81517 N UU AJ**	4	10	—	—	—	8	15	17	1	—	—	87.4	100	160	226
LM 81524 UU	4	17	—	—	—	—	—	—	8	15	24	—	—	—	121	139	255	361
LM 81524 N UU	4	15	**LM 81524 N UU AJ**	4	14.7	—	—	—	8	15	24	1	—	—	121	139	255	361
LM 101929 UU	4	31	—	—	—	—	—	—	10	19	29	—	—	—	179	206	354	501
LM 101929 N UU	4	29.5	**LM 101929 N UU AJ**	4	29	**LM 101929 N UU OP**	3	23	10	19	29	1	6.8	80°	179	206	354	501
LM 122130 UU	4	41	**LM 122130 UU AJ**	4	40	**LM 122130 UU OP**	3	31	12	21	30	1.5	8	80°	259	298	503	711
LM 122130 N UU	4	31.5	**LM 122130 N UU AJ**	4	31	**LM 122130 N UU OP**	3	25	12	21	30	1.5	8	80°	259	298	503	711
LM 132332 UU	4	49	**LM 132332 UU AJ**	4	48	**LM 132332 UU OP**	3	37.5	13	23	32	1.5	9	80°	266	306	506	716
LM 132332 N UU	4	43	**LM 132332 N UU AJ**	4	42	**LM 132332 N UU OP**	3	34	13	23	32	1.5	9	80°	266	306	506	716
LM 162837 UU	4	78	**LM 162837 UU AJ**	4	77	**LM 162837 UU OP**	3	60	16	28	37	1.5	11	80°	426	489	766	1080
LM 162837 N UU	4	69.5	**LM 162837 N UU AJ**	4	68	**LM 162837 N UU OP**	3	52	16	28	37	1.5	11	80°	426	489	766	1080
LM 203242 UU	5	100	**LM 203242 UU AJ**	5	98	**LM 203242 UU OP**	4	85	20	32	42	1.5	11	60°	562	668	1010	1470
LM 203242 N UU	5	98	**LM 203242 N UU AJ**	5	95	**LM 203242 N UU OP**	4	69	20	32	42	1.5	11	60°	562	668	1010	1470
LM 254059 UU	6	260	**LM 254059 UU AJ**	6	255	**LM 254059 UU OP**	5	220	25	40	59	2	12	50°	920	974	1780	2280
LM 254059 N UU	6	220	**LM 254059 N UU AJ**	6	216	**LM 254059 N UU OP**	5	188	25	40	59	2	12	50°	920	974	1780	2280
LM 304564 UU	6	290	**LM 304564 UU AJ**	6	285	**LM 304564 UU OP**	5	245	30	45	64	2.5	15	50°	1350	1430	2500	3200
LM 304564 N UU	6	250	**LM 304564 N UU AJ**	6	245	**LM 304564 N UU OP**	5	210	30	45	64	2.5	15	50°	1350	1430	2500	3200
LM 355270 UU	6	410	**LM 355270 UU AJ**	6	405	**LM 355270 UU OP**	5	346	35	52	70	2.5	17	50°	1610	1710	3080	3940
LM 355270 N UU	6	390	**LM 355270 N UU AJ**	6	384	**LM 355270 N UU OP**	5	335	35	52	70	2.5	17	50°	1610	1710	3080	3940
LM 406080 UU	6	675	**LM 406080 UU AJ**	6	665	**LM 406080 UU OP**	5	575	40	60	80	3	20	50°	2030	2150	3620	4640
LM 406080 N UU	6	585	**LM 406080 N UU AJ**	6	579	**LM 406080 N UU OP**	5	500	40	60	80	3	20	50°	2030	2150	3620	4640
LM 5080100 UU	6	1740	**LM 5080100 UU AJ**	6	1720	**LM 5080100 UU OP**	5	1480	50	80	100	3	25	50°	3940	4180	7130	9120
LM 5080100 N UU	6	1580	**LM 5080100 N UU AJ**	6	1560	**LM 5080100 N UU OP**	5	1340	50	80	100	3	25	50°	3940	4180	7130	9120
LM 6090110 UU	6	2000	**LM 6090110 UU AJ**	6	1980	**LM 6090110 UU OP**	5	1700	60	90	110	3	30	50°	4760	5040	8150	10400
LM 6090110 N UU	6	1860	**LM 6090110 N UU AJ**	6	1820	**LM 6090110 N UU OP**	5	1610	60	90	110	3	30	50°	4760	5040	8150	10400
LM 80120140 UU	6	4480	**LM 80120140 UU AJ**	6	4440	**LM 80120140 UU OP**	5	3810	80	120	140	3	40	50°	8710	9220	14500	18500
LM 100150175 UU	6	8600	**LM 100150175 UU AJ**	6	8540	**LM 100150175 UU OP**	5	7200	100	150	175	3	50	50°	14500	15300	22800	29200
LM 120180200 UU	8	14700	**LM 120180200 UU AJ**	8	14600	**LM 120180200 UU OP**	6	11400	120	180	200	4	85	80°	25800	25500	44300	49400
LM 150210240 UU	8	19900	**LM 150210240 UU AJ**	8	19800	**LM 150210240 UU OP**	6	15400	150	210	240	4	105	80°	35600	35100	61200	68200

LINEAR BUSHINGS (STAINLESS STEEL)

Metric Dimension

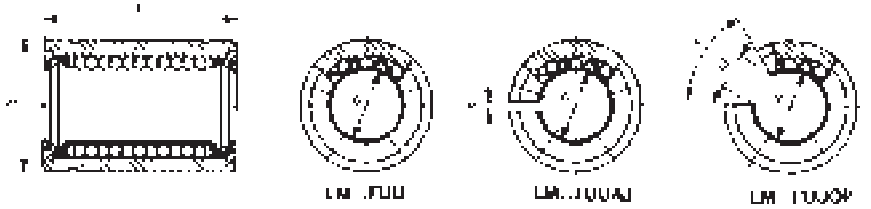


DIMENSION TABLE

IKO NUMBER STANDARD TYPE **LM..F**	NUMBER OF BALL CIRCUIT	WEIGHT (g)	IKO NUMBER ADJUSTABLE TYPE **LM..F AJ**	NUMBER OF BALL CIRCUIT	WEIGHT (g)	IKO NUMBER OPEN TYPE **LM..F OP**	NUMBER OF BALL CIRCUIT	WEIGHT (g)	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)	
									dr	D	L	h	h1	θ	USUAL	MAX.	USUAL	MAX.
LM 61219 F	3	8.5	—	—	—	—	—	—	6	12	19	—	—	—	80.7	92.7	167	237
LM 61219 N F	4	7.6	**LM 61219 N F AJ**	4	7.5	—	—	—	6	12	19	1	—	—	80.7	92.7	167	237
LM 81517 F	3	11	—	—	—	—	—	—	8	15	17	—	—	—	87.4	100	160	226
LM 81517 N F	4	10.4	**LM 81517 N F AJ**	4	10	—	—	—	8	15	17	1	—	—	87.4	100	160	226
LM 81524 F	4	17	—	—	—	—	—	—	8	15	24	—	—	—	121	139	255	361
LM 81524 N F	4	15	**LM 81524 N F AJ**	4	14.7	—	—	—	8	15	24	1	—	—	121	139	255	361
LM 101929 F	4	36	—	—	—	—	—	—	10	19	29	—	—	—	179	206	354	501
LM 101929 N F	4	29.5	**LM 101929 N F AJ**	4	29	**LM 101929 N F OP**	3	23	10	19	29	1	8	80°	179	206	354	501
LM 122130 F	4	42	**LM 122130 F AJ**	4	41	**LM 122130 F OP**	3	32	12	21	30	1.5	8	80°	259	298	503	711
LM 122130 N F	4	31.5	**LM 122130 N F AJ**	4	31	**LM 122130 N F OP**	3	25	12	21	30	1.5	8	80°	259	298	503	711
LM 132332 F	4	49	**LM 132332 F AJ**	4	48	**LM 132332 F OP**	3	37.5	13	23	32	1.5	9	80°	266	306	506	716
LM 132332 N F	4	43	**LM 132332 N F AJ**	4	42	**LM 132332 N F OP**	3	34	13	23	32	1.5	9	80°	266	306	506	716
LM 162837 F	4	78	**LM 162837 F AJ**	4	77	**LM 162837 F OP**	3	60	16	28	37	1.5	11	80°	426	489	766	1080
LM 162837 N F	4	69.5	**LM 162837 N F AJ**	4	68	**LM 162837 N F OP**	3	52	16	28	37	1.5	11	80°	426	489	766	1080
LM 203242 F	5	100	**LM 203242 F AJ**	5	98	**LM 203242 F OP**	4	85	20	32	42	1.5	11	60°	562	668	1010	1470
LM 203242 N F	5	98	**LM 203242 N F AJ**	5	95	**LM 203242 N F OP**	4	69	20	32	42	1.5	11	60°	562	668	1010	1470
LM 254059 F	6	260	**LM 254059 F AJ**	6	255	**LM 254059 F OP**	5	220	25	40	59	2	12	50°	920	974	1780	2280
LM 254059 N F	6	220	**LM 254059 N F AJ**	6	216	**LM 254059 N F OP**	5	188	25	40	59	2	12	50°	920	974	1780	2280
LM 304564 F	6	290	**LM 304564 F AJ**	6	285	**LM 304564 F OP**	5	245	30	45	64	2.5	15	50°	1350	1430	2500	3200
LM 304564 N F	6	250	**LM 304564 N F AJ**	6	245	**LM 304564 N F OP**	5	210	30	45	64	2.5	15	50°	1350	1430	2500	3200
LM 355270 F	6	410	**LM 355270 F AJ**	6	405	**LM 355270 F OP**	5	346	35	52	70	2.5	17	50°	1610	1710	3080	3940
LM 355270 N F	6	390	**LM 355270 N F AJ**	6	384	**LM 355270 N F OP**	5	335	35	52	70	2.5	17	50°	1610	1710	3080	3940
LM 406080 F	6	654	**LM 406080 F AJ**	6	640	**LM 406080 F OP**	5	546	40	60	80	3	20	50°	2030	2150	3620	4640
LM 406080 N F	6	585	**LM 406080 N F AJ**	6	579	**LM 406080 N F OP**	5	500	40	60	80	3	20	50°	2030	2150	3620	4640
LM 5080100 F	6	1700	**LM 5080100 F AJ**	6	1680	**LM 5080100 F OP**	5	1420	50	80	100	3	25	50°	3940	4180	7130	9120
LM 5080100 N F	6	1580	**LM 5080100 N F AJ**	6	1560	**LM 5080100 N F OP**	5	1340	50	80	100	3	25	50°	3940	4180	7130	9120
LM 6090110 F	6	2000	**LM 6090110 F AJ**	6	1980	**LM 6090110 F OP**	5	1650	60	90	110	3	30	50°	4760	5040	8150	10400
LM 6090110 N F	6	1860	**LM 6090110 N F AJ**	6	1820	**LM 6090110 N F OP**	5	1610	60	90	110	3	30	50°	4760	5040	8150	10400

LINEAR BUSHINGS (STAINLESS STEEL)

Metric Dimension

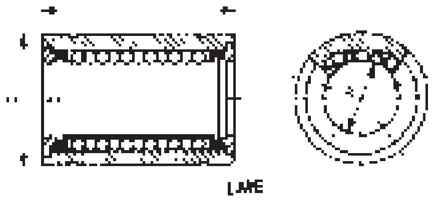


DIMENSION TABLE

IKO NUMBER STANDARD TYPE **LM..F UU**	NUMBER OF BALL CIRCUIT	WEIGHT (g)	IKO NUMBER ADJUSTABLE TYPE **LM..F UU AJ**	NUMBER OF BALL CIRCUIT	WEIGHT (g)	IKO NUMBER OPEN TYPE **LM..F UU OP**	NUMBER OF BALL CIRCUIT	WEIGHT (g)	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)	
									dr	D	L	h	h1	θ	USUAL	MAX.	USUAL	MAX.
LM 61219 F UU	3	8.5	—	—	—	—	—	—	6	12	19	—	—	—	80.7	92.7	167	237
LM 61219 N F UU	4	7.6	**LM 61219 N F UU AJ**	4	7.5	—	—	—	6	12	19	1	—	—	80.7	92.7	167	237
LM 81517 F UU	3	11	—	—	—	—	—	—	8	15	17	—	—	—	87.4	100	160	226
LM 81517 N F UU	4	10.4	**LM 81517 N F UU AJ**	4	10	—	—	—	8	15	17	1	—	—	87.4	100	160	226
LM 81524 F UU	4	17	—	—	—	—	—	—	8	15	24	—	—	—	121	139	255	361
LM 81524 N F UU	4	15	**LM 81524 N F UU AJ**	4	14.7	—	—	—	8	15	24	1	—	—	121	139	255	361
LM 101929 F UU	4	31	—	—	—	—	—	—	10	19	29	—	—	—	179	206	354	501
LM 101929 N F UU	4	29.5	**LM 101929 N F UU AJ**	4	29	**LM 101929 N F UU OP**	3	23	10	19	29	1	8	80°	179	206	354	501
LM 122130 F UU	4	41	**LM 122130 F UU AJ**	4	40	**LM 122130 F UU OP**	3	32	12	21	30	1.5	8	80°	259	298	503	711
LM 122130 N F UU	4	31.5	**LM 122130 N F UU AJ**	4	31	**LM 122130 N F UU OP**	3	25	12	21	30	1.5	8	80°	259	298	503	711
LM 132332 F UU	4	49	**LM 132332 F UU AJ**	4	48	**LM 132332 F UU OP**	3	37.5	13	23	32	1.5	9	80°	266	306	506	716
LM 132332 N F UU	4	43	**LM 132332 N F UU AJ**	4	42	**LM 132332 N F UU OP**	3	34	13	23	32	1.5	9	80°	266	306	506	716
LM 162837 F UU	4	78	**LM 162837 F UU AJ**	4	77	**LM 162837 F UU OP**	3	60	16	28	37	1.5	11	80°	426	489	766	1080
LM 162837 N F UU	4	69.5	**LM 162837 N F UU AJ**	4	68	**LM 162837 N F UU OP**	3	52	16	28	37	1.5	11	80°	426	489	766	1080
LM 203242 F UU	5	100	**LM 203242 F UU AJ**	5	98	**LM 203242 F UU OP**	4	85	20	32	42	1.5	11	60°	562	668	1010	1470
LM 203242 N F UU	5	98	**LM 203242 N F UU AJ**	5	95	**LM 203242 N F UU OP**	4	69	20	32	42	1.5	11	60°	562	668	1010	1470
LM 254059 F UU	6	260	**LM 254059 F UU AJ**	6	255	**LM 254059 F UU OP**	5	220	25	40	59	2	12	50°	920	974	1780	2280
LM 254059 N F UU	6	220	**LM 254059 N F UU AJ**	6	216	**LM 254059 N F UU OP**	5	188	25	40	59	2	12	50°	920	974	1780	2280
LM 304564 F UU	6	290	**LM 304564 F UU AJ**	6	285	**LM 304564 F UU OP**	5	245	30	45	64	2.5	15	50°	1350	1430	2500	3200
LM 304564 N F UU	6	250	**LM 304564 N F UU AJ**	6	245	**LM 304564 N F UU OP**	5	210	30	45	64	2.5	15	50°	1350	1430	2500	3200
LM 355270 F UU	6	410	**LM 355270 F UU AJ**	6	405	**LM 355270 F UU OP**	5	346	35	52	70	2.5	17	50°	1610	1710	3080	3940
LM 355270 N F UU	6	390	**LM 355270 N F UU AJ**	6	384	**LM 355270 N F UU OP**	5	335	35	52	70	2.5	17	50°	1610	1710	3080	3940
LM 406080 F UU	6	636	**LM 406080 F UU AJ**	6	622	**LM 406080 F UU OP**	5	546	40	60	80	3	20	50°	2030	2150	3620	4640
LM 406080 N F UU	6	585	**LM 406080 N F UU AJ**	6	579	**LM 406080 N F UU OP**	5	500	40	60	80	3	20	50°	2030	2150	3620	4640
LM 5080100 F UU	6	1670	**LM 5080100 F UU AJ**	6	1650	**LM 5080100 F UU OP**	5	1410	50	80	100	3	25	50°	3940	4180	7130	9120
LM 5080100 NF UU	6	1580	**LM 5080100 NF UU AJ**	6	1560	**LM 5080100 NF UU OP**	5	1340	50	80	100	3	25	50°	3940	4180	7130	9120
LM 6090110 F UU	6	1930	**LM 6090110 F UU AJ**	6	1910	**LM 6090110 F UU OP**	5	1580	60	90	110	3	30	50°	4760	5040	8150	10400
LM 6090110 NF UU	6	1860	**LM 6090110 NF UU AJ**	6	1820	**LM 6090110 NF UU OP**	5	1610	60	90	110	3	30	50°	4760	5040	8150	10400

LINEAR BUSHINGS

Metric Dimension



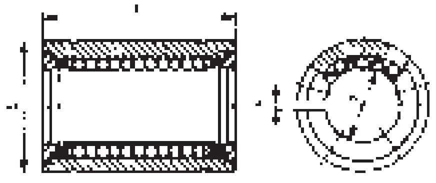
DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER STANDARD TYPE	NUMBER OF BALL CIRCUIT	WEIGHT	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)		STAR	THOMSON	INA	SKF	FAG
LME		(g)	dr	D	L	USUAL	MAX.	USUAL	MAX.	0600..	0600..	KB	LBA(C)R	LAA
LME 51222 N	4	10	5	12	22	90.8	104	219	310	0600-305-00	—	—	LBAR 5	LAA 5×12×22
LME 81625	4	22.5	8	16	25	121	139	255	361	—	0600-308-00	—	—	—
LME 81625 N	4	20	8	16	25	121	139	255	361	0600-308-00	—	—	LBAR 8	LAA 8×16×25
LME 122232	4	45.5	12	22	32	259	298	503	711	0600-012-00	0600-012-00	—	—	—
LME 122232 N	4	41	12	22	32	259	298	503	711	—	—	KB 1232	LBCR 12	LAA 12×22×32
LME 162636	4	59	16	26	36	283	325	514	726	0600-016-00	0600-016-00	—	—	—
LME 162636 N	4	56.5	16	26	36	283	325	514	726	—	—	KB 1636	LBCR 16	LAA 16×26×36
LME 203245	5	105	20	32	45	562	668	1010	1470	0600-020-00	0600-020-00	—	—	—
LME 203245 N	5	92	20	32	45	562	668	1010	1470	—	—	KB 2045	LBCR 20	LAA 20×32×45
LME 254058	6	240	25	40	58	920	974	1780	2280	0600-025-00	0600-025-00	—	—	—
LME 254058 N	6	220	25	40	58	920	974	1780	2280	—	—	KB 2558	LBCR 25	LAA 25×40×58
LME 304768	6	360	30	47	68	1350	1430	2500	3200	0600-030-00	0600-030-00	—	—	—
LME 304768 N	6	325	30	47	68	1350	1430	2500	3200	—	—	KB 3068	LBCR 30	LAA 30×47×68
LME 406280	6	800	40	62	80	2030	2150	3620	4640	0600-040-00	0600-040-00	—	—	—
LME 406280 N	6	705	40	62	80	2030	2150	3620	4640	—	—	KB 4080	LBCR 40	LAA 40×62×80
LME 5075100	6	1260	50	75	100	3940	4180	7130	9120	0600-050-00	0600-050-00	—	—	—
LME 5075100 N	6	1130	50	75	100	3940	4180	7130	9120	—	—	KB 50100	LBCR 50	LAA 50×75×100
LME 6090125	6	2270	60	90	125	4760	5040	8150	10400	0600-060-00	0600-060-00	—	—	—
LME 6090125 N	6	1860	60	90	125	4760	5040	8150	10400	—	—	—	LBAR 60	—
LME 80120165	6	5140	80	120	165	8710	9220	14500	18500	0600-080-00	0600-080-00	—	—	—

LINEAR BUSHINGS

Metric Dimension


LME..AJ

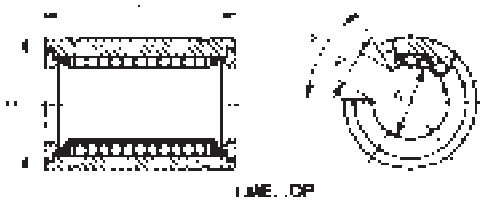
DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER ADJUSTABLE TYPE LME..AJ	NUMBER OF BALL CIRCUIT	WEIGHT (g)	DIMENSIONS (mm)				BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)		STAR	THOMSON	INA	SKF	FAG
			dr	D	L	h	USUAL	MAX.	USUAL	MAX.	0610..	0610..	KBS	LBAS	LAG
LME 51222 N AJ	4	9.5	5	12	22	1	90.8	104	219	310	0610-305-00	—	—	LBAS 5	—
LME 81625 N AJ	4	19	8	16	25	1	121	139	255	361	0610-308-00	—	—	LBAS 8	LAG 8×16×25
LME 122232 AJ	4	44.5	12	22	32	1.5	259	298	503	711	0610-012-00	0610-012-00	—	—	—
LME 122232 N AJ	4	40	12	22	32	1.5	259	298	503	711	—	—	KBS 1232	—	LAG 12×22×32
LME 162636 AJ	4	58	16	26	36	1.5	283	325	514	726	0610-016-00	0610-016-00	—	—	—
LME 162636 N AJ	4	54.5	16	26	36	1.5	283	325	514	726	—	—	KBS 1636	—	LAG 16×26×36
LME 203245 AJ	5	100	20	32	45	2	562	668	1010	1470	0610-020-00	0610-020-00	—	—	—
LME 203245 N AJ	5	90	20	32	45	2	562	668	1010	1470	—	—	KBS 2045	—	LAG 20×32×45
LME 254058 AJ	6	235	25	40	58	2	920	974	1780	2280	0610-025-00	0610-025-00	—	—	—
LME 254058 N AJ	6	215	25	40	58	2	920	974	1780	2280	—	—	KBS 2558	—	LAG 25×40×58
LME 304768 AJ	6	355	30	47	68	2	1350	1430	2500	3200	0610-030-00	0610-030-00	—	—	—
LME 304768 N AJ	6	320	30	47	68	2	1350	1430	2500	3200	—	—	KBS 3068	—	LAG 30×47×68
LME 406280 AJ	6	790	40	62	80	3	2030	2150	3620	4640	0610-040-00	0610-040-00	—	—	—
LME 406280 N AJ	6	694	40	62	80	3	2030	2150	3620	4640	—	—	KBS 4080	—	LAG 40×62×80
LME 5075100 AJ	6	1250	50	75	100	3	3940	4180	7130	9120	0610-050-00	0610-050-00	—	—	—
LME 5075100 N AJ	6	1110	50	75	100	3	3940	4180	7130	9120	—	—	KBS 50100	—	LAG 50×75×100
LME 6090125 AJ	6	2240	60	90	125	3	4760	5040	8150	10400	0610-060-00	0610-060-00	—	—	—
LME 6090125 N AJ	6	1820	60	90	125	3	4760	5040	8150	10400	—	—	—	LBAS 60	—
LME 80120165 AJ	6	5100	80	120	165	3	8710	9220	14500	18500	0610-080-00	0610-080-00	—	—	—

LINEAR BUSHINGS

Metric Dimension



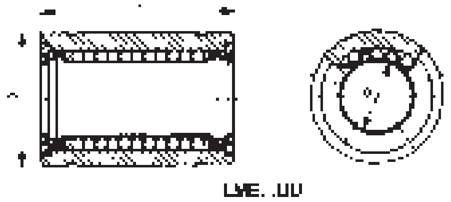
DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER OPEN TYPE	NUMBER OF BALL CIRCUIT	WEIGHT	DIMENSIONS (mm)					BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)		STAR	THOMSON	INA	SKF	FAG
LME..OP		(g)	dr	D	L	h1	θ	USUAL	MAX.	USUAL	MAX.	0630..	0630..	KBO	LBC(A)T	LAN
LME 122232 OP	3	35	12	22	32	7.5	78°	259	298	503	711	0630-012-00	0630-012-00	—	—	—
LME 122232 N OP	3	32	12	22	32	7.5	78°	259	298	503	711	—	—	KBO 1232	LBCT 12	LAN 12×22×32
LME 162636 OP	3	45	16	26	36	10	78°	283	325	514	726	0630-016-00	0630-016-00	—	—	—
LME 162636 N OP	3	44	16	26	36	10	78°	283	325	514	726	—	—	KBO 1636	LBCT 16	LAN 16×26×36
LME 203245 OP	4	84	20	32	45	10	60°	562	668	1010	1470	0630-020-00	0630-020-00	—	—	—
LME 203245 N OP	4	75	20	32	45	10	60°	562	668	1010	1470	—	—	KBO 2045	LBCT 20	LAN 20×32×45
LME 254058 OP	5	200	25	40	58	12.5	60°	920	974	1780	2280	0630-025-00	0630-025-00	—	—	—
LME 254058 N OP	5	181	25	40	58	12.5	60°	920	974	1780	2280	—	—	KBO 2558	LBCT 25	LAN 25×40×58
LME 304768 OP	5	300	30	47	68	12.5	50°	1350	1430	2500	3200	0630-030-00	0630-030-00	—	—	—
LME 304768 N OP	5	272	30	47	68	12.5	50°	1350	1430	2500	3200	—	—	KBO 3068	LBCT 30	LAN 30×47×68
LME 406280 OP	5	670	40	62	80	16.8	50°	2030	2150	3620	4640	0630-040-00	0630-040-00	—	—	—
LME 406280 N OP	5	600	40	62	80	16.8	50°	2030	2150	3620	4640	—	—	KBO 4080	LBCT 40	LAN 40×62×80
LME 5075100 OP	5	1060	50	75	100	21	50°	3940	4180	7130	9120	0630-050-00	0630-050-00	—	—	—
LME 5075100 N OP	5	970	50	75	100	21	50°	3940	4180	7130	9120	—	—	KBO 50100	LBCT 50	LAN 50×75×100
LME 6090125 OP	5	1900	60	90	125	27.2	54°	4760	5040	8150	10400	0630-060-00	0630-060-00	—	—	—
LME 6090125 N OP	5	1610	60	90	125	27.2	54°	4760	5040	8150	10400	—	—	—	LBAT 60	—
LME 80120165 OP	5	4350	80	120	165	36.3	54°	8710	9220	14500	18500	0630-080-00	0630-080-00	—	—	—

LINEAR BUSHINGS

Metric Dimension



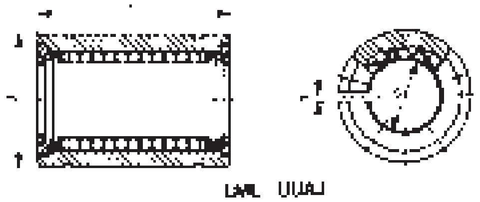
DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER STANDARD TYPE	NUMBER OF BALL CIRCUIT	WEIGHT	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)		STAR	THOMSON	INA	SKF	FAG
LME..UU		(g)	dr	D	L	USUAL	MAX.	USUAL	MAX.	0602..	0602..	KB..PP	LBA(C)R..2LS	LAA..2RS
LME 51222 N UU	4	10	5	12	22	90.8	104	219	310	0602-305-10	—	—	LBAR 5-2LS	LAA 5×12×22.2RS
LME 81625 UU	4	22	8	16	25	121	139	255	361	—	0602-308-10	—	—	—
LME 81625 N UU	4	20	8	16	25	121	139	255	361	0602-308-10	—	—	LBAR 8-2LS	LAA 8×16×25.2RS
LME 122232 UU	4	45.5	12	22	32	259	298	503	711	0602-012-10	0602-012-10	—	—	—
LME 122232 N UU	4	41	12	22	32	259	298	503	711	—	—	KB 1232 PP	LBCR 12-2LS	LAA 12×22×32.2RS
LME 162636 UU	4	59	16	26	36	283	325	514	726	0602-016-10	0602-016-10	—	—	—
LME 162636 N UU	4	56.5	16	26	36	283	325	514	726	—	—	KB 1636 PP	LBCR 16-2LS	LAA 16×26×36.2RS
LME 203245 UU	5	105	20	32	45	562	668	1010	1470	0602-020-10	0602-020-10	—	—	—
LME 203245 N UU	5	92	20	32	45	562	668	1010	1470	—	—	KB 2045 PP	LBCR 20-2LS	LAA 20×32×45.2RS
LME 254058 UU	6	240	25	40	58	920	974	1780	2280	0602-025-10	0602-025-10	—	—	—
LME 254058 N UU	6	220	25	40	58	920	974	1780	2280	—	—	KB 2558 PP	LBCR 25-2LS	LAA 25×40×58.2RS
LME 304768 UU	6	360	30	47	68	1350	1430	2500	3200	0602-030-10	0602-030-10	—	—	—
LME 304768 N UU	6	325	30	47	68	1350	1430	2500	3200	—	—	KB 3068 PP	LBCR 30-2LS	LAA 30×47×68.2RS
LME 406280 UU	6	800	40	62	80	2030	2150	3620	4640	0602-040-10	0602-040-10	—	—	—
LME 406280 N UU	6	705	40	62	80	2030	2150	3620	4640	—	—	KB 4080 PP	LBCR 40-2LS	LAA 40×62×80.2RS
LME 5075100 UU	6	1260	50	75	100	3940	4180	7130	9120	0602-050-10	0602-050-10	—	—	—
LME 5075100 N UU	6	1130	50	75	100	3940	4180	7130	9120	—	—	KB 50100 PP	LBCR 50-2LS	LAA 50×75×100.2RS
LME 6090125 UU	6	2270	60	90	125	4760	5040	8150	10400	0602-060-10	0602-060-10	—	—	—
LME 6090125 N UU	6	2050	60	90	125	4760	5040	8150	10400	—	—	—	LBAR 60-2LS	—
LME 80120165 UU	6	5140	80	120	165	8710	9220	14500	18500	0602-080-10	0602-080-10	—	—	—

LINEAR BUSHINGS

Metric Dimension



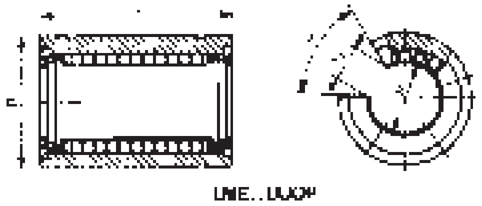
DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER ADJUSTABLE TYPE	NUMBER OF BALL	WEIGHT	DIMENSIONS (mm)				BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)		STAR	THOMSON	INA	SKF	FAG
LME..UU AJ	CIRCUIT	(g)	dr	D	L	h	USUAL	MAX.	USUAL	MAX.	0612..	0612..	KBS..PP	LBAS..2LS	LAG..2RS
LME 51222 N UU AJ	4	9.5	5	12	22	1	90.8	104	219	310	0612-305-10	—	—	LBAS 5-2LS	—
LME 81625 N UU AJ	4	19	8	16	25	1	121	139	255	361	0612-308-10	—	—	LBAS 8-2LS	LAG 8×16×25.2RS
LME 122232 UU AJ	4	44.5	12	22	32	1.5	259	298	503	711	0612-012-10	0612-012-10	—	—	—
LME 122232 N UU AJ	4	40	12	22	32	1.5	259	298	503	711	—	—	KBS 1232 PP	—	LAG 12×22×32.2RS
LME 162636 UU AJ	4	58	16	26	36	1.5	283	325	514	726	0612-016-10	0612-016-10	—	—	—
LME 162636 N UU AJ	4	54.5	16	26	36	1.5	283	325	514	726	—	—	KBS 1636 PP	—	LAG 16×26×36.2RS
LME 203245 UU AJ	5	100	20	32	45	2	562	668	1010	1470	0612-020-10	0612-020-10	—	—	—
LME 203245 N UU AJ	5	90	20	32	45	2	562	668	1010	1470	—	—	KBS 2045 PP	—	LAG 20×32×45.2RS
LME 254058 UU AJ	6	235	25	40	58	2	920	974	1780	2280	0612-025-10	0612-025-10	—	—	—
LME 254058 N UU AJ	6	215	25	40	58	2	920	974	1780	2280	—	—	KBS 2558 PP	—	LAG 25×40×58.2RS
LME 304768 UU AJ	6	355	30	47	68	2	1350	1430	2500	3200	0612-030-10	0612-030-10	—	—	—
LME 304768 N UU AJ	6	320	30	47	68	2	1350	1430	2500	3200	—	—	KBS 3068 PP	—	LAG 30×47×68.2RS
LME 406280 UU AJ	6	790	40	62	80	3	2030	2150	3620	4640	0612-040-10	0612-040-10	—	—	—
LME 406280 N UU AJ	6	694	40	62	80	3	2030	2150	3620	4640	—	—	KBS 4080 PP	—	LAG 40×62×80.2RS
LME 5075100 UU AJ	6	1250	50	75	100	3	3940	4180	7130	9120	0612-050-10	0612-050-10	—	—	—
LME 5075100 N UU AJ	6	1110	50	75	100	3	3940	4180	7130	9120	—	—	KBS 50100 PP	—	LAG 50×75×100.2RS
LME 6090125 UU AJ	6	2240	60	90	125	3	4760	5040	8150	10400	0612-060-10	0612-060-10	—	—	—
LME 6090125 N UU AJ	6	2000	60	90	125	3	4760	5040	8150	10400	—	—	—	LBAS 60-2LS	—
LME 80120165 UU AJ	6	5100	80	120	165	3	8710	9220	14500	18500	0612-080-10	0612-080-10	—	—	—

LINEAR BUSHINGS

Metric Dimension



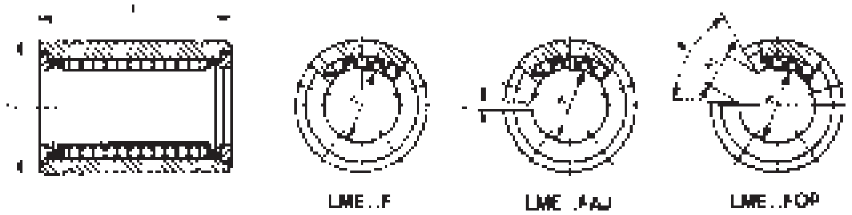
DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER OPEN TYPE LME..UU OP	NUMBER OF BALL CIRCUIT	WEIGHT (g)	DIMENSIONS (mm)					BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)		STAR	THOMSON	INA	SKF	FAG
			dr	D	L	h1	θ	USUAL	MAX.	USUAL	MAX.	0632..	0632..	KBO..PP	LBC(A)T..2LS	LAN..2RS
LME 122232 UU OP	3	35	12	22	32	7.5	78°	259	298	503	711	0632-012-00	0632-012-00	—	—	—
LME 122232 N UU OP	3	32	12	22	32	7.5	78°	259	298	503	711	—	—	KBO 1232 PP	LBCT 12-2LS	LAN 12×22×32.2RS
LME 162636 UU OP	3	45	16	26	36	10	78°	283	325	514	726	0632-016-00	0632-016-00	—	—	—
LME 162636 N UU OP	3	44	16	26	36	10	78°	283	325	514	726	—	—	KBO 1636 PP	LBCT 16-2LS	LAN 16×26×36.2RS
LME 203245 UU OP	4	84	20	32	45	10	60°	562	668	1010	1470	0632-020-00	0632-020-00	—	—	—
LME 203245 N UU OP	4	75	20	32	45	10	60°	562	668	1010	1470	—	—	KBO 2045 PP	LBCT 20-2LS	LAN 20×32×45.2RS
LME 254058 UU OP	5	200	25	40	58	12.5	60°	920	974	1780	2280	0632-025-00	0632-025-00	—	—	—
LME 254058 N UU OP	5	181	25	40	58	12.5	60°	920	974	1780	2280	—	—	KBO 2558 PP	LBCT 25-2LS	LAN 25×40×58.2RS
LME 304768 UU OP	5	300	30	47	68	12.5	50°	1350	1430	2500	3200	0632-030-00	0632-030-00	—	—	—
LME 304768 N UU OP	5	272	30	47	68	12.5	50°	1350	1430	2500	3200	—	—	KBO 3068 PP	LBCT 30-2LS	LAN 30×47×68.2RS
LME 406280 UU OP	5	670	40	62	80	16.8	50°	2030	2150	3620	4640	0632-040-00	0632-040-00	—	—	—
LME 406280 N UU OP	5	600	40	62	80	16.8	50°	2030	2150	3620	4640	—	—	KBO 4080 PP	LBCT 40-2LS	LAN 40×62×80.2RS
LME 5075100 UU OP	5	1060	50	75	100	21	50°	3940	4180	7130	9120	0632-050-00	0632-050-00	—	—	—
LME 5075100 N UU OP	5	970	50	75	100	21	50°	3940	4180	7130	9120	—	—	KBO 50100 PP	LBCT 50-2LS	LAN 50×75×100.2RS
LME 6090125 UU OP	5	1900	60	90	125	27.2	54°	4760	5040	8150	10400	0632-060-00	0632-060-00	—	—	—
LME 6090125 N UU OP	5	1580	60	90	125	27.2	54°	4760	5040	8150	10400	—	—	—	LBAT 60-2LS	—
LME 80120165 UU OP	5	4350	80	120	165	36.3	54°	8710	9220	14500	18500	0632-080-00	0632-080-00	—	—	—

LINEAR BUSHINGS (STAINLESS STEEL)

Metric Dimension

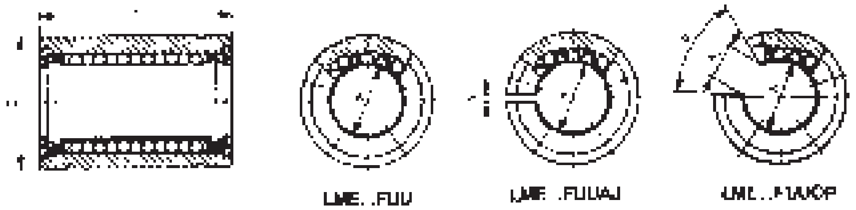


DIMENSION TABLE

IKO NUMBER STANDARD TYPE **LME..F**	NUMBER OF BALL CIRCUIT	WEIGHT (g)	IKO NUMBER ADJUSTABLE TYPE **LME..F AJ**	NUMBER OF BALL CIRCUIT	WEIGHT (g)	IKO NUMBER OPEN TYPE **LME..F OP**	NUMBER OF BALL CIRCUIT	WEIGHT (g)	DIMENSIONS (mm)						BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)	
									dr	D	L	h	h1	θ	USUAL	MAX.	USUAL	MAX.
LME 51222 N F	4	10	**LME 51222 N F AJ**	4	9.5	—	—	—	5	12	22	1	—	—	90.8	104	219	310
LME 81625 F	4	22	—	—	—	—	—	—	8	16	25	—	—	—	121	139	255	361
LME 81625 N F	4	20	**LME 81625 N F AJ**	4	19	—	—	—	8	16	25	1	—	—	121	139	255	361
LME 122232 F	4	45.5	**LME 122232 F AJ**	4	44.5	**LME 122232 F OP**	3	35	12	22	32	1.5	7.5	78°	259	298	503	711
LME 122232 N F	4	41	**LME 122232 N F AJ**	4	40	**LME 122232 N F OP**	3	32	12	22	32	1.5	7.5	78°	259	298	503	711
LME 162636 F	4	59	**LME 162636 F AJ**	4	58	**LME 162636 F OP**	3	45	16	26	36	1.5	10	78°	283	325	514	726
LME 162636 N F	4	56.5	**LME 162636 N F AJ**	4	54.5	**LME 162636 N F OP**	3	44	16	26	36	1.5	10	78°	283	325	514	726
LME 203245 F	5	105	**LME 203245 F AJ**	5	100	**LME 203245 F OP**	4	84	20	32	45	2	10	60°	562	668	1010	1470
LME 203245 N F	5	92	**LME 203245 N F AJ**	5	90	**LME 203245 N F OP**	4	75	20	32	45	2	10	60°	562	668	1010	1470
LME 254058 F	6	240	**LME 254058 F AJ**	6	235	**LME 254058 F OP**	5	200	25	40	58	2	12.5	60°	920	974	1780	2280
LME 254058 N F	6	220	**LME 254058 N F AJ**	6	215	**LME 254058 N F OP**	5	181	25	40	58	2	12.5	60°	920	974	1780	2280
LME 304768 F	6	360	**LME 304768 F AJ**	6	355	**LME 304768 F OP**	5	300	30	47	68	2	12.5	50°	1350	1430	2500	3200
LME 304768 N F	6	325	**LME 304768 N F AJ**	6	320	**LME 304768 N F OP**	5	272	30	47	68	2	12.5	50°	1350	1430	2500	3200
LME 406280 F	6	770	**LME 406280 F AJ**	6	758	**LME 406280 F OP**	5	665	40	62	80	3	16.8	50°	2030	2150	3620	4640
LME 406280 N F	6	705	**LME 406280 N F AJ**	6	694	**LME 406280 N F OP**	5	600	40	62	80	3	16.8	50°	2030	2150	3620	4640
LME 5075100 F	6	1250	**LME 5075100 F AJ**	6	1230	**LME 5075100 F OP**	5	1080	50	75	100	3	21	50°	3940	4180	7130	9120
LME 5075100 N F	6	1130	**LME 5075100 N F AJ**	6	1110	**LME 5075100 N F OP**	5	970	50	75	100	3	21	50°	3940	4180	7130	9120
LME 6090125 F	6	2220	**LME 6090125 F AJ**	6	2170	**LME 6090125 F OP**	5	1900	60	90	125	3	27.2	54°	4760	5040	8150	10400
LME 6090125 N F	6	2050	**LME 6090125 N F AJ**	6	2000	**LME 6090125 N F OP**	5	1580	60	90	125	3	27.2	54°	4760	5040	8150	10400

LINEAR BUSHINGS (STAINLESS STEEL)

Metric Dimension

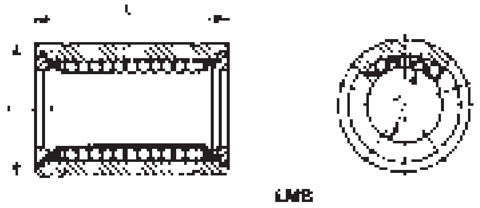


DIMENSION TABLE

IKO NUMBER STANDARD TYPE **LME..F UU**	NUMBER OF BALL CIRCUIT	WEIGHT (g)	IKO NUMBER ADJUSTABLE TYPE **LME..F UU AJ**	NUMBER OF BALL CIRCUIT	WEIGHT (g)	IKO NUMBER OPEN TYPE **LME..F UU OP**	NUMBER OF BALL CIRCUIT	WEIGHT (g)	DIMENSIONS (mm) dr	D	L	h	h1	θ	BASIC DYNAMIC LOAD RATING (N) USUAL	MAX.	BASIC STATIC LOAD RATING (N) USUAL	MAX.
LME 51222 N F UU	4	10	**LME 51222 N F UU AJ**	4	9.5	—	—	—	5	12	22	1	—	—	90.8	104	219	310
LME 81625 F UU	4	22	—	—	—	—	—	—	8	16	25	—	—	—	121	139	255	361
LME 81625 N F UU	4	20	**LME 81625 N F UU AJ**	4	19	—	—	—	8	16	25	1	—	—	121	139	255	361
LME 122232 F UU	4	45.5	**LME 122232 F UU AJ**	4	44.5	**LME 122232 F UU OP**	3	35	12	22	32	1.5	7.5	78°	259	298	503	711
LME 122232 N F UU	4	41	**LME 122232 N F UU AJ**	4	40	**LME 122232 N F UU OP**	3	32	12	22	32	1.5	7.5	78°	259	298	503	711
LME 162636 F UU	4	59	**LME 162636 F UU AJ**	4	58	**LME 162636 F UU OP**	3	45	16	26	36	1.5	10	78°	283	325	514	726
LME 162636 N F UU	4	56.5	**LME 162636 N F UU AJ**	4	54.5	**LME 162636 N F UU OP**	3	44	16	26	36	1.5	10	78°	283	325	514	726
LME 203245 F UU	5	105	**LME 203245 F UU AJ**	5	100	**LME 203245 F UU OP**	4	84	20	32	45	2	10	60°	562	668	1010	1470
LME 203245 N F UU	5	92	**LME 203245 N F UU AJ**	5	90	**LME 203245 N F UU OP**	4	75	20	32	45	2	10	60°	562	668	1010	1470
LME 254058 F UU	6	240	**LME 254058 F UU AJ**	6	235	**LME 254058 F UU OP**	5	200	25	40	58	2	12.5	60°	920	974	1780	2280
LME 254058 N F UU	6	220	**LME 254058 N F UU AJ**	6	215	**LME 254058 N F UU OP**	5	181	25	40	58	2	12.5	60°	920	974	1780	2280
LME 304768 F UU	6	360	**LME 304768 F UU AJ**	6	355	**LME 304768 F UU OP**	5	300	30	47	68	2	12.5	50°	1350	1430	2500	3200
LME 304768 N F UU	6	325	**LME 304768 N F UU AJ**	6	320	**LME 304768 N F UU OP**	5	272	30	47	68	2	12.5	50°	1350	1430	2500	3200
LME 406280 F UU	6	752	**LME 406280 F UU AJ**	6	740	**LME 406280 F UU OP**	5	645	40	62	80	3	16.8	50°	2030	2150	3620	4640
LME 406280 N F UU	6	705	**LME 406280 N F UU AJ**	6	694	**LME 406280 N F UU OP**	5	600	40	62	80	3	16.8	50°	2030	2150	3620	4640
LME 5075100 F UU	6	1210	**LME 5075100 F UU AJ**	6	1190	**LME 5075100 F UU OP**	5	1050	50	75	100	3	21	50°	3940	4180	7130	9120
LME 5075100 NF UU	6	1130	**LME 5075100 NF UU AJ**	6	1110	**LME 5075100 NF UU OP**	5	970	50	75	100	3	21	50°	3940	4180	7130	9120
LME 6090125 F UU	6	2160	**LME 6090125 F UU AJ**	6	2110	**LME 6090125 F UU OP**	5	1850	60	90	125	3	27.2	54°	4760	5040	8150	10400
LME 6090125 NF UU	6	2050	**LME 6090125 NF UU AJ**	6	2000	**LME 6090125 NF UU OP**	5	1580	60	90	125	3	27.2	54°	4760	5040	8150	10400

LINEAR BUSHINGS

Inch Dimension



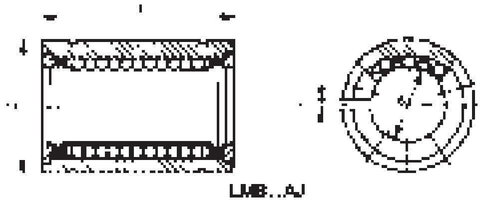
DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER STANDARD TYPE **LMB**	NUMBER OF BALL CIRCUIT	WEIGHT	DIMENSIONS						BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)		THOMSON	HEIM	SCHNEEBERGER
			dr		D		L								
		(g)	inch	mm	inch	mm	inch	mm	USUAL	MAX.	USUAL	MAX.	A	LBB	
LMB 4812	3	9.1	¼	6.350	½	12.700	¾	19.05	82.6	67.0	168	168	A-4812	—	4812
LMB 4812 N	4	8.5	¼	6.350	½	12.700	¾	19.05	82.6	67.0	168	168	—	LBB-250	—
LMB 61014	4	27.5	⅜	9.525	⅝	15.875	⅞	22.225	94.8	109	174	246	A-61014	—	61014
LMB 61014 N	4	12.5	⅜	9.525	⅝	15.875	⅞	22.225	94.8	109	174	246	—	LBB-375	—
LMB 81420	4	44	½	12.700	⅞	22.225	1¼	31.750	264	303	505	714	A-81420	—	81420
LMB 81420 N	4	40	½	12.700	⅞	22.225	1¼	31.750	264	303	505	714	—	LBB-500	—
LMB 101824	4	85	⅝	15.875	1⅛	28.575	1½	38.100	424	488	766	1080	A-101824	—	101824
LMB 101824 N	4	76	⅝	15.875	1⅛	28.575	1½	38.100	424	488	766	1080	—	LBB-625	—
LMB 122026	5	98	¾	19.050	1¼	31.750	1⅝	41.275	554	659	1000	1470	A-122026	—	122026
LMB 122026 N	5	95	¾	19.050	1¼	31.750	1⅝	41.275	554	659	1000	1470	—	LBB-750	—
LMB 162536	6	220	1	25.400	1 9⁄16	39.688	2¼	57.150	923	978	1780	2280	A-162536	—	162536
LMB 162536 N	6	200	1	25.400	1 9⁄16	39.688	2¼	57.150	923	978	1780	2280	—	LBB-1000	—
LMB 203242	6	490	1¼	31.750	2	50.800	2⅝	66.675	1370	1450	2510	3210	A-203242	—	203242
LMB 203242 N	6	440	1¼	31.750	2	50.800	2⅝	66.675	1370	1450	2510	3210	—	LBB-1250	—
LMB 243848	6	730	1½	38.100	2⅜	60.325	3	76.200	2010	2130	3610	4620	A-243848	—	243848
LMB 243848 N	6	670	1½	38.100	2⅜	60.325	3	76.200	2010	2130	3610	4620	—	LBB-1500	—
LMB 324864	6	1530	2	50.800	3	76.200	4	101.600	3960	4190	7140	9130	A-324864	—	324864
LMB 324864 N	6	1140	2	50.800	3	76.200	4	101.600	3960	4190	7140	9130	—	LBB-2000	—
LMB 406080	6	2400	2½	63.500	3¾	95.250	5	127.000	5190	5490	9090	11600	A-406080	—	406080
LMB 487296	6	4400	3	76.200	4½	114.300	6	152.400	8620	9120	14500	18500	A-487296	—	487296
LMB 6496128	6	11000	4	101.600	6	152.400	8	203.200	17000	18000	28600	36500	A-6496128	—	6496128

LINEAR BUSHINGS

Inch Dimension



DIMENSION TABLE

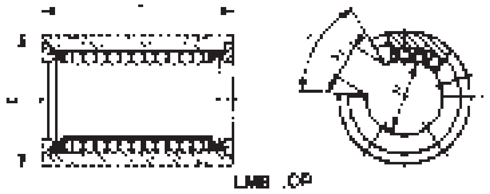
IKO NUMBER ADJUSTABLE TYPE LMB..AJ	NUMBER OF BALL CIRCUIT	WEIGHT (g)	DIMENSIONS dr inch		D inch		L inch		h	BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)	
			inch	mm	inch	mm	inch	mm	mm	USUAL	MAX.	USUAL	MAX.
LMB 4812 N AJ	4	8	¼	6.350	½	12.700	¾	19.050	1	82.6	67.0	168	168
LMB 61014 N AJ	4	12	⅜	9.525	⅝	15.875	⅞	22.225	1	94.8	109	174	246
LMB 81420 AJ	4	43	½	12.700	⅞	22.225	1¼	31.750	1.5	264	303	505	714
LMB 81420 N AJ	4	38	½	12.700	⅞	22.225	1¼	31.750	1.5	264	303	505	714
LMB 101824 AJ	4	83	⅝	15.875	1⅛	28.575	1½	38.100	1.5	424	488	766	1080
LMB 101824 N AJ	4	74	⅝	15.875	1⅛	28.575	1½	38.100	1.5	424	488	766	1080
LMB 122026 AJ	5	96	¾	19.050	1¼	31.750	1⅝	41.275	1.5	554	659	1000	1470
LMB 122026 N AJ	5	93	¾	19.050	1¼	31.750	1⅝	41.275	1.5	554	659	1000	1470
LMB 162536 AJ	6	218	1	25.400	1 9/16	39.688	2¼	57.150	1.5	923	978	1780	2280
LMB 162536 N AJ	6	198	1	25.400	1 9/16	39.688	2¼	57.150	1.5	923	978	1780	2280
LMB 203242 AJ	6	485	1¼	31.750	2	50.800	2⅝	66.675	2.5	1370	1450	2510	3210
LMB 203242 N AJ	6	430	1¼	31.750	2	50.800	2⅝	66.675	2.5	1370	1450	2510	3210
LMB 243848 AJ	6	720	1½	38.100	2⅜	60.325	3	76.200	3	2010	2130	3610	4620
LMB 243848 N AJ	6	660	1½	38.100	2⅜	60.325	3	76.200	3	2010	2130	3610	4620
LMB 324864 AJ	6	1510	2	50.800	3	76.200	4	101.600	3	3960	4190	7140	9130
LMB 324864 N AJ	6	1120	2	50.800	3	76.200	4	101.600	3	3960	4190	7140	9130
LMB 406080 AJ	6	2380	2½	63.500	3¾	95.250	5	127.000	3	5190	5490	9090	11600
LMB 487296 AJ	6	4360	3	76.200	4½	114.300	6	152.400	3	8620	9120	14500	18500
LMB 6496128 AJ	6	10900	4	101.600	6	152.400	8	203.200	3	17000	18000	28600	36500

INTERCHANGE TABLE

IKO NUMBER ADJUSTABLE TYPE LMB..AJ	THOMSON ADJ	HEIM ADJ
LMB 4812 N AJ	—	—
LMB 61014 N AJ	—	ADJ-375
LMB 81420 AJ	ADJ-81420	—
LMB 81420 N AJ	—	ADJ-500
LMB 101824 AJ	ADJ-101824	—
LMB 101824 N AJ	—	ADJ-625
LMB 122026 AJ	ADJ-122026	—
LMB 122026 N AJ	—	ADJ-750
LMB 162536 AJ	ADJ-162536	—
LMB 162536 N AJ	—	ADJ-1000
LMB 203242 AJ	ADJ-203242	—
LMB 203242 N AJ	—	ADJ-1250
LMB 243848 AJ	ADJ-243848	—
LMB 243848 N AJ	—	ADJ-1500
LMB 324864 AJ	ADJ-324864	—
LMB 324864 N AJ	—	ADJ-2000
LMB 406080 AJ	ADJ-406080	—
LMB 487296 AJ	ADJ-487296	—
LMB 6496128 AJ	ADJ-6496128	—

LINEAR BUSHINGS

Inch Dimension



DIMENSION TABLE

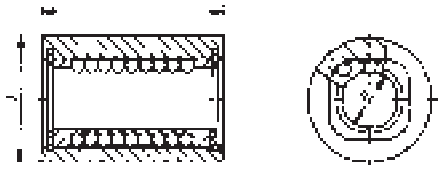
IKO NUMBER OPEN TYPE **LMB..OP**	NUMBER OF BALL CIRCUIT	WEIGHT	DIMENSIONS								BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)	
			dr		D		L		h1					
		(g)	inch	mm	inch	mm	inch	mm	mm	θ	USUAL	MAX.	USUAL	MAX.
LMB 81420 OP	3	33.5	½	12.700	⅞	22.225	1¼	31.750	8.7	80°	264	303	505	714
LMB 81420 N OP	3	28	½	12.700	⅞	22.225	1¼	31.750	8.7	80°	264	303	505	714
LMB 101824 OP	3	64	⅝	15.875	1⅛	28.575	1½	38.100	9.5	80°	424	488	766	1080
LMB 101824 N OP	3	57	⅝	15.875	1⅛	28.575	1½	38.100	9.5	80°	424	488	766	1080
LMB 122026 OP	4	81	¾	19.050	1¼	31.750	1⅝	41.275	10.7	60°	554	659	1000	1470
LMB 122026 N OP	4	76	¾	19.050	1¼	31.750	1⅝	41.275	10.7	60°	554	659	1000	1470
LMB 162536 OP	5	190	1	25.400	1⁹⁄₁₆	39.688	2¼	57.150	11.8	50°	923	978	1780	2280
LMB 162536 N OP	5	170	1	25.400	1⁹⁄₁₆	39.688	2¼	57.150	11.8	50°	923	978	1780	2280
LMB 203242 OP	5	415	1¼	31.750	2	50.800	2⅝	66.675	14.7	50°	1370	1450	2510	3210
LMB 203242 N OP	5	370	1¼	31.750	2	50.800	2⅝	66.675	14.7	50°	1370	1450	2510	3210
LMB 243848 OP	5	620	1½	38.100	2⅜	60.325	3	76.200	17.7	50°	2010	2130	3610	4620
LMB 243848 N OP	5	570	1½	38.100	2⅜	60.325	3	76.200	17.7	50°	2010	2130	3610	4620
LMB 324864 OP	5	1300	2	50.800	3	76.200	4	101.600	24.7	50°	3960	4190	7140	9130
LMB 324864 N OP	5	980	2	50.800	3	76.200	4	101.600	24.7	50°	3960	4190	7140	9130
LMB 406080 OP	5	2040	2½	63.500	3¾	95.250	5	127.000	29.5	50°	5190	5490	9090	11600
LMB 487296 OP	5	3740	3	76.200	4½	114.300	6	152.400	39.6	50°	8620	9120	14500	18500
LMB 6496128 OP	5	9350	4	101.600	6	152.400	8	203.200	49.5	50°	17000	18000	28600	36500

INTERCHANGE TABLE

THOMSON	HEIM	SCHNEEBERGER
OPN	OPN	OUV
OPN-81420	—	OUV 81420
—	OPN-500	—
OPN-101824	—	OUV 101824
—	OPN-625	—
OPN-122026	—	OUV 122026
—	OPN-750	—
OPN-162536	—	OUV 162536
—	OPN-1000	—
OPN-203242	—	OUV 203242
—	OPN-1250	—
OPN-243848	—	OUV 243848
—	OPN-1500	—
OPN-324864	—	OUV 324864
—	OPN-2000	—
OPN-406080	—	OUV 406080
OPN-487296	—	OUV 487296
OPN-6496128	—	OUV 6496128

MINIATURE LINEAR BUSHINGS

Metric Dimension



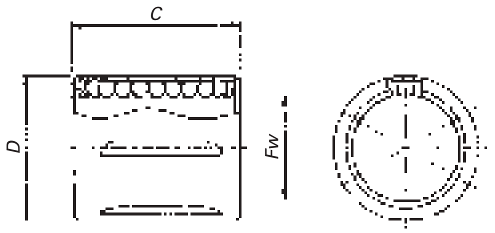
LMS(L)

DIMENSION TABLE

IKO NUMBER LMS	NUMBER OF BALL CIRCUIT	WEIGHT (g)	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)	
			dr	D	L	USUAL	MAX.	USUAL	MAX.
LMS 3	4	1.8	3	7	10	18.4	21.2	39.4	55.8
LMS 3 F	4	1.8	3	7	10	18.4	21.2	39.4	55.8
LMS 3 UU	4	1.8	3	7	10	18.4	21.2	39.4	55.8
LMS 3 FUU	4	1.8	3	7	10	18.4	21.2	39.4	55.8
LMSL 3	4	3.0	3	7	19	30.0	34.4	78.9	112
LMSL 3 F	4	3.0	3	7	19	30.0	34.4	78.9	112
LMSL 3 UU	4	3.0	3	7	19	30.0	34.4	78.9	112
LMSL 3 FUU	4	3.0	3	7	19	30.0	34.4	78.9	112
LMS 4	4	2.8	4	8	12	23.5	27.0	48.6	68.7
LMS 4 F	4	2.8	4	8	12	23.5	27.0	48.6	68.7
LMS 4 UU	4	2.8	4	8	12	23.5	27.0	48.6	68.7
LMS 4 FUU	4	2.8	4	8	12	23.5	27.0	48.6	68.7
LMSL 4	4	4.3	4	8	23	38.1	43.8	97.2	137
LMSL 4 F	4	4.3	4	8	23	38.1	43.8	97.2	137
LMSL 4 UU	4	4.3	4	8	23	38.1	43.8	97.2	137
LMSL 4 FUU	4	4.3	4	8	23	38.1	43.8	97.2	137
LMS 5	4	3.8	5	10	15	51.3	59.0	108	152
LMS 5 F	4	3.8	5	10	15	51.3	59.0	108	152
LMS 5 UU	4	3.8	5	10	15	51.3	59.0	108	152
LMS 5 FUU	4	3.8	5	10	15	51.3	59.0	108	152
LMSL 5	4	6.7	5	10	29	83.4	95.8	215	304
LMSL 5F	4	6.7	5	10	29	83.4	95.8	215	304
LMSL 5 UU	4	6.7	5	10	29	83.4	95.8	215	304
LMSL 5 FUU	4	6.7	5	10	29	83.4	95.8	215	304

COMPACT LINEAR BUSHING

Metric Dimension



LK

DIMENSION TABLE

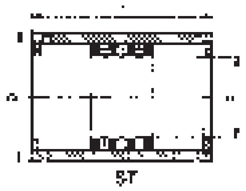
IKO NUMBER WITHOUT SEAL LK	WEIGHT (g)	IKO NUMBER WITH SEAL LK..UU	WEIGHT (g)	DIMENSIONS			BASIC DYNAMIC LOAD RATING (N)		BASIC STATIC LOAD RATING (N)		INA	
				Fw	D	C	USUAL	MAX.	USUAL	MAX.	WITHOUT SEAL KH	WITH SEAL KH..PP
LK 1630	24.4	**LK 1630 UU**	25.2	16	24	30	855	1020	690	1010	KH 1630	KH 1630 PP
LK 2030	29.5	**LK 2030 UU**	30.4	20	28	30	1060	1120	874	1120	KH 2030	KH 2030 PP
LK 2540	61.4	**LK 2540 UU**	62.8	25	35	40	1940	2050	1640	2100	KH 2540	KH 2540 PP
LK 3050	88.2	**LK 3050 UU**	89.8	30	40	50	2790	2750	2670	3070	KH 3050	KH 3050 PP

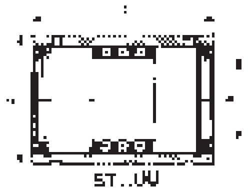
IKO

ST•ST..UU

STROKE ROTARY BUSHINGS

Metric Dimension





DIMENSION TABLE

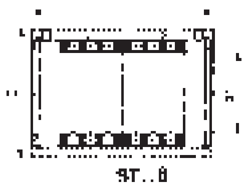
IKO NUMBER WITHOUT SEAL ST	WEIGHT (g)	IKO NUMBER WITH SEAL ST..UU	WEIGHT (g)	DIMENSIONS (mm) dr	D	L	MAX. STROKE (mm) ST	ST..UU	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
ST 4814	2.9	—	—	4	8	14	10	—	112	59.5
ST 51016	5.6	—	—	5	10	16	13	—	121	68.3
ST 61219	8.9	—	—	6	12	19	15	—	278	168
ST 81524	15.6	**ST 81524 UU**	16.5	8	15	24	24	14	315	211
ST 101930	28.8	**ST 101930 UU**	30.7	10	19	30	30	16	659	466
ST 122332	42	**ST 122332 UU**	45	12	23	32	32	17	1110	822
ST 162837	71	**ST 162837 UU**	74	16	28	37	40	24	1230	998
ST 203245	99	**ST 203245 UU**	107	20	32	45	54	32	1390	1250
ST 253745	117	**ST 253745 UU**	121	25	37	45	54	32	1450	1430
ST 304565	205	**ST 304565 UU**	215	30	45	65	82	65	3110	3160
ST 355270	329	**ST 355270 UU**	342	35	52	70	92	75	3290	3550
ST 406080	516	**ST 406080 UU**	529	40	60	80	108	91	4340	4810
ST 456580	563	**ST 456580 UU**	577	45	65	80	108	91	4550	5330
ST 5072100	827	**ST 5072100 UU**	836	50	72	100	138	120	5790	6970
ST 5580100	1160	**ST 5580100 UU**	1190	55	80	100	138	120	6030	7630
ST 6085100	1240	**ST 6085100 UU**	1270	60	85	100	138	120	6260	8300
ST 7095100	1400	**ST 7095100 UU**	1430	70	95	100	138	120	6510	9320
ST 80110100	2050	**ST 80110100 UU**	2080	80	110	100	132	114	8230	12200
ST 90120100	2250	**ST 90120100 UU**	2290	90	120	100	132	114	8550	13500
ST 100130100	2440	**ST 100130100 UU**	2540	100	130	100	132	114	8820	14800

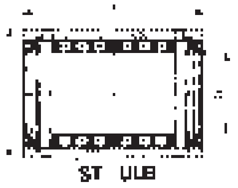
IKO

ST..B•ST..UUB

STROKE ROTARY BUSHINGS

Metric Dimension



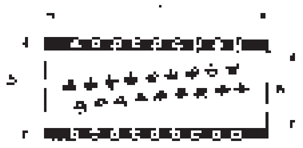


DIMENSION TABLE

IKO NUMBER WITHOUT SEAL ST..B	WEIGHT (g)	IKO NUMBER WITH SEAL ST..UUB	WEIGHT (g)	DIMENSIONS (mm) dr	D	L	MAX. STROKE (mm) ST..B	ST..UUB	BASIC DYNAMIC LOAD RATING (N)	BASIC STATIC LOAD RATING (N)
ST 81524 B	16.8	—	—	8	15	24	8	—	512	422
ST 101930 B	31.2	—	—	10	19	30	8	—	1070	932
ST 122332 B	46	—	—	12	23	32	8	—	1800	1640
ST 162837 B	75	—	—	16	28	37	16	—	1990	2000
ST 203245 B	106	—	—	20	32	45	28	—	2250	2500
ST 253745 B	125	—	—	25	37	45	28	—	2360	2850
ST 304565 B	220	**ST 304565 UUB**	230	30	45	65	44	27	5060	6320
ST 355270 B	346	**ST 355270 UUB**	359	35	52	70	54	37	5340	7100
ST 406080 B	540	**ST 406080 UUB**	553	40	60	80	66	49	7050	9630
ST 456580 B	588	**ST 456580 UUB**	602	45	65	80	66	49	7390	10700
ST 5072100 B	862	**ST 5072100 UUB**	871	50	72	100	88	70	9400	13900
ST 5580100 B	1200	**ST 5580100 UUB**	1230	55	80	100	88	70	9800	15300
ST 6085100 B	1290	**ST 6085100 UUB**	1320	60	85	100	88	70	10200	16600
ST 7095100 B	1450	**ST 7095100 UUB**	1480	70	95	100	88	70	10600	18600
ST 80110100 B	2110	**ST 80110100 UUB**	2140	80	110	100	76	58	13400	24400
ST 90120100 B	2330	**ST 90120100 UUB**	2370	90	120	100	76	58	13900	27000
ST 100130100 B	2520	**ST 100130100 UUB**	2620	100	130	100	76	58	14300	29500

STROKE ROTARY CAGES

Metric Dimension



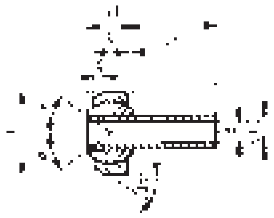
BG

DIMENSION TABLE

IKO NUMBER	WEIGHT	DIMENSIONS (mm)			BASIC DYNAMIC LOAD RATING	BASIC STATIC LOAD RATING
GB	(g)	dr	D	L	(N)	(N)
BG 192555	33	19	25	55	2330	2600
BG 222860	40	22	28	60	2490	2950
BG 253165	48	25	31	65	2660	3390
BG 283670	76	28	36	70	3830	4660
BG 324075	93	32	40	75	4480	6030
BG 384880	162	38	48	80	6750	9390

SUPER FLEXIBLE NOZZLES

SNA

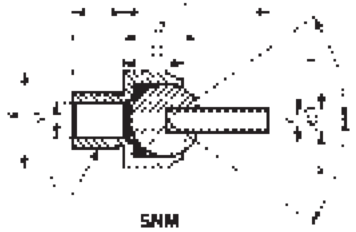


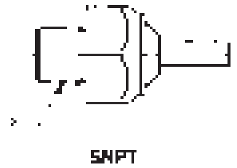
SNA...L

DIMENSION TABLE

IKO NUMBER	DIMENSIONS (mm)								BALL DIAMETER	TILTING ANGLE
SNA	d	D	L	L1	L2	C	ℓ	d1	inch	α
SNA 4	4	15	—	7	1	6	2	—	7/16	36°
SNA 6	6	15	—	7	1	6	2	—	7/16	24°
SNA 3-L	3	15	6 15 32	7	1	6	2	6	7/16	24°
SNA 4-L	4	15	6 16 40	7	1	6	2	6	7/16	24°

SUPER FLEXIBLE NOZZLES


SNM

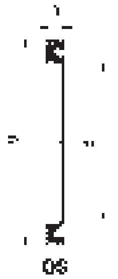

SNPT

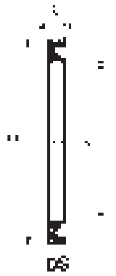
DIMENSION TABLE

IKO NUMBER	DIMENSIONS (mm)									BALL DIAMETER	TILTING ANGLE
SNM•SNPT	d	THREAD S	L	L1	L2	L3	d1	d2	B	inch	α
SNM 10-L	4	M10×1.25	20 40 60	9	13	10.5	6	6	17	½	35°
SNPT 1/4-L	4	PT ¼	20 40 60	9	13	10.5	6	6	17	½	35°
SNM 20-L	6	M20×1.5	30 50 70	13	18	15	8	10	24	¾	35°
SNPT 3/8-L	6	PT ⅜	30 50 70	13	18	15	8	10	24	¾	35°
SNM 24-L	8	M24×2.0	40 60 80	18	23	19	10	12	32	1	35°
SNPT 1/2-L	8	PT ½	40 60 80	18	23	19	10	12	32	1	35°

SEALS FOR NEEDLE ROLLER BEARINGS

Metric Dimension

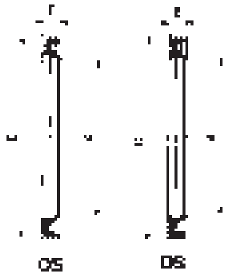

OS


DS

DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER SINGLE-LIP	IKO NUMBER DOUBLE-LIP	DIMENSIONS (mm)			INA		SKF	FAG
					SINGLE-LIP	DOUBLE-LIP	SINGLE-LIP	SINGLE-LIP
OS	DS	d	D	B	G	SD	G	DH
OS 6102.5	—	6	10	2.5	—	—	—	—
OS 7112.5	—	7	11	2.5	—	—	—	—
OS 8123	—	8	12	3	G 8×12×3	—	G 8×12×3	DH 8×12×3
OS 8153	—	8	15	3	G 8×15×3	SD 8×15×3	G 8×15×3	DH 8×15×3
OS 9133	—	9	13	3	G 9×13×3	—	G 9×13×3	DH 9×13×3
OS 9163	—	9	16	3	G 9×16×3	SD 9×16×3	G 9×16×3	—
OS 10143	—	10	14	3	G 10×14×3	—	G 10×14×3	DH 10×14×3
OS 10173	—	10	17	3	G 10×17×3	SD 10×17×3	G 10×17×3	—
OS 12163	—	12	16	3	G 12×16×3	—	G 12×16×3	DH 12×16×3
OS 12183	—	12	18	3	G 12×18×3	SD 12×18×3	G 12×18×3	DH 12×18×3
OS 12193	—	12	19	3	G 12×19×3	SD 12×19×3	G 12×19×3	DH 12×19×3
OS 13193	—	13	19	3	G 13×19×3	SD 13×19×3	G 13×19×3	DH 13×19×3
OS 14203	**DS 14203**	14	20	3	G 14×20×3	SD 14×20×3	G 14×20×3	DH 14×20×3
OS 14223	**DS 14223**	14	22	3	G 14×22×3	SD 14×22×3	G 14×22×3	DH 14×22×3
OS 15213	**DS 15213**	15	21	3	G 15×21×3	SD 15×21×3	G 15×21×3	DH 15×21×3
OS 15223	**DS 15223**	15	22	3	—	—	—	—
OS 15235	**DS 15235**	15	23	5	—	—	—	—
OS 16223	**DS 16223**	16	22	3	G 16×22×3	SD 16×22×3	G 16×22×3	DH 16×22×3
OS 16243	**DS 16243**	16	24	3	G 16×24×3	SD 16×24×3	G 16×24×3	DH 16×24×3
OS 16285	**DS 16285**	16	28	5	—	—	—	—
OS 17233	**DS 17233**	17	23	3	G 17×23×3	SD 17×23×3	G 17×23×3	DH 17×23×3
OS 17243	**DS 17243**	17	24	3	—	—	—	—
OS 17253	**DS 17253**	17	25	3	G 17×25×3	SD 17×25×3	G 17×25×3	DH 17×25×3
OS 18243	**DS 18243**	18	24	3	G 18×24×3	SD 18×24×3	G 18×24×3	DH 18×24×3
OS 18253	**DS 18253**	18	25	3	—	—	—	—
OS 18264	**DS 18264**	18	26	4	G 18×26×4	SD 18×26×4	G 18×26×4	DH 18×26×4
OS 19274	**DS 19274**	19	27	4	G 19×27×4	SD 19×27×4	G 19×27×4	DH 19×27×4
OS 20264	**DS 20264**	20	26	4	G 20×26×4	SD 20×26×4	G 20×26×4	DH 20×26×4
OS 20274	**DS 20274**	20	27	4	—	—	—	—
OS 20284	**DS 20284**	20	28	4	G 20×28×4	SD 20×28×4	G 20×28×4	DH 20×28×4
OS 20304	**DS 20304**	20	30	4	—	—	—	—
OS 20324	**DS 20324**	20	32	4	—	—	—	—
OS 20326	**DS 20326**	20	32	6	—	—	—	—
OS 21294	**DS 21294**	21	29	4	G 21×29×4	SD 21×29×4	G 21×29×4	DH 21×29×4
OS 22284	**DS 22284**	22	28	4	G 22×28×4	SD 22×28×4	G 22×28×4	DH 22×28×4
OS 22294	**DS 22294**	22	29	4	—	—	—	—
OS 22304	**DS 22304**	22	30	4	G 22×30×4	SD 22×30×4	G 22×30×4	DH 22×30×4
OS 24314	**DS 24314**	24	31	4	—	—	—	—
OS 24324	**DS 24324**	24	32	4	G 24×32×4	SD 24×32×4	G 24×32×4	DH 24×32×4
OS 25324	**DS 25324**	25	32	4	G 25×32×4	SD 25×32×4	G 25×32×4	DH 25×32×4



DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER	IKO NUMBER	DIMENSIONS			INA		SKF	FAG
SINGLE-LIP	DOUBLE-LIP	(mm)			SINGLE-LIP	DOUBLE-LIP	SINGLE-LIP	SINGLE-LIP
OS	DS	d	D	B	G	SD	G	DH
OS 25334	**DS 25334**	25	33	4	G 25×33×4	SD 25×33×4	G 25×33×4	DH 25×33×4
OS 25356	**DS 25356**	25	35	6	—	—	—	—
OS 25376	**DS 25376**	25	37	6	—	—	—	—
OS 26344	**DS 26344**	26	34	4	G 26×34×4	SD 26×34×4	G 26×34×4	DH 26×34×4
OS 28354	**DS 28354**	28	35	4	G 28×35×4	SD 28×35×4	G 28×35×4	DH 28×35×4
OS 28374	**DS 28374**	28	37	4	G 28×37×4	SD 28×37×4	G 28×37×4	DH 28×37×4
OS 28396	**DS 28396**	28	39	6	—	—	—	—
OS 28406	**DS 28406**	28	40	6	—	—	—	—
OS 29384	**DS 29384**	29	38	4	G 29×38×4	SD 29×38×4	G 29×38×4	DH 29×38×4
OS 30374	**DS 30374**	30	37	4	G 30×37×4	SD 30×37×4	G 30×37×4	DH 30×37×4
OS 30404	**DS 30404**	30	40	4	G 30×40×4	SD 30×40×4	G 30×40×4	DH 30×40×4
OS 30426	**DS 30426**	30	42	6	—	—	—	—
OS 32424	**DS 32424**	32	42	4	G 32×42×4	SD 32×42×4	G 32×42×4	DH 32×42×4
OS 32456	**DS 32456**	32	45	6	—	—	—	—
OS 35424	**DS 35424**	35	42	4	G 35×42×4	SD 35×42×4	G 35×42×4	DH 35×42×4
OS 35454	**DS 35454**	35	45	4	G 35×45×4	SD 35×45×4	G 35×45×4	DH 35×45×4
OS 35476	**DS 35476**	35	47	6	—	—	—	—
OS 37474	**DS 37474**	37	47	4	G 37×47×4	SD 37×47×4	G 37×47×4	DH 37×47×4
OS 38484	**DS 38484**	38	48	4	G 38×48×4	SD 38×48×4	G 38×48×4	DH 38×48×4
OS 38506	**DS 38506**	38	50	6	—	—	—	—
OS 40474	**DS 40474**	40	47	4	G 40×47×4	SD 40×47×4	G 40×47×4	DH 40×47×4
OS 40504	**DS 40504**	40	50	4	G 40×50×4	SD 40×50×4	G 40×50×4	DH 40×50×4
OS 40526	**DS 40526**	40	52	6	—	—	—	—
OS 40556	**DS 40556**	40	55	6	—	—	—	—
OS 42557	**DS 42557**	42	55	7	—	—	—	—
OS 45524	**DS 45524**	45	52	4	G 45×52×4	SD 45×52×4	G 45×52×4	DH 45×52×4
OS 45554	**DS 45554**	45	55	4	G 45×55×4	SD 45×55×4	G 45×55×4	DH 45×55×4
OS 45627	**DS 45627**	45	62	7	—	—	—	—
OS 48627	**DS 48627**	48	62	7	—	—	—	—
OS 50584	**DS 50584**	50	58	4	G 50×58×4	SD 50×58×4	G 50×58×4	DH 50×58×4
OS 50624	**DS 50624**	50	62	4	—	—	—	—
OS 50657	**DS 50657**	50	65	7	—	—	—	—
OS 52687	**DS 52687**	52	68	7	—	—	—	—
OS 55674	**DS 55674**	55	67	4	—	—	—	—
OS 55687	**DS 55687**	55	68	7	—	—	—	—
OS 55727	—	55	72	7	—	—	—	—
OS 58727	**DS 58727**	58	72	7	—	—	—	—
OS 60724	**DS 60724**	60	72	4	—	—	—	—
OS 60787	**DS 60787**	60	78	7	—	—	—	—
OS 62744	**DS 62744**	62	74	4	—	—	—	—

DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER	IKO NUMBER	DIMENSIONS			INA		SKF	FAG
SINGLE-LIP	DOUBLE-LIP	(mm)			SINGLE-LIP	DOUBLE-LIP	SINGLE-LIP	SINGLE-LIP
OS	DS	d	D	B	G	SD	G	DH
OS 62747	**DS 62747**	62	74	7	—	—	—	—
OS 63807	**DS 63807**	63	80	7	—	—	—	—
OS 65774	**DS 65774**	65	77	4	—	—	—	—
OS 65857	**DS 65857**	65	85	7	—	—	—	—
OS 68857	**DS 68857**	68	85	7	—	—	—	—
OS 70824	**DS 70824**	70	82	4	—	—	—	—
OS 70907	**DS 70907**	70	90	7	—	—	—	—
OS 72907	**DS 72907**	72	90	7	—	—	—	—

CIRCLIPS FOR NEEDLE ROLLER BEARINGS

Metric Dimension

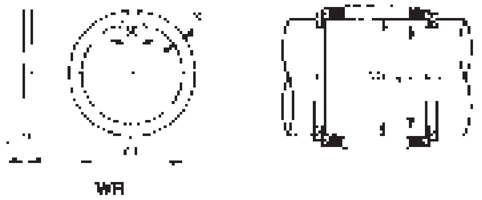
DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER	DIMENSIONS (mm)						INA	FAG
WR	SHAFT d1	MAX. d3	b	t	GROOVE d2	TOLE.	WR	WR
WR 4	4	3.7	0.8	0.5	3.8	0 -0.09	WR 4	WR 4
WR 5	5	4.7	1	0.5	4.8		WR 5	WR 5
WR 6	6	5.6	1.1	0.7	5.7		WR 6	WR 6
WR 7	7	6.5	1.2	0.7	6.7		WR 7	WR 7
WR 8	8	7.4	1.3	1	7.6		WR 8	WR 8
WR 9	9	8.4	1.3	1	8.6		WR 9	WR 9
WR 10	10	9.4	1.3	1	9.6		WR 10	WR 10
WR 11	11	10.2	1.3	1	10.5	0 -0.1	WR 11	WR 11
WR 12	12	11.2	1.3	1	11.5		WR 12	WR 12
WR 13	13	12.1	1.3	1	12.5		—	WR 13
WR 14	14	13.1	1.5	1.2	13.5		WR 14	WR 14
WR 15	15	14	1.75	1.2	14.4		WR 15	WR 15
WR 16	16	15	1.75	1.2	15.4		WR 16	WR 16
WR 17	17	16	1.75	1.2	16.4		WR 17	WR 17
WR 18	18	17	1.75	1.2	17.4		WR 18	WR 18
WR 19	19	17.9	1.75	1.2	18.4	0 -0.15	WR 19	WR 19
WR 20	20	18.7	1.75	1.2	19.2		WR 20	WR 20
WR 21	21	19.7	1.75	1.2	20.2		WR 21	WR 21
WR 22	22	20.7	1.75	1.2	21.2		WR 22	WR 22
WR 23	23	21.6	1.75	1.2	22.2		—	—
WR 24	24	22.5	1.75	1.2	23		WR 24	WR 24
WR 25	25	23.5	1.75	1.2	24		WR 25	WR 25
WR 26	26	24.5	1.75	1.2	25		WR 26	WR 26
WR 28	28	26.5	2.3	1.5	27		WR 28	WR 28
WR 29	29	27.5	2.3	1.5	28		WR 29	WR 29
WR 30	30	28.5	2.3	1.5	29		WR 30	WR 30
WR 32	32	30.2	2.3	1.5	30.8		WR 32	WR 32
WR 35	35	33.2	2.3	1.5	33.8		WR 35	WR 35
WR 36	36	34.2	2.3	1.5	34.8		—	—
WR 37	37	35.2	2.3	1.5	35.8		WR 37	WR 37
WR 38	38	36.2	2.3	1.5	36.8		WR 38	WR 38
WR 40	40	37.8	2.3	1.5	38.5		WR 40	WR 40
WR 42	42	39.8	2.3	1.5	40.5		WR 42	WR 42
WR 43	43	40.8	2.3	1.5	41.5		WR 43	WR 43
WR 45	45	42.8	2.3	1.5	43.5		WR 45	WR 45
WR 47	47	44.8	2.3	1.5	45.5		WR 47	WR 47
WR 50	50	47.8	2.3	1.5	48.5	0 -0.2	WR 50	WR 50
WR 52	52	49.8	2.3	1.5	50.5		WR 52	WR 52
WR 55	55	52.6	2.3	1.5	53.5		WR 55	WR 55
WR 60	60	57.6	2.3	1.5	58.5		WR 60	WR 60

DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER	DIMENSIONS (mm)						INA	FAG
WR	SHAFT d1	MAX. d3	b	t	GROOVE d2	TOLE.	WR	WR
WR 63	63	60.6	2.3	1.5	61.5	0 -0.2	WR 63	WR 63
WR 65	65	62.6	2.3	1.5	63.5		WR 65	WR 65
WR 68	68	65.4	2.8	2	66.2		WR 68	WR 68
WR 70	70	67.4	2.8	2	68.2		WR 70	WR 70
WR 75	75	72.4	2.8	2	73.2		WR 75	WR 75
WR 80	80	77.4	2.8	2	78.2		WR 80	WR 80
WR 82	82	79.3	3.4	2.5	80.2		—	—
WR 85	85	82	3.4	2.5	83		WR 85	WR 85
WR 90	90	87	3.4	2.5	88		WR 90	WR 90
WR 95	95	92	3.4	2.5	93		WR 95	WR 95
WR 100	100	97	3.4	2.5	98		WR 100	WR 100
WR 105	105	101.7	3.4	2.5	102.7		WR 105	WR 105
WR 110	110	106.7	3.4	2.5	107.7		WR 110	WR 110
WR 115	115	111.7	3.4	2.5	112.7		WR 115	WR 115
WR 120	120	116.7	3.4	2.5	117.7		WR 120	WR 120
WR 125	125	121.7	3.4	2.5	122.7	0 -0.25	WR 125	WR 125
WR 130	130	126.7	3.4	2.5	127.7		WR 130	WR 130
WR 135	135	131.6	4	2.5	132.4		WR 135	WR 135
WR 140	140	136.6	4	2.5	137.4		WR 140	WR 140
WR 145	145	141.6	4	2.5	142.4		WR 145	WR 145
WR 150	150	146.6	4	2.5	147.4		WR 150	WR 150
WR 155	155	151.6	4	2.5	152.4		WR 155	WR 155
WR 160	160	156.6	4	2.5	157.4		WR 160	WR 160
WR 165	165	161.6	4	2.5	162.4		WR 165	WR 165
WR 170	170	166.6	4	2.5	167.4		WR 170	WR 170
WR 175	175	171.6	4	2.5	172.4		WR 175	WR 175
WR 180	180	175.6	5	3	177	0 -0.3	WR 180	WR 180
WR 185	185	180.6	5	3	182		WR 185	WR 185
WR 190	190	185.6	5	3	187		WR 190	WR 190
WR 195	195	190.6	5	3	192		WR 195	WR 195
WR 200	200	195.6	5	3	197		WR 200	WR 200
WR 210	210	205.6	5	3	207		WR 210	WR 210
WR 220	220	215.6	5	3	217		WR 220	WR 220
WR 230	230	225.4	5	3	227		WR 230	—
WR 240	240	235.4	5	3	237		WR 240	WR 240
WR 260	260	253	7.5	4	255		WR 260	WR 260
WR 265	265	258	7.5	4	260		WR 265	WR 265
WR 270	270	263	7.5	4	265		WR 270	—
WR 280	280	273	7.5	4	275		WR 280	WR 280
WR 285	285	278	7.5	4	280		WR 285	WR 285

WR



DIMENSION TABLE **INTERCHANGE TABLE**

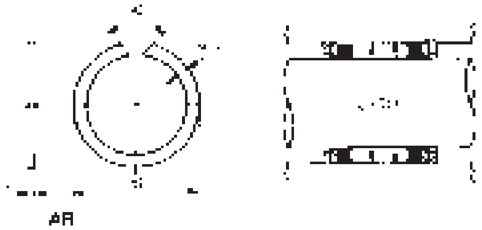
IKO NUMBER	DIMENSIONS (mm)						INA	FAG
WR	SHAFT d1	MAX. d3	b	t	GROOVE d2	TOLE.	WR	WR
WR 300	300	293	7.5	4	295	0 -0.3	WR 300	WR 300
WR 305	305	298	7.5	4	300		WR 305	WR 305
WR 320	320	313	7.5	4	315		WR 320	WR 320
WR 330	330	323	7.5	4	325	0 -0.36	WR 330	WR 330
WR 340	340	333	7.5	4	335		WR 340	WR 340
WR 350	350	343	7.5	4	345		WR 350	WR 350
WR 360	360	353	7.5	4	355		WR 360	WR 360
WR 370	370	363	7.5	4	365		WR 370	WR 370
WR 390	390	383	7.5	4	385		WR 390	WR 390

IKO

AR

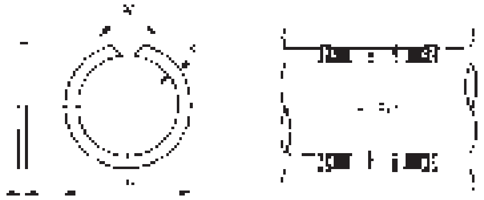
CIRCLIPS FOR NEEDLE ROLLER BEARINGS

Metric Dimension



DIMENSION TABLE **INTERCHANGE TABLE**

IKO NUMBER	DIMENSIONS (mm)						INA	FAG
AR	HOUSING d1	MIN. d3	b	t	GROOVE d2	TOLE.	BR	BR
AR 7	7	7.5	1	0.8	7.3	+0.1 0	BR 7	BR 7
AR 8	8	8.5	1	0.8	8.3		BR 8	BR 8
AR 9	9	9.5	1.1	0.8	9.3		BR 9	BR 9
AR 10	10	10.6	1.2	0.8	10.4		BR 10	BR 10
AR 11	11	11.6	1.3	1	11.4		BR 11	BR 11
AR 12	12	12.7	1.3	1	12.4		BR 12	BR 12
AR 13	13	13.8	1.3	1	13.5		BR 13	BR 13
AR 14	14	14.8	1.3	1	14.5		BR 14	BR 14
AR 15	15	15.8	1.3	1	15.5		BR 15	BR 15
AR 16	16	16.8	1.6	1.2	16.5		BR 16	BR 16
AR 17	17	17.8	1.6	1.2	17.5		BR 17	BR 17
AR 18	18	18.9	1.75	1.2	18.5	+0.15 0	BR 18	BR 18
AR 19	19	19.9	1.75	1.2	19.6		BR 19	BR 19
AR 20	20	21	1.75	1.2	20.6		BR 20	BR 20
AR 21	21	22	1.75	1.2	21.6		BR 21	BR 21
AR 22	22	23	1.75	1.2	22.6		BR 22	BR 22
AR 23	23	24	1.75	1.2	23.6		BR 23	BR 23
AR 24	24	25.2	1.75	1.2	24.8		BR 24	BR 24
AR 25	25	26.2	1.75	1.2	25.8		BR 25	BR 25
AR 26	26	27.2	1.75	1.2	26.8		BR 26	BR 26
AR 27	27	28.2	1.75	1.2	27.8		BR 27	BR 27
AR 28	28	29.2	1.75	1.2	28.8		BR 28	BR 28
AR 29	29	30.2	1.75	1.2	29.8		BR 29	BR 29
AR 30	30	31.4	2.3	1.5	31		BR 30	BR 30
AR 31	31	32.4	2.3	1.5	32		BR 31	BR 31
AR 32	32	33.4	2.3	1.5	33		BR 32	BR 32
AR 33	33	34.4	2.3	1.5	34		BR 33	BR 33
AR 34	34	35.4	2.3	1.5	35		BR 34	BR 34
AR 35	35	36.4	2.3	1.5	36		BR 35	BR 35
AR 37	37	38.8	2.3	1.5	38.2		BR 37	BR 37
AR 38	38	39.8	2.3	1.5	39.2		BR 38	BR 38
AR 39	39	40.8	2.3	1.5	40.2		BR 39	BR 39
AR 40	40	41.8	2.3	1.5	41.2		BR 40	BR 40
AR 42	42	43.8	2.3	1.5	43.2		BR 42	BR 42
AR 43	43	44.8	2.3	1.5	44.2		BR 43	BR 43
AR 44	44	45.8	2.3	1.5	45.2		BR 44	BR 44
AR 45	45	46.8	2.3	1.5	46.2		BR 45	BR 45
AR 47	47	48.8	2.3	1.5	48.2		BR 47	BR 47
AR 48	48	49.8	2.3	1.5	49.2		BR 48	BR 48
AR 50	50	51.8	2.3	1.5	51.2	+0.2 0	BR 50	BR 50



AR

DIMENSION TABLE

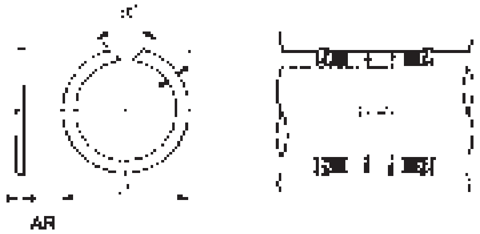
INTERCHANGE TABLE

IKO NUMBER	DIMENSIONS (mm)						INA	FAG
AR	HOUSING d1	MIN. d3	b	t	GROOVE d2	TOLE.	BR	BR
AR 52	52	54.3	2.3	1.5	53.5	+0.2 0	BR 52	BR 52
AR 53	53	55.3	2.3	1.5	54.5		BR 53	BR 53
AR 55	55	57.3	2.3	1.5	56.5		BR 55	BR 55
AR 57	57	59.3	2.3	1.5	58.5		BR 57	BR 57
AR 58	58	60.3	2.3	1.5	59.5		BR 58	BR 58
AR 60	60	62.3	2.3	1.5	61.5		BR 60	BR 60
AR 62	62	64.3	2.3	1.5	63.5		BR 62	BR 62
AR 65	65	67.3	2.3	1.5	66.5		BR 65	BR 65
AR 68	68	70.3	2.3	1.5	69.5		BR 68	BR 68
AR 70	70	72.3	2.3	1.5	71.5		BR 70	BR 70
AR 72	72	74.6	2.8	2	73.8		BR 72	BR 72
AR 73	73	75.6	2.8	2	74.8		BR 73	BR 73
AR 75	75	77.6	2.8	2	76.8		—	—
AR 76	76	78.6	2.8	2	77.8		BR 76	BR 76
AR 78	78	80.6	2.8	2	79.8		BR 78	BR 78
AR 80	80	82.6	2.8	2	81.8		—	BR 80
AR 81	81	83.6	2.8	2	82.8	+0.25 0	BR 81	BR 81
AR 82	82	84.6	2.8	2	83.8		BR 82	BR 82
AR 83	83	85.6	2.8	2	84.8		BR 83	BR 83
AR 85	85	87.6	2.8	2	86.8		—	BR 85
AR 86	86	88.6	2.8	2	87.8		BR 86	BR 86
AR 88	88	91	3.4	2.5	90		BR 88	BR 88
AR 90	90	93	3.4	2.5	92		—	BR 90
AR 92	92	95	3.4	2.5	94		BR 92	BR 92
AR 93	93	96	3.4	2.5	95		BR 93	BR 93
AR 95	95	98	3.4	2.5	97		BR 95	BR 95
AR 97	97	100	3.4	2.5	99		BR 97	BR 97
AR 98	98	101	3.4	2.5	100		BR 98	BR 98
AR 100	100	103	3.4	2.5	102		BR 100	BR 100
AR 102	102	105.3	3.4	2.5	104.3		BR 102	BR 102
AR 103	103	106.3	3.4	2.5	105.3		BR 103	BR 103
AR 105	105	108.3	3.4	2.5	107.3		BR 105	BR 105
AR 107	107	110.3	3.4	2.5	109.3		BR 107	BR 107
AR 108	108	111.3	3.4	2.5	110.3		BR 108	BR 108
AR 110	110	113.3	3.4	2.5	112.3		BR 110	BR 110
AR 112	112	115.3	3.4	2.5	114.3		BR 112	BR 112
AR 113	113	116.3	3.4	2.5	115.3		BR 113	BR 113
AR 115	115	118.3	3.4	2.5	117.3		BR 115	BR 115
AR 117	117	120.3	3.4	2.5	119.3		BR 117	BR 117
AR 118	118	121.3	3.4	2.5	120.3		BR 118	BR 118

DIMENSION TABLE

INTERCHANGE TABLE

IKO NUMBER	DIMENSIONS (mm)						INA	FAG
AR	HOUSING d1	MIN. d3	b	t	GROOVE d2	TOLE.	BR	BR
AR 120	120	123.3	3.4	2.5	122.3	+0.25 0	BR 120	BR 120
AR 123	123	126.3	3.4	2.5	125.3		BR 123	BR 123
AR 125	125	128.3	3.4	2.5	127.3		BR 125	BR 125
AR 127	127	130.3	3.4	2.5	129.3		BR 127	BR 127
AR 130	130	133.3	3.4	2.5	132.3		BR 130	BR 130
AR 133	133	136.3	3.4	2.5	135.3		BR 133	BR 133
AR 135	135	138.3	3.4	2.5	137.3		BR 135	BR 135
AR 137	137	140.3	4	2.5	139.3		BR 137	BR 137
AR 140	140	143.6	4	2.5	142.6		BR 140	BR 140
AR 143	143	146.6	4	2.5	145.6		BR 143	BR 143
AR 145	145	148.6	4	2.5	147.6		—	—
AR 150	150	153.6	4	2.5	152.6		BR 150	BR 150
AR 153	153	156.6	4	2.5	155.6		BR 153	BR 153
AR 160	160	163.6	4	2.5	162.6		BR 160	BR 160
AR 163	163	166.6	4	2.5	165.6		BR 163	BR 163
AR 165	165	168.6	4	2.5	167.6		BR 165	BR 165
AR 170	170	173.6	4	2.5	172.6		BR 170	BR 170
AR 173	173	176.6	4	2.5	175.6		BR 173	BR 173
AR 175	175	178.6	4	2.5	177.6		BR 175	BR 175
AR 180	180	183.6	4	2.5	182.6	+0.3 0	BR 180	BR 180
AR 183	183	186.6	4	2.5	185.6		BR 183	BR 183
AR 190	190	193.6	5	3	192.6		BR 190	BR 190
AR 195	195	199.5	5	3	198		BR 195	BR 195
AR 200	200	204.5	5	3	203		BR 200	BR 200
AR 205	205	209.5	5	3	208		BR 205	BR 205
AR 210	210	214.5	5	3	213		—	BR 210
AR 215	215	219.5	5	3	218		—	BR 215
AR 220	220	224.5	5	3	223		BR 220	BR 220
AR 225	225	229.5	5	3	228		—	BR 225
AR 230	230	234.5	5	3	233		BR 230	BR 230
AR 235	235	239.5	5	3	238		—	—
AR 240	240	244.5	5	3	243		—	BR 240
AR 245	245	249.5	5	3	248		—	—
AR 250	250	254.5	5	3	253		BR 250	BR 250
AR 260	260	267	7.5	4	265		—	—
AR 270	270	277	7.5	4	275		BR 270	BR 270
AR 280	280	287	7.5	4	285		BR 280	BR 280
AR 300	300	307	7.5	4	305		BR 300	BR 300
AR 320	320	327	7.5	4	325		BR 320	BR 320
AR 325	325	332	7.5	4	330	$^{+0.36}_{0}$	BR 325	BR 325



DIMENSION TABLE | **INTERCHANGE TABLE**

IKO NUMBER AR	DIMENSIONS (mm) HOUSING d1	MIN. d3	b	t	GROOVE d2	TOLE.	INA BR	FAG BR
AR 355	355	362	7.5	4	360	+0.36 0	BR 355	BR 355
AR 375	375	382	7.5	4	380		BR 375	BR 375
AR 395	395	402	7.5	4	400		BR 395	BR 395
AR 415	415	422	7.5	4	420	+0.4 0	BR 415	BR 415
AR 420	420	427	7.5	4	425		BR 420	BR 420
AR 440	440	447	7.5	4	445		BR 440	BR 440

● Inch-mm Conversion Table

1 inch = 25.4 mm

inch Fraction	 Decimal	0″	1″	2″	3″	4″	5″	6″	7″	8″
	0		25.400	50.800	76.200	101.600	127.000	152.400	177.800	203.200
1 / 64″	0.015625	0.397	25.797	51.197	76.597	101.997	127.397	152.797	178.197	203.597
1 / 32″	0.031250	0.794	26.194	51.594	76.994	102.394	127.794	153.194	178.594	203.994
3 / 64″	0.046875	1.191	26.591	51.991	77.391	102.791	128.191	153.591	178.991	204.391
1 / 16″	0.062500	1.588	26.988	52.388	77.788	103.188	128.588	153.988	179.388	204.788
5 / 64″	0.078125	1.984	27.384	52.784	78.184	103.584	128.984	154.384	179.784	205.184
3 / 32″	0.093750	2.381	27.781	53.181	78.581	103.981	129.381	154.781	180.181	205.581
7 / 64″	0.109375	2.778	28.178	53.578	78.978	104.378	129.778	155.178	180.578	205.978
1 / 8″	0.125000	3.175	28.575	53.975	79.375	104.775	130.175	155.575	180.975	206.375
9 / 64″	0.140625	3.572	28.972	54.372	79.772	105.172	130.572	155.972	181.372	206.772
5 / 32″	0.156250	3.969	29.369	54.769	80.169	105.569	130.969	156.369	181.769	207.169
11 / 64″	0.171875	4.366	29.766	55.166	80.566	105.966	131.366	156.766	182.166	207.566
3 / 16″	0.187500	4.762	30.162	55.562	80.962	106.362	131.762	157.162	182.562	207.962
13 / 64″	0.203125	5.159	30.559	55.959	81.359	106.759	132.159	157.559	182.959	208.359
7 / 32″	0.218750	5.556	30.956	56.356	81.756	107.156	132.556	157.956	183.356	208.756
15 / 64″	0.234375	5.953	31.353	56.753	82.153	107.553	132.953	158.353	183.753	209.153
1 / 4″	0.250000	6.350	31.750	57.150	82.550	107.950	133.350	158.750	184.150	209.550
17 / 64″	0.265625	6.747	32.147	57.547	82.947	108.347	133.747	159.147	184.547	209.947
9 / 32″	0.281250	7.144	32.544	57.944	83.344	108.744	134.144	159.544	184.944	210.344
19 / 64″	0.296875	7.541	32.941	58.341	83.741	109.141	134.541	159.941	185.341	210.741
5 / 16″	0.312500	7.938	33.338	58.738	84.138	109.538	134.938	160.338	185.738	211.138
21 / 64″	0.328125	8.334	33.734	59.134	84.534	109.934	135.334	160.734	186.134	211.534
11 / 32″	0.343750	8.731	34.131	59.531	84.931	110.331	135.731	161.131	186.531	211.931
23 / 64″	0.359375	9.128	34.528	59.928	85.328	110.728	136.128	161.528	186.928	212.328
3 / 8″	0.375000	9.525	34.925	60.325	85.725	111.125	136.525	161.925	187.325	212.725
25 / 64″	0.390625	9.922	35.322	60.722	86.122	111.522	136.922	162.322	187.722	213.122
13 / 32″	0.406250	10.319	35.719	61.119	86.519	111.919	137.319	162.719	188.119	213.519
27 / 64″	0.421875	10.716	36.116	61.516	86.916	112.316	137.716	163.116	188.516	213.916
7 / 16″	0.437500	11.112	36.512	61.912	87.312	112.712	138.112	163.512	188.912	214.312
29 / 64″	0.453125	11.509	36.909	62.309	87.709	113.109	138.509	163.909	189.309	214.709
15 / 32″	0.468750	11.906	37.306	62.706	88.106	113.506	138.906	164.306	189.706	215.106
31 / 64″	0.484375	12.303	37.703	63.103	88.503	113.903	139.303	164.703	190.103	215.503
1 / 2″	0.500000	12.700	38.100	63.500	88.900	114.300	139.700	165.100	190.500	215.900

1 inch = 25.4 mm

inch		0″	1″	2″	3″	4″	5″	6″	7″	8″
Fraction	Decimal									
33 / 64″	0.515625	13.097	38.497	63.897	89.297	114.697	140.097	165.497	190.897	216.297
17 / 32″	0.531250	13.494	38.894	64.294	89.694	115.094	140.494	165.894	191.294	216.694
35 / 64″	0.546875	13.891	39.291	64.691	90.091	115.491	140.891	166.291	191.691	217.091
9 / 16″	0.562500	14.288	39.688	65.088	90.488	115.888	141.288	166.688	192.088	217.488
37 / 64″	0.578125	14.684	40.084	65.484	90.884	116.284	141.684	167.084	192.484	217.884
19 / 32″	0.593750	15.081	40.481	65.881	91.281	116.681	142.081	167.481	192.881	218.281
39 / 64″	0.609375	15.478	40.878	66.278	91.678	117.078	142.478	167.878	193.278	218.678
5 / 8″	0.625000	15.875	41.275	66.675	92.075	117.475	142.875	168.275	193.675	219.075
41 / 64″	0.640625	16.272	41.672	67.072	92.472	117.872	143.272	168.672	194.072	219.472
21 / 32″	0.656250	16.669	42.069	67.469	92.869	118.269	143.669	169.069	194.469	219.869
43 / 64″	0.671875	17.066	42.466	67.866	93.266	118.666	144.066	169.466	194.866	220.266
11 / 16″	0.687500	17.462	42.862	68.262	93.662	119.062	144.462	169.862	195.262	220.662
45 / 64″	0.703125	17.859	43.259	68.659	94.059	119.459	144.859	170.259	195.659	221.059
23 / 32″	0.718750	18.256	43.656	69.056	94.456	119.856	145.256	170.656	196.056	221.456
47 / 64″	0.734375	18.653	44.053	69.453	94.853	120.253	145.653	171.053	196.453	221.853
3 / 4″	0.750000	19.050	44.450	69.850	95.250	120.650	146.050	171.450	196.850	222.250
49 / 64″	0.765625	19.447	44.847	70.247	95.647	121.047	146.447	171.847	197.247	222.647
25 / 32″	0.781250	19.844	45.244	70.644	96.044	121.444	146.844	172.244	197.644	223.044
51 / 64″	0.796875	20.241	45.641	71.041	96.441	121.841	147.241	172.641	198.041	223.441
13 / 16″	0.812500	20.638	46.038	71.438	96.838	122.238	147.638	173.038	198.438	223.838
53 / 64″	0.828125	21.034	46.434	71.834	97.234	122.634	148.034	173.434	198.834	224.234
27 / 32″	0.843750	21.431	46.831	72.231	97.631	123.031	148.431	173.831	199.231	224.631
55 / 64″	0.859375	21.828	47.228	72.628	98.028	123.428	148.828	174.228	199.628	225.028
7 / 8″	0.875000	22.225	47.625	73.025	98.425	123.825	149.225	174.625	200.025	225.425
57 / 64″	0.890625	22.622	48.022	73.422	98.822	124.222	149.622	175.022	200.422	225.822
29 / 32″	0.906250	23.019	48.419	73.819	99.219	124.619	150.019	175.419	200.819	226.219
59 / 64″	0.921875	23.416	48.816	74.216	99.616	125.016	150.416	175.816	201.216	226.616
15 / 16″	0.937500	23.812	49.212	74.612	100.012	125.412	150.812	176.212	201.612	227.012
61 / 64″	0.953125	24.209	49.609	75.009	100.409	125.809	151.209	176.609	202.009	227.409
31 / 32″	0.968750	24.606	50.006	75.406	100.806	126.206	151.606	177.006	202.406	227.806
63 / 64″	0.984375	25.003	50.403	75.803	101.203	126.603	152.003	177.403	202.803	228.203

● N-lbf Conversion Table

1N = 0.224809 lbf 1lbf = 4.44822 N

N		lbf	N		lbf	N		lbf
4.448	1	0.225	151.24	34	7.643	298.03	67	15.062
8.896	2	0.450	155.69	35	7.868	302.48	68	15.287
13.345	3	0.674	160.14	36	8.093	306.93	69	15.512
17.793	4	0.899	164.58	37	8.318	311.38	70	15.737
22.241	5	1.124	169.03	38	8.543	315.82	71	15.961
26.689	6	1.349	173.48	39	8.768	320.27	72	16.186
31.138	7	1.574	177.93	40	8.992	324.72	73	16.411
35.586	8	1.798	182.38	41	9.217	329.17	74	16.636
40.034	9	2.023	186.83	42	9.442	333.62	75	16.861
44.482	10	2.248	191.27	43	9.667	338.06	76	17.085
48.930	11	2.473	195.72	44	9.892	342.51	77	17.310
53.379	12	2.698	200.17	45	10.116	346.96	78	17.535
57.827	13	2.923	204.62	46	10.341	351.41	79	17.760
62.275	14	3.147	209.07	47	10.566	355.86	80	17.985
66.723	15	3.372	213.51	48	10.791	360.31	81	18.210
71.171	16	3.597	217.96	49	11.016	364.75	82	18.434
75.620	17	3.822	222.41	50	11.240	369.20	83	18.659
80.068	18	4.047	226.86	51	11.465	373.65	84	18.884
84.516	19	4.271	231.31	52	11.690	378.10	85	19.109
88.964	20	4.496	235.76	53	11.915	382.55	86	19.334
93.413	21	4.721	240.20	54	12.140	386.99	87	19.558
97.861	22	4.946	244.65	55	12.364	391.44	88	19.783
102.31	23	5.171	249.10	56	12.589	395.89	89	20.008
106.76	24	5.395	253.55	57	12.814	400.34	90	20.233
111.21	25	5.620	258.00	58	13.039	404.79	91	20.458
115.65	26	5.845	262.44	59	13.264	409.24	92	20.682
120.10	27	6.070	266.89	60	13.489	413.68	93	20.907
124.55	28	6.295	271.34	61	13.713	418.13	94	21.132
129.00	29	6.519	275.79	62	13.938	422.58	95	21.357
133.45	30	6.744	280.24	63	14.163	427.03	96	21.582
137.89	31	6.969	284.69	64	14.388	431.48	97	21.806
142.34	32	7.194	289.13	65	14.613	435.93	98	22.031
146.79	33	7.419	293.58	66	14.837	440.37	99	22.256

How to use : For example, to convert 20 N into lbf, find the number 20 in the center of the first column. By referring to the lbf column on the right, it will be found that 20 N equals 4.496 lbf.
To convert 20 lbf into N, refer to the N column on the left and it will be found that 20 lbf equals 88.964 N.

● N-kgf Conversion Table

1N = 0.1019716 kgf 1kgf = 9.80665 N

N		kgf	N		kgf	N		kgf
9.8066	1	0.1020	333.43	34	3.4670	657.05	67	6.8321
19.613	2	0.2039	343.23	35	3.5690	666.85	68	6.9341
29.420	3	0.3059	353.04	36	3.6710	676.66	69	7.0360
39.227	4	0.4079	362.85	37	3.7729	686.47	70	7.1380
49.033	5	0.5099	372.65	38	3.8749	696.27	71	7.2400
58.840	6	0.6118	382.46	39	3.9769	706.08	72	7.3420
68.647	7	0.7138	392.27	40	4.0789	715.89	73	7.4439
78.453	8	0.8158	402.07	41	4.1808	725.69	74	7.5459
88.260	9	0.9177	411.88	42	4.2828	735.50	75	7.6479
98.066	10	1.0197	421.69	43	4.3848	745.31	76	7.7498
107.87	11	1.1217	431.49	44	4.4868	755.11	77	7.8518
117.68	12	1.2237	441.30	45	4.5887	764.92	78	7.9538
127.49	13	1.3256	451.11	46	4.6907	774.73	79	8.0558
137.29	14	1.4276	460.91	47	4.7927	784.53	80	8.1577
147.10	15	1.5296	470.72	48	4.8946	794.34	81	8.2597
156.91	16	1.6315	480.53	49	4.9966	804.15	82	8.3617
166.71	17	1.7335	490.33	50	5.0986	813.95	83	8.4636
176.52	18	1.8355	500.14	51	5.2006	823.76	84	8.5656
186.33	19	1.9375	509.95	52	5.3025	833.57	85	8.6676
196.13	20	2.0394	519.75	53	5.4045	843.37	86	8.7696
205.94	21	2.1414	529.56	54	5.5065	853.18	87	8.8715
215.75	22	2.2434	539.37	55	5.6084	862.99	88	8.9735
225.55	23	2.3453	549.17	56	5.7104	872.79	89	9.0755
235.36	24	2.4473	558.98	57	5.8124	882.60	90	9.1774
245.17	25	2.5493	568.79	58	5.9144	892.41	91	9.2794
254.97	26	2.6513	578.59	59	6.0163	902.21	92	9.3814
264.78	27	2.7532	588.40	60	6.1183	912.02	93	9.4834
274.59	28	2.8552	598.21	61	6.2203	921.83	94	9.5853
284.39	29	2.9572	608.01	62	6.3222	931.63	95	9.6873
294.20	30	3.0591	617.82	63	6.4242	941.44	96	9.7893
304.01	31	3.1611	627.63	64	6.5262	951.25	97	9.8912
313.81	32	3.2631	637.43	65	6.6282	961.05	98	9.9932
323.62	33	3.3651	647.24	66	6.7301	970.86	99	10.0952

How to use : For example, to convert 20 N into kgf, find the number 20 in the center of the first column. By referring to the kgf column on the right, it will be found that 20 N equals 2.0394 kgf.
To convert 20 kgf into N, refer to the N column on the left and it will be found that 20 kgf equals 196.13 N.

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ISO 9001 & 14001 Quality system registration certificate

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IKO
Innovation, Know-how & Originality

New Product

Needle Rollers with Synthetic resin cage for General Use

KT•••N

NIPPON THOMPSON CO., LTD.

Strong, lightweight, and low-cost. New sizes are now available for Needle Roller Cages with the superior characteristics of synthetic resin.

Structure and features

Needle Roller Cages for General Usage are bearings that provide excellent rotational performance. Specially designed cage precisely guides the needle rollers. They create extremely low-sectional height high-precision rolling guides when combined with accurately ground heat treated shafts and housing bores. **IKO** offers both high carbon style cage types and synthetic resin cage types. New sizes have been recently added to the synthetic resin cage type.

● Features of synthetic resin cages

1 High load capacity

The narrow formed cage stays between the rollers allows for an increase in the number of needle rollers. Thus raising the load capacity by almost 20% when compared against same sized with high carbon steel cage. (In case of KT505825N)

2 Ultra-small sizes are available

Ultra-small sizes (bore diameter 3 to 5 mm), are available unlike those having high carbon steel cages.

3 Lightweight/Low-cost

Synthetic resin cages help reduce equipment weight and costs.

4 Special models for your applications

We offer special versions such as non-standard sizes or materials depending on situation to fit your applications. Please feel free to contact us for more details.

Model

Needle Roller Cages for General Usage are available in the types shown in Table 1.

Table 1 Model of bearing

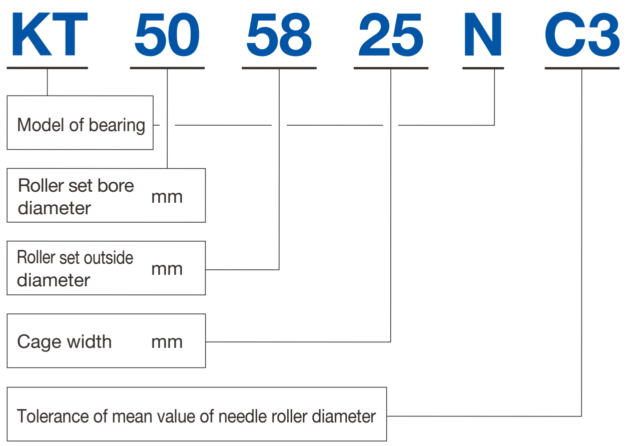
Item	Model of bearing	
	Single row needle roller	Double row needle roller
High carbon steel cage type	KT	KTW
Synthetic resin cage type	KT···N	–

Operating Temperature Range

The operating temperature range for synthetic resin cages is -20 to 110°C. For continuous use, keep the temperature at 100°C or below.

Identification number

Examples of the identification number of Needle Roller Cages for General Usage are shown below.


KT 50 58 25 N C3

Model of bearing

Roller set bore diameter mm

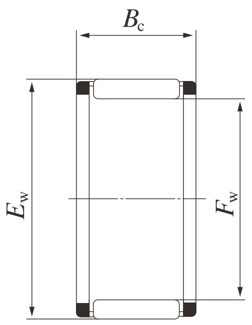
Roller set outside diameter mm

Cage width mm

Tolerance of mean value of needle roller diameter

For details of accuracy, fit, or mounting, please contact **IKO**.

Dimensions



Shaft diameter mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	E_w	B_C	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable (1) rotational speed min^{-1}
3	KT 367N	0.39	3	6	7	1 480	990	140 000
4	KT 477N	0.47	4	7	7	1 800	1 300	100 000
5	KT 587N	0.53	5	8	7	2 070	1 600	85 000
	KT 588N	0.66	5	8	8	2 420	1 950	85 000
6	KT 697N	0.63	6	9	7	2 310	1 900	75 000
	KT 698N	0.75	6	9	8	2 700	2 320	75 000
7	KT 7108N	0.86	7	10	8	2 960	2 690	65 000
8	KT 8118N	0.96	8	11	8	3 190	3 060	60 000
New	KT 81110N	1.2	8	11	10	3 630	3 600	60 000
29	KT 293825N	40.7	29	38	25	35 800	47 800	17 500
50	KT 505825N	66.3	50	58	25	51 400	97 800	10 000

Note (1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable. 1N≈0.102kgf

For dimensions not listed, please contact **IKO**.

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Innovation,Know-how & Originality

CFKR

Double Hex Hole Cam Followers
Now available in sizes 22 and 26

Made in Japan
With Competitive Pricing

INA Comparison		Basic dynamic load rating	Basic Static load rating	INA Comparison		Basic dynamic load rating	Basic Static load rating
		C (N)	C_0 (N)			C (N)	C_0 (N)
IKO	CFKR 30	7910	9790	IKO	CFKR 62	30500	52600
INA	KR30	6800	8600	INA	KR62	26000	48000
IKO	CFKR 32	7910	9790	IKO	CFKR 72	30500	52600
INA	KR32	7100	9200	INA	KR72	28000	53000
IKO	CFKR 35	12000	18300	IKO	CFKR 80	45400	85100
INA	KR35	9700	14300	INA	KR80	38500	77000
IKO	CFKR 40	14800	25200	IKO	CFKR 85	45400	85100
INA	KR40	10900	15800	INA	-	-	-
IKO	CFKR 52	20700	34600	IKO	CFKR 90	45400	85100
INA	KR52	16600	29000	INA	KR90	40500	83000
IKO	CFKR 47	20700	34600				
INA	KR47	15400	26000				

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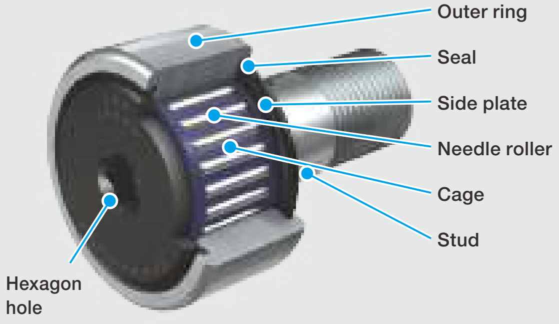
CFKR

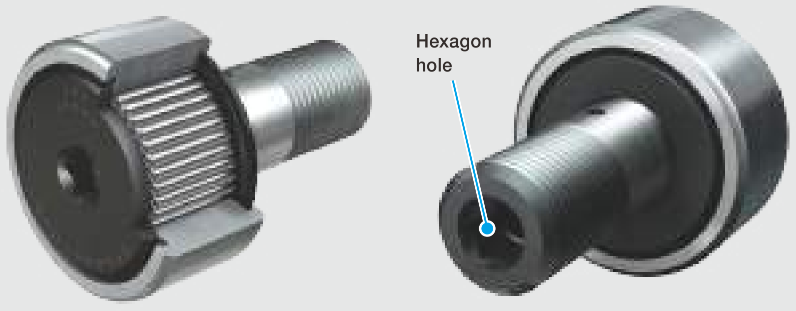
Structure of CFKR

Cam Followers are bearings with a stud incorporating needle rollers in a thick walled outer ring. These bearings are designed for outer ring rotation with superior rotational performance, a small coefficient of friction and high load capacity. Double Hex Hole Cam Followers have a structure with hexagon holes at each end of the stud, allowing for use in any mounting location.

Type with cage



Full complement type

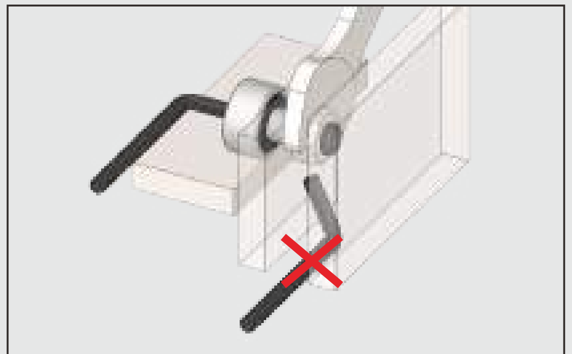


Features

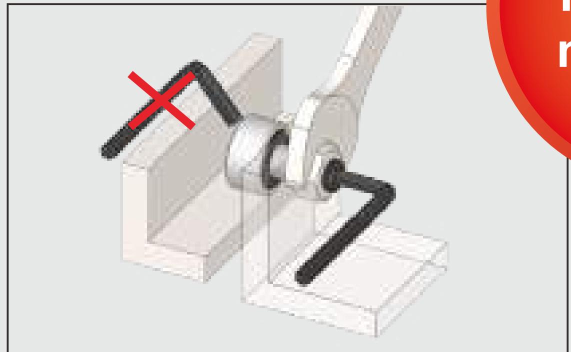
With hexagon hole on both stud ends

The sockets with hexagon hole on both stud ends allow mounting with a hexagon wrench from either side.

Significantly improves mounting options!



When the stud thread is interfering



When the stud head is interfering

Example of Identification Number

CFKR	22	V	UU	R
①	②	③	④	⑤

① Model	
CFKR	Double Hex Hole Cam Followers

② Dimensions

Shows the outer ring outside diameter. (unit: mm)

③ Roller guide method	
No symbol	With cage
V	Full complement

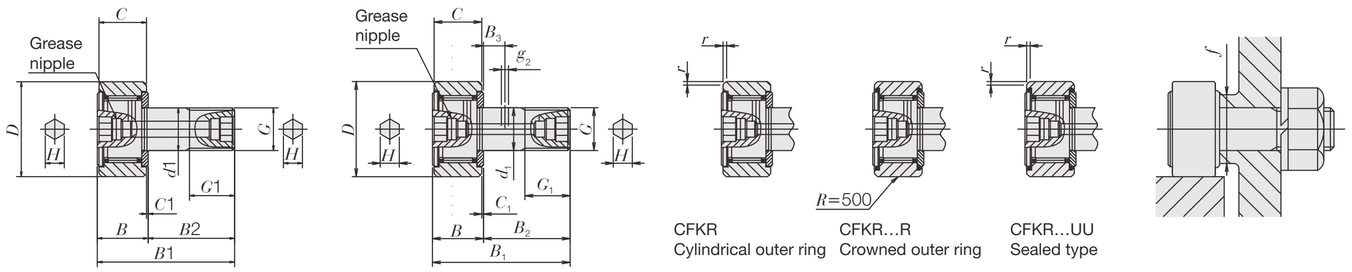
④ Seal structure	
No symbol	Shield type
UU	Sealed type

⑤ Shape of outer ring outside surface	
No symbol	Cylindrical outer ring
R	Crowned outer ring

Variations of CFKR

Model of bearing	Roller guide method	Shape of outer ring outside surface	Seal structure	Identification number	Size (outside dia. of outer ring) 22	26	30	32	35	40	47	52	62	72	80	85	90
Double Hex Hole Cam Followers	With cage	Crowned outer ring	Shield type	CFKR···R New	○	○	○	○	○	○	○	○	○	○	○	○	○
			Sealed type	CFKR···UUR	○	○	○	○	○	○	○	○	○	○	○	○	○
		Cylindrical outer ring	Shield type	CFKR	○	○	○	○	○	○	○	○	○	○	○	○	○
			Sealed type	CFKR···UU	○	○	○	○	○	○	○	○	○	○	○	○	○
	Full complement	Crowned outer ring	Shield type	CFKR···VR	○	○	○	○	○	○	○	○	○	○	○	○	○
			Sealed type	CFKR···VUUR	○	○	○	○	○	○	○	○	○	○	○	○	○
		Cylindrical outer ring	Shield type	CFKR···V	○	○	○	○	○	○	○	○	○	○	○	○	○
			Sealed type	CFKR···VUU	○	○	○	○	○	○	○	○	○	○	○	○	○

Dimensions



Outside dia. of outer ring D 22, 26 mm

Outside dia. of outer ring D 30 - 90 mm

CFKR
Cylindrical outer ring

CFKR…R
Crowned outer ring

CFKR…UU
Sealed type

With cage

Identification number Shield type Crowned outer ring	Shield type Cylindrical outer ring	Sealed type Crowned outer ring	Sealed type Cylindrical outer ring	Mass (Ref.) g	Boundary dimensions mm D	C	d_1	G	G_1	B max	B_1 max	B_2	B_3	C_1	g_2	H	$r_{s\,min}$ (1)	Mounting dimension f Min. mm	Maximum tightening torque N·m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
CFKR22R	CFKR22	CFKR22UUR	CFKR22UU	43	22	12	10	M10X1.0	12	13.2	36.2	23	-	0.6	-	5	0.3	16	13.0	5 430	6 890	6 890
CFKR26R	CFKR26	CFKR26UUR	CFKR26UU	58	26																	
CFKR30R	CFKR30	CFKR30UUR	CFKR30UU	94	30	14	12	M12X1.5	13	15.2	40.2	25	6	0.6	3	6	0.6	21	21.9	7 910	9 790	9 790
CFKR32R	CFKR32	CFKR32UUR	CFKR32UU	104	32																	
CFKR35R	CFKR35	CFKR35UUR	CFKR35UU	165	35	18	16	M16X1.5	17	19.6	52.1	32.5	8	0.8	3	8	0.6	26	58.5	12 000	18 300	18 300
CFKR40R	CFKR40	CFKR40UUR	CFKR40UU	248	40	20	18	M18X1.5	19	21.6	58.1	36.5	8	0.8	3	8	1	29	86.2	14 800	25 200	25 200
CFKR47R	CFKR47	CFKR47UUR	CFKR47UU	378	47	24	20	M20X1.5	21	25.6	66.1	40.5	9	0.8	4	10	1	34	119	20 700	34 600	34 600
CFKR52R	CFKR52	CFKR52UUR	CFKR52UU	453	52																	
CFKR62R	CFKR62	CFKR62UUR	CFKR62UU	795	62	29	24	M24X1.5	25	30.6	80.1	49.5	11	0.8	4	14	1	40	215	30 500	52 600	52 000
CFKR72R	CFKR72	CFKR72UUR	CFKR72UU	1 120	72																	
CFKR80R	CFKR80	CFKR80UUR	CFKR80UU	1 860	80	35	30	M30X1.5	32	37	100	63	15	1	4	14	1	49	438	45 400	85 100	85 100
CFKR85R	CFKR85	CFKR85UUR	CFKR85UU	2 020	85																	
CFKR90R	CFKR90	CFKR90UUR	CFKR90UU	2 210	90																	

Note (1) Minimum allowable value of chamfer dimension r. 1N≒0.102kgf

Full complement

Identification number Shield type Crowned outer ring	Shield type Cylindrical outer ring	Sealed type Crowned outer ring	Sealed type Cylindrical outer ring	Mass (Ref.) g	Boundary dimensions mm D	C	d_1	G	G_1	B max	B_1 max	B_2	B_3	C_1	g_2	H	$r_{s\,min}$ (1)	Mounting dimension f Min. mm	Maximum tightening torque N·m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
CFKR22VR	CFKR22V	CFKR22VUUR	CFKR22VUU	44	22	12	10	M10X1.0	12	13.2	36.2	23	-	0.6	-	5	0.3	16	13.0	9 570	14 500	7 920
CFKR26VR	CFKR26V	CFKR26VUUR	CFKR26VUU	59	26																	
CFKR30VR	CFKR30V	CFKR30VUUR	CFKR30VUU	96	30	14	12	M12X1.5	13	15.2	40.2	25	6	0.6	3	6	0.6	21	21.9	13 500	19 700	13 200
CFKR32VR	CFKR32V	CFKR32VUUR	CFKR32VUU	106	32																	
CFKR35VR	CFKR35V	CFKR35VUUR	CFKR35VUU	168	35	18	16	M16X1.5	17	19.6	52.1	32.5	8	0.8	3	8	0.6	26	58.5	20 700	37 600	23 200
CFKR40VR	CFKR40V	CFKR40VUUR	CFKR40VUU	253	40	20	18	M18X1.5	19	21.6	58.1	36.5	8	0.8	3	8	1	29	86.2	25 300	51 300	31 100
CFKR47VR	CFKR47V	CFKR47VUUR	CFKR47VUU	383	47	24	20	M20X1.5	21	25.6	66.1	40.5	9	0.8	4	10	1	34	119	33 200	64 500	37 500
CFKR52VR	CFKR52V	CFKR52VUUR	CFKR52VUU	458	52																	
CFKR62VR	CFKR62V	CFKR62VUUR	CFKR62VUU	800	62	29	24	M24X1.5	25	30.6	80.1	49.5	11	0.8	4	14	1	40	215	46 600	92 000	52 000
CFKR72VR	CFKR72V	CFKR72VUUR	CFKR72VUU	1 120	72																	
CFKR80VR	CFKR80V	CFKR80VUUR	CFKR80VUU	1 860	80	35	30	M30X1.5	32	37	100	63	15	1	4	14	1	49	438	67 700	144 000	85 900
CFKR85VR	CFKR85V	CFKR85VUUR	CFKR85VUU	2 020	85																	
CFKR90VR	CFKR90V	CFKR90VUUR	CFKR90VUU	2 210	90																	

Note (1) Minimum allowable value of chamfer dimension r. 1N≒0.102kgf

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Oil Minimum
IKO Gentle to The Earth

ISO 9001 Certified
ISO 14001 Certified
ISO 9001 & 14001 Quality system registration certificate

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IKO
Innovation, Know-how & Originality

New Product

High Rigidity Type Crossed Roller Bearing V

CRBHV

Mounting Holed Type High Rigidity Crossed Roller Bearing V

CRBFV

NIPPON THOMPSON CO., LTD.

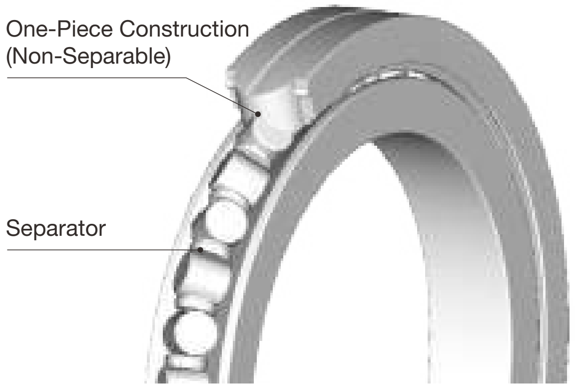
IKO's New CRBHV / CRBFV Models of High Rigidity Crossed Roller Bearings!

Quick delivery and affordable cost Crossed Roller Bearings are now available from IKO.

CRBHV / CRBFV Features

High Rigidity / High Accuracy

Both inner and outer rings have solid one-piece construction that minimizes mounting errors and allows these bearings to easily achieve high rigidity and high accuracy.
Separators incorporated between the cylindrical rollers allow for smooth rotation, and making them suitable for applications with comparatively high rotational speed.



Quick Delivery / Very Affordable

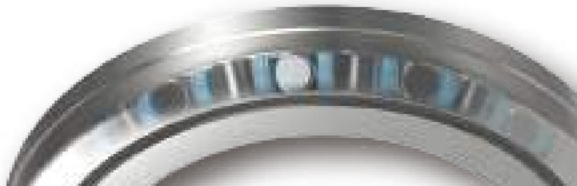
CRBHV/CRBFV are manufactured at a dedicated site. This newly developed site allowed us to shorten lead-times and reduce production cost by making improvements to the whole processes from design to manufacturing. With our continued efforts to support our customers, we now offer these bearings with excellent cost value. This product will contribute to cost reductions and shorter production lead time when integrated into various machines we incorporate.

Special models for your applications

We offer Crossed Roller Bearings with individual specifications customized to our customers' usages and or applications. We have abundant manufacturing experience of special specification products so if you have any requirement for a special product application, please contact IKO.

IKO Crossed Roller Bearings

IKO Crossed Roller Bearings are compact bearings with their rollers alternately crossed at right angles to each other between an inner and outer ring. This allows them to sustain loads such as radial, thrust and moment from any direction at the same time. The rollers make line-contact with raceway surfaces, thus elastic deformation due to bearing loads is very small.

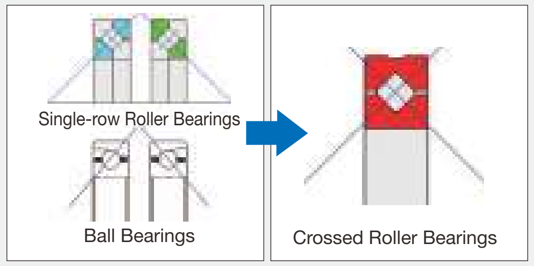


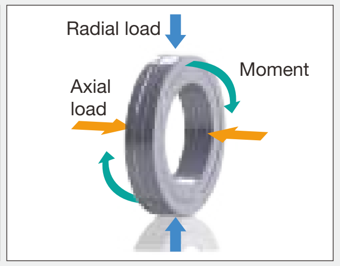
IKO Crossed Roller Bearing advantages.

IKO Crossed Roller Bearings are high performance bearings with a variety of characteristics not seen in other bearings.

Compact

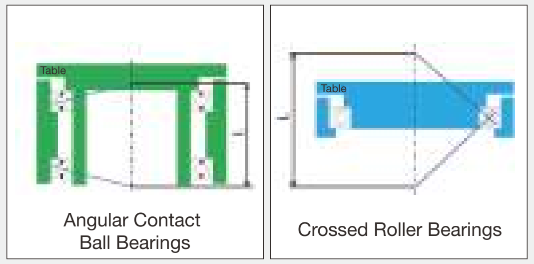
The orthogonal array of rollers makes it possible to simultaneously receive complex loads from various directions with just a single bearing. When compared to opposed mounting single row roller or ball bearings, the contact area can be reduced thus contributing to compactness and space-saving equipment.



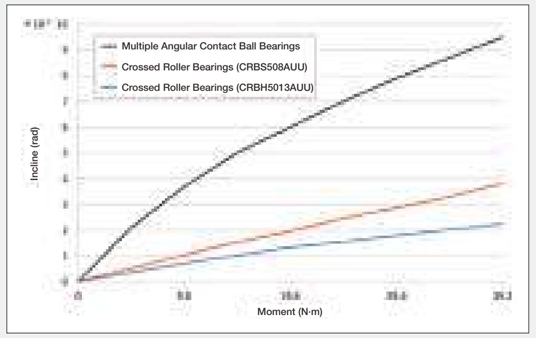


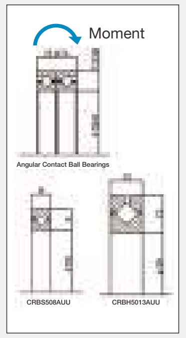
High Rigidity

The figure at right is a cross-section of a rotating turntable. The application point distance from the time a moment load applied to the turntable is L, and the allowable moment load of the bearing is proportional to application point distance L. If increasing application point distance L to increase the moment rigidity of the turntable, two Angular Contact Ball Bearings are required. Because of the need for distance between the bearings, the equipment size increases as well. However, even a single Crossed Roller Bearing can increase application point distance L, keeping equipment compact and improving moment rigidity.



Angular Contact Ball Bearings
Crossed Roller Bearings



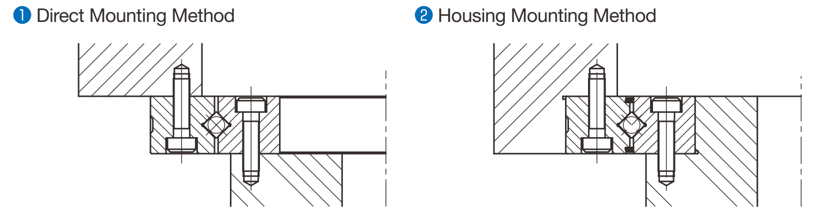


Because of the line contact structure of Crossed Roller Bearings, when using rollers for the bearing inner rolling elements, rigidity is greatly improved compared to ball type bearings. For example, rigidity is increased 3 to 4 times while achieving more compact cross-section dimensions compared to a double row Angular Contact Ball Bearing.

Easy Mounting

Mounting Holed Type High Rigidity Crossed Roller Bearings feature mounting holes to allow direct mounting to the mounting surface without requiring the use of a housing or pressure plate as with conventional Crossed Roller Bearings.
It is recommended to use a housing for applications with large loads or moments.

Mounting Holed Type Crossed Roller Bearing Mounting Example



Quality

Many years of experience with roller type bearings allows IKO the ability to produce highly accurate Crossed Roller Bearings due to our manufacturing know-how and rigorous quality standards.


Needle Roller Bearing manufacturing process
Grinding

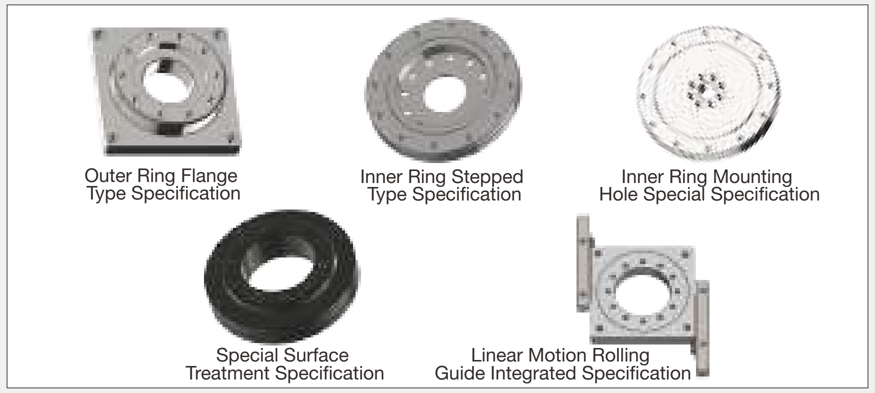

Needle Roller Bearing manufacturing process
Inspection

Diversity

IKO Crossed Roller Bearings are available in a wide variety of types.
For machine tools, large robots, medical, and general industrial equipment, optimal types are CRBH/CRBHV, with its inner and outer ring combined integral structure, and CRB/CRBC, with outer rings split in two in the axial direction.
For electric and electronic automated equipment such as small/medium robotic joints or semiconductors, the Slime Type CRBS with its small cross-sectional dimension works best.
For even smaller precision equipment, the Super Slim Type CRBT is optimal with its minimized cross-sectional area.
The high rigidity CRBF/CRBFV is also available, with mounting holes to simplify the mating with the housing structure.

Flexibility

IKO's unique flexibility and diverse production allows us to offer customized Crossed Roller Bearings to fit the customers' applications. IKO has a sound record of producing a wide variety of special products with non-standard shapes, sizes, surface treatments and other unique features.
Please contact IKO when your application requires certain special features that are not on our stock products.

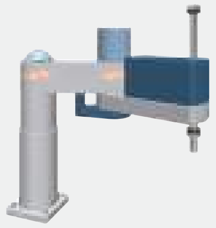


IKO Crossed Roller Bearings application examples.

High performance and compact IKO Crossed Roller Bearings had been integrated into various machines and devices, resulting in improved efficiency, reliability and compactness.
Here are some great examples of Crossed Roller Bearings in action:

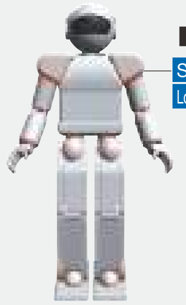
Robot

Increasingly a number of customers are switching out conventional ball bearings with IKO Crossed Roller Bearings on their robots in order to reduce size and weight.



■ Pick-up robot

Structure	Horizontal articulation
Location used	Joint swivel part



■ Androids

Structure	Android Robots
Location used	Joints

■ Welding robot

Structure	Vertical articulation
Location used	Swivel Joints, Gearboxes

Medical equipment

Many various of IKO Crossed Roller Bearings, including those with special specifications, are available for applications requiring smooth operation with high rotational accuracy. Some are designed to be used in environments where rust prevention oil is not allowed or in medical equipment.

■ X-Ray Diagnostic Equipment

Structure	C-Type Arm Operation
Location used	X-Ray Detector Rotors

Motor

High Rotational Accuracy IKO Crossed Roller Bearings also have a proven track record for use on Theta-Axis Rotary Drive units. A key attribute is IKO's ability and flexibility to accommodate special shapes such as flanges and steps.

■ DD Motor

Structure	Direct Drive Motor
Location used	Output Shaft

Machine tools

Bearings supporting rotation often need minimal deflection even when operating in tough environments. High Rigidity IKO Crossed Roller Bearings provide minimal deflection and are especially suited for use in machine tools.

■ Machine Tool Tables

Structure	NC Lathes
Location used	Table Rotating Parts

Windmills

Bearings in windmills are forced to work in harsh environments. They need to stand up to moment loads caused by the wind as well as high rotational speed. It is in the harsh environments that IKO Crossed Roller Bearings show their true potential.

■ Power Generating Windmills

Structure	Compact Wind Generator
Location used	Systems
	Swivel Parts

Capabilities of Crossed Roller Bearings proposed by IKO.

IKO Crossed Roller Bearings are ideally suited for robotics, so IKO proposes using them in the following applications:

Marine Antenna

Marine antennas are constantly battered by strong winds. The support for these antennas require bearings that are very rigid to be able to stand up to these winds. IKO High Rigidity Crossed Roller Bearings are ideal for this application.

■ Marine Antenna

Structure	Marine Parabola Antenna
Location used	Base swivel part

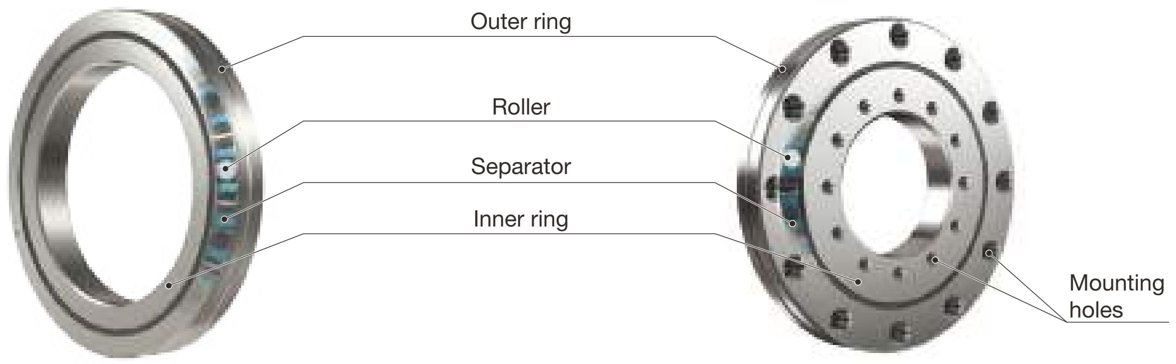
Security Camera

Security cameras move horizontally and vertically nonstop all year round. Extreme reliability is required for this continuous compound operation. IKO Crossed Roller Bearings can receive complex loads from multiple directions, making them ideal for use in security cameras.

■ Security Cameras

Structure	Movable Security Cameras
Location used	Camera Drive Parts

CRBHV / CRBFV Structure



CRBHV

Variation					
Size	Shaft dia. 30-250 mm (1)				
Seal	Yes		None		
Clearance	T1 (Preload)	C1 (Slight)	C2 (Medium)	No symbol (Normal)	
Accuracy class	Class 0	P6 RP6	P5 RP5	P4 RP4	P2 RP2
Accuracy	→ High				

Notes (1) Sizes with a shaft diameter greater than 120mm are scheduled to be produced starting December 2016.

CRBFV

Variation					
Size	Shaft dia. 35-115 mm (1)				
Seal	Yes		None		
Clearance	T1 (Preload)	C1 (Slight)	C2 (Medium)	No symbol (Normal)	
Accuracy class	Class 0	P6 RP6	P5 RP5	P4 RP4	P2 RP2
Accuracy	→ High				

Notes (1) Sizes with a shaft diameter greater than 80mm are scheduled to be produced starting December 2016.

Identification number

The identification number of Crossed Roller Bearings consists of a model code, dimensions, any supplemental codes and a classification symbol. Examples are shown below.

Example ➡ **CRBFV 35 15 A T UU C1 RP6**

Model code	
CRBHV···A	High Rigidity Type Crossed Roller Bearing V (With separator)
CRBFV···A	Mounting Holed High Rigidity Type Crossed Roller Bearing V (With separator)

Dimensions
The dimension indicates the bore diameter of the bearing. (unit: mm)
The dimension indicates the bearing width. (unit: mm)

Supplemental code - 1 (1)	
T	With female threaded mounting holes on the inner ring
No symbol	With counter-bored mounting holes on both inner ring and outer ring in the same direction.
D	With counter-bored mounting holes on both inner ring and outer ring in the opposite direction.

Note (1) Applicable only to CRBFV.

Supplemental code - 2	
No symbol	Open type
UU	Sealed Type
U	One Side Sealed Type (2)
UD	One side sealed in the opposite direction to counter bored mounting holes on outer ring

Note (2) For CRBFV···A, sealed at the side with counter bored mounting holes of outer ring.

Supplemental code - 3	
T1	T1 clearance
C1	C1 clearance
C2	C2 clearance

Classification symbol	
No symbol	Accuracy class 0
P6	Accuracy class 6
P5	Accuracy class 5
P4	Accuracy class 4
P2	Accuracy class 2
RP6	Rotation accuracy class 6
RP5	Rotation accuracy class 5
RP4	Rotation accuracy class 4
RP2	Rotation accuracy class 2

Rotational accuracy class ··· classes specifying accuracy standards for only rotational accuracy (radial runout / axial runout)

Accuracy

CRBHV Accuracy

Table 1 Tolerance and allowance of inner ring

unit: [μm]

d Nominal bore diameter mm		△*dmp* Deviation of mean bore diameter in a single plane								△*Bs*,⊿*Cs* Width of Inner/Outer Rings		*Kia* Radial runout					*Sia* Axial runout				
		Class 0 RP6 to RP2		P6		P5		P4, P2				Class 0	P6 RP6	P5 RP5	P4 RP4	P2 RP2	Class 0	P6 RP6	P5 RP5	P4 RP4	P2 RP2
Exceeding	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	Maximum					Maximum				
18	30	0	-10	0	-8	0	-6	0	-5	0	-75	13	8	4	3	2.5	13	8	4	3	2.5
30	50	0	-12	0	-10	0	-8	0	-6	0	-75	15	10	5	4	2.5	15	10	5	4	2.5
50	80	0	-15	0	-12	0	-9	0	-7	0	-75	20	10	5	4	2.5	20	10	5	4	2.5
80	120	0	-20	0	-15	0	-10	0	-8	0	-75	25	13	6	5	2.5	25	13	6	5	2.5
120	150	0	-25	0	-18	0	-13	0	-10	0	-100	30	18	8	6	2.5	30	18	8	6	2.5
150	180	0	-25	0	-18	0	-13	0	-10	0	-100	30	18	8	6	5	30	18	8	6	5
180	250	0	-30	0	-22	0	-15	0	-12	0	-100	40	20	10	8	5	40	20	10	8	5

Table 2 Tolerance and allowance of outer ring

unit: [μm]

D Nominal outside diameter mm		△*Dmp* Deviation of mean outside diameter in a single plane								*Kea* Radial runout					*Sea* Axial runout				
		Class 0 RP6 to RP2		P6		P5		P4, P2		Class 0	P6 RP6	P5 RP5	P4 RP4	P2 RP2	Class 0	P6 RP6	P5 RP5	P4 RP4	P2 RP2
Exceeding	Incl.	High	Low	High	Low	High	Low	High	Low	Maximum					Maximum				
30	50	0	-11	0	-9	0	-7	0	-6	20	10	7	5	2.5	20	10	7	5	2.5
50	80	0	-13	0	-11	0	-9	0	-7	25	13	8	5	4	25	13	8	5	4
80	120	0	-15	0	-13	0	-10	0	-8	35	18	10	6	5	35	18	10	6	5
120	150	0	-18	0	-15	0	-11	0	-9	40	20	11	7	5	40	20	11	7	5
150	180	0	-25	0	-18	0	-13	0	-10	45	23	13	8	5	45	23	13	8	5
180	250	0	-30	0	-20	0	-15	0	-11	50	25	15	10	7	50	25	15	10	7
250	315	0	-35	0	-25	0	-18	0	-13	60	30	18	11	7	60	30	18	11	7

CRBFV Accuracy

Table 3 Tolerance and allowance of inner ring

unit: [μm]

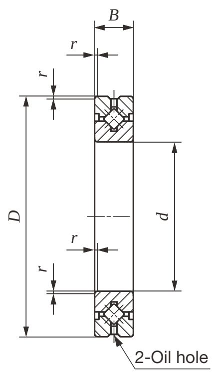
d Nominal bore diameter mm		⊿*dmp* Deviation of mean bore diameter in a single plane								⊿*Bs* Deviation of a single inner ring width		*Kia* Radial runout					*Sia* Axial runout				
		Class 0 RP6 to RP2		P6		P5		P4, P2				Class 0	P6 RP6	P5 RP5	P4 RP4	P2 RP2	Class 0	P6 RP6	P5 RP5	P4 RP4	P2 RP2
Exceeding	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	Maximum					Maximum				
30	35	0	-12	0	-10	0	-8	0	-6	0	-75	15	10	5	4	2.5	15	10	5	4	2.5
35	50	0	-12	0	-10	0	-8	0	-6	0	-75	20	10	5	4	2.5	20	10	5	4	2.5
50	65	0	-15	0	-12	0	-9	0	-7	0	-75	20	10	5	4	2.5	20	10	5	4	2.5
65	80	0	-15	0	-12	0	-9	0	-7	0	-75	25	13	6	5	2.5	25	13	6	5	2.5
80	100	0	-20	0	-15	0	-10	0	-8	0	-75	25	13	6	5	2.5	25	13	6	5	2.5
100	120	0	-20	0	-15	0	-10	0	-8	0	-75	30	18	8	6	2.5	30	18	8	6	2.5

Table 4 Tolerance and allowance of outer ring

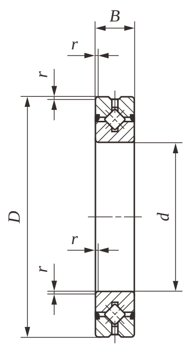
unit: [μm]

D Nominal outside diameter mm		⊿*Dmp* Deviation of mean outside diameter in a single plane								⊿*Cs* Deviation of a single outer ring width		*Kea* Radial runout					*Sea* Axial runout				
		Class 0 RP6 to RP2		P6		P5		P4, P2				Class 0	P6 RP6	P5 RP5	P4 RP4	P2 RP2	Class 0	P6 RP6	P5 RP5	P4 RP4	P2 RP2
Exceeding	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	Maximum					Maximum				
80	95	0	-15	0	-13	0	-10	0	-8	0	-75	25	13	8	5	4	25	13	8	5	4
95	120	0	-15	0	-13	0	-10	0	-8	0	-75	35	18	10	6	5	35	18	10	6	5
120	140	0	-18	0	-15	0	-11	0	-9	0	-75	35	18	10	6	5	35	18	10	6	5
140	150	0	-18	0	-15	0	-11	0	-9	0	-75	40	20	11	7	5	40	20	11	7	5
150	165	0	-25	0	-18	0	-13	0	-10	0	-75	40	20	11	7	5	40	20	11	7	5
165	180	0	-25	0	-18	0	-13	0	-10	0	-75	45	23	13	8	5	45	23	13	8	5
180	210	0	-30	0	-20	0	-15	0	-11	0	-75	45	23	13	8	5	45	23	13	8	5
210	240	0	-30	0	-20	0	-15	0	-11	0	-75	50	25	15	10	7	50	25	15	10	7

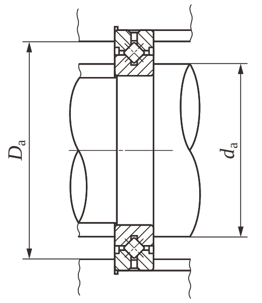
CRBHV Dimensions



CRBHV···A



CRBHV···A UU



Mounting Diagram

Shaft diameter mm	Identification number Open Type	Identification number Sealed Type	Mass (Ref.) kg	Boundary dimensions mm d	D	B	r_{min} (¹)	Mounting related dimensions mm d_a	D_a	Basic dynamic load rating C N	Basic static load rating C_0 N
30	**CRBHV 3010 A**	**CRBHV 3010 A UU**	0.12	30	55	10	0.3	36.5	48.5	7 600	8 370
35	**CRBHV 3510 A**	**CRBHV 3510 A UU**	0.13	35	60	10	0.3	41.5	53.5	7 900	9 130
40	**CRBHV 4010 A**	**CRBHV 4010 A UU**	0.15	40	65	10	0.3	46.5	58.5	8 610	10 600
45	**CRBHV 4510 A**	**CRBHV 4510 A UU**	0.16	45	70	10	0.3	51.5	63.5	8 860	11 300
50	**CRBHV 5013 A**	**CRBHV 5013 A UU**	0.29	50	80	13	0.6	56	74	17 300	20 900
60	**CRBHV 6013 A**	**CRBHV 6013 A UU**	0.33	60	90	13	0.6	66	84	18 800	24 300
70	**CRBHV 7013 A**	**CRBHV 7013 A UU**	0.38	70	100	13	0.6	76	94	20 100	27 700
80	**CRBHV 8016 A**	**CRBHV 8016 A UU**	0.74	80	120	16	0.6	88	112	32 100	43 400
90	**CRBHV 9016 A**	**CRBHV 9016 A UU**	0.81	90	130	16	0.6	98	122	33 100	46 800
100	**CRBHV 10020 A**	**CRBHV 10020 A UU**	1.45	100	150	20	0.6	110	140	50 900	72 200
110	**CRBHV 11020 A**	**CRBHV 11020 A UU**	1.56	110	160	20	0.6	120	150	52 400	77 400
120	**CRBHV 12025 A**	**CRBHV 12025 A UU**	2.62	120	180	25	1	132	168	73 400	108 000
130	**CRBHV 13025 A**	**CRBHV 13025 A UU**	2.82	130	190	25	1	142	178	75 900	115 000
140	**CRBHV 14025 A**	**CRBHV 14025 A UU**	2.96	140	200	25	1	152	188	81 900	130 000
150	**CRBHV 15025 A**	**CRBHV 15025 A UU**	3.16	150	210	25	1	162	198	84 300	138 000
200	**CRBHV 20025 A**	**CRBHV 20025 A UU**	4.0	200	260	25	1	212	248	92 300	169 000
250	**CRBHV 25025 A**	**CRBHV 25025 A UU**	4.97	250	310	25	1.5	262	298	102 000	207 000

Notes (¹) Minimum allowable single value of chamfer dimension r

▭ Starting December 2016

Lubrication

These bearings are generally lubricated with grease. Grease is supplied by applying a grease gun nozzle to various locations on the periphery of the clearance between the inner ring and the outer ring. Grease is packed into sealed types (UU) only. ALVANIA GREASE EP2 (SHOWA SHELL SEKIYU K.K) is prepacked as the lubrication grease.
For bearings without prepacked grease, supply grease or oil before use. Operating without lubrication will increase the wear on the rolling contact surfaces and lead to short bearing life. For the sealed type, be careful with pressure when applying grease so that the seals do not come off. When using a special grease, carefully examine the grease properties and contents such as base oil viscosity and extreme pressure additives. In this case, please contact IKO.

Oil groove

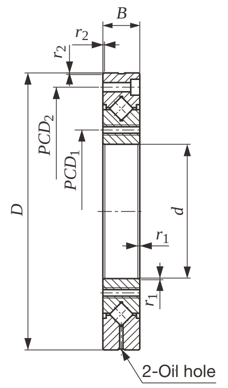
For Crossed Roller Bearings, oil holes and oil grooves can be provided on bearing rings on request. When an oil hole is required on the outer ring, attach "-OH" before the clearance symbol in the identification number. When an oil hole and an oil groove are required on the outer ring, attach "-OG" at the same place in the identification number.
For an oil hole on the inner ring, attach "/OH", and for an oil hole and an oil groove on the inner ring, attach "/OG", at the same place in the identification number. CRBHV and CRBFV have an oil groove and two oil holes on the outer ring as standard. The table below shows availability of oil holes for each bearing type.

Table 5 Oil Hole Availability

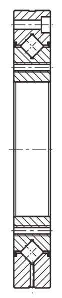
Model code	Oil hole code / nOH	/ nOG	-nOH	-nOG
CRBHV···A	○	○	-	-
CRBFV···A	-	-	-	-

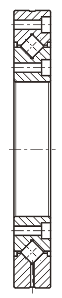
Remarks n denotes the number of oil holes not exceeding 4. For one oil hole, number is not indicated.
When preparing multiple oil holes, please contact IKO.

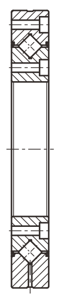
CRBFV Dimensions

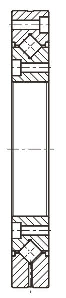


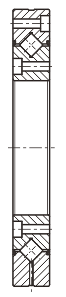
CRBFV···AT

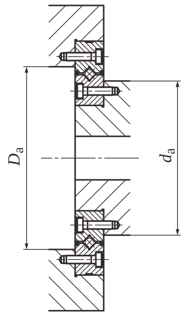

CRBFV···AT UU


CRBFV···A


CRBFV···A UU


CRBFV···AD


CRBFV···AD UU



Mounting Diagram

Shaft diameter mm	Identification number Open Type	Identification number Sealed Type	Mass (Ref.) kg	Boundary dimensions mm d	D	B	r_{1min} (¹)	r_{2min} (¹)	Mounting hole related mm PCD_1	Inner Ring Mounting Hole	PCD_2	Outer Ring Mounting Hole	Mounting related dimensions mm d_a	D_a	Basic dynamic load rating C N	Basic static load rating C_0 N
35	**CRBFV 3515 AT**	**CRBFV 3515 AT UU**	0.66	35	95	15	0.6	0.6	45	8-M4 through	83	8-ϕ4.5 through ϕ8 counter bore depth 4.4	56	74	17 300	20 900
55	**CRBFV 5515 AT**	**CRBFV 5515 AT UU**	0.96	55	120	15	0.6	0.6	65	8-M5 through	105	8-ϕ5.5 through ϕ9.5 counter bore depth 5.4	76	94	20 100	27 700
80	**CRBFV 8022 AT**	**CRBFV 8022 AT UU**	2.63	80	165	22	0.6	1	97	10-M5 through	148	10-ϕ5.5 through ϕ9.5 counter bore Depth 5.4	107	137	51 100	72 000
	CRBFV 8022 A	**CRBFV 8022 A UU**	2.60							10-ϕ5.5 through ϕ9.5 counter bore Depth 5.4						
	CRBFV 8022 AD	**CRBFV 8022 AD UU**														
90	**CRBFV 9025 AT**	**CRBFV 9025 AT UU**	4.83	90	210	25	1.5	1.5	112	12-M8 through	187	12-ϕ9 through ϕ14 counter bore Depth 12	132	168	73 400	108 000
	CRBFV 9025 A	**CRBFV 9025 A UU**	4.67							12-ϕ9 through ϕ14 counter bore Depth 12						
	CRBFV 9025 AD	**CRBFV 9025 AD UU**														
115	**CRBFV 11528 AT**	**CRBFV 11528 AT UU**	6.81	115	240	28	1.5	1.5	139	12-M8 through	217	12-ϕ9 through ϕ14 counter bore Depth 13.5	162	198	84 300	138 000
	CRBFV 11528 A	**CRBFV 11528 A UU**	6.63							12-ϕ9 through ϕ14 counter bore Depth 13.5						
	CRBFV 11528 AD	**CRBFV 11528 AD UU**														

Notes (¹) Minimum allowable single value of chamfer dimension r

▭ Starting December 2016

Allowable rotational speed

The allowable rotational speed of CRBHV / CRBFV is affected by mounting and operating conditions. The table below can be used as a guide for $d_m n$ under general operating conditions.

Table 6 Crossed Roller Bearings $d_m n$ Values (¹)

Lubrication / Model of bearing	Grease lubrication	Oil lubrication
Open type	75 000	150 000
Sealed Type	60 000	-

Notes (¹) $d_m n$ vale = d_m x n
Here, d_m: Mean value of bearing bore and outside diameters, mm
n: Rotational speed, min^{-1}

Operating Temperature Range

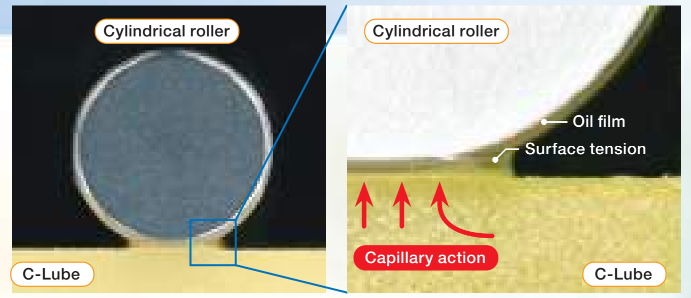
The permissible temperature range of CRBHV / CRBHFV is -20 - +110°C. However, for continuous use, keep the temperature at 100°C or below.

IKO Technology

High Quality, High Performance products manufactured by IKO
IKO Unique and Innovative Technology:

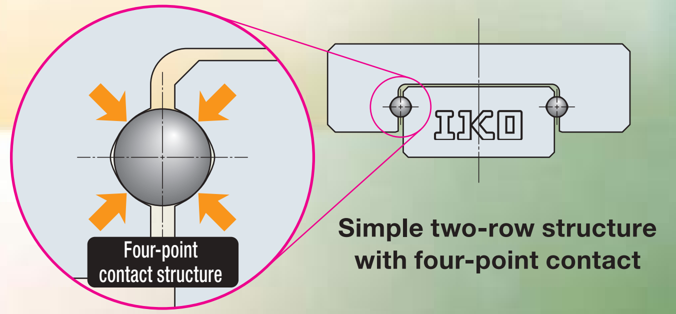
C-Lube Technology

"C-Lube", **IKO**'s innovative and unique lubrication system which utilizes the capillary action of the lubricant can significantly reduce the amount of lubricant required and provide effective maintenance free performance. All **IKO** "C-Lube" products impact the environmental minimally and guarantee superior reliability.



Compact Design

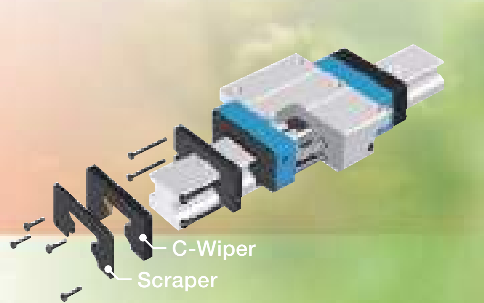
Simple structure and proprietary miniature technology result in assemblies with the smallest footprint. Even our extremely small products feature IKO's signature high quality and high performance.



Simple two-row structure with four-point contact

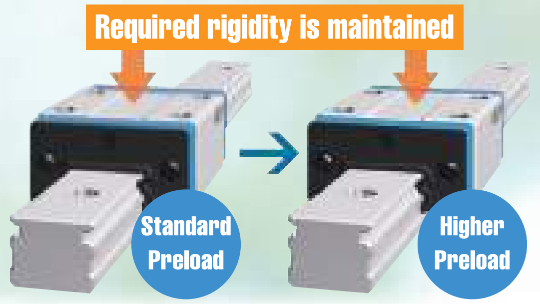
Contamination Protection

IKO offers many options for protection from contamination such as wipers, metallic scrapers, underseals and double seals.



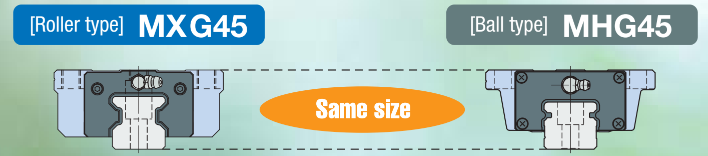
Interchangeability

IKO's unique high precision machining technology and strict dimensional management of slide units and track rails make most linear guides available as interchangeable units. Mixing and matching rails and slide units allow for easy installation and maintenance while maintaining rigidity and accuracy.



Roller Technology

In comparison with ball-type bearings, rollers experience minimal elastic deformation when under load. **IKO** linear rolling guides take advantage of these characteristics and combine smooth operation with high reliability, high rigidity, and high accuracy.

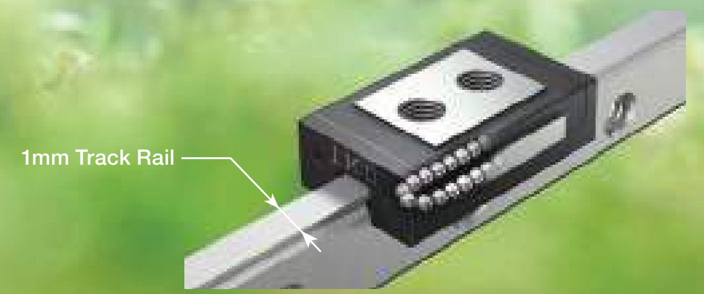


[Roller type] MXG45	[Ball type] MHG45
C = 124 000 N C_0 = 223 000 N	C = 95 200 N C_0 = 114 000 N

C = Basic dynamic load rating
C_0 = Basic static load rating

Miniature Linear Ways

IKO Micro linear way combines superior rigidity and accuracy in a miniature package. A wide variety of track rail widths (from as small as 1mm) are available for even the most demanding micro positioning mechanisms.



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Innovation, Know-how & Originality

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Oil Minimum

IKO Gentle to The Earth

Nippon Thompson Co., Ltd. is proud to be recognized as a leader in sustainability and environmental protection. We are committed to developing products that make our customer's machinery and equipment more reliable, thereby protecting the environment from unnecessary waste.

Innovative IKO products like "C-Lube" and our ISO14001 certification can be seen as prime examples of our commitment to minimize our impact on the global environment.

IKO Clean Lubrication

C-Lube

Friendly to Maintenance

Gentle to the Earth

Linear Motion Rolling Guide Series

A broad line-up of Linear Motion Rolling Guides, ranging from 1mm to 85mm in rail size.


ML / LWL
Miniature Type C-Lube Linear Way


MX / LRX
C-Lube Linear Roller Way


MAG / LSAG
C-Lube Linear Ball Spline


CRW(G) / CRWU(G)
Crossed Roller Way


CRWU…R(S)
Crossed Roller Way Unit


CRWM
Module Type Crossed Roller Way


ME / LWE MH / LWH
C-Lube Linear Way


MV
Compact C-Lube Linear Way with High Load Capacity


MUL / LWU
C-Lube Linear Way with U-Shaped Track Rail


BWU
High Rigidity Precision Ball Slide


BSP / BSPG
Precision Linear Slide


STSI
Miniature Stroke Rotary Bushing

Precision Positioning Table Series

Integrating precision movement with linear motors and encoders to ensure high accuracy positioning.


TE
Low Profile Positioning Table

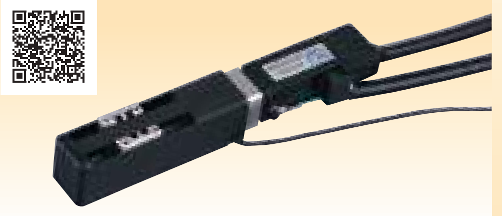

TU
Standard Precision Positioning Table


NT
Ultra-compact Linear Motor Table


LT
Long Stroke Linear Motor Table


TSL…M
Long Stroke Precision Positioning Table


SA…DE
Linear Motor Rotary Table


TM
Miniature Table


TX…M
High Rigidity Precision Positioning Table


TC…E
Cleanroom Precision Positioning Table


CTLH
High Rigidity X-Y Stage


TZ
Precision Elevating Table


Ball Screws
High-Performance Precision Ball Screw

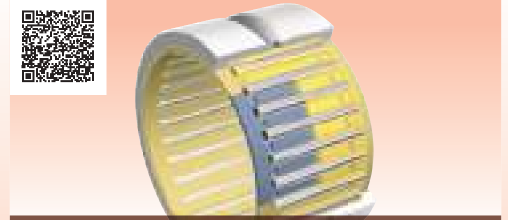
Needle Roller Bearing Series

Needle roller bearings are small and lightweight, with high load capacities that support rotational axes.


CF…WB…/SG
C-Lube Cam Follower


CF / CFKR
Standard Cam Follower


CRBF
Crossed Roller Bearings with Mounting Holes


TAF…/SG
C-Lube Bearings


NART
Non-separable Roller Followers


KT
Needle Roller Cages


POS / PHS
Rod End / Pilloball


GE / SBB
Spherical Bushing


CRB / CRBH / CRBS / CRBT
Cross Roller Bearing


TA / BR / RNA
Machined and Shell-type Needle Bearing


NTB
Thrust Needle Roller Bearings


NAX
Combined Type Needle Roller Bearings

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IKO

New

Precision Positioning Table

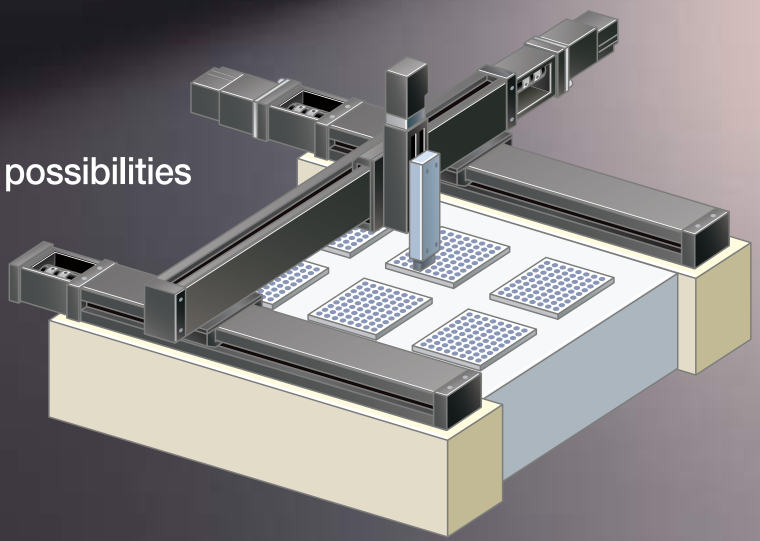
TE···B

Now available with a longer stroke!

NIPPON THOMPSON CO., LTD.

Longer stroke products have been added to the TE series lineup of compact and lightweight precision positioning tables.

Longer stroke capability expands the possibilities for machine design, making the long stroke TE series ideal for devices such as pick and place machines.



Equipment used	Work piece transporting device
Location used	X-axis and Y-axis

Precision Positioning Table

TE···B

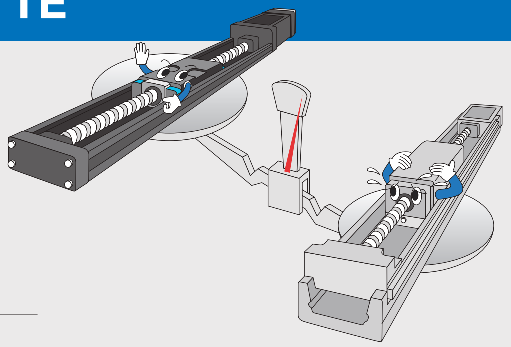
Variation

Model and size	Bed width	Stroke length (bed length)						NEW
TE50B	50	60 (150)	110 (200)	160 (250)	210 (300)	310 (400)	410 (500)	
TE60B	60	50 (150)	100 (200)	200 (300)	300 (400)	400 (500)	500 (600)	600 (700)
TE86B	86	200 (340)	300 (440)	400 (540)	500 (640)	600 (740)	700 (840)	800 (940)

Features of Precision Positioning Table TE

1. Light Weight / Low Profile

Far lighter and with a lower profile than IKO TU series Precision Positioning Tables, the TE series uses a high strength aluminum alloy for its main components with a slide table assembled inside a U-shaped bed. The result: a light weight, compact, precision positioning table.

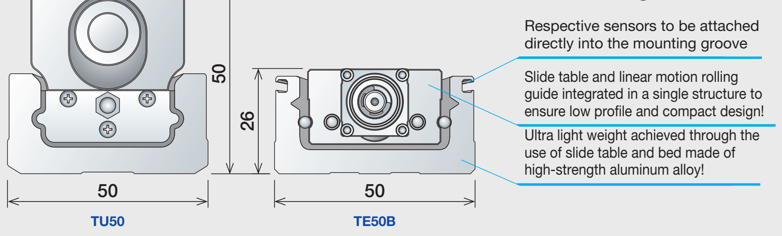


- Mass

unit: kg

Bed width (mm)	TU	TE···B
50	1.8	0.52
60	3.3	1.0
86	10.9	3.7

The value shows the mass of the entire table with 1 standard table.



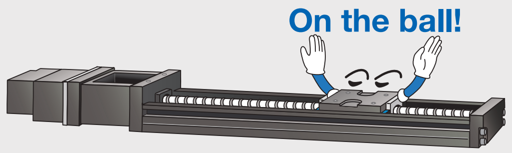
Respective sensors to be attached directly into the mounting groove

Slide table and linear motion rolling guide integrated in a single structure to ensure low profile and compact design!

Ultra light weight achieved through the use of slide table and bed made of high-strength aluminum alloy!

2. High Accuracy Positioning

IKO's unique linear motion rolling guide technology utilizes a precision ball screw which enables higher accuracy positioning. For long stroke products, a high lead ball screw is used to achieve high speed and high accuracy positioning in a longer stroke.



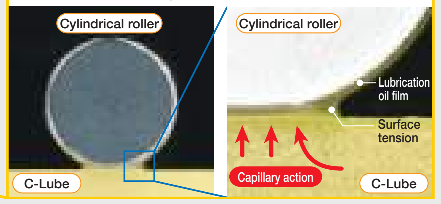
3. Long-Term, Maintenance-Free Operation

With built-in IKO C-Lube technology, long term maintenance free operation is possible. With C-Lube, lubrication is supplied to the surfaces of the rolling elements, reducing the need for lubrication maintenance and improving machine reliability.

C-Lube integrated

Lubrication oil is directly supplied to surfaces of the rolling elements

The surface of C-Lube is always covered with the lubrication oil. Lubrication oil is continuously supplied to the surface of the rolling elements by surface tension in the contact of C-Lube surface and rolling elements.
On the C-Lube surface with which the rolling elements make contact, new lubrication oil is always supplied from the other sections.



Identification Number and Specification

Example of Identification Number

1	2	1	3	4		5	6	7	8	9
TE	50	B	F	300	/	AT001	8	S	C	3

1 Model

TE…B: Precision Positioning Table TE

2 Size

Size indicates bed width.
Select a size from the list in Table 1.

3 Shape of slide table

S: Standard table
F: Flange type standard table

4 Bed length

Select a bed length from the list in Table 1.

Table 1 Sizes and bed lengths unit: mm

Model and size	Bed width	Bed length
TE50B	50	150, 200, 250, 300, 400, 500
TE60B	60	150, 200, 300, 400, 500, 600, 700
TE86B	86	340, 440, 540, 640, 740, 840, 940

Remark: For stroke length, please see the dimension tables shown on page 12 and on.

5 Designation of motor folding back specification/motor attachment

AT000 : Motor inline specification without motor attachment
AT001~AT011 : Motor inline specification with motor attachment
AR000 : Motor folding back specification without motor attachment
AR001~AR008 : Motor folding back specification with motor attachment

To specify the motor attachment, select it from the lists in Table 3.1 and Table 3.2.

- Please specify motor attachment applicable to motor for use.
- If motor inline specification with motor attachment is specified, the main body is shipped with the coupling indicated in Table 4 mounted. However, the final position adjustment should be made by customer since it is only temporarily fixed. For a product without motor attachment (AT000), no coupling is attached.
- If motor folding back specification with motor attachment is specified, housing applicable to the specified motor, pulley (on motor side and ball screw side), cover, motor bracket, belt and bolts necessary for assembly are supplied. Motor mounting bolts should be prepared by customer.

6 Ball screw lead

Select from among ball screw leads applicable to the sizes and bed lengths shown in Table 2.

Table 2 Application of ball screw lead

Model and size	Bed length mm	Ball screw lead mm				
		4	5	8	10	20
TE50B	300 or less	○	-	○	-	-
	400 or more	-	-	○	-	-
TE60B	600 or less	-	○	-	○	-
	700	-	-	-	-	○
TE86B	All	-	-	-	○	○

7 Number of slide tables

S: One unit
C: Two units

8 Cover specification

0: Without cover
C: With bridge cover (applied to TE…BF)

9 Sensor specification

0: Without sensor
2: Two units of sensor mounted (limit)
3: Three units of sensor mounted (limit, pre-origin)
4: Four units of sensor mounted (limit, pre-origin, origin)
5: Two sensors attached (limit)
6: Three sensors attached (limit, pre-origin)
7: Four sensors attached (limit, pre-origin, origin)

If sensor mounting (symbol 2, 3, or 4) is specified, the sensor is mounted into the mounting groove on the side of the bed, and two detecting plates are mounted on the slide table.
If sensor attachment (symbol 5, 6, or 7) is specified, the specified number of sensors are attached, including mounting screws for sensors, nuts, two detecting plates, and mounting screws for the detecting plates.

Identification Number and Specification

Table 3.1 Application of motor attachment (motor inline specification)

Motor to be used					Flange size mm	Motor attachment		
Type	Manufacturer	Series	Model	Rated output W		TE50B	TE60B	TE86B
AC servo motor	YASKAWA ELECTRIC CORPORATION	Σ-V	SGMJV-A5A	50	□40	AT001	AT002	-
			SGMAV-A5A			AT001	AT002	-
			SGMJV-01A	100		-	AT002	-
			SGMAV-01A			-	AT002	-
			SGMJV-02A	200	□60	-	-	AT003
			SGMAV-02A			-	-	AT003
	Mitsubishi Electric Corporation	J3, J4	HF-MP053, HG-MR053	50	□40	AT001	AT002	-
			HF-KP053, HG-KR053			AT001	AT002	-
			HF-MP13, HG-MR13	100		-	AT002	-
			HF-KP13, HG-KR13			-	AT002	-
			HF-MP23, HG-MR23	200	□60	-	-	AT003
			HF-KP23, HG-KR23			-	-	AT003
	Panasonic Corporation	MINAS A5	MSMD5A	50	□38	AT004	AT005	-
			MSME5A			AT004	AT005	-
			MSMD01	100		-	AT005	-
			MSME01			-	AT005	-
			MSMD02	200	□60	-	-	AT006
			MSME02			-	-	AT006
	Hitachi Industrial Equipment Systems Co., Ltd	AD	ADMA-R5L	50	□40	AT001	AT002	-
			ADMA-01L	100		-	AT002	-
			ADMA-02L	200	□60	-	-	AT003
Stepper motor	ORIENTAL MOTOR Co., Ltd.	α step	AR46		□42	AT007	-	-
			AR66		□60	-	-	AT008
			AR69		□60	-	-	AT008
		RK CRK	RK54 · CRK54		□42	AT009	-	-
			RK56 · CRK56 (1)		□60	-	AT010	AT011

Note (1) Applicable to the outer diameter ϕ8 of motor output shaft.
Remark: For detailed motor specifications, please see respective motor manufacturer's catalog.

Table 3.2 Application of NEMA motor attachment (motor inline specification)

Motor to be used					Flange size inch	Motor attachment		
Type	Manufacturer	Series	Model	Rated output W		TE50B	TE60B	TE86B
AC servo motor	Allen-Bradley	TLY(metric)	TLY-A110(AA type)	41	□40	AT001	AT002	-
			TLY-A120(AA type)	86	□40	AT001	AT002	-
			TLY-A130(AA type)	140	□40	AT001	AT002	-
			TLY-A220(AA type)	350	□60	-	-	AT003 (3)
			TLY-A230(AA type)	440	□60	-	-	AT003 (3)
		TLY(NEMA)	TLY-A120(AN type)	86	□42	TAE9043-ATE137 (1)	-	-
			TLY-A130(AN type)	140	□42	TAE9043-ATE137 (1)	-	-
			TLY-A220(AN type)	350	□56.4	-	-	TAE9017-ATE135 (1)
			TLY-A230(AN type)	440	□56.4	-	-	TAE9017-ATE135 (1)
			TLY-A2530(AN type)	690	□86	-	-	TAE9056-ATE134 (1)
			TLY-A2540(AN type)	860	□86	-	-	TAE9056-ATE134 (1)
Servo or Stepper	NEMA17C					TAE9043-ATE110 (1)(2)	-	-
	NEMA23D					TAE9017-ATE096 (1)(2)	TAE9017-ATE096 (1)(2)	-
							TAE9017-ATE097 (1)(2)	-
	NEMA34D					-	-	TAE9056-ATE095 (1)(2)

Note (1) The TAE part numbers are the part number of motor attachment component sold separately. In the TE part number, please choose motor attachment code AT000. No Coupling is included. It is required to consider customer's operation patterns for these motor attachment.
(2) Please confirm the length and the diameter of the motor shaft etc., and check the usability of the motor attachment with your motor beforehand.
(3) It is required to change the delivered coupling to XGS-30C-8×12 which is for the 12mm motor shaft by customer.
Remark: For detailed motor specifications, please see respective motor manufacturer's catalog.

Identification Number and Specification

Table 3.3 Application of motor attachment (motor folding back specification)

Motor to be used					Flange size mm	Motor attachment		
Type	Manufacturer	Series	Model	Rated output W		TE50B	TE60B	TE86B
AC servo motor	YASKAWA ELECTRIC CORPORATION	Σ-V	SGMJV-A5A	50	□40	AR001	AR002	-
			SGMAV-A5A			AR001	AR002	-
			SGMJV-01A	100		-	AR002	-
			SGMAV-01A			-	AR002	-
			SGMJV-02A	200	□60	-	-	AR003
			SGMAV-02A			-	-	AR003
	Mitsubishi Electric Corporation	J3, J4	HF-MP053, HG-MR053	50	□40	AR001	AR002	-
			HF-KP053, HG-KR053			AR001	AR002	-
			HF-MP13, HG-MR13	100		-	AR002	-
			HF-KP13, HG-KR13			-	AR002	-
			HF-MP23, HG-MR23	200	□60	-	-	AR003
			HF-KP23, HG-KR23			-	-	AR003
	Panasonic Corporation	MINAS A5	MSMD5A	50	□38	AR004	AR005	-
			MSME5A			AR004	AR005	-
			MSMD01	100		-	AR005	-
			MSME01			-	AR005	-
			MSMD02	200	□60	-	-	AR006
			MSME02			-	-	AR006
	Hitachi Industrial Equipment Systems Co., Ltd	AD	ADMA-R5L	50	□40	AR001	AR002	-
			ADMA-01L	100		-	AR002	-
			ADMA-02L	200	□60	-	-	AR003
Stepper motor	ORIENTAL MOTOR Co., Ltd.	α step	AR46		□42	AR007	-	-
		RK CRK	RK54 · CRK54		□42	AR008	-	-

Remark: For detailed motor specifications, please see respective motor manufacturer's catalog.

Table 4 Coupling models (motor inline specification)

Motor attachment	Coupling models	Manufacturer	Coupling inertia J_C $\times 10^{-5}$kg・m^2
AT001	XGS-19C- 5× 8	Nabeya Bi-tech Kaisha	0.062
AT002	XGS-19C- 5× 8	Nabeya Bi-tech Kaisha	0.062
AT003	XGS-30C- 8×14	Nabeya Bi-tech Kaisha	0.55
AT004	XGS-19C- 5× 8	Nabeya Bi-tech Kaisha	0.062
AT005	XGS-19C- 5× 8	Nabeya Bi-tech Kaisha	0.062
AT006	XGS-30C- 8×11	Nabeya Bi-tech Kaisha	0.55
AT007	XGS-19C- 5× 6	Nabeya Bi-tech Kaisha	0.062
AT008	XGS-30C- 8×10	Nabeya Bi-tech Kaisha	0.55
AT009	XGS-19C- 5× 5	Nabeya Bi-tech Kaisha	0.062
AT010	XGS-19C- 5× 8	Nabeya Bi-tech Kaisha	0.062
AT011	XGS-30C- 8× 8	Nabeya Bi-tech Kaisha	0.55
TAE9043-ATE137	XGS-19C- 5× 6.35	Nabeya Bi-tech Kaisha	0.062
TAE9017-ATE135	XGS-30C- 8×12.7	Nabeya Bi-tech Kaisha	0.55
TAE9056-ATE134	XGS-34C- 8×15.875	Nabeya Bi-tech Kaisha	1.0

Remark: For detailed coupling specification, please see the manufacturer's catalog.

Specifications

Table 5 Accuracy

unit: mm

Model and size	Bed length	Positioning repeatability	Positioning accuracy (1)	Parallelism in table motion B	Backlash (1)
TE50B	150	±0.002 (±0.020)	0.035	0.008	0.005
	200				
	250		0.040		
	300				
	400		0.045	0.010	
	500			0.012	
TE60B	150	±0.002 (±0.020)	0.035	0.008	0.005
	200				
	300		0.040		
	400		0.045		
	500			0.010	
	600		0.050		
	700		0.060	0.012	
TE86B	340	±0.002 (±0.020)	0.040	0.008	0.005
	440		0.045	0.010	
	540		0.050		
	640			0.012	
	740		0.055		
	840		0.065	0.014	
	940			0.016	

Note (1) This does not apply to tables of motor folding back specification.

Remarks The values in ( ) are reference values provided that the timing belt tension is properly adjusted in motor folding back specification table.

Specifications

Table 6 Maximum speed

Motor type	Model and size	Bed length mm	Maximum speed mm/s				
			Lead 4mm	Lead 5mm	Lead 8mm	Lead 10mm	Lead 20mm
AC servomotor	TE50B	300 or less	400	-	800	-	-
		400	-	-	800	-	-
		500	-	-	620	-	-
	TE60B	500 or less	-	500	-	1 000	-
		600	-	350	-	710	-
		700	-	-	-	-	960
	TE86B	540 or less	-	-	-	930	1 860
		640	-	-	-	830	1 630
		740	-	-	-	590	1 170
		840	-	-	-	440	880
		940	-	-	-	340	690
Stepper motor	TE50B	300 or less	120	-	240	-	-
		400	-	-	240	-	-
		500	-	-	240	-	-
	TE60B	600 or less	-	150	-	300	-
		700	-	-	-	-	600
	TE86B	940 or less	-	-	-	300	600

Remark: To measure the practical maximum speed, it is required to consider operation patterns based on the motor to be used and load conditions.

Table 7 Allowable moment

Model and size	Allowable moment N·m		
	T_0	T_X	T_Y
TE50B	9.8		
TE60B	16.7		
TE86B	49.0		

Remark The value is for one slide table.

Table 8 Maximum carrying mass

Model and size	Ball screw lead mm	Maximum carrying mass kg	
		Horizontal	Vertical
TE50B	4	12	11
	8	12	7
TE60B	5	17	13
	10	17	8
	20	17	7
TE86B	10	36	18
	20	29	10

Remark The value is for one flange type standard table.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Specifications

Table 9 Table inertia and starting torque

Model and size	Bed length mm	Table inertia J_T (²) ×10⁻⁵kg·m²										Starting torque T_S(¹) N·m
		Standard table					Flange type standard table					
		Lead					Lead					
		4mm	5mm	8mm	10mm	20mm	4mm	5mm	8mm	10mm	20mm	
TE50B	150	0.057	-	0.071	-	-	0.060	-	0.084	-	-	0.03
	200	0.069	-	0.083	-	-	0.072	-	0.096	-	-	
	250	0.085	-	0.099	-	-	0.088	-	0.112	-	-	
	300	0.097	-	0.111	-	-	0.100	-	0.124	-	-	
	400	-	-	0.139	-	-	-	-	0.152	-	-	
	500	-	-	0.167	-	-	-	-	0.180	-	-	
TE60B	150	-	0.13	-	0.17	-	-	0.14	-	0.20	-	0.03
	200	-	0.19	-	0.23	-	-	0.20	-	0.26	-	
	300	-	0.26	-	0.30	-	-	0.27	-	0.33	-	
	400	-	0.33	-	0.36	-	-	0.34	-	0.40	-	
	500	-	0.40	-	0.44	-	-	0.41	-	0.47	-	
	600	-	0.47	-	0.51	-	-	0.48	-	0.54	-	
	700	-	-	-	-	0.76	-	-	-	-	0.88	
TE86B	340	-	-	-	0.73	1.19	-	-	-	0.81	1.50	0.05
	440	-	-	-	0.88	1.35	-	-	-	0.95	1.64	
	540	-	-	-	1.03	1.50	-	-	-	1.11	1.80	
	640	-	-	-	1.18	1.64	-	-	-	1.25	1.95	
	740	-	-	-	1.33	1.79	-	-	-	1.41	2.10	
	840	-	-	-	1.48	1.94	-	-	-	1.56	2.25	
	940	-	-	-	1.63	2.10	-	-	-	1.71	2.40	

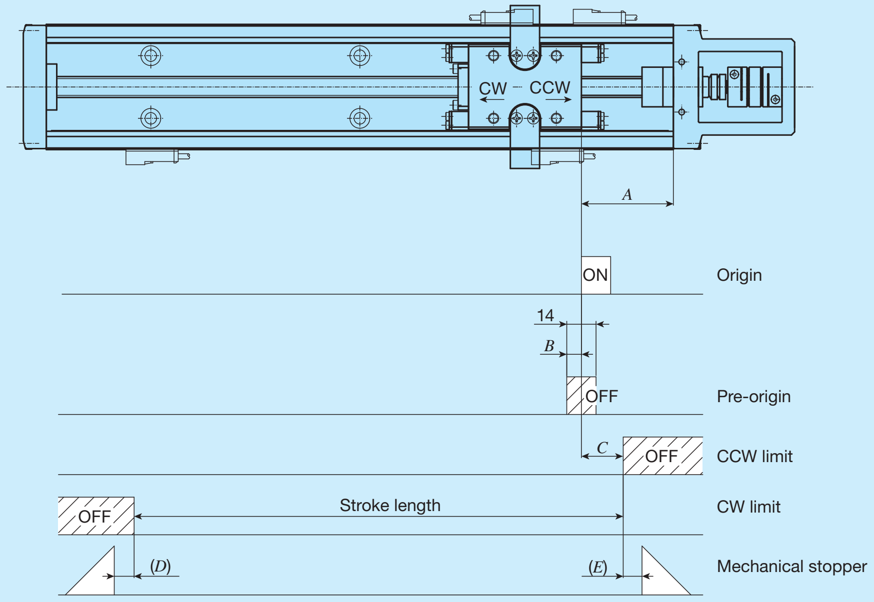
Note (¹) When two units of slide table are used, it is about 1.5 times as long as that of one unit, and when table of motor folding back specification is used, it is about twice.

(²) For motor folding back specification, please add the following value to the value in the table.
TE50B:0.17×10⁻⁵kg·m², TE60B:0.39×10⁻⁵kg·m², TE86B:0.86×10⁻⁵kg·m²

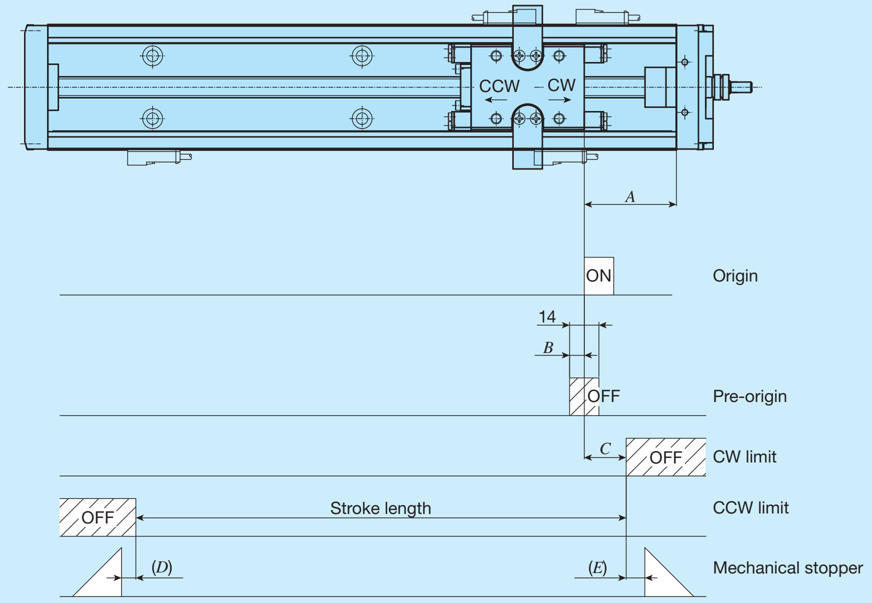
Sensor specification

Table 10 Sensor timing chart

Motor inline specification



Motor folding back specification



unit: mm

Model and size	Ball screw lead	*A*	*B*	*C*	*D*(¹)	*E*
TE50B	4	33	2	10	6 (9)	5
	8		6			
TE60B	5	44	3	20	9.5(8.5)	9
	10		7			
	20		12			
TE86B	10	50	7	20	11 (11)	10
	20		12			

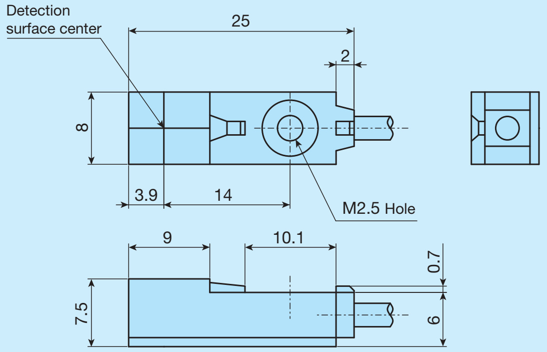
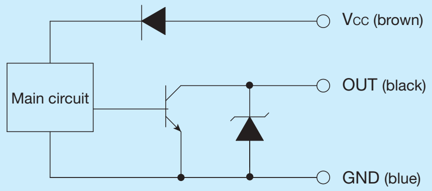
Note (¹) The value in ( ) represents dimensions for two slide tables.

Remarks
1. Mounting a sensor is specified using the corresponding identification number.
2. For the specifications of respective sensors, please see the sensor specifications in Table 11.
3. For the motor folding back specification, CW and CCW will invert.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Sensor specification

Table 11 Sensor specification

Item		Target models: TE···B
Manufacturer		Azbil Corporation
Model (¹)	Pre-origin	APM-D3B1-S APM-D3B1F-S
	CW limit	APM-D3B1-S
	CCW limit	
	Origin	APM-D3A1-S
Shape mm		
Power supply voltage		DC12~24V ±10%
Current consumption		10mA or less
Output		NPN open collector · Maximum input current : 30mA or less (resistance load) · Applied voltage : 26.4VDC or less · Residual voltage : 1V or less at input current of 30mA
Output operation	Pre-origin	OFF in proximity
	Limit	OFF in proximity
	Origin	ON in proximity
Operation indication	Pre-origin	Orange LED (OFF upon detection)
	Limit	Orange LED (OFF upon detection)
	Origin	Orange LED (ON upon detection)
Circuit diagram		

Remarks 1. Wire the sensor cords on your own.
2. Lead runs off by at least 200mm from the table end. Actual length varies depending on stroke length.

Note (¹) Model numbers apply to manufacturer standard products. Depending on the total length of the relevant product, the cable length may be different from that of standard products.

Mounting

■ Machining precision of mounting surface

As the accuracy and performance of the table are effective by the precision of the mounting surface of the stand, the parallelism of the stand mounting surface should be 30 μm or less as a guideline for general conditions. However, it must be in accordance with operating conditions such as required motion performance and positioning accuracy. Be sure to remove dirt and harmful protrusions on the mounting surface.

■ Tightening torque for fixing screw

Typical tightening torque for fixing the Precision Positioning Table is indicated in the following table. If sudden acceleration / deceleration occurs frequently or moment is applied, it is recommended to tighten them to 1.3 times higher torque than that indicated in the table. In addition, when high accuracy is required with no vibration and shock, it is recommended to tighten the screws to torque smaller than that indicated in the table and use adhesive agent to prevent looseness of screws.

Screw tightening torque unit: N·m

Bolt size	Female thread component		
	Steel	Aluminum alloy	
			Screw insert
M4 ×0.7	4.0	About 60% of steel value	About 80% of steel value
M5 ×0.8	7.9		
M6 ×1	13.3		

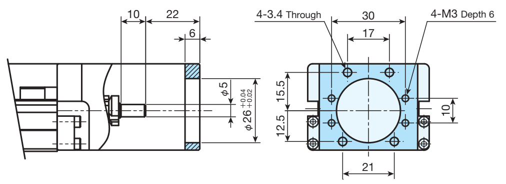
Dimensions of Motor Attachment

■ Motor inline specification

Remark: Motor attachment for NEMA, please see pages Ⅲ-31 or later of the general catalog.

TE50B

AT000
(without attachment)



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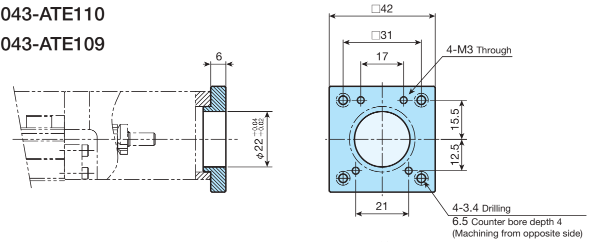
TAE9043-ATE109



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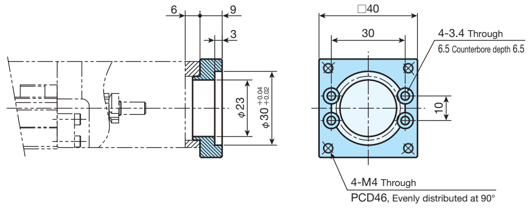

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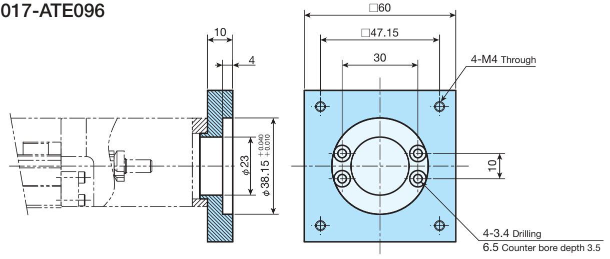

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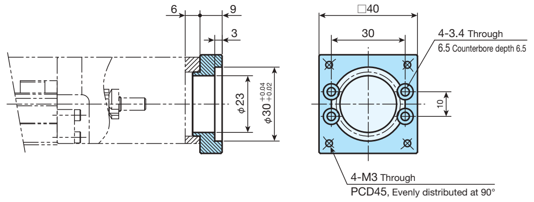

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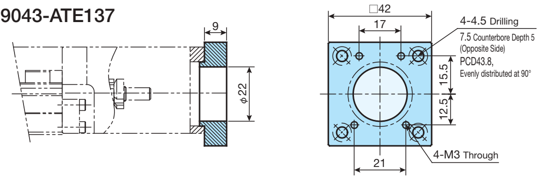

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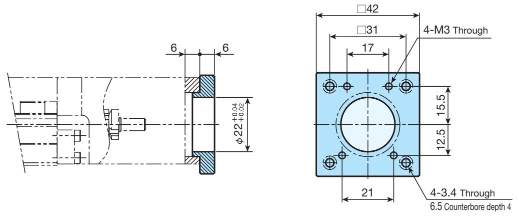
AT009

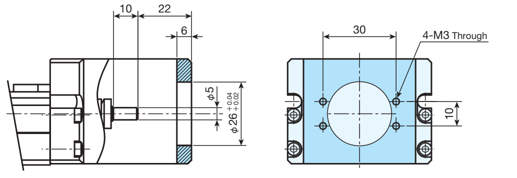


1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Dimensions of Motor Attachment

TE60B

AT000
(without
attachment)



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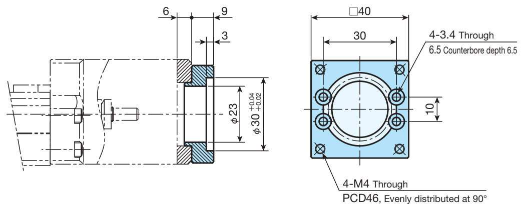

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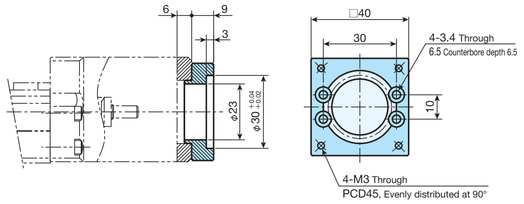

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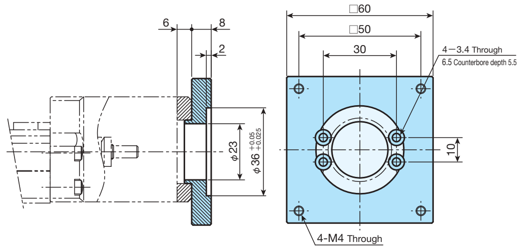

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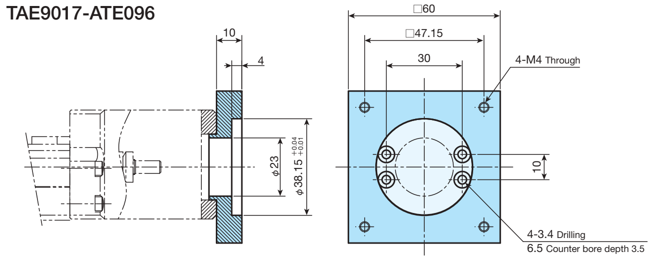

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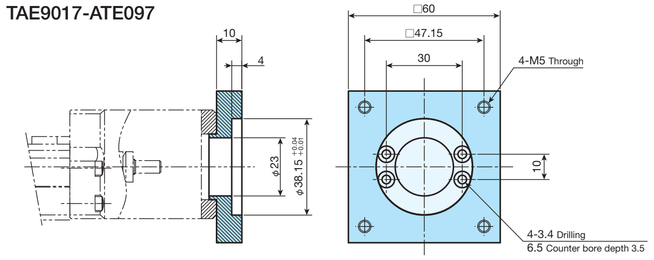
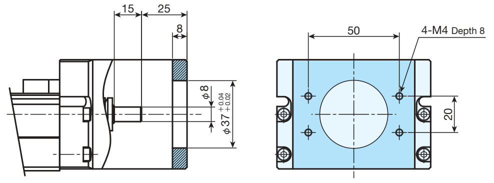


Dimensions of Motor Attachment

TE86B

AT000
(without
attachment)



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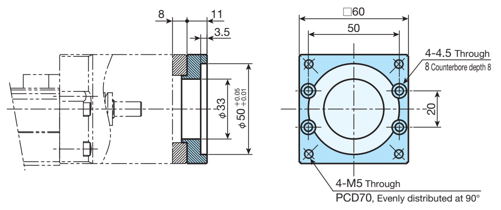

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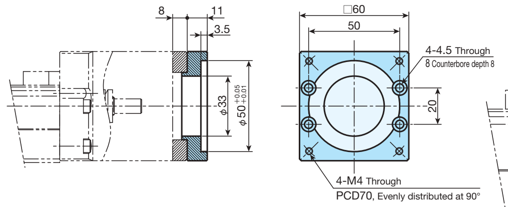

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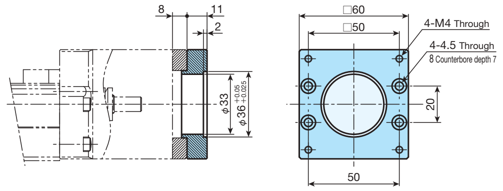
AT011



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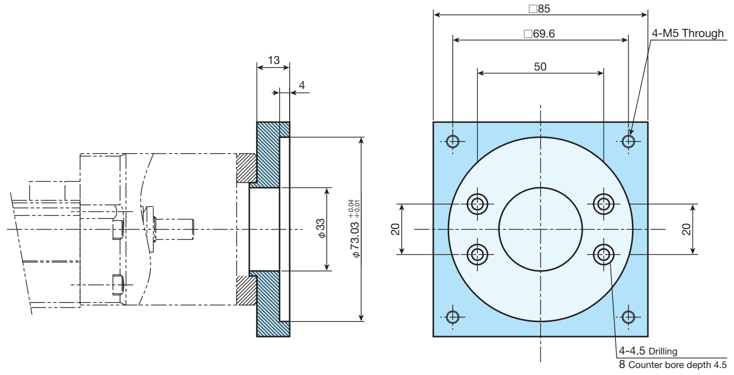

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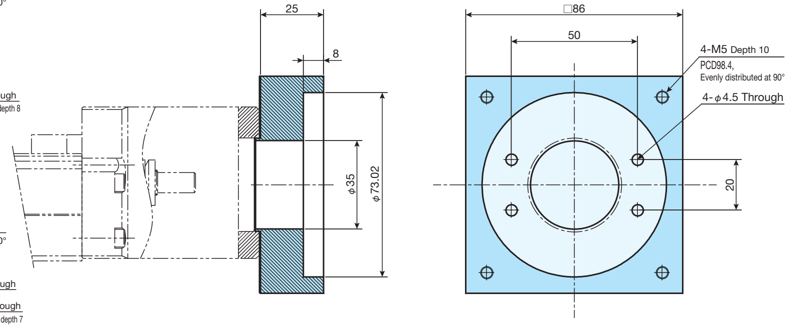

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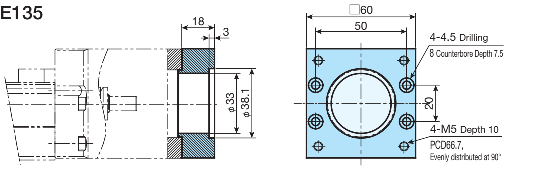


1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

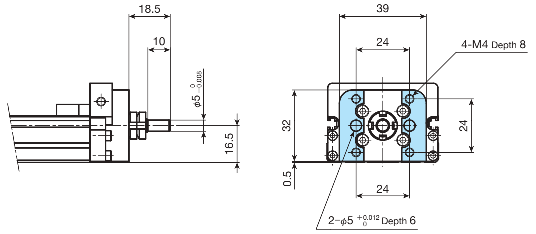
Dimensions of Motor Attachment

Motor folding back specification

TE50B

AR000

(without
attachment)



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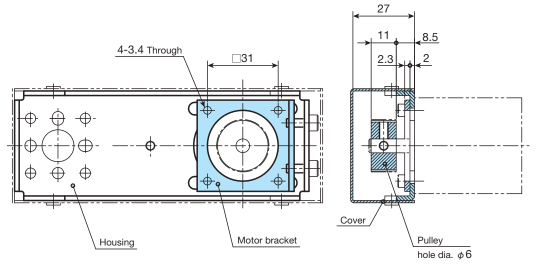

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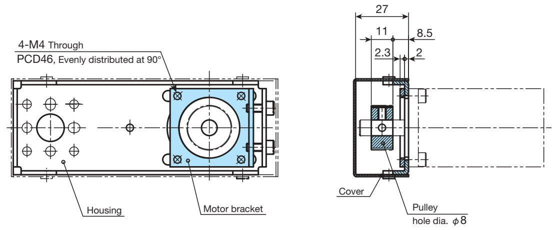

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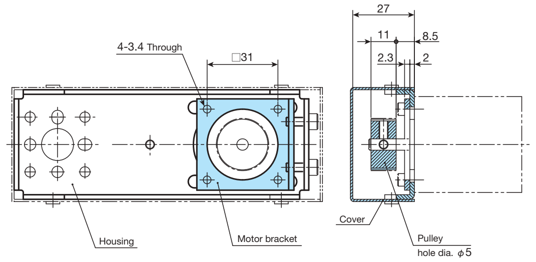

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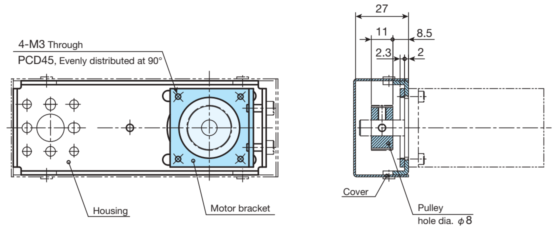
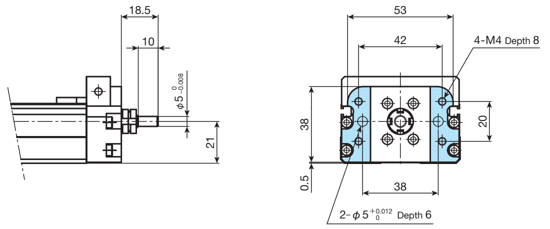


Dimensions of Motor Attachment

TE60B

AR000

(without
attachment)



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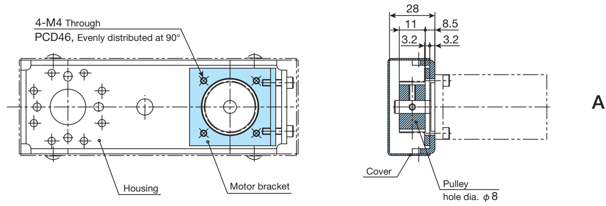

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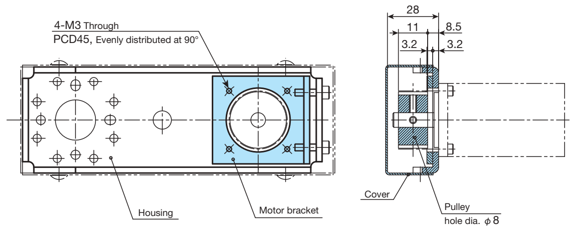
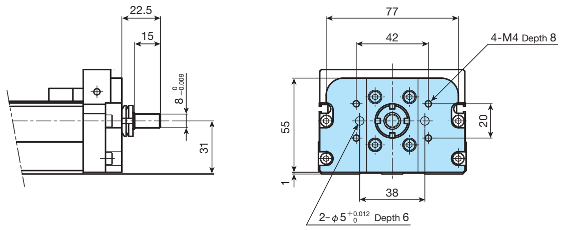


TE86B

AR000

(without
attachment)



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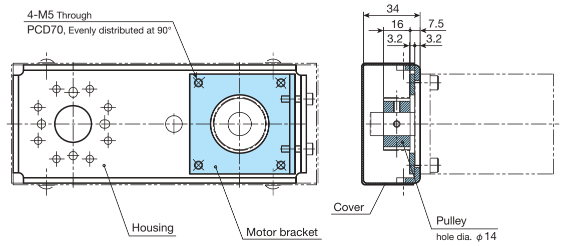

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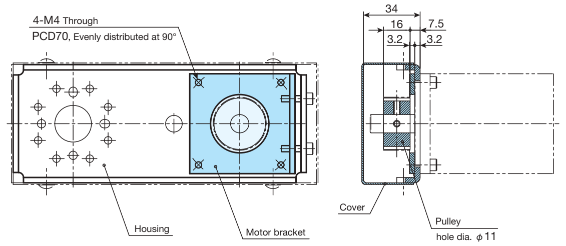
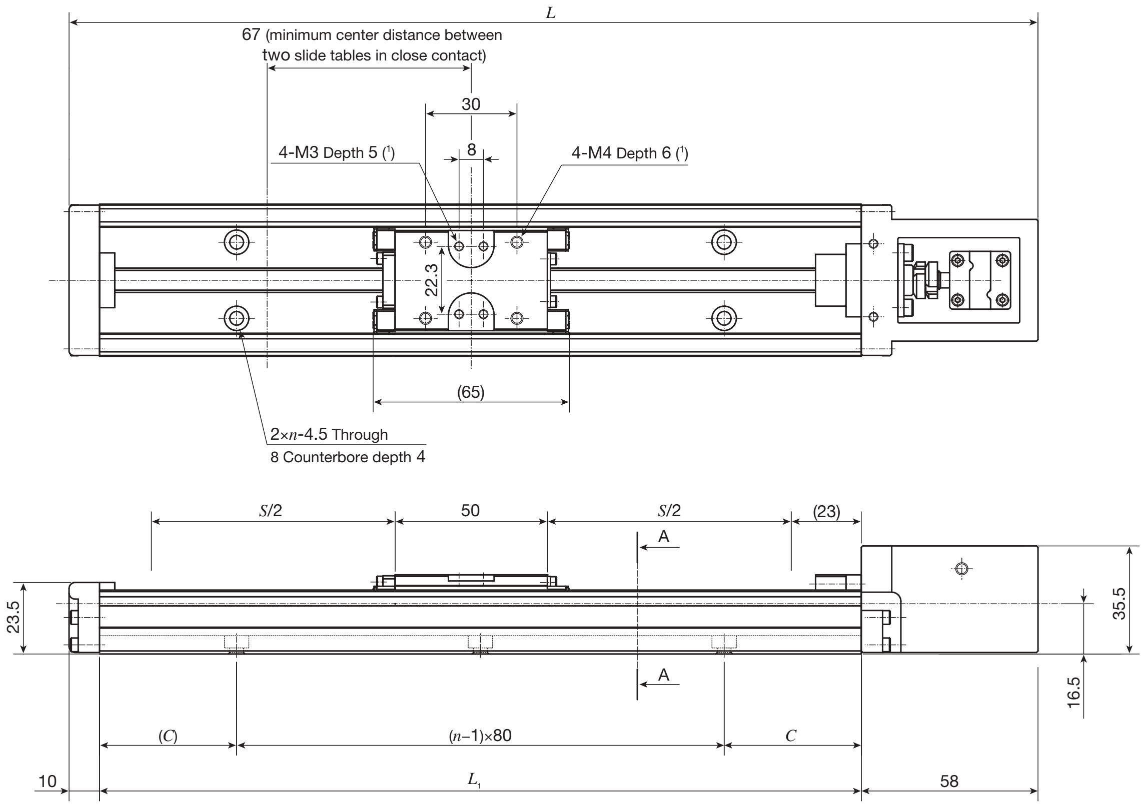
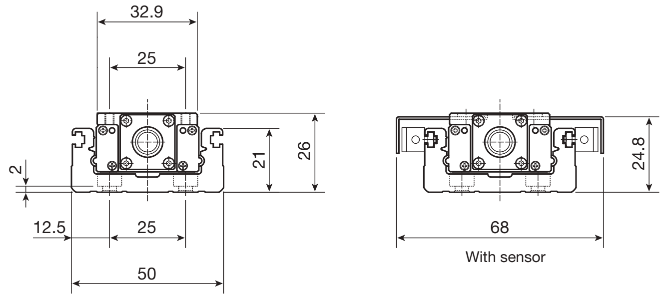


1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO Precision Positioning Table TE

TE50BS (Motor inline specification)





A-A Sectional dimension

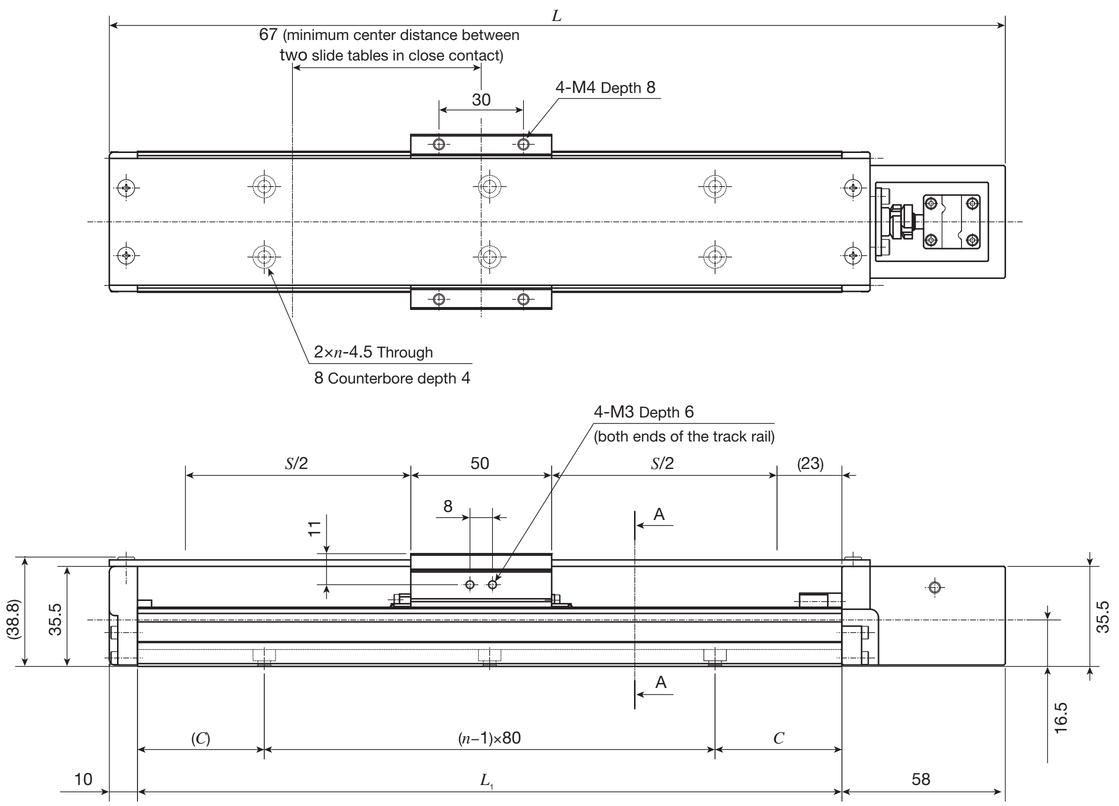
unit: mm

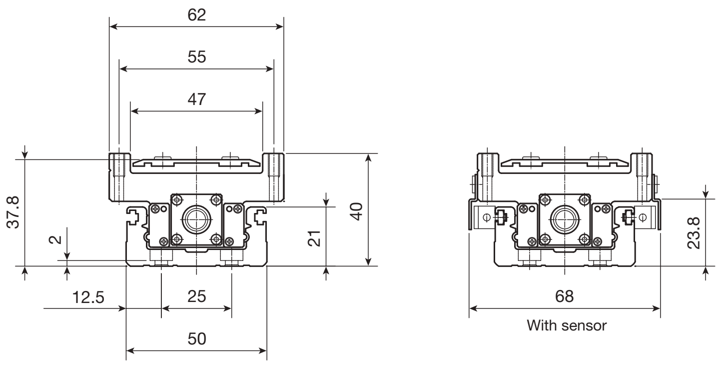
Bed length	Overall length	Stroke length	Mounting holes of bed		Mass (Ref.)
L_1	L	S(2)	C	n	kg(3)
150	218	60(-)	35	2	0.52
200	268	110(40)	20	3	0.62
250	318	160(90)	45	3	0.72
300	368	210(140)	30	4	0.82
400	468	310(240)	40	5	1.02
500	568	410(340)	10	7	1.22

Note (1) Too deep insertion depth of the mounting bolt may affect the running performance of the slide table, so never insert a bolt longer than the depth of the through hole.
(2) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(3) The value shows the mass of the entire table with one slide table, and it is 0.07kg heavier with two slide tables.

Remarks 1. Motor attachment for AC Servomotor is 3.5mm lower than the bottom of the bed.
2. Motor attachment for stepper motor is 4.5mm lower than the bottom of the bed.

TE50BF (Motor inline specification)





A-A Sectional dimension

unit: mm

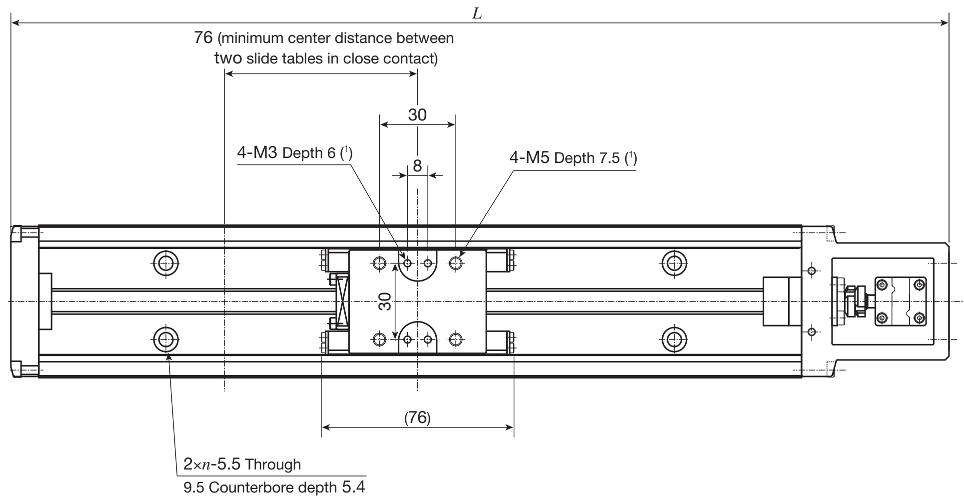
Bed length	Overall length	Stroke length	Mounting holes of bed		Mass (Ref.)
L_1	L	S(1)	C	n	kg(2)
150	218	60(-)	35	2	0.65
200	268	110(40)	20	3	0.75
250	318	160(90)	45	3	0.85
300	368	210(140)	30	4	0.94
400	468	310(240)	40	5	1.14
500	568	410(340)	10	7	1.33

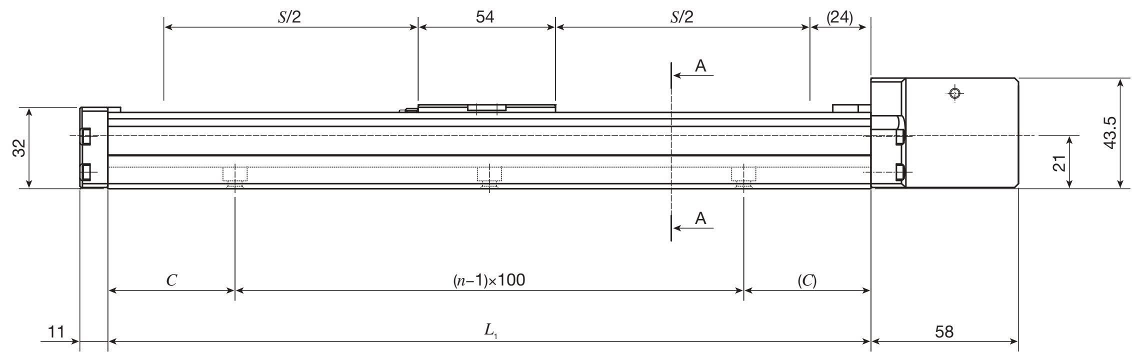
Note (1) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(2) The value shows the mass of the entire table with one slide table, and it is 0.16kg heavier with two slide tables.

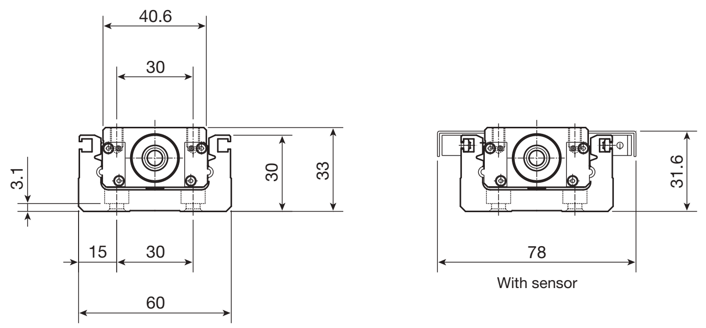
Remarks 1. Motor attachment for AC Servomotor is 3.5mm lower than the bottom of the bed.
2. Motor attachment for stepper motor is 4.5mm lower than the bottom of the bed.

IKO Precision Positioning Table TE

TE60BS (Motor inline specification)







A-A Sectional dimension

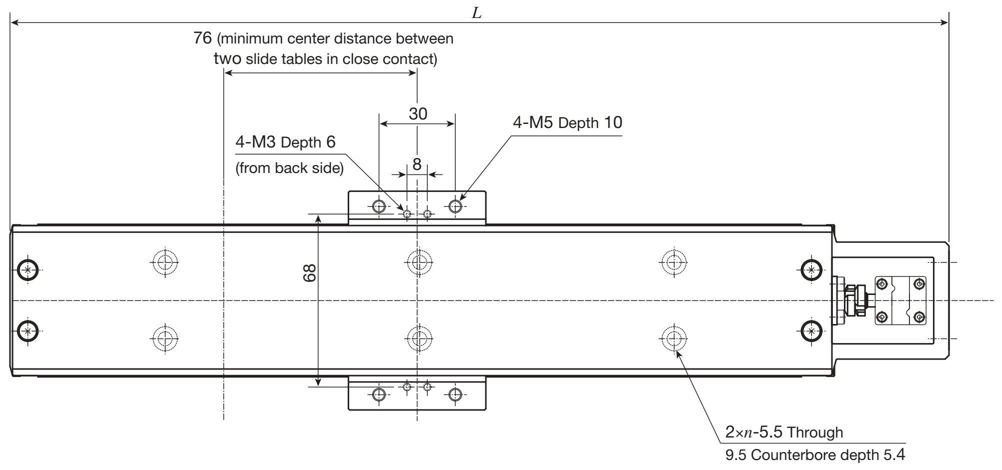
unit: mm

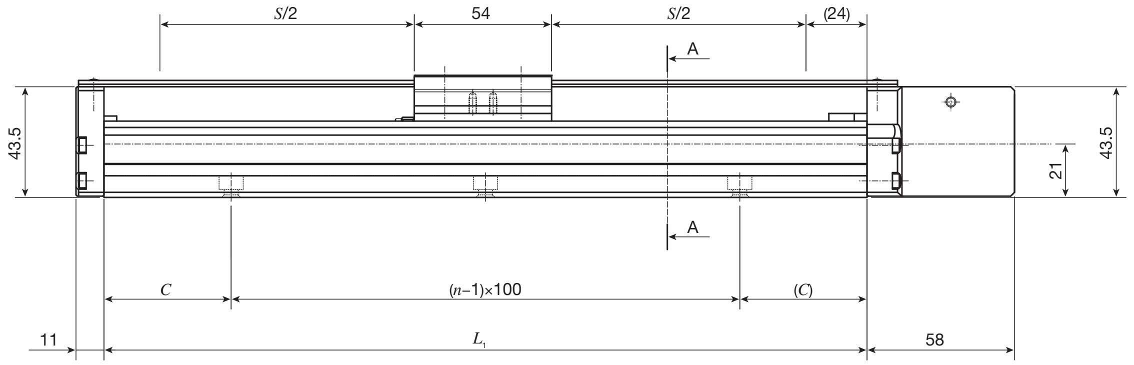
Bed length	Overall length	Stroke length	Mounting holes of bed		Mass (Ref.)
L_1	L	S(2)	C	n	kg(3)
150	219	50(-)	25	2	0.9
200	269	100(-)	50	2	1.0
300	369	200(125)	50	3	1.3
400	469	300(225)	50	4	1.6
500	569	400(325)	50	5	1.9
600	669	500(425)	50	6	2.2
700	769	600(525)	50	7	2.5

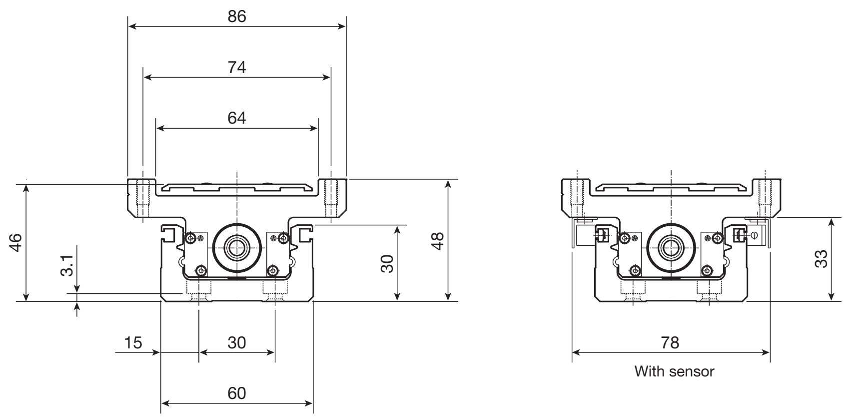
Note (1) Too deep insertion depth of the mounting bolt may affect the running performance of the slide table, so never insert a bolt longer than the depth of the through hole.
(2) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(3) The value shows the mass of the entire table with one slide table, and it is 0.1kg heavier with two slide tables.

Remarks Motor attachment for stepper motor is 9mm lower than the bottom of the bed.

TE60BF (Motor inline specification)







A-A Sectional dimension

unit: mm

Bed length	Overall length	Stroke length	Mounting holes of bed		Mass (Ref.)
L_1	L	S(1)	C	n	kg(2)
150	219	50(-)	25	2	1.1
200	269	100(-)	50	2	1.2
300	369	200(125)	50	3	1.5
400	469	300(225)	50	4	1.9
500	569	400(325)	50	5	2.2
600	669	500(425)	50	6	2.5
700	769	600(525)	50	7	2.8

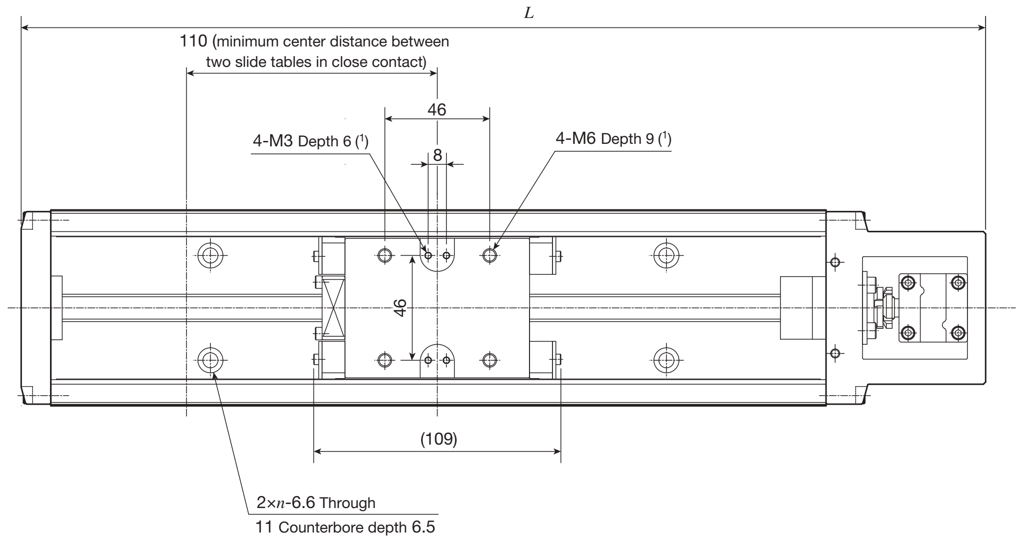
Note (1) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(2) The value shows the mass of the entire table with one slide table, and it is 0.2kg heavier with two slide tables.

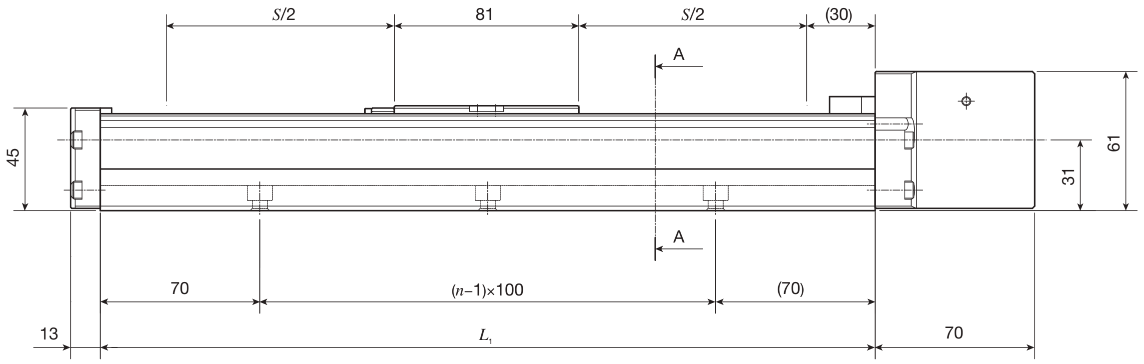
Remarks Motor attachment for stepper motor is 9mm lower than the bottom of the bed.

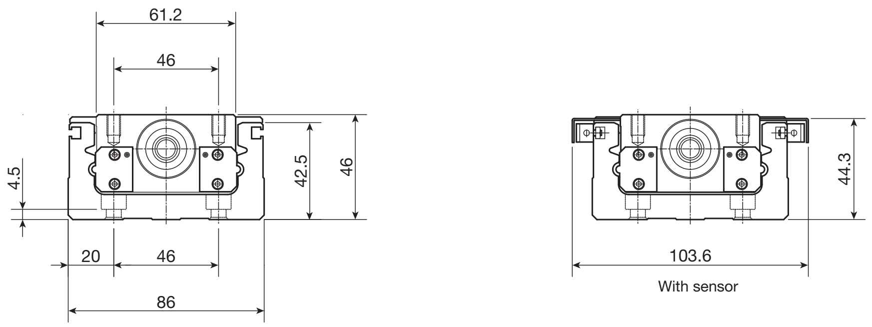
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Precision Positioning Table TE

TE86BS (Motor inline specification)







A-A Sectional dimension

unit: mm

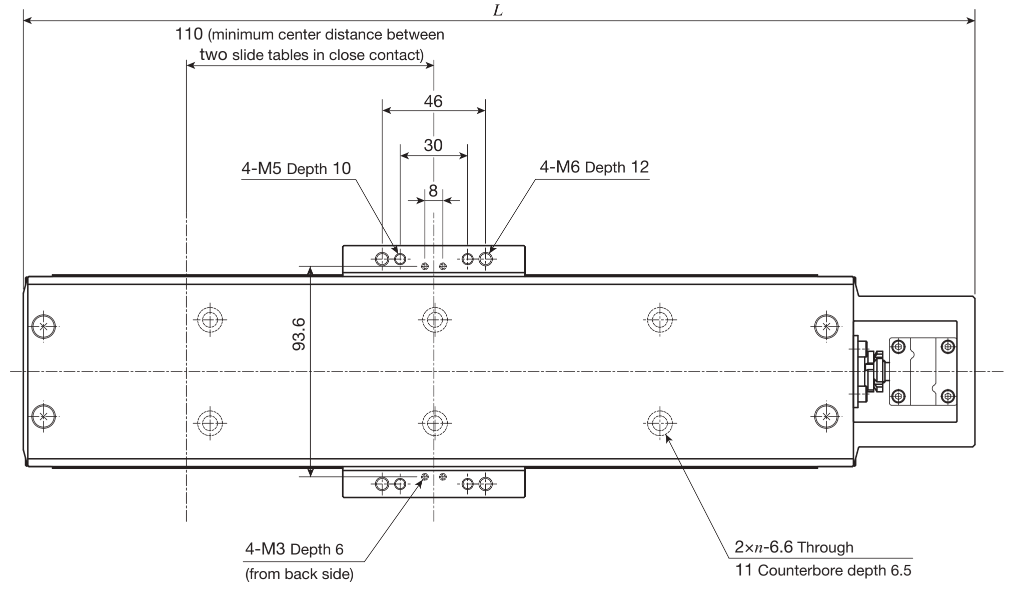
Bed length	Overall length	Stroke length	Mounting holes of bed	Mass(Ref.)
L_1	L	S(2)	n	kg(3)
340	423	200(90)	3	3.1
440	523	300(190)	4	3.7
540	623	400(290)	5	4.2
640	723	500(390)	6	4.7
740	823	600(490)	7	5.2
840	923	700(590)	8	5.7
940	1 023	800(690)	9	6.3

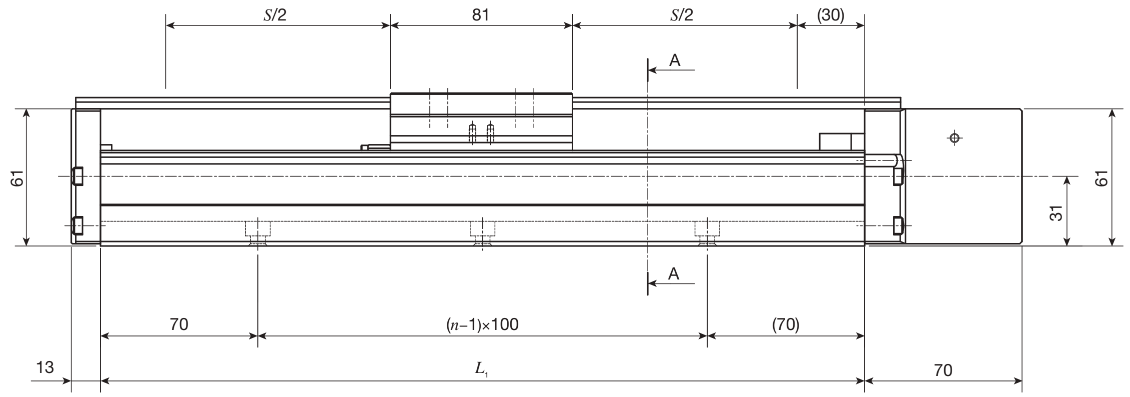
Notes (1) Too deep a fixing thread depth of the mounting bolt may affect the running performance of the slide table, so never insert a bolt longer than the depth of the tapped hole.

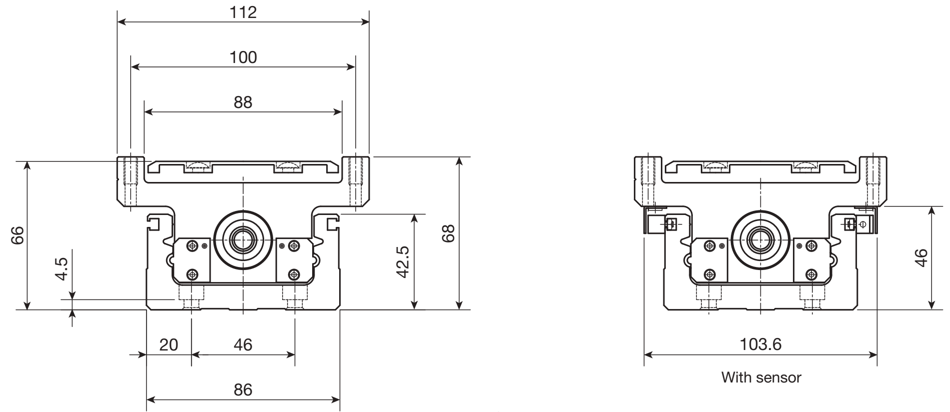
(2) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.

(3) The value shows the mass of the entire table with one slide table, and it is 0.3kg heavier with two slide tables.

TE86BF (Motor inline specification)







A-A Sectional dimension

unit: mm

Bed length	Overall length	Stroke length	Mounting holes of bed	Mass(Ref.)
L_1	L	S(1)	n	kg(2)
340	423	200(90)	3	3.7
440	523	300(190)	4	4.3
540	623	400(290)	5	4.9
640	723	500(390)	6	5.5
740	823	600(490)	7	6.1
840	923	700(590)	8	6.7
940	1 023	800(690)	9	7.2

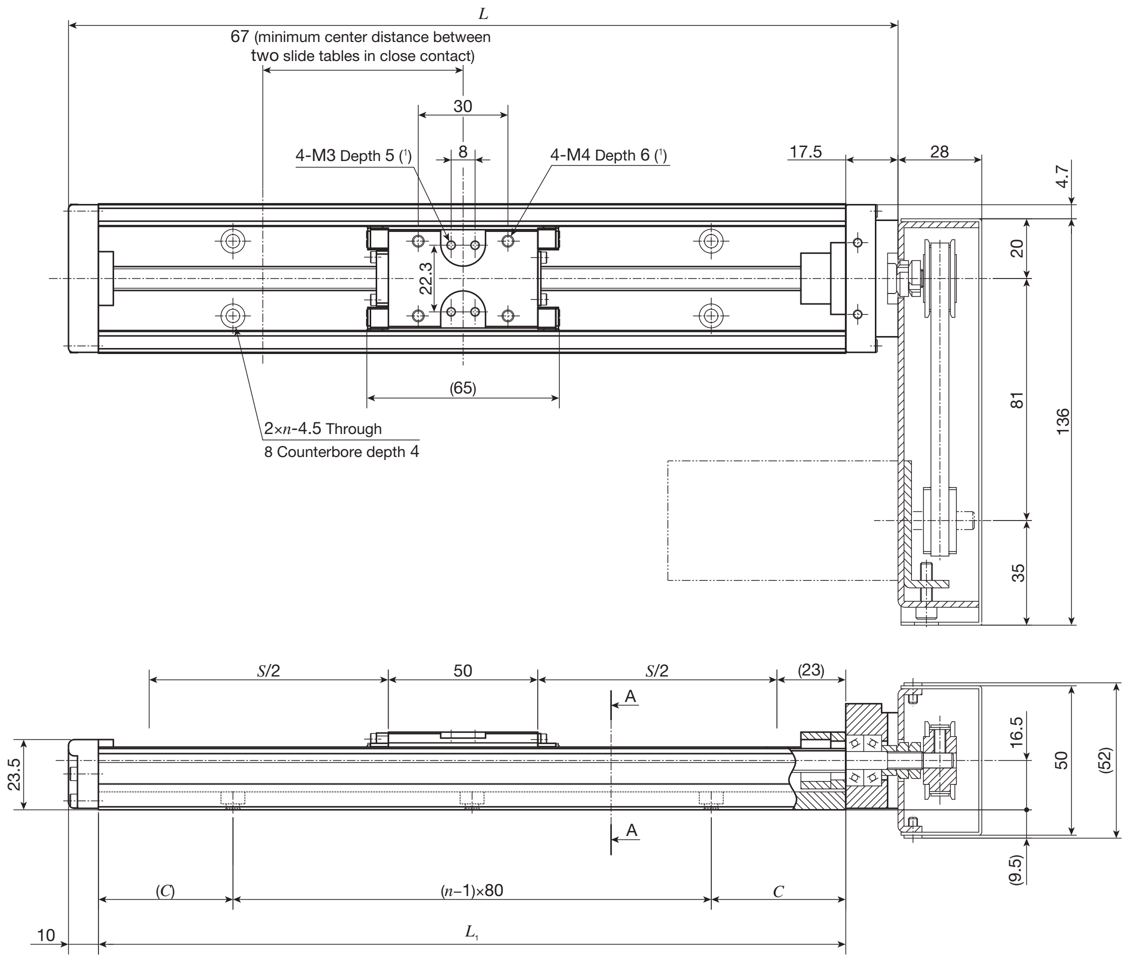
Notes (1) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.

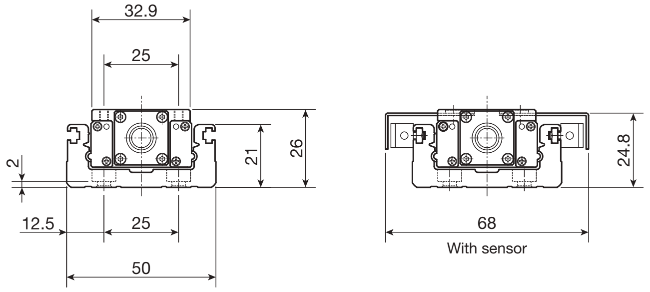
(2) The value shows the mass of the entire table with one slide table, and it is 0.6kg heavier with two slide tables.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Precision Positioning Table TE

TE50BS (Motor folding back specification)





A-A Sectional dimension

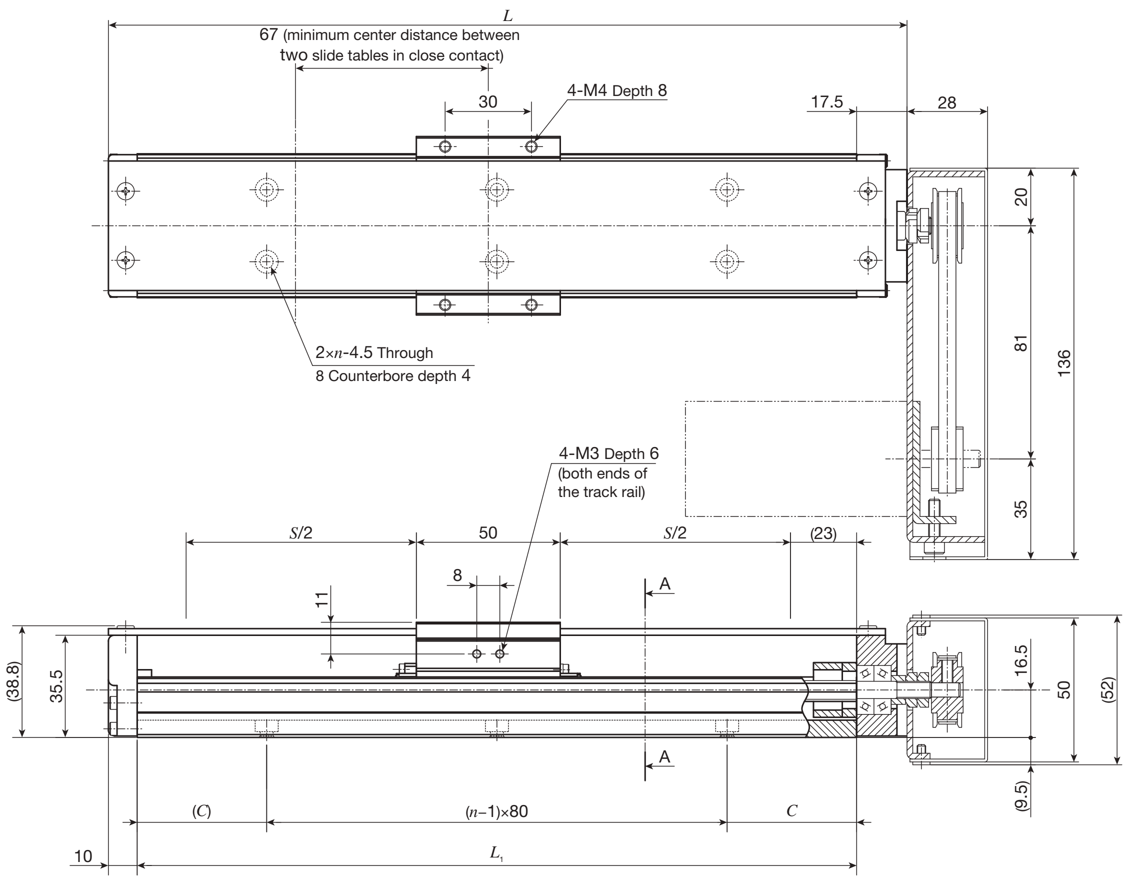
unit: mm

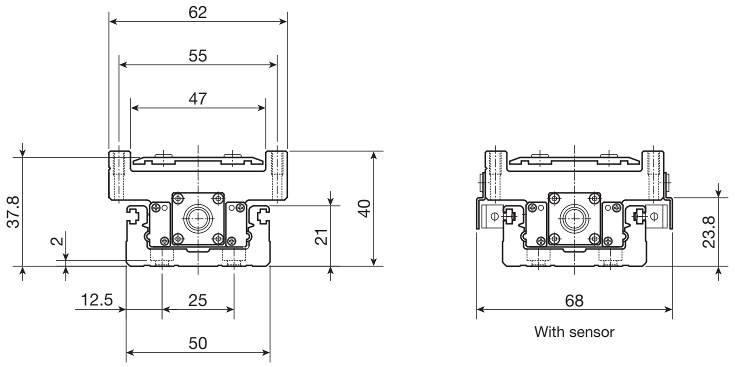
Bed length	Overall length	Stroke length	Mounting holes of bed		Mass (Ref.)
L_1	L	S(2)	C	n	kg(3)
150	177.5	60(-)	35	2	0.72
200	227.5	110(40)	20	3	0.82
250	277.5	160(90)	45	3	0.92
300	327.5	210(140)	30	4	1.02
400	427.5	310(240)	40	5	1.22
500	527.5	410(340)	10	7	1.42

Note (1) Too deep insertion depth of the mounting bolt may affect the running performance of the slide table, so never insert a bolt longer than the depth of the through hole.
(2) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(3) The value shows the mass of the entire table with one slide table, and it is 0.07kg heavier with two slide tables.

Remarks 1. Parts for motor attachment are appended, and this figure indicates a finished state after assembled by the customer.
2. If folded back to right and left, motor attachment is about 9.5mm lower than the bottom of the bed. In addition, it is about 2.5 to 3.5mm lower than the bottom of the bed if AC Servomotor is mounted by customers, and about 4.5mm lower if stepper motor is mounted.
3. If folded back upward, motor attachment is about 3.5mm lower than the bottom of the bed.

TE50BF (Motor folding back specification)





A-A Sectional dimension

unit: mm

Bed length	Overall length	Stroke length	Mounting holes of bed		Mass (Ref.)
L_1	L	S(1)	C	n	kg(2)
150	177.5	60(-)	35	2	0.85
200	227.5	110(40)	20	3	0.95
250	277.5	160(90)	45	3	1.05
300	327.5	210(140)	30	4	1.15
400	427.5	310(240)	40	5	1.35
500	527.5	410(340)	10	7	1.55

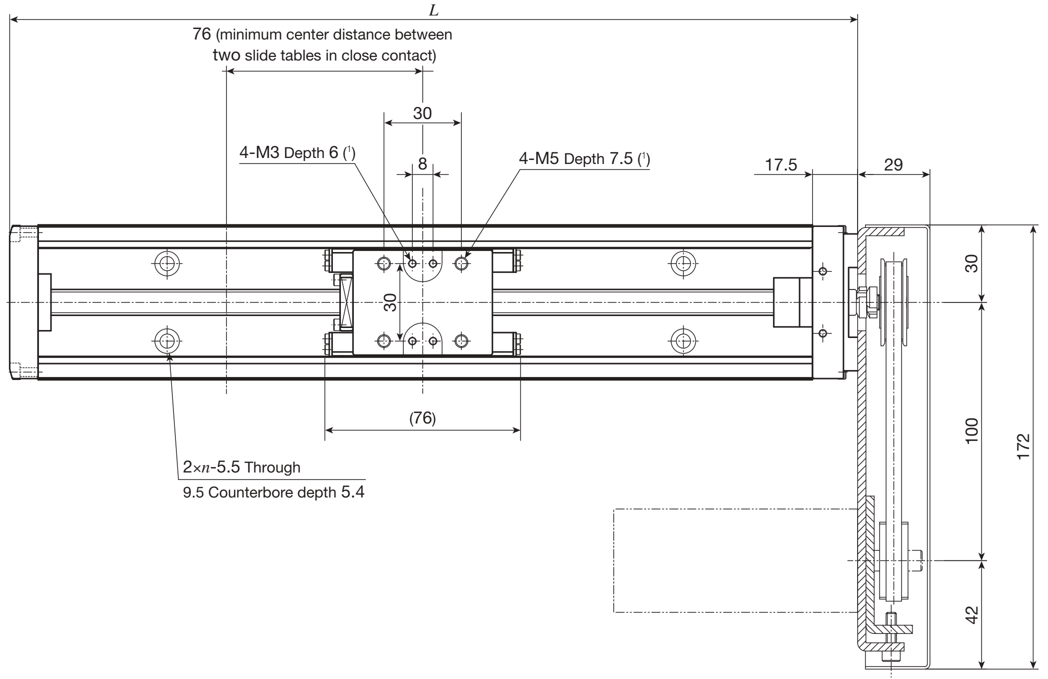
Note (1) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(2) The value shows the mass of the entire table with one slide table, and it is 0.16kg heavier with two slide tables.

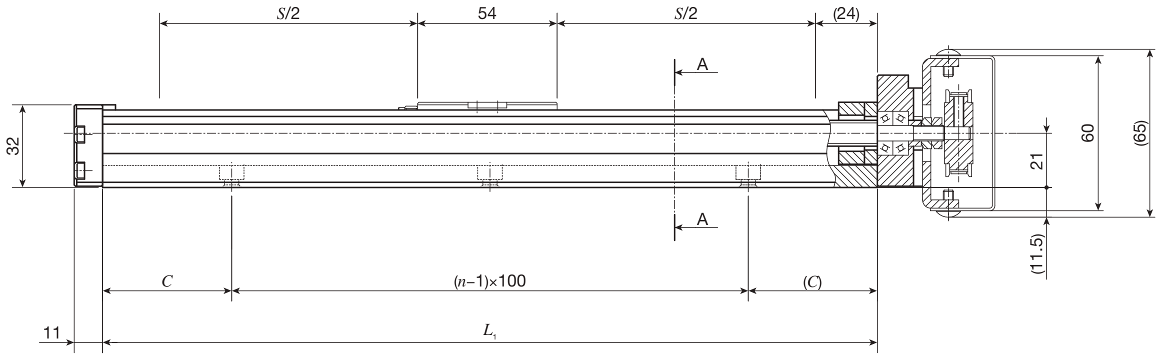
Remarks 1. Parts for motor attachment are appended, and this figure indicates a finished state after assembled by the customer.
2. If folded back to right and left, motor attachment is about 9.5mm lower than the bottom of the bed. In addition, it is about 2.5 to 3.5mm lower than the bottom of the bed if AC Servomotor is mounted by customers, and about 4.5mm lower if stepper motor is mounted.
3. If folded back upward, motor attachment is about 3.5mm lower than the bottom of the bed.

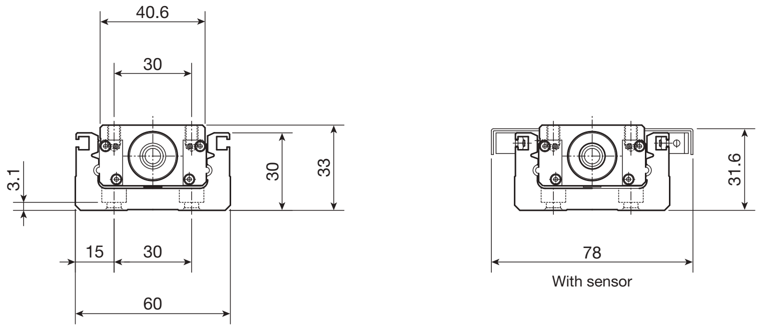
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

IKO Precision Positioning Table TE

TE60BS (Motor folding back specification)







A-A Sectional dimension

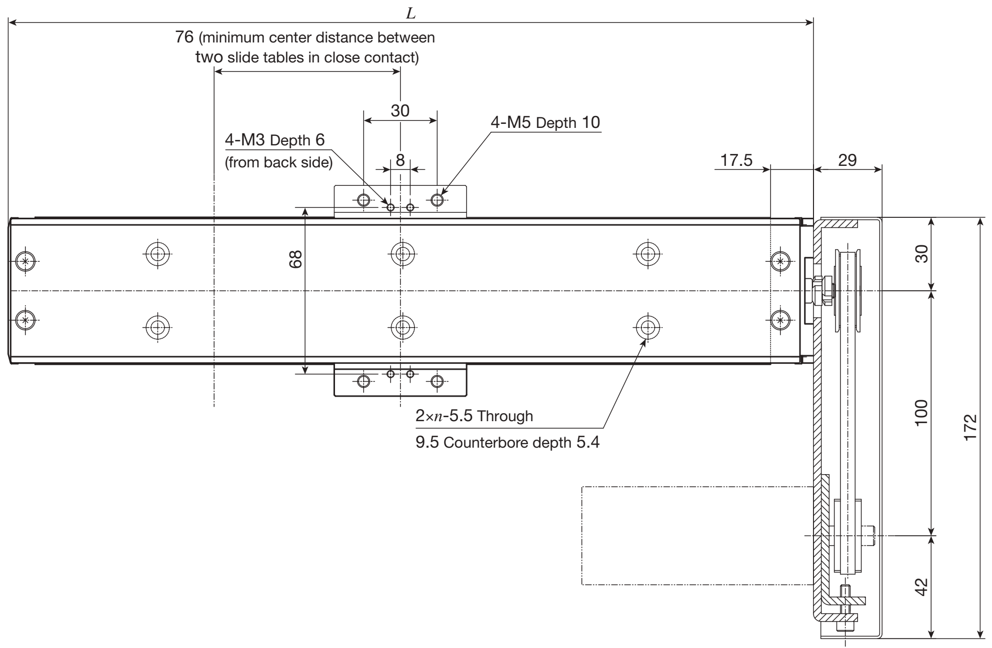
unit: mm

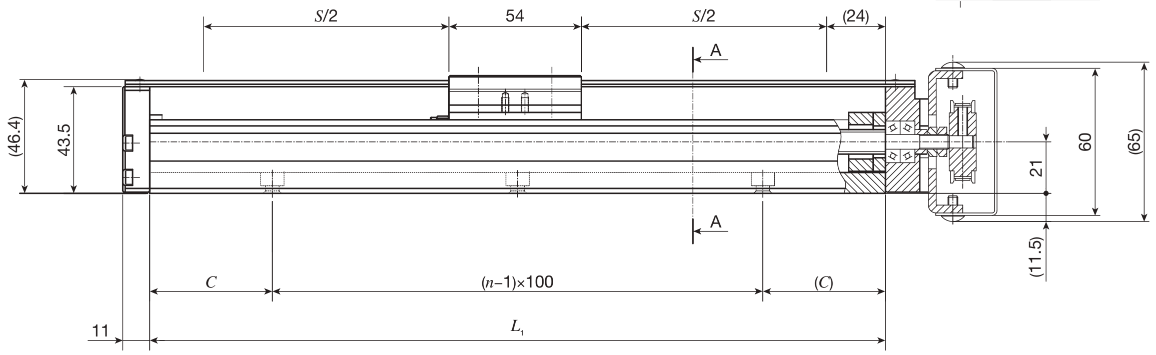
Bed length	Overall length	Stroke length	Mounting holes of bed		Mass (Ref.)
L_1	L	S(2)	C	n	kg(3)
150	178.5	50(-)	25	2	1.2
200	228.5	100(-)	50	2	1.3
300	328.5	200(125)	50	3	1.6
400	428.5	300(225)	50	4	1.9
500	528.5	400(325)	50	5	2.2
600	628.5	500(425)	50	6	2.5
700	728.5	600(525)	50	7	2.8

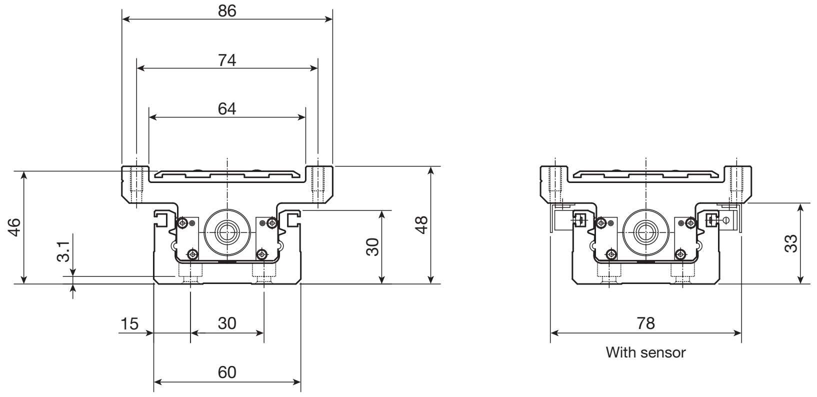
Note (1) Too deep insertion depth of the mounting bolt may affect the running performance of the slide table, so never insert a bolt longer than the depth of the through hole.
(2) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(3) The value shows the mass of the entire table with one slide table, and it is 0.1kg heavier with two slide tables.

Remarks 1. Parts for motor attachment are appended, and this figure indicates a finished state after assembled by the customer.
2. If folded back to right and left, motor attachment is about 11.5mm lower than the bottom of the bed.
3. If folded back upward, motor attachment is about 9mm lower than the bottom of the bed.

TE60BF (Motor folding back specification)







A-A Sectional dimension

unit: mm

Bed length	Overall length	Stroke length	Mounting holes of bed		Mass (Ref.)
L_1	L	S(1)	C	n	kg(2)
150	178.5	50(-)	25	2	1.4
200	228.5	100(-)	50	2	1.5
300	328.5	200(125)	50	3	1.8
400	428.5	300(225)	50	4	2.2
500	528.5	400(325)	50	5	2.5
600	628.5	500(425)	50	6	2.8
700	728.5	600(525)	50	7	3.1

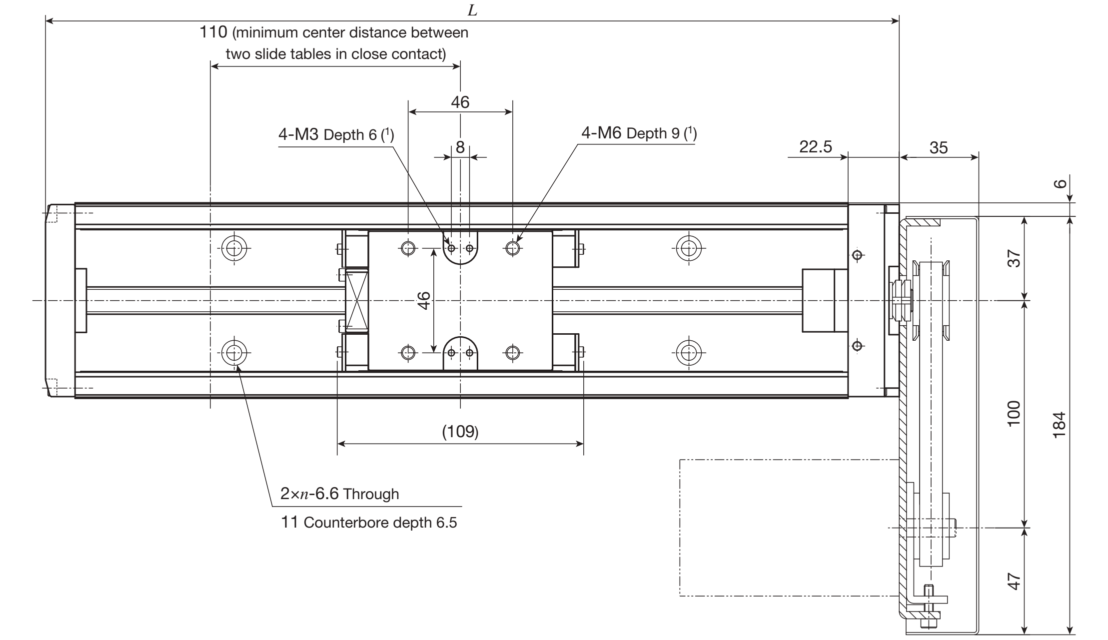
Note (1) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(2) The value shows the mass of the entire table with one slide table, and it is 0.2kg heavier with two slide tables.

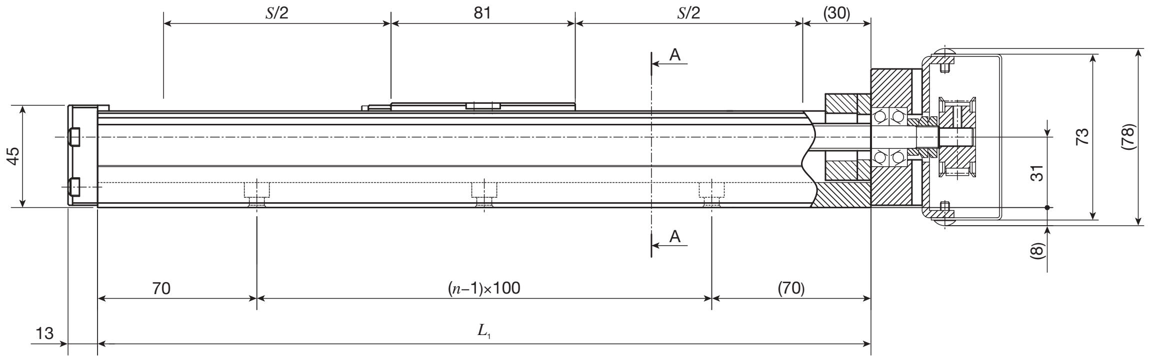
Remarks 1. Parts for motor attachment are appended, and this figure indicates a finished state after assembled by the customer.
2. If folded back to right and left, motor attachment is about 11.5mm lower than the bottom of the bed.
3. If folded back upward, motor attachment is about 9mm lower than the bottom of the bed.

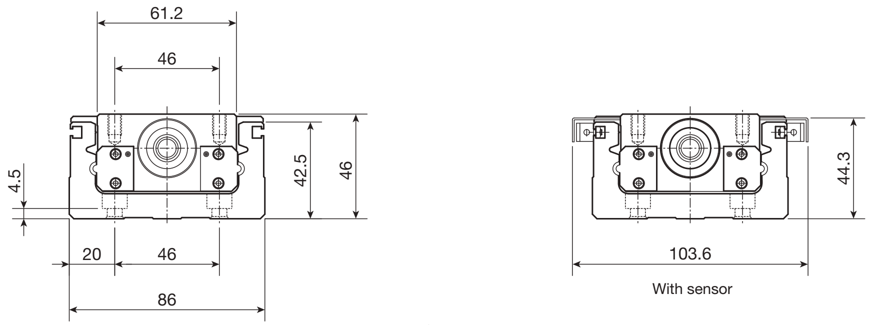
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Precision Positioning Table TE

TE86BS (Motor folding back specification)







A-A Sectional dimension

unit: mm

Bed length	Overall length	Stroke length	Mounting holes of bed	Mass(Ref.)
L_1	L	S(2)	n	kg(3)
340	375.5	200(90)	3	4.0
440	475.5	300(190)	4	4.6
540	575.5	400(290)	5	5.1
640	675.5	500(390)	6	5.6
740	775.5	600(490)	7	6.1
840	875.5	700(590)	8	6.6
940	975.5	800(690)	9	7.2

Notes (1) Too deep a fixing thread depth of the mounting bolt may affect the running performance of the slide table, so never insert a bolt longer than the depth of the tapped hole.

(2) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.

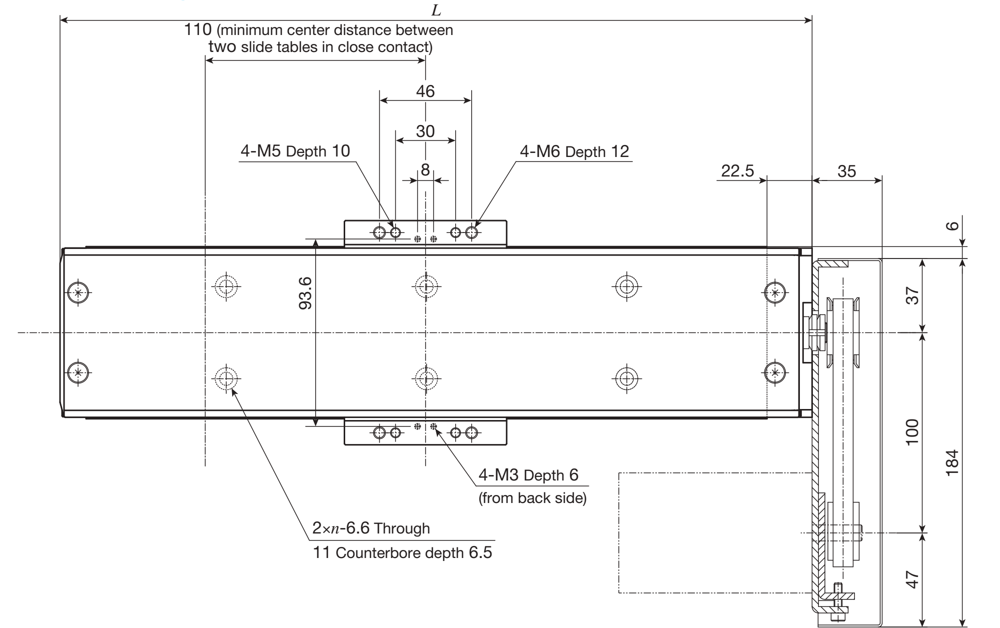
(3) The value shows the mass of the entire table with one slide table, and it is 0.3kg heavier with two slide tables.

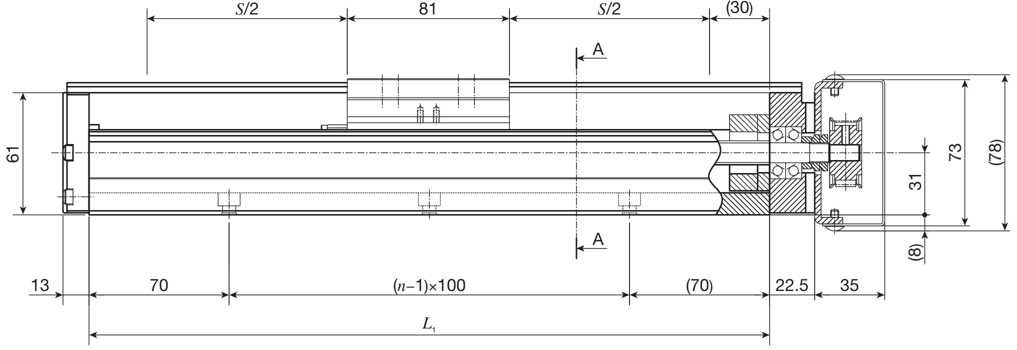
Remarks 1. Parts for motor attachment are appended, and this figure indicates a finished state after assembled by the customer.

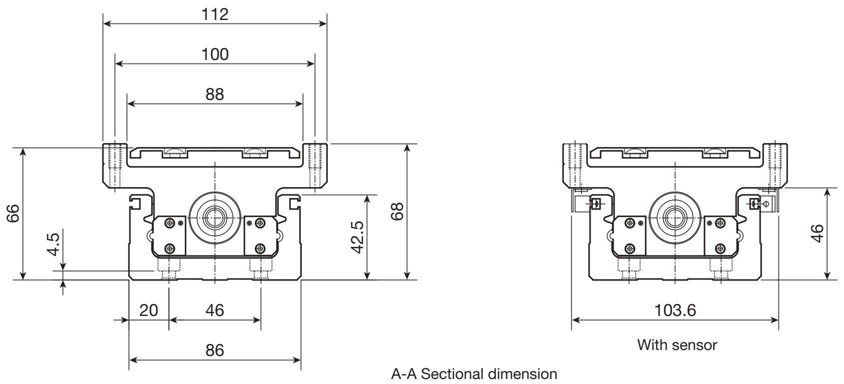
2. If folded back to right and left, motor attachment is about 8mm lower than the bottom of the bed.

3. If folded back upward, motor attachment is about 6mm lower than the bottom of the bed.

TE86BF (Motor folding back specification)







A-A Sectional dimension

unit: mm

Bed length	Overall length	Stroke length	Mounting holes of bed	Mass(Ref.)
L_1	L	S(1)	n	kg(2)
340	375.5	200(90)	3	4.6
440	475.5	300(190)	4	5.2
540	575.5	400(290)	5	5.8
640	675.5	500(390)	6	6.4
740	775.5	600(490)	7	7.0
840	875.5	700(590)	8	7.6
940	975.5	800(690)	9	8.1

Notes (1) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.

(2) The value shows the mass of the entire table with one slide table, and it is 0.6kg heavier with two slide tables.

Remarks 1. Parts for motor attachment are appended, and this figure indicates a finished state after assembled by the customer.

2. If folded back to right and left, motor attachment is about 8mm lower than the bottom of the bed.

3. If folded back upward, motor attachment is about 6mm lower than the bottom of the bed.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Extended Life Specification

Machined Type Needle Roller Bearings

Long-life bearings
for improved machine reliability!

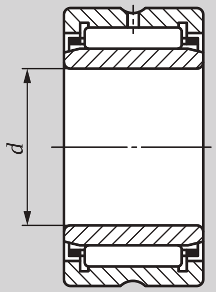
NIPPON THOMPSON CO., LTD.

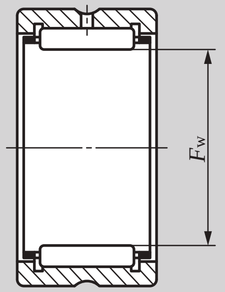
IKO presents the next generation in Needle Roller Bearings: the Extended Life Series

Extended life up to 5 times longer than standard needle roller bearings

IKO's Extended Life Specification Machined Type Needle Roller Bearings are treated with a newly developed special heat treatment that enhances the bearing's surface hardness and toughness, and suppresses the generation and growth of damage on the surface. Significant life extension can be achieved under high load or under the condition of lubrication contaminated with foreign substances. In a life comparison test, IKO's special heat treated Extended Life Series products lasted 5 times longer than standard heat-treated products.

Applicable production size

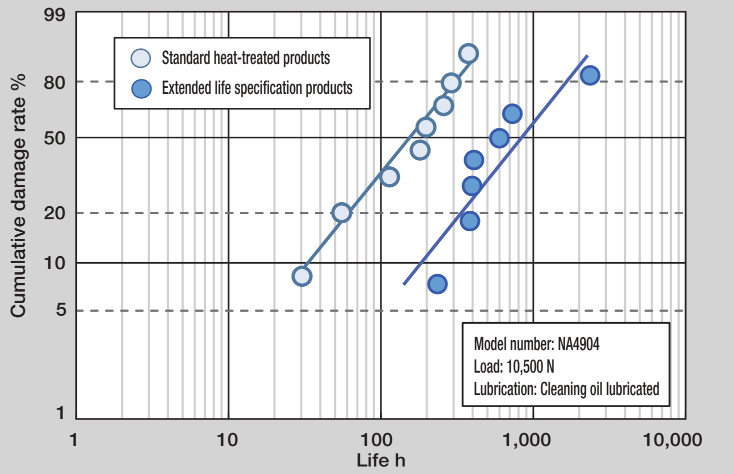




With inner ring		Without inner ring	
d =10 ～ 75mm		*Fw* =14 ～ 85mm	
NA	4900 ～ 4915	RNA	4900 ～ 4915
NA	6901 ～ 6915	RNA	6901 ～ 6915
TAFI	102216 ～ 7510535	TAF	142216 ～ 8510535
TRI	153320 ～ 7510845	TR	203320 ～ 8310845

Extended Life specification Machined Type Needle Roller Bearings are made to order upon request. Please contact IKO when needed.

Life data



This table shows the result of life testing under load conditions at 50% of the basic dynamic rating.
The Extended Life specification with special heat treatment lasted 5 times longer or more in L10 life compared to the standard heat-treated products.

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Oil Minimum
IKO Gentle to The Earth

http://www.ikont.co.jp/eg/

CAT-2941E 2018.07

IKO
Innovation, Know-how & Originality

NEW C-Lube Linear Roller Way Super MX

MX MASTER GRADE

Introducing the new Low Fluctuation specification,
for superb high-precision feeding.

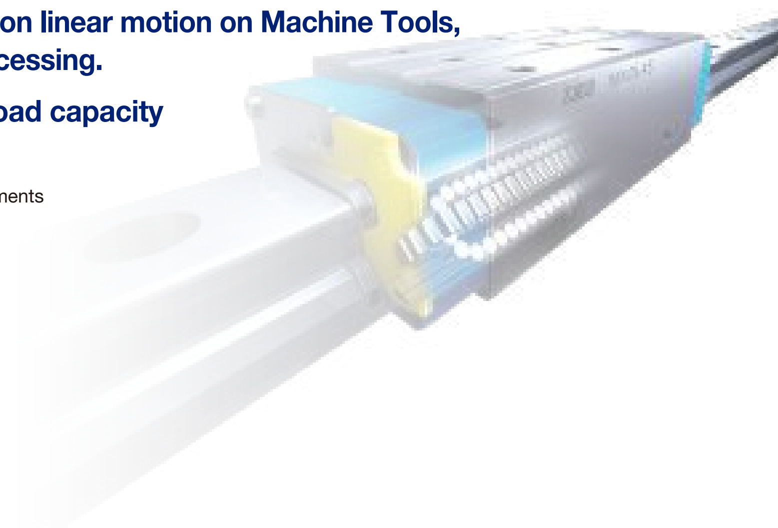
NIPPON THOMPSON CO., LTD.

Features

1 Special raceway processing suppresses small running deflection and reduces fluctuation by approximately 50% compared to standard extra long units.

2 Low fluctuation makes it ideal for ultra-precision linear motion on Machine Tools, which require high-precision, high-quality processing.

3 The extra long unit contributes to improved load capacity and rigidity in mechanical equipment.



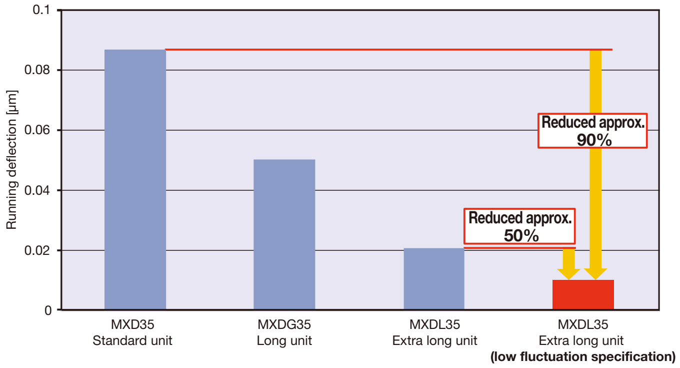
Fluctuation: Refers to the running deflection related to movement of the rolling elements
within the Linear Roller Way.

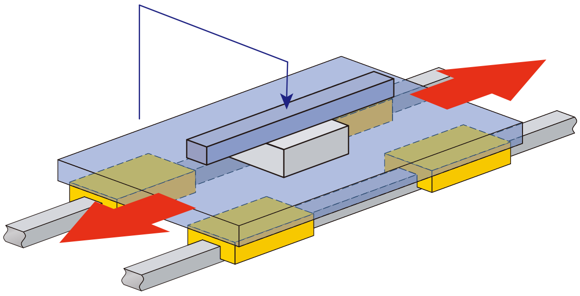
Applicable products

Series	C-Lube Linear Roller Way Super MX
Supported models	MXL, MXDL, MXNL, MXNSL
Size	30/35/45/55

MX Master Grade (low fluctuation specification) is a special order product;
if needed please contact IKO.

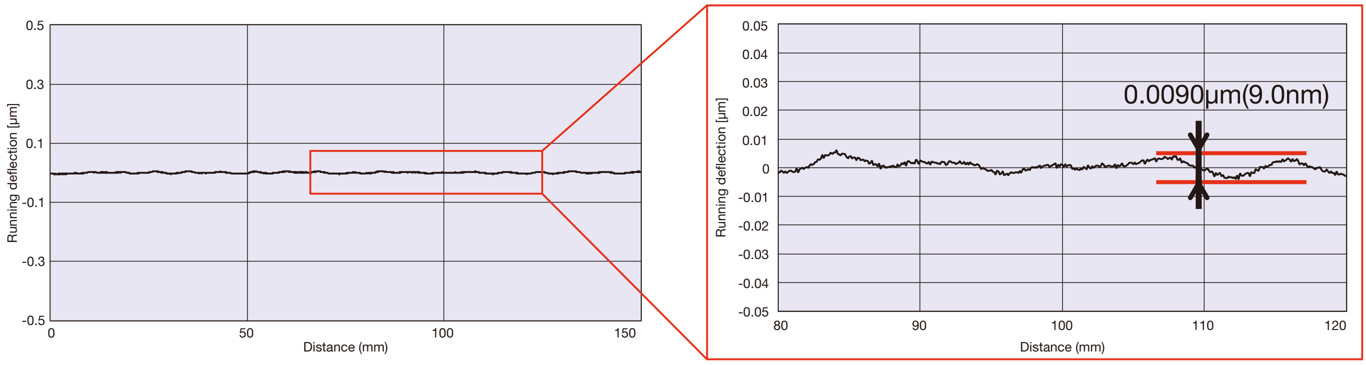
Fluctuation comparison





Fluctuation

The running deflection value for MX Master Grade (low fluctuation specification) is kept within 0.0090 μm (9.0 nm) as verified by testing.



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Plant : Gifu, Kamakura

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Midwest Operations	Phone. **1-(630)766-6464**	Fax. 1-(630)766-6869
Minnesota Sales Office	Phone. **1-(952)892-8415**	Fax. 1-(952)892-1722
West Coast Operations	Phone. **1-(562)941-1019**	Fax. 1-(562)941-4027
Silicon Valley Sales Office	Phone. **1-(408)492-0240**	Fax. 1-(408)492-0245
Southeast Operations	Phone. **1-(770)418-1904**	Fax. 1-(770)418-9403
Southwest Operations	Phone. **1-(972)929-1515**	Fax. 1-(972)915-0060

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CAT-2932E Printed in Japan

Lubricants for the Food Processing Industry

H-1 Food Grade Lubricant

IKO H-1 Food Grade Lubricant is NSF registered and FDA certified which ensures that they are produced and delivered with the hygienic standard.

We also offer H-1 Food Grade Lubricant as C-Lube–Maintenance free specification–for our Linear Ways and Bearings.

Corrosion Resistance

Stainless Steel

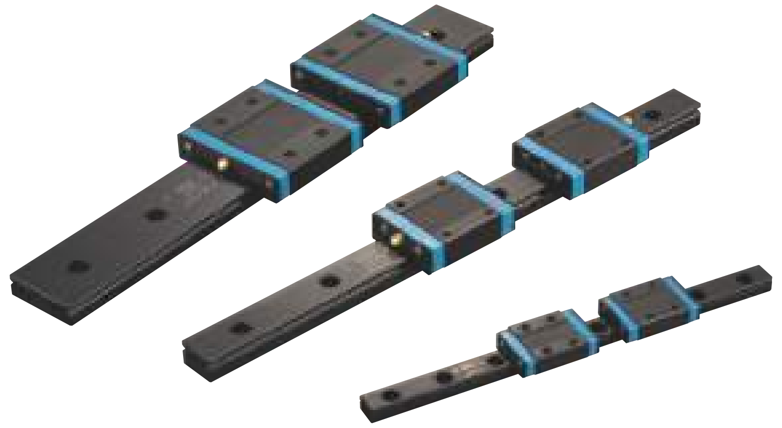
IKO offers stainless steel specification. For applications which incur routine wash down, Stainless Steel is more suitable and last longer than carbon steel.

Fluorine Black Chrome Surface Treatment

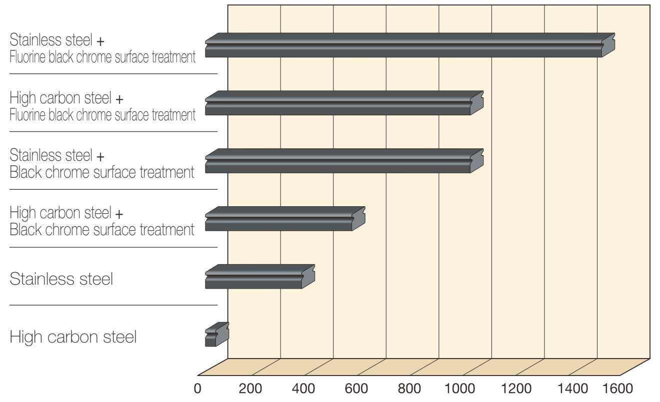
A fluorinated resin coating over the black chrome treatment helps prevent foreign substances from sticking and improves corrosion resistance.

Black Chrome Surface Treatment

This surface treatment improves corrosion resistance.



Corrosion resistance comparison based on humidity cabinet test



Test conditions Temperature 50℃, Relative humidity 95%RH

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Japan USA Europe

ISO 9001 Certified ISO 14001 Certified

ISO 9001 & 14001 Quality system registration certificate

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Oil Minimum
IKO Gentle to The Earth

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IKO
Innovation,Know-how & Originality

Food Processing & Packing Industry

IKO Bearings Cater to The Food Processing & Packaging Machines

NIPPON THOMPSON CO., LTD.

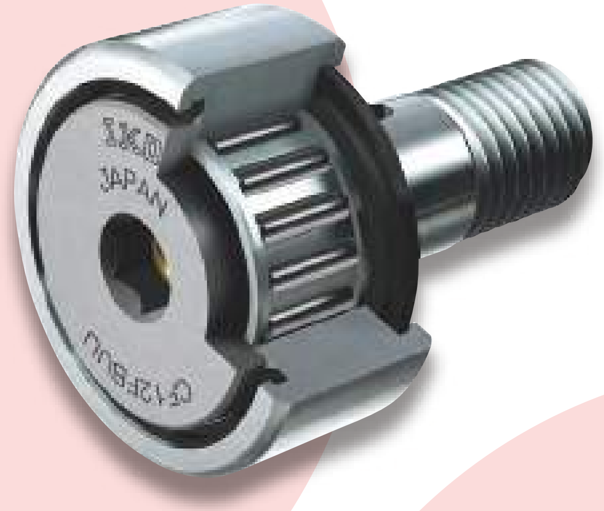
Cam Followers

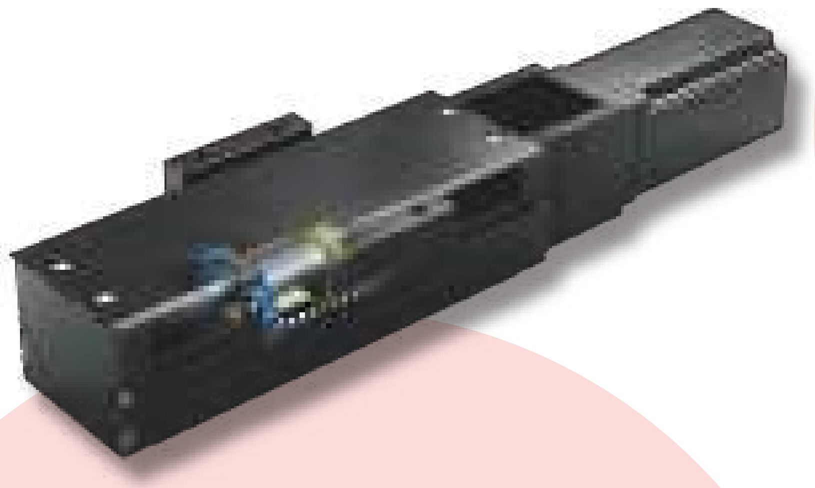
IKO manufactures a wide range of Cam Followers designed to fit the needs of our customers.

C-Lube, one of IKO's innovative technologies, achieves long-term maintenance free operation by filling the inner cavity of the bearing with a cutting-edge thermosetting solid lubricant.

IKO's thrust disk type facilitates thrust loads resulting from issues such as mounting errors.

IKO offers numerous inch as well as metric dimensional sizes and types.





Positioning Table "TE" Series

In the productivity-driven packaging industry, there are many possible solutions to reduce downtime. IKO's TE high accuracy positioning table is one of the solutions. TE's high strength aluminium alloy body structure reduces both cost and weight. Furthermore, the TE comes standard with IKO's C-lube maintenance free technology.

NEMA motor attachment is available.

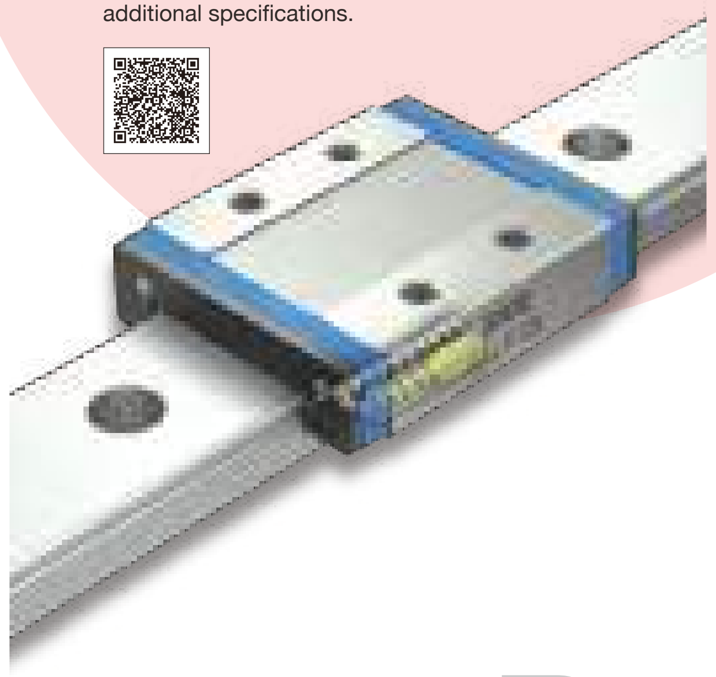
Linear Ways

As you may well know, Japan is a leader in linear motion technology.

IKO ball types are designed so the two rows of balls will make four points of contact with the raceways. This allows for stable accuracy and rigidity even in applications with fluctuating directional or complex loads.

This know-how leads IKO to develop "Linear Roller Way Super X", the highly acclaimed super rigid Linear Way with rollers instead of balls. IKO's lineup in both ball and roller types includes stainless steel and C-Lube maintenance free technology as standard products.

Please visit the IKO website for more information and additional specifications.



Packaging

Food Processing

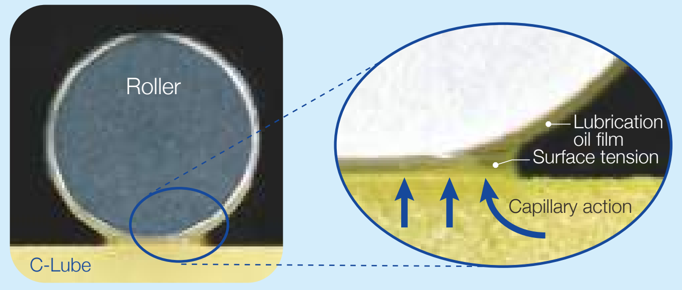
IKO C-Lube Maintenance-free

C-Lube is IKO's original solid lubricant impregnated with a large amount of lubrication oil, allowing machines to endure running over 20,000 km without oil feeding, with lubrication oil in the C-Lube only.

In this way, maintenance free is achieved until the end of device life.

Structure

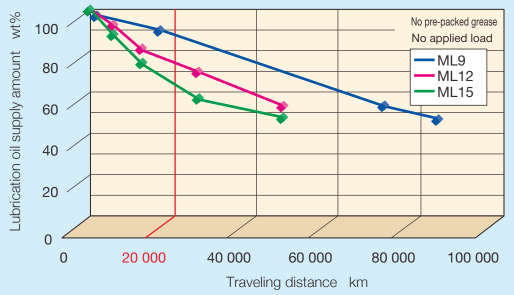
Lubrication oil is continuously supplied to the surface of rolling elements by surface tension in the contact of C-Lube surface and rolling elements.



Eco-friendly

With C-Lube lubrication oil, the consumption of lubrication oil is reduced and lubrication performance is maintained even when running for a long period.

Oil supply test result



Linear Bushings

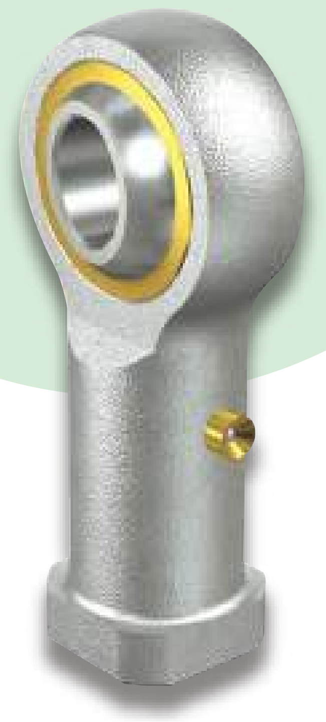
The stainless steel type is well suited for equipment that does not allow rust prevention oil to be used and/or incur routine wash-down. Bearings on food processing machines often need replacement due to corrosion from the wash-downs. Stainless steel inhibits corrosion making them a more affordable choice than other linear motion bearings.

Pillo Ball / Rod Ends

IKO's maintenance free type is suitable for cases where fixed directional loads are applied. They are ideally suited for food processing machines where oil must be avoided.

L-Balls

The superior wear resistance assures stable accuracy for long periods of time and easy-maintenance. These are widely used in link mechanisms in automobile, farm and packaging machines.



Recognizing that conservation of the global environment is the top-priority challenge for the world's population, Nippon Thompson will conduct its activities with consideration of the environment as a corporate social responsibility, reduce its negative impact on the environment, and help foster a rich global environment.

ISO 9001 & 14001 Quality system registration certificate

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IKO NEEDLE ROLLER BEARINGS

CAT-1594E

BEARINGS

NIPPON THOMPSON CO., LTD.

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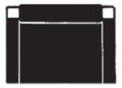
TLA···Z TLAM — B7
YT YTL — B7

BA···Z BAM — B27
BHA···Z BHAM — B27
YB YBH — B27

Shell Type Needle Roller Bearings

B



KT — C5
KT···EG — C21
KTV···EG — C22

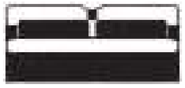
Needle Roller Cages
for general usage

Needle Roller Cages
for engine connecting rods

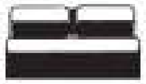
C

(R) NA 49 — (D7)D29
(R) NA 48 — (D23)D41
TAF (I) — D7(D29)

TR (I) — D9(D31)
BR (I) — D47(D51)
TAF···/SG — D77



(R) NA 69 — D9(D29)



GTR (I) — D9(D31)

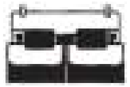
(R) NAF — (D83)D89

Machined Type Needle Roller Bearings

Needle Roller Bearings
with separable cage

D

NAG 49 — E7
NAU 49 — E7
TRU — E7



NAS 50 — E19

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WS GS — F11

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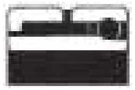
NAX (I) — G5(G7)
NBX (I) — G5(G7)



NATA 59 — G9
NATB 59 — G9

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Roller Followers

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CRBFV — J17

CRBC — J19
CRB — J19

CRBT — J23

CRBTF — J25

CRBS — J27

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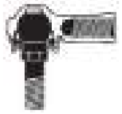
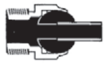
GE — K15
SBB — K23

PB — K37

PHS — K38
POS — K39
PHSA — K42



LHSA — K49
LHS — K51



SNA — K58
SNM — K59
SNPT — K59

Spherical Bushings

Pilloballs L-balls

Super Flexible Nozzles

K

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DS — L4

WR — L19
AR — L21

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Presentation of Mechatronics Series — M55

Miscellaneous Tables

Presentation of Linear Motion Rolling Guide and Mechatronics Series

M

Gifu factory main entrance

Assembling process in a clean room

IKO

Needle Roller Bearing Series

CAT-1594E

The IKO Needle Roller Bearing Series are manufactured through a control system that alleviates their impact on the global environment to meet the quality requirements of ISO 14001 in compliance with the quality requirements level of ISO 9001 for quality improvement.
The standard products listed in this catalog comply with the specifications of the ten hazardous materials mentioned cited in the European RoHS Directive.

This catalog adopts the SI system (system of international units) in conformance with ISO (International Organization for Standardization) Standard 1000.

In the table of dimensions, standard products are referred to using identification numbers marked with 🟦. The products are reputed for high quality, reasonable price and quick delivery. The identification numbers marked with ☐ refer to our semi-standard products.
The specifications and dimensions of products in this catalogue are subject to change without prior notice.

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Description of Each Series & Table of Dimensions

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General Explanation

Nippon Thompson Co., Ltd. is a bearing manufacturer that launched the technical development of needle roller bearings for the first time in Japan and is proud of the high quality level and abundant varieties of its products.

Needle roller bearings are bearings for rotary motion that incorporate needle-shaped thin rollers instead of ordinary bearing balls or rollers. Compared with other rolling bearings, they are small-sized and lightweight but have a large load capacity. They are widely used with high reliability in the fields of automobiles, industrial machinery, OA equipment, etc. as resource-saving type bearings that make the whole machine compact.

Characteristics of Needle Roller Bearings

Bearings can be classified into two main types, namely rolling bearings and sliding bearings. Rolling bearings can be subdivided further into ball bearings and roller bearings according to the rolling elements.
IKO Needle Roller Bearings are high-precision rolling bearings with a low sectional height, incorporating needle rollers as the rolling element. They have the following features.

Merits of Rolling Bearings

Compared with sliding bearings, rolling bearings have the following merits:

❶ Static and kinetic friction is low.

Since the difference between static friction and kinetic friction is small and the frictional coefficient is also small, drive units or machines can be made more compact and lightweight, saving machine costs and power consumption.

❷ Stable accuracy can be maintained for long periods.

Owing to less wear, stable accuracy can be maintained for long periods.

❸ Machine reliability is improved.

Since the bearing life can be estimated based on rolling fatigue, machine reliability is improved.

❹ Lubrication is simplified.

Since grease lubrication is sufficient in most cases, lubrication can be simplified for easy maintenance.

Merits of Needle Roller Bearings

Compared with other rolling bearings, IKO Needle Roller Bearings have the following advantages:

❶ With a low sectional height, they can withstand heavy loads.

Since they have a low sectional height compared with other rolling bearings and yet can withstand heavy loads, machines can be made more compact and lightweight, thus saving costs.

❷ Rotating torque is small, improving mechanical efficiency.

Since the rotating radius is small, the rotating torque is also small under the same frictional conditions, thus improving mechanical efficiency.

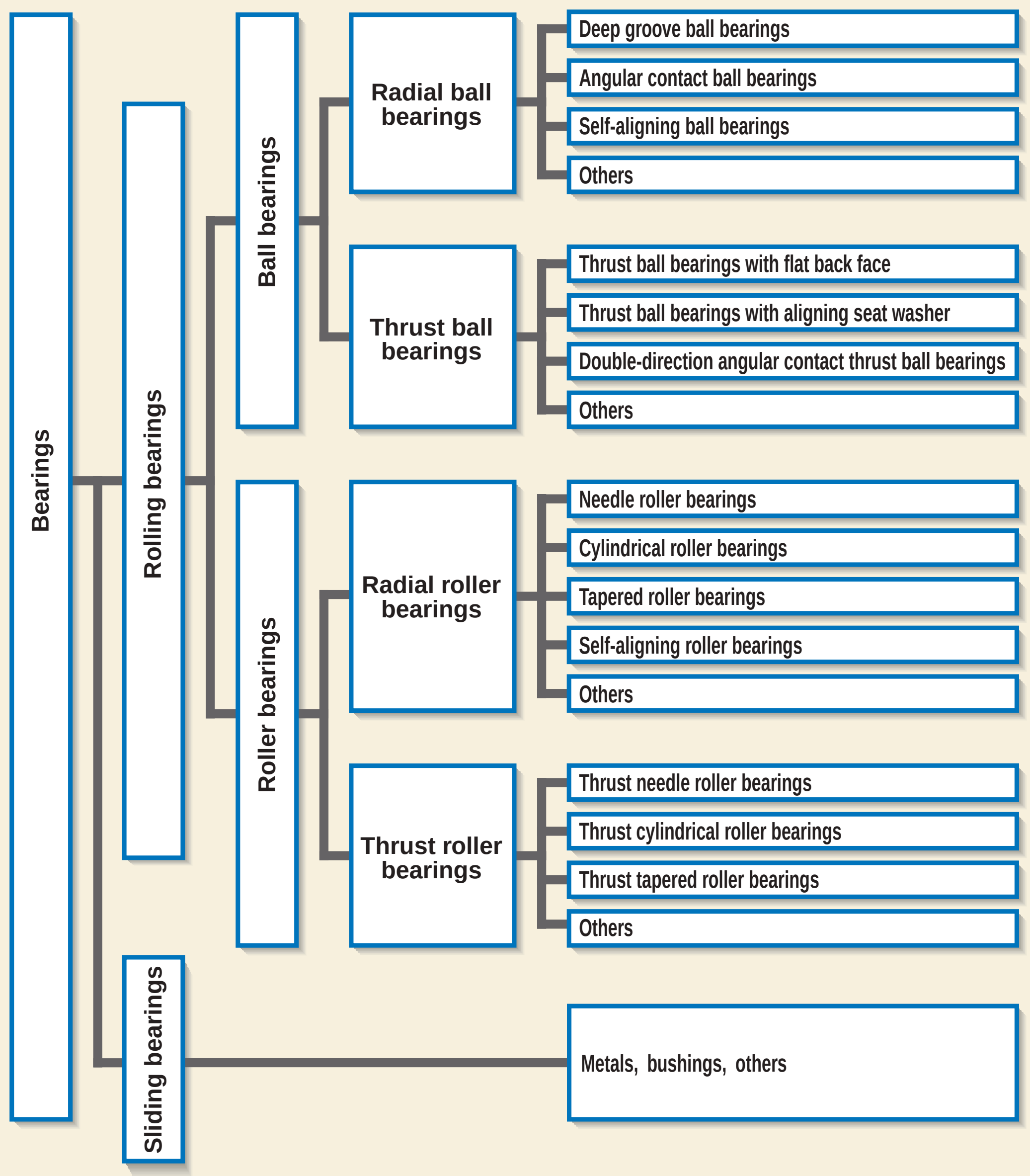
❸ Inertia is minimized.

Since the bearing volume and weight are small, the moment of inertia of the bearing is minimized when it is put in motion.

❹ Most suited to oscillating motions.

Many rolling elements are arranged at a small spacing pitch, and this configuration is most suited to oscillating motions.

Classification of bearings



A
B
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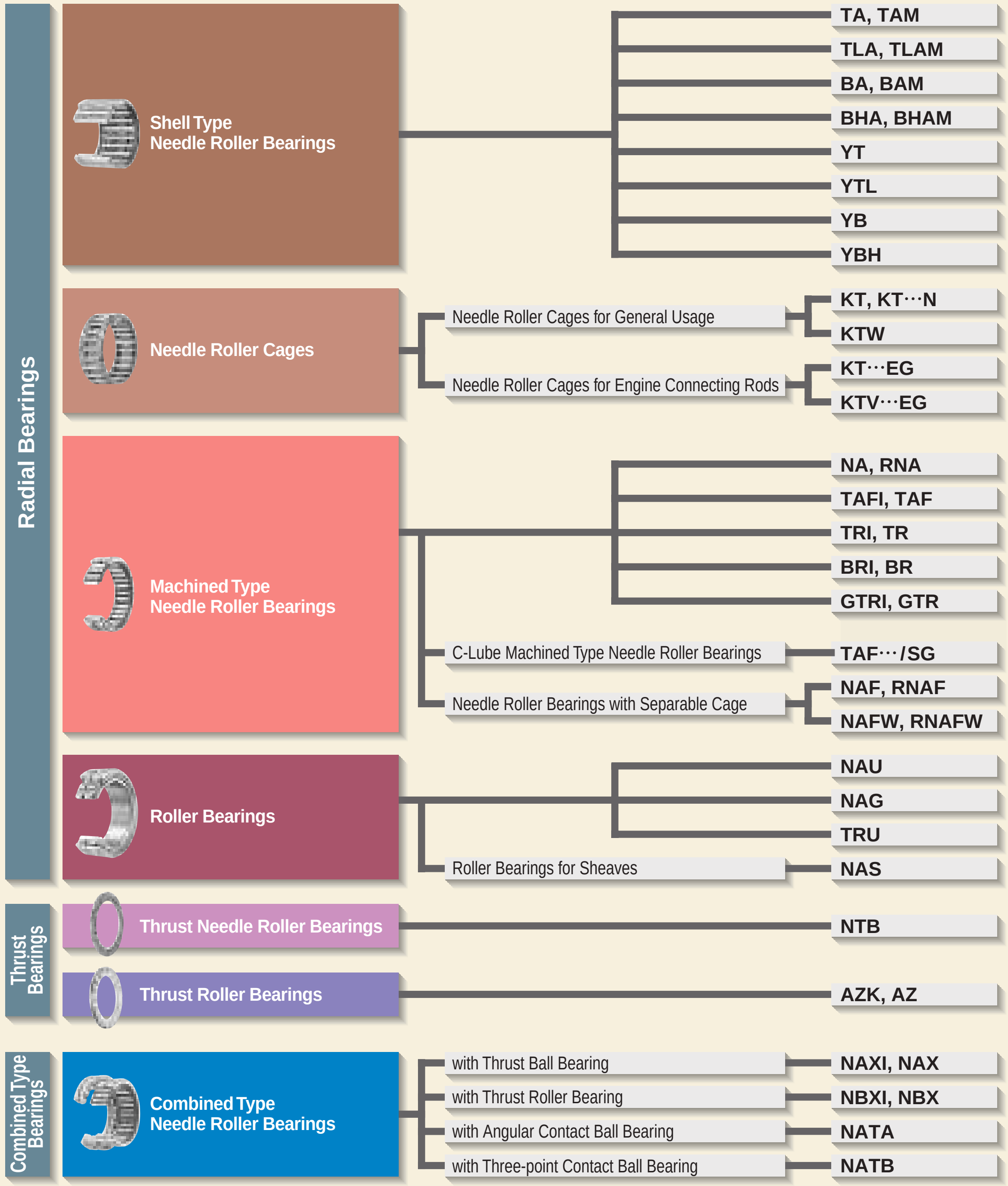
M

Types and Features of Bearings

IKO Bearings can be roughly classified into radial bearings and thrust bearings according to applicable load direction. Radial Bearings are grouped into Shell Type Needle Roller Bearings, Machined Type Needle Roller Bearings, and various other types. Thrust Bearings are grouped into Thrust Needle Roller Bearings and Thrust Roller Bearings. Follower Bearings that are used for cam mechanisms and linear motion are grouped into Cam Followers and Roller Followers.

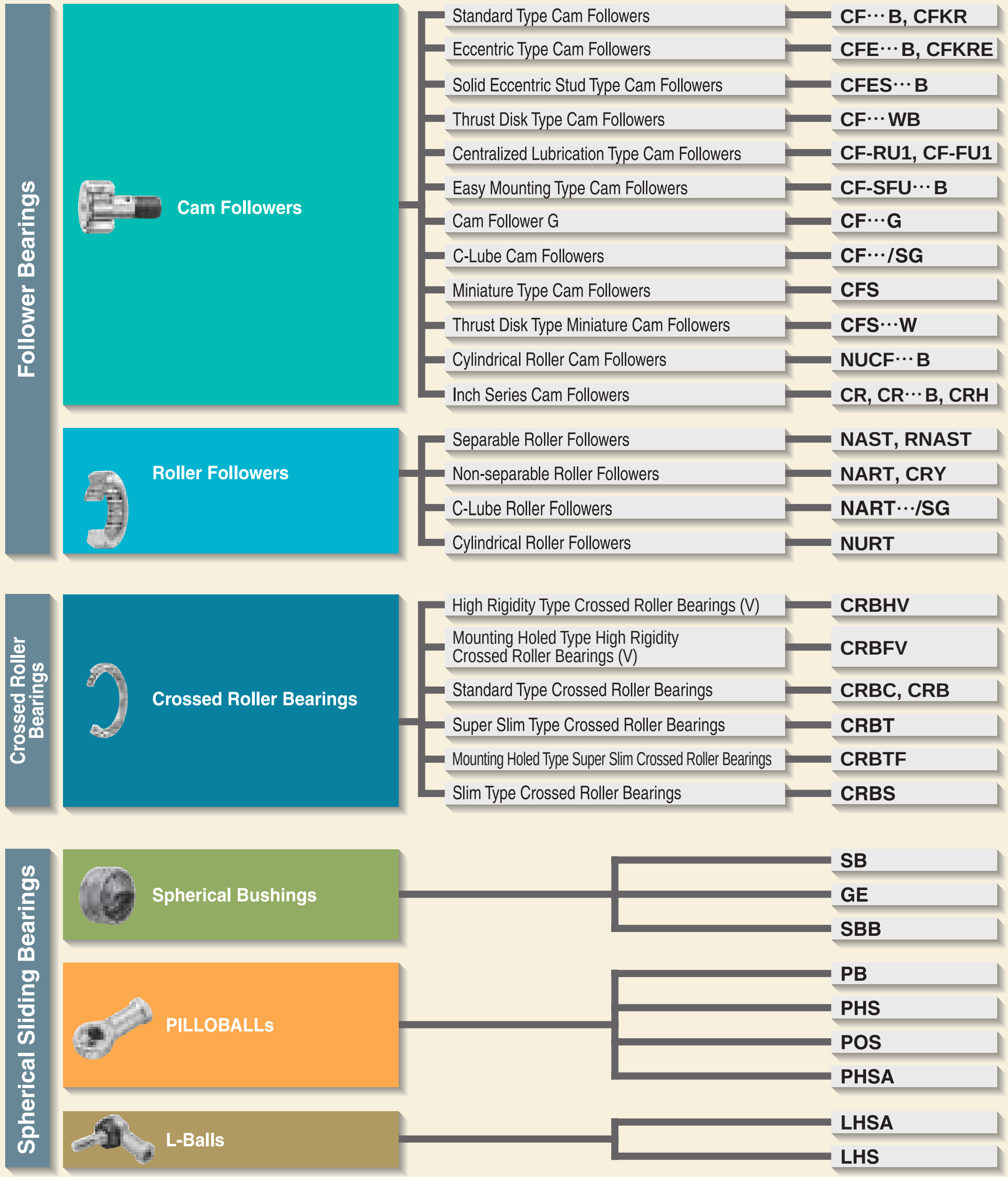
Classification of IKO Bearings



- **Radial Bearings**
  - **Shell Type Needle Roller Bearings**
    - **TA, TAM**
    - **TLA, TLAM**
    - **BA, BAM**
    - **BHA, BHAM**
    - **YT**
    - **YTL**
    - **YB**
    - **YBH**
  - **Needle Roller Cages**
    - Needle Roller Cages for General Usage
      - **KT, KT···N**
      - **KTW**
    - Needle Roller Cages for Engine Connecting Rods
      - **KT···EG**
      - **KTV···EG**
  - **Machined Type Needle Roller Bearings**
    - **NA, RNA**
    - **TAFI, TAF**
    - **TRI, TR**
    - **BRI, BR**
    - **GTRI, GTR**
    - C-Lube Machined Type Needle Roller Bearings
      - **TAF···/SG**
    - Needle Roller Bearings with Separable Cage
      - **NAF, RNAF**
      - **NAFW, RNAFW**
  - **Roller Bearings**
    - **NAU**
    - **NAG**
    - **TRU**
    - Roller Bearings for Sheaves
      - **NAS**
- **Thrust Bearings**
  - **Thrust Needle Roller Bearings**
    - **NTB**
  - **Thrust Roller Bearings**
    - **AZK, AZ**
- **Combined Type Bearings**
  - **Combined Type Needle Roller Bearings**
    - with Thrust Ball Bearing
      - **NAXI, NAX**
    - with Thrust Roller Bearing
      - **NBXI, NBX**
    - with Angular Contact Ball Bearing
      - **NATA**
    - with Three-point Contact Ball Bearing
      - **NATB**

Crossed Roller Bearings are special shape bearings that can simultaneously receive loads in all directions with a single bearing.

Bearings other than rolling bearings, such as self-aligning Spherical Bushings that can support radial loads and axial loads and PILLOBALLs and L-Balls that are used for link mechanisms, are also available.



- **Follower Bearings**
  - **Cam Followers**
    - Standard Type Cam Followers — **CF···B, CFKR**
    - Eccentric Type Cam Followers — **CFE···B, CFKRE**
    - Solid Eccentric Stud Type Cam Followers — **CFES···B**
    - Thrust Disk Type Cam Followers — **CF···WB**
    - Centralized Lubrication Type Cam Followers — **CF-RU1, CF-FU1**
    - Easy Mounting Type Cam Followers — **CF-SFU···B**
    - Cam Follower G — **CF···G**
    - C-Lube Cam Followers — **CF···/SG**
    - Miniature Type Cam Followers — **CFS**
    - Thrust Disk Type Miniature Cam Followers — **CFS···W**
    - Cylindrical Roller Cam Followers — **NUCF···B**
    - Inch Series Cam Followers — **CR, CR···B, CRH**
  - **Roller Followers**
    - Separable Roller Followers — **NAST, RNAST**
    - Non-separable Roller Followers — **NART, CRY**
    - C-Lube Roller Followers — **NART···/SG**
    - Cylindrical Roller Followers — **NURT**
- **Crossed Roller Bearings**
  - **Crossed Roller Bearings**
    - High Rigidity Type Crossed Roller Bearings (V) — **CRBHV**
    - Mounting Holed Type High Rigidity Crossed Roller Bearings (V) — **CRBFV**
    - Standard Type Crossed Roller Bearings — **CRBC, CRB**
    - Super Slim Type Crossed Roller Bearings — **CRBT**
    - Mounting Holed Type Super Slim Crossed Roller Bearings — **CRBTF**
    - Slim Type Crossed Roller Bearings — **CRBS**
- **Spherical Sliding Bearings**
  - **Spherical Bushings**
    - **SB**
    - **GE**
    - **SBB**
  - **PILLOBALLs**
    - **PB**
    - **PHS**
    - **POS**
    - **PHSA**
  - **L-Balls**
    - **LHSA**
    - **LHS**

Shell Type Needle Roller Bearings

Shell Type Needle Roller Bearings are lightweight with the lowest sectional height among needle roller bearings with outer ring, because they employ a shell type outer ring made from a thin special-steel plate which is accurately drawn, carburized and quenched.
Since these bearings are press-fitted into the housing, no axial positioning fixtures are required. They are ideal for use in mass-produced articles that require economy.

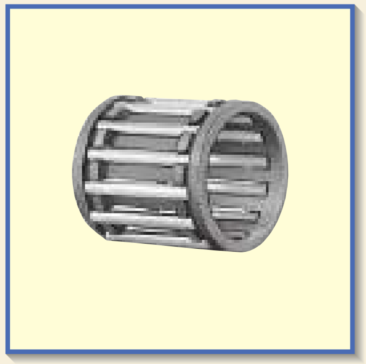
Radial Bearings Page B1

Needle Roller Cages for General Usage

Needle Roller Cages for General Usage are bearings that display excellent rotational performance. Their specially shaped cages with high rigidity and accuracy, precisely guide the needle rollers.
Since needle rollers with extremely small dimensional variations in diameter are incorporated and retained, Needle Roller Cages for General Usage are useful in small spaces when combined with shafts and housing bores that are heat treated and accurately ground as raceway surfaces.

Radial Bearing Page C1

Needle Roller Cages for Engine Connecting Rods



Needle Roller Gages for Engine Connecting Rods are used for motor cycles, small motor vehicles, outboard marines, snow mobiles, general-purpose engines, high-speed compressors, etc. that are operated under extremely severe and complex operating conditions such as heavy shock loads, high speeds, high temperatures, and stringent lubrication.
Needle Roller Cages for Engine Connecting Rods are lightweight and have high load ratings and high rigidity as well as superior wear resistance.

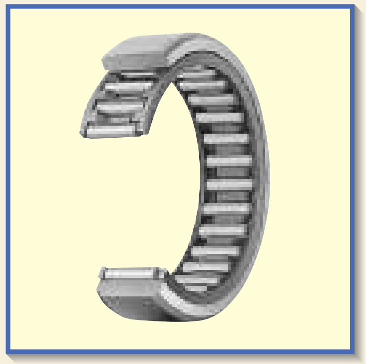
Radial Bearing Page C17

Machined Type Needle Roller Bearings

Machined Type Needle Roller Bearings have an outer ring made by machining, heat treatment, and grinding. The outer ring has stable high rigidity and can be easily used even for light alloy housings.
These bearings are available in various types and optimally selectable for different conditions such as heavy loads, high-speed rotation and low-speed rotation. They are most suitable for general-purpose applications.

Radial Bearing Page D1

Needle Roller Bearings with Separable Cage



In Needle Roller Bearings with Separable Cage, the inner ring, outer ring and Needle Roller Cage are combined, and they can be separated easily. This type has a simple structure with high accuracy. In addition, the radial clearance can be freely selected by choosing an assembly combination.
These bearings have excellent rotational performance, because Needle Roller Cages are used.

Radial Bearing Page D79

Roller Bearings

Roller Bearings, in which rollers are incorporated in double rows, are non-separable heavy-duty bearings. They can withstand not only radial loads but axial loads as well, which are supported at the contacts between the shoulders of inner and outer rings and the end faces of rollers. Therefore, they are most suitable for use at the fixing side of a shaft.

Radial Bearing Page E1

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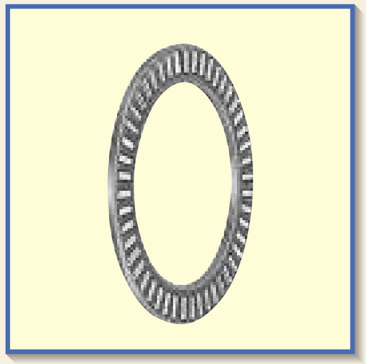
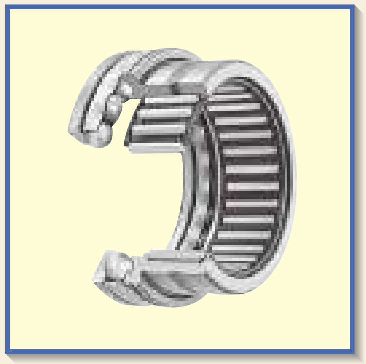
Thrust Bearings



Thrust Bearings consist of a precisely made cage and rollers, and can receive axial loads. They have high rigidity and high load capacities and can be used in small spaces.
Thrust Needle Roller Bearings use needle rollers, while Thrust Roller Bearings use cylindrical rollers.

Thrust Bearing Page F1

Combined Type Needle Roller Bearings



Combined Type Needle Roller Bearings are combinations of a radial bearing and a thrust bearing. Caged Needle Roller Bearings are used as radial bearings and Thrust Ball Bearings or Thrust Roller Bearings are used as thrust bearings.
They can be subjected to radial loads and axial loads simultaneously.

Combined Type Bearing Page G1

Inner Rings

Inner Rings are heat-treated and finished by grinding to a high degree of accuracy and are used for Needle Roller Bearings.
In the case of Needle Roller Bearings, normally the shafts are heat-treated and finished by grinding and used as raceway surfaces. However, when it is impossible to make shaft surfaces according to the specified surface hardness or surface roughness, Inner Rings are used.

Component part Page H1

Cam Followers

Cam Followers are bearings with a stud incorporating needle rollers in a thick walled outer ring.
They are designed for outer ring rotation, and the outer rings run directly on mating cam guide surfaces.
Various types of Cam Followers are available. They are widely used as follower bearings for cam mechanisms and for linear motions.

Follower Bearing Page I1

Roller Followers

Roller Followers are bearings in which needle rollers are incorporated in a thick walled outer ring.
These bearings are designed for outer ring rotation, and the outer rings run directly on mating cam guide surfaces.
They are used as follower bearings for cam mechanisms and for linear motions.

Follower Bearing Page I81

Crossed Roller Bearings

Crossed Roller Bearings are high-rigidity and compact bearings with their cylindrical rollers alternately crossed at right angles to each other between inner and outer rings. A single Crossed Roller Bearing can take loads from any directions at the same time such as radial, thrust, and moment loads.
These bearings are widely used in the rotating parts of industrial robots, machine tools, medical equipment, etc. which require compactness, high rigidity and high rotational accuracy.

Crossed Roller Bearing Page J1

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Spherical Bushings

Spherical Bushings are self-aligning spherical plain bushings, which have inner and outer rings with spherical sliding surfaces. They can take a large radial load and a bi-directional axial load at the same time.
They are divided into steel-on-steel types that are suitable for applications where there are alternate loads or shock loads, and maintenance-free types which require no lubrication.

Spherical Sliding Bearing Page K1

PILLOBALLs

PILLOBALLs are compact self-aligning spherical plain bushings which can support a large radial load and a bi-directional axial load at the same time.
PILLOBALL Rod Ends have either a female thread in the body or a male thread on the body, so they can be easily assembled onto machines.
PILLOBALLs are used in control and link mechanisms in machine tools, textile machines, packaging machines, etc.

Spherical Sliding Bearing Page K29

L-Balls

L-Balls are self-aligning rod-ends consisting of a special zinc die-cast alloy body and a studded ball which has its axis at right-angles to the body.
They can perform tilting movement and rotation with low torque, and transmit power smoothly due to the uniform clearance between the sliding surfaces.
They are used in link mechanisms in automobiles, construction machinery, farm and packaging machines, etc.

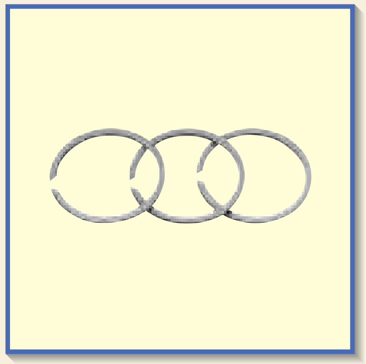
Spherical Sliding Bearing Page K45

Seals for Needle Roller Bearings

Seals for Needle Roller Bearings have a low sectional height and consist of a sheet metal ring and special synthetic rubber.
As these seals are manufactured to the same sectional height as Needle Roller Bearings, grease leakage and the penetration of foreign particles can be effectively prevented by fitting them directly to the sides of combinable bearings.

Component Part Page L1

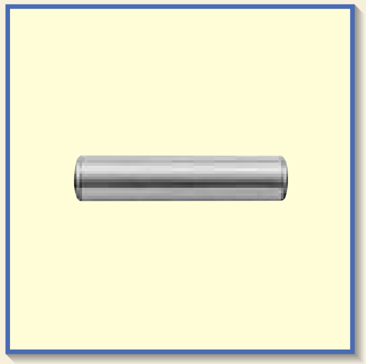
Cir-clips for Needle Roller Bearings



Cir-clips for Needle Roller Bearings have been specially designed for needle roller bearings on which, in many cases, generally available Cir-clips cannot be used. They have a low sectional height and are very rigid.
There are Cir-clips for shafts and for bores, and they are used for positioning to prevent bearing movement in the axial direction.

Component Part Page L17

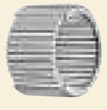
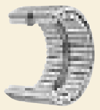
Needle Rollers



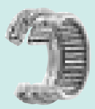
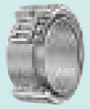
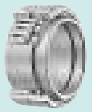
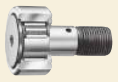
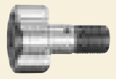
Needle Rollers are used for needle roller bearings and are rigid and highly accurate.
These needle rollers are widely used as rolling elements for bearings, and also as pins and shafts.

Component Part Page L23

Features of IKO Bearings

Bearing series		Appearance	Direction of motion	Load direction and capacity	Allowable rotational speed	Friction	Sectional height	Reference page
Shell Type Needle Roller Bearings	Caged type		↻	↓↑	○	○	◎	B1～
	Full complement type		↻	↓↑	△	△	◎	
Needle Roller Cages	For general usage		↻	⇩⇧	◎	◎	◎	C1～
	For engine connecting rods		↻	⇩⇧	◎	◎	◎	C17～
Machined Type Needle Roller Bearings	Caged type		↻	⇩⇧	○	◎	○	D1～
	Full complement type		↻	⬇⬆	△	△	○	
Needle Roller Bearings with Separable Cage	Caged type		↻	⇩⇧	◎	◎	○	D79～
Roller Bearings	Caged type		↻	⇩⇧ →←	○	○	○	E1～
	Full complement type		↻	⇩⇧ →←	△	△	○	
	For sheaves		↻	⬇⬆ →←	△	△	△	

Symbol ↻ Rotation ⇝ Oscillating motion ↓ Radial load ← Axial load ↓ Light load ⇩ Medium load ⬇ Heavy load ◎ Especially excellent ○ Excellent △ Normal

Bearing series		Appearance	Direction of motion	Load direction and capacity	Allowable rotational speed	Friction	Sectional height	Reference page
Thrust Bearings	Needle roller bearings		↻	⇦	○	○	◎	F1～
	Roller bearings		↻	⬅	○	○	○	
Combined Type Needle Roller Bearings	With thrust ball bearing		↻	⇩⇧ ⇦	○	○	△	G1～
	With thrust roller bearing		↻	⇩⇧ ⬅	○	○	△	
	With angular contact ball bearing		↻	⇩⇧ ←	○	○	○	
	With three-point contact ball bearing		↻	⇩⇧ →←	○	○	○	
Cam Followers	Caged type		↻	⇩⇧	○	○	△	I1～
	Full complement type		↻	⬇⬆	△	△	△	
Roller Followers	Separable caged type		↻	⇩⇧	○	○	△	I81～
	Non-separable caged type		↻	⇩⇧	○	○	△	
	Non-separable full complement type		↻	⬇⬆	△	△	△	

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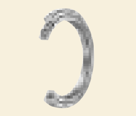
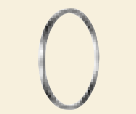
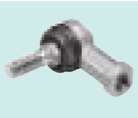
Features of IKO Bearings

Bearing series		Appearance	Direction of motion	Load direction and capacity	Allowable rotational speed	Friction	Sectional height	Reference page
Crossed Roller Bearings	Caged type, Separator type		↻	⇩ ⇦	△	○	○	J1~
	Full complement type		↻	⬇ ⬅	△	△	○	
	Slim type		↻	↓ ←	△	○	◎	
Spherical Bushings	Steel-on-steel type		↻ ⇝	⬇ ⇦	△	△	△	K1~
	Maintenance-free type		↻ ⇝	⇩ ←	△	△	△	
PILLOBALLs	Insert type, Lubrication type		↻ ⇝	⇩ ←	△	△	△	K29~
	Die-casting type, Lubrication type		↻ ⇝	⇩ ←	△	△	△	
	Maintenance-free type		↻ ⇝	⇩ ←	△	△	△	
L-Balls	Lubrication type		↻ ⇝	⇩ ←	△	△	△	K45~

Symbol ↻ Rotation ⇝ Oscillating motion ↓ Radial load ← Axial load ↓ Light load ⇩ Medium load ⬇ Heavy load ◎ Especially excellent ○ Excellent △ Normal

Outline of Bearing Selection

IKO Bearings are available in many types and sizes. To obtain satisfactory bearing performance in machines and equipment, it is essential to select the most suitable bearing by carefully studying the requirements for the application. Although there is no particular procedure or rule for bearing selection, an example of a commonly adopted procedure is shown in the figure below.

An example of procedure for bearing selection

1 *Confirmation of requirements and operating conditions*

- Identify the machine and place where the bearing is to be used.
- Confirm the requirements for bearings such as required bearing performance, and also confirm the operating conditions and special environment conditions.

2 *Selection of bearing type*

- Select the bearing type suitable for the operating conditions by considering load direction and magnitude, rigidity, friction, allowable rotational speed, bearing space, etc.

See page A5

3 *Selection of bearing dimensions*

- Select the bearing dimensions by calculating bearing load, life, static safety factor, etc.

See page A17

4 *Selection of accuracy class, etc.*

- Select the accuracy as required by the machine or equipment.

See page A30

5 *Selection of radial clearance and fit*

- Select the radial clearance considering the fit, temperature, rotational speed, inclination of the inner and outer rings, etc.

See page A37

6 *Determination of bearing dimensions, accuracy, radial clearance and fit*

7 *Selection of lubrication and dust-proof methods*

- Select oil or grease lubrication.
- After selection of lubricant, in case of oil lubrication, select the oil application method.
- Select the sealing method according to the lubricant.

See page A49

8 *Design of surrounding part*

- Design the surrounding part based on how to mount or dismount and based on mounting dimensions.

See page A57

9 *Determination of final specifications of the bearing and the surrounding part*

Basic Dynamic Load Rating and Life

Life

Rolling bearings will suffer damage due to various causes during service. Damage such as abnormal wear, seizure, and cracks is caused by improper use, including incorrect mounting, lack of oil, dust intrusion and so on, and can be avoided by remedying these causes. However, bearings will eventually be damaged due to fatigue-flaking even if used properly. When a bearing rotates under load, the raceways and the rolling elements are subjected to repeated stresses concentrated on the part close to the surface. Fatigue, therefore, occurs in the surface layer, producing damage in the form of scaling. This is called flaking (spalling). When this occurs, the bearing can no longer be used.

Bearing Life

Bearing life is defined as the total number of revolutions (or total service hours at a constant rotational speed) before a sign of the first flaking appears on the rolling surface of raceway or rolling elements. However, even when bearings of the same size, structure, material and heat treatment are subjected to the same conditions, the bearing lives will show variation (See Fig. 1.). This results from the statistical nature of the fatigue phenomenon.

In selecting a bearing, it is incorrect to take an average life for all bearings as the design standard. It is more practical to consider a bearing life that is reliable for the greater proportion of bearings used. Therefore, the basic rating life defined in the following is used.

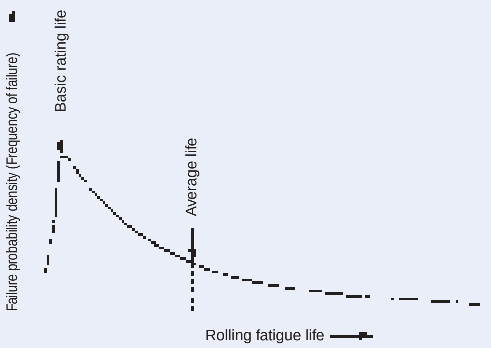


Fig. 1 Variation of rolling fatigue life

Basic rating life

The basic rating life is defined as the total number of revolutions that 90% of a group of identical bearings can be operated individually under the same conditions free from any material damage caused by rolling fatigue.

For rotation at a constant rotational speed, the basic rating life can be represented by the total service hours.

Basic dynamic load rating

The basic dynamic load rating is defined as the constant radial load (in the case of radial bearings) or the constant axial load acting along the bearing central axis (in the case of thrust bearings) that allows a basic rating life of 1,000,000 revolutions.

Calculation of rating life

The relationship among the basic rating life, basic dynamic load rating and dynamic equivalent load (bearing load) of rolling bearings is as follows:

$$L_{10}=\left(\frac{C}{P}\right)^{p} \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (1)$$

where, L_{10} : Basic rating life, 10^6 rev.
C : Basic dynamic load rating, N
P : Dynamic equivalent load, N
p : Exponent, Roller bearing: 10/3
Ball bearing: 3

Accordingly, when the rotational speed per minute is given, the basic rating life is represented as the total service hours according to the following equations:

$$L_{\mathrm{h}}=\frac{10^6 L_{10}}{60n}=500\, f_{\mathrm{h}}^{\,p} \cdots\cdots\cdots\cdots\cdots (2)$$

$$f_{\mathrm{h}}=f_{\mathrm{n}}\frac{C}{P} \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (3)$$

$$f_{\mathrm{n}}=\left(\frac{33.3}{n}\right)^{1/p} \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (4)$$

where, L_{h} : Basic rating life represented by service hours, h
n : Rotational speed, min^{-1}
f_{h} : Life factor
f_{n} : Velocity factor

In addition, the rating life can be calculated by obtaining f_{h} and f_{n} from the life calculation scales of Fig. 2.

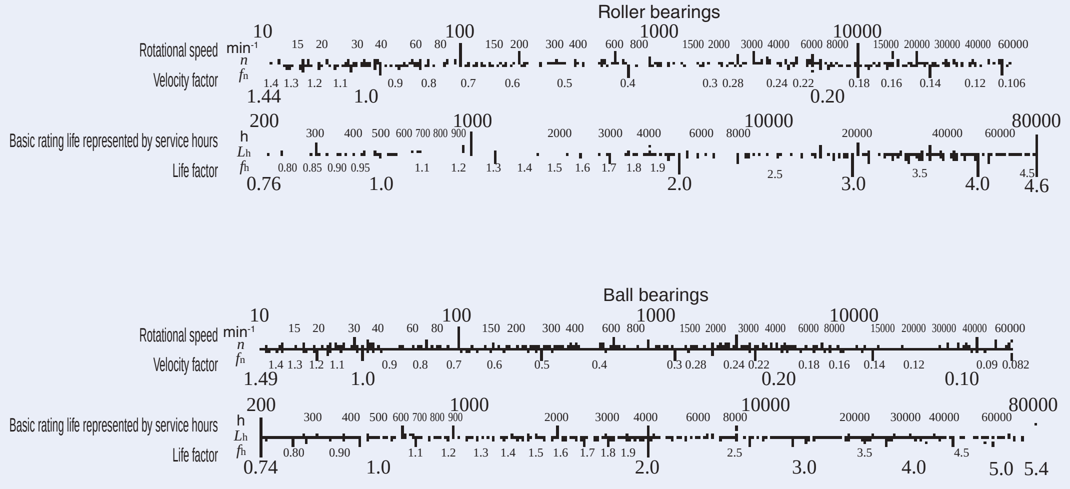


Fig. 2 Scales for rating life calculation

Bearing life factors for various machines

The required life of the bearing must be determined according to the machine in which the bearing is to be used and the operating conditions.

Table 1 shows reference values of life factors for selecting a bearing for each machine.

Table 1 Life factor of bearings f_{h} for various machines

Operating conditions	Machine and life factor f_{h}				
	～3	2～4	3～5	4～7	6～
Occasional or short term usage	・Power tools	・Agricultural machines			
Infrequent usage but requiring reliable operation		・Construction machinery	・Conveyors ・Elevators		
Intermittent operation but for comparatively long periods	・Roll neck of rolling mills	・Small motors ・Deck cranes ・General cargo cranes ・Passenger cars	・Factory motors ・Machine tools ・General gear units ・Printing machines	・Crane sheaves ・Compressors ・Important gear units	
Operated in excess of 8 hours per day or continuously for an extended time		・Escalators	・Centrifugal separators ・Blowers ・Wood working machines ・Plastic extruding machines		・Paper making machines
Continuous use for 24 hours and accidental stops not allowed					・Water supply equipment ・Power station equipment

Life of oscillating bearing

The life of an oscillating bearing can be obtained from equation (5).

$$L_{OC} = \frac{90}{\theta}\left(\frac{C}{P}\right)^{p} \cdots\cdots\cdots\cdots (5)$$

where, L_{OC} : Basic rating life of oscillating bearing, 10^6 cycles
2θ : Oscillating angle, deg. (See Fig.3)
P : Dynamic equivalent load, N

Therefore, when the oscillating frequency $n_1$min^{-1} is given, the basic rating life as represented by total oscillating hours can be obtained by substituting n_1 for n in equation (2) on page A17.
When 2θ is small, an oil film cannot be formed easily between the contact surfaces of the raceway and the rolling elements. This may cause fretting corrosion. In this case, please consult IKO.

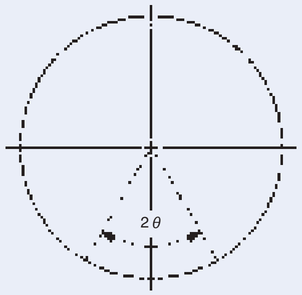


Fig. 3 Oscillating motion

Corrected rating life

When a rolling bearing is used in ordinary applications, the basic rating life can be calculated by equations (1) and (2) mentioned previously.
This basic rating life applies to bearings which require a reliability of 90%, have ordinary bearing properties being made of materials of ordinary quality for rolling bearings, and are used under ordinary operating conditions.
In some applications, however, it is necessary to obtain a rating life that applies to bearings which require high reliability, have special bearing properties or are used under special operating conditions. The corrected rating life for these special cases can be obtained from the following equation by using the bearing life adjustment factors a_1, a_2 and a_3, respectively.

$$L_{na} = a_1 a_2 a_3 L_{10} \cdots\cdots\cdots\cdots (6)$$

where, L_{na} : Corrected rating life, 10^6 rev.
a_1 : Life adjustment factor for reliability
a_2 : Life adjustment factor for special bearing properties
a_3 : Life adjustment factor for operating conditions

Life adjustment factor for reliability a_1

The reliability of rolling bearings is defined as the proportion of bearings having a life equal to or greater than a certain specified value when a group of identical bearings are operated under identical conditions. With respect to individual bearings, it refers to the probability of the life of a bearing being equal to or greater than a certain specified value.
The corrected rating life for a reliability of (100-n)% can be obtained using equation (6). Table 2 shows the values of the life adjustment factor a_1 for various reliabilities.

Table 2 Life adjustment factor for reliability a_1

Reliability %	L_n	a_1
90	L_{10}	1
95	L_5	0.62
96	L_4	0.53
97	L_3	0.44
98	L_2	0.33
99	L_1	0.21

Life adjustment factor for special bearing properties a_2

The bearing life is extended or shortened according to the quality of the material, the manufacturing technology of the bearing and its internal design. For these special bearing life properties, the life is corrected by the life adjustment factor for special bearing properties a_2.
The table of dimensions for IKO Bearings shows the values of the basic dynamic load rating which are determined taking into consideration the fact that bearing life has been extended by improved quality of materials and advances in manufacturing technologies. Therefore, the bearing life is calculated using equation (6) usually assuming $a_2 = 1$.

Life adjustment factor for operating conditions a_3

This factor helps take into account the effects of operating conditions, especially lubrication on the bearing. The bearing life is limited by the phenomenon of fatigue which occurs, in general, beneath surfaces subjected to repeated stresses. Under good lubrication conditions where the rolling element and raceway surfaces are completely separated by an oil film and surface damage can be disregarded, a_3 is set to be 1. However, when conditions of lubrication are not good, namely, when the viscosity of the lubricating oil is low or the peripheral speed of the rolling elements is especially low, and so on, $a_3 < 1$ is used.
On the other hand, when lubrication is especially good, a value of $a_3 > 1$ can be used. When lubrication is not good and $a_3 < 1$ is used, the life adjustment factor a_2 cannot generally exceed 1.

When selecting a bearing according to the basic dynamic load rating, it is recommended that a suitable value for reliability factor a_1 is chosen for each application. The selection should be made using the (C/P) or f_h values determined by machine type and based upon the actual conditions of lubrication, temperature, mounting, etc., which have already been experienced and observed in the same type of machines.

Limiting conditions

These bearing life equations are applicable only when the bearing is mounted and lubricated normally without intrusion of foreign materials and not used under extreme operating conditions.
Unless these conditions are satisfied, the life may be shortened. For example, it is necessary to separately consider the effects of bearing mounting errors, excessive deformation of housing and shaft, centrifugal force acting on rolling elements at high-speed revolution, excessive preload, especially large radial internal clearance of radial bearings, etc.
When the dynamic equivalent load exceeds 1/2 of the basic dynamic load rating, the life equations may not be applicable.

Correction of basic dynamic load rating for temperature and hardness

Temperature factor

The operating temperature for each bearing is determined according to its material and structure. If special heat treatment is performed, bearings can be used at temperatures higher than +150°C. As the allowable contact stress gradually decreases when the bearing temperature exceeds 150°C, the basic dynamic load rating is lowered and can be obtained by the following equation:

$$C_t = f_t\, C \cdots\cdots\cdots\cdots (7)$$

where, C_t : Basic dynamic load rating considering temperature rise, N
f_t : Temperature factor (See Fig. 4.)
C : Basic dynamic load rating, N

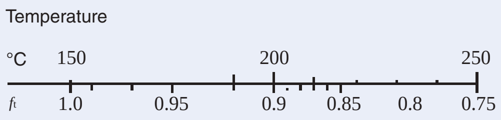


Fig. 4 Temperature factor

Further, if the bearing is used at high temperature, i.e. 120˚C or above, the amount of dimensional displacement gets larger. So special heat treatment is necessary. If needed, please contact IKO.

Hardness factor

When the shaft or housing is used as the raceway surface instead of the inner or outer ring, the surface hardness of the part used as the raceway surface should be 58 ～ 64HRC.
If it is less than 58HRC, the basic dynamic load rating is lowered and can be obtained by the following equation:

$$C_H = f_H\, C \cdots\cdots\cdots\cdots (8)$$

where, C_H : Basic dynamic load rating considering hardness, N
f_H : Hardness factor (See Fig. 5.)
C : Basic dynamic load rating N

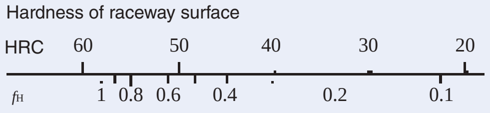


Fig. 5 Hardness factor

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Basic Static Load Rating and Static Safety Factor

Basic static load rating

When a bearing at rest sustains a heavy load or a bearing rotating at a relatively low speed receives a heavy shock load, the contact stress may exceed a certain limiting value, producing a local permanent deformation in the raceways or the rolling elements, and subsequently causing noise or vibration or lowering the rotating performance. The basic static load rating is, therefore, determined as a guideline for the maximum allowable load for the bearing at rest, under which the permanent deformation will not exceed a certain limit value, and the lowering of the rotating performance will not occur. Its definition is given as follows.

The basic static load rating is the static load that gives the contact stress shown in Table 3 at the center of the contact area of the rolling element and the raceway receiving the maximum load. A radial load constant in direction and magnitude is used in the case of radial bearings, while an axial load constant in magnitude acting along the bearing central axis is used in the case of thrust bearings.

Table 3

Type of bearing	Contact stress MPa
Roller bearings	4 000
Self-aligning ball bearings	4 600
Other ball bearings	4 200

Static safety factor

The basic static load rating gives the theoretical allowable limit of the static equivalent load. Normally, this limit is corrected by considering the operating conditions and the requirements for the bearing. The correction factor, namely, the static safety factor f_s is defined as in the following equation and its general values are shown in Table 4.

$$f_s = \frac{C_0}{P_0} \quad \cdots\cdots(9)$$

where, C_0 : Basic static load rating, N
P_0 : Static equivalent load, N

Table 4 Static safety factor

Operating conditions of the bearing	f_s
When high rotational accuracy is required	≧ 3
For ordinary operation conditions	≧ 1.5
For ordinary operation conditions not requiring very smooth rotation When there is almost no rotation	≧ 1

In case of Shell Type Needle Roller Bearings of which outer ring is drawn from a thin steel plate and then carburized and quenched, it is necessary to use a static safety factor of 3 or more.

Calculation of Bearing Loads

The loads acting on bearings include the weight of the machine parts supported by the bearings, the weight of the rotating body, loads produced when operating the machine, loads by belts or gears transmitting power, and various other loads.

These loads can be divided into radial loads perpendicular to the central axis of the bearings and axial loads parallel to the central axis, and they act independently or in combination with other loads. In addition, the magnitude of vibration or shocks on the bearings varies depending on the application of the machine. Thus, theoretically calculated loads may not always be accurate and have to be corrected by multiplying various empirical factors to obtain the actual bearing loads.

Load distribution to bearings

Table 5 shows examples of calculations where static loads are acting in radial direction.

Load factor

Although radial loads and axial loads can be obtained by calculation, it is not unusual for the actual bearing loads to exceed the calculated loads, due to vibration and shocks produced when operating the machine. The actual bearing load is obtained from the following equation, by multiplying the calculated load by the load factor:

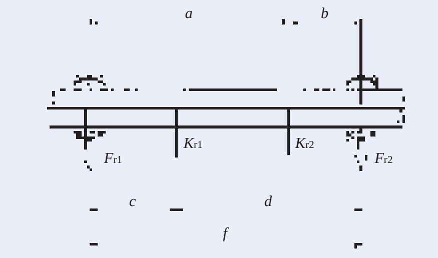
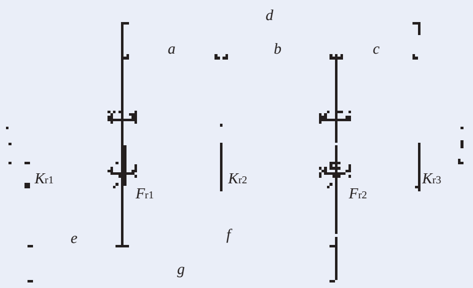
$$F = f_w F_c \quad \cdots\cdots(10)$$

where, F : Bearing load, N
f_w : Load factor (See Table 6.)
F_c : Theoretically calculated load, N

Table 6 Load factor

Operating conditions	Example	f_w
Smooth operation without shocks	Electric motors, Air conditioning equipment, Measuring instruments, Machine tools	1 ～1.2
Ordinary operation	Reduction gearboxes, Vehicles, Textile machinery, Paper making machinery	1.2～1.5
Operation subjected to vibration and shocks	Rolling mills, Rock crushers, Construction machinery	1.5～3

Table 5 Load distribution to bearings

Example	Bearing load
	$F_{r1} = \dfrac{dK_{r1} + bK_{r2}}{f}$ $F_{r2} = \dfrac{cK_{r1} + aK_{r2}}{f}$
	$F_{r1} = \dfrac{gK_{r1} + bK_{r2} - cK_{r3}}{f}$ $F_{r2} = \dfrac{aK_{r2} + dK_{r3} - eK_{r1}}{f}$

Bearing loads in case of belt or chain transmission

When power is transmitted by a belt or chain, the load acting on the pulley or sprocket wheel is obtained from the following equations:

$$T=9550000\,\frac{H}{n} \quad \cdots\cdots(11)$$

$$K_t=\frac{T}{R} \quad \cdots\cdots(12)$$

where, T : Torque acting on pulley or sprocket wheel, N-mm
K_t : Effective transmitting force of belt or chain, N
H : Transmitting power, kW
n : Rotational speed, min^{-1}
R : Effective radius of pulley or sprocket wheel, mm

For belt transmission, the load K_r acting on the pulley shaft is obtained from the following equation, multiplying the effective transmitting force K_t by the belt factor f_b shown in Table 7.

$$K_r=f_b K_t \quad \cdots\cdots(13)$$

Table 7 Belt factor

Type of belt	f_b
V-belts	2 ～2.5
Timing belts	1.3～2
Plain belts (with tension pulley)	2.5～3
Plain belts	4 ～5

In the case of chain transmission, a value of 1.2 to 1.5 is taken as the chain factor corresponding to f_b. The load acting on the sprocket wheel shaft is obtained from equation (13) in the same manner as the belt transmission.

Bearing loads in case of gear transmission

When power is transmitted by gears, the force acting on the gears varies according to the type of gear. Spur gears produce radial loads only, but helical gears, bevel gears and worm gears produce axial loads in addition to radial loads. Taking the simplest case of spur gears as an example, the bearing load is obtained from the following equations:

$$T=9550000\,\frac{H}{n} \quad \cdots\cdots(14)$$

$$K_t=\frac{T}{R} \quad \cdots\cdots(15)$$

$$K_s=K_t\tan\theta \quad \cdots\cdots(16)$$

$$K_c=\sqrt{K_t{}^2+K_s{}^2}=K_t\sec\theta \quad \cdots\cdots(17)$$

where, T : Torque applied to gear, N-mm
K_t : Tangential force acting on gear, N
K_s : Radial force acting on gear, N
K_c : Resultant normal force on gear tooth surface, N
H : Transmitting power, kW
n : Rotational speed, min^{-1}
R : Pitch circle radius of drive gear, mm
θ : Pressure angle of gear, deg.

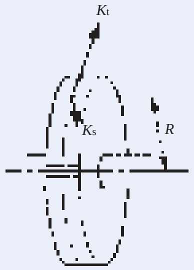


Fig. 6

In this case, the resultant normal force on the tooth surface acts as the radial force to the shaft and the magnitude of vibration or shocks varies depending on the accuracy and surface finish of the gear. Therefore, the radial load K_r applied to the shaft is obtained from the following equation, multiplying the resultant normal force K_c on gear tooth surface by the gear factor f_z shown in Table 8.

$$K_r=f_z\,K_c \quad \cdots\cdots(18)$$

Table 8 Gear factor

Type of gear	f_z
Precision gears (Pitch error and form error: Less than 0.02mm)	1.05～1.1
Ordinary machined gears (Pitch error and form error: 0.02～0.1mm)	1.1 ～1.3

Mean equivalent load corresponding to fluctuating load

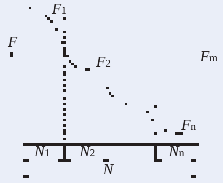
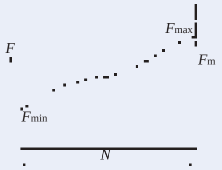
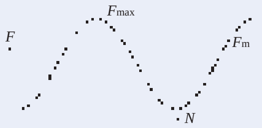
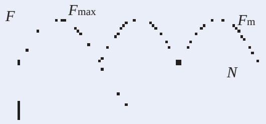
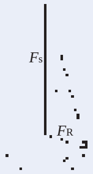
When the load applied to the bearing fluctuates, the bearing life is calculated by using the mean equivalent load F_m, which is a constant load that will give the bearing a life equal to that produced under the fluctuating load. The mean equivalent load is obtained from the following equation:

$$F_m=\sqrt[p]{\frac{1}{N}\int_0^N F_n{}^p\,dN} \quad \cdots\cdots(19)$$

where, F_m : Mean equivalent load, N
N : Total number of revolutions, rev.
F_n : Fluctuating load, N
p : Exponent, Roller bearing = 10/3
Ball bearing = 3

Table 9 shows examples of the calculation of mean equivalent loads for various fluctuating loads.

Table 9 Mean equivalent load for the fluctuation load

Type of fluctuating load		Mean equivalent load F_m
Step load		$F_m=\sqrt[p]{\frac{1}{N}(F_1{}^p N_1+F_2{}^p N_2+\cdots+F_n{}^p N_n)}$ where, N_1 : Total number of revolutions under load F_1 rev. N_2 : Total number of revolutions under load F_2 rev. N_n : Total number of revolutions under load F_n rev.
Monotonously changing load		$F_m=\frac{1}{3}(2F_{max}+F_{min})$ where, F_{max} : Maximum value of fluctuating load, N F_{min} : Minimum value of fluctuating load, N
Sinusoidally fluctuating load		$F_m \fallingdotseq 0.65F_{max}$
		$F_m \fallingdotseq 0.75F_{max}$
Stationary load plus rotating load		$F_m=F_S+F_R-\frac{F_S F_R}{F_S+F_R}$ where, F_S : Stationary load, N F_R : Rotating load, N

Equivalent load

The loads applied to the bearing are divided into radial loads that are applied perpendicular to the central axis and axial loads that are applied in parallel to the central axis. These loads act independently or in combination with other loads.

Dynamic equivalent load

When both radial load and axial load are applied to the bearing simultaneously, the virtual load, acting on the center of the bearing, that will give a life equal to that under the radial load and the axial load is defined as a dynamic equivalent load.
In the case of needle roller bearings, radial bearings receive only radial loads and thrust bearings receive only axial loads. Accordingly, radial loads are directly used in the life calculation of the radial bearings, while axial loads are directly used for the thrust bearings.

[For radial bearings]

$$P_{\mathrm{r}}=F_{\mathrm{r}} \quad \cdots\cdots(20)$$

[For thrust bearings]

$$P_{\mathrm{a}}=F_{\mathrm{a}} \quad \cdots\cdots(21)$$

where, P_{r} : Dynamic equivalent radial load, N
P_{a} : Dynamic equivalent axial load, N
F_{r} : Radial load, N
F_{a} : Axial load, N

Static equivalent load

When both radial load and axial load are applied to the bearing simultaneously, the virtual load, acting on the center of the bearing, that will produce a maximum contact stress on the contact surface between the rolling element and the raceway equal to that given by the radial load and the axial load is defined as a static equivalent load.
In the case of needle roller bearings, radial bearings receive only radial loads and thrust bearings receive only axial loads. Accordingly, radial loads are directly used for the radial bearings, while axial loads are directly used for the thrust bearings.

[For radial bearings]

$$P_{0\mathrm{r}}=F_{\mathrm{r}} \quad \cdots\cdots(22)$$

[For thrust bearings]

$$P_{0\mathrm{a}}=F_{\mathrm{a}} \quad \cdots\cdots(23)$$

where, $P_{0\mathrm{r}}$: Static equivalent radial load, N
$P_{0\mathrm{a}}$: Static equivalent axial load, N
F_{r} : Radial load, N
F_{a} : Axial load, N

Boundary Dimensions and Identification Number

Boundary dimensions

Examples of symbols for quantities indicating the boundary dimensions of IKO Needle Roller Bearings are shown below. For details, see the table of dimensions for each model.

Machined Type Needle Roller Bearing

d : Nominal bearing bore diameter
D : Nominal bearing outside diameter
B : Nominal inner ring width
C : Nominal outer ring width
F_{w} : Nominal roller set bore diameter
r : Chamfer dimensions of inner and outer rings
$r_{\mathrm{s\,min}}$: Smallest permissible single chamfer dimensions of inner and outer rings

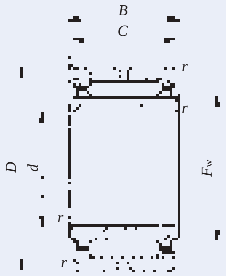


Fig. 7 Machined Type Needle Roller Bearing

Shell Type Needle Roller Bearing

D : Nominal bearing outside diameter
F_{w} : Nominal roller set bore diameter
C : Nominal outer ring width

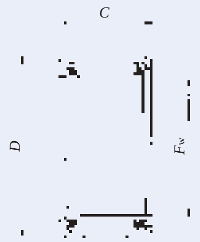


Fig. 8 Shell Type Needle Roller Bearing

Needle Roller Cage

E_{w} : Nominal roller set outside diameter
F_{w} : Nominal roller set bore diameter
B_{c} : Nominal cage width

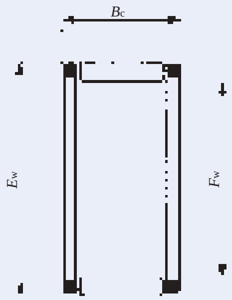


Fig. 9 Needle Roller Cage

Thrust Roller Bearing

D_{c} : Nominal cage outside diameter
d_{c} : Nominal cage bore diameter
D_{w} : Nominal roller diameter

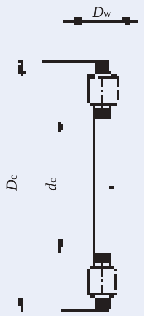


Fig. 10 Thrust Roller Bearing

Identification Number

The identification number of IKO Bearings consists of a model number and supplemental codes. The descriptions of typical codes and their arrangements are shown below. There are many codes other than those described. See the section of identification number of each bearing.

Table 10 Arrangement of identification number of bearing

Model number	Model code	❶
	Boundary dimensions	❷
Supplemental code	Material symbol	❸
	Cage symbol	❹
	Shield symbol Seal symbol,	❺
	Bearing ring shape symbol	❻
	Clearance symbol	❼
	Classification symbol	❽

❶Model code

The model code represents the bearing series. The features of each bearing series are shown on pages A5 to A15.

❷Boundary dimensions

One of the following four kinds of presentation methods is used for showing boundary dimensions in the identification number, which vary depending on the bearing series. Table 11 shows the presentation methods of boundary dimensions for each model code.

(a)Dimension series + Bore diameter number
(b)Bore diameter or roller set bore diameter + Outside diameter or roller set outside diameter + Width
(c)Bore diameter or roller set bore diameter + Width
(d)Basic diameter

❸Material symbol

Symbol	Type of material
F	Stainless steel for bearing rings and rolling elements

❹Cage symbol

Symbol	Descriptions
N	Made of synthetic resin
V	No cage or full complement

❺Seal or shield symbol

Symbol	Descriptions
Z	With dust cover
ZZ	With shields on both sides
U	With a seal on one side
UU	With seals on both sides
S(1)	With ThrustDisk Seals™
2RS	With seals on both sides

Note(1) ThrustDisk Seals™ are embedded on both sides.

❻Bearing ring shape symbol

Symbol	Descriptions
NR	With stop ring on outer surface of outer ring
OH (1)	With oil hole in bearing ring
J	No oil hole

Note(1) This differs depending on the type of bearing. See the section of each bearing.

❼Clearance symbol

Symbol	Descriptions
C2	C2 clearance
(None)	CN clearance
C3	C3 clearance
C4	C4 clearance
C5	C5 clearance
T1	Special radial clearance (Applicable to Crossed Roller Bearings)
C1	
C2	

❽Classification symbol

Symbol	Descriptions
(None)	JIS Class 0
P6	JIS Class 6
P5	JIS Class 5
P4	JIS Class 4

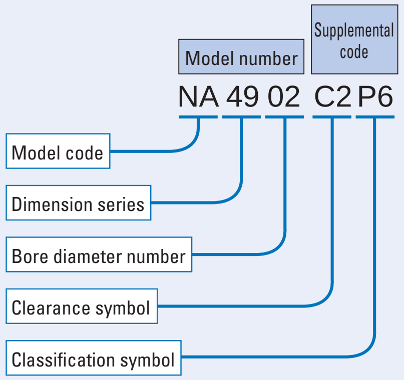
Table 11 Indication of boundary dimensions

Bearing type	Model number	
	Model code	Indication of boundary dimensions
Shell Type Needle Roller Bearings	TA, TLA, YT, YTL	Roller set bore diameter + Outer ring width
	BA, BHA, YB, YBH	Roller set bore diameter + Outer ring width (1)
Needle Roller Cages for General Usage	KT, KTW	Roller set bore diameter + Roller set outside diameter + Cage width
Needle Roller Cages for Engine Connecting Rods	KT···EG, KTV···EG	Roller set bore diameter + Roller set outside diameter + Cage width
Machined Type Needle Roller Bearings	NA, RNA	Dimension series + Bore diameter number
	TR, TAF, GTR	Roller set bore diameter + Bearing outside diameter + Bearing width
	TRI, TAFI, GTRI	Bearing bore diameter + Bearing outside diameter + Outer ring width
	BR	Roller set bore diameter + Bearing outside diameter + Bearing width (1)
	BRI	Bearing bore diameter + Bearing outside diameter + Outer ring width (1)
Needle Roller Bearings with Separable Cage	RNAF, RNAFW	Roller set bore diameter + Bearing outside diameter + Bearing width
	NAF, NAFW	Bearing bore diameter + Bearing outside diameter + Bearing width
Roller Bearings	NAU, NAG, NAS	Dimension series + Bore diameter number
	TRU	Bearing bore diameter + Bearing outside diameter + Bearing width
Thrust Bearings	NTB, AS, WS, GS	Bearing bore diameter + Bearing outside diameter
	AZ	Bearing bore diameter + Bearing outside diameter + Bearing height
	AZK	Bearing bore diameter + Bearing outside diameter + Roller diameter
Combined Type Needle Roller Bearings	NAX, NBX	Roller set bore diameter + Assembled bearing width
	NAXI, NBXI	Inner ring bore diameter + Assembled bearing width
	NATA, NATB	Dimensional series + Bore diameter number
Cam Followers	CF···B, CFS, NUCF···B	Stud diameter
	CFKR	Bearing outside diameter
	CR···B, CR, CRH···B	Bearing outside diameter (1)
Roller Followers	NAST, NART, NURT	Bearing bore diameter
	CRY	Bearing outside diameter (1)
Crossed Roller Bearings	CRBHV, CRBFV, CRBC, CRB, CRBT, CRBTF, CRBS	Bearing bore diameter + Bearing width
Spherical Bushings	SB···A, GE	Inner ring bore diameter
	SBB	Inner ring bore diameter (1)
PILLOBALLs	PB,PHS,POS,PHSB,POSB,PHSA	Inner ring bore diameter
L-Balls	LHSA, LHS	Screw size
Seals for Needle Roller Bearings	OS, DS	Shaft diameter + Seal outside diameter + Seal width
Cir-clips for Needle Roller Bearings	WR	Shaft diameter
	AR	Bore diameter

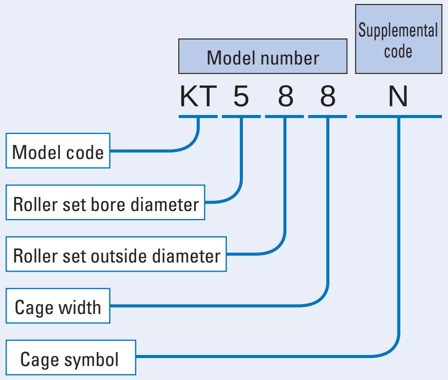
Note(1) The nominal dimensions of inch series bearings are indicated in units of 1/16 inch.

Example of identification number

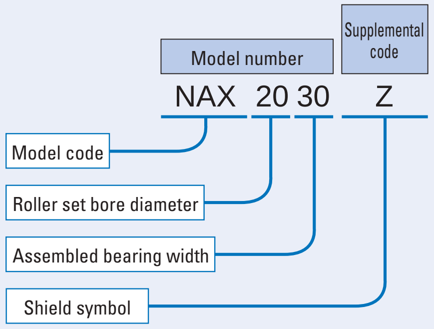
(a) Example of "Dimension series + Bore diameter number"



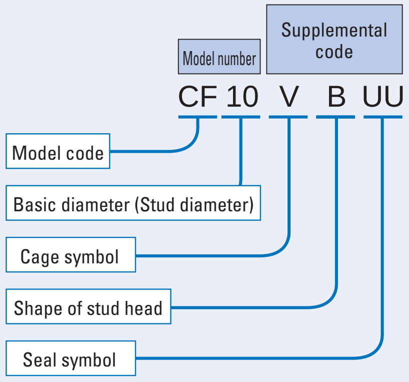
(b) Example of "Bore diameter or roller set bore diameter + Outside diameter or roller set outside diameter + width"



(c) Example of "Bore diameter or roller set bore diameter + width"



(d) Example of "Basic diameter"



Accuracy

The accuracy of IKO Needle Roller Bearings conforms to JIS B 1514-1~-3 (Rolling bearings - Tolerances of bearings), and the dimensional accuracy and rotational accuracy are specified. The specified items are shown in Fig. 11.

Needle Roller Bearings are classified into 4 classes of accuracy. These classes are represented by the numbers 0, 6, 5 and 4, written in order of increasing accuracy.

Table 12 shows the accuracy for the inner rings of radial bearings, Table 13 shows the accuracy for the outer rings of radial bearings, Table 14 shows the tolerances for the smallest single roller set bore diameter of radial bearings, and Table 15 shows the permissible limit values of chamfer dimensions of radial bearings. For thrust bearings, see the section on accuracy of Thrust Bearings. Note that the series of Shell Type Needle Roller Bearings, Roller Bearings, Cam Followers, Roller Followers, Combined Type Needle Roller Bearings, and Crossed Roller Bearings have special accuracy. For further details, see the section on accuracy of each bearing series.

Remarks

The meanings of the new symbols for quantities used for accuracy of radial bearings are as follows:

① Δ represents the deviation of a dimension from the specified value.

② V represents the variation of a dimension.

③ Suffixes $_{s}$, $_{m}$, and $_{p}$ represent a single (or actual) measurement, a mean measurement, and a measurement in a single radial plane, respectively.

[Example] V_{dp} means the difference between the largest and the smallest of the bore diameters in a single radial plane (circularity).

V_{dmp} means the difference between the largest and the smallest of the single plane mean bore diameters (cylindricity).

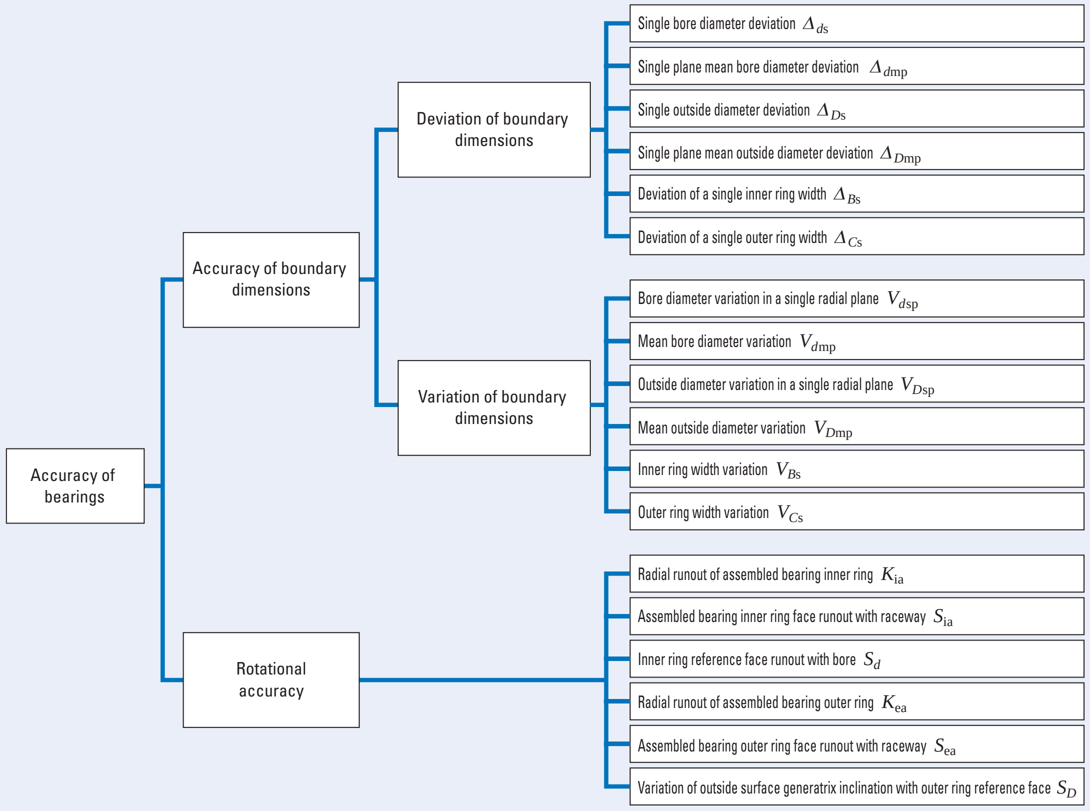


Fig. 11 Accuracy of bearings

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Table 12 Tolerances for inner ring

unit: μ m

d Nominal bearing bore diameter mm		Δ_{dmp} Single plane mean bore diameter deviation								Δ_{ds} Single bore diameter deviation		V_{dsp} Bore diameter variation in a single radial plane								V_{dmp} Mean bore diameter variation			
												Diameter series 8, 9(1)				Diameter series 0(2)							
		Class 0		Class 6		Class 5		Class 4		Class 4		Class 0	Class 6	Class 5	Class 4	Class 0	Class 6	Class 5	Class 4	Class 0	Class 6	Class 5	Class 4
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	Max.				Max.				Max.			
2.5	10	0	- 8	0	- 7	0	- 5	0	- 4	0	- 4	10	9	5	4	8	7	4	3	6	5	3	2
10	18	0	- 8	0	- 7	0	- 5	0	- 4	0	- 4	10	9	5	4	8	7	4	3	6	5	3	2
18	30	0	- 10	0	- 8	0	- 6	0	- 5	0	- 5	13	10	6	5	10	8	5	4	8	6	3	2.5
30	50	0	- 12	0	- 10	0	- 8	0	- 6	0	- 6	15	13	8	6	12	10	6	5	9	8	4	3
50	80	0	- 15	0	- 12	0	- 9	0	- 7	0	- 7	19	15	9	7	19	15	7	5	11	9	5	3.5
80	120	0	- 20	0	- 15	0	- 10	0	- 8	0	- 8	25	19	10	8	25	19	8	6	15	11	5	4
120	180	0	- 25	0	- 18	0	- 13	0	- 10	0	- 10	31	23	13	10	31	23	10	8	19	14	7	5
180	250	0	- 30	0	- 22	0	- 15	0	- 12	0	- 12	38	28	15	12	38	28	12	9	23	17	8	6
250	315	0	- 35	0	- 25	0	- 18					44	31	18		44	31	14		26	19	9	
315	400	0	- 40	0	- 30	0	- 23					50	38	23		50	38	18		30	23	12	
400	500	0	- 45	0	- 35							56	44			56	44			34	26		
500	630	0	- 50	0	- 40							63	50			63	50			38	30		
630	800	0	- 75																				
800	1000	0	- 100																				
1000	1250	0	- 125																				
1250	1600	0	- 160																				
1600	2000	0	- 200																				

K_{ia} Radial runout of assembled bearing inner ring				S_d Inner ring reference face runout with bore		S_{ia}(3) Assembled bearing inner ring face runout with raceway		Δ_{Bs} Deviation of a single inner ring width								V_{Bs} Inner ring width variation				d Nominal bearing bore diameter mm	
Class 0	Class 6	Class 5	Class 4	Class 5	Class 4	Class 5	Class 4	Class 0		Class 6		Class 5		Class 4		Class 0	Class 6	Class 5	Class 4		
Max.				Max.		Max.		High	Low	High	Low	High	Low	High	Low	Max.				Over	Incl.
10	6	4	2.5	7	3	7	3	0	- 120	0	- 120	0	- 40	0	- 40	15	15	5	2.5	2.5	10
10	7	4	2.5	7	3	7	3	0	- 120	0	- 120	0	- 80	0	- 80	20	20	5	2.5	10	18
13	8	4	3	8	4	8	4	0	- 120	0	- 120	0	- 120	0	- 120	20	20	5	2.5	18	30
15	10	5	4	8	4	8	4	0	- 120	0	- 120	0	- 120	0	- 120	20	20	5	3	30	50
20	10	5	4	8	5	8	5	0	- 150	0	- 150	0	- 150	0	- 150	25	25	6	4	50	80
25	13	6	5	9	5	9	5	0	- 200	0	- 200	0	- 200	0	- 200	25	25	7	4	80	120
30	18	8	6	10	6	10	7	0	- 250	0	- 250	0	- 250	0	- 250	30	30	8	5	120	180
40	20	10	8	11	7	13	8	0	- 300	0	- 300	0	- 300	0	- 300	30	30	10	6	180	250
50	25	13		13		15		0	- 350	0	- 350	0	- 350			35	35	13		250	315
60	30	15		15		20		0	- 400	0	- 400	0	- 400			40	40	15		315	400
65	35							0	- 450	0	- 450					50	45			400	500
70	40							0	- 500	0	- 500					60	50			500	630
80								0	- 750							70				630	800
90								0	- 1000							80				800	1000
100								0	- 1250							100				1000	1250
120								0	- 1600							120				1250	1600
140								0	- 2000							140				1600	2000

Note(1) Applicable to all series except NAS series
(2) Applicable to NAS series
(3) Applicable to NATA and NATB series

Table 13 Tolerances for outer ring

unit: μ m

D Nominal bearing outside diameter mm		Δ_{Dmp} Single plane mean outside diameter deviation								Δ_{Ds} Single outside diameter deviation		V_{Dsp}(1) Outside diameter variation in a single radial plane								
												Open bearing								Bearing with seal or shield
												Diameter series 8, 9(2)				Diameter series 0(3)				Diameter series 0(3)
		Class 0		Class 6		Class 5		Class 4		Class 4		Class 0	Class 6	Class 5	Class 4	Class 0	Class 6	Class 5	Class 4	Class 6
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	Max.				Max.				Max.
2.5	6	0	- 8	0	- 7	0	- 5	0	- 4	0	- 4	10	9	5	4	8	7	4	3	9
6	18	0	- 8	0	- 7	0	- 5	0	- 4	0	- 4	10	9	5	4	8	7	4	3	9
18	30	0	- 9	0	- 8	0	- 6	0	- 5	0	- 5	12	10	6	5	9	8	5	4	10
30	50	0	- 11	0	- 9	0	- 7	0	- 6	0	- 6	14	11	7	6	11	9	5	5	13
50	80	0	- 13	0	- 11	0	- 9	0	- 7	0	- 7	16	14	9	7	13	11	7	5	16
80	120	0	- 15	0	- 13	0	- 10	0	- 8	0	- 8	19	16	10	8	19	16	8	6	20
120	150	0	- 18	0	- 15	0	- 11	0	- 9	0	- 9	23	19	11	9	23	19	8	7	25
150	180	0	- 25	0	- 18	0	- 13	0	- 10	0	- 10	31	23	13	10	31	23	10	8	30
180	250	0	- 30	0	- 20	0	- 15	0	- 11	0	- 11	38	25	15	11	38	25	11	8	
250	315	0	- 35	0	- 25	0	- 18	0	- 13	0	- 13	44	31	18	13	44	31	14	10	
315	400	0	- 40	0	- 28	0	- 20	0	- 15	0	- 15	50	35	20	15	50	35	15	11	
400	500	0	- 45	0	- 33	0	- 23					56	41	23		56	41	17		
500	630	0	- 50	0	- 38	0	- 28					63	48	28		63	48	21		
630	800	0	- 75	0	- 45	0	- 35					94	56	35		94	56	26		
800	1000	0	- 100	0	- 60							125	75			125	75			
1000	1250	0	- 125																	
1250	1600	0	- 160																	
1600	2000	0	- 200																	
2000	2500	0	- 250																	

V_{Dmp} Mean outside diameter variation				K_{ea} Radial runout of assembled bearing outer ring				S_D Variation of outside surface generatrix inclination with outer ring reference face		S_{ea}(4) Assembled bearing outer ring face runout with raceway		Δ_{Cs} Deviation of a single outer ring width		V_{Cs} Outer ring width variation				D Nominal bearing outside diameter mm	
Class 0	Class 6	Class 5	Class 4	Class 0	Class 6	Class 5	Class 4	Class 5	Class 4	Class 5	Class 4	Class 0, 6, 5, 4		Class 0	Class 6	Class 5	Class 4		
Max.				Max.				Max.		Max.		High	Low	Max.				Over	Incl.
6	5	3	2	15	8	5	3	8	4	8	5	Same as the tolerance values of Δ_{Bs} for d of the same bearing		Same as the tolerance values of V_{Bs} for d of the same bearing		5	2.5	2.5	6
6	5	3	2	15	8	5	3	8	4	8	5					5	2.5	6	18
7	6	3	2.5	15	9	6	4	8	4	8	5					5	2.5	18	30
8	7	4	3	20	10	7	5	8	4	8	5					5	2.5	30	50
10	8	5	3.5	25	13	8	5	8	4	10	5					6	3	50	80
11	10	5	4	35	18	10	6	9	5	11	6					8	4	80	120
14	11	6	5	40	20	11	7	10	5	13	7					8	5	120	150
19	14	7	5	45	23	13	8	10	5	14	8					8	5	150	180
23	15	8	6	50	25	15	10	11	7	15	10					10	7	180	250
26	19	9	7	60	30	18	11	13	8	18	10					11	7	250	315
30	21	10	8	70	35	20	13	13	10	20	13					13	8	315	400
34	25	12		80	40	23		15		23						15		400	500
38	29	14		100	50	25		18		25						18		500	630
55	34	18		120	60	30		20		30						20		630	800
75	45			140	75													800	1000
				160														1000	1250
				190														1250	1600
				220														1600	2000
				250														2000	2500

Note(1) Classes 0 and 6 are applicable to outer rings without stop rings.
(2) Applicable to all series except NAS series
(3) Applicable to NAS series
(4) Applicable to NATA and NATB series

Table 14 Tolerances for smallest single roller set bore diameter $F_{ws\,min}$(1)

unit: μm

F_w Nominal roller set bore diameter mm		$\Delta_{F ws\,min}$ Deviation of smallest single roller set bore diameter	
Over	Incl.	High	Low
3	6	+ 18	+ 10
6	10	+ 22	+ 13
10	18	+ 27	+ 16
18	30	+ 33	+ 20
30	50	+ 41	+ 25
50	80	+ 49	+ 30
80	120	+ 58	+ 36
120	180	+ 68	+ 43
180	250	+ 79	+ 50
250	315	+ 88	+ 56
315	400	+ 98	+ 62
400	500	+ 108	+ 68

Note(1) This is the diameter of the cylinder used instead of the inner ring, where the radial clearance becomes 0 at least in one radial direction.

Table 15 Permissible limit values for chamfer dimensions of radial bearings

unit: mm

$r_{s\,min}$ Smallest permissible single chamfer dimension	d Nominal bore diameter		$r_{s\,max}$ Largest permissible single chamfer dimension	
	Over	Incl.	Radial direction	Axial direction
0.1	—	—	0.55 (2)	0.55 (2)
0.15	—	—	0.6 (2)	0.6
0.2	—	—	0.7 (2)	0.8
0.3	—	40	0.8 (2)	1
	40	—	0.8	1
0.4 (1)	—	—	0.8	1.2
0.6	—	40	1.1 (2)	2
	40	—	1.3	2
1	—	50	1.5	3
	50	—	1.9	3
1.1	—	120	2	3.5
	120	—	2.5	4
1.5	—	120	2.3	4
	120	—	3	5
2	—	80	3	4.5
	80	220	3.5	5
	220	—	3.8	6
2.1	—	280	4	6.5
	280	—	4.5	7
2.5 (1)	—	100	3.8	6
	100	280	4.5	6
	280	—	5	7
3	—	280	5	8
	280	—	5.5	8
4	—	—	6.5	9
5	—	—	8	10
6	—	—	10	13

Note(1) Not specified in JIS.
(2) The numeric value differs from JIS.

Remark Although the exact shape of the chamfer is not specified, its profile in the axial plane must not extend beyond the imaginary circular arc of radius $r_{s\,min}$ which is tangential to the inner ring side surface and bearing bore surface or to the outer ring side surface and bearing outside surface. (See Fig. 12.)

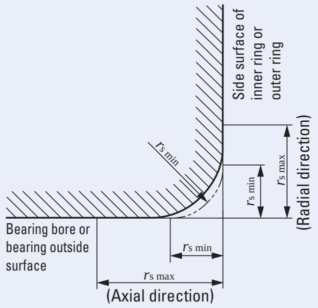


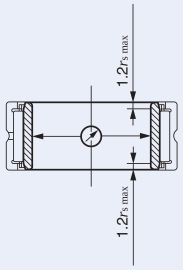
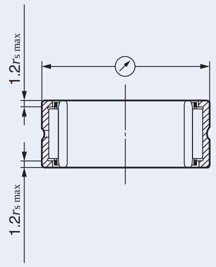
Fig. 12 Permissible values for chamfer dimensions

Methods of Measurement

Measurement of IKO Needle Roller Bearings is based on JIS B 1515-1, -2 (Rolling bearings-Tolerances). Tables 16 and 17 show some examples of the methods.

Special methods are used to measure Shell Type Needle Roller Bearings. Therefore, refer to the section on accuracy for these bearings on page B3.

Table 16 Measurement methods of accuracy of boundary dimensions

Measurement methods		Accuracy and definitions	
Single bore diameter	Zero the gauge indicator to the appropriate size using gauge blocks or a master ring. In several angular directions and in a single radial plane, measure and record the largest and the smallest single bore diameters, $d_{sp\,max}$ and $d_{sp\,min}$, within the measuring zone (excluding the zone 1.2 times the respective maximum allowable chamfer dimensions of the inner ring face). Repeat angular measurements and recordings in several radial planes to determine the largest and the smallest single bore diameter, $d_{s\,max}$ and $d_{s\,min}$.  	d_{mp} Mean bore diameter in a single plane	Calculated mean value of the maximum and minimum values of the single bore diameter within a radial plane. $d_{mp} = \frac{d_{sp\,max} + d_{sp\,min}}{2}$ d_{sp} : Single bore diameter in a single plane
		Δ_{dmp} Deviation of mean bore diameter in a single plane	Deviation of mean bore diameter in a single plane and nominal bore diameter. $\Delta_{dmp} = d_{mp} - d$ d : Nominal bearing bore diameter
		V_{dsp} Variation of bore diameter in a single plane	Deviation of the maximum and minimum values of the single bore diameter within a radial plane. $V_{dsp} = d_{sp\,max} - d_{sp\,min}$
		V_{dmp} Variation of mean bore diameter	Deviation of the maximum and minimum values of mean bore diameter in a single plane, for individual raceway rings with essentially cylindrical bore diameter surfaces. $V_{dmp} = d_{mp\,max} - d_{mp\,min}$
		Δ_{ds} Deviation of a single bore diameter	Deviation of single bore diameter and nominal bore diameter. $\Delta_{ds} = d_s - d$ d_s : Single bore diameter (distance between two parallel straight lines touching the intersection of the single bore diameter surface and the radial plane)
Single outside diameter	Zero the gauge indicator to the appropriate size using gauge blocks or a master. In several angular directions and in a single radial plane, measure and record the largest and the smallest single outside diameters, $D_{sp\,max}$ and $D_{sp\,min}$, within the measuring zone (excluding the zone 1.2 times the respective maximum allowable chamfer dimensions of the outer ring face). Repeat and record measurements in several radial planes to determine the largest and the smallest single outside diameter, $D_{s\,max}$ and $D_{s\,min}$.  	D_{mp} Mean outside diameter in a single plane	Calculated mean value of the maximum and minimum values of the single outside diameter within a radial plane. $D_{mp} = \frac{D_{sp\,max} + D_{sp\,min}}{2}$ D_{sp} : Single outside diameter in a single plane
		Δ_{Dmp} Deviation of mean outside diameter in a single plane	Deviation of mean outside diameter in a single plane and nominal outside diameter. $\Delta_{Dmp} = D_{mp} - D$ D : Nominal bearing outside diameter
		V_{Dsp} Variation of outside diameter in a single plane	Deviation of the maximum and minimum values of the single outside diameter within a radial plane. $V_{Dsp} = D_{sp\,max} - D_{sp\,min}$
		V_{Dmp} Variation of mean outside diameter	Deviation of the maximum and minimum values of mean outside diameter in a single plane, for individual raceway rings with essentially cylindrical outside diameter surfaces. $V_{Dmp} = D_{mp\,max} - D_{mp\,min}$
		Δ_{Ds} Deviation of a single outside diameter	Deviation of single outside diameter and nominal outside diameter. $\Delta_{Ds} = D_s - D$ D_s : Single outside diameter (distance between two parallel straight lines touching the intersection of the single outside diameter surface and the radial plane)

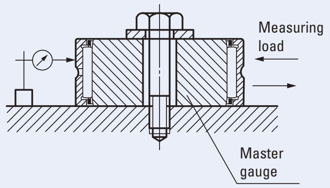
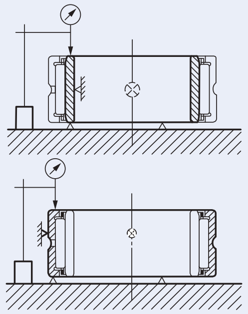
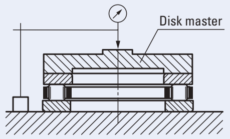
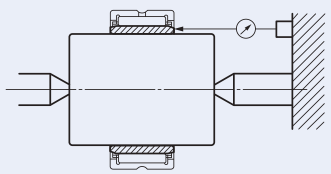
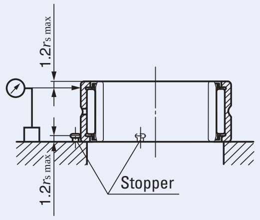
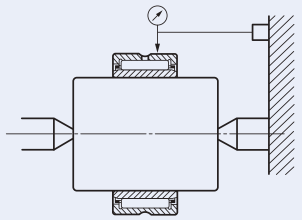
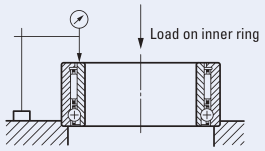
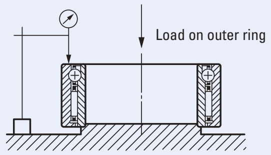
Measurement methods		Accuracy and definitions	
Single bore diameter of rolling element complement	Fasten the master gauge to a surface plate. Position the bearing on the master gauge and apply the indicator in the radial direction near the middle of the width on the ring outside surface. Measure the amount of movement of the outer ring in the radial direction by applying sufficient load on the outer ring in the same radial direction as that of the indicator and in the opposite radial direction. Record indicator readings at the extreme radial positions of the outer ring. Rotate the bearing and repeat the measurement in several different angular positions to determine the largest and the smallest readings, $F_{\mathrm{ws\,max}}$ and $F_{\mathrm{ws\,min}}$.  	F_{ws} Single bore diameter of roller complement	In radial bearings without inner rings, the distance between two parallel straight lines touching the intersection of the inscribed circle of roller complement and the radial plane.
		$F_{\mathrm{ws\,min}}$ Smallest single bore diameter of roller complement	In radial bearings without inner rings, the minimum value of the single bore diameter of roller complement. Remark: Diameter of a cylinder where the smallest single bore diameter of roller complement has zero radial clearance in at least one radial direction.
Inner ring width	Zero the gauge indicator to the appropriate height from the reference surface using gauge blocks or a master. Support one face of the inner or outer ring on three equally spaced fixed supports of equal height and provide two suitable radial supports on the bore or outside surface set at 90° to each other to centre the inner or outer ring. Position the indicator against the other face of the ring opposite one fixed support. Rotate the inner or outer ring one revolution and measure and record the largest and the smallest single inner (outer) ring width, $B_{\mathrm{s\,max}}$ and $B_{\mathrm{s\,min}}$, ($C_{\mathrm{s\,max}}$ and $C_{\mathrm{s\,min}}$). 	Δ_{Bs} Deviation of a single inner ring width	Deviation of single inner ring width and nominal inner ring width. $\Delta_{Bs} = B_{\mathrm{s}} - B$
		V_{Bs} Variation of inner ring width	Deviation of the maximum and minimum values of the single inner ring width for individual inner rings. $V_{Bs} = B_{\mathrm{s\,max}} - B_{\mathrm{s\,min}}$
Outer ring width		Δ_{Cs} Deviation of a single outer ring width	Deviation of single outer ring width and nominal outer ring width. $\Delta_{Cs} = C_{\mathrm{s}} - C$
		V_{Cs} Variation of outer ring width	Deviation of the maximum and minimum values of the single outer ring width for individual outer rings. $V_{Cs} = C_{\mathrm{s\,max}} - C_{\mathrm{s\,min}}$
Bearing height	Support the bearing on a surface plate. Zero the gauge indicator to an appropriate height from the surface plate using gauge blocks or a master. Place a plate of known thickness on the bearing assembly, apply a dynamically stable coaxial load, and position the indicator over the centre of the plate. Rotate the housing washer several times, to be sure to reach the smallest height, and take indicator readings.  	Δ_{Ts} Deviation of the actual bearing height	Deviation of actual bearing height and nominal bearing height of the thrust bearing. $\Delta_{Ts} = T_{\mathrm{s}} - T$ T_{s} : Actual bearing height T : Nominal bearing height

Table 17 Measurement methods for rotational accuracy

Accuracy	Measurement methods	
S_d **Perpendicularity of inner ring face with respect to the bore**	Use a precision arbor having a taper of approximately 1 : 5 000 on diameter. Mount the bearing assembly on the tapered arbor and place the arbor between two centres so that it can be accurately rotated. Position the indicator against the reference face of the inner ring at a radial distance from the arbor axis of half the mean diameter of the face. Take indicator readings while rotating the inner ring one revolution.	
S_D **Perpendicularity of outer ring outside surface with respect to the face**	Support the reference face of the outer ring on a surface plate leaving the inner ring, if an assembled bearing, free. Locate the outer ring cylindrical outside surface against two supports set at 90° to each other to centre the outer ring. Position the indicator directly above one support. The indicator and the two supports are axially located at the extremes of the measurement zone (positions 1.2 times the respective maximum allowable chamfer dimensions of the outer ring face). Take indicator readings while rotating the outer ring one revolution.	
K_{ia} **Radial runout of inner ring of assembled bearing**	Use a precision arbor having a taper of approximately 1 : 5 000 on diameter. Mount the bearing assembly on the tapered arbor and place the arbor between two centres so that it can be accurately rotated. Position the indicator against the outside surface of the outer ring as close as possible to the middle of the outer ring raceway. Hold the outer ring to prevent rotation but ensure its weight is supported by the rolling elements. Take indicator readings while rotating the arbor one revolution.	
K_{ea} **Radial runout of outer ring of assembled bearing**	Use a precision arbor having a taper of approximately 1 : 5 000 on diameter. Mount the bearing assembly on the tapered arbor and place the arbor between two centres so that it can be accurately rotated. Position the indicator against the outside surface of the outer ring as close as possible to the middle of the outer ring raceway. Hold the inner ring stationary. Take indicator readings while rotating the outer ring one revolution.	
S_{ia} **Axial runout of inner ring of assembled bearing**	Support the reference face of the outer ring on a surface plate with a pilot for centering the outside diameter of the ring. Apply a dynamically stable coaxial load to the reference face of the inner ring in order to ensure contact between rolling elements and raceways. Position the indicator against the reference face of the inner ring and take indicator readings while rotating the inner ring one revolution.	
S_{ea} **Axial runout of outer ring of assembled bearing**	Support the reference face of the inner ring on a surface plate with a pilot for centering in the bore of the inner ring. Apply a dynamically stable coaxial load to the reference face of the outer ring in order to ensure contact between rolling elements and raceways. Position the indicator against the reference face of the outer ring and take indicator readings while rotating the outer ring one revolution.	

Clearance

The clearances between the bearing rings and rolling elements are known as bearing clearances. When either the inner or outer ring is fixed and a specified measuring load is applied to the free bearing ring inward and outward alternately in the radial direction, the displacement of the free bearing is referred to as the radial internal clearance. The amount of measuring load in this case is extremely small, and its values are specified in JIS B 1515-2 (Rolling bearings-Tolerances-Part2:Measuring and gauging principles and methods).

❶Table 18 shows the radial internal clearances of Needle Roller Bearings with Inner Ring based on JIS B 1520 (Rolling bearings-Radial internal clearance). The radial internal clearances are classified into C2, CN, C3, C4, and C5, with clearances increasing in this order. CN is used under normal operating conditions. When a smaller range in radial internal clearance than the values shown in Table 18 is required, please consult IKO.

❷In the case of Shell Type Needle Roller Bearings, the correct dimensional accuracy is achieved only after the bearings are press-fitted into the specified housing bore. Therefore, the clearances shown in Table 18 are not applicable. See page B5.

❸For the radial internal clearances of Cam Followers, Roller Followers and Crossed Roller Bearings, see the relevant section for each bearing.

Table 18 Radial internal clearances of Needle Roller Bearings

unit: μm

d Nominal bore diameter mm		Classification of clearances									
		C2		CN		C3		C4		C5	
Over	Incl.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
—	10	0	25	20	45	35	60	50	75	—	—
10	24	0	25	20	45	35	60	50	75	65	90
24	30	0	25	20	45	35	60	50	75	70	95
30	40	5	30	25	50	45	70	60	85	80	105
40	50	5	35	30	60	50	80	70	100	95	125
50	65	10	40	40	70	60	90	80	110	110	140
65	80	10	45	40	75	65	100	90	125	130	165
80	100	15	50	50	85	75	110	105	140	155	190
100	120	15	55	50	90	85	125	125	165	180	220
120	140	15	60	60	105	100	145	145	190	200	245
140	160	20	70	70	120	115	165	165	215	225	275
160	180	25	75	75	125	120	170	170	220	250	300
180	200	35	90	90	145	140	195	195	250	275	330
200	225	45	105	105	165	160	220	220	280	305	365
225	250	45	110	110	175	170	235	235	300	330	395
250	280	55	125	125	195	190	260	260	330	370	440
280	315	55	130	130	205	200	275	275	350	410	485
315	355	65	145	145	225	225	305	305	385	455	535
355	400	100	190	190	280	280	370	370	460	510	600
400	450	110	210	210	310	310	410	410	510	565	665
450	500	110	220	220	330	330	440	440	550	625	735

Remark For bearings with CN clearance, no symbol is attached to the identification number. In the case of bearings with C2, C3, C4 and C5 clearances, these symbols are attached to the identification number.
Example NA 4905 C2

Selection of clearance

Radial clearances of needle roller bearings change according to bearing fit, temperature difference between bearing rings and rolling elements, loads, etc., and these factors greatly influence bearing life, accuracy, noise, generation of heat, etc. If radial clearances are too large, noise and vibration will increase, and if they are too small, abnormally great forces are exerted on the contact areas between raceways and rolling elements, resulting in abnormally high heat generation and a decrease in bearing life. Therefore, in the ideal case, the clearance provided before mounting should be such that it will become zero or slightly larger when the bearing has reached steady-state operation and the temperature has become constant (saturation temperature). However, it is difficult to achieve this ideal state for all bearings. Under general operating conditions, bearings with CN clearance are most widely used, and are manufactured to provide satisfactory performance when fitted according to Tables 21 and 22.

When radial internal clearances other than CN are used, refer to Table 19.

Table 19 Examples of selecting radial internal clearances other than CN clearance

Operating conditions	Selection of clearance
When heavy loads and shock loads are applied, and amount of interference is great.	C3 or larger clearance
When directionally indeterminate loads are applied, and a tight fit is required for both inner and outer rings.	
When temperature of inner ring is much higher than that of outer ring.	
When shaft deflection and/or mounting error to the housing are great.	
When less noise and vibration are required. When a loose fit is required for both inner and outer rings. When preload is required.	C2 or smaller clearance

Reduction of radial clearances by fit

When the inner or outer rings are interference fitted onto shafts and into housings, respectively, they expand or shrink due to elastic deformation. As the result, the radial clearances are reduced. These reduced radial clearances are called residual (internal) clearances.

The amount of reduction is obtained by the following equation, and it is generally 70 to 90% of the interference amount.

$$\Delta_C = \Delta_F + \Delta_E \quad \cdots\cdots (24)$$

where, Δ_C : Amount of reduction of the radial clearance, mm
Δ_F : Amount of expansion of the outside diameter of inner ring, mm
Δ_E : Amount of shrinkage of the bore diameter of outer ring, mm

❶Amount of expansion of the outside diameter of inner ring

- With solid shaft

$$\Delta_F = \Delta_{de} \frac{d}{F} \quad \cdots\cdots (25)$$

- With hollow shaft

$$\Delta_F = \Delta_{de} \frac{d}{F} \frac{1-(d_i/d)^2}{1-(d/F)^2 (d_i/d)^2} \quad \cdots\cdots (26)$$

where, Δ_{de} : Effective interference of inner ring, mm
d : Bore diameter of inner ring, mm
F : Outside diameter of inner ring, mm
d_i : Bore diameter of hollow shaft, mm

❷Amount of shrinkage of the bore diameter of outer ring

- With steel housing $(D_0 = \infty)$

$$\Delta_E = \Delta_{De} \frac{E}{D} \quad \cdots\cdots (27)$$

- With steel housing $(D_0 \neq \infty)$

$$\Delta_E = \Delta_{De} \frac{E}{D} \frac{1-(D/D_0)^2}{1-(E/D)^2 (D/D_0)^2} \quad \cdots\cdots (28)$$

where, Δ_{De} : Effective interference of outer ring, mm
D : Outside diameter of outer ring, mm
E : Bore diameter of outer ring, mm
D_0 : Outside diameter of housing, mm

Reduction of radial clearances due to temperature differences between inner and outer rings

Frictional heat generated by rotation is dissipated through the shafts and housings as well as through oil and air. Under general operating conditions, heat dissipation is larger on the housing side compared with that on the shaft side, and the temperature of the outer ring is usually lower than that of the inner ring. During operation, the temperature of the rolling elements is the highest, followed by that of the inner ring and that of the outer ring. The amount of thermal expansion, therefore, varies, and the radial clearances are reduced. This reduced radial clearance is called the effective (internal) clearance, and the amount of reduction is obtained by the following equation:

$$\Delta\delta = \alpha\Delta_t E \quad \cdots\cdots(29)$$

where,
$\Delta\delta$: Reduction of radial clearance, mm
α : Coefficient of linear expansion for bearing steel $\fallingdotseq 12.5\times10^{-6}$ 1/ °C
Δ_t : Temperature difference between the outer ring and the inner ring plus rolling elements considered as one unit, °C
E : Bore diameter of outer ring, mm

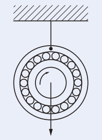
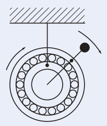
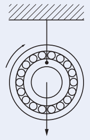
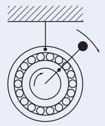
The temperature difference Δ_t is considered to be 5 ~ 10°C under normal operating conditions and 15 ~ 20°C at high rotational speeds. Therefore, when the temperature difference is great, a correspondingly larger radial internal clearance must be selected.

Fit

Purpose of fit

To achieve the best performance of needle roller bearings, it is important that the bearing rings are correctly fitted onto the shaft and into the housing.
The purpose of fit is to provide the appropriate amount of interference required between the inner ring and the shaft or between the outer ring and the housing, to prevent harmful mutual slippage.
If the interference is insufficient, it will cause a harmful relative displacement, known as creep, between the fitted surfaces in the circumferential direction. This may lead to abnormal wear of fitted surfaces, intrusion of wear particles into the bearing, generation of abnormal heat, vibration, etc. Therefore, a suitable fit must be selected.

Table 20 Nature of radial load and fit

Nature of the load			Fit	
		Rotating conditions	Inner ring	Outer ring
Rotating load on inner ring Stationary load on outer ring		Inner ring : Rotating Outer ring : Stationary Load direction : Fixed	Interference fit	Clearance fit
		Inner ring : Stationary Outer ring : Rotating Load direction : Rotating with outer ring		
Rotating load on outer ring Stationary load on inner ring		Inner ring : Stationary Outer ring : Rotating Load direction : Fixed	Clearance fit	Interference fit
		Inner ring : Rotating Outer ring : Stationary Load direction : Rotating with inner ring		
Directionally indeterminate load	The load direction is not fixed, including cases where the load direction is fluctuating or there is an unbalanced load.	Inner ring : Rotating or stationary Outer ring : Rotating or stationary Load direction : Not fixed	Interference fit	Interference fit

Conditions for determination of fit

When determining a suitable fit for a bearing, it is necessary to consider various conditions such as nature and magnitude of the load, temperature, required rotational accuracy, material/finish grade/thickness of the shaft and housing, ease of mounting and dismounting, etc.

❶ Nature of load and fit

Basically, the appropriate fit depends on whether the load direction is rotational or stationary in relation to the inner and outer rings.
The relationship between the nature of radial loads and the fit is, in general, based on Table 20.

❷ Load amount and interference

The greater the load, the larger the interference must be.
When selecting an interference between the inner ring and the shaft, it is necessary to estimate the reduction of interference due to the radial load. The amount of reduction of interference is obtained by the following equations.

· When $F_r \leqq 0.2C_0$

$$\Delta_{dF} = 0.08\sqrt{\frac{d}{B}F_r}\times10^{-3} \quad \cdots\cdots(30)$$

· When $F_r > 0.2C_0$

$$\Delta_{dF} = 0.02\frac{F_r}{B}\times10^{-3} \quad \cdots\cdots(31)$$

where,
F_r : Radial load applied to bearing, N
C_0 : Basic static load rating, N
Δ_{dF} : Amount of reduction of inner ring interference, mm
d : Bore diameter of inner ring, mm
B : Width of inner ring, mm

❸ Temperature conditions and change of interference

The interference of fitted surfaces is also influenced by the temperature difference between the bearing and the shaft and housing. For example, when steam is flowing through a hollow shaft, or when the housing is made of light metal, it is necessary to take into consideration the differences in temperature, the coefficient of linear expansion and other such factors.
Usually, the interference of the inner ring decreases as the bearing temperature increases during operation. If the temperature difference between the inside of the bearing and the outside of the housing is taken as Δ_T, the temperature difference between the inner ring and the shaft can be estimated to be (0.1 ~ 0.15) Δ_T. Accordingly, the amount of reduction of the inner ring interference is obtained by the following equation.

$$\Delta_{dT} = (0.1\sim0.15)\Delta_T\alpha d \fallingdotseq 0.0015\Delta_T d\times10^{-3} \quad \cdots(32)$$

where,
Δ_{dT} : Reduction amount of inner ring interference due to temperature difference, mm
Δ_T : Temperature difference between the inside of the bearing and the outside of the housing, °C
α : Coefficient of linear expansion for bearing steel $\fallingdotseq 12.5\times10^{-6}$ 1/ °C
d : Bore diameter of inner ring, mm

❹ Shaft finish grade and interference

Since peaks of surface roughness of the fitted surface are crushed down when fitting the bearing, the effective interference becomes smaller than the apparent interference obtained by measurements, and it is generally obtained by the following equations.

· For ground shaft

$$\Delta_{de} = \frac{d}{d+2}\Delta_{df} \quad \cdots\cdots(33)$$

· For machined shaft

$$\Delta_{de} = \frac{d}{d+3}\Delta_{df} \quad \cdots\cdots(34)$$

where,
Δ_{de} : Effective interference of inner ring, mm
d : Bore diameter of inner ring, mm
Δ_{df} : Apparent interference, mm

❺ Minimum interference and maximum interference

When the load direction is rotating in relation to the inner ring, the inner ring is fitted with interference to the shaft.
For solid ground steel shafts, the minimum interference (required apparent interference) Δ_{df} is expressed by the following equation which is deduced from equations (30) or (31), (32) and (33).

$$\Delta_{df} \geqq \frac{d+2}{d}(\Delta_{dF} + 0.0015\Delta_T d\times10^{-3}) \quad \cdots(35)$$

It is desired that the maximum interference should be less than 1/1000 of the shaft diameter. In the case of the outer ring, the effective interference varies according to the housing material, thickness, shape, etc., so it is determined empirically.

Selection of fit

When selecting a suitable fit, in addition to the various conditions mentioned above, it is necessary to draw on experience and practical results.

Tables 21 and 22 show the most general fit data.

When a thin housing or a hollow shaft is used, the interference is made larger than an ordinary fit.

The fit between needle roller bearings without inner ring and shafts is based on Table 23.

For the fit between Shell Type Needle Roller Bearings and housing bores, see page B5.

For the fit between inner rings for Shell Type Needle Roller Bearings and shafts, see Table 22.

Table 21 Fit between needle roller bearings and housing bores (Not applicable to Shell Type Needle Roller Bearings)

Operating conditions		Tolerance class of housing bore (1)	Application examples (Reference)
Rotating load on outer ring	Heavy load on thin housing, large shock load	P7 (2)	Flywheels
	Heavy load, normal load	N7 (2)	Wheel bosses, transmission gears
	Light load, fluctuating load	M7	Pulleys, tension pulleys
Directionally indeterminate load	Large shock load	M7	Eccentric wheels, pumps
	Heavy load, normal load	K7	Compressors
	Normal load, light load	J7	Crankshafts, compressors
Stationary load on outer ring	Shock load, heavy load	J7	General bearing applications, gear shafts
	Normal load, light load	H7	General bearing applications
	With heat conduction through shaft	G7	Paper dryers
Light load, normal load, requirements of high-precision rotation and high rigidity		K6	Main spindles of machine tools

Notes(1) This table applies to steel or cast iron housings. For lighter metal, a tighter fit should be selected. For split housings, do not use a fit tighter than J7.
(2) Care should be taken so that the radial internal clearance is not too small.
Remark Light load, normal load and heavy load represent $P \leqq 0.06C$, $0.06C < P \leqq 0.12C$, and $0.12C < P$, respectively, where P is the dynamic equivalent radial load and C is the basic dynamic load rating of the bearing to be used.

Table 22 Fit between needle roller bearings with inner ring and shafts

Operating conditions		Shaft dia. mm Over	Shaft dia. mm Incl.	Tolerance class of shaft (1)	Application examples (Reference)
Stationary load on inner ring	Light load, normal load, low or medium rotating speed	All shaft diameters		g6	Wheels on dead axles Control lever gears Rope sheaves Tension pulleys
	Heavy load, medium rotating speed			h6	
	Especially smooth operation and accuracy are required.			h5	
Rotating load on inner ring or Directionally indeterminate load	Light load	—	50	j5	Electric appliances, Precision machinery Machine tools, Pumps Blowers, Transportation vehicles
		50	100	k5	
		100	200	m6 (2)	
		200	—	n6 (3)	
	Normal load	—	50	k5 (4)	General bearing applications Pumps, Transmission gearboxes, Wood working machinery, Internal combustion engines
		50	150	m5, m6 (2)	
		150	200	n6 (3)	
		200	—	p6 (3)	
	Heavy load Shock load	—	150	n6 (3)	Industrial vehicles, Construction machinery Crushers
		150	—	p6 (3)	

Notes(1) This table applies to solid steel shafts.
(2) It is necessary to examine the reduction of radial internal clearances caused by the expansion of inner rings after mounting.
(3) It is necessary to use bearings with radial internal clearances greater than CN clearance.
(4) For NATA and NATB, do not use a tighter fit than k5.

Table 23 Tolerance class of shafts assembled with needle roller bearings without inner ring

F_w Nominal roller set bore diameter mm		Radial internal clearance		
		Smaller than CN clearance	CN clearance	Larger than CN clearance
Over	Incl.	Tolerance class of shaft (1)		
—	65	k5	h5	g6
65	80	k5	h5	f6
80	160	k5	g5	f6
160	180	k5	g5	e6
180	200	j5	g5	e6
200	250	j5	f6	e6
250	315	h5	f6	e6
315	—	g5	f6	d6

Note(1) When the housing bore fit is tighter than K7, the shaft diameter is made smaller by considering shrinkage of roller set bore diameter after mounting.

Table 24 Fit values for radial bearings (JIS Class 0) (Fit with housing bore)

unit: μm

D Nominal outside diameter mm		Δ_{Dmp} Single plane mean outside diameter deviation		G7	H7	J7	K6	K7	M7	N7	P7
Over	Incl.	High	Low								
3	6	0	-8	-24 ～ -4	-20 ～ 0	-14 ～ 6	-10 ～ 6	-11 ～ 9	-8 ～ 12	-4 ～ 16	0 ～ 20
6	10	0	-8	-28 ～ -5	-23 ～ 0	-16 ～ 7	-10 ～ 7	-13 ～ 10	-8 ～ 15	-4 ～ 19	1 ～ 24
10	18	0	-8	-32 ～ -6	-26 ～ 0	-18 ～ 8	-10 ～ 9	-14 ～ 12	-8 ～ 18	-3 ～ 23	3 ～ 29
18	30	0	-9	-37 ～ -7	-30 ～ 0	-21 ～ 9	-11 ～ 11	-15 ～ 15	-9 ～ 21	-2 ～ 28	5 ～ 35
30	50	0	-11	-45 ～ -9	-36 ～ 0	-25 ～ 11	-14 ～ 13	-18 ～ 18	-11 ～ 25	-3 ～ 33	6 ～ 42
50	80	0	-13	-53 ～ -10	-43 ～ 0	-31 ～ 12	-17 ～ 15	-22 ～ 21	-13 ～ 30	-4 ～ 39	8 ～ 51
80	120	0	-15	-62 ～ -12	-50 ～ 0	-37 ～ 13	-19 ～ 18	-25 ～ 25	-15 ～ 35	-5 ～ 45	9 ～ 59
120	150	0	-18	-72 ～ -14	-58 ～ 0	-44 ～ 14	-22 ～ 21	-30 ～ 28	-18 ～ 40	-6 ～ 52	10 ～ 68
150	180	0	-25	-79 ～ -14	-65 ～ 0	-51 ～ 14	-29 ～ 21	-37 ～ 28	-25 ～ 40	-13 ～ 52	3 ～ 68
180	250	0	-30	-91 ～ -15	-76 ～ 0	-60 ～ 16	-35 ～ 24	-43 ～ 33	-30 ～ 46	-16 ～ 60	3 ～ 79
250	315	0	-35	-104 ～ -17	-87 ～ 0	-71 ～ 16	-40 ～ 27	-51 ～ 36	-35 ～ 52	-21 ～ 66	1 ～ 88
315	400	0	-40	-115 ～ -18	-97 ～ 0	-79 ～ 18	-47 ～ 29	-57 ～ 40	-40 ～ 57	-24 ～ 73	1 ～ 98
400	500	0	-45	-128 ～ -20	-108 ～ 0	-88 ～ 20	-53 ～ 32	-63 ～ 45	-45 ～ 63	-28 ～ 80	0 ～ 108

Remark The negative value denotes a clearance and the positive value denotes an interference.

Table 25 Fit values for radial bearings (JIS Class 0) (Fit with shaft)

unit: μm

d Nominal bore diameter mm		Δ_{dmp} Single plane mean bore diameter deviation		g6	h5	h6	j5	k5	m5	m6	n6	p6
Over	Incl.	High	Low									
3	6	0	-8	-12 ～ 4	-5 ～ 8	-8 ～ 8	-2 ～ 11	1 ～ 14	4 ～ 17	4 ～ 20	8 ～ 24	12 ～ 28
6	10	0	-8	-14 ～ 3	-6 ～ 8	-9 ～ 8	-2 ～ 12	1 ～ 15	6 ～ 20	6 ～ 23	10 ～ 27	15 ～ 32
10	18	0	-8	-17 ～ 2	-8 ～ 8	-11 ～ 8	-3 ～ 13	1 ～ 17	7 ～ 23	7 ～ 26	12 ～ 31	18 ～ 37
18	30	0	-10	-20 ～ 3	-9 ～ 10	-13 ～ 10	-4 ～ 15	2 ～ 21	8 ～ 27	8 ～ 31	15 ～ 38	22 ～ 45
30	50	0	-12	-25 ～ 3	-11 ～ 12	-16 ～ 12	-5 ～ 18	2 ～ 25	9 ～ 32	9 ～ 37	17 ～ 45	26 ～ 54
50	80	0	-15	-29 ～ 5	-13 ～ 15	-19 ～ 15	-7 ～ 21	2 ～ 30	11 ～ 39	11 ～ 45	20 ～ 54	32 ～ 66
80	120	0	-20	-34 ～ 8	-15 ～ 20	-22 ～ 20	-9 ～ 26	3 ～ 38	13 ～ 48	13 ～ 55	23 ～ 65	37 ～ 79
120	140	0	-25	-39 ～ 11	-18 ～ 25	-25 ～ 25	-11 ～ 32	3 ～ 46	15 ～ 58	15 ～ 65	27 ～ 77	43 ～ 93
140	160											
160	180											
180	200	0	-30	-44 ～ 15	-20 ～ 30	-29 ～ 30	-13 ～ 37	4 ～ 54	17 ～ 67	17 ～ 76	31 ～ 90	50 ～ 109
200	225											
225	250											
250	280	0	-35	-49 ～ 18	-23 ～ 35	-32 ～ 35	-16 ～ 42	4 ～ 62	20 ～ 78	20 ～ 87	34 ～ 101	56 ～ 123
280	315											
315	355	0	-40	-54 ～ 22	-25 ～ 40	-36 ～ 40	-18 ～ 47	4 ～ 69	21 ～ 86	21 ～ 97	37 ～ 113	62 ～ 138
355	400											
400	450	0	-45	-60 ～ 25	-27 ～ 45	-40 ～ 45	-20 ～ 52	5 ～ 77	23 ～ 95	23 ～ 108	40 ～ 125	68 ～ 153
450	500											

Remark The negative value denotes a clearance and the positive value denotes an interference.

Design of Shaft and Housing

Accuracy and roughness of shaft and housing

Accuracy and roughness of fitting surface

Since the bearing rings of needle roller bearings are thin, their performance is easily affected by poor accuracy of shafts or housings. Under general operating conditions, the fitting surfaces of shafts and housings can be finished by lathe turning. However, when the load is great and high accuracy and low noise are required, a grinding finish is required.

Table 26 shows the accuracy and roughness of fitting surfaces for general use.

Accuracy and roughness of raceway surface

In case of needle roller bearings unlike other bearings, mating surfaces such as shaft and housing bore surfaces can be used directly as the raceway surfaces. For such use, accuracy and roughness of the raceway surfaces are important because they will influence bearing life, noise and accuracy.

In general, accuracy and roughness of raceway surfaces are based on Table 26.

Inclination of shaft

Shafts and outer rings may have some inclination between them due to deflection of the shaft, machining accuracy of shafts and housings, errors in mounting, etc.

In this case, the use of two or more bearings in tandem arrangement on a single shaft should be avoided. Instead, a bearing with large load ratings should be used.

It is recommended that inclination of shafts be less than 1/1000.

Table 27 Tolerance class IT values for basic dimensions

Basic dimension mm		Tolerance class (1)		
		IT5	IT6	IT7
Over	Incl.	Tolerance μm		
—	3	4	6	10
3	6	5	8	12
6	10	6	9	15
10	18	8	11	18
18	30	9	13	21
30	50	11	16	25
50	80	13	19	30
80	120	15	22	35
120	180	18	25	40
180	250	20	29	46
250	315	23	32	52
315	400	25	36	57
400	500	27	40	63
500	630	30	44	70

Note(1) Based on JIS B 0401.

Table 26 Specifications of shafts and housings for radial needle roller bearings

Item	Shaft		Housing bore	
	Fitting surface	Raceway surface	Fitting surface	Raceway surface
Circularity	0.3 × IT6 (1) or 0.3 × IT5 (1)	0.3 × IT6 (1) or 0.3 × IT5 (1)	0.3 × IT7 (1) or 0.3 × IT6 (1)	0.3 × IT7 (1) or 0.3 × IT6 (1)
Cylindricity	0.5 × IT6 (2) or 0.5 × IT5 (2)	0.3 × IT6 (1) or 0.3 × IT5 (1)	0.5 × IT7 (2) or 0.5 × IT6 (2)	0.3 × IT7 (1) or 0.3 × IT6 (1)
Surface roughness μmR_a (μmR_y)	0.8 (3.2)	0.2 (3) (0.8)	1.6 (6.3)	0.2 (3) (0.8)
Hardness	—	58 ～ 64HRC (4)	—	58 ～ 64HRC (4)

Notes(1) 30% or less of the dimensional tolerance for shafts or housing bores is recommended.
(2) 50% or less of the dimensional tolerance for shafts or housing bores is recommended.
(3) When required accuracy is not critical, a surface roughness within 0.8 μmR_a (3.2 μmR_y) is allowable.
(4) An appropriate thickness of the hardened layer is required.
Remark For tolerance class IT, see Table 27.

Raceway materials and heat treatment

When using shafts and housings as raceways, the following materials are generally used.

High-carbon chromium bearing steel		
	SUJ2	JIS G 4805
Carburizing steel	SCM415～421	JIS G 4053
Carburizing steel	SNCM 220	JIS G 4053
Carburizing steel	SCr 420	JIS G 4053
Carburizing steel	SNC 415, 815	JIS G 4053
Carburizing steel	S 15 CK	JIS G 4051

In addition, S50C and S55C (JIS G 4051) can be used after through hardening or induction hardening.

The hardened layer produced by tempering at +160～+180°C after hardening must have a fine uniform martensite microstructure.

When hardening the raceway surface by case hardening or induction hardening, a surface hardness of 58～64HRC and an appropriate thickness of the hardened layer must be ensured. The minimum effective thickness of the hardened layer after heat treatment and grinding is defined as the distance from the surface to the depth where the hardness is 550HV, and it is obtained by the following equation.

$$E_{ht} \geqq 0.8D_w(0.1 + 0.002D_w) \quad \cdots\cdots\cdots\cdots\cdots (36)$$

where, E_{ht} : Minimum effective thickness of the hardened layer, mm

D_w : Roller diameter, mm

Generally, the required effective thickness of the hardened layer is at least 0.3 mm.

Dimensions related to mounting of bearings

The dimensions of shaft and housing related to mounting of the needle roller bearings are shown in the table of dimensions for each bearing. (See Fig. 13.)

The minimum value of the shaft shoulder diameter d_a which receives the inner ring, and the maximum value of the housing shoulder diameter D_a which receives the outer ring, represent the effective shoulder diameters (excluding the chamfered part) which make proper contact with the side faces of the inner and outer rings respectively.

Also, the maximum value of the shaft shoulder (or inner ring retaining piece) diameter d_a is the dimension related to the ease of mounting/dismounting of the shaft and inner ring to/from the housing and outer ring.

The largest permissible single corner radius $r_{as\ max}$ of the shaft and housing must be smaller than the smallest permissible single chamfer dimension $r_{s\ min}$ of the bearing so that the side surface of the bearing can make proper contact with the shoulder. Table 28 shows the related dimensions.

For dimensions of the fillet relief when finishing the shaft or housing by grinding, the values shown in Table 29 are recommended.

For other dimensions related to mounting, see the related section for each bearing as required.

In addition, for ease in dismounting of bearings, it is convenient to make notches in the shoulder of the shaft or housing to allow the insertion of dismounting hooks.

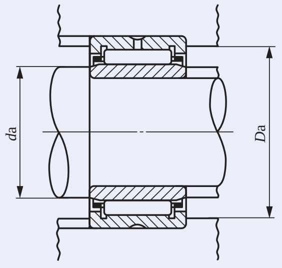


Fig. 13 Dimensions related to mounting

Table 28 Largest permissible single corner radius of shafts and housings $r_{as\ max}$

unit: mm

$r_{s\ min}$ Smallest permissible single chamfer dimension	$r_{as\ max}$ Largest permissible single corner radius of shafts and housings
0.1	0.1
0.15	0.15
0.2	0.2
0.3	0.3
0.4	0.4
0.6	0.6
1	1
1.1	1
1.5	1.5
2	2
2.1	2
2.5	2
3	2.5
4	3
5	4

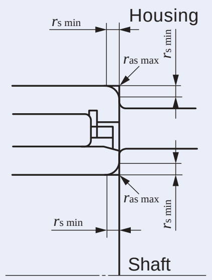
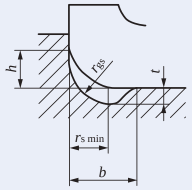


Table 29 Fillet relief dimensions for ground shafts and housings

unit: mm

$r_{s\ min}$ Smallest permissible single chamfer dimension	Fillet relief dimensions		
	t	r_{gs}	b
1	0.2	1.3	2
1.1	0.3	1.5	2.4
1.5	0.4	2	3.2
2	0.5	2.5	4
2.1	0.5	2.5	4
3	0.5	3	4.7
4	0.5	4	5.9
5	0.6	5	7.4
6	0.6	6	8.6
7.5	0.6	7	10



Sealing

To obtain the best performance of rolling bearings, it is necessary to prevent leakage of lubricant and the entry of harmful foreign substances, such as dirt, dust and water. For this reason, sealing devices must always work effectively to seal and prevent against dust penetration under all operating conditions. Also, when selecting a suitable sealing method, it is necessary to consider such factors as the type of lubricant, peripheral speed of the seal, operating temperature, shaft eccentricity, seal friction, etc. as well as ease of assembly and disassembly.

Sealing methods are of the non-contact and contact types, and it is necessary to select the appropriate type depending on the application.

Non-contact type sealing method

There are many methods of non-contact type sealing, including the use of oil grooves, flingers and labyrinths, which utilize the centrifugal force and narrow gaps.

Since they do not make direct contact with the shaft or housing, it is unnecessary to consider friction and wear, and the non-contact sealing method is suitable for high speed rotation and high operating temperatures. However, because of gaps, this method is not always sufficient in preventing oil leakage and dust entry when the machine is not in operation.

❶ Oil groove

Oil grooves are provided on either the shaft or housing bore, or on both for more effective sealing (See Fig. 14.). The clearance between the shaft and the housing bore should be as small as possible, and the values shown in Table 30 are generally used, taking into consideration errors in machining and assembly, shaft deformation, etc. Three or more grooves are made with a width of 3～5 mm and a depth of 4～5 mm. If the grooves are filled with grease, it will be more effective for dust prevention.

As shown in Fig. 15, helical grooves are suitable for horizontal shafts which have a fixed direction of rotation. Right or left handed grooves are used according to the direction of rotation, and they are used for oil lubrication normally in conjunction with a suitable anti-dust device.

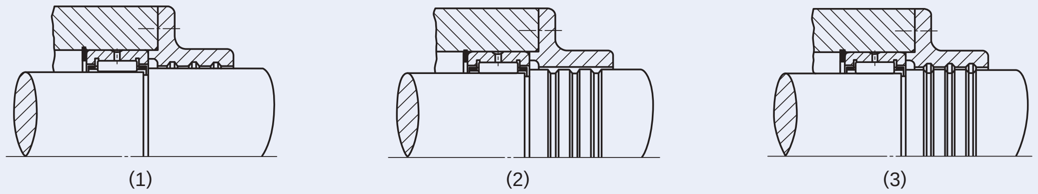

(1) (2) (3)

Fig. 14

Table 30 Clearance between grooved shaft and housing bore

unit: mm

Shaft dia.	Clearance
Incl. 50 mm	0.25 ～ 0.4
Over 50 mm	0.5 ～ 1

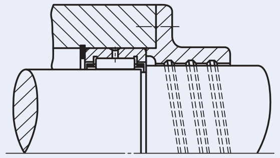
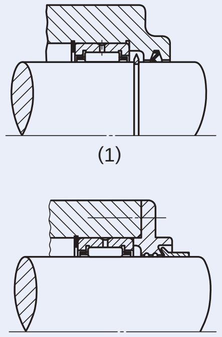


Fig. 15

❷ Flinger

The oil flinger is a disk attached to the shaft which throws off oil due to the centrifugal force of rotation and thus prevents oil leakage and the entry of foreign particles. Fig. 16 (1) shows an example in which the flinger is located inside the housing, mainly to prevent oil leakage. Since it sucks in dust and dirt, it should be used in a dust free environment. Fig. 16 (2) shows an example in which the flinger is located outside the housing, and is used in combination with another sealing device, to prevent entry of foreign particles.



(1)

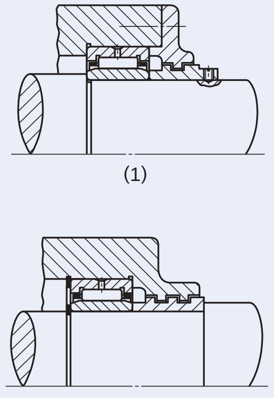
(2)

Fig. 16

❸ Labyrinth

Although it is a little difficult to make, the labyrinth is very effective in preventing oil leakage especially at high speeds. At low speeds, filling the labyrinth with grease is effective in preventing the entry of dust. In Fig. 17, it is necessary to split the housing or cover plate into two. In Fig. 18, it is easy to assemble, and if combined with an oil seal, it improves the sealing effect.

Table 31 shows the labyrinth clearances generally used.



(1)

(2)

Fig. 17

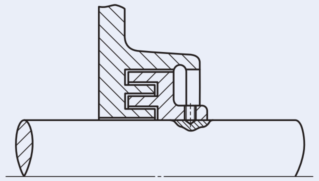


Fig. 18

Table 31 Labyrinth clearance

unit: mm

Shaft dia.	Clearance	
	Radial direction	Axial direction
Incl. 50 mm	0.25 ～ 0.4	1 ～ 2
Over 50 mm	0.5 ～ 1	3 ～ 5

Contact type sealing method

In this type of sealing, the shaft is sealed by the application of pressure resulting from the elasticity of the seal material to the sealing surface of the shaft, which rotates, reciprocates or oscillates. Synthetic rubber, synthetic resin and felt are generally used as sealing materials.

❶ Oil seal

Synthetic rubber oil seals are the most general type of sealing used. The sealing effect is obtained when the elastic lip comes into contact with the shaft. Some lips are spring-loaded to maintain adequate pressing force.

The sliding surfaces of the lip and the shaft always show frictional behavior such that the boundary lubrication and fluid lubrication are mixed. If there is an insufficient amount of oil between the contact surfaces, it will cause heat generation, wear and seizure. Conversely, if the oil film is too thick, it may cause oil leakage.

General oil seals are specified in JIS B 2402-1~5. IKO Oil Seals for Needle Roller Bearings (See page L1.) have a low sectional height to match the Needle Roller Bearings.

Nitrile rubber is generally used as the material for oil seal lips. Table 32 shows the materials and their operating temperature ranges.

The finished surface of the shaft where the seal lip makes contact must have an appropriate surface roughness, as shown in Table 33, according to the peripheral speed. It must also have accurate circularity, and the shaft eccentricity should be less than 0.05 mm.

To increase wear resistance, the hardness of the sliding part of the shaft must be more than 40HRC. This can be achieved by hard-chrome plating or heat treatment.

Table 32 Seal materials and operating temperatures

Seal material		Operating temperature range ℃
Synthetic rubber	Nitrile rubber	－25 ～＋120
	Acrylic rubber	－15 ～＋130
	Silicon rubber	－50 ～＋180
	Fluoro rubber	－10 ～＋180
Tetrafluoethylene resin		－50 ～＋220

Table 33 Peripheral speed and surface roughness of shaft

Peripheral speed m／s		Surface roughness
Over	Incl.	μmR_a (μmR_y)
－	5	0.8(3.2)
5	10	0.4(1.6)
10	－	0.2(0.8)

❷ Felt seal

Because of their simple structure, felt seals have long been used to protect grease lubrication from dust. Since felt absorbs some grease during operation, it hardly causes heat generation and seizure, but it cannot be used when the peripheral speed of the shaft is high (more than 4 m/s). Where there is a high concentration of dirt and dust, they may become attached to the contact surface of felt, sometimes scratching the shaft surface. To prevent this, two felt seals are placed apart from each other, or a felt seal is used together with a synthetic rubber seal.

Lubrication

Purpose of lubrication

The main purpose of bearing lubrication is to reduce friction and wear and to prevent heat generation and seizure. The lubricant and the lubricating method have a big influence on the operating performance of the bearing, and it is therefore necessary to select them suitably for the operating conditions.
The effects of lubrication are as follows.

❶ Reduction of friction and wear
At the contact surfaces between the race rings, rolling elements and cage of the bearing, lubrication prevents metal-to-metal contact, and reduces friction and wear due to sliding and rolling, in the latter of which micro-slips occur by differential slip, skew, spin, or elastic deformation.

❷ Elimination of frictional heat
The lubricant removes the heat generated by friction or transferred from outside, and prevents overheating of the bearing. Circulating lubrication is generally used for this purpose.

❸ Influence on bearing life
The bearing life is extended if the rolling contact surfaces between the race rings and rolling elements are separated by an oil film of adequate thickness, and is shortened if the oil film is inadequate due to low oil viscosity, etc.

❹ Rust prevention
The lubricant prevents rust formation on the inside and outside surfaces of the bearing.

❺ Dust prevention
Grease lubrication is particularly effective for dust prevention. Oil circulating or jet lubrication is effective in washing foreign particles away from the area around the bearing.

Methods of lubrication

Grease lubrication and oil lubrication are generally used for rolling bearings. In special cases, solid lubricants are also used.
In general, grease lubrication requires the simplest sealing structure. It is therefore economical and widely used. Also, once filled with grease, the bearing can be used for a long period without replenishing the grease. However, compared with oil, its heat removal properties and cooling capacity are inferior, since grease has high flow resistance, which causes high churning heat.
Oil has greater fluidity and superior heat removal properties. It is therefore suitable for high-speed operations. In addition, it is simple to filter out dust and dirt from oil. Thus it can prevent the generation of noise and vibration and increase bearing life.
Another advantage of oil lubrication is that it offers the possibility for selecting the appropriate method for particular operating conditions from among various available lubrication methods. However, measures to prevent oil leakage are required. As a guideline for selection, Table 34 compares grease and oil lubrication.
For the lubricants used for IKO Spherical Bushings, see page K8.

Table 34 Comparison between grease lubrication and oil lubrication

Item	Grease lubrication (1)	Oil lubrication
Sealing structure, Housing structure	Simple	Slightly complicated
Temperature	High temperature not allowed	High temperature allowed (Cooling effect by circulation)
Rotational speed	Low and medium speeds	High speed allowed
Load	Low and medium loads	High load allowed
Maintenance	Easy	Elaborate (Pay special attention to oil leaks.)
Lubricant replacement	Slightly complicated	Simple
Lubrication performance	Good	Very good
Dust filtration	Difficult	Simple
Entry of dust and dirt	Easy measures for protection	Dust and dirt can be removed by filtering in circulating lubrication.

Note(1) This represents bearing grease for general use.

Grease lubrication

❶ Amount of grease to be filled
The amount of grease to be filled depends on the housing structure, dimensions, type of grease used and atmosphere. Generally, filling about 1/3 to 1/2 of the free space inside of the bearing and the housing is considered to be appropriate. Too much will cause a rise in temperature, and care should be taken especially at high speed rotations.
In Fig. 19, several grease pockets are provided by the grease sectors on one side of the bearing. Even if the filled grease is dispersed by the centrifugal force at high rotational speeds, it is trapped by the grease pockets and diverted back into the bearing again. Old grease accumulates in the space on the opposite side of the bearing, and this can be removed periodically by taking off the cover.

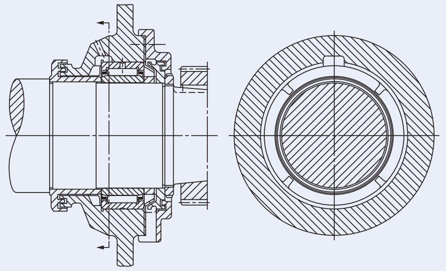
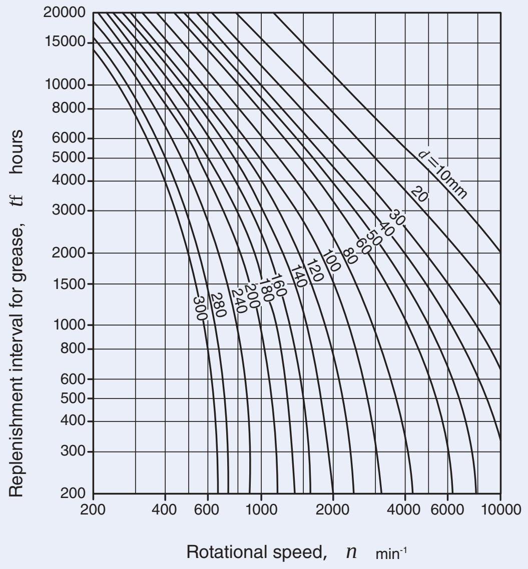


Fig. 19

❷ Replenishment of grease
The life of grease depends on its type and quality, the type and dimensions of the bearing, operating conditions, temperature, amount of wear, penetration of foreign particles and water, etc.
Fig. 20 shows the replenishment intervals for grease, and is used as a general guideline. The values obtained from this diagram apply to cases in which the load condition is normal, the machine body is stationary, and the operating temperature on the outer surface of bearing outer ring is less than +70°C. If the temperature exceeds +70°C, as a general rule, the replenishment interval is halved for every 15°C increase.



Remark
d is the bore diameter of the inner ring. For a bearing without an inner ring, the roller set bore diameter F_w is used for d.

Fig. 20 Interval for replenishment of grease

Oil lubrication

① Oil bath lubrication

This is the most commonly used oil lubrication method, and is used for medium and low speeds. If the amount of oil is too large, heat will be generated by churning, and if the amount is too small, seizure will occur. Therefore, the correct amount of oil must be maintained. When the machine is stationary, the correct oil level in the case of a bearing mounted on a horizontal shaft, is near the center of the lowest rolling element. In the case of a vertical shaft, about 50% of the surfaces of the rolling elements should be submerged in oil.

It is desirable to provide an oil gauge so that the oil level can be easily checked while the machine is stationary or running.

② Oil drip lubrication

Oil drips, which are fed down from a sight-feed oiler or along a fiber string, become an oil spray due to wind pressure generated by the rotating cage, shaft, nut, etc., or they strike the rotating parts and form an oil spray, which fills up the housing and every required part. Because oil spray removes frictional heat, this method has a more effective cooling effect than the oil bath method, and is widely used for high-speed rotation and medium load conditions.

In the case of the sight-feed oiler (Fig. 21), the number of drips can be adjusted. However, this is difficult using the string-feed method. The number of drips depends on the bearing type, rotational speed, etc., but 5 ～ 6 drips per minute is generally used.

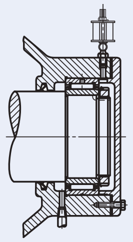


Fig. 21 Oil drip lubrication

③ Oil splash lubrication

In this method, oil is splashed in all directions by the rotation of the gear or disk. This can be used for considerably high-speed rotations without soaking the bearing directly in oil.

In the gear case where shafts and bearings are lubricated with the same oil, wear particles may be introduced into the bearing as they might get mixed with the oil. In this case, a permanent magnet is provided at the bottom of the gear case to collect metal particles, or a shield plate is installed next to the bearing.

Fig. 22 shows another method in which the splashed oil flows along the grooves in the case and accumulates in the oil pockets, keeping the oil level constant. So the oil is steadily supplied to the bearing.

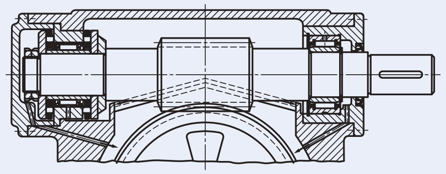


Fig. 22 Oil splash lubrication

④ Oil circulating lubrication

When automatic lubrication is more economical because lubrication is required at many points, or when cooling is required for high rotational speed, this method is used. The oil is supplied with a pump, which can control the oil pressure, and a filter or cooler, etc. can be set up in the circulation system, making this an ideal method of lubrication. As shown in Fig. 23, the oil supply and discharge ports are located opposite to each other, and the discharge port is made large to prevent the accumulation of oil.

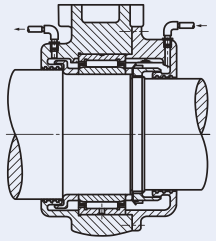


Fig. 23 Oil circulating lubrication

⑤ Oil mist lubrication

After dirt and dust are removed by a filter, the oil is turned into a spray by dry compressed air, and this lubricates the bearing. When the air and oil pass through the bearing, the air cools the bearing and the oil lubricates it. In addition, because the air inside the housing is at a higher pressure than the outside air, the entry of water and foreign particles is prevented. There are many other advantages of this method, and it is suitable for high rotational speed applications such as high speed internal grinding spindles.

⑥ Oil jet lubrication

This is a highly reliable lubrication method and is used under severe conditions such as ultra-high rotational speeds and high temperatures. The speed of the oil jet should be more than 20% of the peripheral speed of the inner ring raceway surface, since the air around the bearing rotates together with the bearing forming an air wall. As shown in Fig. 24, the jet from the nozzle blows directly into the space between the inner ring and the cage. Due to the large amount of oil being used, it is more effective to make the discharge port larger, and use the forced discharge.

When the $d_m n$ value (mean value of the bearing outside and bore diameters in millimeter x rotational speed in min^{-1}) is more than 1,000,000, the speed of the jet should be 10 ～ 20 m/s, the nozzle diameter should be about 1 mm, oil supply pressure should be 0.1 ～ 0.5 MPa, and the oil supply amount should be about 500 cc/min or greater. When the rotational speed is higher, the oil supply pressure and the oil amount should be higher.

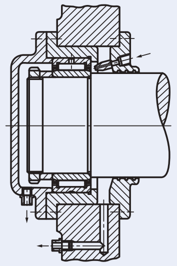


Fig. 24 Oil jet lubrication

Lubricants

For rolling bearings, lubricating grease or oil is generally used. For special applications, solid lubricants are used.

Lubricating grease

Grease is a semi-solid lubricant made by mixing base oil (liquid lubricant) and a thickener under heat and adding additives as required.

There are many types of grease according to various combinations of base oil, thickeners and additives. Grease is usually classified by thickeners and base oil. Table 35 shows the general properties of each type of grease.

Reference examples of the lubricant greece brand and performance are shown on page M46.

Table 35 Properties of various types of grease

Name (Common name) / Item	Calcium grease	Sodium grease	Aluminum grease	Mixed base grease	Barium grease	Lithium grease			Non-soap base grease (Non-soap grease)	
	(Cup grease)	(Fiber grease)	(Mobile grease)				(Diester grease)	(Silicon grease)	(Bentone grease)	
Base oil	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Diester oil	Silicon oil	Mineral oil	Synthetic oil
Thickener	Ca soap	Na soap	Al soap	Na + Ca soap, Li + Ca soap	Ba soap	Li soap	Li soap	Li soap	Bentone	Silica gel. Polyurea, etc.
Appearance	Buttery	Fibrous and buttery	Stringy and buttery	Fibrous and buttery	Fibrous and buttery	Buttery	Buttery	Buttery	Buttery	Buttery
Pour point ℃	80 ～ 90	150 ～ 180	70 ～ 90	160 ～ 190	150 ～ 180	170 ～ 190	170 ～ 190	200 ～ 250	200 ～	None
Operating temperature range ℃	− 10 ～+ 70	− 20 ～+ 120	− 10 ～+ 80	− 10 ～+ 100	− 10 ～+ 135	− 20 ～+ 120	− 50 ～+ 120	− 50 ～+ 180	− 10 ～+ 150	～+ 200
Pressure resistance	Strong to weak	Strong to medium	Strong	Strong	Strong to medium	Medium	Medium	Weak	Medium to weak	Medium
Water resistance	Good	Poor	Good	Good, poor for Na+ Ca soap grease	Good	Good	Good	Good	Good	Good
Mechanical stability	Fair	Good	Poor	Good	Poor	Excellent	Excellent	Excellent	Good	Good to poor
Features and application	Contains about 1% water. When the temperature rises to more than +80°C, the water evaporates and the grease separates into oil and soap. This is used for medium loads.	Long fibrous grease cannot withstand high speeds, but has good pressure resistance properties. Short fibrous grease is comparatively good for high speeds.	It has water and rust resistant properties, and adheres easily to metal surface.	Usable at fairly high speeds.	It has water and heat resistant properties. This is an all-purpose grease.	This is the best all-purpose grease among soap based greases.	Excellent under low temperature conditions and has superior frictional properties. Suitable for small bearings used in measuring instruments.	Mainly used for high temperatures. Not suited to high speeds and heavy loads.	Generally good heat resistance. Grease having a mineral base oil is for general use. Grease having a synthetic base oil is suitable for special use where superior heat and chemical resistance properties are required.	

❶ Base oil

Petroleum lubricating oil is usually used as the base oil.

As the lubricating performance of grease depends mainly on that of base oil, the viscosity of the base oil is an important property. In general, low viscosity is suitable for light-load and high-speed rotations, and high viscosity for heavy-load and low-speed rotations. Synthetic lubricants of the diester or silicon series are used instead of lubricants of the petroleum series in consideration of the pour point and high temperature stability.

❷ Thickener

As shown in Table 35, metal soap bases are mostly used as thickeners. In particular, Na-soap is water-soluble and emulsifies easily, and it cannot be used in damp or wet areas. The type of thickener and the pour point of grease have a close relationship. In general, the higher the pour point, the higher the maximum usable temperature of grease. However, even when the grease uses a thickener having a high pour point, its upper operating temperature limit is low if its base oil has low heat resistance.

❸ Consistency

This represents the hardness grade of grease. Grease becomes harder in proportion to the amount of thickener if the same thickener is used.

Immediately after grease has been stirred (usually 60 times), a depression is formed in the grease in a specified time using a specified cone. The consistency (combined consistency) is expressed by the value of depth of depression (mm) multiplied by 10.

This value gives an estimate of the fluidity during operation with a greater value for softer grease.

Table 36 shows the consistency number of grease and the relationship between the consistency and operating conditions.

Table 36 Consistency and operating conditions of grease

NLGI consistency number	Combined consistency	Application
0	385 ～ 355	For centralized lubrication,
1	340 ～ 310	For oscillating motion
2	295 ～ 265	For general use
3	250 ～ 220	For general use, For high temperature
4	205 ～ 175	For sealing with grease

❹ Additives

Additives include various types of substances, which are added to grease in small quantities to improve its characteristics. For example, when a bearing is kept running for long periods of time, its temperature rises. This results in oxidation of the lubricant and formation of oxides, which lead to corrosion of the bearing. Thus, when a bearing is to be operated for long periods of time without regreasing, antioxidants are added. In addition, grease containing extreme pressure additives is suitable for use in places that are subjected to heavy loads.

❺ Miscibility of different greases

In principle, it is desirable to use grease of the same brand. However, when the mixing of different greases is unavoidable, greases with the same type of thickener and with a similar type of base oil should be used.

It should be noted that if different types of grease are mixed, they may interact with each other and the consistency will become softer than that for the individual greases.

Lubricating oil

For rolling bearings, refined mineral oil or synthetic oil is used. To improve its properties, antioxidant additives, extreme pressure additives and detergent additives are added as required.

When selecting lubricating oil, it is important to select oil which has adequate viscosity under operating temperatures. If the viscosity is too low, the formation of the oil film will be insufficient, causing abnormal wear and seizure. On the other hand, if the viscosity is too high, it will generate excessive heat or increase power loss due to viscous resistance. As a general standard, oil having higher viscosity should be used for heavier loads and oil having lower viscosity should be used for higher rotational speeds.

Under conditions of normal use for various bearings, the values of viscosity shown in Table 37 will be a guideline.

The relationship between viscosity and temperature can be obtained from Fig. 25. Also, Table 38 shows examples of selecting lubricating oil according to the conditions of bearing use.

Table 37 Bearing series and required viscosity of lubricating oil

Bearing series	Kinematic viscosity at operating temperatures
Needle roller bearings Roller bearings	13 mm^2/s or more
Crossed roller bearings	20 mm^2/s or more
Thrust needle roller bearings Thrust roller bearings	32 mm^2/s or more

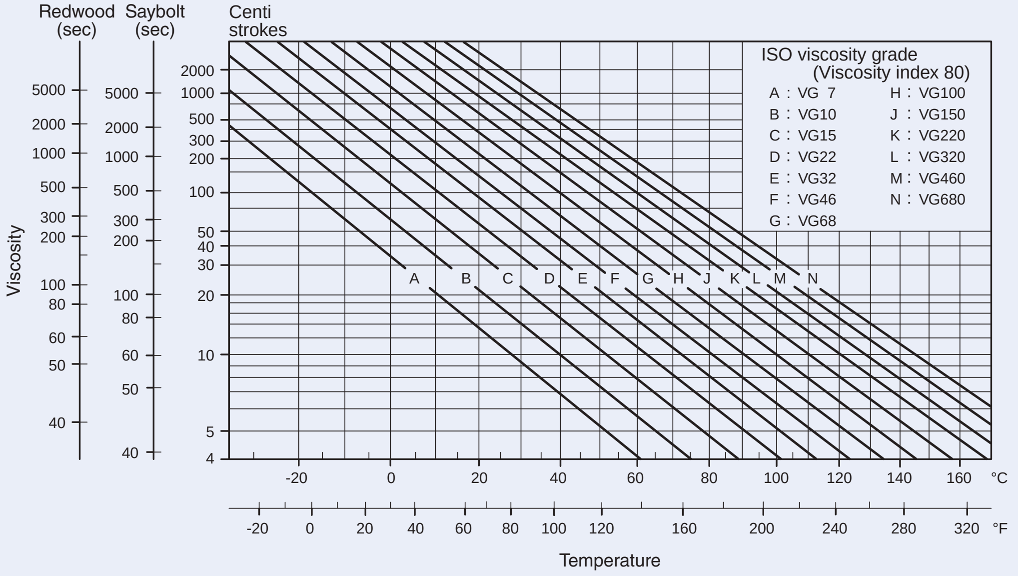


Fig. 25 Relationship between viscosity and temperature of lubricating oil

Table 38 Conditions of bearing use and examples of lubricating oil selection

<table>
<tr><th colspan="2" rowspan="2">Conditions</th><th colspan="12">ISO viscosity grade(VG)</th></tr>
<tr><th>10</th><th>15</th><th>22</th><th>32</th><th>46</th><th>68</th><th>100</th><th>150</th><th>220</th><th>320</th><th>460</th><th>680</th></tr>
<tr><td rowspan="7">Operating temperature</td><td>－30～ 0℃</td><td></td><td colspan="3">◀ Refrigerator oil ▶</td><td colspan="8"></td></tr>
<tr><td rowspan="2">0～ 50℃</td><td colspan="7">◀ Bearing oil ▶</td><td colspan="5"></td></tr>
<tr><td colspan="3"></td><td colspan="3">◀ Turbine oil ▶</td><td colspan="6"></td></tr>
<tr><td rowspan="2">50～ 80℃</td><td colspan="3"></td><td colspan="7">◀ Bearing oil ▶</td><td colspan="2"></td></tr>
<tr><td colspan="3"></td><td colspan="3">◀ Turbine oil ▶</td><td colspan="6"></td></tr>
<tr><td rowspan="2">80～110℃</td><td colspan="5"></td><td colspan="6">◀ Bearing oil ▶</td><td></td></tr>
<tr><td colspan="5"></td><td>◀ Turbine oil ▶</td><td colspan="4"></td><td colspan="2">◀ Gear oil ▶</td></tr>
<tr><td colspan="2">$d_m n$ value</td><td colspan="12">Large ◀ ▶ Small</td></tr>
<tr><td colspan="2">Load</td><td colspan="12">Small ◀ ▶ Large</td></tr>
</table>

Remarks
- Lubricating oils are based on JIS K 2211 (Refrigerating machine oils), JIS K 2239 (Bearing Oil), JIS K 2213 (Turbine Oil), and JIS K 2219 (Gear Oil).
- The method of lubrication in these cases is mainly oil bath lubrication or circulating lubrication.
- When the temperature is on the high side within the operating temperature range, oils of high viscosity are used.
- $d_m n$ represents the mean value of the bore and outside diameters (mm) of the bearing multiplied by the rotational speed (min^{-1}).

C-Lube Bearing

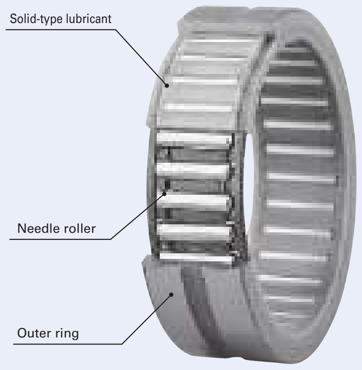
IKO C-Lube Bearing is a bearing that is lubricated with a newly developed thermosetting solid-type lubricant. A large amount of lubricating oil and fine particles of ultra high molecular weight polyolefin resin are solidified by heat treatment to fill the inner space of the bearing. As the bearing rotates, the lubricating oil oozes out onto the raceway in proper quantities, maintaining the lubrication performance for a long period of time.
The dimension tables for C-Lube Machined Type Needle Roller Bearings, C-Lube Cam Followers, and C-Lube Roller Followers are shown on pages D77, I55, and I99.
C-Lube Bearing is available in all Needle Roller Bearing series. Also C-Lube Bearings for food processing are available, using NSF H1-certified lubrication oil and resin compliant with FDA standards to mitigate any effect on human health. If needed, please contact IKO.

Features of C-Lube Bearing

- Most suitable for preventing grease dry-up in applications where lubrication is difficult.
- Great reduction of maintenance work by extending the lubrication interval.
- Elimination of oil contamination, making this bearing most suitable for applications that would be adversely affected by oil.

Cautions for using C-Lube Bearing

- Never wash C-Lube Bearing with organic solvent and/or white kerosene which have the ability to remove fat, or leave the bearing in contact with these agents.
- The operating temperature range is -15～+80°C. For continuous operation, the recommended operating temperature is +60°C or less.
- To ensure normal rotation of the bearing, apply a load of 1% or more of the basic dynamic load rating at use.
- The allowable rotational speed is different from that of the general needle roller bearings. For $d_m n$, $d_1 n$, and dn, use the values in Table 39 or less as guidelines.



Structure of C-Lube Bearing

Table 39 C-Lube Bearing $d_m n$, $d_1 n$, dn

Representative model		Allowable rotational speed
	Main model code	$d_m n$ (1), $d_1 n$ (2), dn (3)
C-Lube Machined Type Needle Roller Bearings	TAF･･･/SG	$d_m n$=20 000
C-Lube Cam Followers	CF･･･/SG	$d_1 n$ =10 000
C-Lube Roller Followers (4)	NART･･･/SG	dn = 8 000

Notes(1) $d_m n$ ＝（bore diameter of bearing ［mm］ ＋ outside diameter of bearing ［mm］）/2 × rotational speed ［min^{-1}］
(2) $d_1 n$ ＝ stud diameter ［mm］ ×rotational speed ［min^{-1}］
(3) dn ＝ inner ring bore diameter ［mm］ ×rotational speed ［min^{-1}］
(4) The allowable rotational speed of C-Lube Roller Followers is applicable to use with oscillating rotation. For use with one-way or continuous rotation, please consult IKO.

Friction and Allowable Rotational Speed

Friction

Compared with sliding bearings, the starting (static) friction for rolling bearings is small, and the difference between the starting (static) friction and the kinetic friction is also small. The loss of power and temperature rise in machines are thus reduced, improving the mechanical efficiency.
Frictional torque is influenced by the bearing type, bearing load, rotational speed, lubricant characteristics, etc. It varies according to the lubricant when operated under light-loads and high-speed conditions, and according to the load when operated under heavy-loads and low-speed conditions.
Frictional torque of rolling bearings is complicated because it is influenced by various factors, but for convenience, it can be expressed approximately by the following equations.

- Radial bearings $$M = \mu\ P\ \frac{d}{2} \quad \cdots\cdots\cdots\cdots(37)$$
- Thrust bearings $$M = \mu\ P\ \frac{d_m}{2} \quad \cdots\cdots\cdots\cdots(38)$$

where, M : Frictional torque, N-mm
μ : Coefficient of friction
P : Bearing load, N
d : Bearing bore diameter, mm
d_m : Mean value of bearing bore and outside diameters, mm

The approximate coefficients of friction of IKO Bearings under operating conditions, in which lubrication and mounting are correct and where loads are relatively large and stable, are shown in Table 40.

Table 40 Coefficient of friction

Bearing series	μ
Needle roller bearings with cage	0.0010 ～ 0.0030
Full complement needle roller bearings	0.0030 ～ 0.0050
Thrust needle roller bearings	0.0030 ～ 0.0040
Thrust roller bearings	0.0030 ～ 0.0040

Allowable rotational speed

As the rotational speed of rolling bearings is increased, the bearing temperature also increases due to the heat generated at the contact surfaces between the cage, raceways and rolling elements, until it finally leads to bearing seizure. It is therefore necessary to maintain the rotational speed of a bearing below a certain limit value to ensure safe operation for long periods. This limit value is called the allowable rotational speed.
Since the amount of heat generated is approximately proportional to the sliding speed at the contact area, this sliding speed is an approximate guide indicating the limit of the bearing rotational speed.
The allowable rotational speed of bearings thus varies according to the bearing type, size, bearing load, method of lubrication, radial clearance, and other such factors.
The allowable rotational speeds shown in the table of dimensions are empirical values. They are not absolute values and can be changed according to the bearing use conditions. Depending on the structure and accuracy around the bearing, the lubricant and the lubrication method, it is possible for some bearings to be operated at more than twice the allowable rotational speed given in the table without trouble.

Operating Temperature Range

The allowable operating temperature range for needle roller bearings is generally -20 ～ +120°C.
When operating at temperatures outside this range, the operation may be limited by the allowable temperature range of prepacked grease, seal, cage material, etc. Further, if the bearing is used at high temperature, i.e. 120°C or above, the amount of dimensional displacement gets larger. So special heat treatment is necessary.
The operating temperature range for some types of bearings is different from the above. See the section for each bearing.

Handling of Bearings

Precautions in handling

Since the bearing is a high-accuracy mechanical element, special attention must be paid to its handling. The following precautions should be noted when handling the bearings.

❶ Bearings and their surrounding parts should be kept clean.
Bearings and their surrounding parts must be kept clean paying special attention to dust and dirt. Tools and the working environment should also be cleaned.

❷ Bearings should be handled carefully.
A shock load during handling may cause scratches, indentations and even cracks or chips on the raceway surfaces and rolling elements.

❸ Bearings should be mounted or dismounted with proper tools.
When mounting and dismounting, tools suitable for the bearing type should be used.

❹ Bearings should be protected against corrosion.
Bearings are treated with anti-corrosive oil. However, when handling them with bare hands, sweat from the hands may result in future rust formation. Gloves should be worn, or hands should be dipped in mineral oil.

❺ Precautions regarding oil components.
Rust prevention oil or grease is used for bearings. Therefore, oil may drip or spatter depending on the operating conditions. Consider installing a shielding plate if necessary.

Storage

Store bearings laid flat indoors, placed in the packing/packaging provided by IKO. Avoid storing in high temperatures, low temperatures, and high humidity. In products pre-packed with lubricant, the lubricant will deteriorate with age if products are stored for a long time. Be sure to reapply lubricant before use.

Mounting

Preparation

Before mounting the bearing, the dimensions and fillets of the shaft and housing should be checked to ensure that they conform to specifications.
Bearings should be unwrapped just before mounting. In case of grease lubrication, bearings should be filled with grease without cleaning the bearings. Even in the case of oil lubrication, it is normally unnecessary to clean the bearings. However, when high accuracy is required or when using at high speeds, the bearings should be cleaned using cleaning oil to remove thoroughly oily contents. The cleaned bearings should not be left alone without anti-corrosive precautions, because bearings can easily be corroded after anti-corrosive agents are removed.
Lubricating grease is prepacked in some types of bearings. Therefore, refer to the relevant section for each bearing.

Methods of mounting

Mounting methods of bearings are different according to the type of bearing and the fit. In general, mounting of needle roller bearings is comparatively easy. However, non-separable bearings with large interferences should be handled with great care.

❶ Mounting by press fit
Small and medium bearings with small interferences require a small pressing-in force for mounting, and they are mounted using a press at room temperature. The bearing should be pressed in carefully, applying a force evenly to the bearing with a fitting tool as shown in Fig. 26. For separable bearings, the inner and outer rings can be mounted separately, and the mounting work is simple. However, when installing the shaft and inner ring assembly into the outer ring, care should be taken not to damage the raceway surfaces and rolling elements.

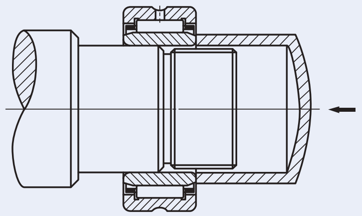


Fig. 26

When mounting non-separable bearings, the inner and outer rings are pressed in simultaneously by applying a cover plate as shown in Fig. 27. It must never happen that the inner ring is press-fitted to the shaft by striking the outer ring, or the outer ring by striking the inner ring, because the raceway surfaces and rolling elements will be scratched or indented.

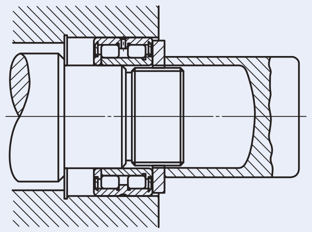


Fig. 27

When press fitting, the friction of the fitting surfaces can be reduced by applying high viscosity oil over the fitting surfaces.
The pressing-in or pulling-out force to be applied to the bearing is given on page A59.

❷ Mounting by shrink fitting
This method is used when the interference is great or when a large bearing is to be fitted. The housing is heated and thermally expanded when fitting the outer ring to the housing and the inner ring is heated and expanded when fitting it to the shaft allowing the bearing to be set easily within a short time. The maximum allowable temperature for the shrink fit is +120°C, and heating should be performed appropriately. Pure non-corrosive mineral oil is recommended as the heating oil for shrink fit, and insulation oil for transformers is considered to be the best. During cooling, the bearing also shrinks in the axial direction. Therefore, to ensure that there is no clearance between the bearing and the shoulder, an axial force must be applied continuously to the bearing until it has cooled.
When the interference between the outer ring and the housing is great, an expansion fit method in which the bearing is cooled using dry ice or other cooling agent before fitting can be used. Immediately after fitting, however, moisture from the air easily condenses on the bearing. Therefore, it is necessary to take preventive measures against corrosion.

Pressing force and pulling force

Guidelines for the pressing force when pressing in the inner ring to the shaft and the pulling force when pulling it out are obtained from the following equation.

$$K = f_{\mathrm{k}}\frac{d}{d+2}\,\Delta_{df}B\left\{1-\left(\frac{d}{F}\right)^{2}\right\} \quad \cdots\cdots\cdots(39)$$

where, K : Pressing or pulling force, N

f_{k} : Resistance factor determined by the coefficient of friction

When pressing in inner ring to shaft, $f_{\mathrm{k}}=4\times10^{4}$

When pulling out inner ring from shaft, $f_{\mathrm{k}}=6\times10^{4}$

d : Bore diameter of inner ring, mm

Δ_{df} : Apparent interference, mm

B : Width of inner ring, mm

F : Outside diameter of inner ring, mm

The actual pressing force or pulling force may be greater than the calculated value due to mounting errors. When designing a puller, it is necessary that the puller has the strength (rigidity) to withstand more than 5 times the calculated value.

Running test

After mounting the bearing, a running test is carried out to check whether the mounting is normal. Usually, it is first checked by manual turning. Then, it is operated by power gradually from no-load and low-speed up to normal operating conditions to check for abnormalities.

Noise can be checked by using a soundscope or similar instrument. In this test, checks are carried out for the following abnormalities.

❶ Manual turning

(a) Uneven torque ·················· Improper mounting

(b) Sticking and rattling ··· Scratches or indentations on the raceway surface

(c) Irregular noise ··· Penetration of dust or foreign particles

❷ Power running

(a) Abnormal noise or vibration ··· Indentations on the raceway surface, too great clearance

(b) Abnormal temperature ··· Unsuitable lubricant, improper mounting, too small clearance

Dismounting

Dismounting of the bearings is carried out for the periodic inspection or repairs of machines. By inspecting the bearing, related parts or mechanisms, lubrication, etc., important data is obtained. In the same manner as in mounting, care should be taken to prevent damage to the bearing or other parts.

A suitable dismounting method should be selected according to the type of the bearing, fit, etc. Bearings mounted by interference fit are especially difficult to dismount, and it is necessary to give due consideration to the structure around the bearing during the design stage.

Dismounting of outer ring

Outer rings mounted by interference fit are dismounted as shown in Fig. 28, by screwing in the push-out bolts evenly through several screw holes provided at places corresponding to the side face of the outer ring.

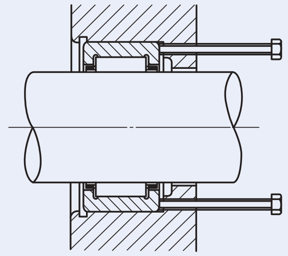


Fig. 28

Dismounting of inner ring

In the case of bearings such as needle roller bearings in which the inner and outer rings are separable, the simplest way to press out the inner ring is by using a press as shown in Fig. 29.

The puller shown in Fig. 30 is also generally used. This is designed according to the bearing size. In addition, there are a 3-hook puller (Fig. 31) and a 2-hook puller for wide-range use.

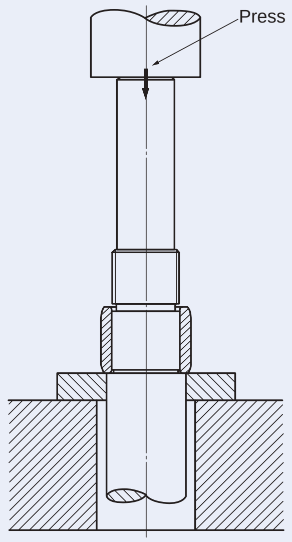


Fig. 29

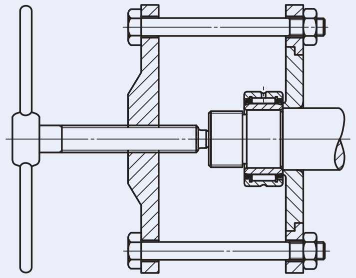


Fig. 30

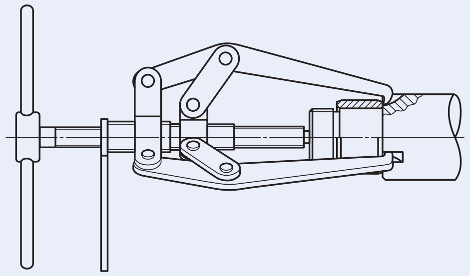


Fig. 31

In addition to these, when it is difficult to remove the inner ring due to high shoulders, several holes for removal pins are made through the shoulder, or several hook grooves are cut in the shoulder as shown in Fig. 32 and Fig. 33.

When a bearing is not to be used again after removal, it may be removed by heating with a torch lamp.

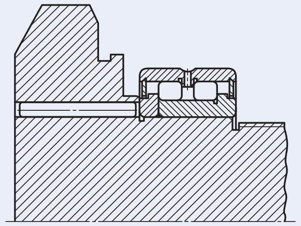


Fig. 32

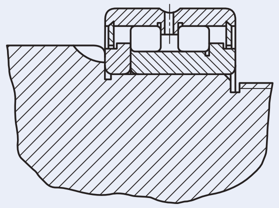


Fig. 33

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Inspection of bearing

Cleaning of bearing

When inspecting a bearing after removal, the appearance of the bearing should be recorded first. Then, after the residual amount of lubricant is checked and a sample of lubricant is collected, the bearing should be cleaned.
For cleaning, light oil or kerosene is commonly used. Cleaning is divided into rough cleaning and final cleaning, and wire gauze is set as a raised bottom in a container to prevent the bearing from touching the bottom of the container.
Lubricating grease and adhering substances such as foreign particles are removed with a brush, etc., using oil for rough cleaning. Care should be taken during this process, because if the bearing is turned with foreign particles attached, the raceway surfaces may be scratched.
Final cleaning is carried out by turning the bearing in cleaning oil. It is desirable that the cleaning oil is kept clean by filtering. Immediately after cleaning, the bearing must be protected against corrosion.

Inspection and evaluation of bearing

The judgement as to whether the removed bearing is reusable depends on the inspection after cleaning. Conditions of the raceway surfaces, rolling elements and fitting surfaces, wear condition of the cage, increase of bearing clearance, dimensions, rotational accuracy, etc. should be checked for damage and abnormalities.
The evaluation is performed based on the experience taking into consideration the degree of damage, machine performance, importance of the machine, operating conditions, period until the next inspection, and other such factors.

Maintenance and inspection

Maintenance and inspection

Maintenance and inspection are carried out to maintain good performance of bearings installed in the machine.
Maintenance is performed by checking the machine operating conditions, checking and replenishing or replacing the lubricant, checking the bearing and related parts by periodic disassembly and other such procedures.
Items for inspection of a running bearing in a machine include the bearing temperature, noise, vibration and condition of lubricant.
When any abnormality is found during operation, the cause should be investigated and measures taken by referring to the section on running test on page A59.
When removing a bearing, refer to the section on dismounting on page A59.

Damage, causes and corrective action

Rolling bearings can generally be used fully up to their rolling fatigue life if they are properly selected, mounted, operated and maintained. However, they may actually be damaged earlier than their expected lifetimes creating problems or accidents. Common causes of damage include improper mounting or handling, insufficient lubrication and penetration of foreign particles.
It may be difficult to determine the exact cause of a problem by checking only the damaged bearing. The conditions of the machine before and after the occurrence of the damage, the location and the operating and ambient conditions of the bearing, the structure around the bearing, etc. should also be examined. It then becomes possible to assess the cause of the damage by linking the conditions of the damaged bearing to the probable causes arising from the machine operation, and to prevent the recurrence of similar problems.
Common types of damage, causes and corrective action are listed in Table 41.

Table 41 Damage, causes and corrective action

Condition of bearing damage		Cause	Corrective action
Flaking	Flakings at opposite circumferential positions on raceway surfaces	Improper roundness of housing bore	Correction of housing bore accuracy
	Flakings in the vicinity of raceway surface edges and roller ends	Improper mounting, Shaft deflection, Poor centering, Poor accuracy of shaft or housing	Careful mounting, Careful centering, Correction of shoulders of shaft and housing for right angles
	Flakings on raceway surfaces with an interval corresponding to roller pitch	Great shock load when mounting, Rusting during machine stoppage	Careful mounting, Protection against rust for long periods of machine stoppage
	Early flaking on raceway surfaces and rolling elements	Too small clearance, Too great load, Poor lubrication, Rusting, etc.	Correct selection of fit and clearance Correct selection of lubricant
Galling	Galling on raceway surfaces and rolling surfaces of rollers	Poor lubrication in early stage Grease consistency too hard High acceleration at start	Selection of softer grease, Avoiding quick acceleration
	Galling between roller end faces and collar guide surfaces	Poor lubrication, Poor mounting, Large axial load	Correct selection of lubricant Correct mounting
Breakage	Cracks in outer or inner ring	Excessive shock load, Too much interference. Poor cylindricity of shaft. Too large fillet radius, Development of thermal cracks, Development of flaking	Reevaluation of load conditions, Correction of fit, Correction of machining accuracy of shaft or sleeve, Making fillet radius smaller than the chamfer dimension of bearing
	Cracked rolling elements, broken collar	Development of flaking Shock to collar when mounting, Dropped by careless handling	Careful handling and mounting
	Broken cage	Abnormal load to cage by poor mounting, Poor lubrication	Minimizing mounting errors, Study of lubricating method and lubricant
Dent	Indentations on raceway surfaces at an interval corresponding to the pitch between rolling elements (brinelling)	Shock load applied when mounting, Excessive load while stopping	Careful handling
	Indentation on raceway surfaces and rolling surfaces of rollers	Biting of foreign substances such as metal chips and sands	Cleaning of housing, Improvement of sealing, Use of clean lubricant
Abnormal wear	False brinelling (Phenomenon like brinelling)	Vibration when the bearing is stationary such as during transportation, Oscillating motion with small amplitude	Fixing of shaft and housing, Use of lubricating oil, Application of preload to reduce vibration
	Fretting Localized wear of fitted surfaces accompanied by red-brown wear particles	Sliding between fitted surfaces	Increase of interference, Application of oil
	Wear on raceway surfaces, collar surfaces, rolling surfaces of rollers, cages, etc.	Penetration of foreign particles, Poor lubrication, Rust	Improvement of sealing, Cleaning of housing Use of clean lubricant
	Creep Wear on fitted surfaces	Sliding between fitted surfaces, Insufficient tightening of sleeve	Increase of interference, Correct tightening of sleeve
Seizure	Discoloration of rolling elements and/or raceway surfaces and/or flange surfaces, Adhesion and welding, Discoloration of cage	Poor lubrication, Too small clearance, Poor mounting	Supply of proper amount of proper lubricant, Rechecking of fit and bearing clearance Rechecking of mounting dimensions and related parts
Electric corrosion	Ripples on raceway surfaces	Melting by sparks due to electric current	Insulation of bearing, Grounding to avoid electric current
Rust, corrosion	Rust or corrosion on bearing inside surfaces or on fitted surfaces	Condensation of vapor in air, Penetration of corrosive substances	Careful storage if under high temperature and high humidity, Protection against rust, Improvement of sealing

Description of Each Series & Table of Dimensions

SHELL TYPE NEEDLE ROLLER BEARINGS

- Shell Type Caged Needle Roller Bearings
- Shell Type Grease Retained Full Complement Needle Roller Bearings

Structure and features

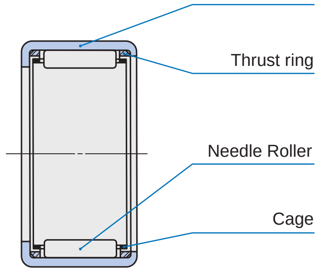
IKO Shell Type Needle Roller Bearings are lightweight bearings with large load ratings. They employ a shell type outer ring made from a thin special-steel plate which is accurately drawn, carburized and quenched, thus providing the lowest sectional height among the needle roller bearings.

There are two types of bearings available in this series; the caged type and the full complement type. The appropriate type can be selected according to the operating conditions. The caged type has a structure in which the needle rollers are accurately guided by the cage and thrust rings. It is useful for applications at high-speed rotation. The full complement type needle roller bearing, on the other hand, is suitable for heavy-load applications at low-speed rotation.

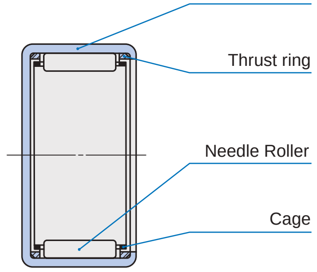
Since these bearings are press-fitted into the housing, no fixtures for axial positioning are needed. They are ideal for use in mass-produced articles that require economy, and have a wide variety of applications.

Structures of Shell Type Needle Roller Bearings

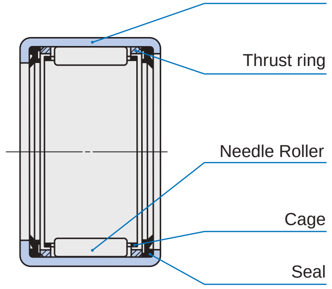
Standard Caged Type



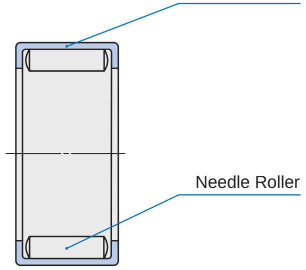
Caged and closed end type



Caged type with two seals



Grease retained full complement type



Types

Numerous varieties of Shell Type Needle Roller Bearings are available as shown in Table 1.

Table 1 Type of bearing

Series		Caged			Full complement
	Type	Standard	Closed end	With seals (1)	Grease retained
Metric series	—	TLA ···Z	TLAM	TLA ··· UU	YTL
	Heavy duty	TA ···Z	TAM	—	YT
Inch series	—	BA ···Z	BAM	—	YB
	Heavy duty	BHA ··· Z	BHAM	—	YBH

Note(1) When the heavy duty type with seals or the closed end type with one seal is required, please consult IKO.

Remark A "W" is added to the model code to indicate that the rolling elements are of the double-row type.
Example TAW 5045 Z

Shell Type Caged Needle Roller Bearings

Standard type

This type has a narrow gap between the bore of the marked-side flange of the outer ring (brand, bearing number, etc. are marked) and the shaft, which prevents grease leaks and the entry of foreign particles. This type has wide applications.

Closed end type

This type is completely closed on one side of the outer ring, and is ideal for use when perfect closing of shaft ends is desired.

The shape of the closed end surface of the outer ring is divided into two types, and the dimensions t_1 and t_2 in the illustrations shown in the dimension tables apply to the bearings with the roller set bore diameters, $F_w > 22$ and $F_w \leqq 22$, respectively.

Type with seals at both sides

This type has a wider outer ring than the standard type and is installed with seals consisting of a reinforcing ring and special synthetic rubber to prevent grease leaks and the entry of foreign particles.

Shell Type Grease Retained Full Complement Needle Roller Bearings

This type has full complement rollers which extend to the full width of the outer ring raceway. It can, therefore, withstand heavy bearing loads and is most suitable for low and medium rotational speeds as well as rocking motions. As lubricating grease is prepacked with the rollers, the bearing can be operated immediately after being fitted.

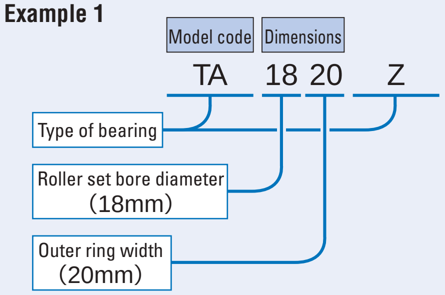
Identification Number

The identification number of Shell Type Needle Roller Bearings consists of a model code and dimensions. Examples of the arrangement are shown below.

When using with inner rings, the assembled inner rings shown in the dimension tables are used. An example in this case is also shown below. Inner rings are delivered separately.

Examples of identification number

Example 1



Example 2 (With inner ring)

Identification number of Shell Type Needle Roller Bearing		Identification number of Inner Ring
TA 1820 Z	+	IRT 1520

Accuracy

The outer rings of Shell Type Needle Roller Bearings are thin and therefore cannot avoid deformation due to heat treatment. It is thus not appropriate to take direct measurements of the bearing. The roller set bore diameter is measured using a plug gauge or tapered gauge after press-fitting the bearing to a suitable ring gauge. The gauge specifications are shown in Tables 2.1 and 2.2.

Tolerances of outer ring width C are shown in Table 3.

Table 2.1 Measuring gauges for metric series bearings unit: mm

F_w Nominal roller set bore diameter	Ring gauge		Plug gauge	
	TA···Z(1)	TLA···Z(2)	Go	No-go
4	—	7.981	4.004	4.016
5	—	8.981	5.004	5.016
6	—	9.981	6.004	6.016
7	—	10.977	7.005	7.020
8	14.992	11.977	8.005	8.020
9	15.992	12.977	9.005	9.020
10	16.992	13.977	10.005	10.020
12	18.991	15.977(3) 17.977(3)	12.006	12.024
13	—	18.972	13.006	13.024
14	21.991	19.972	14.006	14.024
15	21.991	20.972	15.006	15.024
16	23.991	21.972	16.006	16.024
17	23.991	22.972	17.006	17.024
18	24.991	23.972	18.006	18.024
19	26.991	—	19.007	19.028
20	26.991(4) 27.991(4)	25.972	20.007	20.028
21	28.991	—	21.007	21.028
22	28.991(5) 29.991(5)	27.972	22.007	22.028
24	30.989(6) 31.989(6)	—	24.007	24.028
25	32.989	31.967	25.007	25.028
26	33.989	—	26.007	26.028
28	36.989	34.967	28.007	28.028
29	37.989	—	29.007	29.028
30	39.989	36.967	30.007	30.028
32	41.989	—	32.009	32.034
35	44.989	41.967	35.009	35.034
37	46.989	—	37.009	37.034
38	47.989	—	38.009	38.034
40	49.989	46.967	40.009	40.034
45	54.988	51.961	45.009	45.034
50	61.988	57.961	50.009	50.034
55	66.988	62.961	55.010	55.040
60	71.988	—	60.010	60.040
62	73.988	—	62.010	62.040
65	76.988	—	65.010	65.040
70	81.987	—	70.010	70.040

Notes(1) Also applicable to TAM and YT
(2) Also applicable to TLAM, YTL, TLA···UU
(3) The upper value is for TLA 1210Z model, and the lower value is for TLA 1212Z model.
(4) The lower value is for TA 202820Z model, and the upper value is for models other than TA 202820Z model.
(5) The lower value is for TA 223016Z and TA 223020Z models, and the upper value is for models other than those models.
(6) The lower value is for TA 243216Z and TA 243220Z models, and the upper value is for models other than those models.

Table 2.2 Measuring gauges for inch series bearings unit: mm

F_w Nominal roller set bore diameter	Ring gauge		Plug gauge	
	BA···Z(1)	BHA···Z(2)	Go	No-go
3.969	7.155	—	3.990	4.016
4.762	8.730	—	4.783	4.808
6.350	11.125	—	6.388	6.414
7.938	12.713	14.300	7.976	8.001
9.525	14.300	15.888	9.563	9.588
11.112	15.888	17.475	11.151	11.176
12.700	17.475	19.063	12.738	12.764
14.288	19.063	20.650	14.326	14.351
15.875	20.650	22.238	15.913	15.938
17.462	22.238	23.825	17.501	17.526
19.050	25.387	26.975	19.063	19.088
20.638	26.975	28.562	20.650	20.676
22.225	28.562	30.150	22.238	22.263
23.812	30.150	—	23.825	23.851
25.400	31.737	33.325	25.413	25.438
26.988	33.325	—	27.000	27.026
28.575	34.912	38.087	28.588	28.613
30.162	38.087	—	30.175	30.201
31.750	38.087	41.262	31.763	31.788
33.338	41.262	—	33.350	33.378
34.925	41.262	44.437	34.938	34.966
38.100	47.612	—	38.113	38.143
41.275	50.787	—	41.288	41.318
44.450	53.962	57.137	44.463	44.496
47.625	57.137	—	47.638	47.671
50.800	60.312	—	50.815	50.848
52.388	—	64.280	52.413	52.451
53.975	63.487	—	53.990	54.028
57.150	66.662	—	57.165	57.203
66.675	76.187	—	66.700	66.738
69.850	79.362	—	69.875	69.914

Notes(1) Also applicable to BAM and YB
(2) Also applicable to BHAM and YBH

Table 3 Tolerances of outer ring width C unit: mm

Series	Tolerance
Metric	0 ～ −0.20
Inch	0 ～ −0.25

Fit

As the outer ring is thin, the correct dimensions and accuracy of Shell Type Needle Roller Bearings are obtained only after they have been press-fitted into the housing bore. Bearing accuracy is directly affected by housing dimensions, shape and rigidity. This should be taken into account when considering fit and accuracy. The radial clearance after fitting the bearing to the shaft and the housing bore varies with their tolerances.

Table 4 shows the recommended fit for Shell Type Needle Roller Bearings.

Table 5 shows a calculation example of radial clearance after fitting. This calculation applies to bearings without inner ring to be fitted into rigid steel or cast iron housings. When the housing is made of light alloy or a thin steel pipe, it is necessary to check dimensions by actual measurement.

Generally, when making the radial clearance smaller, it is recommended that the shaft diameter be increased, without decreasing the housing bore diameter.

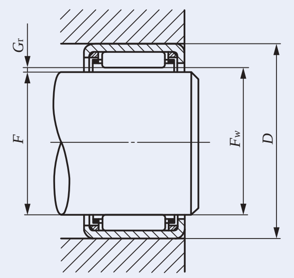
Table 4 Recommended fit

Type of bearing	Housing material	Tolerance class		
		Shaft [1]		Housing bore
		Without inner ring	With inner ring	
TA⋯Z, BA⋯Z, BHA⋯Z, TAM, BAM, BHAM, YT, YB, YBH	Steel Cast iron	h6	k5(j5)	J7
	Light alloy (Thin steel pipe)	h6	k5(j5)	M7(N7)
TLA⋯Z, TLAM, YTL, TLA⋯UU	Steel Cast iron	h6	k5(j5)	N7
	Light alloy (Thin steel pipe)	h6	k5(j5)	R7(S7)

Note[1] When housings are made of light alloy or a thin steel pipe, the roller set bore diameter is greatly affected by the housing thickness and shape. Therefore, before mass-production assembly, assembly tests should be carried out to confirm the amount of dimensional change and to determine the tolerance of the shaft which will give normal clearances.

Table 5 Calculation example of radial clearance after fitting

unit: mm

	Calculation procedure	Example of TLA 2020 Z
 D : Housing bore diameter F_w : Roller set bore diameter F : Shaft diameter G_r : Radial clearance	❶ Dimension of roller set bore diameter of bearing after it has been press-fitted into the ring gauge. Dimension of ring gauge (D_0): See Tables 2.1 and 2.2 on page B4. Max. value of roller set bore dia. ($F_{w\,max}$): No-go dimension of plug gauge Min. value of roller set bore dia. ($F_{w\,min}$): Go dimension of plug gauge	From Table 2.1 on page B4 D_0 =25.972 $F_{w\,max}$ =20.028 $F_{w\,min}$ =20.007
	❷ Dimension of housing bore Max. value of housing bore (D_{max}): See the dimension table. Min. value of housing bore (D_{min}): See the dimension table.	From the dimension table on page B14, D_{max} =25.993 D_{min} =25.972
	❸ Dimension of roller set bore diameter of bearing after it has been press-fitted into the housing bore Max. value of roller set bore dia.($F_{we\,max}$)=($D_{max}-D_0$) $+F_{w\,max}$ Min. value of roller set bore dia.($F_{we\,min}$)=($D_{min}-D_0$) $+F_{w\,min}$	From the equations, $F_{we\,max}$ =20.049 $F_{we\,min}$ =20.007
	❹ Dimension of shaft Max. value of shaft dia. (F_{max}): See the dimension table. Min. value of shaft dia. (F_{min}): See the dimension table.	From the dimension table on page B14, F_{max} =20.000 F_{min} =19.987
	❺ Radial clearance after mounting Max. value of radial clearance($G_{r\,max}$)=$F_{we\,max}-F_{min}$ Min. value of radial clearance($G_{r\,min}$) =$F_{we\,min}-F_{max}$	From the equations, $G_{r\,max}$ =0.062 $G_{r\,min}$ =0.007 The radial clearance after mounting becomes 0.007~0.062 mm.

Lubrication

Bearings with prepacked grease are shown in Table 6. ALVANIA GREASE S2 (Shell Lubricants Japan K.K.) is prepacked as the lubricating grease.

In the case of bearings without prepacked grease, perform proper lubrication for use. If the bearings are operated without lubrication, the wear of the roller contact surfaces will increase and the bearing life will be shortened.

Oil Hole

For Shell Type Needle Roller Bearings with an oil hole, "OH" is appended to the end of the identification number.

Example TA 2525 Z OH

The symbol "OH" is not marked on the bearing itself, but is shown on its packaging, etc. When bearings with multiple oil holes are required, please consult IKO.

Table 6 Bearings with prepacked grease

○ : With prepacked grease × : Without prepacked grease

Series	Bearing type	Caged			Full complement
		Standard	Closed end	With seals	Grease retained
Metric series	TLA, TLAM, YTL	×	×	○	○
	TA, TAM, YT	×	×	–	○
Inch series	BA, BAM, YB	×	×	–	○
	BHA, BHAM, YBH	×	×	–	○

Static Safety Factor

Since Shell Type Needle Roller Bearings employ an outer ring made from a thin steel plate which is drawn, carburized and quenched, excessively large loads must be avoided. The required static safety factor is usually more than 3.

Specifications of shaft and housing

Shell Type Needle Roller Bearings are commonly used without an inner ring. In such cases, the surface hardness of the raceway surface should be 58 ~ 64HRC and the surface roughness should not exceed 0.2 μ mR_a. However, when the operating condition is not severe, a surface roughness 0.8μmR_a or less can be used.

If the surface hardness is low, the load rating must be corrected by the hardness factor shown on page A20.

When the shaft cannot be heat treated and finished by grinding, the use of IKO Inner Rings for Shell Type Needle Roller Bearings (See page H1.) is recommended.

Mounting

Shell Type Needle Roller Bearings should be pressed into the housings gently using the appropriate tool as shown in Fig. 1, with their marked end surface up. As the outer ring is thin, it must never be struck directly with a hammer.

Since the outer rings of Shell Type Needle Roller Bearings are firmly fitted to housing bores with interference, it is unnecessary to fix them axially. Fig. 2 shows mounting examples.

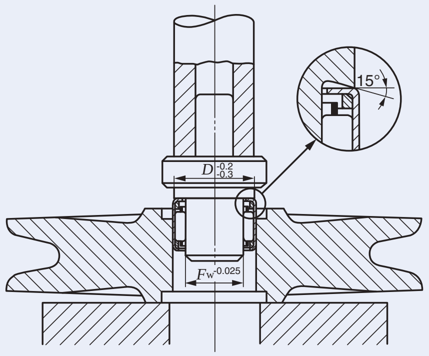


Fig.1 Example of mounting tool

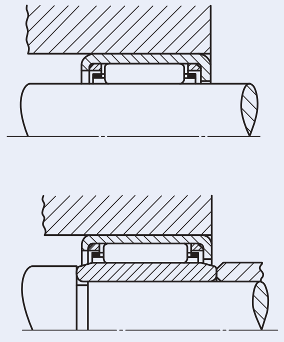
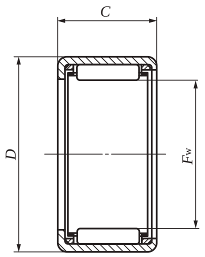
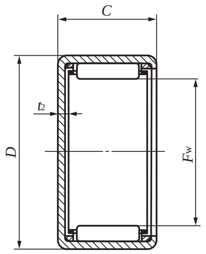


Fig.2 Mounting examples

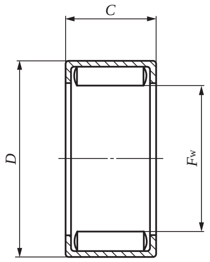
SHELL TYPE NEEDLE ROLLER BEARINGS



TA···Z　TLA···Z



TAM　TLAM



YT　YTL

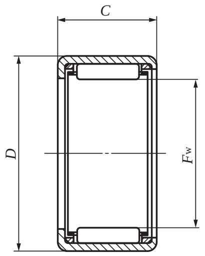
Shaft dia. 4 ─ 10 mm

Shaft dia. mm	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g	Boundary dimensions mm: F_w	D	C	t_2 Max.	Standard mounting dimensions mm: Shaft dia. h6 Max.	Min.	Housing bore dia. J7 Max.	Min.	N7 Max.	Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) min⁻¹	Assembled inner ring
4	—	—	—	—	**TLA 48 Z**	1.54	**TLAM 48**	1.67	—	—	4	8	8	1	4.000	3.992	—	—	7.996	7.981	1 350	1 010	75 000	—
	—	—	—	—	—	—	—	—	**YTL 48**	1.73	4	8	8	—							3 010	2 900	40 000	—
5	—	—	—	—	**TLA 59 Z**	1.9	**TLAM 59**	2	—	—	5	9	9	1	5.000	4.992	—	—	8.996	8.981	1 880	1 600	65 000	—
	—	—	—	—	—	—	—	—	**YTL 59**	2.4	5	9	9	—							4 320	4 750	30 000	—
6	—	—	—	—	**TLA 69 Z**	2.2	**TLAM 69**	2.3	—	—	6	10	9	1	6.000	5.992	—	—	9.996	9.981	2 100	1 900	55 000	—
7	—	—	—	—	**TLA 79 Z**	2.5	**TLAM 79**	2.7	—	—	7	11	9	1	7.000	6.991	—	—	10.995	10.977	2 490	2 450	50 000	—
8	—	—	—	—	**TLA 810 Z**	3.1	**TLAM 810**	3.3	—	—	8	12	10	1	8.000	7.991	—	—	11.995	11.977	3 320	3 670	45 000	—
	TA 810 Z	6.7	**TAM 810**	7.1	—	—	—	—	—	—	8	15	10	1.3	8.000	7.991	15.010	14.992	—	—	3 470	2 880	45 000	—
	TA 815 Z	9.7	**TAM 815**	10.1	—	—	—	—	—	—	8	15	15	1.3							5 780	5 570	45 000	—
	TA 820 Z	12.9	**TAM 820**	13.3	—	—	—	—	—	—	8	15	20	1.3							8 340	8 920	45 000	—
	—	—	—	—	—	—	—	—	**YT 810**	7.7	8	15	10	—							7 530	7 950	19 000	—
9	—	—	—	—	**TLA 910 Z**	3.4	**TLAM 910**	3.6	—	—	9	13	10	1	9.000	8.991	—	—	12.995	12.977	3 500	4 040	45 000	—
	—	—	—	—	**TLA 912 Z**	4	**TLAM 912**	4.3	—	—	9	13	12	1							4 460	5 510	45 000	—
	TA 912 Z	8.7	**TAM 912**	9.2	—	—	—	—	—	—	9	16	12	1.3	9.000	8.991	16.010	15.992	—	—	5 140	4 880	45 000	—
	TA 916 Z	11.4	**TAM 916**	11.9	—	—	—	—	—	—	9	16	16	1.3							6 960	7 210	45 000	—
	—	—	—	—	—	—	—	—	**YT 912**	10.1	9	16	12	—							9 690	11 200	17 000	—
10	—	—	—	—	**TLA 1010 Z**	3.7	**TLAM 1010**	4	—	—	10	14	10	1	10.000	9.991	—	—	13.995	13.977	3 870	4 740	40 000	**IRT 710**
	—	—	—	—	**TLA 1012 Z**	4.4	**TLAM 1012**	4.8	—	—	10	14	12	1							4 920	6 460	40 000	**IRT 712**
	—	—	—	—	**TLA 1015 Z**	5.5	**TLAM 1015**	5.9	—	—	10	14	15	1							6 390	9 040	40 000	**IRT 715**
	TA 1010 Z	7.9	**TAM 1010**	8.5	—	—	—	—	—	—	10	17	10	1.3	10.000	9.991	17.010	16.992	—	—	4 150	3 780	40 000	**IRT 710**
	TA 1012 Z	9.3	**TAM 1012**	10	—	—	—	—	—	—	10	17	12	1.3							5 590	5 540	40 000	**IRT 712**
	TA 1015 Z	11.5	**TAM 1015**	12.2	—	—	—	—	—	—	10	17	15	1.3							6 920	7 300	40 000	**IRT 715**
	TA 1020 Z	15.4	**TAM 1020**	16	—	—	—	—	—	—	10	17	20	1.3							9 990	11 700	40 000	—

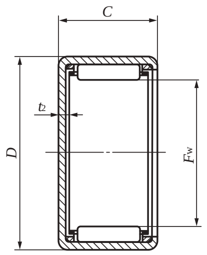
Note(1)　Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remark　Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

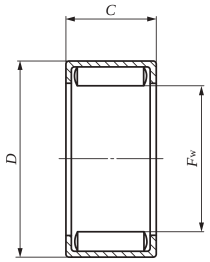
SHELL TYPE NEEDLE ROLLER BEARINGS



TA···Z TLA···Z



TAM TLAM



YT YTL

Shaft dia. 12 ─ 15 mm

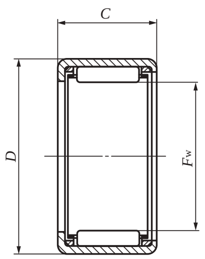
Shaft dia. mm	Identification number										Boundary dimensions mm				Standard mounting dimensions mm						Basic dynamic load rating	Basic static load rating	Allowable rotational speed(1)	Assembled inner ring
	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g	F_w	D	C	t_2 Max.	Shaft dia. h6 Max.	Min.	Housing bore dia. J7 Max.	Min.	N7 Max.	Min.	C N	C_0 N	min⁻¹	
12	—	—	—	—	**TLA 1210 Z**	4.3	**TLAM 1210**	4.7	—	—	12	16	10	1	12.000	11.989	—	—	15.995	15.977	4 350	5 810	35 000	**IRT 810**
	—	—	—	—	—	—	—	—	**YTL 1210**	5.1	12	16	10	—							7 470	11 800	13 000	**IRT 810**
	—	—	—	—	**TLA 1212 Z**	8.6	**TLAM 1212**	9.4	—	—	12	18	12	1.3	12.000	11.989	—	—	17.995	17.977	6 420	7 490	35 000	**IRT 812**
	TA 1212 Z	10.5	**TAM 1212**	11.5	—	—	—	—	—	—	12	19	12	1.3	12.000	11.989	19.012	18.991	—	—	6 000	6 310	35 000	**IRT 812**
	TA 1215 Z	13.1	**TAM 1215**	14	—	—	—	—	—	—	12	19	15	1.3							7 440	8 320	35 000	**IRT 815**
	TA 1220 Z	17.3	**TAM 1220**	18.3	—	—	—	—	—	—	12	19	20	1.3							10 700	13 300	35 000	—
	TA 1225 Z	21.5	**TAM 1225**	22.5	—	—	—	—	—	—	12	19	25	1.3							13 800	18 300	35 000	—
	—	—	—	—	—	—	—	—	**YT 1212**	12.8	12	19	12	—							11 800	15 200	13 000	**IRT 812**
13	—	—	—	—	**TLA 1312 Z**	9.2	**TLAM 1312**	10.1	—	—	13	19	12	1.3	13.000	12.989	—	—	18.993	18.972	6 760	8 170	30 000	**IRT 1012**
14	—	—	—	—	**TLA 1412 Z**	9.8	**TLAM 1412**	10.8	—	—	14	20	12	1.3	14.000	13.989	—	—	19.993	19.972	7 080	8 840	30 000	**IRT 1012-2**
	—	—	—	—	**TLA 1416 Z**	13.2	**TLAM 1416**	14.3	—	—	14	20	16	1.3							8 950	12 000	30 000	**IRT 1016-2**
	TA 1416 Z	18.4	**TAM 1416**	19.6	—	—	—	—	—	—	14	22	16	1.3	14.000	13.989	22.012	21.991	—	—	10 500	12 000	30 000	**IRT 1016-2**
	TA 1420 Z	23	**TAM 1420**	24	—	—	—	—	—	—	14	22	20	1.3							13 900	17 200	30 000	**IRT 1020-2**
15	—	—	—	—	**TLA 1512 Z**	10.4	**TLAM 1512**	11.5	—	—	15	21	12	1.3	15.000	14.989	—	—	20.993	20.972	7 380	9 520	25 000	**IRT 1212**
	—	—	—	—	**TLA 1516 Z**	14	**TLAM 1516**	15.2	—	—	15	21	16	1.3							9 330	12 900	25 000	**IRT 1216**
	—	—	—	—	**TLA 1522 Z**	19.1	**TLAM 1522**	20.5	—	—	15	21	22	1.3							13 600	20 900	25 000	**IRT 1222**
	TA 1510 Z	10.8	**TAM 1510**	12.3	—	—	—	—	—	—	15	22	10	1.3	15.000	14.989	22.012	21.991	—	—	5 290	5 680	25 000	**IRT 1010-1**
	TA 1512 Z	12.9	**TAM 1512**	14.3	—	—	—	—	—	—	15	22	12	1.3							7 120	8 310	25 000	**IRT 1012-1**
	TA 1515 Z	15.9	**TAM 1515**	17.3	—	—	—	—	—	—	15	22	15	1.3							8 830	11 000	25 000	**IRT 1015-1**
	TA 1520 Z	21	**TAM 1520**	22.5	—	—	—	—	—	—	15	22	20	1.3							12 700	17 600	25 000	**IRT 1020-1**
	TA 1525 Z	25	**TAM 1525**	26.5	—	—	—	—	—	—	15	22	25	1.3							16 300	24 200	25 000	**IRT 1025-1**

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

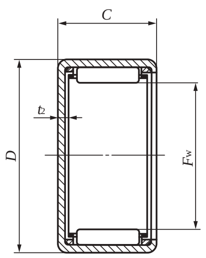
Remark Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

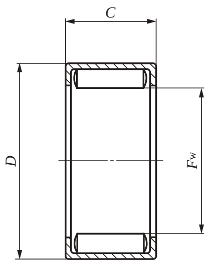
SHELL TYPE NEEDLE ROLLER BEARINGS



TA··· Z　TLA··· Z



TAM　TLAM



YT

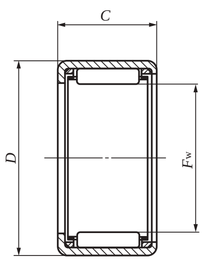
Shaft dia. 16 ー 19mm

Shaft dia. mm	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g	Boundary dimensions mm: F_w	D	C	t_2 Max.	Standard mounting dimensions mm: Shaft dia. h6 Max.	Min.	Housing bore dia. J7 Max.	Min.	N7 Max.	Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) min⁻¹	Assembled inner ring
16	—	—	—	—	**TLA 1612 Z**	10.9	**TLAM 1612**	12.2	—	—	16	22	12	1.3	16.000	15.989	—	—	21.993	21.972	7 670	10 200	25 000	**IRT 1212-1**
	—	—	—	—	**TLA 1616 Z**	14.8	**TLAM 1616**	16.1	—	—	16	22	16	1.3							9 700	13 800	25 000	**IRT 1216-1**
	—	—	—	—	**TLA 1622 Z**	20	**TLAM 1622**	21.5	—	—	16	22	22	1.3							14 200	22 400	25 000	**IRT 1222-1**
	TA 1616 Z	20	**TAM 1616**	22	—	—	—	—	—	—	16	24	16	1.3	16.000	15.989	24.012	23.991	—	—	11 100	13 300	25 000	**IRT 1216-1**
	TA 1620 Z	25	**TAM 1620**	27	—	—	—	—	—	—	16	24	20	1.3							14 700	19 100	25 000	**IRT 1220-1**
17	—	—	—	—	**TLA 1712 Z**	11.5	**TLAM 1712**	13	—	—	17	23	12	1.3	17.000	16.989	—	—	22.993	22.972	7 960	10 900	25 000	—
	TA 1715 Z	17.6	**TAM 1715**	19.5	—	—	—	—	—	—	17	24	15	1.3	17.000	16.989	24.012	23.991	—	—	9 660	12 700	25 000	**IRT 1215-2**
	TA 1720 Z	23.5	**TAM 1720**	25	—	—	—	—	—	—	17	24	20	1.3							13 900	20 400	25 000	**IRT 1220-2**
	TA 1725 Z	29	**TAM 1725**	31	—	—	—	—	—	—	17	24	25	1.3							17 900	28 100	25 000	**IRT 1225-2**
	—	—	—	—	—	—	—	—	**YT 1715**	20.5	17	24	15	—							16 600	26 000	9 000	**IRT 1215-2**
	—	—	—	—	—	—	—	—	**YT 1725**	35.5	17	24	25	—							27 200	49 000	9 000	**IRT 1225-2**
18	—	—	—	—	**TLA 1812 Z**	12	**TLAM 1812**	13.7	—	—	18	24	12	1.3	18.000	17.989	—	—	23.993	23.972	8 230	11 500	20 000	**IRT 1512**
	—	—	—	—	**TLA 1816 Z**	16.2	**TLAM 1816**	17.9	—	—	18	24	16	1.3							10 400	15 600	20 000	**IRT 1516**
	TA 1813 Z	16.4	**TAM 1813**	18.5	—	—	—	—	—	—	18	25	13	1.3	18.000	17.989	25.012	24.991	—	—	9 100	12 000	20 000	**IRT 1513**
	TA 1815 Z	18.5	**TAM 1815**	20.5	—	—	—	—	—	—	18	25	15	1.3							10 100	13 600	20 000	**IRT 1515**
	TA 1817 Z	21	**TAM 1817**	23	—	—	—	—	—	—	18	25	17	1.3							11 900	16 900	20 000	**IRT 1517**
	TA 1819 Z	23.5	**TAM 1819**	25.5	—	—	—	—	—	—	18	25	19	1.3							13 700	20 200	20 000	**IRT 1519**
	TA 1820 Z	24.5	**TAM 1820**	26.5	—	—	—	—	—	—	18	25	20	1.3							14 500	21 800	20 000	**IRT 1520**
	TA 1825 Z	30.5	**TAM 1825**	32.5	—	—	—	—	—	—	18	25	25	1.3							18 600	30 000	20 000	**IRT 1525**
19	**TA 1916 Z**	23	**TAM 1916**	25.5	—	—	—	—	—	—	19	27	16	1.3	19.000	18.987	27.012	26.991	—	—	12 200	15 700	20 000	**IRT 1516-1**
	TA 1920 Z	29	**TAM 1920**	31	—	—	—	—	—	—	19	27	20	1.3							16 100	22 600	20 000	**IRT 1520-1**

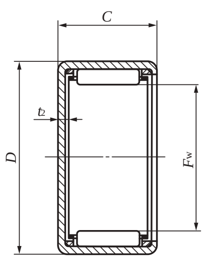
Note(1)　Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remark　Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

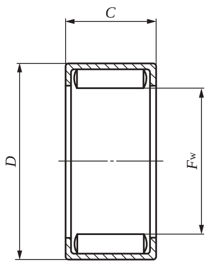
SHELL TYPE NEEDLE ROLLER BEARINGS



TA⋯Z　TLA⋯Z



TAM　TLAM



YT

Shaft dia. 20 — 21mm

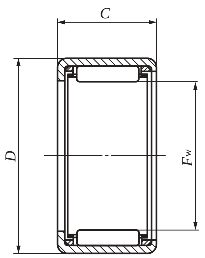
Shaft dia. mm	Identification number									
	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
20	—	—	—	—	**TLA 2012 Z**	13.2	**TLAM 2012**	15.2	—	—
	—	—	—	—	**TLA 2016 Z**	17.8	**TLAM 2016**	19.9	—	—
	—	—	—	—	**TLA 2020 Z**	22	**TLAM 2020**	24	—	—
	—	—	—	—	**TLA 2030 Z**	33	**TLAM 2030**	35	—	—
	TA 2015 Z	20	**TAM 2015**	22.5	—	—	—	—	—	—
	TA 2020 Z	26.5	**TAM 2020**	29	—	—	—	—	—	—
	TA 2025 Z	33	**TAM 2025**	35.5	—	—	—	—	—	—
	TA 2030 Z	39.5	**TAM 2030**	42	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 2015**	23.5
	—	—	—	—	—	—	—	—	**YT 2025**	41
	TA 202820 Z	30	**TAM 202820**	32.5	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 202820**	37.5
21	**TA 2116 Z**	25	**TAM 2116**	28	—	—	—	—	—	—
	TA 2120 Z	31.5	**TAM 2120**	34.5	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 2116**	31
	—	—	—	—	—	—	—	—	**YT 2120**	39

Boundary dimensions mm				Standard mounting dimensions mm						Basic dynamic load rating	Basic static load rating	Allowable rotational speed(1)	Assembled inner ring
				Shaft dia. h6		Housing bore dia. J7		N7		C	C_0		
F_w	D	C	t_2 Max.	Max.	Min.	Max.	Min.	Max.	Min.	N	N	min⁻¹	
20	26	12	1.3	20.000	19.987	—	—	25.993	25.972	8 740	12 900	20 000	—
20	26	16	1.3							11 100	17 500	20 000	**IRT 1716**
20	26	20	1.3							14 500	24 700	20 000	**IRT 1720**
20	26	30	1.3							22 300	42 900	20 000	**IRT 1730**
20	27	15	1.3	20.000	19.987	27.012	26.991	—	—	10 400	14 600	20 000	**IRT 1515-2**
20	27	20	1.3							15 000	23 400	20 000	**IRT 1520-2**
20	27	25	1.3							19 200	32 200	20 000	**IRT 1525-2**
20	27	30	1.3							23 100	41 000	20 000	**IRT 1530-2**
20	27	15	—							18 400	30 900	7 500	**IRT 1515-2**
20	27	25	—							30 000	58 300	7 500	**IRT 1525-2**
20	28	20	1.3	20.000	19.987	28.012	27.991	—	—	16 900	24 300	20 000	**IRT 1520-2**
20	28	20	—							26 800	44 600	7 500	**IRT 1520-2**
21	29	16	1.3	21.000	20.987	29.012	28.991	—	—	13 300	18 100	19 000	**IRT 1716-1**
21	29	20	1.3							17 600	25 900	19 000	**IRT 1720-1**
21	29	16	—							22 100	35 200	7 000	**IRT 1716-1**
21	29	20	—							27 500	46 800	7 000	**IRT 1720-1**

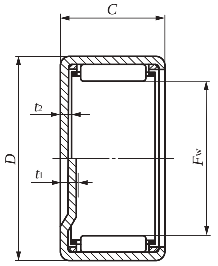
Note(1)　Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remark　Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

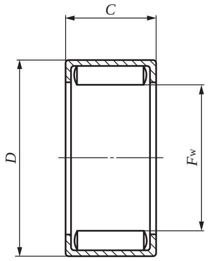
SHELL TYPE NEEDLE ROLLER BEARINGS



TA⋯Z　TLA⋯Z



TAM　TLAM
t_1 ($F_w \geqq 24$)
t_2 ($F_w \leqq 22$)



YT

Shaft dia. 22 – 24mm

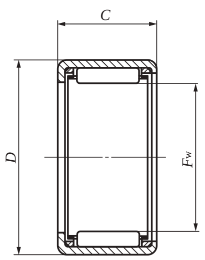
Shaft dia. mm	Identification number Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
22	—	—	—	—	**TLA 2212 Z**	15.6	**TLAM 2212**	18.1	—	—
	—	—	—	—	**TLA 2216 Z**	21.5	**TLAM 2216**	24	—	—
	—	—	—	—	**TLA 2220 Z**	26.5	**TLAM 2220**	29	—	—
	TA 2210 Z	15	**TAM 2210**	18.1	—	—	—	—	—	—
	TA 2215 Z	21.5	**TAM 2215**	24.5	—	—	—	—	—	—
	TA 2220 Z	29	**TAM 2220**	32	—	—	—	—	—	—
	TA 2225 Z	35.5	**TAM 2225**	38.5	—	—	—	—	—	—
	TA 2230 Z	42.5	**TAM 2230**	45.5	—	—	—	—	—	—
	TA 223016 Z	26	**TAM 223016**	29	—	—	—	—	—	—
	TA 223020 Z	32.5	**TAM 223020**	35.5	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 223016**	32
	—	—	—	—	—	—	—	—	**YT 223020**	40.5
24	**TA 2420 Z**	31	**TAM 2420**	35	—	—	—	—	—	—
	TA 2428 Z	43.5	**TAM 2428**	47	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 2428**	54
	TA 243216 Z	28	**TAM 243216**	32	—	—	—	—	—	—
	TA 243220 Z	35.5	**TAM 243220**	39	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 243216**	34.5
	—	—	—	—	—	—	—	—	**YT 243220**	43.5

Note(1)　Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remark　Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

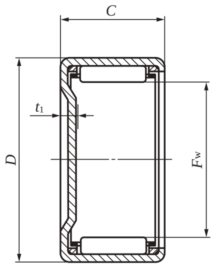
Boundary dimensions mm F_w	D	C	t_1, t_2 Max.	Standard mounting dimensions mm Shaft dia. h6 Max.	Min.	Housing bore dia. J7 Max.	Min.	N7 Max.	Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) min⁻¹	Assembled inner ring
22	28	12	1.3	22.000	21.987	—	—	27.993	27.972	9 230	14 300	18 000	—
22	28	16	1.3							11 700	19 300	18 000	**IRT 1716-2**
22	28	20	1.3							15 300	27 300	18 000	**IRT 1720-2**
22	29	10	1.3	22.000	21.987	29.012	28.991	—	—	6 650	8 500	18 000	**IRT 1710-2**
22	29	15	1.3							11 100	16 400	18 000	**IRT 1715-2**
22	29	20	1.3							16 000	26 300	18 000	**IRT 1720-2**
22	29	25	1.3							19 700	34 300	18 000	**IRT 1725-2**
22	29	30	1.3							23 800	43 700	18 000	**IRT 1730-2**
22	30	16	1.3	22.000	21.987	30.012	29.991	—	—	13 200	18 200	18 000	**IRT 1716-2**
22	30	20	1.3							17 500	26 100	18 000	**IRT 1720-2**
22	30	16	—							22 600	36 800	7 000	**IRT 1716-2**
22	30	20	—							28 200	48 900	7 000	**IRT 1720-2**
24	31	20	3.4	24.000	23.987	31.014	30.989	—	—	17 000	29 200	16 000	**IRT 2020**
24	31	28	3.4							24 500	46 700	16 000	**IRT 2028**
24	31	28	—							36 800	79 900	6 500	**IRT 2028**
24	32	16	3.4	24.000	23.987	32.014	31.989	—	—	14 200	20 500	16 000	**IRT 2016**
24	32	20	3.4							18 800	29 400	16 000	**IRT 2020**
24	32	16	—							23 700	40 100	6 500	**IRT 2016**
24	32	20	—							29 500	53 200	6 500	**IRT 2020**

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

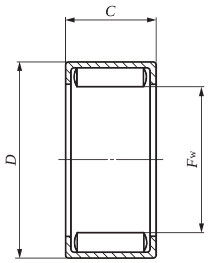
SHELL TYPE NEEDLE ROLLER BEARINGS



TA···Z　TLA···Z



TAM　TLAM



YT　YTL

Shaft dia. 25 ─ 28 mm

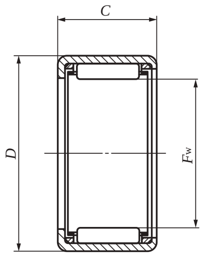
Shaft dia. mm	Identification number										Boundary dimensions mm				Standard mounting dimensions mm						Basic dynamic load rating	Basic static load rating	Allowable rotational speed(1)	Assembled inner ring
	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g	F_w	D	C	t_1 Max.	Shaft dia. h6 Max.	Shaft dia. h6 Min.	Housing bore dia. J7 Max.	Housing bore dia. J7 Min.	Housing bore dia. N7 Max.	Housing bore dia. N7 Min.	C N	C_0 N	min^{-1}	
25	—	—	—	—	**TLA 2512 Z**	19.7	**TLAM 2512**	23.5	—	—	25	32	12	2.8	25.000	24.987	—	—	31.992	31.967	9 440	13 900	15 000	—
	—	—	—	—	**TLA 2516 Z**	26	**TLAM 2516**	29.5	—	—	25	32	16	2.8							12 800	20 500	15 000	—
	—	—	—	—	**TLA 2520 Z**	32	**TLAM 2520**	36	—	—	25	32	20	2.8							16 900	29 300	15 000	**IRT 2020-1**
	—	—	—	—	**TLA 2526 Z**	41.5	**TLAM 2526**	45.5	—	—	25	32	26	2.8							22 600	42 500	15 000	**IRT 2026-1**
	—	—	—	—	**TLAW2538Z**	58.5	**TLAMW2538**	62	—	—	25	32	38	2.8							28 900	58 500	15 000	**IRT 2038-1**
	—	—	—	—	—	—	—	—	**YTL 2526**	51.5	25	32	26	—							35 000	75 800	6 000	**IRT 2026-1**
	TA 2510 Z	19.1	**TAM 2510**	23	—	—	—	—	—	—	25	33	10	3.4	25.000	24.987	33.014	32.989	—	—	7 990	9 900	15 000	**IRT 2010-1**
	TA 2515 Z	28.5	**TAM 2515**	32.5	—	—	—	—	—	—	25	33	15	3.4							13 400	19 300	15 000	**IRT 2015-1**
	TA 2520 Z	36.5	**TAM 2520**	40.5	—	—	—	—	—	—	25	33	20	3.4							19 500	31 100	15 000	**IRT 2020-1**
	TA 2525 Z	45.5	**TAM 2525**	49	—	—	—	—	—	—	25	33	25	3.4							24 100	40 800	15 000	**IRT 2025-1**
	TA 2530 Z	54.5	**TAM 2530**	58.5	—	—	—	—	—	—	25	33	30	3.4							29 100	52 000	15 000	**IRT 2030-1**
	—	—	—	—	—	—	—	—	**YT 2510**	22.5	25	33	10	—	25.000	24.987	33.014	32.989	—	—	15 500	23 600	6 000	**IRT 2010-1**
	—	—	—	—	—	—	—	—	**YT 2515**	33	25	33	15	—							22 700	38 300	6 000	**IRT 2015-1**
	—	—	—	—	—	—	—	—	**YT 2520**	45	25	33	20	—							30 200	55 400	6 000	**IRT 2020-1**
	—	—	—	—	—	—	—	—	**YT 2525**	57	25	33	25	—							37 200	72 500	6 000	**IRT 2025-1**
26	**TA 2616 Z**	30.5	**TAM 2616**	34.5	—	—	—	—	—	—	26	34	16	3.4	26.000	25.987	34.014	33.989	—	—	15 200	22 900	15 000	**IRT 2216**
	TA 2620 Z	38	**TAM 2620**	42.5	—	—	—	—	—	—	26	34	20	3.4							20 100	32 800	15 000	**IRT 2220**
	—	—	—	—	—	—	—	—	**YT 2616**	37	26	34	16	—							24 700	43 300	6 000	**IRT 2216**
	—	—	—	—	—	—	—	—	**YT 2620**	46.5	26	34	20	—							30 800	57 500	6 000	**IRT 2220**
28	—	—	—	—	**TLA 2816 Z**	28.5	**TLAM 2816**	33.5	—	—	28	35	16	2.8	28.000	27.987	—	—	34.992	34.967	13 800	23 500	13 000	—
	—	—	—	—	**TLA 2820 Z**	35.5	**TLAM 2820**	40.5	—	—	28	35	20	2.8							18 300	33 600	13 000	**IRT 2220-1**
	TA 2820 Z	45	**TAM 2820**	50	—	—	—	—	—	—	28	37	20	3.4	28.000	27.987	37.014	36.989	—	—	21 200	32 300	13 000	**IRT 2220-1**
	TA 2830 Z	67.5	**TAM 2830**	72.5	—	—	—	—	—	—	28	37	30	3.4							33 000	56 900	13 000	**IRT 2230-1**
	—	—	—	—	—	—	—	—	**YT 2820**	56.5	28	37	20	—							34 700	61 700	5 500	**IRT 2220-1**

Note(1)　Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

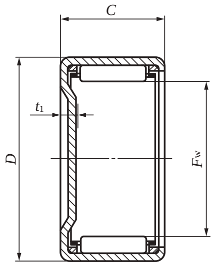
Remarks1.　"W" in the identification number indicates that rolling elements are arranged in double rows.

2.　Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

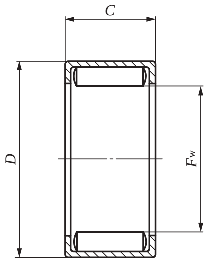
SHELL TYPE NEEDLE ROLLER BEARINGS



TA…Z TLA…Z



TAM TLAM



YT

Shaft dia. 29 ー 35mm

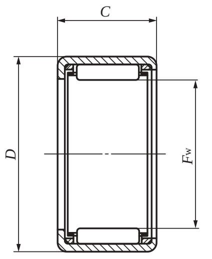
Shaft dia. mm	Identification number										Boundary dimensions mm				Standard mounting dimensions mm						Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) min⁻¹	Assembled inner ring
	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g	F_w	D	C	t_1 Max.	Shaft dia. h6 Max.	Shaft dia. h6 Min.	Housing bore dia. J7 Max.	Housing bore dia. J7 Min.	Housing bore dia. N7 Max.	Housing bore dia. N7 Min.				
29	**TA 2920 Z**	47	**TAM 2920**	52	—	—	—	—	—	—	29	38	20	3.4	29.000	28.987	38.014	37.989	—	—	22 000	34 200	13 000	**IRT 2520**
	TA 2930 Z	70	**TAM 2930**	75.5	—	—	—	—	—	—	29	38	30	3.4							34 200	60 300	13 000	**IRT 2530**
	—	—	—	—	—	—	—	—	**YT 2920**	58.5	29	38	20	—							35 500	64 100	5 000	**IRT 2520**
30	—	—	—	—	**TLA 3012 Z**	23.5	**TLAM 3012**	29	—	—	30	37	12	2.8	30.000	29.987	—	—	36.992	36.967	10 400	16 600	12 000	—
	—	—	—	—	**TLA 3016 Z**	30.5	**TLAM 3016**	36	—	—	30	37	16	2.8							14 100	24 500	12 000	—
	—	—	—	—	**TLA 3018 Z**	34.5	**TLAM 3018**	40	—	—	30	37	18	2.8							16 400	29 800	12 000	—
	—	—	—	—	**TLA 3020 Z**	38	**TLAM 3020**	43.5	—	—	30	37	20	2.8							18 600	35 100	12 000	**IRT 2520-1**
	—	—	—	—	**TLA 3026 Z**	49	**TLAM 3026**	54.5	—	—	30	37	26	2.8							24 800	50 900	12 000	**IRT 2526-1**
	—	—	—	—	**TLAW3038 Z**	69	**TLAMW3038**	74.5	—	—	30	37	38	2.8							31 900	70 200	12 000	**IRT 2538-1**
	TA 3013 Z	36.5	**TAM 3013**	42.5	—	—	—	—	—	—	30	40	13	3.4	30.000	29.987	40.014	39.989	—	—	13 500	16 800	12 000	—
	TA 3015 Z	42	**TAM 3015**	47.5	—	—	—	—	—	—	30	40	15	3.4							16 800	22 400	12 000	**IRT 2515-1**
	TA 3020 Z	54.5	**TAM 3020**	60	—	—	—	—	—	—	30	40	20	3.4							24 500	36 300	12 000	**IRT 2520-1**
	TA 3025 Z	68	**TAM 3025**	73.5	—	—	—	—	—	—	30	40	25	3.4							31 600	50 300	12 000	**IRT 2525-1**
	TA 3030 Z	80	**TAM 3030**	85.5	—	—	—	—	—	—	30	40	30	3.4							36 700	60 700	12 000	**IRT 2530-1**
32	**TA 3220 Z**	57.5	**TAM 3220**	63.5	—	—	—	—	—	—	32	42	20	3.4	32.000	31.984	42.014	41.989	—	—	25 400	38 600	11 000	**IRT 2820**
	TA 3230 Z	86	**TAM 3230**	97.5	—	—	—	—	—	—	32	42	30	3.4							39 500	68 400	11 000	**IRT 2830**
	—	—	—	—	—	—	—	—	**YT 3220**	71.5	32	42	20	—							39 900	70 100	4 500	**IRT 2820**
35	—	—	—	—	**TLA 3512 Z**	27	**TLAM 3512**	34.5	—	—	35	42	12	2.8	35.000	34.984	—	—	41.992	41.967	11 600	20 000	10 000	**IRT 3012**
	—	—	—	—	**TLA 3516 Z**	35	**TLAM 3516**	42.5	—	—	35	42	16	2.8							15 700	29 600	10 000	—
	—	—	—	—	**TLA 3520 Z**	43.5	**TLAM 3520**	51	—	—	35	42	20	2.8							20 700	42 300	10 000	**IRT 3020**
	TA 3512 Z	38.5	**TAM 3512**	46	—	—	—	—	—	—	35	45	12	3.4	35.000	34.984	45.014	44.989	—	—	14 800	19 900	10 000	**IRT 3012**
	TA 3515 Z	48	**TAM 3515**	56	—	—	—	—	—	—	35	45	15	3.4							18 500	26 500	10 000	**IRT 3015**
	TA 3520 Z	62.5	**TAM 3520**	70	—	—	—	—	—	—	35	45	20	3.4							27 000	43 100	10 000	**IRT 3020**
	TA 3525 Z	78	**TAM 3525**	85.5	—	—	—	—	—	—	35	45	25	3.4							34 800	59 700	10 000	**IRT 3025**
	TA 3530 Z	97	**TAM 3530**	105	—	—	—	—	—	—	35	45	30	3.4							40 600	72 600	10 000	**IRT 3030**

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

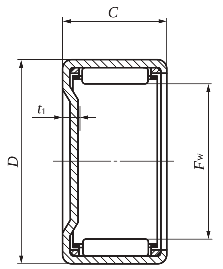
Remarks1. "W" in the identification number indicates that rolling elements are arranged in double rows.

2. Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

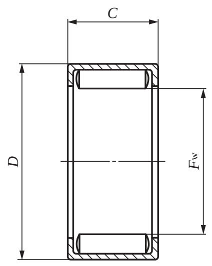
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch



TA···Z TLA···Z



TAM TLAM



YT

Shaft dia. 37 — 45mm

Shaft dia. mm	Identification number									
	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
37	**TA 3720 Z**	64.5	**TAM 3720**	73	—	—	—	—	—	—
	TA 3730 Z	101	**TAM 3730**	110	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 3720**	81
38	**TA 3815 Z**	51	**TAM 3815**	60	—	—	—	—	—	—
	TA 3820 Z	65.5	**TAM 3820**	74.5	—	—	—	—	—	—
	TA 3825 Z	82.5	**TAM 3825**	96	—	—	—	—	—	—
	TA 3830 Z	104	**TAM 3830**	114	—	—	—	—	—	—
	TAW 3845 Z	149	**TAMW 3845**	159	—	—	—	—	—	—
40	—	—	—	—	**TLA 4012 Z**	30	**TLAM 4012**	40	—	—
	—	—	—	—	**TLA 4016 Z**	39	**TLAM 4016**	49	—	—
	—	—	—	—	**TLA 4020 Z**	49	**TLAM 4020**	58.5	—	—
	TA 4015 Z	54	**TAM 4015**	63.5	—	—	—	—	—	—
	TA 4020 Z	69.5	**TAM 4020**	79	—	—	—	—	—	—
	TA 4025 Z	86.5	**TAM 4025**	102	—	—	—	—	—	—
	TA 4030 Z	110	**TAM 4030**	120	—	—	—	—	—	—
	TA 4040 Z	144	**TAM 4040**	154	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 4015**	63.5
	—	—	—	—	—	—	—	—	**YT 4025**	109
45	—	—	—	—	**TLA 4516 Z**	43.5	**TLAM 4516**	56	—	—
	—	—	—	—	**TLA 4520 Z**	54.5	**TLAM 4520**	67	—	—
	TA 4520 Z	77	**TAM 4520**	90	—	—	—	—	—	—
	TA 4525 Z	102	**TAM 4525**	115	—	—	—	—	—	—
	TA 4530 Z	122	**TAM 4530**	135	—	—	—	—	—	—
	TA 4540 Z	161	**TAM 4540**	174	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YT 4520**	96
	—	—	—	—	—	—	—	—	**YT 4525**	122

Boundary dimensions mm				Standard mounting dimensions mm						Basic dynamic load rating	Basic static load rating	Allowable rotational speed(1)	Assembled inner ring
F_w	D	C	t_1 Max.	Shaft dia. h6 Max.	Min.	Housing bore dia. J7 Max.	Min.	N7 Max.	Min.	C N	C_0 N	min⁻¹	
37	47	20	3.4	37.000	36.984	47.014	46.989	—	—	27 800	45 400	9 500	**IRT 3220**
37	47	30	3.4							41 800	76 700	9 500	**IRT 3230**
37	47	20	—							43 300	81 300	4 000	**IRT 3220**
38	48	15	3.4	38.000	37.984	48.014	47.989	—	—	19 000	28 000	9 000	**IRT 3215-1**
38	48	20	3.4							27 700	45 600	9 000	**IRT 3220-1**
38	48	25	3.4							35 600	63 100	9 000	**IRT 3225-1**
38	48	30	3.4							43 100	80 600	9 000	**IRT 3230-1**
38	48	45	3.4							55 700	112 000	9 000	**IRT 3245-1**
40	47	12	2.8	40.000	39.984	—	—	46.992	46.967	12 400	22 800	8 500	—
40	47	16	2.8							16 700	33 700	8 500	—
40	47	20	2.8							22 100	48 200	8 500	**IRT 3520**
40	50	15	3.4	40.000	39.984	50.014	49.989	—	—	19 500	29 400	8 500	**IRT 3515**
40	50	20	3.4							28 400	47 800	8 500	**IRT 3520**
40	50	25	3.4							36 600	66 200	8 500	**IRT 3525**
40	50	30	3.4							44 300	84 600	8 500	**IRT 3530**
40	50	40	3.4							56 700	116 000	8 500	**IRT 3540**
40	50	15	—							33 400	59 800	4 000	**IRT 3515**
40	50	25	—							55 300	114 000	4 000	**IRT 3525**
45	52	16	2.8	45.000	44.984	—	—	51.991	51.961	17 800	37 800	7 500	—
45	52	20	2.8							23 400	54 000	7 500	**IRT 4020**
45	55	20	3.4	45.000	44.984	55.018	54.988	—	—	30 600	54 600	7 500	**IRT 4020**
45	55	25	3.4							39 400	75 600	7 500	**IRT 4025**
45	55	30	3.4							47 700	96 600	7 500	**IRT 4030**
45	55	40	3.4							61 300	133 000	7 500	**IRT 4040**
45	55	20	—							47 800	98 200	3 500	**IRT 4020**
45	55	25	—							59 100	129 000	3 500	**IRT 4025**

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

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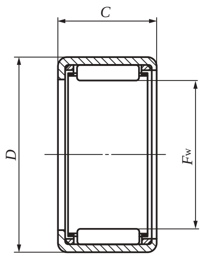
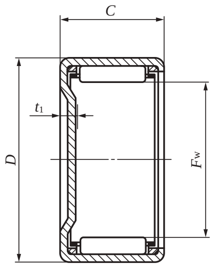


TA⋯Z TLA⋯Z



TAM TLAM

Shaft dia. 50 ー 62mm

Shaft dia. mm	Identification number									
	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
50	—	—	—	—	**TLA 5020 Z**	69	**TLAM 5020**	84.5	—	—
	—	—	—	—	**TLA 5025 Z**	86	**TLAM 5025**	107	—	—
	TA 5012 Z	62.5	**TAM 5012**	78	—	—	—	—	—	—
	TA 5015 Z	78	**TAM 5015**	98.5	—	—	—	—	—	—
	TA 5020 Z	107	**TAM 5020**	123	—	—	—	—	—	—
	TA 5025 Z	134	**TAM 5025**	150	—	—	—	—	—	—
	TA 5030 Z	161	**TAM 5030**	178	—	—	—	—	—	—
	TA 5040 Z	210	**TAM 5040**	230	—	—	—	—	—	—
	TAW 5045 Z	230	**TAMW 5045**	245	—	—	—	—	—	—
55	—	—	—	—	**TLA 5520 Z**	75	**TLAM 5520**	98.5	—	—
	—	—	—	—	**TLA 5525 Z**	98.5	**TLAM 5525**	118	—	—
	TA 5520 Z	116	**TAM 5520**	136	—	—	—	—	—	—
	TA 5525 Z	145	**TAM 5525**	165	—	—	—	—	—	—
	TA 5530 Z	175	**TAM 5530**	195	—	—	—	—	—	—
	TA 5540 Z	230	**TAM 5540**	250	—	—	—	—	—	—
	TAW 5545 Z	250	**TAMW 5545**	270	—	—	—	—	—	—
	TAW 5550 Z	280	**TAMW 5550**	300	—	—	—	—	—	—
60	**TA 6025 Z**	158	**TAM 6025**	182	—	—	—	—	—	—
	TA 6030 Z	191	**TAM 6030**	215	—	—	—	—	—	—
	TA 6040 Z	250	**TAM 6040**	275	—	—	—	—	—	—
	TAW 6045 Z	270	**TAMW 6045**	295	—	—	—	—	—	—
	TAW 6050 Z	305	**TAMW 6050**	330	—	—	—	—	—	—
62	**TA 6212 Z**	78	**TAM 6212**	107	—	—	—	—	—	—

Boundary dimensions mm				Standard mounting dimensions mm						Basic dynamic load rating	Basic static load rating	Allowable rotational speed(1)	Assembled inner ring
				Shaft dia. h6		Housing bore dia. J7		Housing bore dia. N7		C	C_0		
F_w	D	C	t_1 Max.	Max.	Min.	Max.	Min.	Max.	Min.	N	N	min⁻¹	
50	58	20	2.8	50.000	49.984	—	—	57.991	57.961	28 800	64 100	6 500	**IRT 4520**
50	58	25	2.8							36 900	88 400	6 500	**IRT 4525**
50	62	12	3.4	50.000	49.984	62.018	61.988	—	—	17 700	24 000	6 500	**IRT 4512**
50	62	15	3.4							25 800	39 000	6 500	**IRT 4515**
50	62	20	3.4							38 000	64 000	6 500	**IRT 4520**
50	62	25	3.4							49 100	89 000	6 500	**IRT 4525**
50	62	30	3.4							59 500	114 000	6 500	**IRT 4530**
50	62	40	3.4							76 500	157 000	6 500	**IRT 4540**
50	62	45	3.4							76 700	158 000	6 500	**IRT 4545**
55	63	20	2.8	55.000	54.981	—	—	62.991	62.961	29 800	69 400	5 500	**IRT 5020-1**
55	63	25	2.8							38 300	95 700	5 500	**IRT 5025-1**
55	67	20	3.4	55.000	54.981	67.018	66.988	—	—	39 600	69 700	5 500	**IRT 5020-1**
55	67	25	3.4							51 200	97 000	5 500	**IRT 5025-1**
55	67	30	3.4							62 000	124 000	5 500	**IRT 5030-1**
55	67	40	3.4							80 000	172 000	5 500	**IRT 5040-1**
55	67	45	3.4							79 900	172 000	5 500	**IRT 5045-1**
55	67	50	3.4							91 500	205 000	5 500	**IRT 5050-1**
60	72	25	3.4	60.000	59.981	72.018	71.988	—	—	54 700	108 000	5 000	**IRT 5025**
60	72	30	3.4							66 300	139 000	5 000	**IRT 5030**
60	72	40	3.4							85 700	193 000	5 000	**IRT 5040**
60	72	45	3.4							85 400	193 000	5 000	**IRT 5045**
60	72	50	3.4							97 800	229 000	5 000	**IRT 5050**
62	74	12	3.4	62.000	61.981	74.018	73.988	—	—	20 100	30 300	4 500	**IRT 5212**

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

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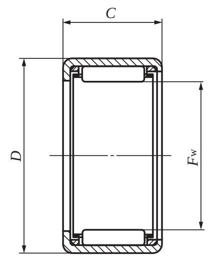
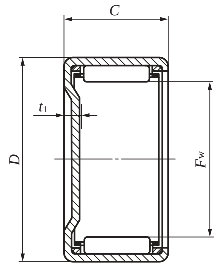
SHELL TYPE NEEDLE ROLLER BEARINGS



TA⋯Z



TAM

Shaft dia. 65 − 70mm

Shaft dia. mm	Identification number Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
65	**TA 6525 Z**	169	**TAM 6525**	197	—	—	—	—	—	—
	TA 6530 Z	205	**TAM 6530**	230	—	—	—	—	—	—
	TAW 6545 Z	290	**TAMW 6545**	315	—	—	—	—	—	—
	TAW 6550 Z	330	**TAMW 6550**	355	—	—	—	—	—	—
70	**TA 7025 Z**	181	**TAM 7025**	215	—	—	—	—	—	—
	TA 7030 Z	220	**TAM 7030**	250	—	—	—	—	—	—
	TA 7040 Z	290	**TAM 7040**	320	—	—	—	—	—	—
	TAW 7050 Z	350	**TAMW 7050**	380	—	—	—	—	—	—

Boundary dimensions mm F_w	D	C	t_1 Max.	Standard mounting dimensions mm Shaft dia. h6 Max.	Min.	Housing bore dia. J7 Max.	Min.	N7 Max.	Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) min⁻¹	Assembled inner ring
65	77	25	3.4	65.000	64.981	77.018	76.988	—	—	56 500	116 000	4 000	**IRT 5525**
65	77	30	3.4							68 500	149 000	4 000	**IRT 5530**
65	77	45	3.4							88 300	207 000	4 000	**IRT 5545**
65	77	50	3.4							101 000	246 000	4 000	**IRT 5550**
70	82	25	3.4	70.000	69.981	82.022	81.987	—	—	58 500	124 000	3 500	**IRT 6025**
70	82	30	3.4							70 900	159 000	3 500	**IRT 6030**
70	82	40	3.4							92 000	222 000	3 500	**IRT 6040**
70	82	50	3.4							105 000	262 000	3 500	**IRT 6050**

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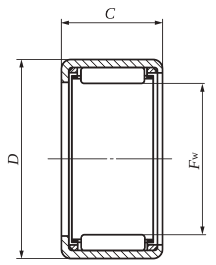
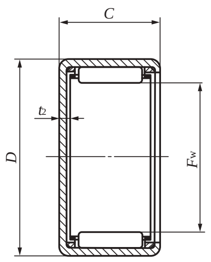
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SHELL TYPE NEEDLE ROLLER BEARINGS

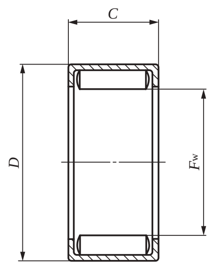
Inch Series



BA…Z　BHA…Z



BAM　BHAM



YB

Shaft dia. 3.969 ー 9.525mm

Shaft dia. mm (inch)	Identification number									
	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
3.969 (5/32)	—	—	—	—	—	—	—	—	**YB 2.5 2.5**	0.64
	—	—	—	—	—	—	—	—	**YB 2.5 4**	0.96
4.762 (3/16)	—	—	—	—	—	—	—	—	**YB 34**	1.6
6.350 (1/4)	**BA 44**	2.1	—	—	—	—	—	—	—	—
	BA 45 Z	2.5	**BAM 45**	2.7	—	—	—	—	—	—
	BA 47 Z	3.5	**BAM 47**	3.7	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YB 45**	3.2
	—	—	—	—	—	—	—	—	**YB 47**	4.6
7.938 (5/16)	**BA 55 Z**	3	**BAM 55**	3.3	—	—	—	—	—	—
	BA 56 Z	3.6	**BAM 56**	3.9	—	—	—	—	—	—
	BA 57 Z	4.3	**BAM 57**	4.6	—	—	—	—	—	—
	BA 59 Z	5.4	**BAM 59**	5.7	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YB 55**	3.8
	—	—	—	—	**BHA 57 Z**	6.3	**BHAM 57**	6.6	—	—
9.525 (3/8)	**BA 65 Z**	3.5	**BAM 65**	3.9	—	—	—	—	—	—
	BA 66 Z	4.2	**BAM 66**	4.6	—	—	—	—	—	—
	BA 68 Z	5.7	**BAM 68**	6.1	—	—	—	—	—	—
	BA 69 Z	6.3	**BAM 69**	6.7	—	—	—	—	—	—
	BA 610 Z	7	**BAM 610**	7.4	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YB 64**	3.4
	—	—	—	—	—	—	—	—	**YB 66**	5.3
	—	—	—	—	—	—	—	—	**YB 68**	7.2
	—	—	—	—	—	—	—	—	**YB 610**	9.1
	—	—	—	—	**BHA 68 Z**	8.2	**BHAM 68**	8.6	—	—

Note[1]　Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

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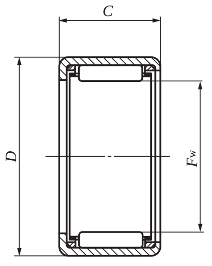
Boundary dimensions mm(inch)				Standard mounting dimensions mm				Basic dynamic load rating C	Basic static load rating C_0	Allowable rotational speed[1]	Assembled inner ring
				Shaft dia. h6		Housing bore dia. J7					
F_w	D	C	t_2 Max.	Max.	Min.	Max.	Min.	N	N	min⁻¹	
3.969 (5/32)	7.144 (9/32)	3.96(.156)	—	3.969	3.961	7.152	7.137	1 350	1 220	40 000	—
3.969 (5/32)	7.144 (9/32)	6.35(.250)	—					2 320	2 440	40 000	—
4.762 (3/16)	8.731 (11/32)	6.35(.250)	—	4.762	4.754	8.739	8.724	2 770	2 700	30 000	—
6.350 (1/4)	11.112 (7/16)	6.35(.250)	1	6.350	6.341	11.122	11.104	1 770	1 390	55 000	—
6.350 (1/4)	11.112 (7/16)	7.92(.312)	1					1 510	1 120	55 000	—
6.350 (1/4)	11.112 (7/16)	11.13(.438)	1					2 650	2 310	55 000	—
6.350 (1/4)	11.112 (7/16)	7.92(.312)	—					4 450	4 870	25 000	—
6.350 (1/4)	11.112 (7/16)	11.13(.438)	—					6 320	7 650	25 000	—
7.938 (5/16)	12.700 (1/2)	7.92(.312)	1	7.938	7.929	12.710	12.692	1 880	1 560	45 000	—
7.938 (5/16)	12.700 (1/2)	9.52(.375)	1					2 620	2 390	45 000	—
7.938 (5/16)	12.700 (1/2)	11.13(.438)	1					3 310	3 220	45 000	—
7.938 (5/16)	12.700 (1/2)	14.27(.562)	1					4 190	4 360	45 000	—
7.938 (5/16)	12.700 (1/2)	7.92(.312)	—					5 110	6 090	20 000	—
7.938 (5/16)	14.288 (9/16)	11.13(.438)	1.3	7.938	7.929	14.298	14.280	4 150	3 730	45 000	—
9.525 (3/8)	14.288 (9/16)	7.92(.312)	1	9.525	9.516	14.298	14.280	2 220	2 010	40 000	—
9.525 (3/8)	14.288 (9/16)	9.52(.375)	1					3 090	3 080	40 000	—
9.525 (3/8)	14.288 (9/16)	12.70(.500)	1					4 190	4 560	40 000	—
9.525 (3/8)	14.288 (9/16)	14.27(.562)	1					4 940	5 630	40 000	—
9.525 (3/8)	14.288 (9/16)	15.88(.625)	1					5 660	6 700	40 000	—
9.525 (3/8)	14.288 (9/16)	6.35(.250)	—	9.525	9.516	14.298	14.280	4 470	5 360	16 000	—
9.525 (3/8)	14.288 (9/16)	9.52(.375)	—					6 920	9 410	16 000	—
9.525 (3/8)	14.288 (9/16)	12.70(.500)	—					9 210	13 600	16 000	—
9.525 (3/8)	14.288 (9/16)	15.88(.625)	—					11 300	17 800	16 000	—
9.525 (3/8)	15.875 (5/8)	12.70(.500)	1.3	9.525	9.516	15.885	15.867	4 880	4 740	40 000	—

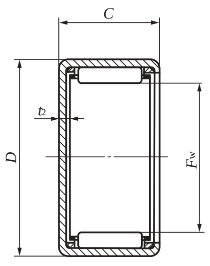
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SHELL TYPE NEEDLE ROLLER BEARINGS

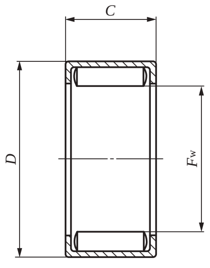
Inch Series



BA…Z　BHA…Z



BAM　BHAM



YB　YBH

Shaft dia. 11.112 ─ 12.700mm

Shaft dia. mm (inch)	Identification number									
	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
11.112 (7/16)	**BA 76 Z**	4.8	**BAM 76**	5.3	—	—	—	—	—	—
	BA 77 Z	5.6	**BAM 77**	6.2	—	—	—	—	—	—
	BA 78 Z	6.4	**BAM 78**	7	—	—	—	—	—	—
	BA 710 Z	7.9	**BAM 710**	8.5	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YB 78**	8.2
	—	—	—	—	**BHA 78 Z**	9.3	**BHAM 78**	10	—	—
	—	—	—	—	—	—	—	—	**YBH 78**	10.5
12.700 (1/2)	**BA 85 Z**	4.4	**BAM 85**	5.2	—	—	—	—	—	—
	BA 86 Z	5.3	**BAM 86**	6.1	—	—	—	—	—	—
	BA 87 Z	6.3	**BAM 87**	7	—	—	—	—	—	—
	BA 88 Z	7.2	**BAM 88**	7.9	—	—	—	—	—	—
	BA 810 Z	8.9	**BAM 810**	9.6	—	—	—	—	—	—
	BA 812 Z	10.6	**BAM 812**	11.3	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YB 84**	4.3
	—	—	—	—	—	—	—	—	**YB 86**	6.7
	—	—	—	—	—	—	—	—	**YB 87**	7.9
	—	—	—	—	—	—	—	—	**YB 88**	9.1
	—	—	—	—	—	—	—	—	**YB 810**	11.5
	—	—	—	—	—	—	—	—	**YB 812**	13.9
	—	—	—	—	**BHA 87 Z**	9.1	**BHAM 87**	9.9	—	—
	—	—	—	—	**BHA 88 Z**	10.4	**BHAM 88**	11.3	—	—
	—	—	—	—	**BHA 810 Z**	12.5	**BHAM 810**	13.3	—	—
	—	—	—	—	**BHA 812 Z**	15	**BHAM 812**	15.8	—	—
	—	—	—	—	—	—	—	—	**YBH 810**	16

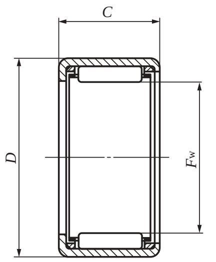
Boundary dimensions mm(inch)				Standard mounting dimensions mm				Basic dynamic load rating	Basic static load rating	Allowable rotational speed(1)	Assembled inner ring
				Shaft dia. h6		Housing bore dia. J7		C	C_0		
F_w	D	C	t_2 Max.	Max.	Min.	Max.	Min.	N	N	min-1	
11.112 (7/16)	15.875 (5/8)	9.52(.375)	1	11.112	11.101	15.885	15.867	3 290	3 470	35 000	—
11.112 (7/16)	15.875 (5/8)	11.13(.438)	1					4 150	4 680	35 000	—
11.112 (7/16)	15.875 (5/8)	12.70(.500)	1					4 460	5 130	35 000	—
11.112 (7/16)	15.875 (5/8)	15.88(.625)	1					6 020	7 550	35 000	—
11.112 (7/16)	15.875 (5/8)	12.70(.500)	—					10 100	15 900	14 000	—
11.112 (7/16)	17.462 (11/16)	12.70(.500)	1.3	11.112	11.101	17.472	17.454	5 680	5 970	35 000	—
11.112 (7/16)	17.462 (11/16)	12.70(.500)	—					12 500	15 800	14 000	—
12.700 (1/2)	17.462 (11/16)	7.92(.312)	1	12.700	12.689	17.472	17.454	2 490	2 510	30 000	—
12.700 (1/2)	17.462 (11/16)	9.52(.375)	1					3 470	3 850	30 000	—
12.700 (1/2)	17.462 (11/16)	11.13(.438)	1					4 380	5 190	30 000	—
12.700 (1/2)	17.462 (11/16)	12.70(.500)	1					4 710	5 700	30 000	**IRB 58**
12.700 (1/2)	17.462 (11/16)	15.88(.625)	1					6 350	8 380	30 000	—
12.700 (1/2)	17.462 (11/16)	19.05(.750)	1					7 840	11 000	30 000	—
12.700 (1/2)	17.462 (11/16)	6.35(.250)	—	12.700	12.689	17.472	17.454	5 260	7 150	12 000	—
12.700 (1/2)	17.462 (11/16)	9.52(.375)	—					8 150	12 600	12 000	—
12.700 (1/2)	17.462 (11/16)	11.13(.438)	—					9 530	15 300	12 000	—
12.700 (1/2)	17.462 (11/16)	12.70(.500)	—					10 800	18 100	12 000	**IRB 58**
12.700 (1/2)	17.462 (11/16)	15.88(.625)	—					13 400	23 700	12 000	—
12.700 (1/2)	17.462 (11/16)	19.05(.750)	—					15 800	29 300	12 000	—
12.700 (1/2)	19.050 (3/4)	11.13(.438)	1.3	12.700	12.689	19.062	19.041	5 670	6 120	30 000	—
12.700 (1/2)	19.050 (3/4)	12.70(.500)	1.3					6 040	6 650	30 000	**IRB 58**
12.700 (1/2)	19.050 (3/4)	15.88(.625)	1.3					8 830	10 900	30 000	—
12.700 (1/2)	19.050 (3/4)	19.05(.750)	1.3					11 100	14 500	30 000	—
12.700 (1/2)	19.050 (3/4)	15.88(.625)	—					16 300	23 500	12 000	—

Note(1)　Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

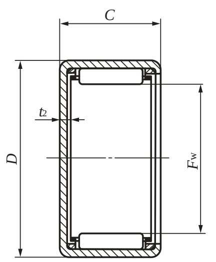
Remark　Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

SHELL TYPE NEEDLE ROLLER BEARINGS

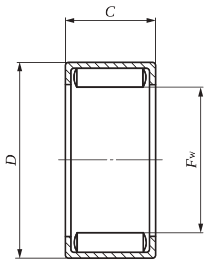
Inch Series



BA···Z　BHA···Z



BAM　BHAM



YB　YBH

Shaft dia. 14.288 ─ 15.875mm

Shaft dia. mm (inch)	Identification number										Boundary dimensions mm(inch)				Standard mounting dimensions mm				Basic dynamic load rating	Basic static load rating	Allowable rotational speed(1)	Assembled inner ring
	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g	F_w	D	C	t_2	Shaft dia. h6		Housing bore dia. J7		C	C_0		
														Max.	Max.	Min.	Max.	Min.	N	N	min-1	
14.288 (9/16)	**BA 95 Z**	4.9	**BAM 95**	5.8	—	—	—	—	—	—	14.288 (9/16)	19.050 (3/4)	7.92(.312)	1.3	14.288	14.277	19.062	19.041	2 760	2 970	30 000	—
	BA 96 Z	5.9	**BAM 96**	6.8	—	—	—	—	—	—	14.288 (9/16)	19.050 (3/4)	9.52(.375)	1.3					3 850	4 560	30 000	—
	BA 97 Z	6.9	**BAM 97**	7.8	—	—	—	—	—	—	14.288 (9/16)	19.050 (3/4)	11.13(.438)	1.3					4 860	6 140	30 000	—
	BA 98 Z	7.9	**BAM 98**	8.9	—	—	—	—	—	—	14.288 (9/16)	19.050 (3/4)	12.70(.500)	1.3					5 220	6 740	30 000	**IRB 68**
	BA 910 Z	9.9	**BAM 910**	10.8	—	—	—	—	—	—	14.288 (9/16)	19.050 (3/4)	15.88(.625)	1.3					7 050	9 910	30 000	—
	BA 912 Z	11.7	**BAM 912**	12.6	—	—	—	—	—	—	14.288 (9/16)	19.050 (3/4)	19.05(.750)	1.3					8 690	13 000	30 000	**IRB 612**
	—	—	—	—	—	—	—	—	**YB 98**	10.1	14.288 (9/16)	19.050 (3/4)	12.70(.500)	—					11 600	20 400	11 000	**IRB 68**
	—	—	—	—	—	—	—	—	**YB 910**	12.7	14.288 (9/16)	19.050 (3/4)	15.88(.625)	—					14 300	26 700	11 000	—
	—	—	—	—	—	—	—	—	**YB 912**	15.4	14.288 (9/16)	19.050 (3/4)	19.05(.750)	—					16 800	33 000	11 000	**IRB 612**
	—	—	—	—	**BHA 98 Z**	11.4	**BHAM 98**	12.5	—	—	14.288 (9/16)	20.638 (13/16)	12.70(.500)	1.3	14.288	14.277	20.650	20.629	6 380	7 330	30 000	**IRB 68**
	—	—	—	—	**BHA 910 Z**	13.6	**BHAM 910**	14.7	—	—	14.288 (9/16)	20.638 (13/16)	15.88(.625)	1.3					9 280	11 900	30 000	—
	—	—	—	—	**BHA 912 Z**	16.3	**BHAM 912**	17.4	—	—	14.288 (9/16)	20.638 (13/16)	19.05(.750)	1.3					11 600	15 900	30 000	**IRB 612**
15.875 (5/8)	**BA 105 Z**	5.3	**BAM 105**	6.5	—	—	—	—	—	—	15.875 (5/8)	20.638 (13/16)	7.92(.312)	1.3	15.875	15.864	20.650	20.629	2 870	3 220	25 000	—
	BA 107 Z	7.6	**BAM 107**	8.7	—	—	—	—	—	—	15.875 (5/8)	20.638 (13/16)	11.13(.438)	1.3					5 040	6 660	25 000	—
	BA 108 Z	8.7	**BAM 108**	9.9	—	—	—	—	—	—	15.875 (5/8)	20.638 (13/16)	12.70(.500)	1.3					5 420	7 310	25 000	**IRB 68-1**
	BA 1010 Z	10.8	**BAM 1010**	12	—	—	—	—	—	—	15.875 (5/8)	20.638 (13/16)	15.88(.625)	1.3					7 320	10 700	25 000	—
	BA 1012 Z	12.9	**BAM 1012**	14	—	—	—	—	—	—	15.875 (5/8)	20.638 (13/16)	19.05(.750)	1.3					9 020	14 100	25 000	**IRB 612-1**
	BA 1014 Z	15.1	**BAM 1014**	16.2	—	—	—	—	—	—	15.875 (5/8)	20.638 (13/16)	22.22(.875)	1.3					10 700	17 500	25 000	**IRB 714**
	BA 1016 Z	17.3	**BAM 1016**	18.4	—	—	—	—	—	—	15.875 (5/8)	20.638 (13/16)	25.40(1.000)	1.3					12 300	20 800	25 000	**IRB 716**
	—	—	—	—	—	—	—	—	**YB 105**	6.7	15.875 (5/8)	20.638 (13/16)	7.92(.312)	—					7 580	12 200	9 500	—
	—	—	—	—	—	—	—	—	**YB 108**	11	15.875 (5/8)	20.638 (13/16)	12.70(.500)	—					12 300	22 700	9 500	**IRB 68-1**
	—	—	—	—	—	—	—	—	**YB 1012**	16.9	15.875 (5/8)	20.638 (13/16)	19.05(.750)	—					17 800	36 600	9 500	**IRB 612-1**
	—	—	—	—	**BHA 108 Z**	12.6	**BHAM 108**	13.9	—	—	15.875 (5/8)	22.225 (7/8)	12.70(.500)	1.3	15.875	15.864	22.237	22.216	6 680	8 020	25 000	**IRB 68-1**
	—	—	—	—	**BHA 1010 Z**	14.9	**BHAM 1010**	16.2	—	—	15.875 (5/8)	22.225 (7/8)	15.88(.625)	1.3					10 200	13 800	25 000	—
	—	—	—	—	**BHA 1012 Z**	18	**BHAM 1012**	19.3	—	—	15.875 (5/8)	22.225 (7/8)	19.05(.750)	1.3					12 700	18 500	25 000	**IRB 612-1**
	—	—	—	—	**BHA 1016 Z**	24	**BHAM 1016**	25	—	—	15.875 (5/8)	22.225 (7/8)	25.40(1.000)	1.3					17 400	27 600	25 000	**IRB 716**
	—	—	—	—	—	—	—	—	**YBH 108**	15.3	15.875 (5/8)	22.225 (7/8)	12.70(.500)	—					15 000	22 400	9 500	**IRB 68-1**

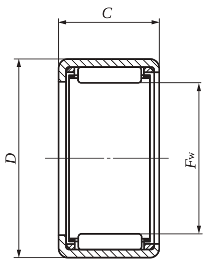
Note(1)　Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remark　Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

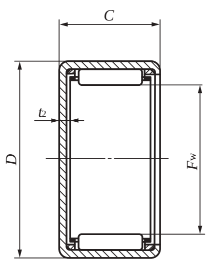
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SHELL TYPE NEEDLE ROLLER BEARINGS

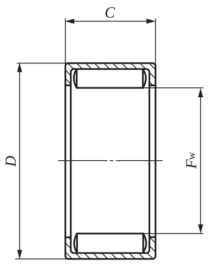
Inch Series



BA…Z　BHA…Z



BAM　BHAM



YB

Shaft dia. 17.462 – 19.050mm

Shaft dia. mm (inch)	Identification number									
	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
17.462 (11/16)	**BA 116 Z**	7	**BAM 116**	8.4	—	—	—	—	—	—
	BA 118 Z	9.5	**BAM 118**	10.8	—	—	—	—	—	—
	BA 1110 Z	11.8	**BAM 1110**	13.2	—	—	—	—	—	—
	BA 1112 Z	14	**BAM 1112**	15.4	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YB 1112**	18.3
	—	—	—	—	**BHA 117 Z**	11.9	**BHAM 117**	13.5	—	—
	—	—	—	—	**BHA 118 Z**	13.7	**BHAM 118**	15.3	—	—
	—	—	—	—	**BHA 1110 Z**	16	**BHAM 1110**	17.6	—	—
	—	—	—	—	**BHA 1112 Z**	19.3	**BHAM 1112**	21	—	—
19.050 (3/4)	**BA 126 Z**	10	**BAM 126**	11.7	—	—	—	—	—	—
	BA 128 Z	13.5	**BAM 128**	15.2	—	—	—	—	—	—
	BA 1210 Z	17	**BAM 1210**	18.6	—	—	—	—	—	—
	BA 1212 Z	20.5	**BAM 1212**	22	—	—	—	—	—	—
	BA 1214 Z	23.5	**BAM 1214**	25	—	—	—	—	—	—
	BA 1216 Z	27	**BAM 1216**	28.5	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YB 124**	8.5
	—	—	—	—	—	—	—	—	**YB 128**	17.8
	—	—	—	—	—	—	—	—	**YB 1210**	22.5
	—	—	—	—	—	—	—	—	**YB 1212**	27
	—	—	—	—	**BHA 1212 Z**	26.5	**BHAM 1212**	28.5	—	—

Boundary dimensions mm(inch)				Standard mounting dimensions mm				Basic dynamic load rating	Basic static load rating	Allowable rotational speed(1)	Assembled inner ring
				Shaft dia. h6		Housing bore dia. J7					
F_w	D	C	t_2 Max.	Max.	Min.	Max.	Min.	C N	C_0 N	min⁻¹	
17.462 (11/16)	22.225 (7/8)	9.52(.375)	1.3	17.462	17.451	22.237	22.216	4 530	5 980	25 000	**IRB 86**
17.462 (11/16)	22.225 (7/8)	12.70(.500)	1.3					6 140	8 850	25 000	**IRB 88**
17.462 (11/16)	22.225 (7/8)	15.88(.625)	1.3					8 280	13 000	25 000	—
17.462 (11/16)	22.225 (7/8)	19.05(.750)	1.3					10 200	17 000	25 000	**IRB 812**
17.462 (11/16)	22.225 (7/8)	19.05(.750)	—					18 700	40 300	8 500	**IRB 812**
17.462 (11/16)	23.812 (15/16)	11.13(.438)	1.3	17.462	17.451	23.824	23.803	6 860	8 530	25 000	—
17.462 (11/16)	23.812 (15/16)	12.70(.500)	1.3					7 320	9 270	25 000	**IRB 88**
17.462 (11/16)	23.812 (15/16)	15.88(.625)	1.3					10 500	14 900	25 000	—
17.462 (11/16)	23.812 (15/16)	19.05(.750)	1.3					13 200	19 900	25 000	**IRB 812**
19.050 (3/4)	25.400 (1)	9.52(.375)	1.3	19.050	19.037	25.412	25.391	5 040	5 850	20 000	—
19.050 (3/4)	25.400 (1)	12.70(.500)	1.3					6 910	8 780	20 000	**IRB 88-1**
19.050 (3/4)	25.400 (1)	15.88(.625)	1.3					9 500	13 200	20 000	**IRB 810-1**
19.050 (3/4)	25.400 (1)	19.05(.750)	1.3					11 900	17 700	20 000	**IRB 812-1**
19.050 (3/4)	25.400 (1)	22.22(.875)	1.3					14 200	22 200	20 000	**IRB 814-1**
19.050 (3/4)	25.400 (1)	25.40(1.000)	1.3					16 300	26 500	20 000	**IRB 816-1**
19.050 (3/4)	25.400 (1)	6.35(.250)	—	19.050	19.037	25.412	25.391	7 820	10 200	8 000	—
19.050 (3/4)	25.400 (1)	12.70(.500)	—					16 600	26 900	8 000	**IRB 88-1**
19.050 (3/4)	25.400 (1)	15.88(.625)	—					20 500	35 300	8 000	**IRB 810-1**
19.050 (3/4)	25.400 (1)	19.05(.750)	—					24 100	43 400	8 000	**IRB 812-1**
19.050 (3/4)	26.988 (1 1/16)	19.05(.750)	1.3	19.050	19.037	27.000	26.979	16 600	22 600	20 000	**IRB 812-1**

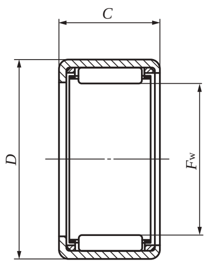
Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remark Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

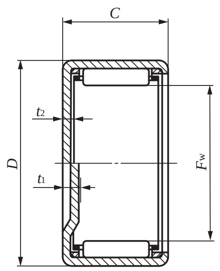
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SHELL TYPE NEEDLE ROLLER BEARINGS

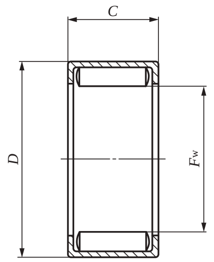
Inch Series



BA ··· Z　BHA ··· Z



BAM　BHAM
t_1 (F_w≧22.225)
t_2 (F_w≦20.638)



YB　YBH

Shaft dia. 20.638 – 22.225mm

Shaft dia. mm (inch)	Identification number											
	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
20.638 (13/16)	**BA 136 Z**	10.7	**BAM 136**	12.6	—	—	—	—	—	—
	BA 138 Z	14.5	**BAM 138**	16.4	—	—	—	—	—	—
	BA 1310 Z	18.2	**BAM 1310**	20	—	—	—	—	—	—
	BA 1312 Z	22	**BAM 1312**	23.5	—	—	—	—	—	—
	BA 1314 Z	25	**BAM 1314**	27	—	—	—	—	—	—
	BA 1316 Z	28.5	**BAM 1316**	30.5	—	—	—	—	—	—
	BA 1320 Z	35.5	**BAM 1320**	37.5	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YB 136**	14.1
	—	—	—	—	—	—	—	—	**YB 138**	19.1
	—	—	—	—	**BHA 138 Z**	20	**BHAM 138**	22.5	—	—
	—	—	—	—	**BHA 1310 Z**	23.5	**BHAM 1310**	25.5	—	—
	—	—	—	—	**BHA 1312 Z**	28.5	**BHAM 1312**	30.5	—	—
	—	—	—	—	—	—	—	—	**YBH 1310**	30.5
	—	—	—	—	—	—	—	—	**YBH 1312**	37
22.225 (7/8)	**BA 146 Z**	11.5	**BAM 146**	13.8	—	—	—	—	—	—
	BA 148 Z	15.6	**BAM 148**	17.8	—	—	—	—	—	—
	BA 1412 Z	23.5	**BAM 1412**	26	—	—	—	—	—	—
	BA 1414 Z	27	**BAM 1414**	29.5	—	—	—	—	—	—
	BA 1416 Z	31	**BAM 1416**	33.5	—	—	—	—	—	—
	BA 1418 Z	34.5	**BAM 1418**	37	—	—	—	—	—	—
	BA 1422 Z	42.5	**BAM 1422**	44.5	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YB 148**	20.5
	—	—	—	—	—	—	—	—	**YB 1412**	31
	—	—	—	—	—	—	—	—	**YB 1416**	41.5
	—	—	—	—	**BHA 1410 Z**	25	**BHAM 1410**	27.5	—	—
	—	—	—	—	**BHA 1412 Z**	30	**BHAM 1412**	32.5	—	—
	—	—	—	—	**BHA 1416 Z**	39.5	**BHAM 1416**	42	—	—
	—	—	—	—	—	—	—	—	**YBH 1412**	39

Boundary dimensions mm(inch)				Standard mounting dimensions mm				Basic dynamic load rating	Basic static load rating	Allowable rotational speed(1)	Assembled inner ring
F_w	D	C	t_1 t_2 Max.	Shaft dia. h6 Max.	Shaft dia. h6 Min.	Housing bore dia. J7 Max.	Housing bore dia. J7 Min.	C N	C_0 N	min⁻¹	
20.638 (13/16)	26.988 (1 1/16)	9.52 (.375)	1.3	20.638	20.625	27.000	26.979	5 230	6 300	19 000	—
20.638 (13/16)	26.988 (1 1/16)	12.70 (.500)	1.3					7 170	9 450	19 000	**IRB 98**
20.638 (13/16)	26.988 (1 1/16)	15.88 (.625)	1.3					9 870	14 200	19 000	**IRB 910**
20.638 (13/16)	26.988 (1 1/16)	19.05 (.750)	1.3					12 400	19 000	19 000	**IRB 912**
20.638 (13/16)	26.988 (1 1/16)	22.22 (.875)	1.3					14 700	23 800	19 000	**IRB 914**
20.638 (13/16)	26.988 (1 1/16)	25.40 (1.000)	1.3					16 900	28 500	19 000	**IRB 916**
20.638 (13/16)	26.988 (1 1/16)	31.75 (1.250)	1.3					21 200	38 100	19 000	**IRB 920**
20.638 (13/16)	26.988 (1 1/16)	9.52 (.375)	—					13 000	20 100	7 500	—
20.638 (13/16)	26.988 (1 1/16)	12.70 (.500)	—					17 400	29 200	7 500	**IRB 98**
20.638 (13/16)	28.575 (1 1/8)	12.70 (.500)	1.3	20.638	20.625	28.587	28.566	9 500	11 200	19 000	**IRB 98**
20.638 (13/16)	28.575 (1 1/8)	15.88 (.625)	1.3					13 800	18 200	19 000	**IRB 910**
20.638 (13/16)	28.575 (1 1/8)	19.05 (.750)	1.3					17 300	24 400	19 000	**IRB 912**
20.638 (13/16)	28.575 (1 1/8)	15.88 (.625)	—					22 900	36 300	7 500	**IRB 910**
20.638 (13/16)	28.575 (1 1/8)	19.05 (.750)	—					27 200	45 300	7 500	**IRB 912**
22.225 (7/8)	28.575 (1 1/8)	9.52 (.375)	2.8	22.225	22.212	28.587	28.566	5 430	6 740	18 000	**IRB 106**
22.225 (7/8)	28.575 (1 1/8)	12.70 (.500)	2.8					7 440	10 100	18 000	**IRB 108**
22.225 (7/8)	28.575 (1 1/8)	19.05 (.750)	2.8					12 800	20 400	18 000	**IRB 1012**
22.225 (7/8)	28.575 (1 1/8)	22.22 (.875)	2.8					15 300	25 500	18 000	**IRB 1014**
22.225 (7/8)	28.575 (1 1/8)	25.40 (1.000)	2.8					17 600	30 500	18 000	**IRB 1016**
22.225 (7/8)	28.575 (1 1/8)	28.58 (1.125)	2.8					19 800	35 600	18 000	—
22.225 (7/8)	28.575 (1 1/8)	34.92 (1.375)	2.8					24 100	45 700	18 000	**IRB 1022**
22.225 (7/8)	28.575 (1 1/8)	12.70 (.500)	—					18 100	31 400	7 000	**IRB 108**
22.225 (7/8)	28.575 (1 1/8)	19.05 (.750)	—					26 300	50 700	7 000	**IRB 1012**
22.225 (7/8)	28.575 (1 1/8)	25.40 (1.000)	—					33 800	70 200	7 000	**IRB 1016**
22.225 (7/8)	30.162 (1 3/16)	15.88 (.625)	3.4	22.225	22.212	30.176	30.151	14 300	19 500	18 000	—
22.225 (7/8)	30.162 (1 3/16)	19.05 (.750)	3.4					18 000	26 100	18 000	**IRB 1012**
22.225 (7/8)	30.162 (1 3/16)	25.40 (1.000)	3.4					23 600	36 900	18 000	**IRB 1016**
22.225 (7/8)	30.162 (1 3/16)	19.05 (.750)	—					28 200	49 000	7 000	**IRB 1012**

Note(1)　Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

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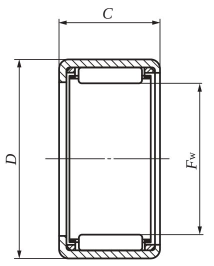
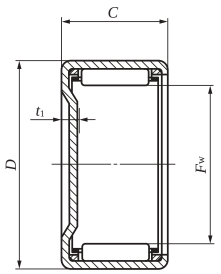
SHELL TYPE NEEDLE ROLLER BEARINGS

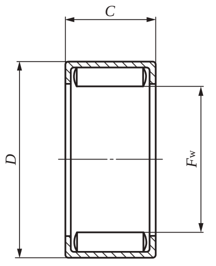
Inch Series



BA···Z BHA···Z



BAM BHAM



YB YBH

Shaft dia. 23.812 ─ 26.988mm

Shaft dia. mm (inch)	Identification number									
	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
23.812 (15/16)	**BA 158 Z**	16.5	**BAM 158**	19	—	—	—	—	—	—
	BA 1510 Z	20.5	**BAM 1510**	23	—	—	—	—	—	—
	BA 1516 Z	33	**BAM 1516**	35.5	—	—	—	—	—	—
25.400 (1)	**BA 166 Z**	13.1	**BAM 166**	16	—	—	—	—	—	—
	BA 167 Z	15.4	**BAM 167**	18.3	—	—	—	—	—	—
	BA 168 Z	17.7	**BAM 168**	20.5	—	—	—	—	—	—
	BA 1610 Z	22	**BAM 1610**	25	—	—	—	—	—	—
	BA 1612 Z	26.5	**BAM 1612**	29.5	—	—	—	—	—	—
	BA 1614 Z	31	**BAM 1614**	33.5	—	—	—	—	—	—
	BA 1616 Z	35.5	**BAM 1616**	38	—	—	—	—	—	—
	BA 1620 Z	44	**BAM 1620**	46.5	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YB 168**	23
	—	—	—	—	—	—	—	—	**YB 1612**	34.5
	—	—	—	—	—	—	—	—	**YB 1616**	46.5
	—	—	—	—	**BHA 168 Z**	24	**BHAM 168**	27	—	—
	—	—	—	—	**BHA 1610 Z**	28	**BHAM 1610**	31	—	—
	—	—	—	—	**BHA 1612 Z**	33.5	**BHAM 1612**	37	—	—
	—	—	—	—	**BHA 1614 Z**	39.5	**BHAM 1614**	42.5	—	—
	—	—	—	—	**BHA 1616 Z**	45	**BHAM 1616**	48	—	—
	—	—	—	—	**BHA 1620 Z**	56.5	**BHAM 1620**	59.5	—	—
	—	—	—	—	**BHA 1624 Z**	67.5	**BHAM 1624**	71	—	—
	—	—	—	—	—	—	—	—	**YBH 168**	29
	—	—	—	—	—	—	—	—	**YBH 1612**	44.5
	—	—	—	—	—	—	—	—	**YBH 1616**	59.5
26.988 (1 1/16)	**BA 1710 Z**	23.5	**BAM 1710**	26.5	—	—	—	—	—	—
	BA 1716 Z	37	**BAM 1716**	40.5	—	—	—	—	—	—

Boundary dimensions mm(inch)				Standard mounting dimensions mm				Basic dynamic load rating	Basic static load rating	Allowable rotational speed(1)	Assembled inner ring
				Shaft dia. h6		Housing bore dia. J7		C	C_0		
F_w	D	C	t_1 Max.	Max.	Min.	Max.	Min.	N	N	min-1	
23.812 (15/16)	30.162 (1 3/16)	12.70(.500)	2.8	23.812	23.799	30.176	30.151	8 000	11 400	16 000	—
23.812 (15/16)	30.162 (1 3/16)	15.88(.625)	2.8					11 000	17 100	16 000	**IRB 1110**
23.812 (15/16)	30.162 (1 3/16)	25.40(1.000)	2.8					18 900	34 300	16 000	**IRB 1116**
25.400 (1)	31.750 (1 1/4)	9.52(.375)	2.8	25.400	25.387	31.764	31.739	6 010	8 020	15 000	—
25.400 (1)	31.750 (1 1/4)	11.13(.438)	2.8					7 720	11 100	15 000	—
25.400 (1)	31.750 (1 1/4)	12.70(.500)	2.8					8 240	12 000	15 000	**IRB 128**
25.400 (1)	31.750 (1 1/4)	15.88(.625)	2.8					11 300	18 100	15 000	—
25.400 (1)	31.750 (1 1/4)	19.05(.750)	2.8					14 200	24 300	15 000	**IRB 1212**
25.400 (1)	31.750 (1 1/4)	22.22(.875)	2.8					16 900	30 400	15 000	**IRB 1214**
25.400 (1)	31.750 (1 1/4)	25.40(1.000)	2.8					19 400	36 300	15 000	**IRB 1216**
25.400 (1)	31.750 (1 1/4)	31.75(1.250)	2.8					24 400	48 500	15 000	**IRB 1220**
25.400 (1)	31.750 (1 1/4)	12.70(.500)	—					19 400	36 000	6 000	**IRB 128**
25.400 (1)	31.750 (1 1/4)	19.05(.750)	—					28 200	58 000	6 000	**IRB 1212**
25.400 (1)	31.750 (1 1/4)	25.40(1.000)	—					36 300	80 300	6 000	**IRB 1216**
25.400 (1)	33.338 (1 5/16)	12.70(.500)	3.4	25.400	25.387	33.352	33.327	10 200	13 100	15 000	**IRB 128**
25.400 (1)	33.338 (1 5/16)	15.88(.625)	3.4					15 300	22 100	15 000	—
25.400 (1)	33.338 (1 5/16)	19.05(.750)	3.4					19 300	29 700	15 000	**IRB 1212**
25.400 (1)	33.338 (1 5/16)	22.22(.875)	3.4					23 000	37 200	15 000	**IRB 1214**
25.400 (1)	33.338 (1 5/16)	25.40(1.000)	3.4					26 400	44 500	15 000	**IRB 1216**
25.400 (1)	33.338 (1 5/16)	31.75(1.250)	3.4					33 200	59 600	15 000	**IRB 1220**
25.400 (1)	33.338 (1 5/16)	38.10(1.500)	3.4					39 400	74 400	15 000	—
25.400 (1)	33.338 (1 5/16)	12.70(.500)	—					20 900	34 100	6 000	**IRB 128**
25.400 (1)	33.338 (1 5/16)	19.05(.750)	—					30 700	56 100	6 000	**IRB 1212**
25.400 (1)	33.338 (1 5/16)	25.40(1.000)	—					39 900	78 400	6 000	**IRB 1216**
26.988 (1 1/16)	33.338 (1 5/16)	15.88(.625)	2.8	26.988	26.975	33.352	33.327	11 600	19 200	14 000	—
26.988 (1 1/16)	33.338 (1 5/16)	25.40(1.000)	2.8					20 000	38 300	14 000	—

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

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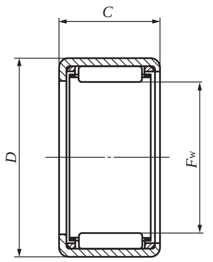
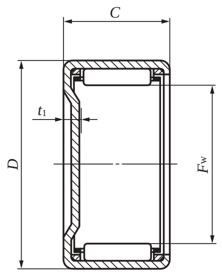
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SHELL TYPE NEEDLE ROLLER BEARINGS

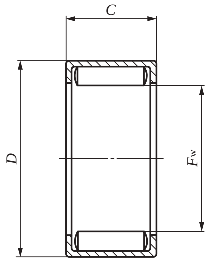
Inch Series



BA⋯Z BHA⋯Z



BAM BHAM



YB

Shaft dia. 28.575 ー 30.162mm

Shaft dia. mm (inch)	Identification number											
	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
28.575 (1 1/8)	**BA 186 Z**	14.5	**BAM 186**	18.1	—	—	—	—	—	—
	BA 188 Z	19.5	**BAM 188**	23	—	—	—	—	—	—
	BA 1812 Z	29.5	**BAM 1812**	33	—	—	—	—	—	—
	BA 1816 Z	39	**BAM 1816**	42.5	—	—	—	—	—	—
	BA 1820 Z	48.5	**BAM 1820**	52	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YB 188**	25.5
	—	—	—	—	—	—	—	—	**YB 1812**	38.5
	—	—	—	—	—	—	—	—	**YB 1816**	51.5
	—	—	—	—	**BHA 1812 Z**	45	**BHAM 1812**	49	—	—
	—	—	—	—	**BHA 1816 Z**	60	**BHAM 1816**	64	—	—
	—	—	—	—	**BHA 1818 Z**	67.5	**BHAM 1818**	71.5	—	—
	—	—	—	—	**BHA 1820 Z**	73.5	**BHAM 1820**	78	—	—
30.162 (1 3/16)	**BA 1910 Z**	32.5	**BAM 1910**	37.5	—	—	—	—	—	—
	BA 1916 Z	52	**BAM 1916**	57	—	—	—	—	—	—
	—		—	—	—	—	—	—	**YB 1910**	42.5

Boundary dimensions mm(inch)				Standard mounting dimensions mm				Basic dynamic load rating	Basic static load rating	Allowable rotational speed(1)	Assembled inner ring
F_w	D	C	t_1 Max.	Shaft dia. h6 Max.	Min.	Housing bore dia. J7 Max.	Min.	C N	C_0 N	min^{-1}	
28.575 (1 1/8)	34.925 (1 3/8)	9.52(.375)	2.8	28.575	28.562	34.939	34.914	6 330	8 910	13 000	—
28.575 (1 1/8)	34.925 (1 3/8)	12.70(.500)	2.8					8 680	13 400	13 000	**IRB 148**
28.575 (1 1/8)	34.925 (1 3/8)	19.05(.750)	2.8					15 000	26 900	13 000	**IRB 1412**
28.575 (1 1/8)	34.925 (1 3/8)	25.40(1.000)	2.8					20 500	40 300	13 000	**IRB 1416**
28.575 (1 1/8)	34.925 (1 3/8)	31.75(1.250)	2.8					25 700	53 900	13 000	**IRB 1420**
28.575 (1 1/8)	34.925 (1 3/8)	12.70(.500)	—					20 700	40 500	5 500	**IRB 148**
28.575 (1 1/8)	34.925 (1 3/8)	19.05(.750)	—					30 000	65 300	5 500	**IRB 1412**
28.575 (1 1/8)	34.925 (1 3/8)	25.40(1.000)	—					38 700	90 400	5 500	**IRB 1416**
28.575 (1 1/8)	38.100 (1 1/2)	19.05(.750)	3.4	28.575	28.562	38.114	38.089	22 500	32 200	13 000	**IRB 1412**
28.575 (1 1/8)	38.100 (1 1/2)	25.40(1.000)	3.4					30 900	48 600	13 000	**IRB 1416**
28.575 (1 1/8)	38.100 (1 1/2)	28.58(1.125)	3.4					34 900	56 600	13 000	—
28.575 (1 1/8)	38.100 (1 1/2)	31.75(1.250)	3.4					37 100	61 100	13 000	**IRB 1420**
30.162 (1 3/16)	38.100 (1 1/2)	15.88(.625)	2.8	30.162	30.146	38.114	38.089	15 000	22 500	12 000	—
30.162 (1 3/16)	38.100 (1 1/2)	25.40(1.000)	2.8					25 800	45 300	12 000	—
30.162 (1 3/16)	38.100 (1 1/2)	15.88(.625)	—					28 400	53 600	5 000	—

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

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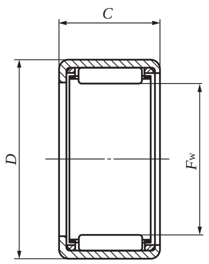
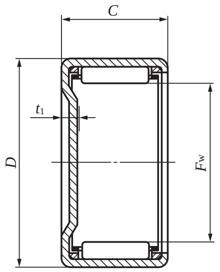
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SHELL TYPE NEEDLE ROLLER BEARINGS

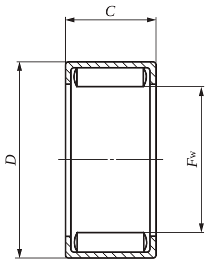
Inch Series



BA···Z BHA···Z



BAM BHAM



YB

Shaft dia. 31.750 ─ 33.338mm

Shaft dia. mm (inch)	Identification number									
	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
31.750 (1 1/4)	**BA 208 Z**	21.5	**BAM 208**	26	—	—	—	—	—	—
	BA 2010 Z	27	**BAM 2010**	31.5	—	—	—	—	—	—
	BA 2012 Z	32.5	**BAM 2012**	37	—	—	—	—	—	—
	BA 2016 Z	43	**BAM 2016**	47.5	—	—	—	—	—	—
	BA 2020 Z	53.5	**BAM 2020**	58	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YB 2010**	35
	—	—	—	—	—	—	—	—	**YB 2012**	42.5
	—	—	—	—	—	—	—	—	**YB 2016**	57
	—	—	—	—	—	—	—	—	**YB 2018**	64
	—	—	—	—	—	—	—	—	**YB 2020**	68
	—	—	—	—	**BHA 208 Z**	34.5	**BHAM 208**	40	—	—
	—	—	—	—	**BHA 2012 Z**	49.5	**BHAM 2012**	54.5	—	—
	—	—	—	—	**BHA 2016 Z**	66	**BHAM 2016**	71	—	—
	—	—	—	—	**BHA 2020 Z**	81.5	**BHAM 2020**	86.5	—	—
33.338 (1 5/16)	**BA 218 Z**	28.5	**BAM 218**	35	—	—	—	—	—	—
	BA 2110 Z	35.5	**BAM 2110**	41.5	—	—	—	—	—	—
	BA 2112 Z	43	**BAM 2112**	49	—	—	—	—	—	—

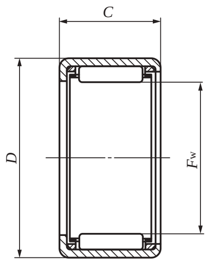
Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remark Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

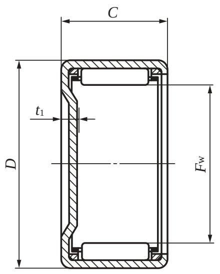
Boundary dimensions mm(inch)				Standard mounting dimensions mm				Basic dynamic load rating	Basic static load rating	Allowable rotational speed(1)	Assembled inner ring
				Shaft dia. h6		Housing bore dia. J7		C	C_0		
F_w	D	C	t_1 Max.	Max.	Min.	Max.	Min.	N	N	min⁻¹	
31.750 (1 1/4)	38.100 (1 1/2)	12.70(.500)	2.8	31.750	31.734	38.114	38.089	9 100	14 700	12 000	**IRB 168**
31.750 (1 1/4)	38.100 (1 1/2)	15.88(.625)	2.8					12 500	22 200	12 000	**IRB 1610**
31.750 (1 1/4)	38.100 (1 1/2)	19.05(.750)	2.8					15 700	29 600	12 000	**IRB 1612**
31.750 (1 1/4)	38.100 (1 1/2)	25.40(1.000)	2.8					21 500	44 300	12 000	**IRB 1616**
31.750 (1 1/4)	38.100 (1 1/2)	31.75(1.250)	2.8					26 900	59 200	12 000	**IRB 1620**
31.750 (1 1/4)	38.100 (1 1/2)	15.88(.625)	—	31.750	31.734	38.114	38.089	27 000	59 000	4 500	**IRB 1610**
31.750 (1 1/4)	38.100 (1 1/2)	19.05(.750)	—					31 800	72 500	4 500	**IRB 1612**
31.750 (1 1/4)	38.100 (1 1/2)	25.40(1.000)	—					40 900	100 000	4 500	**IRB 1616**
31.750 (1 1/4)	38.100 (1 1/2)	28.58(1.125)	—					45 300	114 000	4 500	—
31.750 (1 1/4)	38.100 (1 1/2)	31.75(1.250)	—					49 400	128 000	4 500	**IRB 1620**
31.750 (1 1/4)	41.275 (1 5/8)	12.70(.500)	3.4	31.750	31.734	41.289	41.264	13 700	17 600	12 000	**IRB 168**
31.750 (1 1/4)	41.275 (1 5/8)	19.05(.750)	3.4					24 100	36 400	12 000	**IRB 1612**
31.750 (1 1/4)	41.275 (1 5/8)	25.40(1.000)	3.4					33 200	55 000	12 000	**IRB 1616**
31.750 (1 1/4)	41.275 (1 5/8)	31.75(1.250)	3.4					40 000	69 600	12 000	**IRB 1620**
33.338 (1 5/16)	41.275 (1 5/8)	12.70(.500)	2.8	33.338	33.322	41.289	41.264	11 100	15 800	11 000	**IRB 168-1**
33.338 (1 5/16	41.275 (1 5/8)	15.88(.625)	2.8					15 400	23 900	11 000	**IRB 1610-1**
33.338 (1 5/16)	41.275 (1 5/8)	19.05(.750)	2.8					19 300	32 100	11 000	**IRB 1612-1**

SHELL TYPE NEEDLE ROLLER BEARINGS

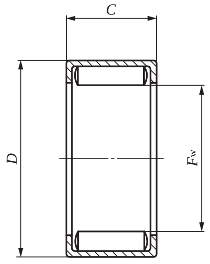
Inch Series



BA⋯Z BHA⋯Z



BAM BHAM



YB

Shaft dia. 34.925 ― 38.100mm

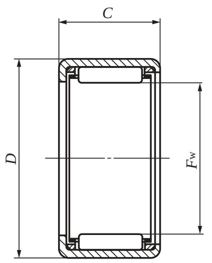
Shaft dia. mm (inch)	Identification number										Boundary dimensions mm(inch)				Standard mounting dimensions mm				Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) min⁻¹	Assembled inner ring
	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g	F_w	D	C	t_1 Max.	Shaft dia. h6 Max.	Shaft dia. h6 Min.	Housing bore dia. J7 Max.	Housing bore dia. J7 Min.				
34.925 (1 3/8)	**BA 228 Z**	23.5	**BAM 228**	29	—	—	—	—	—	—	34.925 (1 3/8)	41.275 (1 5/8)	12.70(.500)	2.8	34.925	34.909	41.289	41.264	9 770	16 600	10 000	**IRB 188**
	BA 2212 Z	35.5	**BAM 2212**	41	—	—	—	—	—	—	34.925 (1 3/8)	41.275 (1 5/8)	19.05(.750)	2.8					16 900	33 500	10 000	**IRB 1812**
	BA 2216 Z	47.5	**BAM 2216**	53	—	—	—	—	—	—	34.925 (1 3/8)	41.275 (1 5/8)	25.40(1.000)	2.8					23 100	50 200	10 000	**IRB 1816**
	BA 2220 Z	59	**BAM 2220**	64	—	—	—	—	—	—	34.925 (1 3/8)	41.275 (1 5/8)	31.75(1.250)	2.8					28 900	67 100	10 000	**IRB 1820**
	—	—	—	—	—	—	—	—	**YB 228**	30.5	34.925 (1 3/8)	41.275 (1 5/8)	12.70(.500)	—					23 000	49 500	4 500	**IRB 188**
	—	—	—	—	—	—	—	—	**YB 2212**	46	34.925 (1 3/8)	41.275 (1 5/8)	19.05(.750)	—					33 400	79 800	4 500	**IRB 1812**
	—	—	—	—	—	—	—	—	**YB 2220**	77.5	34.925 (1 3/8)	41.275 (1 5/8)	31.75(1.250)	—					52 000	141 000	4 500	**IRB 1820**
	—	—	—	—	**BHA 228 Z**	37	**BHAM 228**	43	—	—	34.925 (1 3/8)	44.450 (1 3/4)	12.70(.500)	3.4	34.925	34.909	44.464	44.439	14 100	18 800	10 000	**IRB 188**
	—	—	—	—	**BHA 2210 Z**	44	**BHAM 2210**	50	—	—	34.925 (1 3/8)	44.450 (1 3/4)	15.88(.625)	3.4					19 700	28 800	10 000	—
	—	—	—	—	**BHA 2212 Z**	53	**BHAM 2212**	59	—	—	34.925 (1 3/8)	44.450 (1 3/4)	19.05(.750)	3.4					24 800	38 800	10 000	**IRB 1812**
	—	—	—	—	**BHA 2216 Z**	71	**BHAM 2216**	77	—	—	34.925 (1 3/8)	44.450 (1 3/4)	25.40(1.000)	3.4					34 100	58 400	10 000	**IRB 1816**
	—	—	—	—	**BHA 2220 Z**	87	**BHAM 2220**	98.5	—	—	34.925 (1 3/8)	44.450 (1 3/4)	31.75(1.250)	3.4					41 200	74 200	10 000	**IRB 1820**
38.100 (1 1/2)	**BA 248 Z**	38.5	**BAM 248**	47.5	—	—	—	—	—	—	38.100 (1 1/2)	47.625 (1 7/8)	12.70(.500)	2.8	38.100	38.084	47.639	47.614	12 900	17 900	9 000	—
	BA 2410 Z	48.5	**BAM 2410**	57.5	—	—	—	—	—	—	38.100 (1 1/2)	47.625 (1 7/8)	15.88(.625)	2.8					17 800	27 100	9 000	**IRB 2010**
	BA 2412 Z	58.5	**BAM 2412**	67.5	—	—	—	—	—	—	38.100 (1 1/2)	47.625 (1 7/8)	19.05(.750)	2.8					22 500	36 600	9 000	—
	BA 2414 Z	69	**BAM 2414**	78	—	—	—	—	—	—	38.100 (1 1/2)	47.625 (1 7/8)	22.22(.875)	2.8					26 700	45 600	9 000	**IRB 2014**
	BA 2416 Z	79	**BAM 2416**	88	—	—	—	—	—	—	38.100 (1 1/2)	47.625 (1 7/8)	25.40(1.000)	2.8					31 100	55 400	9 000	**IRB 2016**
	BA 2420 Z	97.5	**BAM 2420**	106	—	—	—	—	—	—	38.100 (1 1/2)	47.625 (1 7/8)	31.75(1.250)	2.8					39 000	74 200	9 000	**IRB 2020**
	—	—	—	—	—	—	—	—	**YB 246**	38	38.100 (1 1/2)	47.625 (1 7/8)	9.52(.375)	—	38.100	38.084	47.639	47.614	21 000	34 100	4 000	—
	—	—	—	—	—	—	—	—	**YB 248**	51.5	38.100 (1 1/2)	47.625 (1 7/8)	12.70(.500)	—					28 700	50 900	4 000	—
	—	—	—	—	—	—	—	—	**YB 2414**	91	38.100 (1 1/2)	47.625 (1 7/8)	22.22(.875)	—					48 900	101 000	4 000	**IRB 2014**
	—	—	—	—	—	—	—	—	**YB 2416**	105	38.100 (1 1/2)	47.625 (1 7/8)	25.40(1.000)	—					55 100	118 000	4 000	**IRB 2016**
	—	—	—	—	—	—	—	—	**YB 2420**	131	38.100 (1 1/2)	47.625 (1 7/8)	31.75(1.250)	—					66 800	151 000	4 000	**IRB 2020**

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remark Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SHELL TYPE NEEDLE ROLLER BEARINGS

Inch Series



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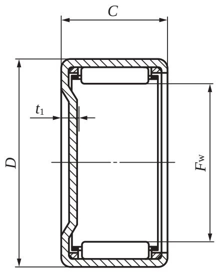
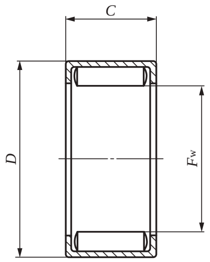


BAM　BHAM



YB

Shaft dia. 41.275 ─ 52.388mm

Shaft dia. mm (inch)	Identification number									
	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
41.275 (1 5/8)	**BA 268 Z**	41	**BAM 268**	51.5	—	—	—	—	—	—
	BA 2610 Z	52	**BAM 2610**	62.5	—	—	—	—	—	—
	BA 2616 Z	85	**BAM 2616**	95.5	—	—	—	—	—	—
	BA 2620 Z	105	**BAM 2620**	115	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YB 2610**	69
44.450 (1 3/4)	**BA 2812 Z**	67.5	**BAM 2812**	79.5	—	—	—	—	—	—
	BA 2816 Z	91	**BAM 2816**	103	—	—	—	—	—	—
	BA 2820 Z	112	**BAM 2820**	125	—	—	—	—	—	—
	BA 2824 Z	136	**BAM 2824**	148	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YB 2816**	119
	—	—	—	—	**BHA 2824 Z**	195	**BHAM 2824**	210	—	—
47.625 (1 7/8)	**BA 308 Z**	47.5	**BAM 308**	61	—	—	—	—	—	—
	BA 3010 Z	60	**BAM 3010**	74	—	—	—	—	—	—
	BA 3012 Z	72.5	**BAM 3012**	86.5	—	—	—	—	—	—
	BA 3016 Z	97.5	**BAM 3016**	112	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YB 3012**	95
50.800 (2)	**BA 328 Z**	50	**BAM 328**	66	—	—	—	—	—	—
	BA 3216 Z	104	**BAM 3216**	119	—	—	—	—	—	—
	BA 3220 Z	128	**BAM 3220**	144	—	—	—	—	—	—
	BA 3224 Z	155	**BAM 3224**	170	—	—	—	—	—	—
	BAW3228Z	180	**BAMW3228**	196	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	**YB 3216**	130
52.388 (2 1/16)	—	—	—	—	**BHA 3312 Z**	104	**BHAM 3312**	122	—	—
	—	—	—	—	**BHA 3316 Z**	139	**BHAM 3316**	157	—	—
	—	—	—	—	**BHA 3324 Z**	205	**BHAM 3324**	225	—	—

Boundary dimensions mm(inch)				Standard mounting dimensions mm				Basic dynamic load rating	Basic static load rating	Allowable rotational speed(1)	Assembled inner ring
F_w	D	C	t_1	Shaft dia. h6		Housing bore dia. J7		C	C_0		
			Max.	Max.	Min.	Max.	Min.	N	N	min^{-1}	
41.275 (1 5/8)	50.800 (2)	12.70(.500)	2.8	41.275	41.259	50.818	50.788	13 700	19 800	8 000	—
41.275 (1 5/8)	50.800 (2)	15.88(.625)	2.8					18 900	30 000	8 000	**IRB 2210**
41.275 (1 5/8)	50.800 (2)	25.40(1.000)	2.8					33 000	61 400	8 000	—
41.275 (1 5/8)	50.800 (2)	31.75(1.250)	2.8					41 400	82 100	8 000	**IRB 2220**
41.275 (1 5/8)	50.800 (2)	15.88(.625)	—					37 000	71 700	3 500	**IRB 2210**
44.450 (1 3/4)	53.975 (2 1/8)	19.05(.750)	2.8	44.450	44.434	53.993	53.963	25 200	44 500	7 500	**IRB 2412**
44.450 (1 3/4)	53.975 (2 1/8)	25.40(1.000)	2.8					34 800	67 400	7 500	**IRB 2416**
44.450 (1 3/4)	53.975 (2 1/8)	31.75(1.250)	2.8					43 600	90 200	7 500	—
44.450 (1 3/4)	53.975 (2 1/8)	38.10(1.500)	2.8					52 000	113 000	7 500	**IRB 2424**
44.450 (1 3/4)	53.975 (2 1/8)	25.40(1.000)	—					59 500	136 000	3 500	**IRB 2416**
44.450 (1 3/4)	57.150 (2 1/4)	38.10(1.500)	3.4	44.450	44.434	57.168	57.138	72 200	135 000	7 500	**IRB 2424**
47.625 (1 7/8)	57.150 (2 1/4)	12.70(.500)	2.8	47.625	47.609	57.168	57.138	14 700	22 800	7 000	**IRB 248-1**
47.625 (1 7/8)	57.150 (2 1/4)	15.88(.625)	2.8					20 300	34 500	7 000	**IRB 2410-1**
47.625 (1 7/8)	57.150 (2 1/4)	19.05(.750)	2.8					25 700	46 700	7 000	—
47.625 (1 7/8)	57.150 (2 1/4)	25.40(1.000)	2.8					35 400	70 600	7 000	—
47.625 (1 7/8)	57.150 (2 1/4)	19.05(.750)	—					47 800	105 000	3 000	—
50.800 (2)	60.325 (2 3/8)	12.70(.500)	2.8	50.800	50.781	60.343	60.313	15 400	24 700	6 000	—
50.800 (2)	60.325 (2 3/8)	25.40(1.000)	2.8					37 100	76 500	6 000	**IRB 2616**
50.800 (2)	60.325 (2 3/8)	31.75(1.250)	2.8					46 600	102 000	6 000	**IRB 2720**
50.800 (2)	60.325 (2 3/8)	38.10(1.500)	2.8					55 500	128 000	6 000	—
50.800 (2)	60.325 (2 3/8)	44.45(1.750)	2.8					57 900	136 000	6 000	**IRB 2628**
50.800 (2)	60.325 (2 3/8)	25.40(1.000)	—					64 100	156 000	2 500	**IRB 2616**
52.388 (2 1/16)	64.294 (2 17/32)	19.05(.750)	3.4	52.388	52.369	64.312	64.282	36 400	62 100	6 000	—
52.388 (2 1/16)	64.294 (2 17/32)	25.40(1.000)	3.4					50 600	94 700	6 000	—
52.388 (2 1/16)	64.294 (2 17/32)	38.10(1.500)	3.4					73 900	154 000	6 000	—

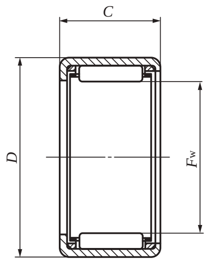
Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remarks1. "W" in the identification number indicates that rolling elements are arranged in double rows.

2. Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

SHELL TYPE NEEDLE ROLLER BEARINGS

Inch Series



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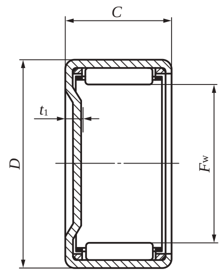


BAM

Shaft dia. 53.975 ー 69.850mm

Shaft dia. mm (inch)	Identification number: Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Standard	Mass (Ref.) g	Closed end	Mass (Ref.) g	Grease retained	Mass (Ref.) g
53.975 (2 1/8)	**BA 348 Z**	53	**BAM 348**	70.5	—	—	—	—	—	—
	BA 3416 Z	109	**BAM 3416**	127	—	—	—	—	—	—
	BA 3424 Z	162	**BAM 3424**	180	—	—	—	—	—	—
57.150 (2 1/4)	**BA 3612 Z**	85.5	**BAM 3612**	105	—	—	—	—	—	—
	BA 3616 Z	115	**BAM 3616**	135	—	—	—	—	—	—
	BA 3620 Z	143	**BAM 3620**	163	—	—	—	—	—	—
	BA 3624 Z	172	**BAM 3624**	192	—	—	—	—	—	—
66.675 (2 5/8)	**BA 4216 Z**	133	**BAM 4216**	161	—	—	—	—	—	—
69.850 (2 3/4)	**BA 4410 Z**	85.5	**BAM 4410**	115	—	—	—	—	—	—
	BA 4412 Z	103	**BAM 4412**	133	—	—	—	—	—	—
	BA 4416 Z	139	**BAM 4416**	169	—	—	—	—	—	—
	BA 4420 Z	173	**BAM 4420**	205	—	—	—	—	—	—

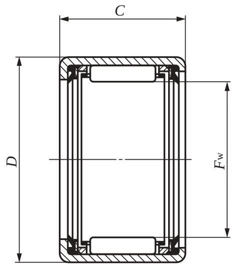
Boundary dimensions mm(inch) F_w	D	C	t_1 Max.	Standard mounting dimensions mm Shaft dia. h6 Max.	Min.	Housing bore dia. J7 Max.	Min.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) min⁻¹	Assembled inner ring
53.975(2 1/8)	63.500(2 1/2)	12.70(.500)	2.8	53.975	53.956	63.518	63.488	16 100	26 600	5 500	—
53.975(2 1/8)	63.500(2 1/2)	25.40(1.000)	2.8					38 700	82 500	5 500	**IRB 3016**
53.975(2 1/8)	63.500(2 1/2)	38.10(1.500)	2.8					57 900	138 000	5 500	**IRB 3024**
57.150(2 1/4)	66.675(2 5/8)	19.05(.750)	2.8	57.150	57.131	66.693	66.663	28 500	56 700	5 000	—
57.150(2 1/4)	66.675(2 5/8)	25.40(1.000)	2.8					39 300	85 700	5 000	—
57.150(2 1/4)	66.675(2 5/8)	31.75(1.250)	2.8					49 400	115 000	5 000	—
57.150(2 1/4)	66.675(2 5/8)	38.10(1.500)	2.8					58 800	144 000	5 000	—
66.675(2 5/8)	76.200(3)	25.40(1.000)	2.8	66.675	66.656	76.218	76.188	42 000	97 900	4 000	**IRB 3616**
69.850(2 3/4)	79.375(3 1/8)	15.88(.625)	2.8	69.850	69.831	79.393	79.363	25 000	50 800	3 500	—
69.850(2 3/4)	79.375(3 1/8)	19.05(.750)	2.8					31 500	68 700	3 500	—
69.850(2 3/4)	79.375(3 1/8)	25.40(1.000)	2.8					43 500	104 000	3 500	**IRB 4016**
69.850(2 3/4)	79.375(3 1/8)	31.75(1.250)	2.8					54 600	139 000	3 500	**IRB 4020**

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remark Shell Type Grease Retained Full Complement Needle Roller Bearings are provided with prepacked grease. Standard type and closed end type bearings are not provided with prepacked grease, so perform proper lubrication when using these types of bearings.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SHELL TYPE NEEDLE ROLLER BEARINGS

With seals



TLA ··· UU

Shaft dia. 12 ─ 50mm

Shaft dia.	Identification number	Mass (Ref.)	Boundary dimensions mm			Standard mounting dimensions mm				Basic dynamic load rating	Basic static load rating	Allowable rotational speed(1)
						Shaft dia. h6		Housing bore dia. N7		C	C_0	
mm		g	F_w	D	C	Max.	Min.	Max.	Min.	N	N	min^{-1}
12	**TLA 1216 UU**	11.7	12	18	16	12.000	11.989	17.995	17.977	6 420	7 490	14 000
14	**TLA 1416 UU**	13.3	14	20	16	14.000	13.989	19.993	19.972	7 080	8 840	12 000
15	**TLA 1516 UU**	14	15	21	16	15.000	14.989	20.993	20.972	7 380	9 520	11 000
16	**TLA 1616 UU**	14.8	16	22	16	16.000	15.989	21.993	21.972	7 670	10 200	11 000
18	**TLA 1816 UU**	16.3	18	24	16	18.000	17.989	23.993	23.972	8 230	11 500	9 000
20	**TLA 2016 UU**	17.8	20	26	16	20.000	19.987	25.993	25.972	8 740	12 900	9 000
	TLA 2020 UU	22.5	20	26	20					11 100	17 500	9 000
22	**TLA 2216 UU**	19.4	22	28	16	22.000	21.987	27.993	27.972	9 230	14 300	8 000
	TLA 2220 UU	25	22	28	20					11 700	19 300	8 000
25	**TLA 2516 UU**	26	25	32	16	25.000	24.987	31.992	31.967	9 440	13 900	7 000
	TLA 2520 UU	33	25	32	20					12 800	20 500	7 000
28	**TLA 2820 UU**	36.5	28	35	20	28.000	27.987	34.992	34.967	13 800	23 500	6 000
30	**TLA 3016 UU**	30.5	30	37	16	30.000	29.987	36.992	36.967	10 400	16 600	5 500
	TLA 3020 UU	39	30	37	20					14 100	24 500	5 500
35	**TLA 3516 UU**	35	35	42	16	35.000	34.984	41.992	41.967	11 600	20 000	5 000
	TLA 3520 UU	45	35	42	20					15 700	29 600	5 000
40	**TLA 4016 UU**	39.5	40	47	16	40.000	39.984	46.992	46.967	12 400	22 800	4 500
	TLA 4020 UU	50.5	40	47	20					16 700	33 700	4 500
45	**TLA 4520 UU**	56	45	52	20	45.000	44.984	51.991	51.961	17 800	37 800	4 000
50	**TLA 5026 UU**	89	50	58	26	50.000	49.984	57.991	57.961	28 800	64 100	3 500

Note(1) Allowable rotational speed applies to grease lubrication.
Remark The type with seals is provided with prepacked grease.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

NEEDLE ROLLER CAGES FOR GENERAL USAGE

● High carbon steel cage type

● Synthetic resin cage type

Structure and Features

IKO Needle Roller Cages for General Usage are bearings which display excellent rotational performance. Needle rollers with extremely small dimensional variations in diameter are incorporated and retained in their specially shaped cages with high rigidity and accuracy, which precisely guide the needle rollers.

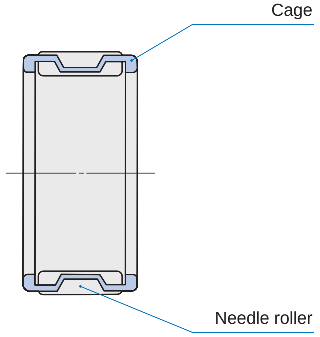
When combined with shafts and housing bores that are heat treated and accurately ground as raceway surfaces, Needle Roller Cages for General Usage are particularly useful in small spaces.

In addition, since they are lightweight and have high rigidity as well as a large lubricant holding capacity, they can withstand severe operating conditions such as high speed rotation and shock loads, and they are used in a wide range of applications.

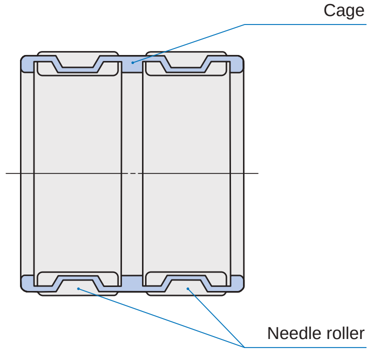
Structures of Needle Roller Cages for General Usage

High carbon steel cage type

KT

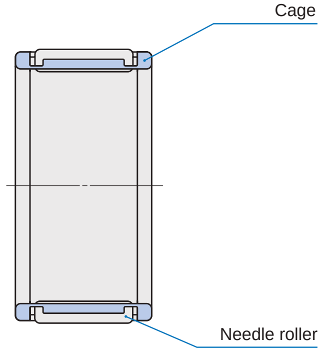


KTW



Synthetic resin cage type

KT…N



Types

Needle Roller Cages for General Usage are available in the types shown in Table 1.

For applications such as crank shafts where these bearings are difficult to install, it is also possible to make split type bearings.

If such bearings are required, please contact IKO.

For Needle Roller Cages for Engine Connecting Rods (KT···EG and KTV···EG), see page C17.

Table 1 Model of bearing

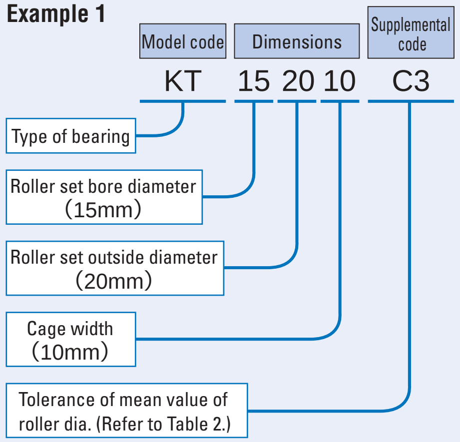
Item	Model of bearing	
	Single row needle roller	Double row needle roller
High carbon steel cage type	KT	KTW
Synthetic resin cage type	KT···N	–

Identification Number

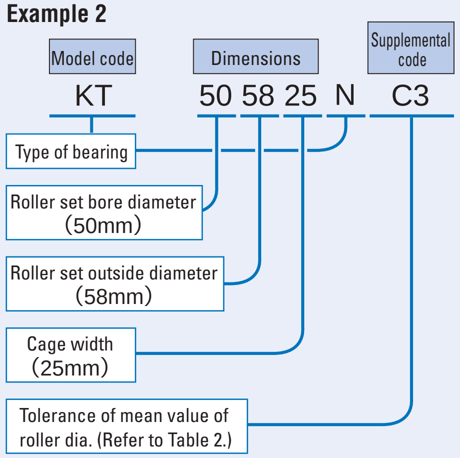
The identification number of Needle Roller Cages for General Usage consists of a model code, dimensions and any supplemental codes. The arrangement examples are shown below.

Examples of identification number

Example 1



Example 2



Accuracy

The diameter tolerances of needle rollers of Needle Roller Cages for General Usage are classified by classification symbols shown in Table 2. If a classification symbol is not indicated in an identification number, the classification symbol "C3" is applied.

When two or more bearings are used in tandem arrangement on the same shaft, it is necessary to select bearings of the same classification symbol to obtain an even load distribution.

The tolerance of the cage width B_c is -0.20 〜 -0.55 mm.

Table 2 Diameter tolerances of needle rollers unit: μm

Classification symbol	Tolerance of mean value of needle roller diameter
C 3	0 〜 − 3
B 2	0 〜 − 2
B 4	− 2 〜 − 4
B 6	− 4 〜 − 6
B 8	− 6 〜 − 8
B10	− 8 〜 − 10

Fit

Radial clearances of Needle Roller Cages for General Usage are determined by the dimensional accuracy of the raceways and needle rollers. Table 3 shows the recommended fits for the operating conditions.

Table 3 Recommended fits of shaft to the housing bore diameter G6

Shaft / Operating conditions	Tolerance class of shaft	
	$F_w \leqq 68$mm	$F_w > 68$mm
When high operating accuracy is required. When shock loads and oscillating motions are applied.	j5	h5
For general use	h5	g5
When the temperature is high, or mounting errors are large.	g6	f6

Remark When setting the required radial clearance according to the operating conditions, the clearance can easily be obtained by selecting and matching the tolerances of needle rollers, shaft and housing bore. When variation of the clearance does not create any problems, h6 and G7 are used for shaft and housing bore, respectively.

Specifications of shaft and housing

For the raceways, a surface hardness of 58 〜 64HRC and a surface roughness 0.2μmR_a or less are desirable. However, when the operating conditions are not severe, a surface roughness 0.8μmR_a or less can be used.

When the surface hardness is low, it is necessary to correct the load rating by the hardness factor specified on page A20.

Operating temperature range

The operating temperature range for high carbon steel cage types is -20 to 120°C. The maximum allowable temperature for synthetic resin cage types is +110 ℃, and +100 ℃ when they are continuously operated.

Mounting

The dimensions related to mounting of Needle Roller Cages for General Usage are shown in Figs. 1 and 2.

When mounting Needle Roller Cages for General Usage, they are axially positioned by using, for example, Cir-clips for shaft and housing bore (WR and AR on page L17) as shown in Figs. 3, 4 and 5.

For high rotational speed applications, a heat treated and ground spacer is positioned between the cage and the cir-clip as shown in Fig. 5 so that the cage does not make direct contact with the cir-clip. In this case, the cir-clip is normally mounted on the non-rotating side.

Fig. 3 shows a mounting example in the case of outer ring rotation, and Figs. 4 and 5 show examples in the case of inner ring rotation.

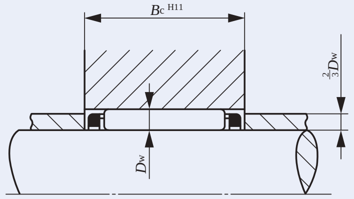


Fig.1

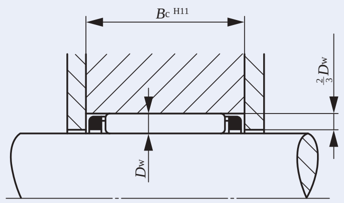


Fig.2

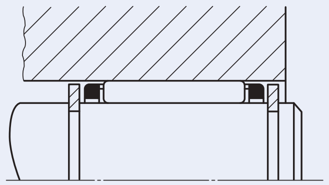


Fig.3

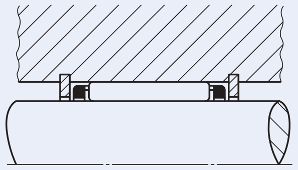


Fig.4

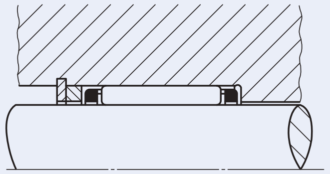
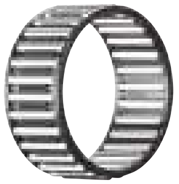


Fig.5

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

NEEDLE ROLLER CAGES FOR GENERAL USAGE

High carbon steel cage type



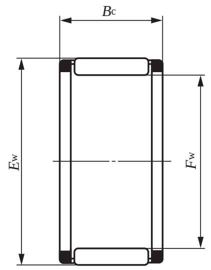
Synthetic resin cage type

Shaft dia. 3 ― 14mm

Shaft dia.	Identification number	Mass (Ref.)	Boundary dimensions mm			Basic dynamic load rating C	Basic static load rating C_0	Allowable rotational speed(1)
mm		g	F_w	E_w	B_c	N	N	min^{-1}
3	**KT 367N**	0.39	3	6	7	1 480	990	140 000
4	**KT 477N**	0.47	4	7	7	1 800	1 300	100 000
5	**KT 587N**	0.53	5	8	7	2 070	1 600	85 000
	KT 588N	0.66	5	8	8	2 420	1 950	85 000
6	**KT 697N**	0.63	6	9	7	2 310	1 900	75 000
	KT 698N	0.75	6	9	8	2 700	2 320	75 000
	KT 6910	1.45	6	9	10	3 010	2 660	75 000
	KT 61013	2.7	6	10	13	4 410	3 720	75 000
7	**KT 7108N**	0.86	7	10	8	2 960	2 690	65 000
	KT 71010	1.69	7	10	10	3 340	3 130	65 000
8	**KT 8118N**	0.96	8	11	8	3 190	3 060	60 000
	KT 81110	1.9	8	11	10	3 630	3 600	60 000
	KT 81110N	1.2	8	11	10	3 630	3 600	60 000
	KT 81113	2.5	8	12	13	4 500	4 750	60 000
	KT 8128	2.1	8	12	8	3 630	3 040	60 000
	KT 81211	3	8	12	11	4 630	4 170	60 000
	KT 91210	2.1	9	12	10	3 900	4 070	55 000
	KT 91213	2.8	9	12	13	4 840	5 370	55 000
9	**KT 10138**	1.9	10	13	8	3 370	3 470	50 000
	KT 101310	2.3	10	13	10	4 160	4 550	50 000
	KT 101313	3	10	13	13	5 160	6 000	50 000
	KT 101410	3.2	10	14	10	4 900	4 680	50 000
	KT 101412	3.8	10	14	12	5 940	6 000	50 000
10	**KT 101413**	4.2	10	14	13	6 100	6 200	50 000
	KT 101415	4.8	10	14	15	7 080	7 520	50 000
11	**KT 111410**	2.5	11	14	10	4 400	5 020	45 000

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.

Remark For synthetic resin cage types, "N" is added at the end of the identification number. For sizes not listed in the dimension tables, please contact IKO.



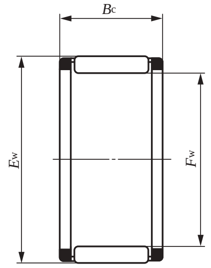
KT (··· N)

Shaft dia.	Identification number	Mass (Ref.)	Boundary dimensions mm			Basic dynamic load rating C	Basic static load rating C_0	Allowable rotational speed(1)
mm		g	F_w	E_w	B_c	N	N	min^{-1}
12	**KT 12158**	2.2	12	15	8	3 750	4 200	40 000
	KT 121510	2.7	12	15	10	4 620	5 490	40 000
	KT 121512	3.2	12	15	12	5 590	7 020	40 000
	KT 121513	3.6	12	15	13	5 730	7 250	40 000
	KT 121514	3.8	12	15	14	6 200	8 010	40 000
	KT 121610	4	12	16	10	5 650	5 890	40 000
	KT 121613	5.2	12	16	13	7 020	7 800	40 000
	KT 121618	7	12	16	18	9 790	11 900	40 000
	KT 121710	5.1	12	17	10	6 170	5 740	40 000
	KT 121812	7.8	12	18	12	9 030	8 460	40 000
	KT 121820	13.2	12	18	20	13 700	14 400	40 000
13	**KT 131710**	4.3	13	17	10	5 990	6 500	40 000
	KT 131815	8.2	13	18	15	9 660	10 400	40 000
	KT 131816	8.7	13	18	16	10 300	11 400	40 000
14	**KT 14188**	3.7	14	18	8	5 110	5 410	35 000
	KT 141810	4.6	14	18	10	6 320	7 110	35 000
	KT 141811	5.2	14	18	11	6 520	7 410	35 000
	KT 141813	6	14	18	13	7 860	9 410	35 000
	KT 141816	7.3	14	18	16	9 750	12 400	35 000
	KT 141910	5.9	14	19	10	7 130	7 180	35 000
	KT 141916	9.4	14	19	16	11 100	12 600	35 000
	KT 141918	10.5	14	19	18	12 400	14 700	35 000
	KT 142012	8.7	14	20	12	9 790	9 680	35 000
	KT 142017	12.4	14	20	17	13 300	14 400	35 000

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

NEEDLE ROLLER CAGES FOR GENERAL USAGE

High carbon steel cage type



KT

Shaft dia. 15 ー 18mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	E_w	B_c	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) min-1
15	**KT 15199**	4.4	15	19	9	6 120	6 950	35 000
	KT 151910	4.9	15	19	10	6 630	7 720	35 000
	KT 151911	5.5	15	19	11	6 850	8 040	35 000
	KT 151913	6.4	15	19	13	8 250	10 200	35 000
	KT 151917	8.2	15	19	17	10 900	14 600	35 000
	KT 151918	8.7	15	19	18	11 500	15 600	35 000
	KT 152010	6.3	15	20	10	7 580	7 920	35 000
	KT 152115	11.9	15	21	15	12 600	13 500	35 000
16	**KT 162010**	5.2	16	20	10	6 930	8 330	30 000
	KT 162013	6.8	16	20	13	8 620	11 000	30 000
	KT 162016	8.3	16	20	16	10 700	14 600	30 000
	KT 162017	8.7	16	20	17	11 400	15 700	30 000
	KT 162118	12	16	21	18	14 000	17 700	30 000
	KT 162120	13.6	16	21	20	14 700	18 900	30 000
	KT 162125	16.6	16	21	25	18 300	25 100	30 000
	KT 162212	9.7	16	22	12	10 500	10 900	30 000
	KT 162214	11.5	16	22	14	11 600	12 500	30 000
	KT 162217	13.8	16	22	17	14 200	16 100	30 000
	KT 162220	16.5	16	22	20	15 900	18 600	30 000
	KT 162420	23.5	16	24	20	18 500	19 000	30 000
17	**KT 172110**	5.5	17	21	10	7 220	8 950	30 000
	KT 172113	7.2	17	21	13	8 980	11 800	30 000
	KT 172115	8.2	17	21	15	10 400	14 400	30 000
	KT 172117	9.3	17	21	17	11 800	16 900	30 000
	KT 172220	14	17	22	20	15 500	20 500	30 000
	KT 172311	9.6	17	23	11	10 100	10 500	30 000
	KT 172315	13.1	17	23	15	13 300	15 100	30 000
	KT 172418	18.6	17	24	18	16 500	18 000	30 000

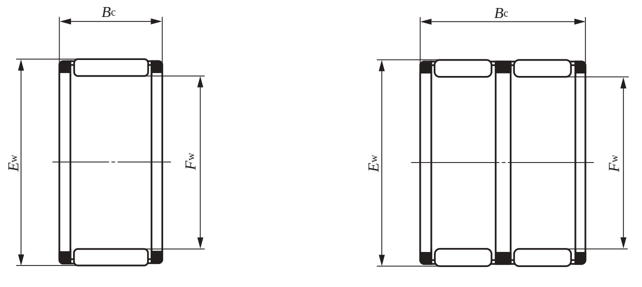
Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	E_w	B_c	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) min-1
18	**KT 18228**	4.7	18	22	8	6 060	7 270	30 000
	KT 182210	5.8	18	22	10	7 500	9 560	30 000
	KT 182213	7.6	18	22	13	9 330	12 700	30 000
	KT 182216	9.2	18	22	16	11 600	16 700	30 000
	KT 182412	11	18	24	12	11 800	13 100	30 000
	KT 182416	14.8	18	24	16	15 100	17 900	30 000
	KT 182417	15.7	18	24	17	16 000	19 400	30 000
	KT 182420	18.7	18	24	20	17 900	22 400	30 000
	KT 182517	18.8	18	25	17	16 700	18 600	30 000
	KT 182519	21	18	25	19	18 700	21 400	30 000
	KT 182522	24.5	18	25	22	20 600	24 200	30 000
	KT 182614	18.1	18	26	14	14 600	14 400	30 000
	KT 182620	26	18	26	20	20 000	21 600	30 000

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

NEEDLE ROLLER CAGES FOR GENERAL USAGE

High carbon steel cage type



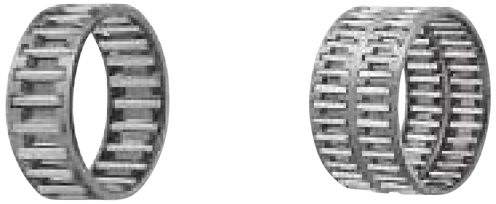
Shaft dia. 20 – 24mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm			Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) min^{-1}
			F_w	E_w	B_c			
20	**KT 202410**	6.3	20	24	10	7 710	10 200	25 000
	KT 202413	8.3	20	24	13	9 590	13 500	25 000
	KT 202417	10.6	20	24	17	12 600	19 300	25 000
	KTW 202422	14.6	20	24	22	13 700	21 300	25 000
	KT 202525	19.7	20	25	25	19 900	29 800	25 000
	KTW 202531.6	26.5	20	25	31.6	21 700	33 200	25 000
	KTW 202540	32.5	20	25	40	27 500	44 900	25 000
	KT 202611	11.1	20	26	11	11 200	12 500	25 000
	KT 202612	12	20	26	12	12 400	14 300	25 000
	KT 202614	14.2	20	26	14	13 700	16 400	25 000
	KT 202617	17	20	26	17	16 800	21 200	25 000
	KT 202620	20.5	20	26	20	18 700	24 400	25 000
	KT 202624	24	20	26	24	22 500	30 900	25 000
	KT 202627	26.5	20	26	27	26 000	37 300	25 000
	KT 202814	20	20	28	14	15 700	16 100	25 000
	KT 202820	29	20	28	20	21 500	24 200	25 000
	KT 203225	49.5	20	32	25	30 800	30 500	25 000
21	**KT 212610**	8.5	21	26	10	9 090	11 000	25 000
	KT 212611	9.6	21	26	11	9 390	11 500	25 000
22	**KT 222610**	6.9	22	26	10	8 220	11 500	25 000
	KT 222613	9.1	22	26	13	10 200	15 200	25 000
	KT 222617	11.6	22	26	17	13 500	21 600	25 000
	KTW 222625	17.7	22	26	25	17 100	29 400	25 000
	KT 222720	17.9	22	27	20	17 400	25 700	25 000
	KT 222726	22.5	22	27	26	22 500	35 800	25 000
	KT 222817	18.4	22	28	17	17 500	23 000	25 000
	KT 222912	16.1	22	29	12	12 900	14 000	25 000
	KT 222916	21	22	29	16	17 600	20 900	25 000
	KT 222917	22.5	22	29	17	18 700	22 600	25 000
	KT 222918	23.5	22	29	18	19 800	24 400	25 000
	KT 222920	26.5	22	29	20	20 900	26 100	25 000
	KT 223015	23.5	22	30	15	17 900	19 700	25 000
	KT 223230	52.5	22	32	30	36 400	42 700	25 000
	KT 223232	56	22	32	32	38 800	46 300	25 000
23	**KT 232824**	22	23	28	24	21 600	34 500	20 000
	KT 232913	15.1	23	29	13	13 800	17 200	20 000
	KT 233015	21	23	30	15	17 300	20 800	20 000
	KT 233016	22	23	30	16	18 600	22 600	20 000
24	**KT 242813**	9.9	24	28	13	10 800	16 800	20 000
	KT 242816	12	24	28	16	13 400	22 200	20 000
	KTW 242834	27	24	28	34	21 600	40 700	20 000
	KT 242913	12.8	24	29	13	12 700	17 600	20 000
	KT 243020	23.5	24	30	20	20 300	28 500	20 000

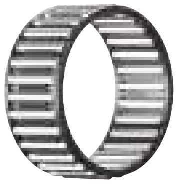
Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

NEEDLE ROLLER CAGES FOR GENERAL USAGE



High carbon steel cage type



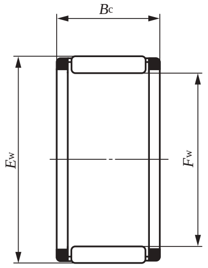
Synthetic resin cage type

Shaft dia. 25 – 32mm

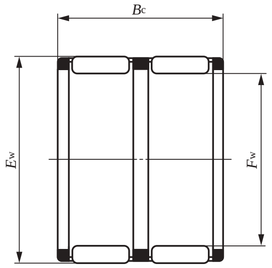
Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	 E_w	 B_c	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) min⁻¹
25	**KT 252910**	7.9	25	29	10	8 940	13 300	20 000
	KT 252913	10.3	25	29	13	11 100	17 600	20 000
	KT 253013	13.3	25	30	13	13 100	18 600	20 000
	KT 253016	16.2	25	30	16	16 300	24 600	20 000
	KT 253017	17.1	25	30	17	17 300	26 600	20 000
	KT 253020	20	25	30	20	18 600	29 100	20 000
	KT 253113	16.2	25	31	13	14 300	18 400	20 000
	KT 253116	19.6	25	31	16	17 800	24 400	20 000
	KT 253117	20.5	25	31	17	19 000	26 500	20 000
	KT 253120	25	25	31	20	21 200	30 500	20 000
	KT 253216	23.5	25	32	16	19 400	24 500	20 000
	KT 253224	35	25	32	24	27 700	38 700	20 000
	KT 253515	33	25	35	15	22 600	23 800	20 000
	KT 253525	48	25	35	25	32 500	37 900	20 000
	KT 253530	58	25	35	30	39 100	48 000	20 000
26	**KT 263013**	10.7	26	30	13	11 400	18 400	19 000
	KT 263832	79.5	26	38	32	47 200	55 300	19 000
28	**KT 283313**	14.8	28	33	13	13 800	20 700	18 000
	KT 283317	18.9	28	33	17	18 300	29 500	18 000
	KT 283327	29	28	33	27	26 300	47 300	18 000
	KT 283417	23	28	34	17	20 300	29 900	18 000
	KT 283516	26	28	35	16	20 100	26 500	18 000
	KT 283528	44.5	28	35	28	33 200	50 600	18 000
	KT 283620	38.5	28	36	20	26 500	34 700	18 000
	KT 284138	110	28	41	38	58 700	71 100	18 000
29	**KT 293825N**	40.7	29	38	25	35 800	47 800	17 500

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.

Remark For synthetic resin cage types, "N" is added at the end of the identification number. For sizes not listed in the dimension tables, please contact IKO.



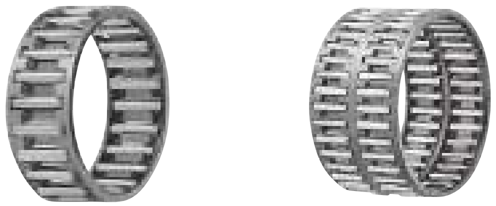
KT (… N)



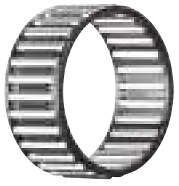
KTW

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	 E_w	 B_c	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) min⁻¹
30	**KT 303513**	15.6	30	35	13	14 100	21 700	17 000
	KT 303516	18.9	30	35	16	17 500	28 700	17 000
	KT 303517	20	30	35	17	18 700	31 100	17 000
	KT 303524	28.5	30	35	24	24 900	45 100	17 000
	KT 303527	31.5	30	35	27	27 900	52 100	17 000
	KT 303613	19.1	30	36	13	15 800	22 100	17 000
	KT 303620	29.5	30	36	20	23 300	36 500	17 000
	KT 303630	41.5	30	36	30	33 200	57 500	17 000
	KT 303715	26	30	37	15	19 500	26 000	17 000
	KT 303716	27.5	30	37	16	20 800	28 400	17 000
	KT 303720	35	30	37	20	24 700	35 400	17 000
	KT 303723	39.5	30	37	23	28 500	42 500	17 000
	KT 303818	36.5	30	38	18	26 200	34 800	17 000
	KT 303824	48.5	30	38	24	33 200	47 200	17 000
	KT 304232	93	30	42	32	54 000	68 100	17 000
	KTW 304237	117	30	42	37	55 900	71 300	17 000
32	**KT 323713**	16.7	32	37	13	14 900	23 700	16 000
	KT 323717	21.5	32	37	17	19 600	33 900	16 000
	KT 323723	28.5	32	37	23	24 400	44 800	16 000
	KT 323813	20.5	32	38	13	16 800	24 400	16 000
	KT 323820	31.5	32	38	20	24 800	40 300	16 000
	KT 323916	29	32	39	16	21 600	30 200	16 000
	KT 323920	37	32	39	20	25 600	37 700	16 000
	KT 324519	63.5	32	45	19	33 700	35 900	16 000
	KT 324525	84.5	32	45	25	45 600	53 000	16 000
	KT 324532	109	32	45	32	58 500	73 000	16 000
	KT 324550	162	32	45	50	81 500	111 000	16 000

NEEDLE ROLLER CAGES FOR GENERAL USAGE



High carbon steel cage type



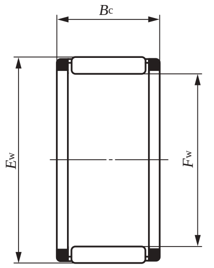
Synthetic resin cage type

Shaft dia. 35 – 52mm

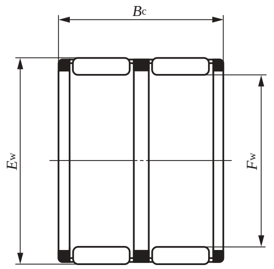
Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	 E_w	 B_c	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) min⁻¹
35	**KT 354013**	18.1	35	40	13	15 500	25 800	14 000
	KT 354017	23	35	40	17	20 500	36 900	14 000
	KT 354026	34.5	35	40	26	28 700	56 800	14 000
	KT 354113	22.5	35	41	13	17 700	26 800	14 000
	KT 354216	32	35	42	16	23 100	33 900	14 000
	KT 354218	35.5	35	42	18	26 000	39 500	14 000
	KT 354220	40.5	35	42	20	27 400	42 300	14 000
	KT 354230	59	35	42	30	40 600	70 300	14 000
	KT 354525	68.5	35	45	25	42 100	57 900	14 000
36	**KT 364216**	27.5	36	42	16	21 900	35 700	14 000
38	**KT 384417**	30.5	38	44	17	23 800	40 400	13 000
	KT 384620	50	38	46	20	30 500	45 400	13 000
	KT 384632	80	38	46	32	45 400	75 700	13 000
40	**KT 404513**	20.5	40	45	13	16 800	29 800	12 000
	KT 404517	26.5	40	45	17	22 200	42 700	12 000
	KT 404527	41	40	45	27	32 400	69 200	12 000
	KT 404817	44	40	48	17	28 100	41 600	12 000
	KT 404820	52.5	40	48	20	31 400	48 000	12 000
	KT 404825	64.5	40	48	25	39 300	64 000	12 000
	KT 404834	87.5	40	48	34	51 100	89 600	12 000
	KT 405015	48.5	40	50	15	28 200	35 900	12 000
	KT 405017	56.5	40	50	17	30 200	39 200	12 000
	KT 405020	61	40	50	20	35 700	48 600	12 000
	KTW 405238	158	40	52	38	65 000	93 000	12 000
	KT 405432	144	40	54	32	66 800	87 200	12 000
	KT 405450	215	40	54	50	93 600	134 000	12 000
	KT 405463	270	40	54	63	115 000	175 000	12 000

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.

Remark For synthetic resin cage types, "N" is added at the end of the identification number. For sizes not listed in the dimension tables, please contact IKO.



KT (…N)



KTW

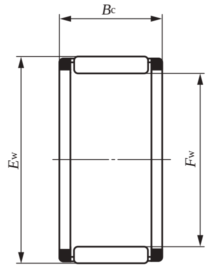
Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	 E_w	 B_c	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) min⁻¹
41	**KT 414835**	78.5	41	48	35	47 800	90 800	12 000
42	**KT 424717**	27.5	42	47	17	22 500	44 200	12 000
	KT 424815	30	42	48	15	22 400	38 600	12 000
	KT 424816	32	42	48	16	24 000	42 100	12 000
	KT 425020	55	42	50	20	32 400	50 600	12 000
	KT 425030	80.5	42	50	30	48 200	84 400	12 000
45	**KT 455017**	29.5	45	50	17	23 300	47 100	11 000
	KT 455027	46	45	50	27	34 800	79 000	11 000
	KT 455320	58	45	53	20	33 200	53 300	11 000
	KT 455325	71.5	45	53	25	41 500	71 100	11 000
	KT 455330	86	45	53	30	47 800	85 300	11 000
	KT 455335	101	45	53	35	53 900	99 500	11 000
	KT 455527	90.5	45	55	27	50 300	78 200	11 000
48	**KT 485320**	37	48	53	20	26 800	57 600	10 000
	KT 485420	46	48	54	20	30 600	60 400	10 000
50	**KT 505520**	38.5	50	55	20	27 100	59 300	10 000
	KT 505527	50.5	50	55	27	35 600	84 100	10 000
	KT 505820	65	50	58	20	35 900	61 100	10 000
	KT 505825	80	50	58	25	44 900	81 500	10 000
	KT 505825N	66.3	50	58	25	51 400	97 800	10 000
	KT 505830	96.5	50	58	30	51 700	97 800	10 000
	KT 505835	113	50	58	35	58 300	114 000	10 000
52	**KT 525817**	41	52	58	17	28 300	56 000	9 500
	KT 526024	80	52	60	24	44 000	80 800	9 500

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

NEEDLE ROLLER CAGES FOR GENERAL USAGE

High carbon steel cage type

Shaft dia. 55 ─ 100mm



KT

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	E_w	B_c	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(1) min-1
55	**KT 556020**	42.5	55	60	20	28 600	66 000	9 000
	KT 556027	55.5	55	60	27	37 600	93 900	9 000
	KT 556120	52	55	61	20	32 600	68 500	9 000
	KT 556315	52.5	55	63	15	29 400	48 700	9 000
	KT 556320	71	55	63	20	37 400	66 400	9 000
	KT 556325	87	55	63	25	46 800	88 600	9 000
58	**KT 586320**	44.5	58	63	20	29 300	69 400	8 500
	KT 586420	54.5	58	64	20	33 600	72 500	8 500
60	**KT 606520**	45.5	60	65	20	29 700	71 100	8 500
	KT 606820	76.5	60	68	20	38 900	71 700	8 500
	KT 606825	94	60	68	25	48 600	95 600	8 500
	KT 606827	101	60	68	27	52 400	105 000	8 500
	KT 607236	205	60	72	36	86 700	152 000	8 500
63	**KT 637120**	79.5	63	71	20	39 500	74 400	8 000
65	**KT 657320**	83.5	65	73	20	41 200	79 600	7 500
	KT 657330	124	65	73	30	59 300	127 000	7 500
68	**KT 687620**	86.5	68	76	20	41 800	82 200	7 500
70	**KT 707820**	89	70	78	20	42 500	84 900	7 000
	KT 707830	132	70	78	30	61 200	136 000	7 000
72	**KT 728020**	91.5	72	80	20	43 200	87 500	7 000
75	**KT 758320**	94.5	75	83	20	43 800	90 200	6 500
	KT 758325	116	75	83	25	54 800	120 000	6 500
	KT 758330	141	75	83	30	63 100	144 000	6 500
	KT 758335	164	75	83	35	71 200	168 000	6 500
80	**KT 808822**	110	80	88	22	49 700	108 000	6 000
	KT 808825	123	80	88	25	56 400	127 000	6 000
	KT 808830	149	80	88	30	65 000	153 000	6 000
85	**KT 859112**	44.5	85	91	12	25 200	56 700	6 000
	KT 859325	130	85	93	25	57 800	134 000	6 000
	KT 859330	157	85	93	30	66 600	161 000	6 000
90	**KT 909825**	138	90	98	25	60 400	145 000	5 500
	KT 909830	167	90	98	30	69 600	174 000	5 500
95	**KT 9510330**	175	95	103	30	70 900	182 000	5 500
100	**KT 10010830**	184	100	108	30	72 500	191 000	4 500

Note(1) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

NEEDLE ROLLER CAGES FOR ENGINE CONNECTING RODS

- ●Needle Roller Cages for Big End
- ●Needle Roller Cages for Small End

Structure and Features

IKO Needle Roller Cages for Engine Connecting Rods are bearings for use in engine connecting rods. These bearings have superior performance proven in high performance engines of racing motor cycles, and are widely used in small motor vehicles, motor cycles, outboard marines, snow mobiles, high-speed compressors, etc. and also in general-purpose engines.
Bearings for engine connecting rods are used under extremely severe and complex operating conditions such as heavy shock loads, high speeds, high temperatures and stringent lubrication.
Needle Roller Cages for Engine Connecting Rods are lightweight, and have high load ratings and high rigidity as well as superior wear resistance to withstand these severe conditions.

Types

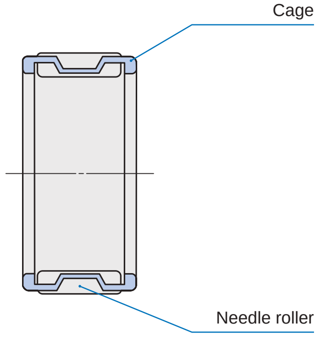
In Needle Roller Cages for Engine Connecting Rods, the types shown in Table 1 are available.

Table 1 Types

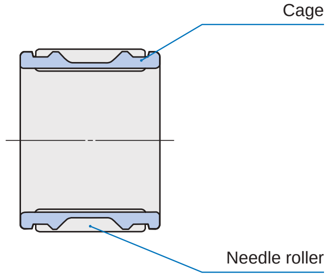
Type	For big end	For small end
Model code	KT···EG	KTV···EG

Structures of Needle Roller Cages for Engine Connecting Rods

KT···EG



KTV···EG



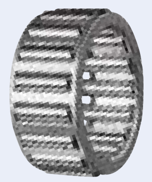
Needle Roller Cages for Big End KT···EG

These roller cages are subjected to acceleration and deceleration during their rotating and epicyclic motion due to crank shaft rotation. To withstand such conditions, they are made of a special alloy and are lightweight with high rigidity.

They are guided on their outer periphery surface with superior lubricating properties.

For the purpose of using them under severe conditions such as high rotational speed and stringent lubrication, bearings plated with non-ferrous metals are also available on request.

High-load capacity and high-rigidity cages to be used for racing motor cycles (See the photo bellow.), split needle cages for solid (one-piece) type crank-shafts and other special specification cages of various types are also available. Please consult IKO when required.



High-load capacity and high-rigidity cage KTZ···EG

Needle Roller Cages for Small End KTV···EG

These roller cages oscillates at high speeds within a limited loading zone under heavy shock loads. Thus, these cages are designed to be lightweight and have high rigidity with a well-balanced structure. In these cages, a number of needle rollers having a small diameter are incorporated to reduce the rolling contact stress in the loading zone.

Needle Roller Cages for Small End are classified into two types, the outer surface guide type and the inner surface guide type. This classification is shown in the table of dimensions.

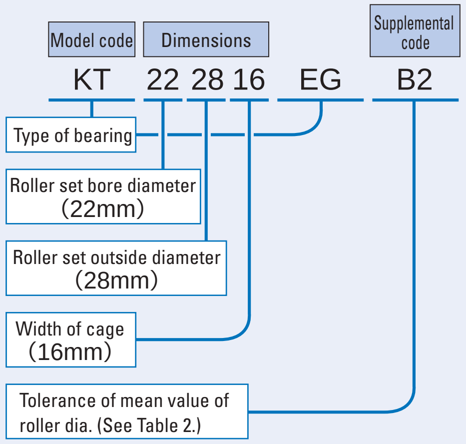
In the outer surface guide type, the cage is guided by the sliding contact between the inner surface of the connecting rod and the outer surface of the cage.

In the inner surface guide type, the cage is guided by the sliding contact between the outer surface of the pin and the inner surface of the cage.

Identification Number

The identification number of Needle Roller Cages for Engine Connecting Rods consists of a model code, dimensions and any supplemental codes as shown below.

Examples of identification number



Accuracy

The diameter tolerances of needle rollers of Needle Roller Cages for Engine Connecting Rods are classified as shown in Table 2. When the classification symbol is not indicated in the identification number, the classification symbol "B2" is applied.

The tolerance of the cage width B_c is −0.2〜−0.4 mm. But cages with marks in the B_c column in the dimension tables are manufactured with the following width tolerances.

● : 0〜−0.2 mm ■ : −0.1〜−0.3 mm

Table 2 Tolerances of needle roller diameter unit: μm

Class	Classification symbol(1)	Tolerance of mean value of roller dia. (2)
Standard	B 2	0〜− 2
	B 4	− 2〜− 4
Semi-standard	B 6	− 4〜− 6
	B 8	− 6〜− 8
	B10	− 8〜−10

Notes(1) The classification symbol is indicated at the end of the identification number.

(2) Tolerances for circularity are based on JIS B 1506 (Rolling bearings - Rollers).

Clearance

Radial internal clearances are selected according to the type of engine and the operating conditions (rotational speed, load, lubricating conditions, etc.). If a bearing is used with an inadequate clearance, bearing troubles such as seizure, early flaking and noise increase may occur, leading to an engine failure. Therefore, it is necessary to select the clearance carefully according to test results and experience.

Recommended radial internal clearances are shown in Table 3. When operating at high speeds, it is recommended to select the upper limit of the clearance.

Fit

To obtain the recommended clearance shown in Table 3, it is general practice to match a connecting rod, crank pin or piston pin and needle roller cage of suitable tolerances for assembly.

Precautions for Use

When designing a connecting rod, crank pin and piston pin, the following precautions should be taken, because the raceways are subjected to loads under extremely severe conditions.

❶ Material

It is recommended to use carburizing steel because the raceways are subjected to fluctuating loads with frequent and heavy shock loads. Generally, chromium molybdenum steel is used. Nickel chromium molybdenum steel is also used.

❷ Hardness

The recommended surface hardness of the raceway is 697〜800HV (60〜64HRC). While the effective hardening depth differs depending on the applications, the general value is 0.6〜1.2 mm.

❸ Surface roughness

To minimize initial wear and to extend life, it is recommended that the surface roughness of the crank pin and piston pin be 0.1 μmR_a or less, and the surface roughness of the connecting rod large end and small end bores be 0.2 μmR_a or less.

❹ Accuracy

Circularity and cylindricity of connecting rod, piston pin and crank pin are as shown in Table 4.

❺ Parallelism and torsional accuracy of connecting rod bores

L±0.02 mm and E±0.02 mm shown in Fig. 1 indicate the parallelism and torsional accuracy between the big end and small end bores of the connecting rod, respectively. The tolerance range is 0.04 mm or less per 100 mm in case of a general-purpose engine and 0.02 mm or less for a high-speed engine such as a racing motorcycle engine. When these accuracy conditions are not satisfied, the axial forces on the needle roller cage and connecting rod will increase, directly leading to a failure such as seizure. Careful consideration is required.

Table 3 Recommended radial internal clearance unit: μm

Shaft dia. mm		Big end	Small end
Over	Incl.		
−	18	$(d_p - 6) \sim d_p$	3〜15
18	30	$(d_p - 8) \sim d_p$	
30	40	$(d_p - 12) \sim d_p$	

Remark d_p is obtained using the following equation for roller pitch circle diameter in millimeters, and changing the unit from millimeters to micrometers.

Roller pitch circle dia. = $\dfrac{F_w + E_w}{2}$

Example KT 222814 EG for big end
Recommended clearance is; 17〜25 μm

Table 4 Accuracy of connecting rod, piston pin and crank pin unit: μm

Range of dia. mm		Crank pin diameter d_1 Piston pin diameter d_2		Big end bore D_1 Small end bore D_2	
Over	Incl.	Circularity MAX.	Cylindricity MAX.	Circularity MAX.	Cylindricity MAX.
−	18	1	2	2	3
18	30	2	3	3	4
30	40	3	4	4	5

Remark Refer to Fig.1 for the dimension symbols.

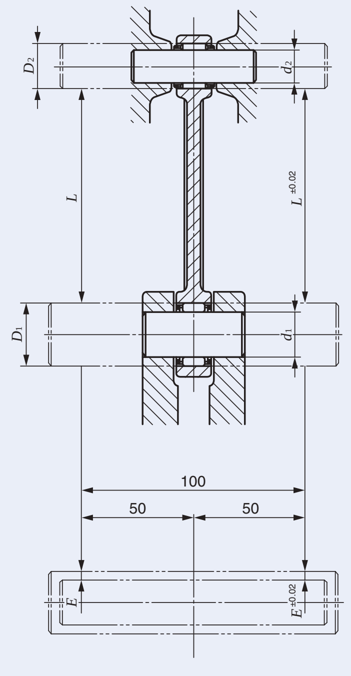
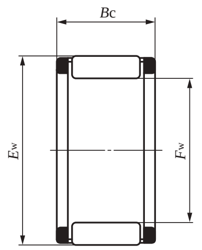


Fig.1

Needle Roller Cages for Big End

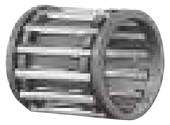


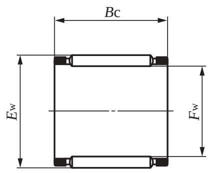
KT ··· EG

Shaft dia. 8 – 32mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	E_w	B_c	Basic dynamic load rating C N	Basic static load rating C_0 N
8	**KT 8128 EG**	2.1	8	12	8	3 280	2 660
10	**KT 101410 EG**	3.2	10	14	10	4 900	4 680
12	**KT 121610 EG**	3.8	12	16	10	5 650	5 890
	KT 121710 EG	5.3	12	17	10	6 670	6 380
14	**KT 14199.7 EG**	5.7	14	19	9.7	6 120	5 880
	KT 141910 EG	5.7	14	19	10	6 640	6 530
15	**KT 15199 EG**	4.2	15	19	9	5 790	6 460
	KT 152010 EG	6.1	15	20	10	7 100	7 260
16	**KT 162211.5 EG**	9.5	16	22	■11.5	9 550	9 660
	KT 162212 EG	9.7	16	22	12	10 500	10 900
18	**KT 182210 EG**	5.7	18	22	10	7 500	9 560
	KT 182411.6 EG	11	18	24	■11.6	10 600	11 500
	KT 182412 EG	11	18	24	12	11 800	13 100
20	**KT 202612 EG**	12	20	26	12	12 400	14 300
	KT 202614 EG	13.8	20	26	14	13 000	15 200
	KT 202814 EG	20	20	28	●14	15 700	16 100
22	**KT 222814 EG**	14.9	22	28	14	13 600	16 600
	KT 222816 EG	17.5	22	28	16	15 700	19 800
	KT 222912 EG	15.2	22	29	12	12 900	14 000
	KT 223215 EG	30	22	32	15	21 300	21 500
23	**KT 232913 EG**	14.9	23	29	13	12 800	15 600
24	**KT 243015 EG**	17.9	24	30	15	14 200	18 000
	KT 243016 EG	18.2	24	30	16	16 300	21 500
	KT 243120 EG	28	24	31	20	20 800	26 400
30	**KT 303818 EG**	35.5	30	38	18	24 900	32 600
32	**KT 324220 EG**	54	32	42	20	31 900	39 400

Needle Roller Cages for Small End





KTV ··· EG

Shaft dia. 9 – 18mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	E_w	B_c	Basic dynamic load rating C N	Basic static load rating C_0 N	Cage guide type
9	**KTV 91211.5 EG**	2.8	9	12	●11.5	3 900	4 070	Outer surface guide
	KTV 91214 EG	3.5	9	12	14	4 440	4 810	Inner surface guide
10	**KTV 101316 EG**	4.5	10	13	16	4 400	4 880	Inner surface guide
	KTV 101410 EG	3.8	10	14	10	4 520	4 220	Inner surface guide
	KTV 101411 EG	4.1	10	14	11	5 060	4 880	Outer surface guide
	KTV 101412.5 EG	4.8	10	14	●12.5	5 590	5 540	Inner surface guide
10.5	**KTV 10.51415 EG**	5.1	10.5	14	15	5 710	6 270	Outer surface guide
12	**KTV 121514.3 EG**	4.3	12	15	●14.3	5 840	7 390	Outer surface guide
	KTV 121613 EG	5.6	12	16	13	7 020	7 800	Outer surface guide
	KTV 121615.5 EG	6.8	12	16	●15.5	7 600	8 600	Outer surface guide
14	**KTV 141812 EG**	6	14	18	12	6 780	7 760	Inner surface guide
	KTV 141816.5 EG	8.2	14	18	16.5	9 180	11 500	Outer surface guide
	KTV 141822 EG	10.8	14	18	●22	9 950	12 600	Inner surface guide
16	**KTV 162019 EG**	10.6	16	20	19	10 800	14 600	Outer surface guide
	KTV 162022 EG	12.7	16	20	22	11 400	15 700	Inner surface guide
18	**KTV 182223.5 EG**	14.9	18	22	■23.5	13 000	19 300	Inner surface guide
	KTV 182321 EG	16.4	18	23	21	14 400	18 900	Inner surface guide

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

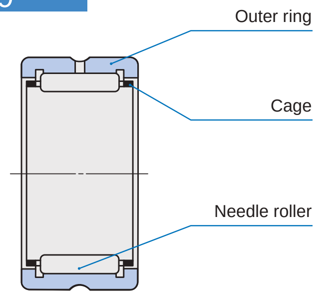
- ●Machined Type Caged Needle Roller Bearings
- ●Machined Type Guide Needle Roller Bearings

Structure and Features

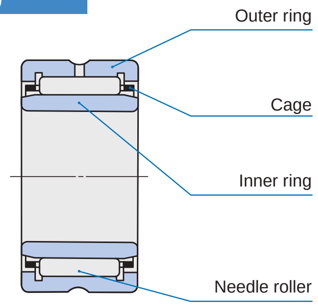
IKO Machined Type Needle Roller Bearings are bearings with a low sectional height and large load ratings. The outer ring has high rigidity and can easily be used even for light alloy housings. These bearings are available in metric series and inch series, both of which have the caged type and the full complement type. It is therefore possible to select a suitable bearing for use under various conditions such as heavy loads and high-speed or low-speed rotations. In addition, there are bearings with and without an inner ring. As the type without inner ring uses a shaft as the raceway surface, a compact design is possible.

Structures of Machined Type Needle Roller Bearings

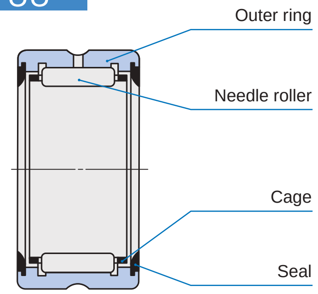
RNA49



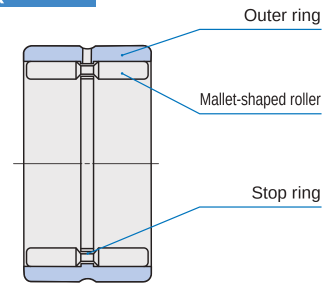
NA49



RNA49···UU



GTR



D
NA
TAFI
TRI
BRI

Types

Machined Type Needle Roller Bearings are available in various types shown in Table 1.

Table 1.1 Type of bearing (Standard type)

Series \ Type		Caged Needle Roller Bearings		Guide Needle Roller Bearings	
		Without inner ring	With inner ring	Without inner ring	With inner ring
Metric series	Dimension series 49	RNA 49	NA 49	GTR	GTRI
	Dimension series 69	RNA 69	NA 69		
	Dimension series 48	RNA 48	NA 48		
	For heavy duty	TR	TRI		
	For light duty	TAF	TAFI		
Inch series		BR	BRI	—	—

Table 1.2 Type of bearing (With seal)

Series \ Type			Caged Needle Roller Bearings		Guide Needle Roller Bearings	
			Without inner ring	With inner ring	Without inner ring	With inner ring
Metric series	Dimension series 49	Two side seals	RNA 49···UU	NA 49···UU	—	—
		One side seal	RNA 49···U	NA 49···U		
	Dimension series 69	Two side seals	RNA 69···UU	NA 69···UU		
		One side seal	RNA 69···U	NA 69···U		
Inch series		Two side seals	BR ···UU	BRI ···UU	—	—
		One side seal	—	—	—	—

Caged Needle Roller Bearings

This type of bearing combines a collared outer ring with the IKO's unique lightweight rigid cage and needle rollers. During operation, needle rollers are guided precisely by the cage, and an ideal load distribution is obtained.

The metric series consists of the NA48 and NA49 series of ISO Standard, NA69 and TAFI series which are based on the international dimension series, and the heavy duty TRI series which is widely used in Japan. The TAFI series has a sectional height as low as that of the shell type and is used for light loads.

The inch series or BRI series is based on the specifications of ANSI Standard of USA.

Caged Needle Roller Bearings without Inner Ring

As shown in the section "Design of shaft and housing" on page A44, any desired radial clearance can be selected by assembling this type of bearing with a shaft which is heat-treated and finished by grinding.

These bearings are free from the effects on dimensional accuracy caused by assembling an inner ring, so that the rotational accuracy is improved. Also, the shaft rigidity can be improved as the shaft diameter can be increased by an amount corresponding to the inner ring thickness.

Caged Needle Roller Bearings with Inner Ring

This type of bearing is used when the shaft cannot be heat-treated and finished by grinding. The outer and inner rings are separable and a small relief clearance is provided on both sides of the inner ring raceway to facilitate bearing mounting. In the TRI and BRI series, the width of the inner ring is larger than that of the outer ring.

Due to heat expansion during operation or mounting errors, the inner or outer ring may be shifted axially and the whole length of the rollers may not be in contact with the raceway. Therefore, attention should be paid to the allowable axial shift *S* as shown in the table of dimensions.

Needle Roller Bearings with Seal

These bearings are sealed types of the NA49, NA69 and BRI series bearings, in which a seal is installed on one side (type with one seal) or both sides (type with two seals) of the bearing. The seal is made of special synthetic rubber and effectively prevents dust penetration and grease leakage.

Guide Needle Roller Bearings

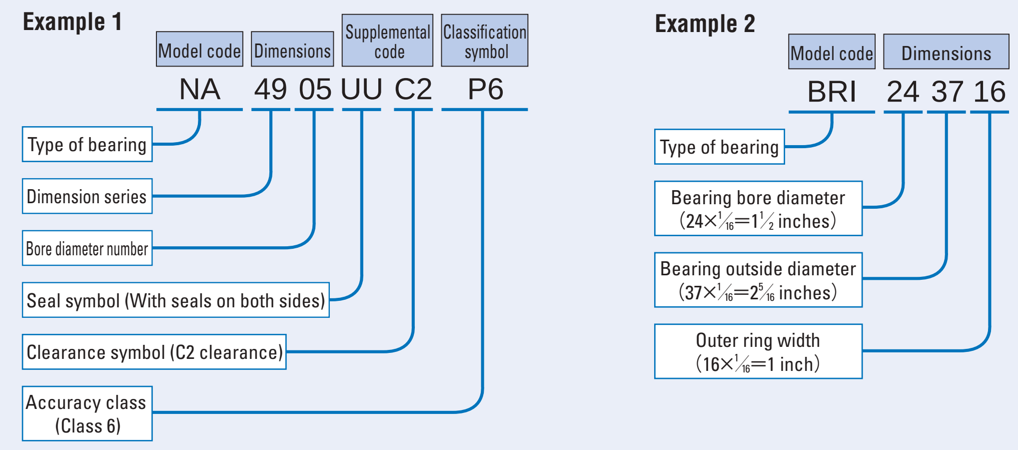
These bearings are full complement type bearings and use mallet-shaped rollers which are guided accurately by the guide rail located at the center of the outer ring raceway and the guide groove of the mallet-shaped roller. This minimizes skewing (tilting of the roller from its rotating axis), which is normally a weak point of full complement bearings, and improves the rotational accuracy. This type of bearing is especially suitable for heavy loads, shock loads and oscillating motions.

Bearings with and without inner rings are available. In bearings with an inner ring, the width of the inner ring is larger than that of the outer ring.

Identification Number

The identification number of Machined Type Needle Roller Bearings consists of a model code, dimensions, any supplemental codes and a classification symbol. Examples are shown below.

Examples of identification number



Accuracy

Machined Type Needle Roller Bearings are manufactured based on JIS (See page A31.). The tolerances for the smallest single roller set bore diameter of bearings without inner ring are based on Table 14 on page A33. For BR and BRI series, the accuracy is based on Table 2 and the tolerances for the smallest single roller set bore diameter are based on Table 3.

Table 2 Accuracy of inner and outer rings of inch series BR and BRII

unit: μ m

d or D Nominal bearing bore dia. or outside dia. mm		Δ_{dmp} Single plane mean bore diameter deviation		Δ_{Dmp} Single plane mean outside diameter deviation		Δ_{Bs} (Δ_{Cs}) Deviation of a single inner (or outer) ring width		K_{ia} Radial runout of assembled bearing inner ring	K_{ea} Radial runout of assembled bearing outer ring
Over	Incl.	High	Low	High	Low	High	Low	Max.	Max.
—	19.050	0	− 10	—	—	0	− 130	10	—
19.050	30.162	0	− 13	0	− 13	0	− 130	13	15
30.162	50.800	0	− 13	0	− 13	0	− 130	15	20
50.800	82.550	0	− 15	0	− 15	0	− 130	20	25
82.550	120.650	0	− 20	0	− 20	0	− 130	25	35
120.650	184.150	—	—	0	− 25	0	− 130	30	45

Remark d for Δ_{dmp}, Δ_{Bs}, Δ_{Cs} and K_{ia}, and D for Δ_{Dmp} and K_{ea}

Table 3 Tolerances for smallest single roller set bore diameter $F_{ws\,min}$ of inch series BR unit: μm

F_w Nominal roller set bore diameter mm		$\Delta_{F_{ws\,min}}$ Deviation of smallest single roller set bore diameter	
Over	Incl.	High	Low
–	18.034	+ 43	+ 20
18.034	30.226	+ 46	+ 23
30.226	41.910	+ 48	+ 25
41.910	50.038	+ 51	+ 25
50.038	70.104	+ 53	+ 28
70.104	80.010	+ 58	+ 28
80.010	102.108	+ 61	+ 31

Clearance

Radial internal clearances of Machined Type Needle Roller Bearings are made to the CN clearance shown in Table 18 on page A37. Radial internal clearances of BRI series are based on Table 4.

Table 4 Radial internal clearance of inch series BRI unit: μm

F_w Nominal roller set bore diameter mm		Radial internal clearance	
Over	Incl.	Min.	Max.
–	18.034	33	66
18.034	25.908	41	76
25.908	30.226	46	82
30.226	35.052	48	86
35.052	41.910	50	89
41.910	50.038	50	92
50.038	70.104	56	99
70.104	80.010	56	104
80.010	100.076	63	117
100.076	102.108	68	127

Fit

The recommended fits for Machined Type Needle Roller Bearings are shown in Tables 22 to 24 on pages A41 and A42.

Lubrication

Bearings with prepacked grease are shown in Table 5. ALVANIA GREASE S2 (Shell Lubricants Japan K.K.) is prepacked as the lubricating grease.

In the case of bearings without prepacked grease, perform proper lubrication. Operating them without lubrication will increase the wear of the rolling contact surfaces and shorten their lives.

Table 5 Bearings with prepacked grease ○ : With prepacked grease × : Without prepacked grease

Bearing type			Standard type	With seals on both sides	With a seal on one side
Caged Needle Roller Bearings	Metric series	RNA, NA	×	○	×
		TR, TRI	×	–	–
		TAF, TAFI, TAF/SG	×	–	–
	Inch series	BR, BRI	×	○	–
Guide Needle Roller Bearings	Metric series	GTR, GTRI	×	–	–

Oil Hole

Table 6.1 shows the number of oil holes of the outer ring and Table 6.2 shows the number of oil holes of the inner ring.

When an outer ring with an oil hole is especially required for the type without an oil hole, add "－OH" before the clearance symbol in the identification number. When an outer ring with an oil hole and an oil groove is required for the type without an oil hole, attach "－OG" before the clearance symbol.

Example: TAFI 203216 － OH C2 P6

When an outer ring with multiple oil holes or an inner ring with an oil hole(s) is required, please consult IKO.

Table 6.1 Number of oil holes of the outer ring

Bearing type			Nominal roller set bore diameter F_w mm	Number of oil holes of the outer ring: Standard type	With seals on both sides	With a seal on one side
Caged Needle Roller Bearings	Metric series	RNA, NA		1	1	1
		TR, TRI		1	–	–
		TAF, TAFI	$F_w \leqq 26$	0	–	–
			$26 < F_w$	1	–	–
	Inch series	BR, BRI	$F_w \leqq 69.850$	1	1	–
			$69.850 < F_w$	2	1	–
Guide Needle Roller Bearings	Metric series	GTR, GTRI		1	–	–

Remark The type with an oil hole(s) is provided with an oil groove.

Table 6.2 Number of oil holes of the inner ring

Bearing type			Nominal bearing bore diameter d mm	Number of oil holes of the inner ring: Standard type	With seals on both sides	With a seal on one side
Caged Needle Roller Bearings	Metric series	NA		0	0	0
		TRI		0	0	0
		TAFI		0	–	–
	Inch series	BRI	$d \leqq 76.200$	1	1	–
			$76.200 < d$	2	1	–
Guide Needle Roller Bearings	Metric series	GTRI		0	–	–

Remark The type with an oil hole(s) is provided with an oil groove.

Matched Set Bearings

When using two or more Machined Type Needle Roller Bearings adjacent to each other on the same shaft, it is necessary to obtain an even load distribution. On request, a set of bearings is available, in which bearings are matched to obtain an even load distribution.

Mounting

Mounting dimensions for Machined Type Needle Roller Bearings are shown in the table of dimensions.

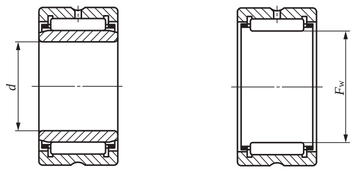
Extended Life Specification Machined Type Needle Roller Bearings

Extended Life Specification Machined Type Needle Roller Bearings are treated with a newly developed special heat treatment that enhances the bearing's surface hardness and toughness, and suppresses the generation and growth of damage on the surface. Significant life extension can be achieved under high load or under the condition of lubrication contaminated with foreign substances.

In a life comparison test, as shown in Figure 1, IKO's special heat treated Extended Life Specification products lasted 5 times longer than standard heat-treated products.

Extended Life Specification Machined Type Needle Roller Bearings, available according to the "Applicable Production Size" shown in Table 7, are made to order upon request.

Table 7 Applicable Production Size



With inner ring	Without inner ring
d=10 ～ 75mm	Fw=14 ～ 85mm
NA 4900 ～ 4915	RNA 4900 ～ 4915
NA 6901 ～ 6915	RNA 6901 ～ 6915
TAFI 102216 ～ 7510535	TAF 142216 ～ 8510535
TRI 153320 ～ 7510845	TR 203320 ～ 8310845

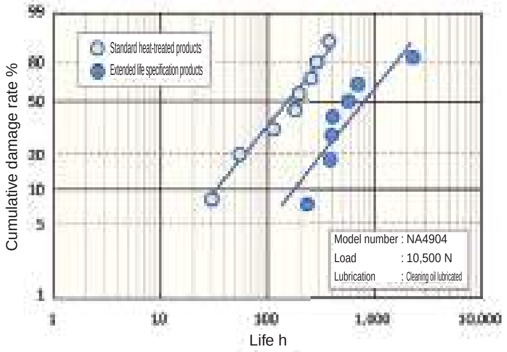
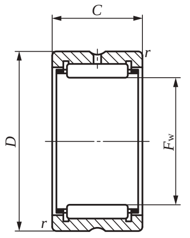


Fig. 1 Life Test Result

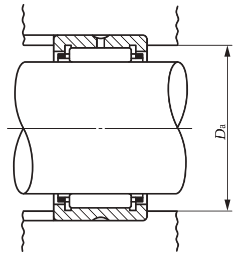
Remark This table shows the result of life testing under load conditions at 50% of the basic dynamic rating. The Extended Life Specification with special heat treatment lasted 5 times longer or more in L10 life compared to the standard heat-treated products.

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring



RNA49 TAF
RNA69（F_w ≦ 35）



Shaft dia. 5 ─ 15mm

Shaft dia. mm	Identification number						Mass (Ref.) g	Boundary dimensions mm				Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min^{-1}
	RNA 49	RNA 69	RNA 48	TAF	TR	GTR		F_w	D	C	$r_{s\,min}$(1)				
5	—	—	—	TAF 51010	—	—	3.4	5	10	10	0.2	8.4	2 420	1 950	80 000
	—	—	—	TAF 51012	—	—	4.2	5	10	12	0.2	8.4	3 080	2 660	80 000
	RNA 493	—	—	—	—	—	4.6	5	11	10	0.15	9.8	2 420	1 950	80 000
6	RNA 494	—	—	—	—	—	5.3	6	12	10	0.15	10.8	2 700	2 320	70 000
	—	—	—	TAF 61212	—	—	6.4	6	12	12	0.2	10.4	3 440	3 170	70 000
7	RNA 495	—	—	—	—	—	5.9	7	13	10	0.15	11.8	2 960	2 690	60 000
	—	—	—	TAF 71410	—	—	6.9	7	14	10	0.2	12.4	3 600	2 960	60 000
	—	—	—	TAF 71412	—	—	8.3	7	14	12	0.2	12.4	4 610	4 050	60 000
8	RNA 496	—	—	—	—	—	7.4	8	15	10	0.15	13.8	3 960	3 420	50 000
	—	—	—	TAF 81512	—	—	9.1	8	15	12	0.2	13.4	5 060	4 690	50 000
	—	—	—	TAF 81516	—	—	12.9	8	15	16	0.2	13.4	7 080	7 220	50 000
9	—	—	—	TAF 91612	—	—	9.8	9	16	12	0.2	14.4	5 490	5 330	45 000
	—	—	—	TAF 91616	—	—	13.2	9	16	16	0.2	14.4	7 680	8 210	45 000
	RNA 497	—	—	—	—	—	9.3	9	17	10	0.15	15.8	4 530	3 650	45 000
10	—	—	—	TAF 101712	—	—	10.7	10	17	12	0.2	15.4	5 880	5 970	40 000
	—	—	—	TAF 101716	—	—	14.3	10	17	16	0.2	15.4	8 230	9 190	40 000
	RNA 498	—	—	—	—	—	12.6	10	19	11	0.2	17.4	6 180	5 030	40 000
12	—	—	—	TAF 121912	—	—	12.2	12	19	12	0.3	17	6 610	7 260	35 000
	—	—	—	TAF 121916	—	—	16.3	12	19	16	0.3	17	9 250	11 200	35 000
	RNA 499	—	—	—	—	—	13.6	12	20	11	0.3	18	6 600	6 310	35 000
14	RNA 4900	—	—	—	—	—	16.5	14	22	13	0.3	20	9 230	10 100	30 000
	—	—	—	TAF 142216	—	—	21	14	22	16	0.3	20	11 700	13 700	30 000
	—	—	—	TAF 142220	—	—	26.5	14	22	20	0.3	20	14 800	18 600	30 000
15	—	—	—	TAF 152316	—	—	22.5	15	23	16	0.3	21	12 300	14 900	30 000
	—	—	—	TAF 152320	—	—	28	15	23	20	0.3	21	15 600	20 200	30 000

Notes(1) Minimum allowable value of chamfer dimension r

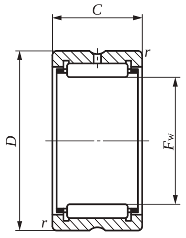
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remarks1. TAF series with a roller set bore diameter F_w of 26 mm or less have no oil hole. In others, the outer ring has an oil groove and an oil hole.

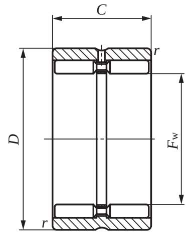
2. No grease is prepacked. Perform proper lubrication.

MACHINED TYPE NEEDLE ROLLER BEARINGS

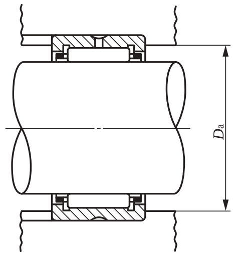
Without Inner Ring



RNA49 TAF TR
RNA69 (F_w ≦ 35)



GTR



Shaft dia. 16 ー 22mm

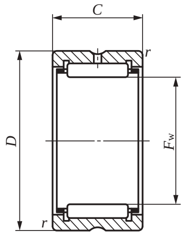
Shaft dia. mm	Identification number						Mass (Ref.) g	Boundary dimensions mm				Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min^{-1}
	RNA 49	RNA 69	RNA 48	TAF	TR	GTR		F_w	D	C	$r_{s\,min}$(1)				
16	**RNA 4901**	—	—	—	—	—	18.1	16	24	13	0.3	22	9 660	11 100	25 000
	—	—	—	**TAF 162416**	—	—	23	16	24	16	0.3	22	12 300	15 100	25 000
	—	—	—	**TAF 162420**	—	—	29	16	24	20	0.3	22	15 500	20 400	25 000
	—	**RNA 6901**	—	—	—	—	30	16	24	22	0.3	22	17 100	23 000	25 000
17	—	—	—	**TAF 172516**	—	—	24.5	17	25	16	0.3	23	12 900	16 300	25 000
	—	—	—	**TAF 172520**	—	—	30.5	17	25	20	0.3	23	16 300	22 000	25 000
18	**RNA 49/14**	—	—	—	—	—	19.9	18	26	13	0.3	24	10 600	12 800	20 000
	—	—	—	**TAF 182616**	—	—	25.5	18	26	16	0.3	24	13 400	17 500	20 000
	—	—	—	**TAF 182620**	—	—	32	18	26	20	0.3	24	17 000	23 600	20 000
19	—	—	—	**TAF 192716**	—	—	27	19	27	16	0.3	25	14 000	18 700	20 000
	—	—	—	**TAF 192720**	—	—	34	19	27	20	0.3	25	17 700	25 300	20 000
20	**RNA 4902**	—	—	—	—	—	21.5	20	28	13	0.3	26	10 900	13 800	20 000
	—	—	—	**TAF 202816**	—	—	27.5	20	28	16	0.3	26	13 900	18 800	20 000
	—	—	—	**TAF 202820**	—	—	35.5	20	28	20	0.3	26	17 600	25 400	20 000
	—	**RNA 6902**	—	—	—	—	37	20	28	23	0.3	26	19 300	28 800	20 000
	—	—	—	—	**TR 203320**	—	59.5	20	33	20	0.3	31	24 300	26 500	20 000
	—	—	—	—	—	**GTR 203320**	69	20	33	20	0.3	31	29 200	37 200	7 500
21	—	—	—	**TAF 212916**	—	—	29	21	29	16	0.3	27	14 400	20 000	19 000
	—	—	—	**TAF 212920**	—	—	36	21	29	20	0.3	27	18 200	27 100	19 000
22	**RNA 4903**	—	—	—	—	—	23.5	22	30	13	0.3	28	11 700	15 600	18 000
	—	—	—	**TAF 223016**	—	—	30	22	30	16	0.3	28	14 900	21 200	18 000
	—	—	—	**TAF 223020**	—	—	37.5	22	30	20	0.3	28	18 900	28 700	18 000
	—	**RNA 6903**	—	—	—	—	40.5	22	30	23	0.3	28	20 800	32 500	18 000
	—	—	—	—	**TR 223425**	—	73.5	22	34	25	0.3	32	29 100	36 800	18 000
	—	—	—	—	—	**GTR 223425**	87	22	34	25	0.3	32	37 900	57 800	7 000

Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

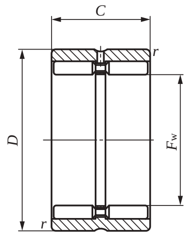
Remarks1. TAF series with a roller set bore diameter F_w of 26 mm or less have no oil hole. In others, the outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

MACHINED TYPE NEEDLE ROLLER BEARINGS

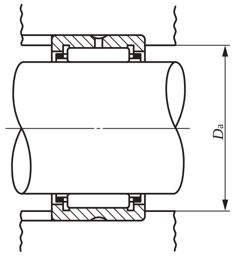
Without Inner Ring



RNA49 TAF TR
RNA69 ($F_w \leq 35$)



GTR



D
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Shaft dia. 24 — 30mm

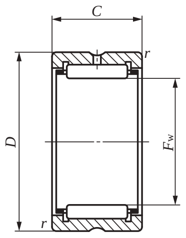
Shaft dia. mm	Identification number						Mass (Ref.) g	Boundary dimensions mm				Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min-1
	RNA 49	RNA 69	RNA 48	TAF	TR	GTR		F_w	D	C	$r_{s\,min}$ (1)				
24	—	—	—	**TAF 243216**	—	—	32	24	32	16	0.3	30	15 300	22 500	17 000
	—	—	—	**TAF 243220**	—	—	40.5	24	32	20	0.3	30	19 400	30 500	17 000
25	—	—	—	**TAF 253316**	—	—	33.5	25	33	16	0.3	31	15 800	23 700	16 000
	—	—	—	**TAF 253320**	—	—	42	25	33	20	0.3	31	20 000	32 100	16 000
	RNA 4904	—	—	—	—	—	55.5	25	37	17	0.3	35	21 000	25 000	16 000
	—	**RNA 6904**	—	—	—	—	95.5	25	37	30	0.3	35	35 400	48 900	16 000
	—	—	—	—	**TR 253820**	—	71	25	38	20	0.3	36	28 900	35 000	16 000
	—	—	—	—	**TR 253825**	—	89	25	38	25	0.3	36	34 800	44 400	16 000
	—	—	—	—	—	**GTR 253820**	81.5	25	38	20	0.3	36	33 300	46 500	6 000
	—	—	—	—	—	**GTR 253825**	104	25	38	25	0.3	36	42 400	63 700	6 000
26	—	—	—	**TAF 263416**	—	—	34.5	26	34	16	0.3	32	16 300	24 900	15 000
	—	—	—	**TAF 263420**	—	—	43.5	26	34	20	0.3	32	20 600	33 800	15 000
28	—	—	—	**TAF 283720**	—	—	51.5	28	37	20	0.3	35	21 700	37 100	14 000
	—	—	—	**TAF 283730**	—	—	83.5	28	37	30	0.3	35	31 100	58 900	14 000
	RNA 49/22	—	—	—	—	—	56.5	28	39	17	0.3	37	21 400	28 900	14 000
	—	**RNA 69/22**	—	—	—	—	97.5	28	39	30	0.3	37	36 300	56 900	14 000
29	—	—	—	**TAF 293820**	—	—	57	29	38	20	0.3	36	21 600	37 200	14 000
	—	—	—	**TAF 293830**	—	—	85	29	38	30	0.3	36	30 900	59 100	14 000
30	—	—	—	**TAF 304020**	—	—	64.5	30	40	20	0.3	38	25 100	40 100	13 000
	—	—	—	**TAF 304030**	—	—	97.5	30	40	30	0.3	38	36 000	63 900	13 000
	RNA 4905	—	—	—	—	—	64	30	42	17	0.3	40	23 700	30 700	13 000
	—	**RNA 6905**	—	—	—	—	111	30	42	30	0.3	40	42 100	64 300	13 000
	—	—	—	—	**TR 304425**	—	115	30	44	25	0.3	42	37 900	52 100	13 000
	—	—	—	—	—	**GTR 304425**	133	30	44	25	0.3	42	47 000	76 500	5 000

Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

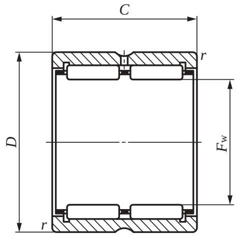
Remarks1. TAF series with a roller set bore diameter F_w of 26 mm or less have no oil hole. In others, the outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring



RNA49 TAF TR
RNA69 $(F_w \leqq 35)$



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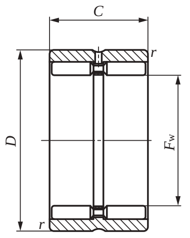
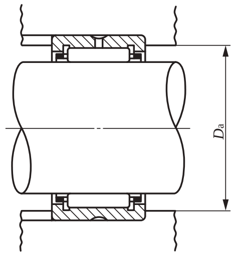


GTR



Shaft dia. 32 ─ 40mm

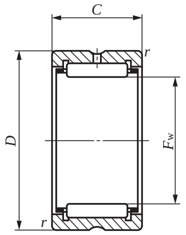
Shaft dia. mm	Identification number RNA 49	RNA 69	RNA 48	TAF	TR	GTR	Mass (Ref.) g	Boundary dimensions mm F_w	D	C	$r_{s\,min}$ (1)	Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min⁻¹
32	—	—	—	TAF 324220	—	—	68	32	42	20	0.3	40	25 700	42 200	12 000
	—	—	—	TAF 324230	—	—	102	32	42	30	0.3	40	36 800	67 200	12 000
	RNA 49/28	—	—	—	—	—	76.5	32	45	17	0.3	43	24 500	32 700	12 000
	—	RNA 69/28	—	—	—	—	133	32	45	30	0.3	43	41 800	64 800	12 000
	—	—	—	—	—	GTR 324530	152	32	45	30	0.3	43	58 000	101 000	4 500
35	—	—	—	TAF 354520	—	—	73.5	35	45	20	0.3	43	26 900	46 200	11 000
	—	—	—	TAF 354530	—	—	112	35	45	30	0.3	43	38 600	73 600	11 000
	RNA 4906	—	—	—	—	—	72.5	35	47	17	0.3	45	25 200	34 700	11 000
	—	RNA 6906	—	—	—	—	125	35	47	30	0.3	45	43 000	69 000	11 000
	—	—	—	—	TR 354830	—	139	35	48	30	0.3	46	47 400	72 300	11 000
	—	—	—	—	—	GTR 354830	163	35	48	30	0.3	46	61 100	110 000	4 500
37	—	—	—	TAF 374720	—	—	77.5	37	47	20	0.3	45	28 200	50 100	11 000
	—	—	—	TAF 374730	—	—	117	37	47	30	0.3	45	40 500	79 800	11 000
38	—	—	—	TAF 384820	—	—	79	38	48	20	0.3	46	28 100	50 200	11 000
	—	—	—	TAF 384830	—	—	119	38	48	30	0.3	46	40 300	80 000	11 000
	—	—	—	—	TR 385230	—	168	38	52	30	0.6	48	50 800	81 100	11 000
	—	—	—	—	—	GTR 385230	195	38	52	30	0.6	48	64 200	121 000	4 000
40	—	—	—	TAF 405020	—	—	83	40	50	20	0.3	48	29 400	54 100	10 000
	—	—	—	TAF 405030	—	—	125	40	50	30	0.3	48	42 300	86 200	10 000
	RNA 49/32	—	—	—	—	—	96	40	52	20	0.6	48	31 200	47 800	10 000
	—	RNA 69/32	—	—	—	—	172	40	52	36	0.6	48	53 500	95 700	10 000
	—	—	—	—	TR 405520	—	129	40	55	20	0.6	51	37 400	55 700	10 000
	—	—	—	—	—	GTR 405520	144	40	55	20	0.6	51	44 300	73 600	3 500

Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

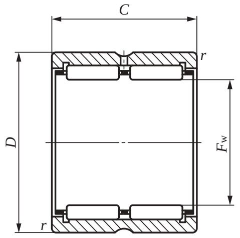
Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

MACHINED TYPE NEEDLE ROLLER BEARINGS

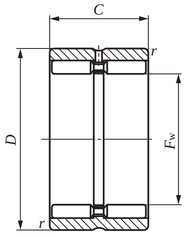
Without Inner Ring



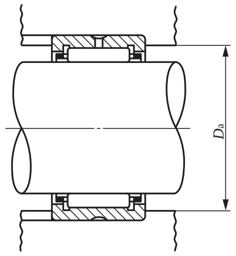
RNA49 TAF TR



RNA69



GTR



Shaft dia. 42 ー 50mm

Shaft dia. mm	Identification number RNA 49	RNA 69	RNA 48	TAF	TR	GTR	Mass (Ref.) g
42	—	—	—	TAF 425220	—	—	86.5
	—	—	—	TAF 425230	—	—	130
	RNA 4907	—	—	—	—	—	113
	—	RNA 6907	—	—	—	—	200
	—	—	—	—	TR 425630	—	183
	—	—	—	—	—	GTR 425630	210
43	—	—	—	TAF 435320	—	—	88.5
	—	—	—	TAF 435330	—	—	133
45	—	—	—	TAF 455520	—	—	92
	—	—	—	TAF 455530	—	—	138
	RNA 49/38	—	—	—	—	—	120
	—	—	—	—	TR 455930	—	193
	—	—	—	—	—	GTR 455930	225
47	—	—	—	TAF 475720	—	—	95
	—	—	—	TAF 475730	—	—	144
48	RNA 4908	—	—	—	—	—	152
	—	—	—	—	TR 486230	—	205
	—	RNA 6908	—	—	—	—	275
	—	—	—	—	—	GTR 486230	240
50	—	—	—	TAF 506225	—	—	159
	—	—	—	TAF 506235	—	—	225
	—	—	—	—	TR 506430	—	210
	RNA 49/42	—	—	—	—	—	174
	—	—	—	—	—	GTR 506430	245

Boundary dimensions mm F_w	D	C	$r_{s\ min}$ (1)	Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min⁻¹
42	52	20	0.3	50	29 900	56 200	9 500
42	52	30	0.3	50	43 000	89 400	9 500
42	55	20	0.6	51	32 000	50 100	9 500
42	55	36	0.6	51	54 900	100 000	9 500
42	56	30	0.6	52	53 800	90 100	9 500
42	56	30	0.6	52	67 500	133 000	3 500
43	53	20	0.3	51	30 500	58 200	9 500
43	53	30	0.3	51	43 800	92 600	9 500
45	55	20	0.3	53	31 000	60 200	9 000
45	55	30	0.3	53	44 600	95 800	9 000
45	58	20	0.6	54	33 600	54 600	9 000
45	59	30	0.6	55	55 100	94 800	9 000
45	59	30	0.6	55	70 300	142 000	3 500
47	57	20	0.3	55	31 500	62 200	8 500
47	57	30	0.3	55	45 200	99 100	8 500
48	62	22	0.6	58	41 600	67 400	8 500
48	62	30	0.6	58	56 300	99 500	8 500
48	62	40	0.6	58	71 300	135 000	8 500
48	62	30	0.6	58	72 700	154 000	3 000
50	62	25	0.3	60	43 000	85 300	8 000
50	62	35	0.3	60	58 000	125 000	8 000
50	64	30	0.6	60	57 700	104 000	8 000
50	65	22	0.6	61	42 500	70 300	8 000
50	64	30	0.6	60	74 600	158 000	3 000

Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring

Shaft dia. 52 – 68mm

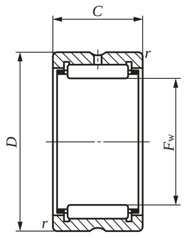
Shaft dia. mm	Identification number RNA 49	RNA 69	RNA 48	TAF	TR	GTR	Mass (Ref.) g
52	**RNA 4909**	—	—	—	—	—	197
	—	**RNA 6909**	—	—	—	—	355
55	—	—	—	**TAF 556825**	—	—	193
	—	—	—	**TAF 556835**	—	—	255
	RNA 49/48	—	—	—	—	—	188
58	**RNA 4910**	—	—	—	—	—	179
	—	**RNA 6910**	—	—	—	—	320
	—	—	—	—	**TR 587745**	—	515
	—	—	—	—	—	**GTR 587745**	590
60	—	—	—	**TAF 607225**	—	—	187
	—	—	—	**TAF 607235**	—	—	260
	RNA 49/52	—	—	—	—	—	205
62	—	—	—	—	**TR 628138**	—	460
	—	—	—	—	—	**GTR 628138**	520
63	**RNA 4911**	—	—	—	—	—	265
	—	**RNA 6911**	—	—	—	—	475
65	—	—	—	**TAF 657825**	—	—	225
	—	—	—	**TAF 657835**	—	—	315
	RNA 49/58	—	—	—	—	—	275
68	—	—	—	**TAF 688225**	—	—	250
	—	—	—	**TAF 688235**	—	—	350
	RNA 4912	—	—	—	—	—	285
	—	**RNA 6912**	—	—	—	—	510

Notes(1) Minimum allowable value of chamfer dimension *r*

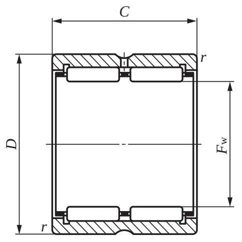
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remarks1. The outer ring has an oil groove and an oil hole.

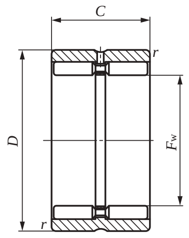
2. No grease is prepacked. Perform proper lubrication.



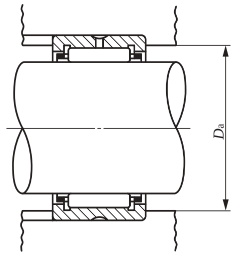
RNA49 TAF TR



RNA69



GTR

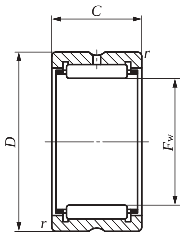


Boundary dimensions mm F_w	D	C	$r_{s\,min}$(1)	Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min^{-1}
52	68	22	0.6	64	43 500	73 300	7 500
52	68	40	0.6	64	74 600	147 000	7 500
55	68	25	0.3	66	45 400	94 000	7 500
55	68	35	0.3	66	61 200	138 000	7 500
55	70	22	0.6	66	44 300	76 300	7 500
58	72	22	0.6	68	46 200	82 100	7 000
58	72	40	0.6	68	79 200	164 000	7 000
58	77	45	1	72	104 000	191 000	7 000
58	77	45	1	72	135 000	280 000	2 500
60	72	25	0.3	70	47 500	103 000	6 500
60	72	35	0.3	70	64 100	151 000	6 500
60	75	22	0.6	71	47 100	85 100	6 500
62	81	38	1	76	92 000	166 000	6 500
62	81	38	1	76	118 000	241 000	2 500
63	80	25	1	75	57 600	97 200	6 500
63	80	45	1	75	98 700	194 000	6 500
65	78	25	0.6	74	49 600	112 000	6 000
65	78	35	0.6	74	67 000	164 000	6 000
65	82	25	1	77	58 900	101 000	6 000
68	82	25	0.6	78	54 800	117 000	6 000
68	82	35	0.6	78	72 000	166 000	6 000
68	85	25	1	80	60 200	105 000	6 000
68	85	45	1	80	103 000	211 000	6 000

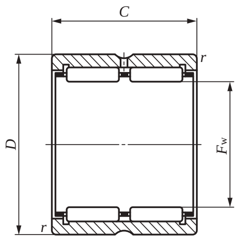
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring



RNA49 TAF TR



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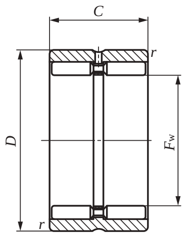
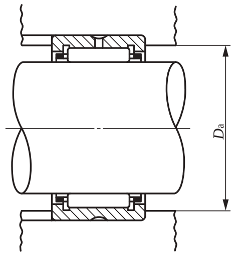


GTR



Shaft dia. 70 ─ 85mm

Shaft dia. mm	Identification number						Mass (Ref.)	Boundary dimensions mm				Standard mounting dimension	Basic dynamic load rating	Basic static load rating	Allowable rotational speed(2)
	RNA 49	RNA 69	RNA 48	TAF	TR	GTR	g	F_w	D	C	(1) $r_{s\,min}$	D_a Max. mm	C N	C_0 N	min^{-1}
70	—	—	—	**TAF 708525**	—	—	280	70	85	25	0.6	81	55 500	120 000	5 500
	—	—	—	**TAF 708535**	—	—	395	70	85	35	0.6	81	73 000	171 000	5 500
	RNA 49/62	—	—	—	—	—	320	70	88	25	1	83	61 500	109 000	5 500
	—	—	—	—	**TR 708945**	—	605	70	89	45	1	84	114 000	228 000	5 500
	—	—	—	—	—	**GTR 708945**	690	70	89	45	1	84	147 000	336 000	2 000
72	**RNA 4913**	—	—	—	—	—	325	72	90	25	1	85	62 700	113 000	5 500
	—	**RNA 6913**	—	—	—	—	585	72	90	45	1	85	108 000	227 000	5 500
73	—	—	—	**TAF 739025**	—	—	335	73	90	25	1	85	61 100	127 000	5 500
	—	—	—	**TAF 739035**	—	—	475	73	90	35	1	85	80 400	181 000	5 500
75	—	—	—	**TAF 759225**	—	—	345	75	92	25	1	87	62 100	131 000	5 500
	—	—	—	**TAF 759235**	—	—	485	75	92	35	1	87	81 700	186 000	5 500
	RNA 49/68	—	—	—	—	—	470	75	95	30	1	90	79 900	147 000	5 500
80	—	—	—	**TAF 809525**	—	—	315	80	95	25	1	90	59 400	137 000	5 000
	—	—	—	**TAF 809535**	—	—	445	80	95	35	1	90	78 100	195 000	5 000
	RNA 4914	—	—	—	—	—	495	80	100	30	1	95	83 200	158 000	5 000
	—	**RNA 6914**	—	—	—	—	910	80	100	54	1	95	134 000	311 000	5 000
83	—	—	—	—	**TR 8310845**	—	995	83	108	45	1	103	146 000	270 000	5 000
	—	—	—	—	—	**GTR 8310845**	1 090	83	108	45	1	103	190 000	396 000	1 800
85	—	—	—	**TAF 8510525**	—	—	435	85	105	25	1	100	76 300	145 000	4 500
	RNA 4915	—	—	—	—	—	525	85	105	30	1	100	86 200	169 000	4 500
	—	—	—	**TAF 8510535**	—	—	610	85	105	35	1	100	102 000	210 000	4 500
	—	**RNA 6915**	—	—	—	—	960	85	105	54	1	100	138 000	331 000	4 500

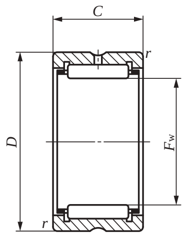
Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

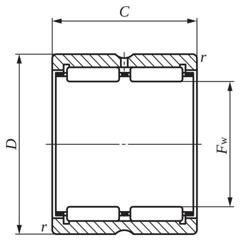
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

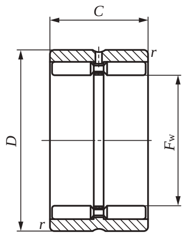
Without Inner Ring



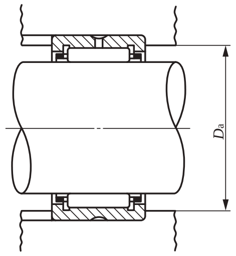
RNA49 TAF TR



RNA69



GTR



Shaft dia. 90 — 105mm

Shaft dia. mm	Identification number						Mass (Ref.) g	Boundary dimensions mm				Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min-1
	RNA 49	RNA 69	RNA 48	TAF	TR	GTR		F_w	D	C	(1) $r_{s\,min}$				
90	—	—	—	**TAF 9011025**	—	—	455	90	110	25	1	105	77 300	150 000	4 500
	RNA 4916	—	—	—	—	—	550	90	110	30	1	105	87 300	175 000	4 500
	—	—	—	**TAF 9011035**	—	—	640	90	110	35	1	105	103 000	217 000	4 500
	—	**RNA 6916**	—	—	—	—	1 010	90	110	54	1	105	143 000	351 000	4 500
93	—	—	—	—	**TR 9311850**	—	1 210	93	118	50	1	113	165 000	329 000	4 500
	—	—	—	—	—	**GTR 9311850**	1 340	93	118	50	1	113	224 000	509 000	1 600
95	—	—	—	**TAF 9511526**	—	—	495	95	115	26	1	110	79 700	159 000	4 000
	RNA 49/82	—	—	—	—	—	575	95	115	30	1	110	90 000	186 000	4 000
	—	—	—	**TAF 9511536**	—	—	690	95	115	36	1	110	106 000	231 000	4 000
	—	—	—	—	**TR 9512045**	—	1 120	95	120	45	1.5	112	155 000	305 000	4 000
	—	—	—	—	—	**GTR 9512045**	1 230	95	120	45	1.5	112	204 000	455 000	1 600
100	—	—	—	**TAF 10012026**	—	—	525	100	120	26	1	115	82 400	168 000	4 000
	RNA 4917	—	—	—	—	—	705	100	120	35	1.1	113.5	110 000	244 000	4 000
	—	—	—	**TAF 10012036**	—	—	725	100	120	36	1	115	110 000	244 000	4 000
	—	**RNA 6917**	—	—	—	—	1 300	100	120	63	1.1	113.5	173 000	467 000	4 000
	—	—	—	—	**TR 10012550**	—	1 290	100	125	50	1.5	117	172 000	355 000	4 000
	—	—	—	—	—	**GTR 10012550**	1 440	100	125	50	1.5	117	234 000	549 000	1 500
105	—	—	—	**TAF 10512526**	—	—	545	105	125	26	1	120	84 700	178 000	4 000
	RNA 4918	—	—	—	—	—	740	105	125	35	1.1	118.5	113 000	258 000	4 000
	—	—	—	**TAF 10512536**	—	—	760	105	125	36	1	120	113 000	258 000	4 000
	—	**RNA 6918**	—	—	—	—	1 360	105	125	63	1.1	118.5	178 000	490 000	4 000

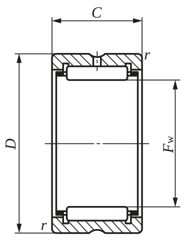
Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

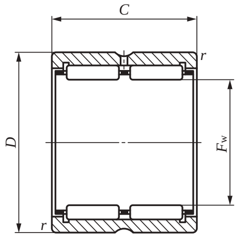
MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring

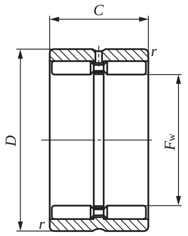




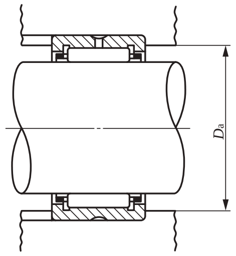
RNA49 RNA48
TAF TR



RNA69



GTR



Shaft dia. 110 – 170mm

Shaft dia. mm	Identification number						Mass (Ref.) g	Boundary dimensions mm				Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min^{-1}
	RNA 49	RNA 69	RNA 48	TAF	TR	GTR		F_w	D	C	$r_{s\,min}$(1)				
110	—	—	—	**TAF 11013030**	—	—	660	110	130	30	1	125	106 000	240 000	3 500
	RNA 4919	—	—	—	—	—	770	110	130	35	1.1	123.5	116 000	271 000	3 500
	—	—	—	**TAF 11013040**	—	—	880	110	130	40	1	125	134 000	324 000	3 500
	—	**RNA 6919**	—	—	—	—	1 420	110	130	63	1.1	123.5	182 000	514 000	3 500
	—	—	—	—	**TR 11013550**	—	1 400	110	135	50	1.5	127	183 000	395 000	3 500
	—	—	—	—	—	**GTR 11013550**	1 560	110	135	50	1.5	127	245 000	603 000	1 400
115	**RNA 4920**	—	—	—	—	—	1 190	115	140	40	1.1	133.5	145 000	329 000	3 500
	—	—	—	—	**TR 11515350**	—	2 350	115	153	50	1.5	145	233 000	414 000	3 500
	—	—	—	—	—	**GTR 11515350**	2 600	115	153	50	1.5	145	315 000	614 000	1 300
120	—	—	**RNA 4822**	—	—	—	790	120	140	30	1	135	93 200	239 000	3 500
125	**RNA 4922**	—	—	—	—	—	1 280	125	150	40	1.1	143.5	152 000	357 000	3 000
130	—	—	**RNA 4824**	—	—	—	850	130	150	30	1	145	96 900	259 000	3 000
135	**RNA 4924**	—	—	—	—	—	1 930	135	165	45	1.1	158.5	187 000	435 000	3 000
140	—	—	—	—	**TR 14017860**	—	3 320	140	178	60	1.5	170	307 000	625 000	3 000
	—	—	—	—	—	**GTR 14017860**	3 730	140	178	60	1.5	170	409 000	923 000	1 100
145	—	—	**RNA 4826**	—	—	—	1 100	145	165	35	1.1	158.5	116 000	340 000	3 000
150	**RNA 4926**	—	—	—	—	—	2 360	150	180	50	1.5	172	215 000	540 000	2 500
	—	—	—	—	**TR 15018860**	—	3 540	150	188	60	1.5	180	320 000	675 000	2 500
	—	—	—	—	—	**GTR 15018860**	3 970	150	188	60	1.5	180	423 000	989 000	1 000
155	—	—	**RNA 4828**	—	—	—	1 170	155	175	35	1.1	168.5	120 000	363 000	2 500
160	**RNA 4928**	—	—	—	—	—	2 500	160	190	50	1.5	182	224 000	580 000	2 500
165	—	—	**RNA 4830**	—	—	—	1 750	165	190	40	1.1	183.5	168 000	446 000	2 500
170	**RNA 4930**	—	—	—	—	—	4 090	170	210	60	2	201	324 000	712 000	2 500

Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remarks 1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring

RNA49 RNA48

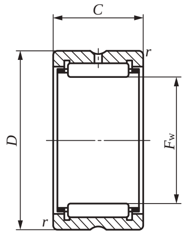
Shaft dia. 175 ー 350mm

Shaft dia. mm	Identification number						Mass (Ref.) g	Boundary dimensions mm				Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min^{-1}
	RNA 49	RNA 69	RNA 48	TAF	TR	GTR		F_w	D	C	$r_{s\,\min}$(1)				
175	—	—	**RNA 4832**	—	—	—	1 850	175	200	40	1.1	193.5	173 000	474 000	2 500
180	**RNA 4932**	—	—	—	—	—	4 310	180	220	60	2	211	337 000	761 000	1 900
185	—	—	**RNA 4834**	—	—	—	2 700	185	215	45	1.1	208.5	211 000	567 000	1 900
190	**RNA 4934**	—	—	—	—	—	4 530	190	230	60	2	221	347 000	810 000	1 900
195	—	—	**RNA 4836**	—	—	—	2 840	195	225	45	1.1	218.5	218 000	602 000	1 900
205	**RNA 4936**	—	—	—	—	—	6 250	205	250	69	2	241	434 000	989 000	1 900
210	—	—	**RNA 4838**	—	—	—	3 380	210	240	50	1.5	232	249 000	726 000	1 800
215	**RNA 4938**	—	—	—	—	—	6 500	215	260	69	2	251	440 000	1 020 000	1 700
220	—	—	**RNA 4840**	—	—	—	3 520	220	250	50	1.5	242	255 000	766 000	1 600
225	**RNA 4940**	—	—	—	—	—	10 400	225	280	80	2.1	269	518 000	1 120 000	1 600
240	—	—	**RNA 4844**	—	—	—	3 820	240	270	50	1.5	262	266 000	833 000	1 500
245	**RNA 4944**	—	—	—	—	—	11 200	245	300	80	2.1	289	536 000	1 200 000	1 400
265	—	—	**RNA 4848**	—	—	—	5 670	265	300	60	2	291	345 000	1 150 000	1 300
	RNA 4948	—	—	—	—	—	12 000	265	320	80	2.1	309	565 000	1 320 000	1 300
285	—	—	**RNA 4852**	—	—	—	6 070	285	320	60	2	311	354 000	1 220 000	1 100
290	**RNA 4952**	—	—	—	—	—	21 200	290	360	100	2.1	349	847 000	1 900 000	1 100
305	—	—	**RNA 4856**	—	—	—	9 750	305	350	69	2	341	486 000	1 550 000	950
310	**RNA 4956**	—	—	—	—	—	22 500	310	380	100	2.1	369	877 000	2 040 000	950
330	—	—	**RNA 4860**	—	—	—	13 200	330	380	80	2.1	369	610 000	1 900 000	900
340	**RNA 4960**	—	—	—	—	—	33 400	340	420	118	3	407	1 130 000	2 650 000	850
350	—	—	**RNA 4864**	—	—	—	14 100	350	400	80	2.1	389	635 000	2 040 000	750

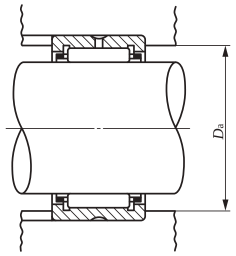
Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring



RNA49 RNA48



Shaft dia. 360 ─ 490mm

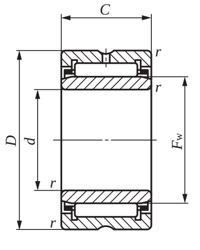
Shaft dia. mm	Identification number RNA 49	RNA 69	RNA 48	TAF	TR	GTR	Mass (Ref.) g	Boundary dimensions mm F_w	D	C	$r_{s\,min}$ (1)	Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min^{-1}
360	**RNA 4964**	—	—	—	—	—	35 200	360	440	118	3	427	1 170 000	2 830 000	750
370	—	—	**RNA 4868**	—	—	—	14 800	370	420	80	2.1	409	651 000	2 140 000	700
380	**RNA 4968**	—	—	—	—	—	37 000	380	460	118	3	447	1 220 000	3 020 000	700
390	—	—	**RNA 4872**	—	—	—	15 600	390	440	80	2.1	429	680 000	2 320 000	650
400	**RNA 4972**	—	—	—	—	—	38 700	400	480	118	3	467	1 260 000	3 200 000	600
415	—	—	**RNA 4876**	—	—	—	27 900	415	480	100	2.1	469	951 000	2 860 000	600
430	**RNA 4976**	—	—	—	—	—	56 400	430	520	140	4	504	1 540 000	4 030 000	500
450	**RNA 4980**	—	—	—	—	—	58 800	450	540	140	4	524	1 590 000	4 270 000	500
470	**RNA 4984**	—	—	—	—	—	61 200	470	560	140	4	544	1 640 000	4 510 000	500
490	**RNA 4988**	—	—	—	—	—	86 900	490	600	160	4	584	1 910 000	5 140 000	400

Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

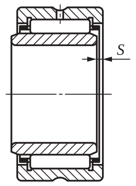
Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

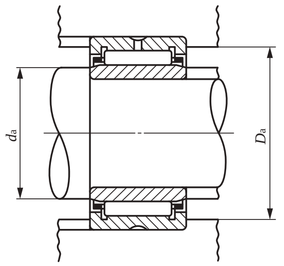
MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring



NA49 TAFI
NA69 (*d* ≦ 30)





Shaft dia. 5 – 12mm

Shaft dia. mm	Identification number						Mass (Ref.)		Boundary dimensions mm						Standard mounting dimensions mm			Basic dynamic load rating	Basic static load rating	Allowable rotational speed(3)	Assembled inner ring
	NA 49	NA 69	NA 48	TAFI	TRI	GTRI	g	*d*	*D*	*C*	*B*	(1) $r_{s\,min}$	F_w	(2) *S*	d_a Min.	d_a Max.	D_a Max.	*C* N	C_0 N	min⁻¹	
5	**NA 495**	—	—	—	—	—	7.3	5	13	10	—	0.15	7	0.5	6.2	6.7	11.8	2 960	2 690	60 000	**LRT 5710**
	—	—	—	**TAFI 51512**	—	—	11.9	5	15	12	—	0.2	8	0.5	6.6	7.7	13.4	5 060	4 690	50 000	**LRT 5812**
	—	—	—	**TAFI 51516**	—	—	16.7	5	15	16	—	0.2	8	0.5	6.6	7.7	13.4	7 080	7 220	50 000	**LRT 5816**
6	**NA 496**	—	—	—	—	—	9.1	6	15	10	—	0.15	8	0.5	7.2	7.7	13.8	3 960	3 420	50 000	**LRT 6810**
	—	—	—	**TAFI 61612**	—	—	13	6	16	12	—	0.2	9	0.5	7.6	8.7	14.4	5 490	5 330	45 000	**LRT 6912**
	—	—	—	**TAFI 61616**	—	—	17.5	6	16	16	—	0.2	9	0.5	7.6	8.7	14.4	7 680	8 210	45 000	**LRT 6916**
7	**NA 497**	—	—	—	—	—	11.2	7	17	10	—	0.15	9	0.5	8.2	8.7	15.8	4 530	3 650	45 000	**LRT 7910**
	—	—	—	**TAFI 71712**	—	—	14.3	7	17	12	—	0.2	10	0.5	8.6	9.7	15.4	5 880	5 970	40 000	**LRT 71012**
	—	—	—	**TAFI 71716**	—	—	19.2	7	17	16	—	0.2	10	0.5	8.6	9.7	15.4	8 230	9 190	40 000	**LRT 71016**
8	**NA 498**	—	—	—	—	—	15	8	19	11	—	0.2	10	0.5	9.6	9.9	17.4	6 180	5 030	40 000	**LRT 81011**
9	—	—	—	**TAFI 91912**	—	—	16.7	9	19	12	—	0.3	12	0.5	11	11.5	17	6 610	7 260	35 000	**LRT 91212**
	—	—	—	**TAFI 91916**	—	—	22.5	9	19	16	—	0.3	12	0.5	11	11.5	17	9 250	11 200	35 000	**LRT 91216**
	NA 499	—	—	—	—	—	16.7	9	20	11	—	0.3	12	0.5	11	11.5	18	6 600	6 310	35 000	**LRT 91211**
10	**NA 4900**	—	—	—	—	—	24	10	22	13	—	0.3	14	0.5	12	13	20	9 230	10 100	30 000	**LRT 101413**
	—	—	—	**TAFI 102216**	—	—	30	10	22	16	—	0.3	14	0.5	12	13	20	11 700	13 700	30 000	**LRT 101416**
	—	—	—	**TAFI 102220**	—	—	38	10	22	20	—	0.3	14	0.5	12	13	20	14 800	18 600	30 000	**LRT 101420**
12	**NA 4901**	—	—	—	—	—	26.5	12	24	13	—	0.3	16	0.5	14	15	22	9 660	11 100	25 000	**LRT 121613**
	—	—	—	**TAFI 122416**	—	—	33.5	12	24	16	—	0.3	16	0.5	14	15	22	12 300	15 100	25 000	**LRT 121616**
	—	—	—	**TAFI 122420**	—	—	42.5	12	24	20	—	0.3	16	0.5	14	15	22	15 500	20 400	25 000	**LRT 121620**
	—	**NA 6901**	—	—	—	—	44.5	12	24	22	—	0.3	16	0.5	14	15	22	17 100	23 000	25 000	**LRT 121622**

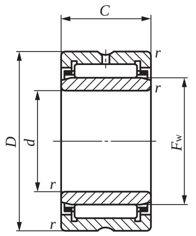
Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable axial shift amount of inner ring to outer ring
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remarks1. TAFI series with a bore diameter *d* of 22 mm or less have no oil hole. In others, the outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

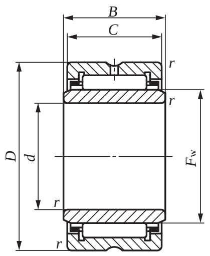
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring



NA49 TAFI
NA69（$d \leqq 30$）



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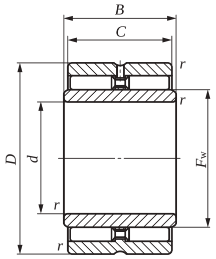

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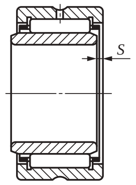
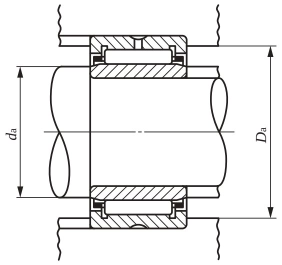




Shaft dia. 15 ─ 22mm

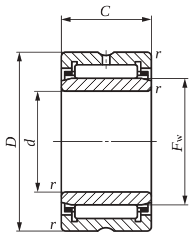
Shaft dia. mm	Identification number						Mass (Ref.) g	d	Boundary dimensions mm						Standard mounting dimensions mm			Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(3) min^{-1}	Assembled inner ring
	NA 49	NA 69	NA 48	TAFI	TRI	GTRI			D	C	B	(1) $r_{s\,min}$	F_w	(2) S	d_a Min.	d_a Max.	D_a Max.				
15	—	—	—	**TAFI 152716**	—	—	39.5	15	27	16	—	0.3	19	0.5	17	18	25	14 000	18 700	20 000	**LRT 151916**
	—	—	—	**TAFI 152720**	—	—	50	15	27	20	—	0.3	19	0.5	17	18	25	17 700	25 300	20 000	**LRT 151920**
	NA 4902	—	—	—	—	—	35	15	28	13	—	0.3	20	0.3	17	19	26	10 900	13 800	20 000	**LRT 152013**
	—	**NA 6902**	—	—	—	—	61	15	28	23	—	0.3	20	0.3	17	19	26	19 300	28 800	20 000	**LRT 152023**
	—	—	—	—	**TRI 153320**	—	81	15	33	20	20.5	0.3	20	0.3	17	19	31	24 300	26 500	20 000	**LRT 152020**
	—	—	—	—	—	**GTRI 153320**	90.5	15	33	20	20.5	0.3	20	—	17	19	31	29 200	37 200	7 500	**LRTZ 152020**
17	—	—	—	**TAFI 172916**	—	—	43.5	17	29	16	—	0.3	21	0.5	19	20	27	14 400	20 000	19 000	**LRT 172116**
	—	—	—	**TAFI 172920**	—	—	54	17	29	20	—	0.3	21	0.5	19	20	27	18 200	27 100	19 000	**LRT 172120**
	NA 4903	—	—	—	—	—	39	17	30	13	—	0.3	22	0.3	19	21	28	11 700	15 600	18 000	**LRT 172213**
	—	**NA 6903**	—	—	—	—	67	17	30	23	—	0.3	22	0.3	19	21	28	20 800	32 500	18 000	**LRT 172223**
	—	—	—	—	**TRI 173425**	—	104	17	34	25	25.5	0.3	22	0.5	19	21	32	29 100	36 800	18 000	**LRT 172225**
	—	—	—	—	—	**GTRI 173425**	117	17	34	25	25.5	0.3	22	—	19	21	32	37 900	57 800	7 000	**LRTZ 172225**
20	—	—	—	**TAFI 203216**	—	—	48.5	20	32	16	—	0.3	24	0.5	22	23	30	15 300	22 500	17 000	**LRT 202416**
	—	—	—	**TAFI 203220**	—	—	61	20	32	20	—	0.3	24	0.5	22	23	30	19 400	30 500	17 000	**LRT 202420**
	NA 4904	—	—	—	—	—	78.5	20	37	17	—	0.3	25	0.5	22	24	35	21 000	25 000	16 000	**LRT 202517**
	—	**NA 6904**	—	—	—	—	136	20	37	30	—	0.3	25	0.5	22	24	35	35 400	48 900	16 000	**LRT 202530**
	—	—	—	—	**TRI 203820**	—	99	20	38	20	20.5	0.3	25	0.3	22	24	36	28 900	35 000	16 000	**LRT 202520**
	—	—	—	—	**TRI 203825**	—	124	20	38	25	25.5	0.3	25	0.5	22	24	36	34 800	44 400	16 000	**LRT 202525**
	—	—	—	—	—	**GTRI 203820**	110	20	38	20	20.5	0.3	25	—	22	24	36	33 300	46 500	6 000	**LRTZ 202520**
	—	—	—	—	—	**GTRI 203825**	138	20	38	25	25.5	0.3	25	—	22	24	36	42 400	63 700	6 000	**LRTZ 202525**
22	—	—	—	**TAFI 223416**	—	—	52	22	34	16	—	0.3	26	0.5	24	25	32	16 300	24 900	15 000	**LRT 222616**
	—	—	—	**TAFI 223420**	—	—	67.5	22	34	20	—	0.3	26	0.5	24	25	32	20 600	33 800	15 000	**LRT 222620**
	NA 49/22	—	—	—	—	—	87	22	39	17	—	0.3	28	1	24	27	37	21 400	28 900	14 000	**LRT 222817**
	—	**NA 69/22**	—	—	—	—	152	22	39	30	—	0.3	28	0.5	24	27	37	36 300	56 900	14 000	**LRT 222830**

Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable axial shift amount of inner ring to outer ring
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

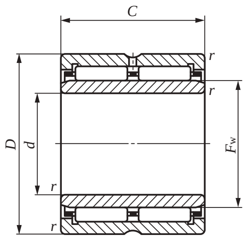
Remarks1. TAFI series with a bore diameter d of 22 mm or less have no oil hole. In others, the outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring



NA49 TAFI
NA69 (*d* ≦ 30)



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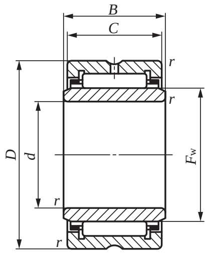

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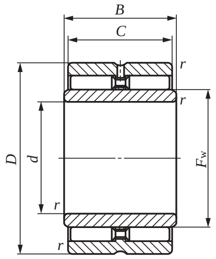

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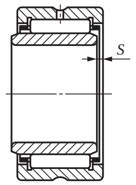
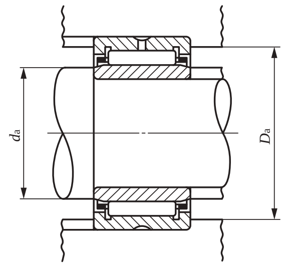




Shaft dia. 25 – 32mm

Shaft dia. mm	NA 49	NA 69	NA 48	TAFI	TRI	GTRI	Mass (Ref.) g	*d*	*D*	*C*	*B*	$r_{s\,min}$ (1)	F_w	*S* (2)	d_a Min.	d_a Max.	D_a Max.	Basic dynamic load rating *C* N	Basic static load rating C_0 N	Allowable rotational speed(3) min⁻¹	Assembled inner ring
25	—	—	—	**TAFI 253820**	—	—	82	25	38	20	—	0.3	29	0.5	27	28	36	21 600	37 200	14 000	**LRT 252920**
	—	—	—	**TAFI 253830**	—	—	123	25	38	30	—	0.3	29	1	27	28	36	30 900	59 100	14 000	**LRT 252930**
	NA 4905	—	—	—	—	—	92.5	25	42	17	—	0.3	30	0.5	27	29	40	23 700	30 700	13 000	**LRT 253017**
	—	**NA 6905**	—	—	—	—	160	25	42	30	—	0.3	30	0.5	27	29	40	42 100	64 300	13 000	**LRT 253030**
	—	—	—	—	**TRI 254425**	—	157	25	44	25	25.5	0.3	30	0.5	27	29	42	37 900	52 100	13 000	**LRT 253025**
	—	—	—	—	—	**GTRI 254425**	175	25	44	25	25.5	0.3	30	—	27	29	42	47 000	76 500	5 000	**LRTZ 253025**
28	—	—	—	**TAFI 284220**	—	—	96.5	28	42	20	—	0.3	32	0.5	30	31	40	25 700	42 200	12 000	**LRT 283220**
	—	—	—	**TAFI 284230**	—	—	145	28	42	30	—	0.3	32	1	30	31	40	36 800	67 200	12 000	**LRT 283230**
	NA 49/28	—	—	—	—	—	101	28	45	17	—	0.3	32	1	30	31	43	24 500	32 700	12 000	**LRT 283217**
	—	**NA 69/28**	—	—	—	—	176	28	45	30	—	0.3	32	1	30	31	43	41 800	64 800	12 000	**LRT 283230**
	—	—	—	—	—	**GTRI 284530**	196	28	45	30	30.5	0.3	32	—	30	31	43	58 000	101 000	4 500	**LRTZ 283230**
30	—	—	—	**TAFI 304520**	—	—	112	30	45	20	—	0.3	35	0.3	32	34	43	26 900	46 200	11 000	**LRT 303520**
	—	—	—	**TAFI 304530**	—	—	171	30	45	30	—	0.3	35	0.5	32	34	43	38 600	73 600	11 000	**LRT 303530**
	NA 4906	—	—	—	—	—	106	30	47	17	—	0.3	35	0.5	32	34	45	25 200	34 700	11 000	**LRT 303517**
	—	**NA 6906**	—	—	—	—	184	30	47	30	—	0.3	35	0.5	32	34	45	43 000	69 000	11 000	**LRT 303530**
	—	—	—	—	**TRI 304830**	—	199	30	48	30	30.5	0.3	35	1	32	34	46	47 400	72 300	11 000	**LRT 303530-1**
	—	—	—	—	—	**GTRI 304830**	225	30	48	30	30.5	0.3	35	—	32	34	46	61 100	110 000	4 500	**LRTZ 303530**
32	—	—	—	**TAFI 324720**	—	—	121	32	47	20	—	0.3	37	0.3	34	36	45	28 200	50 100	11 000	**LRT 323720**
	—	—	—	**TAFI 324730**	—	—	180	32	47	30	—	0.3	37	0.5	34	36	45	40 500	79 800	11 000	**LRT 323730**
	NA 49/32	—	—	—	—	—	165	32	52	20	—	0.6	40	0.5	36	39	48	31 200	47 800	10 000	**LRT 324020**
	—	—	—	—	**TRI 325230**	—	245	32	52	30	30.5	0.6	38	0.5	36	37	48	50 800	81 100	11 000	**LRT 323830**
	—	**NA 69/32**	—	—	—	—	295	32	52	36	—	0.6	40	0.3	36	39	48	53 500	95 700	10 000	**LRT 324036**
	—	—	—	—	—	**GTRI 325230**	270	32	52	30	30.5	0.6	38	—	36	37	48	64 200	121 000	4 000	**LRTZ 323830**

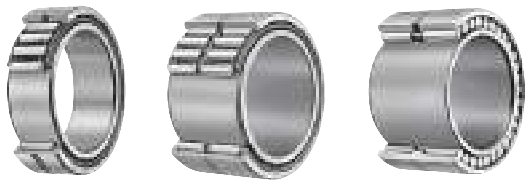
Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable axial shift amount of inner ring to outer ring
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

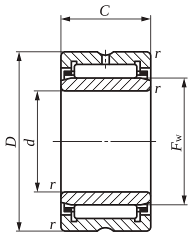
Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

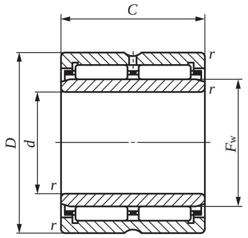
MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring





NA49 TAFI



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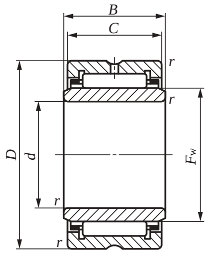

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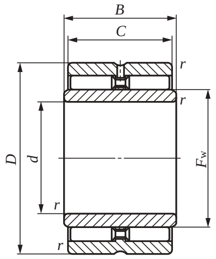

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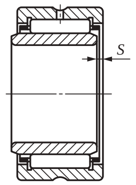
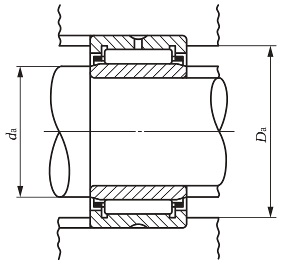




Shaft dia. 35 – 45mm

Shaft dia. mm	Identification number NA 49	NA 69	NA 48	TAFI	TRI	GTRI	Mass (Ref.) g	d	Boundary dimensions mm D	C	B	$r_{s\ min}$ (1)	F_w	S (2)	Standard mounting dimensions mm d_a Min.	d_a Max.	D_a Max.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(3) min-1	Assembled inner ring
35	—	—	—	**TAFI 355020**	—	—	129	35	50	20	—	0.3	40	0.3	37	39	48	29 400	54 100	10 000	**LRT 354020**
	—	—	—	**TAFI 355030**	—	—	192	35	50	30	—	0.3	40	0.5	37	39	48	42 300	86 200	10 000	**LRT 354030**
	NA 4907	—	—	—	—	—	178	35	55	20	—	0.6	42	0.5	39	41	51	32 000	50 100	9 500	**LRT 354220**
	—	**NA 6907**	—	—	—	—	320	35	55	36	—	0.6	42	0.3	39	41	51	54 900	100 000	9 500	**LRT 354236**
	—	—	—	—	**TRI 355630**	—	280	35	56	30	30.5	0.6	42	0.5	39	41	52	53 800	90 100	9 500	**LRT 354230**
	—	—	—	—	—	**GTRI 355520**	191	35	55	20	20.5	0.6	40	—	39	39.5	51	44 300	73 600	3 500	**LRTZ 354020**
	—	—	—	—	—	**GTRI 355630**	310	35	56	30	30.5	0.6	42	—	39	41	52	67 500	133 000	3 500	**LRTZ 354230**
38	—	—	—	**TAFI 385320**	—	—	136	38	53	20	—	0.3	43	0.3	40	42	51	30 500	58 200	9 500	**LRT 384320**
	—	—	—	**TAFI 385330**	—	—	205	38	53	30	—	0.3	43	0.5	40	42	51	43 800	92 600	9 500	**LRT 384330**
40	—	—	—	**TAFI 405520**	—	—	143	40	55	20	—	0.3	45	0.3	42	44	53	31 000	60 200	9 000	**LRT 404520**
	—	—	—	**TAFI 405530**	—	—	215	40	55	30	—	0.3	45	0.5	42	44	53	44 600	95 800	9 000	**LRT 404530**
	—	—	—	—	**TRI 405930**	—	270	40	59	30	30.5	0.6	45	1	44	44.5	55	55 100	94 800	9 000	**LRT 404530-1**
	NA 4908	—	—	—	—	—	245	40	62	22	—	0.6	48	0.5	44	47	58	41 600	67 400	8 500	**LRT 404822**
	—	**NA 6908**	—	—	—	—	440	40	62	40	—	0.6	48	0.3	44	47	58	71 300	135 000	8 500	**LRT 404840**
	—	—	—	—	—	**GTRI 405930**	300	40	59	30	30.5	0.6	45	—	44	44.5	55	70 300	142 000	3 500	**LRTZ 404530**
42	—	—	—	**TAFI 425720**	—	—	149	42	57	20	—	0.3	47	0.3	44	46	55	31 500	62 200	8 500	**LRT 424720**
	—	—	—	**TAFI 425730**	—	—	225	42	57	30	—	0.3	47	0.5	44	46	55	45 200	99 100	8 500	**LRT 424730**
	—	—	—	—	**TRI 426230**	—	305	42	62	30	30.5	0.6	48	0.5	46	47	58	56 300	99 500	8 500	**LRT 424830**
	—	—	—	—	—	**GTRI 426230**	340	42	62	30	30.5	0.6	48	—	46	47	58	72 700	154 000	3 000	**LRTZ 424830**
45	—	—	—	**TAFI 456225**	—	—	230	45	62	25	—	0.3	50	0.5	47	49	60	43 000	85 300	8 000	**LRT 455025**
	—	—	—	**TAFI 456235**	—	—	320	45	62	35	—	0.3	50	1	47	49	60	58 000	125 000	8 000	**LRT 455035**
	—	—	—	—	**TRI 456430**	—	300	45	64	30	30.5	0.6	50	1	49	49.5	60	57 700	104 000	8 000	**LRT 455030**
	NA 4909	—	—	—	—	—	285	45	68	22	—	0.6	52	0.5	49	51	64	43 500	73 300	7 500	**LRT 455222**
	—	**NA 6909**	—	—	—	—	520	45	68	40	—	0.6	52	0.3	49	51	64	74 600	147 000	7 500	**LRT 455240**
	—	—	—	—	—	**GTRI 456430**	335	45	64	30	30.5	0.6	50	—	49	49.5	60	74 600	158 000	3 000	**LRTZ 455030**

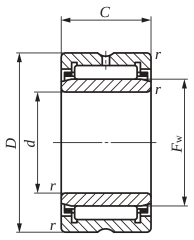
Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable axial shift amount of inner ring to outer ring
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

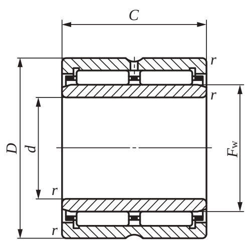
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring



NA49 TAFI



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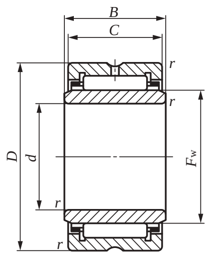
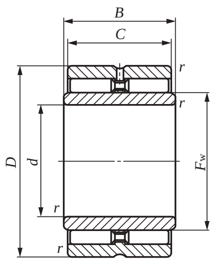


TRI



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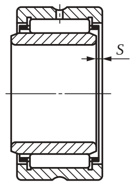
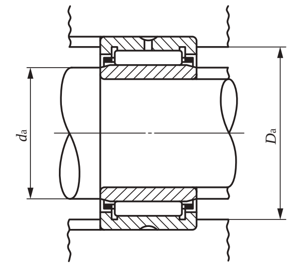




Shaft dia. 50 – 70mm

Shaft dia. mm	Identification number						Mass (Ref.) g	d
	NA 49	NA 69	NA 48	TAFI	TRI	GTRI		
50	—	—	—	**TAFI 506825**	—	—	270	50
	—	—	—	**TAFI 506835**	—	—	365	50
	NA 4910	—	—	—	—	—	295	50
	—	**NA 6910**	—	—	—	—	530	50
	—	—	—	—	**TRI 507745**	—	755	50
	—	—	—	—	—	**GTRI 507745**	825	50
55	—	—	—	**TAFI 557225**	—	—	275	55
	—	—	—	**TAFI 557235**	—	—	380	55
	NA 4911	—	—	—	—	—	410	55
	—	**NA 6911**	—	—	—	—	730	55
	—	—	—	—	**TRI 558138**	—	650	55
	—	—	—	—	—	**GTRI 558138**	710	55
60	—	—	—	**TAFI 608225**	—	—	395	60
	—	—	—	**TAFI 608235**	—	—	560	60
	NA 4912	—	—	—	—	—	440	60
	—	**NA 6912**	—	—	—	—	785	60
	—	—	—	—	**TRI 608945**	—	960	60
	—	—	—	—	—	**GTRI 608945**	1 050	60
65	**NA 4913**	—	—	—	—	—	470	65
	—	—	—	**TAFI 659035**	—	—	710	65
	—	**NA 6913**	—	—	—	—	840	65
70	—	—	—	**TAFI 709525**	—	—	540	70
	—	—	—	**TAFI 709535**	—	—	755	70
	NA 4914	—	—	—	—	—	765	70
	—	**NA 6914**	—	—	—	—	1 400	70

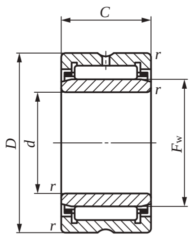
Boundary dimensions mm						Standard mounting dimensions mm			Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(3) min⁻¹	Assembled inner ring
D	C	B	(1) $r_{s\,min}$	F_w	(2) S	d_a Min.	d_a Max.	D_a Max.				
68	25	—	0.3	55	0.5	52	54	66	45 400	94 000	7 500	**LRT 505525**
68	35	—	0.3	55	1	52	54	66	61 200	138 000	7 500	**LRT 505535**
72	22	—	0.6	58	0.5	54	57	68	46 200	82 100	7 000	**LRT 505822**
72	40	—	0.6	58	0.3	54	57	68	79 200	164 000	7 000	**LRT 505840**
77	45	45.5	1	58	2	55	57	72	104 000	191 000	7 000	**LRT 505845**
77	45	45.5	1	58	—	55	57	72	135 000	280 000	2 500	**LRTZ 505845**
72	25	—	0.3	60	0.5	57	59	70	47 500	103 000	6 500	**LRT 556025**
72	35	—	0.3	60	1	57	59	70	64 100	151 000	6 500	**LRT 556035**
80	25	—	1	63	1	60	61	75	57 600	97 200	6 500	**LRT 556325**
80	45	—	1	63	0.5	60	61	75	98 700	194 000	6 500	**LRT 556345**
81	38	38.5	1	62	1.5	60	60.5	76	92 000	166 000	6 500	**LRT 556238**
81	38	38.5	1	62	—	60	60.5	76	118 000	241 000	2 500	**LRTZ 556238**
82	25	—	0.6	68	0.3	64	66	78	54 800	117 000	6 000	**LRT 606825**
82	35	—	0.6	68	1	64	66	78	72 000	166 000	6 000	**LRT 606835**
85	25	—	1	68	1	65	66	80	60 200	105 000	6 000	**LRT 606825-1**
85	45	—	1	68	0.5	65	66	80	103 000	211 000	6 000	**LRT 606845**
89	45	45.5	1	70	2	65	68	84	114 000	228 000	5 500	**LRT 607045**
89	45	45.5	1	70	—	65	68	84	147 000	336 000	2 000	**LRTZ 607045**
90	25	—	1	72	1	70	70.5	85	62 700	113 000	5 500	**LRT 657225**
90	35	—	1	73	1	70	71	85	80 400	181 000	5 500	**LRT 657335**
90	45	—	1	72	0.5	70	70.5	85	108 000	227 000	5 500	**LRT 657245**
95	25	—	1	80	0.3	75	78	90	59 400	137 000	5 000	**LRT 708025**
95	35	—	1	80	1	75	78	90	78 100	195 000	5 000	**LRT 708035**
100	30	—	1	80	1.5	75	78	95	83 200	158 000	5 000	**LRT 708030**
100	54	—	1	80	1	75	78	95	134 000	311 000	5 000	**LRT 708054**

Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable axial shift amount of inner ring to outer ring
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

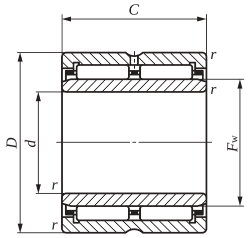
Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

MACHINED TYPE NEEDLE ROLLER BEARINGS

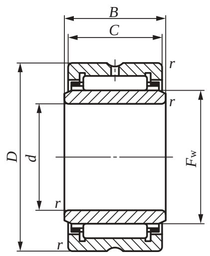
With Inner Ring



NA49 TAFI



NA69



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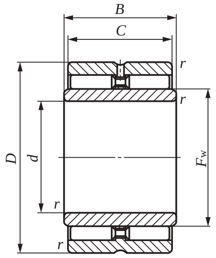
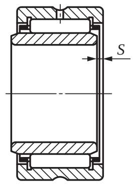
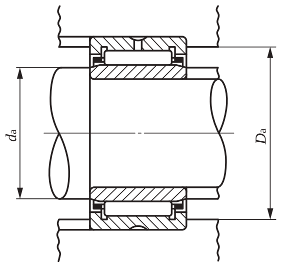


GTRI





Shaft dia. 75 — 90mm

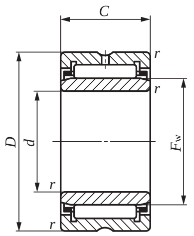
Shaft dia. mm	Identification number NA 49	NA 69	NA 48	TAFI	TRI	GTRI	Mass (Ref.) g	d	Boundary dimensions mm D	C	B	$r_{s\ min}$ (1)	F_w	S (2)	Standard mounting dimensions mm d_a Min.	d_a Max.	D_a Max.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(3) min⁻¹	Assembled inner ring
75	—	—	—	TAFI 7510525	—	—	675	75	105	25	—	1	85	0.5	80	83	100	76 300	145 000	4 500	LRT 758525
	NA 4915	—	—	—	—	—	810	75	105	30	—	1	85	1.5	80	83	100	86 200	169 000	4 500	LRT 758530
	—	—	—	TAFI 7510535	—	—	945	75	105	35	—	1	85	1.5	80	83	100	102 000	210 000	4 500	LRT 758535
	—	NA 6915	—	—	—	—	1 480	75	105	54	—	1	85	1	80	83	100	138 000	331 000	4 500	LRT 758554
	—	—	—	—	TRI 7510845	—	1 340	75	108	45	45.5	1	83	2.5	80	81	103	146 000	270 000	5 000	LRT 758345
	—	—	—	—	—	GTRI 7510845	1 440	75	108	45	45.5	1	83	—	80	81	103	190 000	396 000	1 800	LRTZ 758345
80	—	—	—	TAFI 8011025	—	—	710	80	110	25	—	1	90	0.5	85	88	105	77 300	150 000	4 500	LRT 809025
	NA 4916	—	—	—	—	—	855	80	110	30	—	1	90	1.5	85	88	105	87 300	175 000	4 500	LRT 809030
	—	—	—	TAFI 8011035	—	—	995	80	110	35	—	1	90	1.5	85	88	105	103 000	217 000	4 500	LRT 809035
	—	NA 6916	—	—	—	—	1 560	80	110	54	—	1	90	1	85	88	105	143 000	351 000	4 500	LRT 809054
85	—	—	—	TAFI 8511526	—	—	775	85	115	26	—	1	95	1	90	93	110	79 700	159 000	4 000	LRT 859526
	—	—	—	TAFI 8511536	—	—	1 080	85	115	36	—	1	95	2	90	93	110	106 000	231 000	4 000	LRT 859536
	NA 4917	—	—	—	—	—	1 280	85	120	35	—	1.1	100	1	91.5	98	113.5	110 000	244 000	4 000	LRT 8510035
	—	NA 6917	—	—	—	—	2 340	85	120	63	—	1.1	100	0.5	91.5	98	113.5	173 000	467 000	4 000	LRT 8510063
	—	—	—	—	TRI 8511850	—	1 640	85	118	50	50.5	1	93	3	90	91	113	165 000	329 000	4 500	LRT 859350
	—	—	—	—	TRI 8512045	—	1 610	85	120	45	45.5	1.5	95	2.5	93	93.5	112	155 000	305 000	4 000	LRT 859545
	—	—	—	—	—	GTRI 8511850	1 780	85	118	50	50.5	1	93	—	90	91	113	224 000	509 000	1 600	LRTZ 859350
	—	—	—	—	—	GTRI 8512045	1 720	85	120	45	45.5	1.5	95	—	93	93.5	112	204 000	455 000	1 600	LRTZ 859545
90	—	—	—	TAFI 9012026	—	—	820	90	120	26	—	1	100	1	95	98	115	82 400	168 000	4 000	LRT 9010026
	—	—	—	TAFI 9012036	—	—	1 140	90	120	36	—	1	100	2	95	98	115	110 000	244 000	4 000	LRT 9010036
	NA 4918	—	—	—	—	—	1 350	90	125	35	—	1.1	105	1	96.5	103	118.5	113 000	258 000	4 000	LRT 9010535
	—	—	—	—	TRI 9012550	—	1 870	90	125	50	50.5	1.5	100	3	98	98.5	117	172 000	355 000	4 000	LRT 9010050
	—	NA 6918	—	—	—	—	2 460	90	125	63	—	1.1	105	0.5	96.5	103	118.5	178 000	490 000	4 000	LRT 9010563
	—	—	—	—	—	GTRI 9012550	2 020	90	125	50	50.5	1.5	100	—	98	98.5	117	234 000	549 000	1 500	LRTZ 9010050

Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable axial shift amount of inner ring to outer ring
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

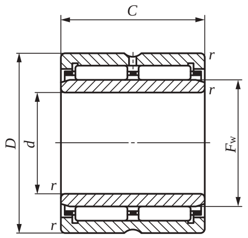
Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring



NA49 TAFI
NA48



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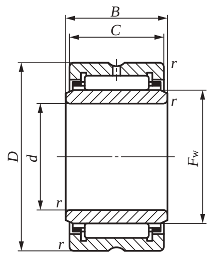

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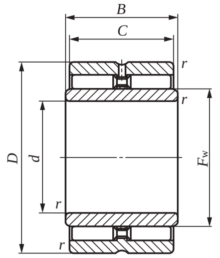
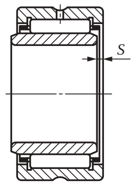
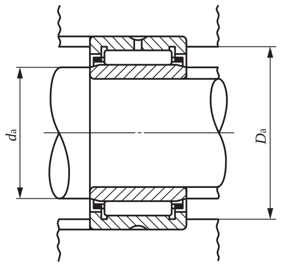


GTRI





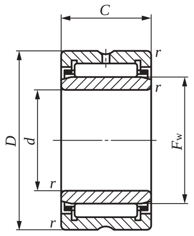
Shaft dia. 95 — 150mm

Shaft dia. mm	Identification number						Mass (Ref.) g	d	Boundary dimensions mm						Standard mounting dimensions mm			Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(3) min⁻¹	Assembled inner ring
	NA 49	NA 69	NA 48	TAFI	TRI	GTRI			D	C	B	(1) $r_{s\,min}$	F_w	(2) S	d_a Min.	d_a Max.	D_a Max.				
95	—	—	—	**TAFI 9512526**	—	—	860	95	125	26	—	1	105	1	100	103	120	84 700	178 000	4 000	**LRT 9510526**
	—	—	—	**TAFI 9512536**	—	—	1 190	95	125	36	—	1	105	2	100	103	120	113 000	258 000	4 000	**LRT 9510536**
	NA 4919	—	—	—	—	—	1 420	95	130	35	—	1.1	110	1	101.5	108	123.5	116 000	271 000	3 500	**LRT 9511035**
	—	**NA 6919**	—	—	—	—	2 580	95	130	63	—	1.1	110	0.5	101.5	108	123.5	182 000	514 000	3 500	**LRT 9511063**
100	—	—	—	**TAFI 10013030**	—	—	1 040	100	130	30	—	1	110	0.5	105	108	125	106 000	240 000	3 500	**LRT 10011030**
	—	—	—	**TAFI 10013040**	—	—	1 380	100	130	40	—	1	110	1.5	105	108	125	134 000	324 000	3 500	**LRT 10011040**
	—	—	—	—	**TRI 10013550**	—	2 040	100	135	50	50.5	1.5	110	3	108	108.5	127	183 000	395 000	3 500	**LRT 10011050**
	NA 4920	—	—	—	—	—	1 960	100	140	40	—	1.1	115	1	106.5	113	133.5	145 000	329 000	3 500	**LRT 10011540**
	—	—	—	—	—	**GTRI 10013550**	2 200	100	135	50	50.5	1.5	110	—	108	108.5	127	245 000	603 000	1 400	**LRTZ 10011050**
105	—	—	—	—	**TRI 10515350**	—	3 020	105	153	50	50.5	1.5	115	3	113	113.5	145	233 000	414 000	3 500	**LRT 10511550**
	—	—	—	—	—	**GTRI 10515350**	3 270	105	153	50	50.5	1.5	115	—	113	113.5	145	315 000	614 000	1 300	**LRTZ 10511550**
110	—	—	**NA 4822**	—	—	—	1 200	110	140	30	—	1	120	1	115	118	135	93 200	239 000	3 500	**LRT 11012030**
	NA 4922	—	—	—	—	—	2 120	110	150	40	—	1.1	125	1	116.5	123	143.5	152 000	357 000	3 000	**LRT 11012540**
120	—	—	**NA 4824**	—	—	—	1 300	120	150	30	—	1	130	1	125	128	145	96 900	259 000	3 000	**LRT 12013030**
	NA 4924	—	—	—	—	—	2 960	120	165	45	—	1.1	135	2	126.5	133	158.5	187 000	435 000	3 000	**LRT 12013545**
125	—	—	—	—	**TRI 12517860**	—	4 780	125	178	60	60.5	1.5	140	2.5	133	138	170	307 000	625 000	3 000	**LRT 12514060**
	—	—	—	—	—	**GTRI 12517860**	5 180	125	178	60	60.5	1.5	140	—	133	138	170	409 000	923 000	1 100	**LRTZ 12514060**
130	—	—	**NA 4826**	—	—	—	1 960	130	165	35	—	1.1	145	1	136.5	143	158.5	116 000	340 000	3 000	**LRT 13014535**
	NA 4926	—	—	—	—	—	4 030	130	180	50	—	1.5	150	2.5	138	148	172	215 000	540 000	2 500	**LRT 13015050**
135	—	—	—	—	**TRI 13518860**	—	5 100	135	188	60	60.5	1.5	150	2.5	143	148	180	320 000	675 000	2 500	**LRT 13515060**
	—	—	—	—	—	**GTRI 13518860**	5 530	135	188	60	60.5	1.5	150	—	143	148	180	423 000	989 000	1 000	**LRTZ 13515060**
140	—	—	**NA 4828**	—	—	—	2 100	140	175	35	—	1.1	155	1	146.5	153	168.5	120 000	363 000	2 500	**LRT 14015535**
	NA 4928	—	—	—	—	—	4 290	140	190	50	—	1.5	160	2.5	148	158	182	224 000	580 000	2 500	**LRT 14016050**
150	—	—	**NA 4830**	—	—	—	2 880	150	190	40	—	1.1	165	1.5	156.5	163	183.5	168 000	446 000	2 500	**LRT 15016540**
	NA 4930	—	—	—	—	—	6 380	150	210	60	—	2	170	3	159	168	201	324 000	712 000	2 500	**LRT 15017060**

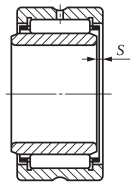
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable axial shift amount of inner ring to outer ring
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

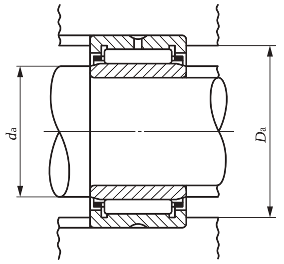
MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring



NA49 NA48





Shaft dia. 160 ー 340mm

Shaft dia. mm	Identification number NA 49	NA 69	NA 48	TAFI	TRI	GTRI	Mass (Ref.) g	d
160	—	—	**NA 4832**	—	—	—	3 050	160
	NA 4932	—	—	—	—	—	6 750	160
170	—	—	**NA 4834**	—	—	—	4 120	170
	NA 4934	—	—	—	—	—	7 110	170
180	—	—	**NA 4836**	—	—	—	4 340	180
	NA 4936	—	—	—	—	—	10 200	180
190	—	—	**NA 4838**	—	—	—	5 760	190
	NA 4938	—	—	—	—	—	10 700	190
200	—	—	**NA 4840**	—	—	—	6 040	200
	NA 4940	—	—	—	—	—	15 400	200
220	—	—	**NA 4844**	—	—	—	6 570	220
	NA 4944	—	—	—	—	—	16 700	220
240	—	—	**NA 4848**	—	—	—	10 200	240
	NA 4948	—	—	—	—	—	18 000	240
260	—	—	**NA 4852**	—	—	—	11 000	260
	NA 4952	—	—	—	—	—	31 100	260
280	—	—	**NA 4856**	—	—	—	15 800	280
	NA 4956	—	—	—	—	—	33 100	280
300	—	—	**NA 4860**	—	—	—	22 300	300
	NA 4960	—	—	—	—	—	51 400	300
320	—	—	**NA 4864**	—	—	—	23 700	320
	NA 4964	—	—	—	—	—	54 400	320
340	—	—	**NA 4868**	—	—	—	25 000	340
	NA 4968	—	—	—	—	—	57 300	340

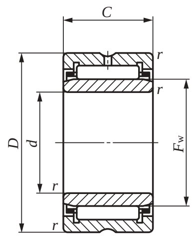
Boundary dimensions mm D	C	B	$r_{s\,min}$ (1)	F_w	S (2)	Standard mounting dimensions mm d_a Min.	d_a Max.	D_a Max.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(3) min-1	Assembled inner ring
200	40	—	1.1	175	1.5	166.5	173	193.5	173 000	474 000	2 500	**LRT 16017540**
220	60	—	2	180	3	169	178	211	337 000	761 000	1 900	**LRT 16018060**
215	45	—	1.1	185	1.5	176.5	183	208.5	211 000	567 000	1 900	**LRT 17018545**
230	60	—	2	190	3	179	188	221	347 000	810 000	1 900	**LRT 17019060**
225	45	—	1.1	195	1.5	186.5	193	218.5	218 000	602 000	1 900	**LRT 18019545**
250	69	—	2	205	3	189	203	241	434 000	989 000	1 900	**LRT 18020569**
240	50	—	1.5	210	1.5	198	208	232	249 000	726 000	1 800	**LRT 19021050**
260	69	—	2	215	3	199	213	251	440 000	1 020 000	1 700	**LRT 19021569**
250	50	—	1.5	220	1.5	208	218	242	255 000	766 000	1 600	**LRT 20022050**
280	80	—	2.1	225	4	211	223	269	518 000	1 120 000	1 600	**LRT 20022580**
270	50	—	1.5	240	1.5	228	238	262	266 000	833 000	1 500	**LRT 22024050**
300	80	—	2.1	245	4	231	243	289	536 000	1 200 000	1 400	**LRT 22024580**
300	60	—	2	265	2	249	262	291	345 000	1 150 000	1 300	**LRT 24026560**
320	80	—	2.1	265	4	251	262	309	565 000	1 320 000	1 300	**LRT 24026580**
320	60	—	2	285	2	269	282	311	354 000	1 220 000	1 100	**LRT 26028560**
360	100	—	2.1	290	4	271	287	349	847 000	1 900 000	1 100	**LRT 260290100**
350	69	—	2	305	2.5	289	302	341	486 000	1 550 000	950	**LRT 28030569**
380	100	—	2.1	310	4	291	307	369	877 000	2 040 000	950	**LRT 280310100**
380	80	—	2.1	330	2.5	311	327	369	610 000	1 900 000	900	**LRT 30033080**
420	118	—	3	340	4	313	337	407	1 130 000	2 650 000	850	**LRT 300340118**
400	80	—	2.1	350	2.5	331	347	389	635 000	2 040 000	750	**LRT 32035080**
440	118	—	3	360	4	333	357	427	1 170 000	2 830 000	750	**LRT 320360118**
420	80	—	2.1	370	2.5	351	367	409	651 000	2 140 000	700	**LRT 34037080**
460	118	—	3	380	4	353	377	447	1 220 000	3 020 000	700	**LRT 340380118**

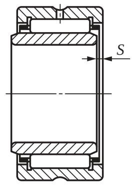
Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable axial shift amount of inner ring to outer ring
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

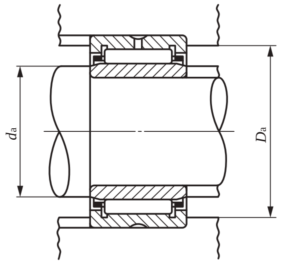
MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring





NA49 NA48



D
NA
TAFI
TRI
BRI

Shaft dia. 360 – 440mm

Shaft dia. mm	Identification number NA 49	NA 69	NA 48	TAFI	TRI	GTRI	Mass (Ref.) g	d	Boundary dimensions mm D	C	B	$r_{s\,\min}$ (1)	F_w	S (2)	Standard mounting dimensions mm d_a Min.	d_a Max.	D_a Max.	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(3) min^{-1}	Assembled inner ring
360	—	—	**NA 4872**	—	—	—	26 400	360	440	80	—	2.1	390	2.5	371	387	429	680 000	2 320 000	650	**LRT 36039080**
	NA 4972	—	—	—	—	—	60 200	360	480	118	—	3	400	4	373	397	467	1 260 000	3 200 000	600	**LRT 360400118**
380	—	—	**NA 4876**	—	—	—	44 600	380	480	100	—	2.1	415	3	391	412	469	951 000	2 860 000	600	**LRT 380415100**
	NA 4976	—	—	—	—	—	90 300	380	520	140	—	4	430	5	396	427	504	1 540 000	4 030 000	500	**LRT 380430140**
400	**NA 4980**	—	—	—	—	—	94 400	400	540	140	—	4	450	5	416	447	524	1 590 000	4 270 000	500	**LRT 400450140**
420	**NA 4984**	—	—	—	—	—	98 500	420	560	140	—	4	470	5	436	467	544	1 640 000	4 510 000	500	**LRT 420470140**
440	**NA 4988**	—	—	—	—	—	131 000	440	600	160	—	4	490	5	456	487	584	1 910 000	5 140 000	400	**LRT 440490160**

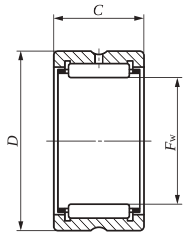
Notes(1) Minimum allowable value of chamfer dimension r
(2) Allowable axial shift amount of inner ring to outer ring
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

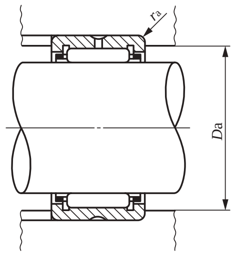
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring, Inch Series



BR



Shaft dia. 15.875 – 47.625mm

Shaft dia. mm (inch)	Identification number	Mass (Ref.) g	Boundary dimensions mm(inch) F_w	D	C	Standard mounting dimensions mm D_a Max.	$r_{as\,max}$(1)	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min^{-1}
15.875 (5/8)	**BR 101812**	49	15.875 (5/8)	28.575 (1 1/8)	19.050 (3/4)	24.5	0.6	18 900	19 700	25 000
19.050 (3/4)	**BR 122012** **BR 122016**	56 75	19.050 (3/4) 19.050 (3/4)	31.750 (1 1/4) 31.750 (1 1/4)	19.050 (3/4) 25.400 (1)	26.5 26.5	1 1	21 700 27 600	24 400 33 100	20 000 20 000
22.225 (7/8)	**BR 142212** **BR 142216**	63 84.5	22.225 (7/8) 22.225 (7/8)	34.925 (1 3/8) 34.925 (1 3/8)	19.050 (3/4) 25.400 (1)	29.7 29.7	1 1	23 000 29 100	27 100 36 800	18 000 18 000
25.400 (1)	**BR 162412** **BR 162416**	69 92.5	25.400 (1) 25.400 (1)	38.100 (1 1/2) 38.100 (1 1/2)	19.050 (3/4) 25.400 (1)	32.9 32.9	1 1	25 300 32 100	31 900 43 300	16 000 16 000
28.575 (1 1/8)	**BR 182616** **BR 182620**	102 128	28.575 (1 1/8) 28.575 (1 1/8)	41.275 (1 5/8) 41.275 (1 5/8)	25.400 (1) 31.750 (1 1/4)	36 36	1 1	34 900 43 200	49 900 65 600	14 000 14 000
31.750 (1 1/4)	**BR 202816** **BR 202820**	110 138	31.750 (1 1/4) 31.750 (1 1/4)	44.450 (1 3/4) 44.450 (1 3/4)	25.400 (1) 31.750 (1 1/4)	39.2 39.2	1 1	36 000 44 600	53 500 70 300	13 000 13 000
34.925 (1 3/8)	**BR 223016** **BR 223020**	119 149	34.925 (1 3/8) 34.925 (1 3/8)	47.625 (1 7/8) 47.625 (1 7/8)	25.400 (1) 31.750 (1 1/4)	42.4 42.4	1 1	38 500 47 700	60 000 78 900	11 000 11 000
38.100 (1 1/2)	**BR 243316** **BR 243320**	149 187	38.100 (1 1/2) 38.100 (1 1/2)	52.388 (2 1/16) 52.388 (2 1/16)	25.400 (1) 31.750 (1 1/4)	45.1 45.1	1.5 1.5	43 700 54 200	66 900 88 200	11 000 11 000
41.275 (1 5/8)	**BR 263516** **BR 263520**	158 199	41.275 (1 5/8) 41.275 (1 5/8)	55.562 (2 3/16) 55.562 (2 3/16)	25.400 (1) 31.750 (1 1/4)	48.3 48.3	1.5 1.5	44 800 55 600	70 900 93 400	9 500 9 500
44.450 (1 3/4)	**BR 283716** **BR 283720** **BR 283820**	170 215 250	44.450 (1 3/4) 44.450 (1 3/4) 44.450 (1 3/4)	58.738 (2 5/16) 58.738 (2 5/16) 60.325 (2 3/8)	25.400 (1) 31.750 (1 1/4) 31.750 (1 1/4)	51.5 51.5 53.1	1.5 1.5 1.5	47 500 58 900 58 900	78 200 103 000 103 000	9 000 9 000 9 000
47.625 (1 7/8)	**BR 303920**	225	47.625 (1 7/8)	61.912 (2 7/16)	31.750 (1 1/4)	54.7	1.5	60 100	108 000	8 500

Notes(1) Maximum permissible corner radius of the housing

(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

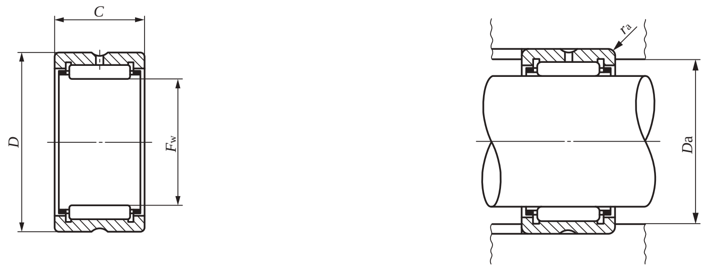
Remarks1. The outer ring has an oil groove and an oil hole.

2. No grease is prepacked. Perform proper lubrication.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring, Inch Series



BR

Shaft dia. 50.800 ー 101.600mm

Shaft dia. mm (inch)	Identification number	Mass (Ref.) g	Boundary dimensions mm(inch) F_w	D	C	Standard mounting dimensions mm D_a Max.	$r_{as\ max}$(1)	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min⁻¹
50.800 (2)	**BR 324116**	190	50.800 (2)	65.088 (2 9/16)	25.400 (1)	57.8	1.5	51 000	89 400	8 000
	BR 324120	240	50.800 (2)	65.088 (2 9/16)	31.750 (1 1/4)	57.8	1.5	63 200	118 000	8 000
57.150 (2 1/4)	**BR 364824**	435	57.150 (2 1/4)	76.200 (3)	38.100 (1 1/2)	69	1.5	90 300	158 000	7 000
	BR 364828	510	57.150 (2 1/4)	76.200 (3)	44.450 (1 3/4)	69	1.5	105 000	191 000	7 000
63.500 (2 1/2)	**BR 405224**	475	63.500 (2 1/2)	82.550 (3 1/4)	38.100 (1 1/2)	74.3	2	94 600	174 000	6 500
	BR 405228	555	63.500 (2 1/2)	82.550 (3 1/4)	44.450 (1 3/4)	74.3	2	110 000	210 000	6 500
69.850 (2 3/4)	**BR 445624**	510	69.850 (2 3/4)	88.900 (3 1/2)	38.100 (1 1/2)	80.7	2	98 700	189 000	5 500
	BR 445628	600	69.850 (2 3/4)	88.900 (3 1/2)	44.450 (1 3/4)	80.7	2	114 000	228 000	5 500
76.200 (3)	**BR 486024**	555	76.200 (3)	95.250 (3 3/4)	38.100 (1 1/2)	87	2	105 000	211 000	5 500
	BR 486028	650	76.200 (3)	95.250 (3 3/4)	44.450 (1 3/4)	87	2	122 000	255 000	5 500
82.550 (3 1/4)	**BR 526828**	990	82.550 (3 1/4)	107.950 (4 1/4)	44.450 (1 3/4)	99.7	2	141 000	259 000	5 000
	BR 526832	1 140	82.550 (3 1/4)	107.950 (4 1/4)	50.800 (2)	99.7	2	154 000	290 000	5 000
88.900 (3 1/2)	**BR 567232**	1 220	88.900 (3 1/2)	114.300 (4 1/2)	50.800 (2)	106.1	2	162 000	316 000	4 500
95.250 (3 3/4)	**BR 607632**	1 290	95.250 (3 3/4)	120.650 (4 3/4)	50.800 (2)	111.4	2.5	169 000	342 000	4 000
101.600 (4)	**BR 648032**	1 370	101.600 (4)	127.000 (5)	50.800 (2)	117.8	2.5	176 000	368 000	4 000

Notes(1) Maximum permissible corner radius of the housing

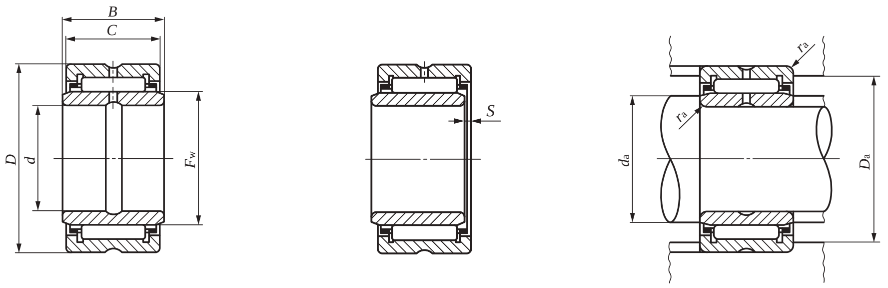
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remarks1. In bearings with a roller set bore diameter F_w of 69.850 mm or less, the outer ring has an oil groove and an oil hole. In others, the outer ring has an oil groove and two oil holes.

2. No grease is prepacked. Perform proper lubrication.

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring, Inch Series



BRI

Shaft dia. 9.525 ー 41.275mm

Shaft dia. mm (inch)	Identification number	Mass (Ref.) g	Boundary dimensions mm(inch) d	D	C	B	F_w	S (1)	Standard mounting dimensions mm d_a Min.	d_a Max.	D_a Max.	$r_{as\ max}$ (2)	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(3) min⁻¹	Assembled inner ring
9.525 (3/8)	**BRI 61812**	67.5	9.525 (3/8)	28.575 (1 1/8)	19.050 (3/4)	19.300	15.875 (5/8)	0.3	14	14.5	24.5	0.6	18 900	19 700	25 000	**LRB 61012**
12.700 (1/2)	**BRI 82012**	79.5	12.700 (1/2)	31.750 (1 1/4)	19.050 (3/4)	19.300	19.050 (3/4)	0.3	17.5	18	26.5	1	21 700	24 400	20 000	**LRB 81212**
	BRI 82016	106	12.700 (1/2)	31.750 (1 1/4)	25.400 (1)	25.650	19.050 (3/4)	0.5	17.5	18	26.5	1	27 600	33 100	20 000	**LRB 81216**
15.875 (5/8)	**BRI 102212**	91	15.875 (5/8)	34.925 (1 3/8)	19.050 (3/4)	19.300	22.225 (7/8)	0.3	21	21.2	29.7	1	23 000	27 100	18 000	**LRB 101412**
	BRI 102216	122	15.875 (5/8)	34.925 (1 3/8)	25.400 (1)	25.650	22.225 (7/8)	0.5	21	21.2	29.7	1	29 100	36 800	18 000	**LRB 101416**
19.050 (3/4)	**BRI 122412**	102	19.050 (3/4)	38.100 (1 1/2)	19.050 (3/4)	19.300	25.400 (1)	0.3	24	24.4	32.9	1	25 300	31 900	16 000	**LRB 121612**
	BRI 122416	136	19.050 (3/4)	38.100 (1 1/2)	25.400 (1)	25.650	25.400 (1)	0.5	24	24.4	32.9	1	32 100	43 300	16 000	**LRB 121616**
22.225 (7/8)	**BRI 142616**	152	22.225 (7/8)	41.275 (1 5/8)	25.400 (1)	25.650	28.575 (1 1/8)	0.5	27	27.5	36	1	34 900	49 900	14 000	**LRB 141816**
	BRI 142620	190	22.225 (7/8)	41.275 (1 5/8)	31.750 (1 1/4)	32.000	28.575 (1 1/8)	0.5	27	27.5	36	1	43 200	65 600	14 000	**LRB 141820**
25.400 (1)	**BRI 162816**	166	25.400 (1)	44.450 (1 3/4)	25.400 (1)	25.650	31.750 (1 1/4)	0.5	30.5	30.7	39.2	1	36 000	53 500	13 000	**LRB 162016**
	BRI 162820	210	25.400 (1)	44.450 (1 3/4)	31.750 (1 1/4)	32.000	31.750 (1 1/4)	0.5	30.5	30.7	39.2	1	44 600	70 300	13 000	**LRB 162020**
28.575 (1 1/8)	**BRI 183016**	182	28.575 (1 1/8)	47.625 (1 7/8)	25.400 (1)	25.650	34.925 (1 3/8)	0.5	33.5	33.9	42.4	1	38 500	60 000	11 000	**LRB 182216**
	BRI 183020	225	28.575 (1 1/8)	47.625 (1 7/8)	31.750 (1 1/4)	32.000	34.925 (1 3/8)	0.5	33.5	33.9	42.4	1	47 700	78 900	11 000	**LRB 182220**
31.750 (1 1/4)	**BRI 203316**	220	31.750 (1 1/4)	52.388 (2 1/16)	25.400 (1)	25.650	38.100 (1 1/2)	0.5	37	37.1	45.1	1.5	43 700	66 900	11 000	**LRB 202416**
	BRI 203320	275	31.750 (1 1/4)	52.388 (2 1/16)	31.750 (1 1/4)	32.000	38.100 (1 1/2)	0.5	37	37.1	45.1	1.5	54 200	88 200	11 000	**LRB 202420**
34.925 (1 3/8)	**BRI 223516**	235	34.925 (1 3/8)	55.562 (2 3/16)	25.400 (1)	25.650	41.275 (1 5/8)	0.5	40.2	40.2	48.3	1.5	44 800	70 900	9 500	**LRB 222616**
	BRI 223520	295	34.925 (1 3/8)	55.562 (2 3/16)	31.750 (1 1/4)	32.000	41.275 (1 5/8)	0.5	40.2	40.2	48.3	1.5	55 600	93 400	9 500	**LRB 222620**
38.100 (1 1/2)	**BRI 243716**	250	38.100 (1 1/2)	58.738 (2 5/16)	25.400 (1)	25.650	44.450 (1 3/4)	0.5	43.3	43.4	51.5	1.5	47 500	78 200	9 000	**LRB 242816**
	BRI 243720	315	38.100 (1 1/2)	58.738 (2 5/16)	31.750 (1 1/4)	32.000	44.450 (1 3/4)	0.5	43.3	43.4	51.5	1.5	58 900	103 000	9 000	**LRB 242820**
	BRI 243820	350	38.100 (1 1/2)	60.325 (2 3/8)	31.750 (1 1/4)	32.000	44.450 (1 3/4)	0.5	43.3	43.4	53.1	1.5	58 900	103 000	9 000	**LRB 242820**
	BRI 243920	380	38.100 (1 1/2)	61.912 (2 7/16)	31.750 (1 1/4)	32.000	47.625 (1 7/8)	0.5	43.3	43.4	54.7	1.5	60 100	108 000	8 500	**LRB 243020**
41.275 (1 5/8)	**BRI 264116**	325	41.275 (1 5/8)	65.088 (2 9/16)	25.400 (1)	25.650	50.800 (2)	0.5	48	49	57.8	1.5	51 000	89 400	8 000	**LRB 263216**
	BRI 264120	410	41.275 (1 5/8)	65.088 (2 9/16)	31.750 (1 1/4)	32.000	50.800 (2)	0.5	48	49	57.8	1.5	63 200	118 000	8 000	**LRB 263220**

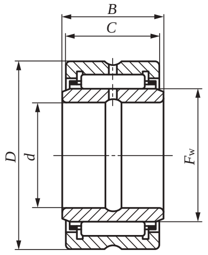
Notes(1) Allowable axial shift amount of inner ring to outer ring
(2) Maximum permissible corner radius of the shaft or housing
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remarks1. The inner ring and the outer ring each have an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

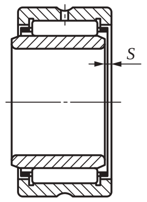
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

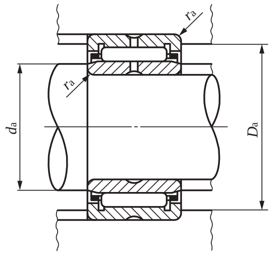
MACHINED TYPE NEEDLE ROLLER BEARINGS

With Inner Ring, Inch Series



BRI





Shaft dia. 44.450 ー 88.900mm

Shaft dia. mm (inch)	Identification number	Mass (Ref.) g	Boundary dimensions mm(inch)						Standard mounting dimensions mm				Basic dynamic load rating N	Basic static load rating N	Allowable rotational speed(3) min⁻¹	Assembled inner ring
			d	D	C	B	F_w	S(1)	d_a Min.	d_a Max.	D_a Max.	$r_{as\,max}$(2)	C	C_0		
44.450 (1 3/4)	**BRI 284824**	735	44.450 (1 3/4)	76.200 (3)	38.100 (1 1/2)	38.350	57.150 (2 1/4)	1	52.5	55	69	1.5	90 300	158 000	7 000	**LRB 283624**
	BRI 284828	855	44.450 (1 3/4)	76.200 (3)	44.450 (1 3/4)	44.700	57.150 (2 1/4)	1	52.5	55	69	1.5	105 000	191 000	7 000	**LRB 283628**
50.800 (2)	**BRI 325224**	810	50.800 (2)	82.550 (3 1/4)	38.100 (1 1/2)	38.350	63.500 (2 1/2)	1	58	61	74.3	2	94 600	174 000	6 500	**LRB 324024**
	BRI 325228	945	50.800 (2)	82.550 (3 1/4)	44.450 (1 3/4)	44.700	63.500 (2 1/2)	1	58	61	74.3	2	110 000	210 000	6 500	**LRB 324028**
57.150 (2 1/4)	**BRI 365624**	885	57.150 (2 1/4)	88.900 (3 1/2)	38.100 (1 1/2)	38.350	69.850 (2 3/4)	1	65	67	80.7	2	98 700	189 000	5 500	**LRB 364424**
	BRI 365628	1 040	57.150 (2 1/4)	88.900 (3 1/2)	44.450 (1 3/4)	44.700	69.850 (2 3/4)	1	65	67	80.7	2	114 000	228 000	5 500	**LRB 364428**
63.500 (2 1/2)	**BRI 406024**	965	63.500 (2 1/2)	95.250 (3 3/4)	38.100 (1 1/2)	38.350	76.200 (3)	1	71	73	87	2	105 000	211 000	5 500	**LRB 404824**
	BRI 406028	1 130	63.500 (2 1/2)	95.250 (3 3/4)	44.450 (1 3/4)	44.700	76.200 (3)	1	71	73	87	2	122 000	255 000	5 500	**LRB 404828**
69.850 (2 3/4)	**BRI 446828**	1 520	69.850 (2 3/4)	107.950 (4 1/4)	44.450 (1 3/4)	44.700	82.550 (3 1/4)	1.5	77	79	99.7	2	141 000	259 000	5 000	**LRB 445228**
	BRI 446832	1 740	69.850 (2 3/4)	107.950 (4 1/4)	50.800 (2)	51.050	82.550 (3 1/4)	3	77	79	99.7	2	154 000	290 000	5 000	**LRB 445232**
76.200 (3)	**BRI 487232**	1 860	76.200 (3)	114.300 (4 1/2)	50.800 (2)	51.050	88.900 (3 1/2)	3	83.5	86	106.1	2	162 000	316 000	4 500	**LRB 485632**
82.550 (3 1/4)	**BRI 527632**	1 980	82.550 (3 1/4)	120.650 (4 3/4)	50.800 (2)	51.050	95.250 (3 3/4)	3	91	93	111.4	2.5	169 000	342 000	4 000	**LRB 526032**
88.900 (3 1/2)	**BRI 568032**	2 120	88.900 (3 1/2)	127.000 (5)	50.800 (2)	51.050	101.600 (4)	3	97	99	117.8	2.5	176 000	368 000	4 000	**LRB 566432**

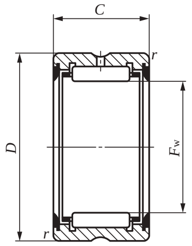
Notes(1) Allowable axial shift amount of inner ring to outer ring
(2) Maximum permissible corner radius of the shaft or housing
(3) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.

Remarks1. In bearings with a bearing bore diameter, d, of 57.150 mm or less, the outer ring has an oil groove and an oil hole. In bearings with a bearing bore diameter, d, of 76.200 mm or less, the inner ring has an oil groove and an oil hole. In others, the inner ring and the outer ring each have an oil groove and two oil holes.
2. No grease is prepacked. Perform proper lubrication.

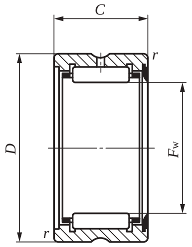
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

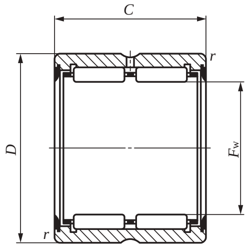
With Seal, Without Inner Ring



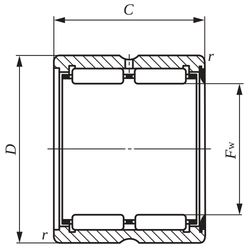
RNA49 ··· UU
RNA69 ··· UU(F_w ≦ 35)



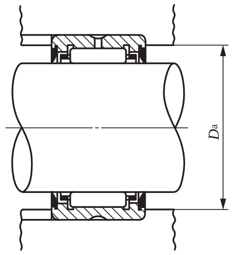
RNA49 ··· U
RNA69 ··· U(F_w ≦ 35)



RNA69 ··· UU



RNA69 ··· U



Shaft dia. 14 — 45mm

Shaft dia. mm	Identification number				Mass (Ref.) g	Boundary dimensions mm				Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min⁻¹
	With two seals	With one seal	With two seals	With one seal		F_w	D	C	$r_{s\,min}$(1)				
14	**RNA 4900UU**	**RNA 4900U**	—	—	16.3	14	22	13	0.3	20	8 080	8 490	14 000
16	**RNA 4901UU**	**RNA 4901U**	—	—	17.9	16	24	13	0.3	22	8 470	9 320	12 000
	—	—	**RNA 6901UU**	**RNA 6901U**	30	16	24	22	0.3	22	15 500	20 400	12 000
18	**RNA 49/14UU**	**RNA 49/14U**	—	—	19.7	18	26	13	0.3	24	9 260	10 800	11 000
20	**RNA 4902UU**	**RNA 4902U**	—	—	21.5	20	28	13	0.3	26	9 570	11 600	9 500
	—	—	**RNA 6902UU**	**RNA 6902U**	37.5	20	28	23	0.3	26	18 500	27 100	9 500
22	**RNA 4903UU**	**RNA 4903U**	—	—	23	22	30	13	0.3	28	10 300	13 100	8 500
	—	—	**RNA 6903UU**	**RNA 6903U**	40.5	22	30	23	0.3	28	19 800	30 600	8 500
25	**RNA 4904UU**	**RNA 4904U**	—	—	54.5	25	37	17	0.3	35	18 000	20 500	7 500
	—	—	**RNA 6904UU**	**RNA 6904U**	95.5	25	37	30	0.3	35	33 000	44 600	7 500
28	**RNA 49/22UU**	**RNA 49/22U**	—	—	55.5	28	39	17	0.3	37	18 300	23 700	7 000
	—	—	**RNA 69/22UU**	**RNA 69/22U**	97.5	28	39	30	0.3	37	33 800	52 000	7 000
30	**RNA 4905UU**	**RNA 4905U**	—	—	63	30	42	17	0.3	40	20 300	25 100	6 500
	—	—	**RNA 6905UU**	**RNA 6905U**	111	30	42	30	0.3	40	39 200	58 700	6 500
32	**RNA 49/28UU**	**RNA 49/28U**	—	—	75.5	32	45	17	0.3	43	21 000	26 800	6 000
	—	—	**RNA 69/28UU**	**RNA 69/28U**	133	32	45	30	0.3	43	38 900	59 100	6 000
35	**RNA 4906UU**	**RNA 4906U**	—	—	71	35	47	17	0.3	45	21 500	28 400	5 500
	—	—	**RNA 6906UU**	**RNA 6906U**	125	35	47	30	0.3	45	40 100	63 000	5 500
40	**RNA 49/32UU**	**RNA 49/32U**	—	—	94.5	40	52	20	0.6	48	29 400	44 200	5 000
	—	—	**RNA 69/32UU**	**RNA 69/32U**	170	40	52	36	0.6	48	50 300	88 300	5 000
42	**RNA 4907UU**	**RNA 4907U**	—	—	112	42	55	20	0.6	51	30 100	46 300	4 500
	—	—	**RNA 6907UU**	**RNA 6907U**	200	42	55	36	0.6	51	51 600	92 600	4 500
45	**RNA 49/38UU**	**RNA 49/38U**	—	—	119	45	58	20	0.6	54	31 600	50 400	4 000

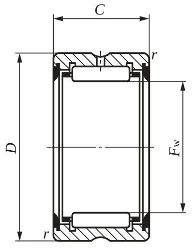
Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable rotational speed applies to grease lubrication.

Remarks 1. The outer ring has an oil groove and an oil hole.
2. Bearings are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

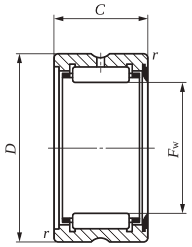
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

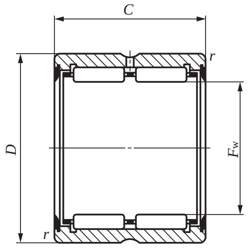
With Seal, Without Inner Ring



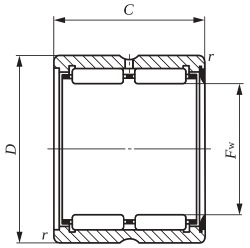
RNA49 ··· UU



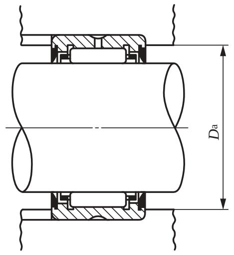
RNA49 ··· U



RNA69 ··· UU



RNA69 ··· U



Shaft dia. 48 ─ 85mm

Shaft dia. mm	Identification number With two seals	With one seal	With two seals	With one seal	Mass (Ref.) g	Boundary dimensions mm F_w	D	C	$r_{s\,min}$ (1)	Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min⁻¹
48	RNA 4908UU	RNA 4908U	—	—	150	48	62	22	0.6	58	37 200	58 400	4 000
	—	—	RNA 6908UU	RNA 6908U	270	48	62	40	0.6	58	63 700	117 000	4 000
50	RNA 49/42UU	RNA 49/42U	—	—	173	50	65	22	0.6	61	38 000	60 900	4 000
52	RNA 4909UU	RNA 4909U	—	—	197	52	68	22	0.6	64	38 900	63 400	3 500
	—	—	RNA 6909UU	RNA 6909U	355	52	68	40	0.6	64	66 600	127 000	3 500
55	RNA 49/48UU	RNA 49/48U	—	—	187	55	70	22	0.6	66	39 600	66 100	3 500
58	RNA 4910UU	RNA 4910U	—	—	177	58	72	22	0.6	68	41 300	71 100	3 500
	—	—	RNA 6910UU	RNA 6910U	320	58	72	40	0.6	68	70 800	142 000	3 500
60	RNA 49/52UU	RNA 49/52U	—	—	200	60	75	22	0.6	71	42 100	73 600	3 000
63	RNA 4911UU	RNA 4911U	—	—	265	63	80	25	1	75	52 200	85 700	3 000
	—	—	RNA 6911UU	RNA 6911U	470	63	80	45	1	75	89 400	171 000	3 000
65	RNA 49/58UU	RNA 49/58U	—	—	275	65	82	25	1	77	53 400	89 200	3 000
68	RNA 4912UU	RNA 4912U	—	—	285	68	85	25	1	80	54 500	92 800	3 000
	—	—	RNA 6912UU	RNA 6912U	505	68	85	45	1	80	93 400	186 000	3 000
70	RNA 49/62UU	RNA 49/62U	—	—	320	70	88	25	1	83	55 700	96 300	2 500
72	RNA 4913UU	RNA 4913U	—	—	325	72	90	25	1	85	56 800	99 800	2 500
	—	—	RNA 6913UU	RNA 6913U	580	72	90	45	1	85	97 400	200 000	2 500
75	RNA 49/68UU	RNA 49/68U	—	—	465	75	95	30	1	90	73 900	133 000	2 500
80	RNA 4914UU	RNA 4914U	—	—	495	80	100	30	1	95	76 900	143 000	2 500
	—	—	RNA 6914UU	RNA 6914U	910	80	100	54	1	95	124 000	281 000	2 500
85	RNA 4915UU	RNA 4915U	—	—	520	85	105	30	1	100	79 600	153 000	2 000
	—	—	RNA 6915UU	RNA 6915U	960	85	105	54	1	100	128 000	299 000	2 000

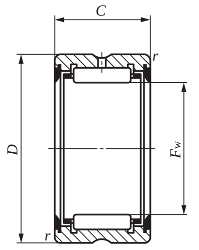
Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable rotational speed applies to grease lubrication.

Remarks1. The outer ring has an oil groove and an oil hole.
2. Bearings are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

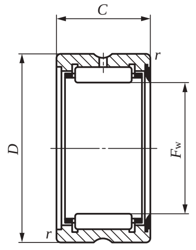
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

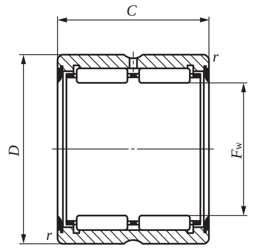
With Seal, Without Inner Ring



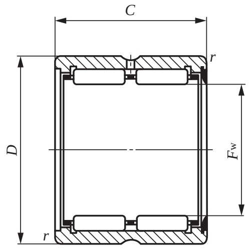
RNA49 ··· UU



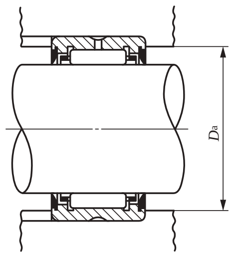
RNA49 ··· U



RNA69 ··· UU



RNA69 ··· U



Shaft dia. 90 — 160mm

Shaft dia. mm	Identification number				Mass (Ref.) g	Boundary dimensions mm				Standard mounting dimension D_a Max. mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min^{-1}
	With two seals	With one seal	With two seals	With one seal		F_w	D	C	$r_{s\,min}$(1)				
90	**RNA 4916UU**	**RNA 4916U**	—	—	545	90	110	30	1	105	80 700	158 000	2 000
	—	—	**RNA 6916UU**	**RNA 6916U**	1 010	90	110	54	1	105	132 000	317 000	2 000
95	**RNA 49/82UU**	**RNA 49/82U**	—	—	570	95	115	30	1	110	83 200	168 000	2 000
100	**RNA 4917UU**	**RNA 4917U**	—	—	695	100	120	35	1.1	113.5	103 000	225 000	1 900
	—	—	**RNA 6917UU**	**RNA 6917U**	1 300	100	120	63	1.1	113.5	168 000	448 000	1 900
105	**RNA 4918UU**	**RNA 4918U**	—	—	730	105	125	35	1.1	118.5	106 000	238 000	1 800
	—	—	**RNA 6918UU**	**RNA 6918U**	1 360	105	125	63	1.1	118.5	172 000	471 000	1 800
110	**RNA 4919UU**	**RNA 4919U**	—	—	760	110	130	35	1.1	123.5	109 000	250 000	1 700
	—	—	**RNA 6919UU**	**RNA 6919U**	1 420	110	130	63	1.1	123.5	177 000	493 000	1 700
115	**RNA 4920UU**	**RNA 4920U**	—	—	1 200	115	140	40	1.1	133.5	134 000	297 000	1 700
125	**RNA 4922UU**	**RNA 4922U**	—	—	1 280	125	150	40	1.1	143.5	140 000	322 000	1 500
135	**RNA 4924UU**	**RNA 4924U**	—	—	1 940	135	165	45	1.1	158.5	178 000	410 000	1 400
150	**RNA 4926UU**	**RNA 4926U**	—	—	2 360	150	180	50	1.5	172	206 000	511 000	1 300
160	**RNA 4928UU**	**RNA 4928U**	—	—	2 510	160	190	50	1.5	182	214 000	549 000	1 200

Notes(1) Minimum allowable value of chamfer dimension *r*

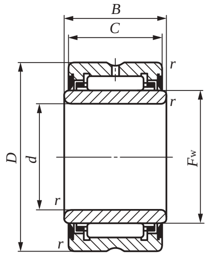
(2) Allowable rotational speed applies to grease lubrication.

Remarks1. The outer ring has an oil groove and an oil hole.

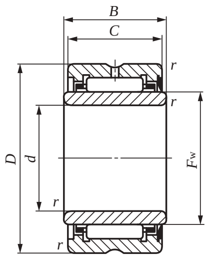
2. Bearings are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

MACHINED TYPE NEEDLE ROLLER BEARINGS

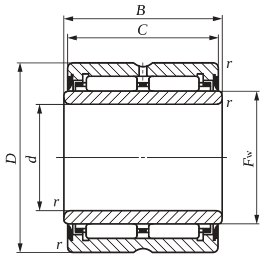
With Seal, With Inner Ring



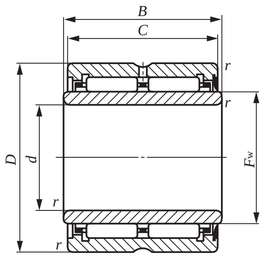
NA49 ⋯ UU
NA69 ⋯ UU(*d* ≦ 30)



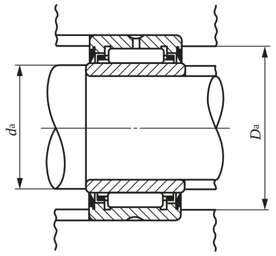
NA49 ⋯ U
NA69 ⋯ U(*d* ≦ 30)



NA69 ⋯ UU



NA69 ⋯ U



Shaft dia. 10 ― 40mm

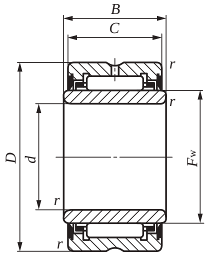
Shaft dia.	Identification number				Mass (Ref.)	Boundary dimensions mm						Standard mounting dimensions mm			Basic dynamic load rating	Basic static load rating	Allowable rotational speed(2)	Assembled inner ring
	With two seals	With one seal	With two seals	With one seal								d_a		D_a	C	C_0		
mm					g	d	D	C	B	$r_{s\,min}$ (1)	F_w	Min.	Max.	Max.	N	N	min-1	
10	**NA 4900UU**	**NA 4900U**	—	—	24.5	10	22	13	14	0.3	14	12	13	20	8 080	8 490	14 000	**LRTZ 101414**
12	**NA 4901UU**	**NA 4901U**	—	—	27.5	12	24	13	14	0.3	16	14	15	22	8 470	9 320	12 000	**LRTZ 121614**
	—	—	**NA 6901UU**	**NA 6901U**	45.5	12	24	22	23	0.3	16	14	15	22	15 500	20 400	12 000	**LRTZ 121623**
15	**NA 4902UU**	**NA 4902U**	—	—	36	15	28	13	14	0.3	20	17	19	26	9 570	11 600	9 500	**LRTZ 152014**
	—	—	**NA 6902UU**	**NA 6902U**	62.5	15	28	23	24	0.3	20	17	19	26	18 500	27 100	9 500	**LRTZ 152024**
17	**NA 4903UU**	**NA 4903U**	—	—	39.5	17	30	13	14	0.3	22	19	21	28	10 300	13 100	8 500	**LRTZ 172214**
	—	—	**NA 6903UU**	**NA 6903U**	68.5	17	30	23	24	0.3	22	19	21	28	19 800	30 600	8 500	**LRTZ 172224**
20	**NA 4904UU**	**NA 4904U**	—	—	78.5	20	37	17	18	0.3	25	22	24	35	18 000	20 500	7 500	**LRTZ 202518**
	—	—	**NA 6904UU**	**NA 6904U**	137	20	37	30	31	0.3	25	22	24	35	33 000	44 600	7 500	**LRTZ 202531**
22	**NA 49/22UU**	**NA 49/22U**	—	—	87.5	22	39	17	18	0.3	28	24	27	37	18 300	23 700	7 000	**LRTZ 222818**
	—	—	**NA 69/22UU**	**NA 69/22U**	153	22	39	30	31	0.3	28	24	27	37	33 800	52 000	7 000	**LRTZ 222831**
25	**NA 4905UU**	**NA 4905U**	—	—	92.5	25	42	17	18	0.3	30	27	29	40	20 300	25 100	6 500	**LRTZ 253018**
	—	—	**NA 6905UU**	**NA 6905U**	162	25	42	30	31	0.3	30	27	29	40	39 200	58 700	6 500	**LRTZ 253031**
28	**NA 49/28UU**	**NA 49/28U**	—	—	101	28	45	17	18	0.3	32	30	31	43	21 000	26 800	6 000	**LRTZ 283218**
	—	—	**NA 69/28UU**	**NA 69/28U**	177	28	45	30	31	0.3	32	30	31	43	38 900	59 100	6 000	**LRTZ 283231**
30	**NA 4906UU**	**NA 4906U**	—	—	106	30	47	17	18	0.3	35	32	34	45	21 500	28 400	5 500	**LRTZ 303518**
	—	—	**NA 6906UU**	**NA 6906U**	185	30	47	30	31	0.3	35	32	34	45	40 100	63 000	5 500	**LRTZ 303531**
32	**NA 49/32UU**	**NA 49/32U**	—	—	167	32	52	20	21	0.6	40	36	39	48	29 400	44 200	5 000	**LRTZ 324021**
	—	—	**NA 69/32UU**	**NA 69/32U**	300	32	52	36	37	0.6	40	36	39	48	50 300	88 300	5 000	**LRTZ 324037**
35	**NA 4907UU**	**NA 4907U**	—	—	179	35	55	20	21	0.6	42	39	41	51	30 100	46 300	4 500	**LRTZ 354221**
	—	—	**NA 6907UU**	**NA 6907U**	320	35	55	36	37	0.6	42	39	41	51	51 600	92 600	4 500	**LRTZ 354237**
40	**NA 4908UU**	**NA 4908U**	—	—	245	40	62	22	23	0.6	48	44	47	58	37 200	58 400	4 000	**LRTZ 404823**
	—	—	**NA 6908UU**	**NA 6908U**	440	40	62	40	41	0.6	48	44	47	58	63 700	117 000	4 000	**LRTZ 404841**

Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable rotational speed applies to grease lubrication.

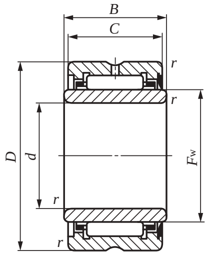
Remarks1. The outer ring has an oil groove and an oil hole.
2. Bearings are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

MACHINED TYPE NEEDLE ROLLER BEARINGS

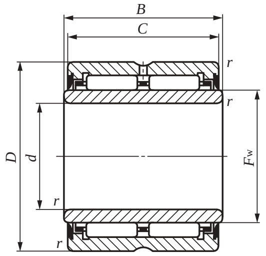
With Seal, With Inner Ring



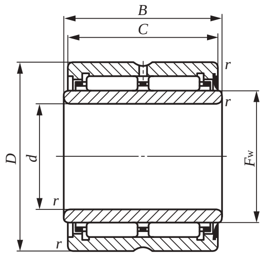
NA49 ··· UU



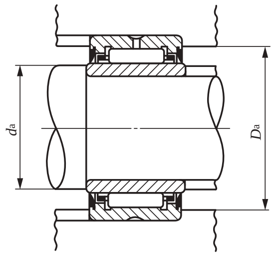
NA49 ··· U



NA69 ··· UU



NA69 ··· U



Shaft dia. 45 — 110mm

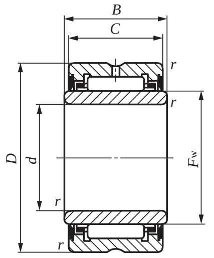
Shaft dia. mm	Identification number				Mass (Ref.) g	Boundary dimensions mm				(1) $r_{s\,min}$	F_w	Standard mounting dimensions mm			Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min⁻¹	Assembled inner ring
	With two seals	With one seal	With two seals	With one seal		d	D	C	B			d_a Min.	d_a Max.	D_a Max.				
45	**NA 4909UU**	**NA 4909U**	—	—	290	45	68	22	23	0.6	52	49	51	64	38 900	63 400	3 500	**LRTZ 455223**
	—	—	**NA 6909UU**	**NA 6909U**	520	45	68	40	41	0.6	52	49	51	64	66 600	127 000	3 500	**LRTZ 455241**
50	**NA 4910UU**	**NA 4910U**	—	—	295	50	72	22	23	0.6	58	54	57	68	41 300	71 100	3 500	**LRTZ 505823**
	—	—	**NA 6910UU**	**NA 6910U**	530	50	72	40	41	0.6	58	54	57	68	70 800	142 000	3 500	**LRTZ 505841**
55	**NA 4911UU**	**NA 4911U**	—	—	415	55	80	25	26	1	63	60	61	75	52 200	85 700	3 000	**LRTZ 556326**
	—	—	**NA 6911UU**	**NA 6911U**	730	55	80	45	46	1	63	60	61	75	89 400	171 000	3 000	**LRTZ 556346**
60	**NA 4912UU**	**NA 4912U**	—	—	445	60	85	25	26	1	68	65	66	80	54 500	92 800	3 000	**LRTZ 606826**
	—	—	**NA 6912UU**	**NA 6912U**	785	60	85	45	46	1	68	65	66	80	93 400	186 000	3 000	**LRTZ 606846**
65	**NA 4913UU**	**NA 4913U**	—	—	475	65	90	25	26	1	72	70	70.5	85	56 800	99 800	2 500	**LRTZ 657226**
	—	—	**NA 6913UU**	**NA 6913U**	845	65	90	45	46	1	72	70	70.5	85	97 400	200 000	2 500	**LRTZ 657246**
70	**NA 4914UU**	**NA 4914U**	—	—	770	70	100	30	31	1	80	75	78	95	76 900	143 000	2 500	**LRTZ 708031**
	—	—	**NA 6914UU**	**NA 6914U**	1 400	70	100	54	55	1	80	75	78	95	124 000	281 000	2 500	**LRTZ 708055**
75	**NA 4915UU**	**NA 4915U**	—	—	815	75	105	30	31	1	85	80	83	100	79 600	153 000	2 000	**LRTZ 758531**
	—	—	**NA 6915UU**	**NA 6915U**	1 480	75	105	54	55	1	85	80	83	100	128 000	299 000	2 000	**LRTZ 758555**
80	**NA 4916UU**	**NA 4916U**	—	—	860	80	110	30	31	1	90	85	88	105	80 700	158 000	2 000	**LRTZ 809031**
	—	—	**NA 6916UU**	**NA 6916U**	1 570	80	110	54	55	1	90	85	88	105	132 000	317 000	2 000	**LRTZ 809055**
85	**NA 4917UU**	**NA 4917U**	—	—	1 300	85	120	35	36	1.1	100	91.5	98	113.5	103 000	225 000	1 900	**LRTZ 8510036**
	—	—	**NA 6917UU**	**NA 6917U**	2 360	85	120	63	64	1.1	100	91.5	98	113.5	168 000	448 000	1 900	**LRTZ 8510064**
90	**NA 4918UU**	**NA 4918U**	—	—	1 360	90	125	35	36	1.1	105	96.5	103	118.5	106 000	238 000	1 800	**LRTZ 9010536**
	—	—	**NA 6918UU**	**NA 6918U**	2 480	90	125	63	64	1.1	105	96.5	103	118.5	172 000	471 000	1 800	**LRTZ 9010564**
95	**NA 4919UU**	**NA 4919U**	—	—	1 420	95	130	35	36	1.1	110	101.5	108	123.5	109 000	250 000	1 700	**LRTZ 9511036**
	—	—	**NA 6919UU**	**NA 6919U**	2 600	95	130	63	64	1.1	110	101.5	108	123.5	177 000	493 000	1 700	**LRTZ 9511064**
100	**NA 4920UU**	**NA 4920U**	—	—	1 980	100	140	40	41	1.1	115	106.5	113	133.5	134 000	297 000	1 700	**LRTZ 10011541**
110	**NA 4922UU**	**NA 4922U**	—	—	2 150	110	150	40	41	1.1	125	116.5	123	143.5	140 000	322 000	1 500	**LRTZ 11012541**

Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable rotational speed applies to grease lubrication.

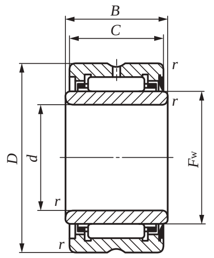
Remarks1. The outer ring has an oil groove and an oil hole.
2. Bearings are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

MACHINED TYPE NEEDLE ROLLER BEARINGS

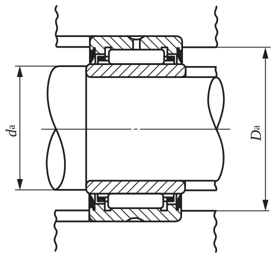
With Seal, With Inner Ring



NA49 ··· UU



NA49 ··· U



Shaft dia. 120 — 140mm

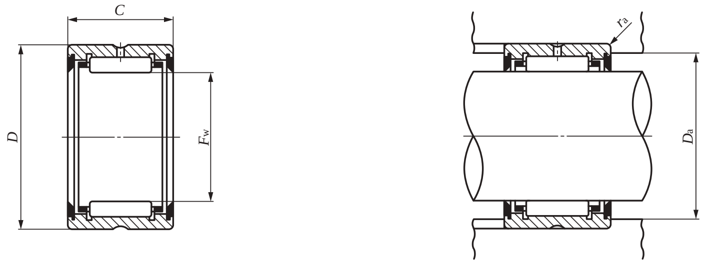
Shaft dia. mm	Identification number				Mass (Ref.) g	Boundary dimensions mm				$r_{s\,min}$(1)	F_w	Standard mounting dimensions mm			Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min^{-1}	Assembled inner ring
	With two seals	With one seal	With two seals	With one seal		d	D	C	B			d_a Min.	d_a Max.	D_a Max.				
120	**NA 4924UU**	**NA 4924U**	—	—	2 990	120	165	45	46	1.1	135	126.5	133	158.5	178 000	410 000	1 400	**LRTZ 12013546**
130	**NA 4926UU**	**NA 4926U**	—	—	4 080	130	180	50	51	1.5	150	138	148	172	206 000	511 000	1 300	**LRTZ 13015051**
140	**NA 4928UU**	**NA 4928U**	—	—	4 340	140	190	50	51	1.5	160	148	158	182	214 000	549 000	1 200	**LRTZ 14016051**

Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable rotational speed applies to grease lubrication.

Remarks1. The outer ring has an oil groove and an oil hole.
2. Bearings are provided with prepacked grease. Bearings with a seal on one side are not provided with prepacked grease. Perform proper lubrication for use.

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, Without Inner Ring, Inch Series



BR···UU

Shaft dia. 15.875 – 50.800mm

Shaft dia. mm (inch)	Identification number With two seals	Mass (Ref.) g	Boundary dimensions mm(inch) F_w	D	C	Standard mounting dimensions mm D_a Max.	$r_{as\ max}$(1)	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min⁻¹
15.875 (5/8)	**BR 101816 UU**	54	15.875 (5/8)	28.575 (1 1/8)	25.400 (1)	24.5	0.6	18 300	20 000	12 000
19.050 (3/4)	**BR 122016 UU**	68	19.050 (3/4)	31.750 (1 1/4)	25.400 (1)	26.5	1.0	20 700	24 400	10 000
22.225 (7/8)	**BR 142216 UU**	76	22.225 (7/8)	34.925 (1 3/8)	25.400 (1)	29.7	1.0	21 600	26 900	9 000
25.400 (1)	**BR 162416 UU**	83	25.400 (1)	38.100 (1 1/2)	25.400 (1)	32.9	1.0	23 600	31 300	8 000
28.575 (1 1/8)	**BR 182620 UU**	115	28.575 (1 1/8)	41.275 (1 5/8)	31.750 (1 1/4)	36.0	1.0	34 900	49 900	7 000
31.750 (1 1/4)	**BR 202820 UU**	124	31.750 (1 1/4)	44.450 (1 3/4)	31.750 (1 1/4)	39.2	1.0	36 000	53 500	6 500
34.925 (1 3/8)	**BR 223020 UU**	134	34.925 (1 3/8)	47.625 (1 7/8)	31.750 (1 1/4)	42.4	1.0	38 500	60 000	5 500
38.100 (1 1/2)	**BR 243320 UU**	168	38.100 (1 1/2)	52.388 (2 1/16)	31.750 (1 1/4)	45.1	1.5	43 700	66 900	5 500
41.275 (1 5/8)	**BR 263520 UU**	179	41.275 (1 5/8)	55.562 (2 3/16)	31.750 (1 1/4)	48.3	1.5	44 800	70 900	4 500
44.450 (1 3/4)	**BR 283720 UU**	193	44.450 (1 3/4)	58.738 (2 5/16)	31.750 (1 1/4)	51.5	1.5	47 500	78 200	4 500
47.625 (1 7/8)	**BR 303920 UU**	202	47.625 (1 7/8)	61.912 (2 7/16)	31.750 (1 1/4)	54.7	1.5	48 500	82 100	4 000
50.800 (2)	**BR 324120 UU**	216	50.800 (2)	65.088 (2 9/16)	31.750 (1 1/4)	57.8	1.5	51 000	89 400	4 000

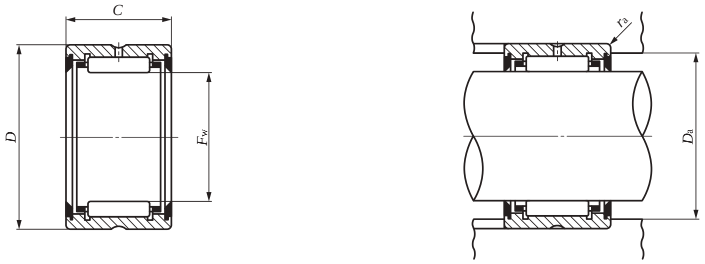
Notes(1) Maximum permissible corner radius of the housing
(2) Allowable rotational speed applies to grease lubrication.

Remarks 1. The outer ring has an oil groove and an oil hole.
2. Bearings are provided with prepacked grease.
3. If one side sealed type are needed, please contact IKO.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, Without Inner Ring, Inch Series



BR ··· UU

Shaft dia. 57.150 ─ 95.250mm

Shaft dia. mm (inch)	Identification number With two seals	Mass (Ref.) g	Boundary dimensions mm(inch) F_w	D	C	Standard mounting dimensions mm D_a Max.	$r_{as\ max}$(1)	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min⁻¹
57.150 (2 1/4)	**BR 364828 UU**	459	57.150 (2 1/4)	76.200 (3)	44.450 (1 3/4)	69.0	1.5	90 300	158 000	3 500
63.500 (2 1/2)	**BR 405228 UU**	499	63.500 (2 1/2)	82.550 (3 1/4)	44.450 (1 3/4)	74.3	2.0	94 600	174 000	3 000
69.850 (2 3/4)	**BR 445628 UU**	540	69.850 (2 3/4)	88.900 (3 1/2)	44.450 (1 3/4)	80.7	2.0	98 700	189 000	2 500
76.200 (3)	**BR 486028 UU**	585	76.200 (3)	95.250 (3 3/4)	44.450 (1 3/4)	87.0	2.0	105 000	211 000	2 500
82.550 (3 1/4)	**BR 526828 UU**	891	82.550 (3 1/4)	107.950 (4 1/4)	44.450 (1 3/4)	99.7	2.0	109 000	227 000	2 500
88.900 (3 1/2)	**BR 567232 UU**	1 098	88.900 (3 1/2)	114.300 (4 1/2)	50.800 (2)	106.1	2.0	142 000	265 000	2 000
95.250 (3 3/4)	**BR 607632 UU**	1 161	95.250 (3 3/4)	120.650 (4 3/4)	50.800 (2)	111.4	2.5	148 000	287 000	2 000

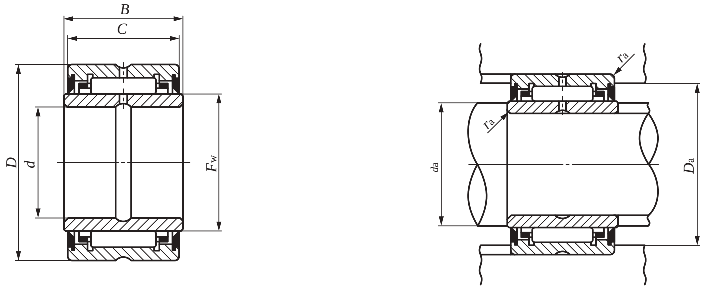
Notes(1) Maximum permissible corner radius of the housing
(2) Allowable rotational speed applies to grease lubrication.

Remarks
1. The outer ring has an oil groove and an oil hole.
2. Bearings are provided with prepacked grease.
3. If one side sealed type are needed, please contact IKO.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, With Inner Ring, Inch Series



BRI ··· UU

Shaft dia. 9.525 − 44.450mm

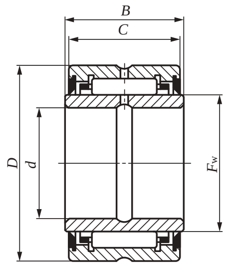
Shaft dia. mm (inch)	Identification number	Mass (Ref.)	Boundary dimensions mm(inch)					Standard mounting dimensions mm				Basic dynamic load rating	Basic static load rating	Allowable rotational speed(2)	Assembled inner ring
	With two seals	g	d	D	C	B	F_w	d_a Min.	d_a Max.	D_a Max.	$r_{as\ max}$(1)	C N	C_0 N	min⁻¹	
9.525 (3⁄8)	**BRI 61816 UU**	79	9.525 (3⁄8)	28.575 (1 1⁄8)	25.400 (1)	25.650	15.875 (5⁄8)	14	14.5	24.5	0.6	18 300	20 000	12 000	**LRBZ 61016 B**
12.700 (1⁄2)	**BRI 82016 UU**	99	12.700 (1⁄2)	31.750 (1 1⁄4)	25.400 (1)	25.650	19.050 (3⁄4)	17.5	18	26.5	0.6	20 700	24 400	10 000	**LRBZ 81216 B**
15.875 (5⁄8)	**BRI 102216 UU**	113.5	15.875 (5⁄8)	34.925 (1 3⁄8)	25.400 (1)	25.650	22.225 (7⁄8)	21	21.2	29.7	0.6	21 600	26 900	9 000	**LRBZ 101416 B**
19.050 (3⁄4)	**BRI 122416 UU**	127	19.050 (3⁄4)	38.100 (1 1⁄2)	25.400 (1)	25.650	25.400 (1)	24	24.4	32.9	0.6	23 600	31 300	8 000	**LRBZ 121616 B**
22.225 (7⁄8)	**BRI 142620 UU**	177	22.225 (7⁄8)	41.275 (1 5⁄8)	31.750 (1 1⁄4)	32.000	28.575 (1 1⁄8)	27	27.5	36.0	0.6	34 900	49 900	7 000	**LRBZ 141820 B**
25.400 (1)	**BRI 162820 UU**	196	25.400 (1)	44.450 (1 3⁄4)	31.750 (1 1⁄4)	32.000	31.750 (1 1⁄4)	30.5	30.7	39.2	0.6	36 000	53 500	6 500	**LRBZ 162020 B**
28.575 (1 1⁄8)	**BRI 183020 UU**	211	28.575 (1 1⁄8)	47.625 (1 7⁄8)	31.750 (1 1⁄4)	32.000	34.925 (1 3⁄8)	33.5	33.9	42.4	0.6	38 500	60 000	5 500	**LRBZ 182220 B**
31.750 (1 1⁄4)	**BRI 203320 UU**	254	31.750 (1 1⁄4)	52.388 (2 1⁄16)	31.750 (1 1⁄4)	32.000	38.100 (1 1⁄2)	37	37.1	45.1	0.6	43 700	66 900	5 500	**LRBZ 202420 B**
34.925 (1 3⁄8)	**BRI 223520 UU**	275	34.925 (1 3⁄8)	55.562 (2 3⁄16)	31.750 (1 1⁄4)	32.000	41.275 (1 5⁄8)	40.2	40.2	48.3	0.6	44 800	70 900	4 500	**LRBZ 222620 B**
38.100 (1 1⁄2)	**BRI 243720 UU** **BRI 243920 UU**	293 362	38.100 (1 1⁄2) 38.100 (1 1⁄2)	58.738 (2 5⁄16) 61.912 (2 7⁄16)	31.750 (1 1⁄4) 31.750 (1 1⁄4)	32.000 32.000	44.450 (1 3⁄4) 47.625 (1 7⁄8)	43.3 43.3	43.4 45	51.5 54.7	0.6 1	47 500 48 500	78 200 82 100	4 500 4 000	**LRBZ 242820 B** **LRBZ 243020 B**
41.275 (1 5⁄8)	**BRI 264120 UU**	386	41.275 (1 5⁄8)	65.088 (2 9⁄16)	31.750 (1 1⁄4)	32.000	50.800 (2)	48	49	57.8	1	51 000	89 400	4 000	**LRBZ 263220 B**
44.450 (1 3⁄4)	**BRI 284828 UU**	804	44.450 (1 3⁄4)	76.200 (3)	44.450 (1 3⁄4)	44.700	57.150 (2 1⁄4)	52.5	55	69.0	1.5	90 300	158 000	3 500	**LRBZ 283628 B**

Notes(1) Maximum permissible corner radius of the shaft or housing
(2) Allowable rotational speed applies to grease lubrication.

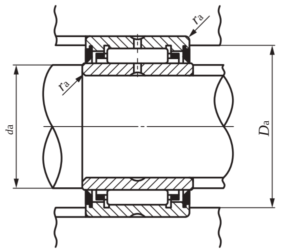
Remarks 1. The inner ring and the outer ring each have an oil groove and an oil hole.
2. Bearings are provided with prepacked grease.
3. If one side sealed type are needed, please contact IKO.

MACHINED TYPE NEEDLE ROLLER BEARINGS

With Seal, With Inner Ring, Inch Series



BRI ··· UU



Shaft dia. 50.800 ─ 82.550mm

Shaft dia. mm (inch)	Identification number	Mass (Ref.)	Boundary dimensions mm(inch)					Standard mounting dimensions mm				Basic dynamic load rating	Basic static load rating	Allowable rotational speed(2)	Assembled inner ring
	With two seals	g	d	D	C	B	F_w	d_a Min.	d_a Max.	D_a Max.	$r_{as\ max}$(1)	C N	C_0 N	min-1	
50.800 (2)	**BRI 325228 UU**	889	50.800 (2)	82.550 (3 1/4)	44.450 (1 3/4)	44.700	63.500 (2 1/2)	58	61	74.3	1.5	94 600	174 000	3 000	**LRBZ 324028 B**
57.150 (2 1/4)	**BRI 365628 UU**	980	57.150 (2 1/4)	88.900 (3 1/2)	44.450 (1 3/4)	44.700	69.850 (2 3/4)	65	67	80.7	1.5	98 700	189 000	2 500	**LRBZ 364428 B**
63.500 (2 1/2)	**BRI 406028 UU**	1 065	63.500 (2 1/2)	95.250 (3 3/4)	44.450 (1 3/4)	44.700	76.200 (3)	71	73	87.0	1.5	105 000	211 000	2 500	**LRBZ 404828 B**
69.850 (2 3/4)	**BRI 446828 UU**	1 421	69.850 (2 3/4)	107.950 (4 1/4)	44.450 (1 3/4)	44.700	82.550 (3 1/4)	77	79	99.7	1.5	109 000	227 000	2 500	**LRBZ 445228 B**
76.200 (3)	**BRI 487232 UU**	1 738	76.200 (3)	114.300 (4 1/2)	50.800 (2)	51.050	88.900 (3 1/2)	83.5	86	106.1	1.5	142 000	265 000	2 000	**LRBZ 485632 B**
82.550 (3 1/4)	**BRI 527632 UU**	1 851	82.550 (3 1/4)	120.650 (4 3/4)	50.800 (2)	51.050	95.250 (3 3/4)	91	93	111.4	1.5	148 000	287 000	2 000	**LRBZ 526032 B**

Notes(1) Maximum permissible corner radius of the shaft or housing
(2) Allowable rotational speed applies to grease lubrication.

Remarks1. The inner ring and the outer ring each have an oil groove and an oil hole.
2. Bearings are provided with prepacked grease.
3. If one side sealed type are needed, please contact IKO.

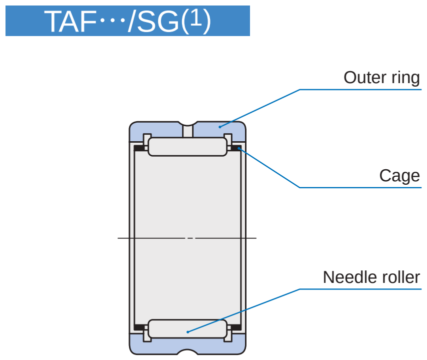
C-LUBE
MACHINED TYPE NEEDLE ROLLER BEARINGS

Structure and features

C-Lube Machined Type Needle Roller Bearing is a bearing that is lubricated with a newly developed thermosetting solid-type lubricant. A large amount of lubricating oil and fine particles of ultra high molecular weight polyolefin resin are solidified by heat treatment to fill the inner space of the bearing. As the bearing rotates, the lubricating oil oozes out onto the raceway in proper quantities, maintaining the lubrication performance for a long period of time.

C-Lube Machined Type Needle Roller Bearings are bearings with a low sectional height and large load ratings. The outer ring has high rigidity and can easily be used even for light alloy housings.

Structure of C-Lube Machined Type Needle Roller Bearing



Note(1) Thermosetting solid-type lubricant fills inner space of the bearing.

Type

C-Lube Machined Type Needle Roller Bearing is available in type shown in Table 1.

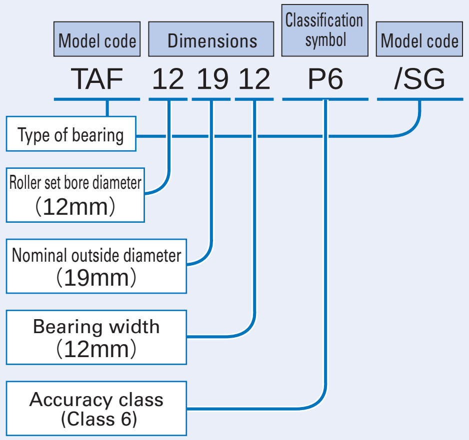
Table 1 Type of bearing

Type Series		Needle bearing with cage
		Without inner ring
Metric series	For light duty	TAF···/SG

Identification number

The identification number of C-Lube Machined Type Needle Roller Bearing consists of model code, dimensions and classification symbol. Example is shown below.

Example of identification number



Accuracy

C-Lube Machined Type Needle Roller Bearings are manufactured based on JIS (See page A31.). The tolerances for the smallest single roller set bore diameter of bearings without inner ring are based on Table 14 on page A33.

Fit

The recommended fits for C-Lube Machined Type Needle Roller Bearings are shown in Tables 21 to 23 on pages A41 and A42.

Allowable Rotational Speed

The allowable rotational speed of C-Lube Machined Type Needle Roller Bearing is affected by mounting and operating conditions. The reference $d_m n$ value (1) is 20,000.

Note(1) $d_m n$ value = {(Bore diameter of bearing [mm] + Outside diameter of bearing [mm])/2} x rotational speed [min^{-1}]

Lubrication

As the internal space of C-Lube Machined Type Needle Roller Bearing is filled with thermosetting solid-type lubricant C-Lube, regreasing is not possible due to the structure.

Oil hole

Table 2 shows the number of oil holes on the outer ring.

Table 2 Number of oil holes of outer ring

Nominal roller set bore diameter F_w mm	Number of hole holes of outer ring
$F_w \leqq 26$	0
$26 < F_w$	1

Remark If there is oil hole on the outer ring, care must be exercised not to let oil holes within the load range.

Mounting

❶ Mounting dimensions for C-Lube Machined Type Needle Roller Bearings are shown in the table of dimensions.
❷ When mounting, pay special attention to avoid locating the oil hole within the loading zone. This may lead to a short bearing life.

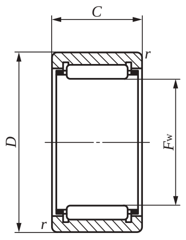
Precaution for Use

❶ Do not wash C-Lube Machined Type Needle Roller Bearing with organic solvent and/or white kerosene, which have the ability of removing fat nor leave them in contact with the above agents.
❷ To ensure normal rotation of the C-Lube Machined Type Needle Roller Bearing, apply a load of 1% or over of the dynamic load rating at use.
❸ The operating temperature range is -15～+80˚C. For continuous operation, the recommended operating temperature is +60˚C or less.
❹ When using two or more C-Lube Machined Type Needle Roller Bearings adjacent to each other on the same shaft, it is necessary to obtain an even load distribution. On request, a set of bearings is available, in which bearings are matched to obtain an even load distribution.

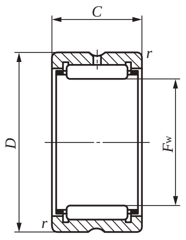
Further, C-Lube Machined Type Needle Roller Bearing for food machinery is also available. If needed, please contact IKO.

C-LUBE MACHINED TYPE NEEDLE ROLLER BEARINGS

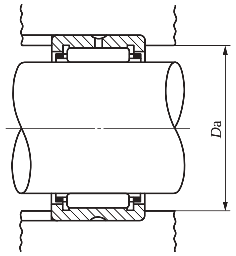
Without Inner Ring



TAF⋯/SG
$F_w \leqq 26$



TAF⋯/SG
$F_w > 26$



Shaft dia. 10－45mm

Shaft dia.	Identification number	Mass (Ref.)	Boundary dimensions mm				Standard mounting dimension	Basic dynamic load rating	Basic static load rating
			F_w	D	C	$r_{s\ min}$(1)	D_a	C	C_0
		g					Max. mm	N	N
10	**TAF 101712/SG**	11	10	17	12	0.2	15.4	5 880	5 970
	TAF 101716/SG	14.7	10	17	16	0.2	15.4	8 230	9 190
12	**TAF 121912/SG**	12.5	12	19	12	0.3	17	6 610	7 260
	TAF 121916/SG	16.8	12	19	16	0.3	17	9 250	11 200
14	**TAF 142216/SG**	22	14	22	16	0.3	20	11 700	13 700
	TAF 142220/SG	27.5	14	22	20	0.3	20	14 800	18 600
15	**TAF 152316/SG**	23.5	15	23	16	0.3	21	12 300	14 900
	TAF 152320/SG	29	15	23	20	0.3	21	15 600	20 200
16	**TAF 162416/SG**	24	16	24	16	0.3	22	12 300	15 100
	TAF 162420/SG	30	16	24	20	0.3	22	15 500	20 400
18	**TAF 182616/SG**	26.5	18	26	16	0.3	24	13 400	17 500
	TAF 182620/SG	33	18	26	20	0.3	24	17 000	23 600
19	**TAF 192716/SG**	28	19	27	16	0.3	25	14 000	18 700
	TAF 192720/SG	35.5	19	27	20	0.3	25	17 700	25 300
20	**TAF 202816/SG**	28.5	20	28	16	0.3	26	13 900	18 800
	TAF 202820/SG	37	20	28	20	0.3	26	17 600	25 400
21	**TAF 212916/SG**	30	21	29	16	0.3	27	14 400	20 000
	TAF 212920/SG	37.5	21	29	20	0.3	27	18 200	27 100
22	**TAF 223016/SG**	31	22	30	16	0.3	28	14 900	21 200
	TAF 223020/SG	39	22	30	20	0.3	28	18 900	28 700
24	**TAF 243216/SG**	33	24	32	16	0.3	30	15 300	22 500
	TAF 243220/SG	42	24	32	20	0.3	30	19 400	30 500
25	**TAF 253316/SG**	35	25	33	16	0.3	31	15 800	23 700
	TAF 253320/SG	43.5	25	33	20	0.3	31	20 000	32 100
29	**TAF 293820/SG**	59	29	38	20	0.3	36	21 600	37 200
	TAF 293830/SG	88	29	38	30	0.3	36	30 900	59 100
30	**TAF 304020/SG**	67	30	40	20	0.3	38	25 100	40 100
	TAF 304030/SG	101	30	40	30	0.3	38	36 000	63 900
35	**TAF 354520/SG**	76.5	35	45	20	0.3	43	26 900	46 200
	TAF 354530/SG	116.5	35	45	30	0.3	43	38 600	73 600
40	**TAF 405020/SG**	86	40	50	20	0.3	48	29 400	54 100
	TAF 405030/SG	130	40	50	30	0.3	48	42 300	86 200
45	**TAF 455520/SG**	95.5	45	55	20	0.3	53	31 000	60 200
	TAF 455530/SG	144	45	55	30	0.3	53	44 600	95 800

Note(1) Minimum allowable value of chamfer dimension r.

Remarks1. Models with a nominal roller set bore diameter F_w of 26mm or less are provided without oil holes. other models are provided with one oil hole and oil groove.

2. This bearing can not be re-lubricated as thermosetting solid-type lubricant C-Lube fills inner space of the bearing.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

●Needle Roller Bearings with Separable Cage - Without Inner Ring

●Needle Roller Bearings with Separable Cage - With Inner Ring

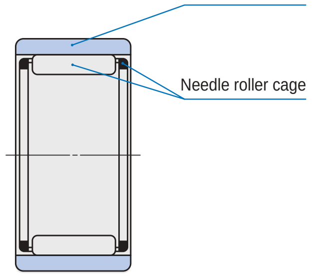
Structure and Features

In IKO Needle Roller Bearings with Separable Cage, the inner ring, outer ring and IKO Needle Roller Cage are combined, and they can be separated easily. This type has a simple structure with high accuracy. In addition, the radial clearance can be freely chosen by selecting and combining these component parts. As Needle Roller Cages are used, these bearings have excellent rotational performance.

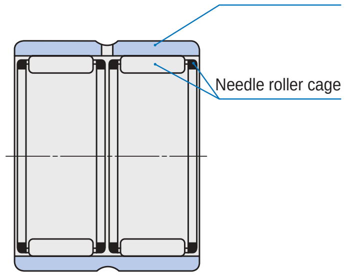
These bearings are most suitable for mass-production high accuracy products such as machine tools, textile machinery, and printing machines.

Structures of Needle Roller Bearings with Separable Cage

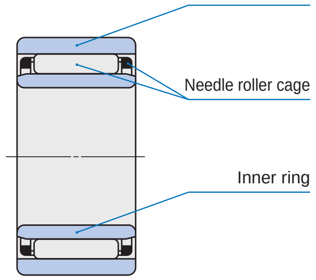
RNAF



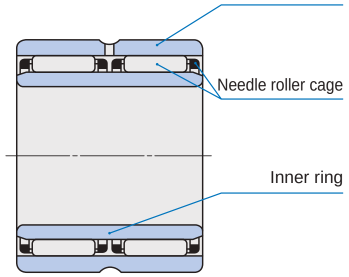
RNAFW



NAF



NAFW



Types

Needle Roller Bearings with Separable Cage are available in the types shown in Table 1.

Table 1 Type of bearing

Type	Single-row		Double-row	
	Without inner ring	With inner ring	Without inner ring	With inner ring
Model code	RNAF	NAF	RNAFW	NAFW

Needle Roller Bearings with Separable Cage - Without Inner Ring

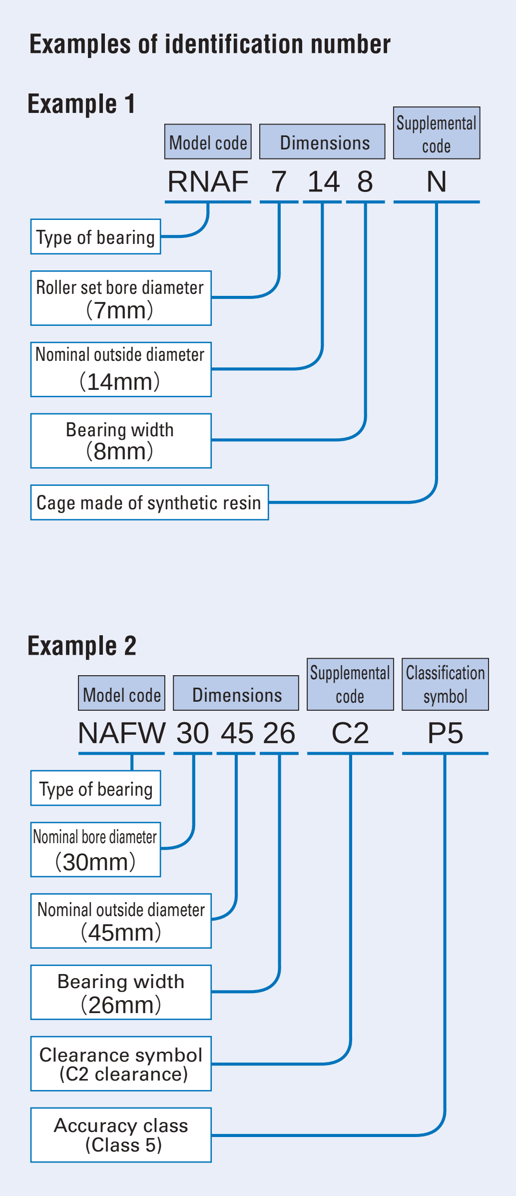
The single-row as well as the double-row types are available with the same sectional height, and either of them can be selected according to load conditions. As shown in the section, "Design of shaft and housing" on page A44, any desired radial internal clearance can be selected by combining a shaft which is heat-treated and finished by grinding.

Needle Roller Bearings with Separable Cage - With Inner Ring

These bearings are made to the CN clearance shown in Table 19 on page A37. When especially high accuracy is required, it is possible to supply semi-finished inner rings which have a finishing allowance on their outside diameter so that they can be ground after being press-fitted to shafts.

Identification Number

The identification number of Needle Roller Bearings with Separable Cage consists of a model code, dimensions, any supplemental codes and a classification symbol. The arrangement examples are as follows.



Accuracy

Needle Roller Bearings with Separable Cage are manufactured to the accuracy based on JIS (See page A31.). Tolerances for the smallest single roller set bore diameter of bearings without inner ring are based on Table 14 on page A33.

Clearance

Radial internal clearances of Needle Roller Bearings with Separable Cage are made to the CN clearance shown in Table 18 on page A37.

Fit

Recommended fits for Needle Roller Bearings with Separable Cage are shown in Tables 21 to 23 on pages A41 and A42.

Lubrication

Needle Roller Bearings with Separable Cage are not provided with prepacked grease. Perform proper lubrication for use. Using them without lubrication will increase the wear of the rolling contact surfaces and shorten their lives.

Oil Hole

The double-row type outer rings have both an oil hole and an oil groove, but the single-row type outer rings do not. When outer rings with an oil hole are required, attach "-OH" before the clearance symbol in the identification number, and when outer rings with both an oil hole and an oil groove are required, attach "-OG" to the same position.
Example: NAF 203517 - OH C2 P6
When outer rings with multiple oil holes or inner rings with oil hole(s) are required, please contact IKO.

Operating temperature range

For synthetic resin cages, "N" is added at the end of the identification number. The operating temperature range for Needle Roller Bearings with Separable Cage is -20～+120˚C. However, the maximum allowable temperature for synthetic resin cages is +110˚C, and when they are continuously operated, it is +100˚C.

Mounting

Mounting examples of Needle Roller Bearings with Separable Cage are shown in Fig.1.
When mounting Needle Roller Bearings with Separable Cage, it is necessary to locate the needle cage axially. The needle cage is guided by shoulders of the shaft and housing or by side plates, and their guide surfaces must be heat-treated and finished by grinding at right angles to the shaft central axis.
Dimensions related to mounting are shown in the table of dimensions.

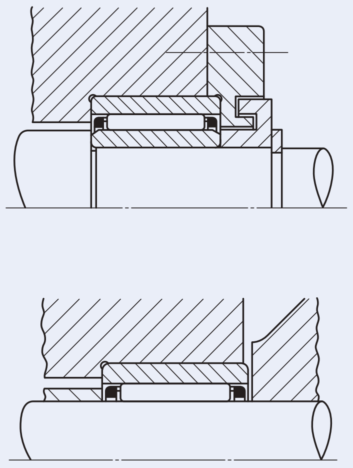
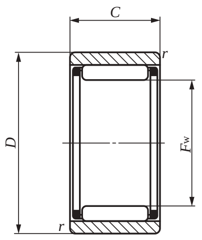


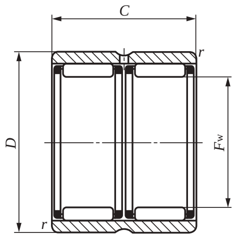
Fig.1 Mounting examples

NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

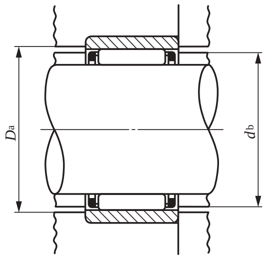
Without Inner Ring

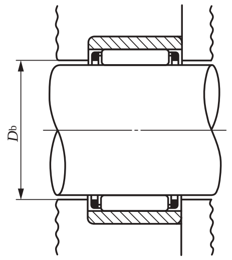


RNAF



RNAFW





Shaft dia. 5 ─ 18mm

Shaft dia.	Identification number	Mass (Ref.)	Boundary dimensions mm				Standard mounting dimensions mm			Basic dynamic load rating	Basic static load rating	Allowable rotational speed(2)
mm		g	F_w	D	C	$r_{s\,min}$(1)	d_b	D_a Max.	D_b	C N	C_0 N	min⁻¹
5	**RNAF 5108N**	2.8	5	10	8	0.2	6.7	8.4	5.4	2 420	1 950	85 000
6	**RNAF 6138N**	5.5	6	13	8	0.3	8.4	11	6.4	2 700	2 320	75 000
7	**RNAF 7148N**	6.1	7	14	8	0.3	9.4	12	7.4	2 960	2 690	65 000
8	**RNAF 81510**	8.2	8	15	10	0.3	10.4	13	8.4	3 630	3 600	60 000
	RNAFW 81620	20.5	8	16	20	0.3	10.8	14	8.4	6 220	7 200	60 000
10	**RNAF 101710**	9.6	10	17	10	0.3	12.4	15	10.4	4 160	4 550	50 000
	RNAF 102012	18.7	10	20	12	0.3	13.5	18	10.4	5 940	6 000	50 000
12	**RNAF 122212**	19.5	12	22	12	0.3	15.5	20	12.4	9 030	8 460	40 000
14	**RNAF 142213**	18.7	14	22	13	0.3	17.6	20	14.6	7 860	9 410	35 000
	RNAFW 142220	28.5	14	22	20	0.3	17.6	20	14.6	10 800	14 200	35 000
	RNAF 142612	29	14	26	12	0.3	19.4	24	14.6	9 790	9 680	35 000
15	**RNAF 152313**	19.7	15	23	13	0.3	18.6	21	15.6	8 250	10 200	35 000
	RNAFW 152320	30.5	15	23	20	0.3	18.6	21	15.6	11 400	15 400	35 000
16	**RNAF 162413**	21	16	24	13	0.3	19.6	22	16.6	8 620	11 000	30 000
	RNAFW 162420	32	16	24	20	0.3	19.6	22	16.6	11 900	16 700	30 000
	RNAF 162812	31.5	16	28	12	0.3	21.4	26	16.6	10 500	10 900	30 000
17	**RNAF 172513**	22	17	25	13	0.3	20.6	23	17.6	8 980	11 800	30 000
	RNAFW 172520	33.5	17	25	20	0.3	20.6	23	17.6	12 400	17 900	30 000
18	**RNAF 182613**	23	18	26	13	0.3	21.6	24	18.6	9 330	12 700	30 000
	RNAFW 182620	35	18	26	20	0.3	21.6	24	18.6	12 900	19 100	30 000
	RNAF 183012	34.5	18	30	12	0.3	23.4	28	18.6	11 800	13 100	30 000
	RNAFW 183024	69.5	18	30	24	0.3	23.4	28	18.6	20 200	26 200	30 000

Notes(1) Minimum allowable value of chamfer dimension *r*

(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.

Remarks1. The character "N" at the end of the identification number indicates that a synthetic resin cage is incorporated.

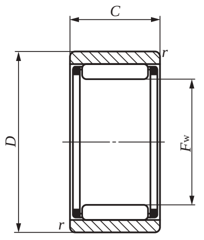
2. RNAF has no oil hole. RNAFW is provided with an oil groove and an oil hole on the outer ring.

3. No grease is prepacked. Perform proper lubrication.

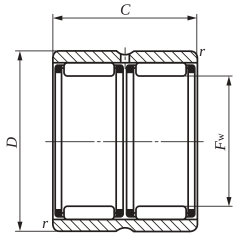
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

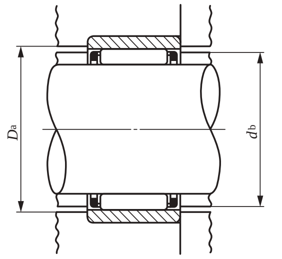
Without Inner Ring

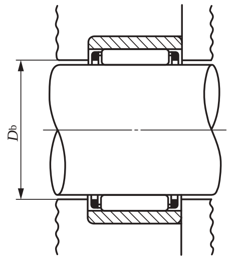


RNAF



RNAFW





Shaft dia. 20 ー 40mm

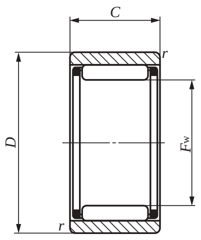
Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm F_w	D	C	$r_{s\,min}$ (1)	Standard mounting dimensions mm d_b	D_a Max.	D_b	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min^{-1}
20	**RNAF 202813**	25	20	28	13	0.3	23.6	26	20.6	9 590	13 500	25 000
	RNAFW 202826	49.5	20	28	26	0.3	23.6	26	20.6	16 400	27 100	25 000
	RNAF 203212	37.5	20	32	12	0.3	25.4	30	20.6	12 400	14 300	25 000
	RNAFW 203224	75	20	32	24	0.3	25.4	30	20.6	21 200	28 600	25 000
22	**RNAF 223013**	27	22	30	13	0.3	25.6	28	22.6	10 200	15 200	25 000
	RNAFW 223026	53.5	22	30	26	0.3	25.6	28	22.6	17 500	30 300	25 000
	RNAF 223516	58.5	22	35	16	0.3	27.8	33	22.6	17 600	20 900	25 000
	RNAFW 223532	117	22	35	32	0.3	27.8	33	22.6	30 200	41 800	25 000
25	**RNAF 253517**	51	25	35	17	0.3	29.5	33	25.6	17 300	26 600	20 000
	RNAFW 253526	78	25	35	26	0.3	29.5	33	25.6	22 400	37 200	20 000
	RNAF 253716	57	25	37	16	0.3	30.4	35	25.6	19 400	24 500	20 000
	RNAFW 253732	114	25	37	32	0.3	30.4	35	25.6	33 200	49 000	20 000
28	**RNAF 284016**	62.5	28	40	16	0.3	33.4	38	28.6	20 100	26 500	18 000
	RNAFW 284032	125	28	40	32	0.3	33.4	38	28.6	34 400	53 000	18 000
30	**RNAF 304017**	59	30	40	17	0.3	34.5	38	30.6	18 700	31 100	17 000
	RNAFW 304026	90.5	30	40	26	0.3	34.5	38	30.6	24 200	43 400	17 000
	RNAF 304216	66	30	42	16	0.3	35.4	40	30.6	20 800	28 400	17 000
	RNAFW 304232	132	30	42	32	0.3	35.4	40	30.6	35 700	56 800	17 000
35	**RNAF 354517**	67.5	35	45	17	0.3	39.5	43	35.6	20 500	36 900	14 000
	RNAFW 354526	103	35	45	26	0.3	39.5	43	35.6	26 600	51 500	14 000
	RNAF 354716	75.5	35	47	16	0.3	40.4	45	35.6	23 100	33 900	14 000
	RNAFW 354732	151	35	47	32	0.3	40.4	45	35.6	39 500	67 800	14 000
40	**RNAF 405017**	76	40	50	17	0.3	43.5	48	40.8	22 200	42 700	12 000
	RNAFW 405034	152	40	50	34	0.3	43.5	48	40.8	38 000	85 400	12 000
	RNAF 405520	140	40	55	20	0.3	45.2	53	40.8	31 400	48 000	12 000
	RNAFW 405540	280	40	55	40	0.3	45.2	53	40.8	53 900	96 000	12 000

Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.
Remarks1. RNAF has no oil hole. RNAFW is provided with an oil groove and an oil hole on the outer ring.
2. No grease is prepacked. Perform proper lubrication.

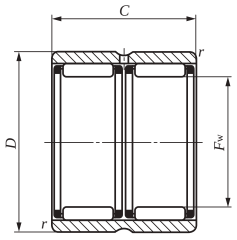
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

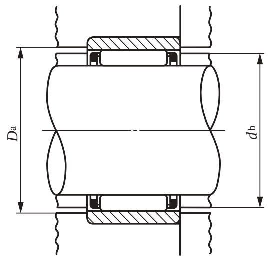
Without Inner Ring

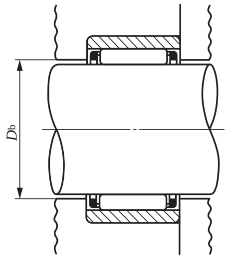


RNAF



RNAFW





Shaft dia. 45 – 100mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm				Standard mounting dimensions mm			Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min⁻¹
			F_w	D	C	$r_{s\,min}$ (1)	d_b	D_a Max.	D_b			
45	**RNAF 455517**	83.5	45	55	17	0.3	48.5	53	45.8	23 300	47 100	11 000
	RNAFW 455534	167	45	55	34	0.3	48.5	53	45.8	39 900	94 200	11 000
	RNAF 456220	184	45	62	20	0.3	50.9	60	45.8	33 200	53 300	11 000
	RNAFW 456240	370	45	62	40	0.3	50.9	60	45.8	56 900	107 000	11 000
50	**RNAF 506220**	138	50	62	20	0.3	54.2	60	50.8	27 100	59 300	10 000
	RNAFW 506240	275	50	62	40	0.3	54.2	60	50.8	46 400	119 000	10 000
	RNAF 506520	170	50	65	20	0.3	55.2	63	50.8	35 900	61 100	10 000
	RNAFW 506540	340	50	65	40	0.6	55.2	61	50.8	61 500	122 000	10 000
55	**RNAF 556820**	167	55	68	20	0.3	59.5	66	55.8	28 600	66 000	9 000
	RNAFW 556840	335	55	68	40	0.3	59.5	66	55.8	49 000	132 000	9 000
	RNAF 557220	220	55	72	20	1	60.9	67	55.8	37 400	66 400	9 000
	RNAFW 557240	440	55	72	40	1	60.9	67	55.8	64 100	133 000	9 000
60	**RNAF 607820**	255	60	78	20	1	66.3	73	60.8	38 900	71 700	8 500
	RNAFW 607840	510	60	78	40	1	66.3	73	60.8	66 700	143 000	8 500
65	**RNAF 658530**	470	65	85	30	1.5	72	77	66	59 300	127 000	7 500
	RNAFW 658560	945	65	85	60	1.5	72	77	66	102 000	255 000	7 500
70	**RNAF 709030**	500	70	90	30	1.5	77	82	71	61 200	136 000	7 000
	RNAFW 709060	1 000	70	90	60	1.5	77	82	71	105 000	272 000	7 000
75	**RNAF 759530**	530	75	95	30	1.5	82	87	76	63 100	144 000	6 500
	RNAFW 759560	1 060	75	95	60	1.5	82	87	76	108 000	289 000	6 500
80	**RNAF 8010030**	560	80	100	30	1.5	87	92	81	65 000	153 000	6 000
	RNAFW 8010060	1 120	80	100	60	1.5	87	92	81	111 000	306 000	6 000
85	**RNAF 8510530**	590	85	105	30	1.5	92	97	86	66 600	161 000	6 000
90	**RNAF 9011030**	625	90	110	30	1.5	97	102	91	69 600	174 000	5 500
95	**RNAF 9511530**	655	95	115	30	1.5	102	107	96	70 900	182 000	5 500
100	**RNAF 10012030**	685	100	120	30	1.5	107	112	101	72 500	191 000	4 500

Notes(1) Minimum allowable value of chamfer dimension *r*

(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.

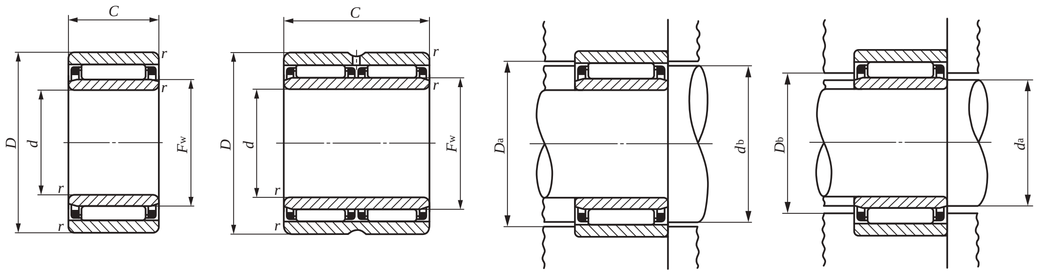
Remarks1. RNAF has no oil hole. RNAFW is provided with an oil groove and an oil hole on the outer ring.

2. No grease is prepacked. Perform proper lubrication.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

With Inner Ring



NAF NAFW

Shaft dia. 6 — 25mm

Shaft dia.	Identification number	Mass (Ref.)	Boundary dimensions mm					Standard mounting dimensions mm					Basic dynamic load rating	Basic static load rating	Allowable rotational speed$^{(2)}$	Assembled inner ring
			d	D	C	$r_{s\ min}^{(1)}$	F_w	d_b	D_a	d_a		D_b	C	C_0		
mm		g							Max.	Min.	Max.		N	N	min⁻¹	
6	**NAF 61710**	13.5	6	17	10	0.3	10	12.4	15	8	9.7	10.4	4 160	4 550	50 000	**LRT 61010**
7	**NAF 72012**	22.5	7	20	12	0.3	10	13.5	18	9	9.7	10.4	5 940	6 000	50 000	**LRT 71012-1**
9	**NAF 92212**	24	9	22	12	0.3	12	15.5	20	11	11.5	12.4	9 030	8 460	40 000	**LRT 91212**
10	**NAF 102213**	26	10	22	13	0.3	14	17.6	20	12	13	14.6	7 860	9 410	35 000	**LRT 101413**
	NAFW 102220	40	10	22	20	0.3	14	17.6	20	12	13	14.6	10 800	14 200	35 000	**LRT 101420**
	NAF 102612	36	10	26	12	0.3	14	19.4	24	12	13	14.6	9 790	9 680	35 000	**LRT 101412**
12	**NAF 122413**	29.5	12	24	13	0.3	16	19.6	22	14	15	16.6	8 620	11 000	30 000	**LRT 121613**
	NAFW 122420	45.5	12	24	20	0.3	16	19.6	22	14	15	16.6	11 900	16 700	30 000	**LRT 121620**
	NAF 122812	40	12	28	12	0.3	16	21.4	26	14	15	16.6	10 500	10 900	30 000	**LRT 121612**
15	**NAF 152813**	38.5	15	28	13	0.3	20	23.6	26	17	19	20.6	9 590	13 500	25 000	**LRT 152013**
	NAFW 152826	77.5	15	28	26	0.3	20	23.6	26	17	19	20.6	16 400	27 100	25 000	**LRT 152026**
	NAF 153212	50.5	15	32	12	0.3	20	25.4	30	17	19	20.6	12 400	14 300	25 000	**LRT 152012**
17	**NAF 173013**	42.5	17	30	13	0.3	22	25.6	28	19	21	22.6	10 200	15 200	25 000	**LRT 172213**
	NAFW 173026	84.5	17	30	26	0.3	22	25.6	28	19	21	22.6	17 500	30 300	25 000	**LRT 172226**
	NAF 173516	77.5	17	35	16	0.3	22	27.8	33	19	21	22.6	17 600	20 900	25 000	**LRT 172216**
	NAFW 173532	155	17	35	32	0.3	22	27.8	33	19	21	22.6	30 200	41 800	25 000	**LRT 172232**
20	**NAF 203517**	74	20	35	17	0.3	25	29.5	33	22	24	25.6	17 300	26 600	20 000	**LRT 202517**
	NAFW 203526	114	20	35	26	0.3	25	29.5	33	22	24	25.6	22 400	37 200	20 000	**LRT 202526**
	NAF 203716	79	20	37	16	0.3	25	30.4	35	22	24	25.6	19 400	24 500	20 000	**LRT 202516**
	NAFW 203732	158	20	37	32	0.3	25	30.4	35	22	24	25.6	33 200	49 000	20 000	**LRT 202532**
25	**NAF 254017**	87.5	25	40	17	0.3	30	34.5	38	27	29	30.6	18 700	31 100	17 000	**LRT 253017**
	NAFW 254026	135	25	40	26	0.3	30	34.5	38	27	29	30.6	24 200	43 400	17 000	**LRT 253026**
	NAF 254216	94	25	42	16	0.3	30	35.4	40	27	29	30.6	20 800	28 400	17 000	**LRT 253016**
	NAFW 254232	186	25	42	32	0.3	30	35.4	40	27	29	30.6	35 700	56 800	17 000	**LRT 253032**

Notes(1) Minimum allowable value of chamfer dimension *r*

(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.

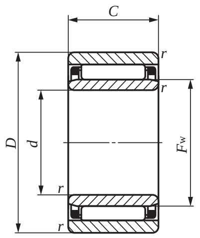
Remarks1. NAF has no oil hole. NAFW is provided with an oil groove and an oil hole on the outer ring.

2. No grease is prepacked. Perform proper lubrication.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

With Inner Ring



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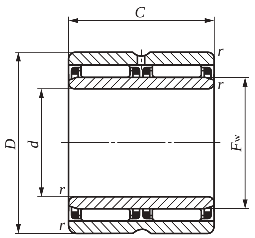
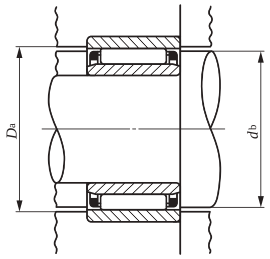
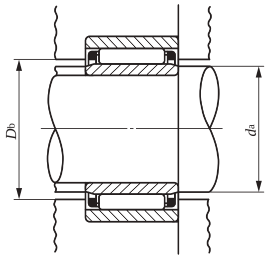


NAFW





Shaft dia. 30 ─ 65mm

Shaft dia.	Identification number	Mass (Ref.)	Boundary dimensions mm					Standard mounting dimensions mm					Basic dynamic load rating	Basic static load rating	Allowable rotational speed(2)	Assembled inner ring
			d	D	C	$r_{s\ min}$ (1)	F_w	d_b	D_a Max.	d_a Min.	d_a Max.	D_b	C	C_0		
mm		g											N	N	min⁻¹	
30	**NAF 304517**	101	30	45	17	0.3	35	39.5	43	32	34	35.6	20 500	36 900	14 000	**LRT 303517**
	NAFW 304526	155	30	45	26	0.3	35	39.5	43	32	34	35.6	26 600	51 500	14 000	**LRT 303526**
	NAF 304716	107	30	47	16	0.3	35	40.4	45	32	34	35.6	23 100	33 900	14 000	**LRT 303516**
	NAFW 304732	215	30	47	32	0.3	35	40.4	45	32	34	35.6	39 500	67 800	14 000	**LRT 303532**
35	**NAF 355017**	115	35	50	17	0.3	40	43.5	48	37	39	40.8	22 200	42 700	12 000	**LRT 354017**
	NAFW 355034	230	35	50	34	0.3	40	43.5	48	37	39	40.8	38 000	85 400	12 000	**LRT 354034**
	NAF 355520	186	35	55	20	0.3	40	45.2	53	37	39	40.8	31 400	48 000	12 000	**LRT 354020**
	NAFW 355540	375	35	55	40	0.3	40	45.2	53	37	39	40.8	53 900	96 000	12 000	**LRT 354040**
40	**NAF 405517**	128	40	55	17	0.3	45	48.5	53	42	44	45.8	23 300	47 100	11 000	**LRT 404517**
	NAFW 405534	255	40	55	34	0.3	45	48.5	53	42	44	45.8	39 900	94 200	11 000	**LRT 404534**
	NAF 406220	235	40	62	20	0.3	45	50.9	60	42	44	45.8	33 200	53 300	11 000	**LRT 404520**
	NAFW 406240	475	40	62	40	0.3	45	50.9	60	42	44	45.8	56 900	107 000	11 000	**LRT 404540**
45	**NAF 456220**	196	45	62	20	0.3	50	54.2	60	47	49	50.8	27 100	59 300	10 000	**LRT 455020**
	NAFW 456240	390	45	62	40	0.3	50	54.2	60	47	49	50.8	46 400	119 000	10 000	**LRT 455040**
	NAF 457220	340	45	72	20	1	55	60.9	67	50	54	55.8	37 400	66 400	9 000	**LRT 455520**
	NAFW 457240	685	45	72	40	1	55	60.9	67	50	54	55.8	64 100	133 000	9 000	**LRT 455540**
50	**NAF 506820**	230	50	68	20	0.3	55	59.5	66	52	54	55.8	28 600	66 000	9 000	**LRT 505520**
	NAFW 506840	465	50	68	40	0.3	55	59.5	66	52	54	55.8	49 000	132 000	9 000	**LRT 505540**
	NAF 507820	390	50	78	20	1	60	66.3	73	55	59	60.8	38 900	71 700	8 500	**LRT 506020**
	NAFW 507840	775	50	78	40	1	60	66.3	73	55	59	60.8	66 700	143 000	8 500	**LRT 506040**
55	**NAF 558530**	690	55	85	30	1.5	65	72	77	63	63.5	66	59 300	127 000	7 500	**LRT 556530**
	NAFW 558560	1 380	55	85	60	1.5	65	72	77	63	63.5	66	102 000	255 000	7 500	**LRT 556560**
60	**NAF 609030**	740	60	90	30	1.5	70	77	82	68	68.5	71	61 200	136 000	7 000	**LRT 607030**
	NAFW 609060	1 480	60	90	60	1.5	70	77	82	68	68.5	71	105 000	272 000	7 000	**LRT 607060**
65	**NAF 659530**	790	65	95	30	1.5	75	82	87	73	73.5	76	63 100	144 000	6 500	**LRT 657530**
	NAFW 659560	1 580	65	95	60	1.5	75	82	87	73	73.5	76	108 000	289 000	6 500	**LRT 657560**

Notes(1) Minimum allowable value of chamfer dimension *r*

(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.

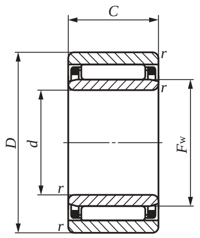
Remarks1. NAF has no oil hole. NAFW is provided with an oil groove and an oil hole on the outer ring.

2. No grease is prepacked. Perform proper lubrication.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

NEEDLE ROLLER BEARINGS WITH SEPARABLE CAGE

With Inner Ring



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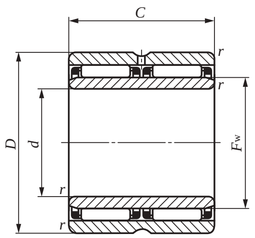
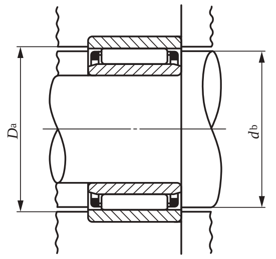
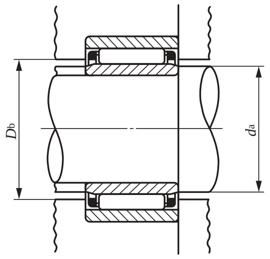


NAFW





Shaft dia. 70 ─ 90mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm d	D	C	$r_{s\,min}$ (1)	F_w	Standard mounting dimensions mm d_b	D_a Max.	d_a Min.	d_a Max.	D_b	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min^{-1}	Assembled inner ring
70	**NAF 7010030**	835	70	100	30	1.5	80	87	92	78	78.5	81	65 000	153 000	6 000	**LRT 708030-1**
	NAFW 7010060	1 680	70	100	60	1.5	80	87	92	78	78.5	81	111 000	306 000	6 000	**LRT 708060**
75	**NAF 7510530**	885	75	105	30	1.5	85	92	97	83	83.5	86	66 600	161 000	6 000	**LRT 758530-1**
80	**NAF 8011030**	935	80	110	30	1.5	90	97	102	88	88.5	91	69 600	174 000	5 500	**LRT 809030-1**
85	**NAF 8511530**	985	85	115	30	1.5	95	102	107	93	93.5	96	70 900	182 000	5 500	**LRT 859530**
90	**NAF 9012030**	1 040	90	120	30	1.5	100	107	112	98	98.5	101	72 500	191 000	4 500	**LRT 9010030**

Notes(1) Minimum allowable value of chamfer dimension *r*

(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 50% of this value is allowable.

Remarks1. NAF has no oil hole. NAFW is provided with an oil groove and an oil hole on the outer ring.

2. No grease is prepacked. Perform proper lubrication.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

ROLLER BEARINGS

- ●Caged Roller Bearings
- ●Full Complement Roller Bearings
- ●Roller Bearings for Sheaves

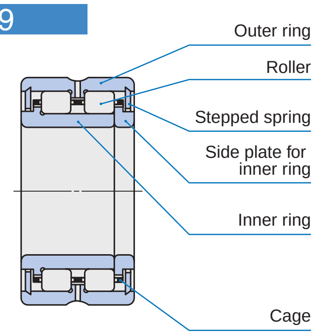
Structure and Features

IKO Roller Bearings in which rollers are incorporated in two rows are non-separable heavy-duty bearings. They can withstand not only radial loads but axial loads as well, which are supported at the contacts between the shoulders of inner and outer rings and the end faces of rollers. Therefore, they are most suitable for use at the fixing side of a shaft. Like needle roller bearings, they are also compact.

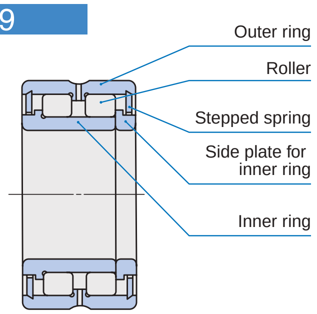
Roller bearings include the caged type, full complement type and the type for sheaves, and any bearings suitable for the operating conditions can be selected. In particular, these bearings are used for heavy-duty machines such as construction machinery, and industrial machinery.

Structures of Roller Bearings

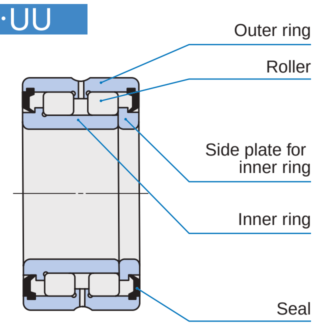
NAU49



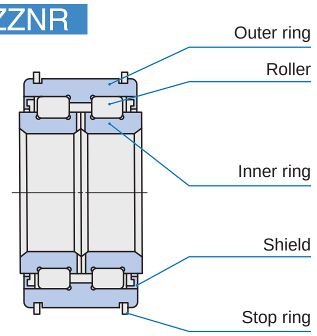
NAG49



NAG49···UU



NAS50···ZZNR



Types

The types of Roller Bearings shown in Table 1 are available.

Table 1 Type of bearing

Type / Series	Caged type	Full complement type	For sheaves
Standard	NAU49 TRU	NAG49	—
With seal	NAU49⋯UU TRU⋯UU	NAG49⋯UU	NAS50⋯UUNR
With shield	—	—	NAS50⋯ZZNR

Caged Roller Bearings

These bearings are suitable for high-speed rotations and fluctuating loads. Also, as the axial distance between the double-row rollers is comparatively large, large moment loads can be supported.

Caged roller bearings with seal incorporate seals on both sides. Synthetic resin rubber seals are excellent in the prevention of dust penetration and grease leakage, providing an excellent sealing effect.

Full Complement Roller Bearings

These bearings are suitable for low-speed rotations or oscillating motions and heavy loads. Similar to the caged type, the structure is advantageous for supporting moment loads.

The bearings with seal incorporate seals on both sides.

Roller Bearings for Sheaves

These bearings are the double-row full complement type with a low sectional height designed for use in sheaves. There are two types; the sealed type and the shield type. They can withstand heavy radial loads and shock loads at comparatively low-speed rotations, and can also withstand axial loads.

They can easily be fixed axially to sheaves using the stop rings of the outer ring. As the width of the inner ring is designed to be larger than that of the outer ring, they require no spacer between sheaves. The structure is stable because the double-row rollers can withstand the moment loads caused by rope transition.

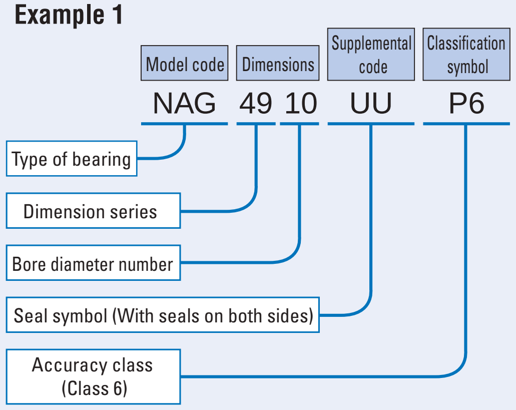
The surfaces of these bearings are treated to have high corrosion resistance.

Identification Number

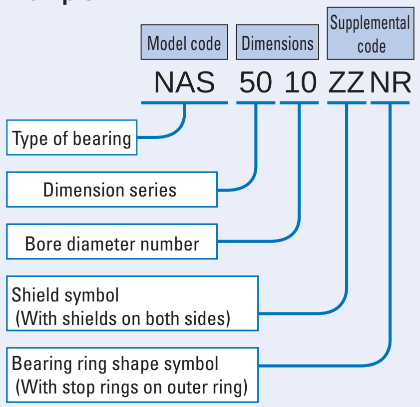
The identification number of Roller Bearings consists of a model code, dimensions, any supplemental codes and a classification symbol. The arrangement examples are shown below.

Examples of identification number

Example 1



Example 2



Accuracy

Roller Bearings are manufactured in accordance with JIS (See page A31.). A side plate for inner ring is assembled on one side of caged or full complement roller bearings. The tolerance of bore diameter of the side plate is shown below. Tolerances of Roller Bearings for Sheaves represent the values before surface treatment. The tolerance of internal distance between cir-clips is shown below.

Tolerance of bore diameter of the side plate d: E7

Tolerance of internal distance between cir-clips C_1: 0～+0.4mm

Clearance

Roller Bearings are manufactured to the CN clearance shown in Table 18 on page A37. However, Roller Bearings for Sheaves are manufactured so that proper operating clearances are obtained after being mounted with a specified fit.

Fit

The recommended fits for Roller Bearings are shown in Tables 21 to 22 on pages A41 and A42. The recommended fits for Roller Bearings for Sheaves are shown in Table 2.

Table 2 Recommended fits for Roller Bearings for Sheaves

Tolerance class of shaft	Tolerance class of housing bore
g6	N7

Lubrication

Bearings with prepacked grease are shown in Table 3. For Caged Roller Bearings and Full Complement Roller Bearings, ALVANIA GREASE S2 (Shell Lubricants Japan K.K.) is prepacked as the lubricating grease. For Roller Bearings for Sheaves, ALVANIA GREASE EP2 (Shell Lubricants Japan K.K.) is prepacked as the lubricating grease.

In the case of bearings without prepacked grease, perform proper lubrication for use. Operating without lubrication will increase the wear of the rolling contact surfaces and shorten their lirees.

Oil Hole

The number of oil holes of the inner and outer rings is shown in Table 4.

Operating Temperature Range

The operating temperature range for Roller Bearings is −20℃～+120℃. However, the maximum allowable temperature for Roller Bearings for Sheaves is +110℃.

Table 3 Bearings with prepacked grease

○ : With prepacked grease × : Without prepacked grease

Type		Standard	With seals	With shields
Caged type	NAU , TRU	×	○	–
Full complement type	NAG	×	○	–
For sheaves	NAS	–	○	○

Table 4 Number of oil holes of the inner ring and outer ring

Type		Nominal bore diameter d mm	Number of oil holes of the outer ring: Standard	With seals	With shields	Number of oil holes of the inner ring
Caged type	NAU	$d \leqq 17$	0	0	—	0
		$17 < d$	2	2		
	TRU		2	2	—	0
Full complement type	NAG	$d \leqq 17$	0	0	—	0
		$17 < d$	2	2		
For sheaves	NAS		—	0	0	2

Remark The bearings with oil holes are also provided with an oil groove.

Axial Load Capacity

Axial load capacity is not determined from the basic dynamic load rating based on rolling fatigue, but is determined by the amount of heat generated by sliding contact between the ends of rollers and guide shoulders of the inner and outer rings. It is therefore limited by the load conditions, sliding speeds, lubrication methods, etc.

The axial load capacity of Roller Bearings is obtained from the following equation.

If the axial load increases in comparison with the radial load, it will start to interfere with the smooth rolling motion. The axial load should therefore be within 20% of the radial load.

$$C_A = f_v\, a\, f_A \quad \cdots\cdots (1)$$

where, C_A : Axial load capacity N

f_v : Speed correction factor

f_v is obtained from Fig.2 by calculating the $d_m n$ value.

$$d_m n = d_m \times n$$

d_m : Mean value of bearing bore and outside diameters mm

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

n : Rotational speed min^{-1}

When $d_m n \leqq 1000$, $f_v = 1$.

a : Value determined by type of bearing (See Table 5.)

f_A : Axial load capacity factor (See Fig.1.)

Table 5 Value by type of bearing

Type of bearing	a
NAS 50	1
NAG 49	0.78
NAU 49, TRU	0.7

Calculation example

When a roller bearing for sheaves NAS 5016 ZZ NR is run at n = 250 min^{-1} under grease lubrication and subjected to an intermittent axial load, the axial load capacity is calculated as follows.

As the bearing bore diameter is 80 mm, f_A = 18000 is obtained from the axial load capacity line of Fig. 1 (ii).

$a = 1$

$$d_m \doteqdot \frac{80+125}{2} = 102.5$$

$d_m n = 102.5 \text{ x } 250 \doteqdot 25600$

From Fig. 2, $f_v \doteqdot 0.87$

Therefore, the axial load capacity C_A is obtained.

$C_A = f_v\, a\, f_A = 0.87 \times 1 \times 18000 \doteqdot 15700$ N

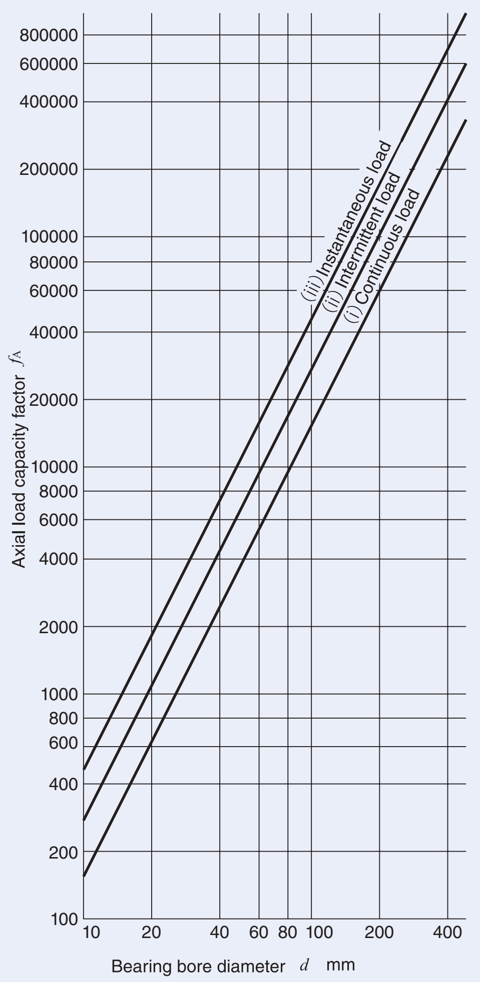


Fig. 1 Axial load capacity factor

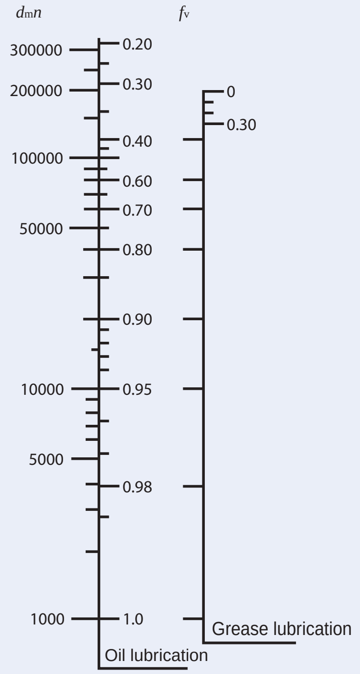


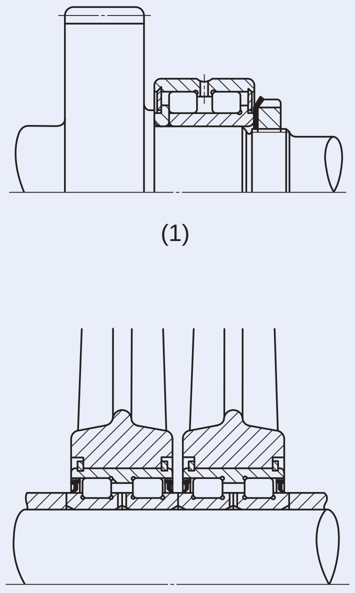
Fig. 2 Speed correction factor

Mounting

Unlike needle roller bearings, Caged and Full Complement Roller Bearings are non-separable.

As shown in Fig. 3 (1), the inner ring should be press-fitted until it makes close contact with the shaft shoulder, and fixed axially with a nut. Dimensions of the shoulders of the shaft and housing should be based on J and E_W shown in the table of dimensions, respectively.

In the case of Roller Bearings for Sheaves, as shown in Fig. 3 (2), the outer ring should be fixed by stop rings after being press-fitted into the sheaves, and the inner ring should be fixed securely in the axial direction.

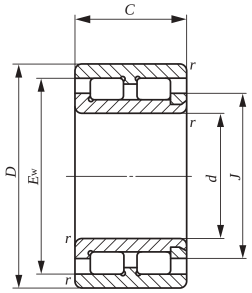


(1)

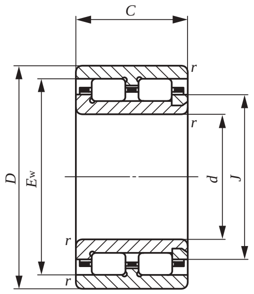
(2)

Fig. 3 Mounting examples

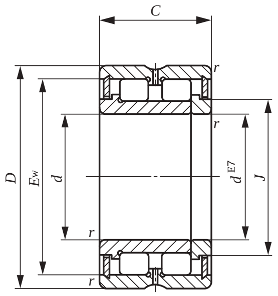
Caged Roller Bearings
Full Complement Roller Bearings



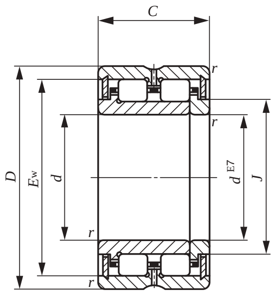
NAG49
(*d* ≦ 17)



NAU49
(*d* ≦ 17)



NAG49



NAU49 TRU

Shaft dia. 10 — 35mm

Shaft dia. mm	Identification number: Full complement type	Identification number: Caged type		Mass (Ref.) g	Boundary dimensions mm: d	D	C	$r_{s\,min}$ (1)	J	E_w	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min-1
10	**NAG 4900**	—	—	25.5	10	22	13	0.3	15.5	18.5	9 650	10 800	17 000
	—	**NAU 4900**	—	24.5	10	22	13	0.3	15.5	18.5	6 580	6 470	30 000
12	**NAG 4901**	—	—	28.5	12	24	13	0.3	17	20	10 300	12 000	15 000
	—	**NAU 4901**	—	27.5	12	24	13	0.3	17	20	6 950	7 120	25 000
15	**NAG 4902**	—	—	38	15	28	13	0.3	21	24	11 800	15 200	12 000
	—	**NAU 4902**	—	36.5	15	28	13	0.3	21	24	7 950	9 020	20 000
	—	—	**TRU 153320**	80.5	15	33	20	0.3	19.5	27	10 400	10 400	20 000
17	**NAG 4903**	—	—	41	17	30	13	0.3	22.5	25.5	12 300	16 500	11 000
	—	**NAU 4903**	—	39.5	17	30	13	0.3	22.5	25.5	8 240	9 670	19 000
	—	—	**TRU 173425**	100	17	34	25	0.3	21.5	29.5	18 000	21 600	18 000
20	**NAG 4904**	—	—	76.5	20	37	17	0.3	24	31.5	15 600	18 900	9 500
	—	**NAU 4904**	—	76	20	37	17	0.3	24	31.5	10 700	11 300	16 000
	—	—	**TRU 203820**	96.5	20	38	20	0.3	25	32.5	12 100	13 400	16 000
	—	—	**TRU 203825**	122	20	38	25	0.3	25	32.5	18 700	23 600	16 000
25	**NAG 4905**	—	—	89.5	25	42	17	0.3	29.5	37	17 500	23 200	7 500
	—	**NAU 4905**	—	89	25	42	17	0.3	29.5	37	11 900	13 900	13 000
	—	—	**TRU 254425**	154	25	44	25	0.3	30.5	38	21 000	28 900	13 000
28	—	—	**TRU 284530**	173	28	45	30	0.3	31.5	39.5	28 700	43 800	12 000
30	**NAG 4906**	—	—	103	30	47	17	0.3	34	41.5	19 400	27 600	6 500
	—	**NAU 4906**	—	102	30	47	17	0.3	34	41.5	13 000	16 200	12 000
	—	—	**TRU 304830**	197	30	48	30	0.3	35	42.5	29 400	46 600	11 000
32	—	—	**TRU 325230**	260	32	52	30	0.6	38	46	29 800	44 200	10 000
35	**NAG 4907**	—	—	172	35	55	20	0.6	40	49	28 700	43 800	5 500
	—	**NAU 4907**	—	168	35	55	20	0.6	40	49	19 500	26 300	10 000
	—	—	**TRU 355630**	270	35	56	30	0.6	40	49	32 200	49 800	10 000

Notes(1) Minimum allowable value of chamfer dimension r

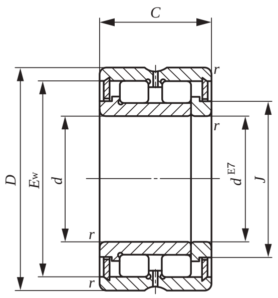
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable. Considering that the axial load acts under practical operating conditions, up to 1/10 of this value is recommended for actual use.

Remarks1. The NAG and NAU series with a bore diameter d of 17 mm or less have no oil hole. In others, the outer ring has an oil groove and two oil holes.

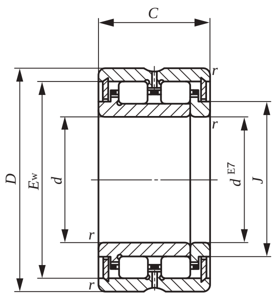
2. No grease is prepacked. Perform proper lubrication.

ROLLER BEARINGS

Caged Roller Bearings
Full Complement Roller Bearings



NAG49



NAU49 TRU

Shaft dia. 40 — 80mm

Shaft dia. mm	Identification number			Mass (Ref.)	Boundary dimensions mm						Basic dynamic load rating	Basic static load rating	Allowable rotational speed(2)
	Full complement type	Caged type		g	d	D	C	$r_{s\,min}$ (1)	J	E_w	C N	C_0 N	min^{-1}
40	NAG 4908	—	—	225	40	62	22	0.6	46	56	34 600	49 500	5 000
	—	—	TRU 405930	265	40	59	30	0.6	45	52.5	34 700	62 500	8 500
	—	NAU 4908	—	220	40	62	22	0.6	46	56	23 400	29 400	8 500
42	—	—	TRU 426230	290	42	62	30	0.6	48	56.5	34 600	57 800	8 000
45	NAG 4909	—	—	265	45	68	22	0.6	51	61	36 400	54 700	4 500
	—	—	TRU 456430	295	45	64	30	0.6	50.5	58.5	32 600	59 700	8 000
	—	NAU 4909	—	260	45	68	22	0.6	51	61	24 800	32 800	8 000
50	NAG 4910	—	—	270	50	72	22	0.6	55.5	65.5	38 200	59 900	4 000
	—	NAU 4910	—	265	50	72	22	0.6	55.5	65.5	26 200	36 200	7 000
	—	—	TRU 507745	710	50	77	45	1	58	69	75 700	134 000	7 000
55	NAG 4911	—	—	395	55	80	25	1	61.5	72.5	48 100	77 700	3 500
	—	NAU 4911	—	385	55	80	25	1	61.5	72.5	33 000	47 000	6 500
	—	—	TRU 558138	615	55	81	38	1	61.5	72.5	61 400	104 000	6 500
60	NAG 4912	—	—	425	60	85	25	1	67	77.5	50 300	84 300	3 500
	—	NAU 4912	—	415	60	85	25	1	67	77.5	34 700	51 400	6 000
	—	—	TRU 608945	880	60	89	45	1	69.5	81.5	88 100	152 000	6 000
65	NAG 4913	—	—	455	65	90	25	1	72	83	53 200	93 000	3 000
	—	NAU 4913	—	440	65	90	25	1	72	83	36 900	57 100	5 500
70	NAG 4914	—	—	725	70	100	30	1	79	91.5	77 700	139 000	3 000
	—	NAU 4914	—	705	70	100	30	1	79	91.5	53 700	84 600	5 000
75	NAG 4915	—	—	775	75	105	30	1	83.5	95.5	80 000	146 000	2 500
	—	NAU 4915	—	750	75	105	30	1	83.5	95.5	54 800	88 200	5 000
	—	—	TRU 7510845	1 240	75	108	45	1	85.5	98.5	103 000	190 000	4 500
80	NAG 4916	—	—	815	80	110	30	1	89.5	102	83 000	157 000	2 500
	—	NAU 4916	—	790	80	110	30	1	89.5	102	57 200	95 500	4 500

Notes(1) Minimum allowable value of chamfer dimension r

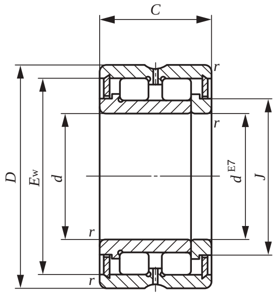
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable. Considering that the axial load acts under practical operating conditions, up to 1/10 of this value is recommended for actual use.

Remarks1. The outer ring has an oil groove and two oil holes.

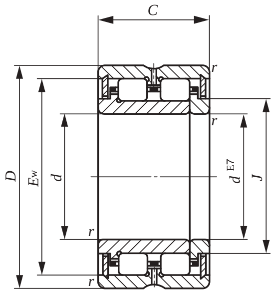
2. No grease is prepacked. Perform proper lubrication.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Caged Roller Bearings
Full Complement Roller Bearings



NAG49



NAU49 TRU

Shaft dia. 85 ─ 140mm

Shaft dia. mm	Identification number			Mass (Ref.)	Boundary dimensions mm						Basic dynamic load rating	Basic static load rating	Allowable rotational speed(2)
	Full complement type	Caged type		g	d	D	C	(1) $r_{\text{s min}}$	J	E_w	C N	C_0 N	min⁻¹
85	**NAG 4917**	—	—	1 190	85	120	35	1.5	96	110	111 000	200 000	2 500
	—	—	**TRU 8511850**	1 530	85	118	50	1	94.5	107.5	114 000	222 000	4 000
	—	**NAU 4917**	—	1 150	85	120	35	1.5	96	110	75 400	120 000	4 000
	—	—	**TRU 8512045**	1 500	85	120	45	1.5	96.5	110	110 000	215 000	4 000
90	**NAG 4918**	—	—	1 250	90	125	35	1.5	101	115.5	114 000	211 000	2 500
	—	**NAU 4918**	—	1 210	90	125	35	1.5	101	115.5	79 500	130 000	4 000
	—	—	**TRU 9012550**	1 740	90	125	50	1.5	101	114	119 000	240 000	4 000
95	**NAG 4919**	—	—	1 300	95	130	35	1.5	106	120.5	117 000	222 000	2 000
	—	**NAU 4919**	—	1 270	95	130	35	1.5	106	120.5	81 000	136 000	4 000
100	**NAG 4920**	—	—	1 850	100	140	40	1.5	114.5	129.5	152 000	292 000	2 000
	—	—	**TRU 10013550**	1 900	100	135	50	1.5	112	125.5	124 000	264 000	3 500
	—	**NAU 4920**	—	1 770	100	140	40	1.5	114.5	129.5	106 000	181 000	3 500
105	—	—	**TRU 10515350**	2 890	105	153	50	1.5	120	138	159 000	286 000	3 500
110	**NAG 4922**	—	—	2 010	110	150	40	1.5	123	138.5	161 000	322 000	1 900
	—	**NAU 4922**	—	1 930	110	150	40	1.5	123	138.5	113 000	200 000	3 500
120	**NAG 4924**	—	—	2 780	120	165	45	1.5	136	153.5	208 000	431 000	1 700
	—	**NAU 4924**	—	2 680	120	165	45	1.5	136	153.5	146 000	268 000	3 000
125	—	—	**TRU 12517860**	4 490	125	178	60	1.5	143.5	162	211 000	408 000	3 000
130	**NAG 4926**	—	—	3 750	130	180	50	2	147	165.5	240 000	495 000	1 600
	—	**NAU 4926**	—	3 610	130	180	50	2	147	165.5	166 000	304 000	2 500
135	—	—	**TRU 13518860**	4 790	135	188	60	1.5	154	172.5	220 000	442 000	2 500
140	**NAG 4928**	—	—	3 990	140	190	50	2	157.5	176	249 000	531 000	1 500
	—	**NAU 4928**	—	3 840	140	190	50	2	157.5	176	174 000	327 000	2 500

Notes(1) Minimum allowable value of chamfer dimension *r*

(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable. Considering that the axial load acts under practical operating conditions, up to 1/10 of this value is recommended for actual use.

Remarks1. The outer ring has an oil groove and two oil holes.

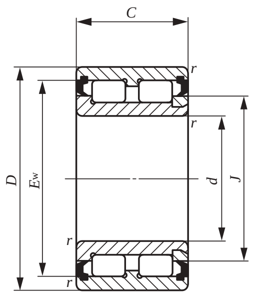
2. No grease is prepacked. Perform proper lubrication.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

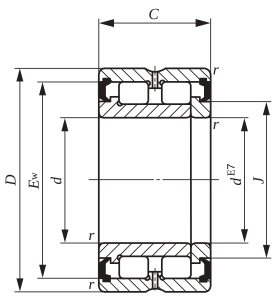
ROLLER BEARINGS

Caged Roller Bearings **With Seal**

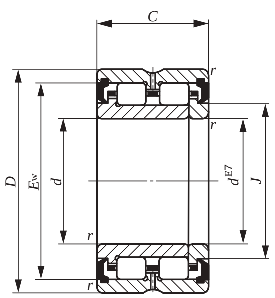
Full Complement Roller Bearings **With Seal**



NAG49 ··· UU
($d \leq 17$)



NAG49 ··· UU



NAU49 ··· UU
TRU ··· UU

Shaft dia. 10 ー 40mm

Shaft dia. mm	Identification number Full complement type	Caged type		Mass (Ref.) g	Boundary dimensions mm d	D	C	(1) $r_{s\,min}$	J	E_w	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min^{-1}
10	**NAG 4900UU**	—	—	25.5	10	22	13	0.3	15.5	19.5	9 650	10 800	10 000
12	**NAG 4901UU**	—	—	28.5	12	24	13	0.3	17	21	10 300	12 000	9 000
15	**NAG 4902UU**	—	—	38	15	28	13	0.3	21	25	11 800	15 200	7 000
	—	—	**TRU 153320UU**	80.5	15	33	20	0.3	19.5	27	10 400	10 400	9 500
17	**NAG 4903UU**	—	—	41	17	30	13	0.3	22.5	26.5	12 300	16 500	6 500
	—	—	**TRU 173425UU**	100	17	34	25	0.3	21.5	29.5	18 000	21 600	8 500
20	**NAG 4904UU**	—	—	76.5	20	37	17	0.3	24	31.5	15 600	18 900	5 500
	—	**NAU 4904UU**	—	76	20	37	17	0.3	24	31.5	10 700	11 300	8 000
	—	—	**TRU 203820UU**	96.5	20	38	20	0.3	25	32.5	12 100	13 400	7 500
	—	—	**TRU 203825UU**	122	20	38	25	0.3	25	32.5	18 700	23 600	7 500
25	**NAG 4905UU**	—	—	89.5	25	42	17	0.3	29.5	37	17 500	23 200	4 500
	—	**NAU 4905UU**	—	89	25	42	17	0.3	29.5	37	11 900	13 900	6 500
	—	—	**TRU 254425UU**	154	25	44	25	0.3	30.5	38	21 000	28 900	6 000
28	—	—	**TRU 284530UU**	173	28	45	30	0.3	31.5	39.5	28 700	43 800	6 000
30	**NAG 4906UU**	—	—	103	30	47	17	0.3	34	41.5	19 400	27 600	4 000
	—	**NAU 4906UU**	—	102	30	47	17	0.3	34	41.5	13 000	16 200	5 500
	—	—	**TRU 304830UU**	197	30	48	30	0.3	35	42.5	29 400	46 600	5 500
32	—	—	**TRU 325230UU**	260	32	52	30	0.6	38	46	29 800	44 200	5 000
35	**NAG 4907UU**	—	—	172	35	55	20	0.6	40	49	28 700	43 800	3 500
	—	**NAU 4907UU**	—	168	35	55	20	0.6	40	49	19 500	26 300	4 500
	—	—	**TRU 355630UU**	270	35	56	30	0.6	40	49	32 200	49 800	4 500
40	**NAG 4908UU**	—	—	225	40	62	22	0.6	46	56	34 600	49 500	3 000
	—	—	**TRU 405930UU**	265	40	59	30	0.6	45	52.5	34 700	62 500	4 000
	—	**NAU 4908UU**	—	220	40	62	22	0.6	46	56	23 400	29 400	4 000

Notes(1) Minimum allowable value of chamfer dimension r

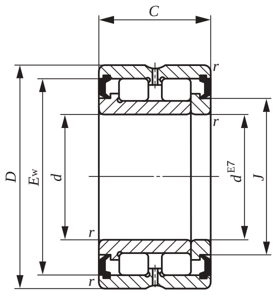
(2) Allowable rotational speed applies to grease lubrication. Considering that the axial load acts under practical operating conditions, up to 1/10 of this value is recommended for actual use.

Remarks1. The NAG and NAU series with a bore diameter, d, of 17 mm or less have no oil hole. In others, the outer ring has an oil groove and two oil holes.

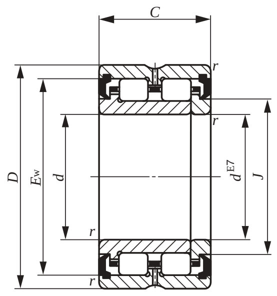
2. The bearings with seals are provided with prepacked grease.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Caged Roller Bearings With Seal
Full Complement Roller Bearings With Seal



NAG49 ··· UU



NAU49 ··· UU
TRU ··· UU

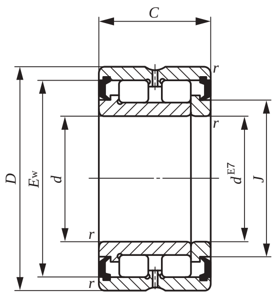
Shaft dia. 42 – 80mm

Shaft dia. mm	Identification number			Mass (Ref.)	Boundary dimensions mm						Basic dynamic load rating	Basic static load rating	Allowable rotational speed(2)
	Full complement type	Caged type		g	d	D	C	(1) $r_{s\,min}$	J	E_w	C N	C_0 N	min^{-1}
42	—	—	**TRU 426230UU**	290	42	62	30	0.6	48	56.5	34 600	57 800	4 000
45	**NAG 4909UU**	—	—	265	45	68	22	0.6	51	61	36 400	54 700	2 500
	—	—	**TRU 456430UU**	295	45	64	30	0.6	50.5	58.5	32 600	59 700	3 500
	—	**NAU 4909UU**	—	260	45	68	22	0.6	51	61	24 800	32 800	3 500
50	**NAG 4910UU**	—	—	270	50	72	22	0.6	55.5	65.5	38 200	59 900	2 500
	—	**NAU 4910UU**	—	265	50	72	22	0.6	55.5	65.5	26 200	36 200	3 500
	—	—	**TRU 507745UU**	710	50	77	45	1	58	69	75 700	134 000	3 500
55	**NAG 4911UU**	—	—	395	55	80	25	1	61.5	72.5	48 100	77 700	2 000
	—	**NAU 4911UU**	—	385	55	80	25	1	61.5	72.5	33 000	47 000	3 000
	—	—	**TRU 558138UU**	615	55	81	38	1	61.5	72.5	61 400	104 000	3 000
60	**NAG 4912UU**	—	—	425	60	85	25	1	67	77.5	50 300	84 300	2 000
	—	**NAU 4912UU**	—	415	60	85	25	1	67	77.5	34 700	51 400	3 000
	—	—	**TRU 608945UU**	880	60	89	45	1	69.5	81.5	88 100	152 000	3 000
65	**NAG 4913UU**	—	—	455	65	90	25	1	72	83	53 200	93 000	1 900
	—	**NAU 4913UU**	—	440	65	90	25	1	72	83	36 900	57 100	2 500
70	**NAG 4914UU**	—	—	725	70	100	30	1	79	91.5	77 700	139 000	1 800
	—	**NAU 4914UU**	—	705	70	100	30	1	79	91.5	53 700	84 600	2 500
75	**NAG 4915UU**	—	—	775	75	105	30	1	83.5	95.5	80 000	146 000	1 700
	—	**NAU 4915UU**	—	750	75	105	30	1	83.5	95.5	54 800	88 200	2 500
	—	—	**TRU 7510845UU**	1 240	75	108	45	1	85.5	98.5	103 000	190 000	2 000
80	**NAG 4916UU**	—	—	815	80	110	30	1	89.5	102	83 000	157 000	1 600
	—	**NAU 4916UU**	—	790	80	110	30	1	89.5	102	57 200	95 500	2 000

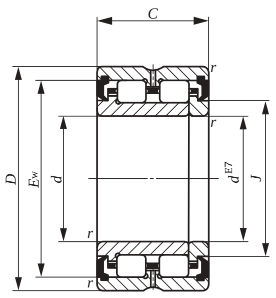
Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable rotational speed applies to grease lubrication. Considering that the axial load acts under practical operating conditions, up to 1/10 of this value is recommended for actual use.

Remarks1. The outer ring has an oil groove and two oil holes.
2. The bearings with seals are provided with prepacked grease.

Caged Roller Bearings With Seal
Full Complement Roller Bearings With Seal



NAG49 ··· UU



NAU49 ··· UU
TRU ··· UU

Shaft dia. 85 ─ 140mm

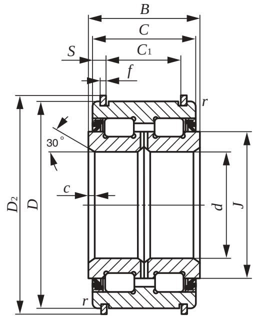
Shaft dia. mm	Identification number			Mass (Ref.)	Boundary dimensions mm					E_w	Basic dynamic load rating C	Basic static load rating C_0	Allowable rotational speed$^{(2)}$
	Full complement type	Caged type		g	d	D	C	$r_{s\,min}$ $^{(1)}$	J		N	N	min^{-1}
85	**NAG 4917UU**	—	—	1 190	85	120	35	1.5	96	110	111 000	200 000	1 500
	—	—	**TRU 8511850UU**	1 530	85	118	50	1	94.5	107.5	114 000	222 000	2 000
	—	**NAU 4917UU**	—	1 150	85	120	35	1.5	96	110	75 400	120 000	2 000
	—	—	**TRU 8512045UU**	1 500	85	120	45	1.5	96.5	110	110 000	215 000	2 000
90	**NAG 4918UU**	—	—	1 250	90	125	35	1.5	101	115.5	114 000	211 000	1 400
	—	**NAU 4918UU**	—	1 210	90	125	35	1.5	101	115.5	79 500	130 000	1 900
	—	—	**TRU 9012550UU**	1 740	90	125	50	1.5	101	114	119 000	240 000	1 900
95	**NAG 4919UU**	—	—	1 300	95	130	35	1.5	106	120.5	117 000	222 000	1 300
	—	**NAU 4919UU**	—	1 270	95	130	35	1.5	106	120.5	81 000	136 000	1 800
100	**NAG 4920UU**	—	—	1 850	100	140	40	1.5	114.5	129.5	152 000	292 000	1 200
	—	—	**TRU 10013550UU**	1 900	100	135	50	1.5	112	125.5	124 000	264 000	1 700
	—	**NAU 4920UU**	—	1 770	100	140	40	1.5	114.5	129.5	106 000	181 000	1 700
105	—	—	**TRU 10515350UU**	2 890	105	153	50	1.5	120	138	159 000	286 000	1 600
110	**NAG 4922UU**	—	—	2 010	110	150	40	1.5	123	138.5	161 000	322 000	1 100
	—	**NAU 4922UU**	—	1 930	110	150	40	1.5	123	138.5	113 000	200 000	1 600
120	**NAG 4924UU**	—	—	2 780	120	165	45	1.5	136	153.5	208 000	431 000	1 000
	—	**NAU 4924UU**	—	2 680	120	165	45	1.5	136	153.5	146 000	268 000	1 400
125	—	—	**TRU 12517860UU**	4 490	125	178	60	1.5	143.5	162	211 000	408 000	1 400
130	**NAG 4926UU**	—	—	3 750	130	180	50	2	147	165.5	240 000	495 000	950
	—	**NAU 4926UU**	—	3 610	130	180	50	2	147	165.5	166 000	304 000	1 300
135	—	—	**TRU 13518860UU**	4 790	135	188	60	1.5	154	172.5	220 000	442 000	1 300
140	**NAG 4928UU**	—	—	3 990	140	190	50	2	157.5	176	249 000	531 000	900
	—	**NAU 4928UU**	—	3 840	140	190	50	2	157.5	176	174 000	327 000	1 200

Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable rotational speed applies to grease lubrication. Considering that the axial load acts under practical operating conditions, up to 1/10 of this value is recommended for actual use.

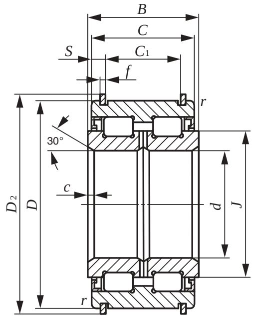
Remarks1. The outer ring has an oil groove and two oil holes.
2. The bearings with seals are provided with prepacked grease.

ROLLER BEARINGS

Roller Bearings for Sheaves



NAS50 ··· UUNR



NAS50 ··· ZZNR

Shaft dia. 40 – 170mm

Shaft dia. mm	Identification number		Mass (Ref.) kg	Boundary dimensions mm											Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min⁻¹
	Sealed type	Shield type		d	D	D_2	B	C	C_1	S	f	c	(1) $r_{s\,min}$	J			
40	**NAS 5008UUNR**	**NAS 5008ZZNR**	0.55	40	68	71.8	38	37	28	4.5	2	1.5	0.6	50	79 500	116 000	2 500
45	**NAS 5009UUNR**	**NAS 5009ZZNR**	0.70	45	75	78.8	40	39	30	4.5	2	1.5	0.6	56	95 500	144 000	2 000
50	**NAS 5010UUNR**	**NAS 5010ZZNR**	0.75	50	80	83.8	40	39	30	4.5	2	1.5	0.6	61	100 000	158 000	2 000
55	**NAS 5011UUNR**	**NAS 5011ZZNR**	1.15	55	90	94.8	46	45	34	5.5	2.5	2	0.6	68	118 000	193 000	1 800
60	**NAS 5012UUNR**	**NAS 5012ZZNR**	1.20	60	95	99.8	46	45	34	5.5	2.5	2	0.6	73	123 000	208 000	1 700
65	**NAS 5013UUNR**	**NAS 5013ZZNR**	1.30	65	100	104.8	46	45	34	5.5	2.5	2	0.6	78	128 000	224 000	1 600
70	**NAS 5014UUNR**	**NAS 5014ZZNR**	1.90	70	110	114.5	54	53	42	5.5	2.5	2	0.6	84	171 000	284 000	1 400
75	**NAS 5015UUNR**	**NAS 5015ZZNR**	2.00	75	115	119.5	54	53	42	5.5	2.5	2	0.6	91	179 000	308 000	1 300
80	**NAS 5016UUNR**	**NAS 5016ZZNR**	2.65	80	125	129.5	60	59	48	5.5	2.5	2	0.6	97	251 000	428 000	1 300
85	**NAS 5017UUNR**	**NAS 5017ZZNR**	2.80	85	130	134.5	60	59	48	5.5	2.5	2	0.6	101	257 000	446 000	1 200
90	**NAS 5018UUNR**	**NAS 5018ZZNR**	3.70	90	140	145.4	67	66	54	6	2.5	2.5	0.6	110	305 000	540 000	1 100
95	**NAS 5019UUNR**	**NAS 5019ZZNR**	3.90	95	145	150.4	67	66	54	6	2.5	2.5	0.6	114	312 000	562 000	1 100
100	**NAS 5020UUNR**	**NAS 5020ZZNR**	4.05	100	150	155.4	67	66	54	6	2.5	2.5	0.6	118	318 000	584 000	1 000
110	**NAS 5022UUNR**	**NAS 5022ZZNR**	6.50	110	170	175.4	80	79	65	7	2.5	3	1	130	384 000	697 000	900
120	**NAS 5024UUNR**	**NAS 5024ZZNR**	6.95	120	180	188.4	80	79	65	7	3	3	1	139.5	400 000	750 000	850
130	**NAS 5026UUNR**	**NAS 5026ZZNR**	10.5	130	200	208.4	95	94	77	8.5	3	3	1	156	537 000	1 000 000	750
140	**NAS 5028UUNR**	**NAS 5028ZZNR**	11.0	140	210	218.4	95	94	77	8.5	3	3	1	167	543 000	1 070 000	700
150	**NAS 5030UUNR**	**NAS 5030ZZNR**	13.5	150	225	233.4	100	99	81	9	3	3.5	1	176.5	623 000	1 210 000	650
160	**NAS 5032UUNR**	**NAS 5032ZZNR**	16.5	160	240	248.4	109	108	89	9.5	3	3.5	1.5	188.5	720 000	1 390 000	650
170	**NAS 5034UUNR**	**NAS 5034ZZNR**	22.5	170	260	270	122	121	99	11	4	3.5	1.5	204.5	857 000	1 730 000	600

Notes(1) Minimum allowable value of chamfer dimension r

(2) Allowable rotational speed applies to grease lubrication. Considering that the axial load acts under practical operating conditions, up to 1/10 of this value is recommended for actual use.

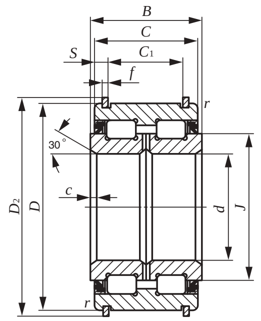
Remarks1. The inner ring has an oil groove and two oil holes.

2. Roller Bearings for Sheaves are provided with prepacked grease.

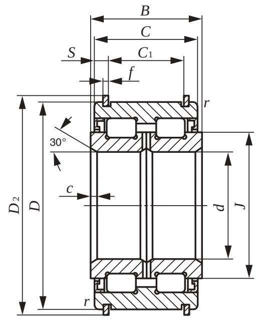
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

ROLLER BEARINGS

Roller Bearings for Sheaves



NAS50…UUNR



NAS50…ZZNR

Shaft dia. 180 ─ 280mm

Shaft dia. mm	Identification number		Mass (Ref.) kg	Boundary dimensions mm											Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min^{-1}
	Sealed type	Shield type		d	D	D_2	B	C	C_1	S	f	c	(1) $r_{s\,min}$	J			
180	**NAS 5036UUNR**	**NAS 5036ZZNR**	30.0	180	280	294	136	135	110	12.5	5	3.5	1.5	217	1 070 000	2 140 000	550
190	**NAS 5038UUNR**	**NAS 5038ZZNR**	31.5	190	290	306	136	135	110	12.5	5	3.5	1.5	225	1 120 000	2 230 000	500
200	**NAS 5040UUNR**	**NAS 5040ZZNR**	40.5	200	310	326	150	149	120	14.5	5	3.5	1.5	242	1 310 000	2 650 000	500
220	**NAS 5044UUNR**	**NAS 5044ZZNR**	52.0	220	340	356	160	159	130	14.5	6	4	1.5	260	1 510 000	3 110 000	450
240	**NAS 5048UUNR**	**NAS 5048ZZNR**	55.5	240	360	376	160	159	130	14.5	6	4	1.5	278.5	1 570 000	3 350 000	400
260	**NAS 5052UUNR**	**NAS 5052ZZNR**	85.0	260	400	416	190	189	154	17.5	7	5	2	312	2 130 000	4 510 000	350
280	**NAS 5056UUNR**	**NAS 5056ZZNR**	90.9	280	420	440	190	189	154	17.5	7	5	2	335	2 210 000	4 860 000	350

Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable rotational speed applies to grease lubrication. Considering that the axial load acts under practical operating conditions, up to 1/10 of this value is recommended for actual use.

Remarks1. The inner ring has an oil groove and two oil holes.
2. Roller Bearings for Sheaves are provided with prepacked grease.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

THRUST BEARINGS

- **Thrust Needle Roller Bearings**
- **Thrust Roller Bearings**

Structure and Features

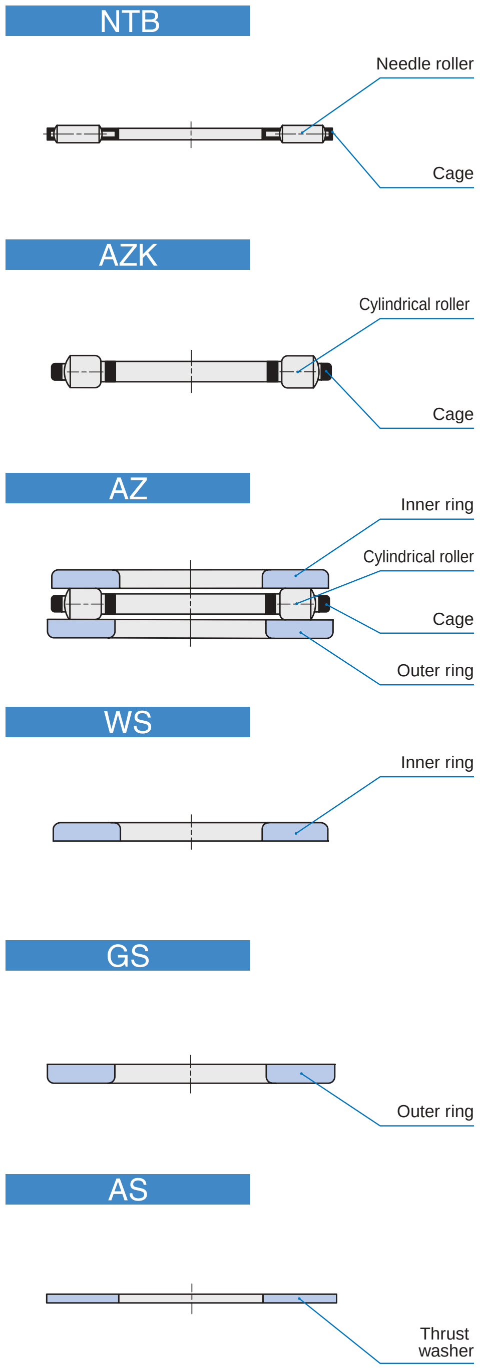
IKO Thrust Bearings consist of a precisely made cage and rollers. They have high rigidity and high load capacities and can be used in small spaces.

Thrust Needle Roller Bearings incorporate needle rollers, while Thrust Roller Bearings incorporate cylindrical rollers. Various types of raceway rings are available, and suitable bearings can be selected according to the operating conditions.

When the bearing mounting surfaces of a machine are heat-treated and finished by grinding as raceways, Thrust Bearings can be used without raceway rings allowing the machine to be made more compact.

They are most suited to applications where high accuracy is required at high speeds and under fluctuating heavy loads, such as driving mechanisms for automobiles, machine tools, and high-pressure pumps.

Structures of Thrust Bearings



F
NTB
AS
AZK
WS·GS

Types

In IKO Thrust Bearings, the types shown in Table 1 are available.

Table 1.1 Type of bearing

Type	Thrust needle roller bearings	Thrust roller bearings	
		Without inner and outer rings	With inner and outer rings
Model code	NTB	AZK	AZ

Table 1.2 Type of bearing ring

Type	Inner ring	Outer ring	Thrust washer
Model code	WS	GS	AS

Thrust Needle Roller Bearings

These bearings consist of a cage made from a steel plate, which is precisely press formed and surface-hardened, and needle rollers with a diameter variation within 2 μ m. They have a rigid structure and a high lubricant-retaining capacity.
As they have the lowest sectional height compared with other thrust bearings, they can be used instead of conventional thrust washers and can withstand high-speed rotations with a low coefficient of friction.
Specially designed thin inner rings (WS) and outer rings (GS), and especially thin (1 mm thick) thrust washers (AS), are available for use in various applications.
These bearings are generally used by utilizing their inner surface as the guide surface.

Thrust Roller Bearings

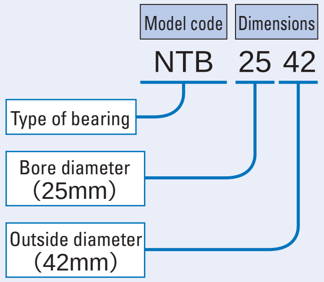
In this series, the caged cylindrical rollers AZK and the complete bearings AZ in which AZK are combined with an inner ring (WS) and an outer ring (GS) are available.
The cage has a special precise structure which is highly rigid, and cylindrical rollers are outwardly arranged and guided by the cage with exact precision to withstand them to withstand heavy loads even at high rotational speeds.
Owing to the high accuracy of the bearing height T, they are suitable for use in machine tools, ultra-high pressure pumps, etc.
These bearings are generally used by utilizing their inner surface as the guide surface.

Identification Number

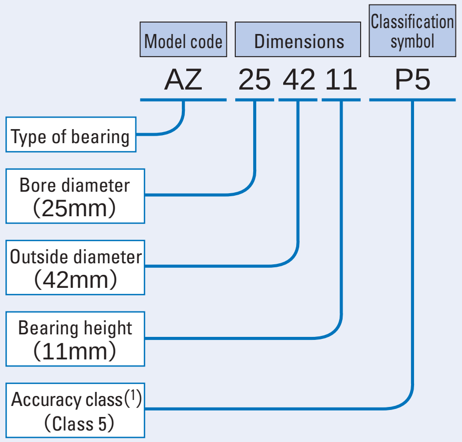
The identification number of Thrust Bearings consists of a model code, dimensions and a classification symbol. Some examples are shown below.

Examples of identification number

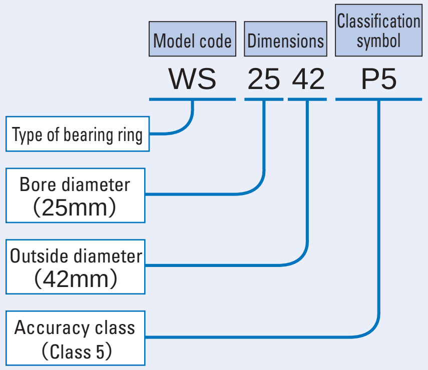
Example 1 (In case of NTB or AS)



Example 2 (In case of AZ or AZK)



Example 3 (In case of WS or GS)



Note(1) Not applicable to the model AZK.

Accuracy

The accuracy of Thrust Bearings is based on JIS B 1514-2, -3 as shown in Table 2.

Table 2.1 Tolerances unit: μ m

Type of bearing \ Item		Dimension	Dimension symbol	Tolerance	
Thrust needle roller bearings	NTB	Bore diameter	d	E11	
		Outside diameter	D	c12	
		Width	D_w	Equivalent to JIS B 1506 Class 2	
Thrust roller bearings	AZK	Bore diameter	d_c	As per Table 2.2	
		Outside diameter	D_c		
		Width	D_w	$1 \leqq D_w \leqq 10$	Equivalent to JIS B 1506 Class 2
				$10 < D_w \leqq 30$	Equivalent to JIS B 1506 Class 3
	AZ	Height	T	As per Table 2.3	
Inner rings	WS	Bore diameter	d	As per Table 2.4	
		Outside diameter	D	b12	
		Width	B	h11	
Outer rings	GS	Bore diameter	d	B12	
		Outside diameter	D	As per Table 2.4	
		Width	B	h11	
Thrust washers	AS	Bore diameter	d	E12	
		Outside diameter	D	e12	
		Width	s	± 50	

Table 2.2 Tolerances of bore and outside diameters for AZK series unit: μ m

Nominal dimension mm		Δ_{dc} Cage bore diameter deviation		Δ_{Dc} Cage outside diameter deviation	
Over	Incl.	High	Low	High	Low
−	50	+ 100	0	0	− 300
50	100	+ 200	0	0	− 400
100	200	+ 300	0	0	− 500
200	300	+ 500	0	0	− 700
300	400	+ 700	0	0	− 1000
400	500	−	−	0	− 1200

Table 2.3 Tolerances of height for AZ series unit: μ m

d Nominal bearing bore dia. mm		Δ_{Ts} Deviation of an actual bearing height	
Over	Incl.	High	Low
−	18	0	− 75
18	30	0	− 75
30	50	0	− 100
50	80	0	− 125
80	120	0	− 150
120	180	0	− 175
180	250	0	− 200
250	315	0	− 225
315	400	0	− 300
400	500	0	− 400

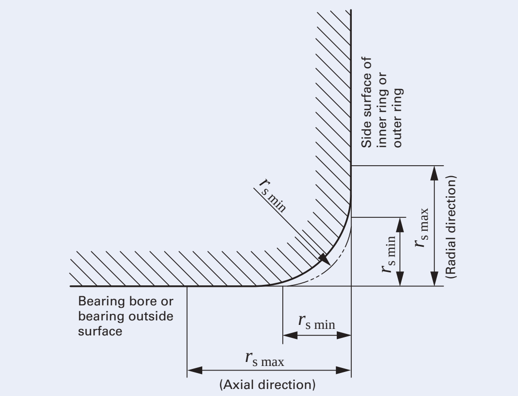
Table 2.4 Tolerances and allowable values for WS and GS

unit: μ m

d or D (1) Nominal bearing bore dia. or outside dia. mm		Inner ring Δ_{dmp} Single plane mean bore diameter deviation		Inner ring V_{dsp} Bore diameter variation in a single radial plane	Outer ring Δ_{Dmp} Single plane mean outside diameter deviation		Outer ring V_{Dsp} Outside diameter variation in a single radial plane	Inner ring or outer ring S_i or S_e (2) Bearing ring thickness variation		
								Class 0	Class 6	Class 5
Over	Incl.	High	Low	Max.	High	Low	Max.	Max.		
–	18	0	− 8	6	0	− 11	8	10	5	3
18	30	0	− 10	8	0	− 13	10	10	5	3
30	50	0	− 12	9	0	− 16	12	10	6	3
50	80	0	− 15	11	0	− 19	14	10	7	4
80	120	0	− 20	15	0	− 22	17	15	8	4
120	180	0	− 25	19	0	− 25	19	15	9	5
180	250	0	− 30	23	0	− 30	23	20	10	5
250	315	0	− 35	26	0	− 35	26	25	13	7
315	400	0	− 40	30	0	− 40	30	30	15	7
400	500	0	− 45	34	0	− 45	34	30	18	9

Notes(1) d for Δ_{dmp} and V_{dp}, and D for Δ_{Dmp} and V_{Dp}, respectively.
d for thickness variations of inner and outer rings .
(2) d_i for thickness variations of rings for NAX(l) and NBX(l) .

Table 2.5 Permissible limit values for chamfer dimension



unit: mm

$r_{s\,min}$	Radial and axial directions $r_{s\,max}$
0.3	0.8
0.6	1.5
1	2.2
1.1	2.7
1.5	3.5
2	4
2.1	4.5
3	5.5
4	6.5
5	8

Fit

The recommended fits for Thrust Bearings are shown in Table 3.

Table 3 Recommended fits

Type of bearing		Tolerance class Shaft	Tolerance class Housing bore
Thrust needle roller bearings	NTB	h8	——
Thrust roller bearings	AZK	h6	——
	AZ		H7
Inner rings	WS	h6	——
Outer rings	GS	——	H7
Thrust washers	AS	h8	——

Mounting

When mounting Thrust Bearings, the following items should be considered.

❶When inner and outer rings are not used, the hardness of the raceway surfaces should be 58 ～ 64HRC, the effective hardening depth should be adequate, and the surface roughness should be less than 0.2μ mR_a.

❷When mounting inner and outer rings to shaft and housing bore, dimensions related to mounting should be based on the dimension tables.

Also, the mounting surfaces should be finished at right angles to the center axis and they should be sufficiently rigid.

❸To avoid elastic deformation, the thrust washer AS must be seated uniformly on its mating surface.

A small warp in an AS washer will be corrected automatically when an axial load is applied.

❹Thrust Roller Bearings are combinations of a copper alloy component and cylindrical rollers. When handling the AZK itself, care should be taken to prevent deformations, blemishes, etc.

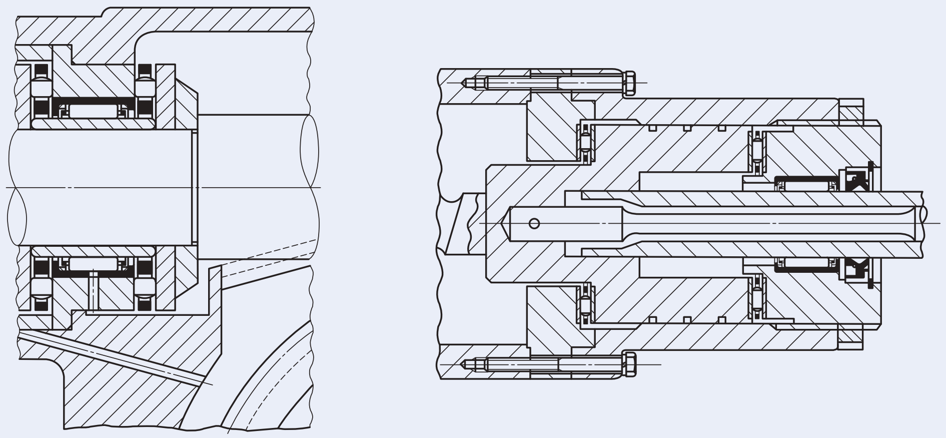
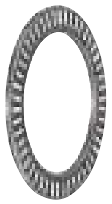
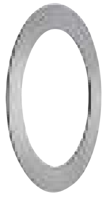


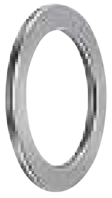
Fig.1 Mounting examples

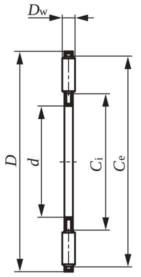
THRUST BEARINGS

Thrust Needle Roller Bearings









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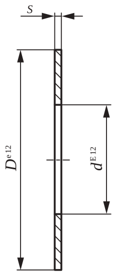

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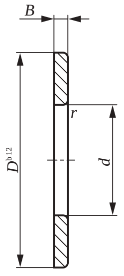

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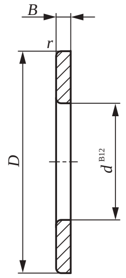


GS

Shaft dia. 10 ─ 85mm

Shaft dia. mm	Identification number Thrust needle roller bearing	Mass (Ref.) g	Thrust washer	Mass (Ref.) g	Inner ring	Outer ring	Mass (Ref.) g	Boundary dimensions mm d	D	D_w	s	B	$r_{s\,min}$ ⁽¹⁾	C_i	C_e	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed⁽²⁾ min⁻¹
10	**NTB 1024**	3.3	**AS 1024**	2.9	**WS 1024**	**GS 1024**	8	10	24	2	1	2.75	0.3	14	22	7 820	23 900	15 000
12	**NTB 1226**	3.8	**AS 1226**	3.2	**WS 1226**	**GS 1226**	8.9	12	26	2	1	2.75	0.3	16	24	8 340	26 900	13 000
15	**NTB 1528**	4.1	**AS 1528**	3.4	**WS 1528**	**GS 1528**	9.3	15	28	2	1	2.75	0.3	18	26	8 830	29 900	12 000
16	**NTB 1629**	4.3	**AS 1629**	3.6	**WS 1629**	**GS 1629**	9.8	16	29	2	1	2.75	0.3	19	27	9 070	31 400	11 000
17	**NTB 1730**	4.5	**AS 1730**	3.7	**WS 1730**	**GS 1730**	10.2	17	30	2	1	2.75	0.3	20	28	9 320	32 900	11 000
18	**NTB 1831**	4.7	**AS 1831**	3.9	**WS 1831**	**GS 1831**	10.7	18	31	2	1	2.75	0.3	21	29	9 550	34 400	10 000
20	**NTB 2035**	6.1	**AS 2035**	5	**WS 2035**	**GS 2035**	13.8	20	35	2	1	2.75	0.3	23	33	11 700	46 500	9 000
25	**NTB 2542**	8.2	**AS 2542**	6.9	**WS 2542**	**GS 2542**	21	25	42	2	1	3	0.6	29	40	14 400	64 700	7 500
30	**NTB 3047**	9.4	**AS 3047**	7.9	**WS 3047**	**GS 3047**	24	30	47	2	1	3	0.6	34	45	15 400	73 300	6 500
35	**NTB 3552**	10.6	**AS 3552**	8.9	**WS 3552**	**GS 3552**	31.5	35	52	2	1	3.5	0.6	39	50	16 300	81 900	5 500
40	**NTB 40603**	22	**AS 4060**	12.1	**WS 4060**	**GS 4060**	42.5	40	60	3	1	3.5	0.6	45	57	24 200	108 000	5 000
45	**NTB 4565**	24.5	**AS 4565**	13.3	**WS 4565**	**GS 4565**	53.5	45	65	3	1	4	0.6	50	62	25 900	121 000	4 500
50	**NTB 5070**	26.5	**AS 5070**	14.5	**WS 5070**	**GS 5070**	58.5	50	70	3	1	4	0.6	55	67	27 600	135 000	4 000
55	**NTB 5578**	33.5	**AS 5578**	18.5	**WS 5578**	**GS 5578**	93	55	78	3	1	5	0.6	61	75	32 400	171 000	4 000
60	**NTB 6085**	38.5	**AS 6085**	22	**WS 6085**	**GS 6085**	105	60	85	3	1	4.75	1	66	82	38 200	219 000	3 500
65	**NTB 6590**	41.5	**AS 6590**	23.5	**WS 6590**	**GS 6590**	124	65	90	3	1	5.25	1	71	87	40 100	237 000	3 000
70	**NTB 7095**	61	**AS 7095**	25	**WS 7095**	**GS 7095**	132	70	95	4	1	5.25	1	75	91	47 400	244 000	3 000
75	**NTB 75100**	65	**AS 75100**	26.5	**WS 75100**	**GS 75100**	153	75	100	4	1	5.75	1	80	96	48 400	256 000	3 000
80	**NTB 80105**	68.5	**AS 80105**	28	**WS 80105**	**GS 80105**	162	80	105	4	1	5.75	1	85	101	49 500	267 000	2 500
85	**NTB 85110**	72	**AS 85110**	29.5	**WS 85110**	**GS 85110**	170	85	110	4	1	5.75	1	90	106	50 300	279 000	2 500

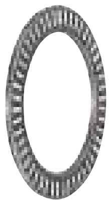
Notes(1) Minimum allowable value of chamfer dimension *r*

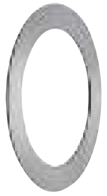
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 25% of this value is allowable.

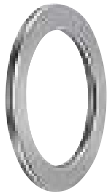
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

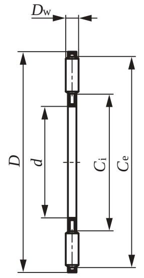
THRUST BEARINGS

Thrust Needle Roller Bearings









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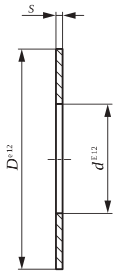

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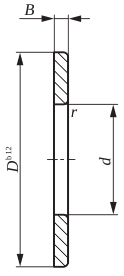

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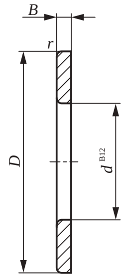


GS

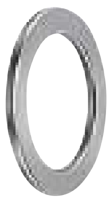
Shaft dia. 90 — 130mm

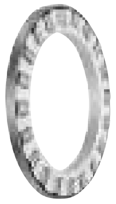
Shaft dia. mm	Identification number						
	Thrust needle roller bearing	Mass (Ref.) g	Thrust washer	Mass (Ref.) g	Inner ring	Outer ring	Mass (Ref.) g
90	**NTB 90120**	92	**AS 90120**	38	**WS 90120**	**GS 90120**	250
100	**NTB 100135**	119	**AS 100135**	50	**WS 100135**	**GS 100135**	350
110	**NTB 110145**	129	—	—	**WS 110145**	**GS 110145**	380
120	**NTB 120155**	139	—	—	**WS 120155**	**GS 120155**	410
130	**NTB 130170**	225	—	—	**WS 130170**	**GS 130170**	660

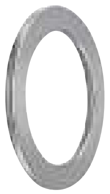
Boundary dimensions mm								Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) min⁻¹
d	D	D_w	s	B	$r_{s\,min}$ (1)	C_i	C_e			
90	120	4	1	6.5	1	96	116	64 500	394 000	2 500
100	135	4	1	7	1	107	131	80 300	541 000	2 000
110	145	4	—	7	1	117	141	83 200	578 000	2 000
120	155	4	—	7	1	127	151	87 900	634 000	1 800
130	170	5	—	9	1	137	165	120 000	839 000	1 700

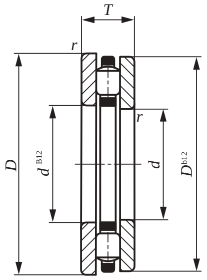
Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 25% of this value is allowable.

Thrust Roller Bearings









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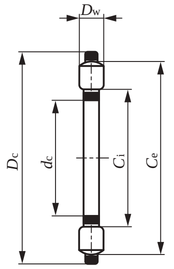
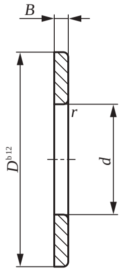


AZK



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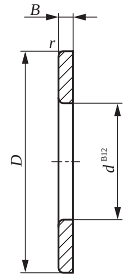

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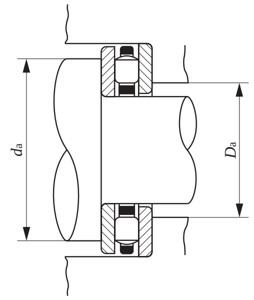


Shaft dia. 10 ─ 65mm

Shaft dia. mm	Identification number						
	Thrust roller bearing	Mass (Ref.) g	Thrust roller bearing	Mass (Ref.) g	Inner ring	Outer ring	Mass (Ref.) g
10	**AZ 10249**	24.6	**AZK 10243.5**	8.6	**WS 1024**	**GS 1024**	8
12	**AZ 12269**	26.5	**AZK 12263.5**	8.7	**WS 1226**	**GS 1226**	8.9
15	**AZ 15289**	28	**AZK 15283.5**	9.4	**WS 1528**	**GS 1528**	9.3
17	**AZ 17309**	30.5	**AZK 17303.5**	10.1	**WS 1730**	**GS 1730**	10.2
20	**AZ 203510**	45.5	**AZK 20354.5**	17.9	**WS 2035**	**GS 2035**	13.8
25	**AZ 254211**	70	**AZK 25425**	28	**WS 2542**	**GS 2542**	21
30	**AZ 304711**	79	**AZK 30475**	31	**WS 3047**	**GS 3047**	24
	AZ 305216	160	**AZK 30527.5**	70	**WS 3052**	**GS 3052**	45
35	**AZ 355212**	99	**AZK 35525**	36	**WS 3552**	**GS 3552**	31.5
	AZ 356218	260	**AZK 35627.5**	98	**WS 3562**	**GS 3562**	81
40	**AZ 406013**	139	**AZK 40606**	54	**WS 4060**	**GS 4060**	42.5
	AZ 406819	310	**AZK 40689**	132	**WS 4068**	**GS 4068**	89
45	**AZ 456514**	169	**AZK 45656**	62	**WS 4565**	**GS 4565**	53.5
	AZ 457320	360	**AZK 45739**	144	**WS 4573**	**GS 4573**	108
50	**AZ 507014**	185	**AZK 50706**	68	**WS 5070**	**GS 5070**	58.5
	AZ 507822	430	**AZK 507811**	194	**WS 5078**	**GS 5078**	118
55	**AZ 557816**	275	**AZK 55786**	89	**WS 5578**	**GS 5578**	93
	AZ 559025	725	**AZK 559011**	275	**WS 5590**	**GS 5590**	225
60	**AZ 608517**	345	**AZK 60857.5**	135	**WS 6085**	**GS 6085**	105
	AZ 609526	770	**AZK 609511**	290	**WS 6095**	**GS 6095**	240
	AZ 6013026	2 090	**AZK 6013010**	790	**WS 60130**	**GS 60130**	650
65	**AZ 659018**	380	**AZK 65907.5**	132	**WS 6590**	**GS 6590**	124
	AZ 6510027	860	**AZK 6510011**	310	**WS 65100**	**GS 65100**	275

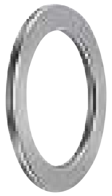
Boundary dimensions mm										Standard mounting dimensions mm		Basic dynamic load rating	Basic static load rating	Allowable rotational speed(2)
d	D	T	d_c	D_c	D_w	B	(1) $r_{s\,min}$	C_i	C_e	d_a Min.	D_a Max.	C N	C_0 N	min^{-1}
10	24	9	10.04	23.6	3.5	2.75	0.3	13	21	21	13	8 990	19 100	18 000
12	26	9	12.04	25.6	3.5	2.75	0.3	15	23	23	16	10 400	23 900	16 000
15	28	9	15.04	27.6	3.5	2.75	0.3	17	25	25	18	10 200	23 900	14 000
17	30	9	17.04	29.6	3.5	2.75	0.3	19	27	27	20	11 400	28 600	13 000
20	35	10	20.04	34.6	4.5	2.75	0.3	22	33	33	23	19 000	48 700	11 000
25	42	11	25.05	41.6	5	3	0.6	28	39	39	28	22 700	60 700	9 000
30	47	11	30.05	46.5	5	3	0.6	33	44	44	33	27 400	81 000	8 000
30	52	16	30.05	51.5	7.5	4.25	0.6	35	49	48	36	38 400	95 700	7 500
35	52	12	35.05	51.5	5	3.5	0.6	38	49	49	39	29 100	91 100	7 000
35	62	18	35.05	61.5	7.5	5.25	1	42	58	57	43	47 900	135 000	6 500
40	60	13	40.05	59.5	6	3.5	0.6	44	57	57	44	41 700	133 000	6 000
40	68	19	40.05	67.5	9	5	1	45	64	64	46	68 700	195 000	5 500
45	65	14	45.05	64.5	6	4	0.6	49	62	62	49	40 800	133 000	5 500
45	73	20	45.05	72.5	9	5.5	1	50	69	69	51	75 700	227 000	5 000
50	70	14	50.05	69.5	6	4	0.6	54	67	67	54	43 300	148 000	5 000
50	78	22	50.05	77.5	11	5.5	1	55	74	73	56	84 300	232 000	4 500
55	78	16	55.05	77.5	6	5	0.6	59	75	75	60	51 700	192 000	4 500
55	90	25	55.05	89.5	11	7	1	63	85	84	63	108 000	332 000	4 000
60	85	17	60.05	84.5	7.5	4.75	1	65	81	81	66	64 600	224 000	4 000
60	95	26	60.05	94.5	11	7.5	1	68	90	89	68	106 000	332 000	4 000
60	130	26	60.05	129.5	10	8	1.5	79	119	119	80	158 000	634 000	3 000
65	90	18	65.05	89.5	7.5	5.25	1	70	86	86	71	68 300	247 000	4 000
65	100	27	65.05	99.5	11	8	1	73	95	94	73	116 000	379 000	3 500

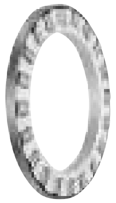
Notes(1) Minimum allowable value of chamfer dimension *r*

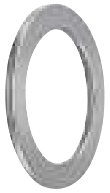
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 25% of this value is allowable.

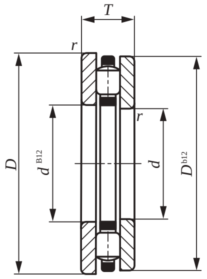
THRUST BEARINGS

Thrust Roller Bearings









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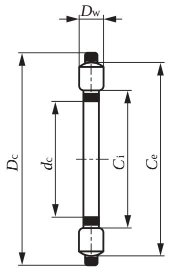

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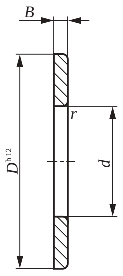

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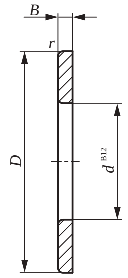

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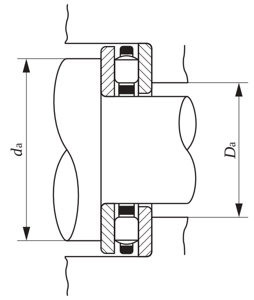


Shaft dia. 70 ─ 130mm

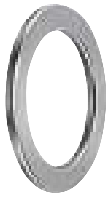
Shaft dia. mm	Identification number							Boundary dimensions mm										Standard mounting dimensions mm		Basic dynamic load rating C	Basic static load rating C_0	Allowable rotational speed(2)
	Thrust roller bearing	Mass (Ref.) g	Thrust roller bearing	Mass (Ref.) g	Inner ring	Outer ring	Mass (Ref.) g	d	D	T	d_c	D_c	D_w	B	(1) $r_{s\,min}$	C_i	C_e	d_a Min.	D_a Max.	N	N	min^{-1}
70	**AZ 709518**	420	**AZK 70957.5**	156	**WS 7095**	**GS 7095**	132	70	95	18	70.05	94.5	7.5	5.25	1	75	91	91	76	72 000	269 000	3 500
	AZ 7010527	905	**AZK 7010511**	325	**WS 70105**	**GS 70105**	290	70	105	27	70.05	104.5	11	8	1	78	100	99	78	114 000	379 000	3 500
	AZ 7014026	2 250	**AZK 7014010**	890	**WS 70140**	**GS 70140**	680	70	140	26	70.05	139.5	10	8	1.1	89	129	129	90	169 000	713 000	3 000
75	**AZ 7510019**	465	**AZK 751007.5**	159	**WS 75100**	**GS 75100**	153	75	100	19	75.05	99.5	7.5	5.75	1	80	96	96	81	71 100	269 000	3 500
	AZ 7511027	960	**AZK 7511011**	340	**WS 75110**	**GS 75110**	310	75	110	27	75.05	109.5	11	8	1	83	105	104	83	123 000	427 000	3 000
80	**AZ 8010519**	495	**AZK 801057.5**	171	**WS 80105**	**GS 80105**	162	80	105	19	80.05	104.5	7.5	5.75	1	85	101	101	86	74 500	292 000	3 000
	AZ 8011528	1 060	**AZK 8011511**	370	**WS 80115**	**GS 80115**	345	80	115	28	80.05	114.5	11	8.5	1	88	110	109	88	122 000	427 000	3 000
	AZ 8015026	2 500	**AZK 8015010**	920	**WS 80150**	**GS 80150**	790	80	150	26	80.05	149.5	10	8	1.5	99	139	139	100	180 000	792 000	2 500
85	**AZ 8511019**	530	**AZK 851107.5**	190	**WS 85110**	**GS 85110**	170	85	110	19	85.05	109.5	7.5	5.75	1	90	106	106	91	77 800	314 000	3 000
	AZ 8512531	1 460	**AZK 8512512**	510	**WS 85125**	**GS 85125**	475	85	125	31	85.05	124.5	12	9.5	1	95	119	118	95	145 000	513 000	3 000
90	**AZ 9012022**	790	**AZK 901209**	290	**WS 90120**	**GS 90120**	250	90	120	22	90.05	119.5	9	6.5	1	97	116	115	97	99 700	390 000	3 000
	AZ 9013535	2 040	**AZK 9013514**	750	**WS 90135**	**GS 90135**	645	90	135	35	90.05	134.5	14	10.5	1.1	100	129	128	101	181 000	626 000	2 500
	AZ 9016026	2 710	**AZK 9016010**	1 000	**WS 90160**	**GS 90160**	855	90	160	26	90.05	159.5	10	8	1.5	109	149	149	110	189 000	871 000	2 500
100	**AZ 10013525**	1 190	**AZK 10013511**	490	**WS 100135**	**GS 100135**	350	100	135	25	100.05	134.5	11	7	1	108	130	129	108	136 000	522 000	2 500
	AZ 10015038	2 720	**AZK 10015015**	980	**WS 100150**	**GS 100150**	870	100	150	38	100.05	149.5	15	11.5	1.1	112	143	142	113	219 000	796 000	2 500
	AZ 10019039	5 960	**AZK 10019015**	2 120	**WS 100190**	**GS 100190**	1 920	100	190	39	100.1	189.3	15	12	1.5	119	179	177	120	333 000	1 420 000	2 000
110	**AZ 11014525**	1 350	**AZK 11014511**	590	**WS 110145**	**GS 110145**	380	110	145	25	110.1	144.5	11	7	1	118	140	139	118	142 000	569 000	2 500
	AZ 11016040	3 220	**AZK 11016017**	1 320	**WS 110160**	**GS 110160**	950	110	160	40	110.1	159.5	17	11.5	1.1	120	154	153	121	282 000	1 030 000	2 000
	AZ 11020039	6 400	**AZK 11020015**	2 280	**WS 110200**	**GS 110200**	2 060	110	200	39	110.1	199.3	15	12	2	129	188	187	130	388 000	1 770 000	2 000
120	**AZ 12015525**	1 450	**AZK 12015511**	630	**WS 120155**	**GS 120155**	410	120	155	25	120.1	154.5	11	7	1	128	150	149	128	149 000	617 000	2 000
	AZ 12017542	4 020	**AZK 12017518**	1 640	**WS 120175**	**GS 120175**	1 190	120	175	42	120.1	174.5	18	12	1.1	132	168	167	133	313 000	1 160 000	2 000
	AZ 12022039	7 730	**AZK 12022015**	2 730	**WS 120220**	**GS 120220**	2 500	120	220	39	120.1	219	15	12	2.1	141	207	206	142	415 000	1 980 000	1 800
130	**AZ 13017030**	2 180	**AZK 13017012**	860	**WS 130170**	**GS 130170**	660	130	170	30	130.1	169.5	12	9	1	140	164	163	140	176 000	741 000	2 000
	AZ 13018542	4 300	**AZK 13018518**	1 760	**WS 130185**	**GS 130185**	1 270	130	185	42	130.1	184.5	18	12	1.5	142	178	177	143	333 000	1 290 000	1 900
	AZ 13023039	8 240	**AZK 13023015**	2 940	**WS 130230**	**GS 130230**	2 650	130	230	39	130.1	229	15	12	2.1	151	217	216	152	440 000	2 180 000	1 700

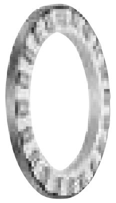
Notes(1) Minimum allowable value of chamfer dimension *r*

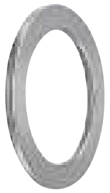
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 25% of this value is allowable.

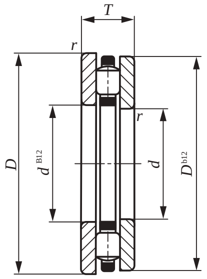
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Thrust Roller Bearings

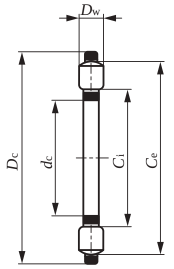




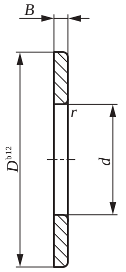




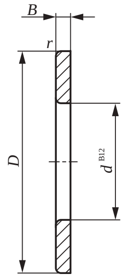
AZ



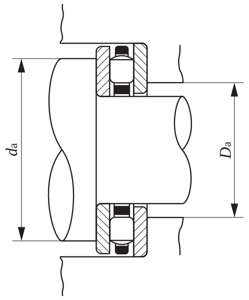
AZK



WS



GS



Shaft dia. 140 ─ 280mm

Shaft dia. mm	Identification number							Boundary dimensions mm										Standard mounting dimensions mm		Basic dynamic load rating	Basic static load rating	Allowable rotational speed(2)
	Thrust roller bearing	Mass (Ref.) g	Thrust roller bearing	Mass (Ref.) g	Inner ring	Outer ring	Mass (Ref.) g	d	D	T	d_c	D_c	D_w	B	(1) $r_{s\,min}$	C_i	C_e	d_a Min.	D_a Max.	C N	C_0 N	min^{-1}
140	**AZ 14018031**	2 410	**AZK 14018012**	920	**WS 140180**	**GS 140180**	745	140	180	31	140.1	179.5	12	9.5	1	150	174	173	150	184 000	798 000	1 900
	AZ 14019542	4 560	**AZK 14019518**	1 860	**WS 140195**	**GS 140195**	1 350	140	195	42	140.1	194.5	18	12	1.5	152	188	187	153	353 000	1 420 000	1 800
	AZ 14024039	8 680	**AZK 14024015**	3 100	**WS 140240**	**GS 140240**	2 790	140	240	39	140.1	239	15	12	2.1	161	227	226	162	435 000	2 180 000	1 600
150	**AZ 15019031**	2 560	**AZK 15019012**	980	**WS 150190**	**GS 150190**	790	150	190	31	150.1	189.5	12	9.5	1	160	184	183	160	181 000	798 000	1 800
	AZ 15020542	4 840	**AZK 15020518**	1 980	**WS 150205**	**GS 150205**	1 430	150	205	42	150.1	204.5	18	12	1.5	162	198	197	163	349 000	1 420 000	1 700
	AZ 15025039	9 140	**AZK 15025015**	3 260	**WS 150250**	**GS 150250**	2 940	150	250	39	150.1	249	15	12	2.1	171	237	236	172	459 000	2 380 000	1 500
160	**AZ 16020031**	2 710	**AZK 16020012**	1 030	**WS 160200**	**GS 160200**	840	160	200	31	160.1	199.5	12	9.5	1	170	194	193	170	189 000	855 000	1 700
	AZ 16027039	10 800	**AZK 16027015**	3 840	**WS 160270**	**GS 160270**	3 480	160	270	39	160.1	269	15	12	3	183	256	255	184	519 000	2 850 000	1 400
170	**AZ 17023045**	6 220	**AZK 17023019**	2 420	**WS 170230**	**GS 170230**	1 900	170	230	45	170.1	229	19	13	1.5	183	221	220	184	406 000	1 730 000	1 500
	AZ 17028039	11 300	**AZK 17028015**	4 020	**WS 170280**	**GS 170280**	3 640	170	280	39	170.1	279	15	12	3	193	266	265	194	543 000	3 070 000	1 300
180	**AZ 18024045**	6 540	**AZK 18024019**	2 540	**WS 180240**	**GS 180240**	2 000	180	240	45	180.1	239	19	13	1.5	193	231	230	194	426 000	1 870 000	1 400
	AZ 18031039	14 600	**AZK 18031015**	5 200	**WS 180310**	**GS 180310**	4 700	180	310	39	180.1	308	15	12	3	204	294	293	205	619 000	3 710 000	1 200
190	**AZ 19025548**	8 060	**AZK 19025520**	3 100	**WS 190255**	**GS 190255**	2 480	190	255	48	190.1	254	20	14	2	205	245	244	206	470 000	2 080 000	1 300
	AZ 19032039	15 000	**AZK 19032015**	5 280	**WS 190320**	**GS 190320**	4 860	190	320	39	190.1	318	15	12	4	214	304	303	215	647 000	3 980 000	1 200
200	**AZ 20026548**	8 430	**AZK 20026520**	3 250	**WS 200265**	**GS 200265**	2 590	200	265	48	200.15	264	20	14	2	215	255	254	216	465 000	2 080 000	1 300
	AZ 20034039	17 200	**AZK 20034015**	6 120	**WS 200340**	**GS 200340**	5 540	200	340	39	200.15	338	15	12	4	227	323	322	228	710 000	4 580 000	1 100
220	**AZ 22029050**	10 400	**AZK 22029022**	4 280	**WS 220290**	**GS 220290**	3 060	220	290	50	220.15	289	22	14	2	236	280	278	237	557 000	2 530 000	1 300
	AZ 22036052	24 000	**AZK 22036020**	8 000	**WS 220360**	**GS 220360**	8 000	220	360	52	220.15	358	20	16	4	246	343	342	247	943 000	5 520 000	1 000
240	**AZ 24031554**	13 200	**AZK 24031524**	5 520	**WS 240315**	**GS 240315**	3 840	240	315	54	240.15	314	24	15	2	256	304	302	257	695 000	3 250 000	1 100
	AZ 24038052	26 500	**AZK 24038020**	9 440	**WS 240380**	**GS 240380**	8 530	240	380	52	240.15	378	20	16	4	266	363	362	267	977 000	5 910 000	1 000
260	**AZ 26034055**	15 400	**AZK 26034025**	6 600	**WS 260340**	**GS 260340**	4 400	260	340	55	260.15	339	25	15	2.1	278	328	326	279	739 000	3 510 000	1 000
	AZ 26042080	51 600	**AZK 26042030**	18 200	**WS 260420**	**GS 260420**	16 700	260	420	80	260.15	418	30	25	5	289	402	400	291	1 430 000	7 490 000	900
280	**AZ 28044080**	54 600	**AZK 28044030**	19 200	**WS 280440**	**GS 280440**	17 700	280	440	80	280.15	438	30	25	5	309	422	420	311	1 420 000	7 490 000	800

Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 25% of this value is allowable.

COMBINED TYPE NEEDLE ROLLER BEARINGS

- ●Needle Roller Bearings with Thrust Ball Bearing
- ●Needle Roller Bearings with Thrust Roller Bearing
- ●Needle Roller Bearings with Angular Contact Ball Bearing
- ●Needle Roller Bearings with Three-point Contact Ball Bearing

Structure and Features

IKO Combined Type Needle Roller Bearings are combinations of a radial bearing and a thrust bearing. Caged needle roller bearings are used as radial bearings and thrust ball bearings or thrust roller bearings are used as thrust bearings. They are compact and very economical, and can be subjected to radial loads and axial loads simultaneously.
They are widely used for machine tools, textile machinery, and industrial machinery.

Types

The types of Combined Type Needle Roller Bearings shown in Table 1 are available.

Table 1.1 Type of bearing

Type	Combined with thrust ball bearing		Combined with thrust roller bearing	
	Without inner ring	With inner ring	Without inner ring	With inner ring
——	NAX	NAXI	NBX	NBXI
With dust cover	NAX…Z	NAXI…Z	NBX…Z	NBXI…Z

Table 1.2 Type of bearing

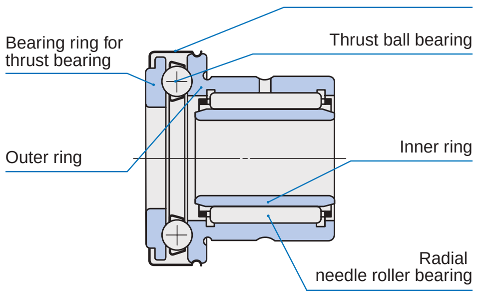
Type	Combined with angular contact ball bearing	Combined with three-point contact ball bearing
Model code	NATA	NATB

Needle Roller Bearings with Thrust Ball Bearing

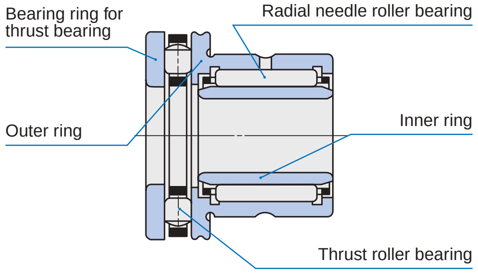
In this series, needle roller bearings are combined with thrust ball bearings to receive thrust loads.
In bearings with a dust cover, the dust cover is formed from a thin steel plate and fixed to a groove cut on the outer cylindrical surface of the outer ring collar. The cover forms a labyrinth with the thrust raceway ring, and is therefore effective in preventing leakage of grease and penetration of dust and dirt.
In the case of bearings without an inner ring, the tolerances of roller set bore diameter F_w are shown in Table 14 on page A33. Therefore, the required radial internal clearances can be selected by combining the bearings with shafts that have been heat-treated and finished by grinding as shown in Table 23 on page A42 and Table 26 on page A44.

Structures of Combined Type Needle Roller Bearings

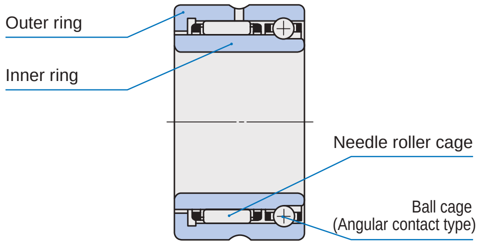
NAXI…Z



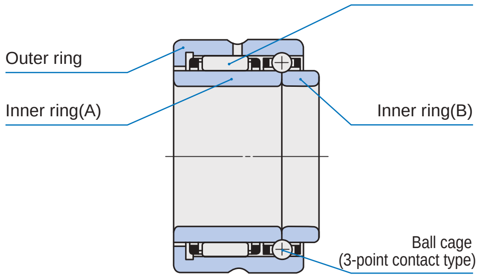
NBXI



NATA



NATB



Needle Roller Bearings with Thrust Roller Bearing

In this series, needle roller bearings are combined with thrust roller bearings to receive thrust loads.
Their axial load ratings are greater than those of bearings that are combined with thrust ball bearings. Also, elastic deformation of the rolling contact surfaces under load is minimal. Furthermore, the thrust bearing section is finished to high accuracy, and therefore high rotational accuracy is obtained in the case of both vertical and horizontal shafts.
Like the needle roller bearings with thrust ball bearing, this series also includes bearings with a dust cover and bearings with an inner ring.

Needle Roller Bearings with Angular Contact Ball Bearing

In this series, caged needle roller bearings are combined with angular contact ball bearings to receive thrust loads. These bearings conform to the international dimension series #59, which is based on the ISO Standard. They can withstand heavy radial loads and unidirectional axial loads simultaneously.
When the axial load exceeds 25% of the radial load, the radial load will be induced in the angular contact ball bearing, and bearing life will be affected. The relationship between the two loads must therefore be taken into careful consideration.

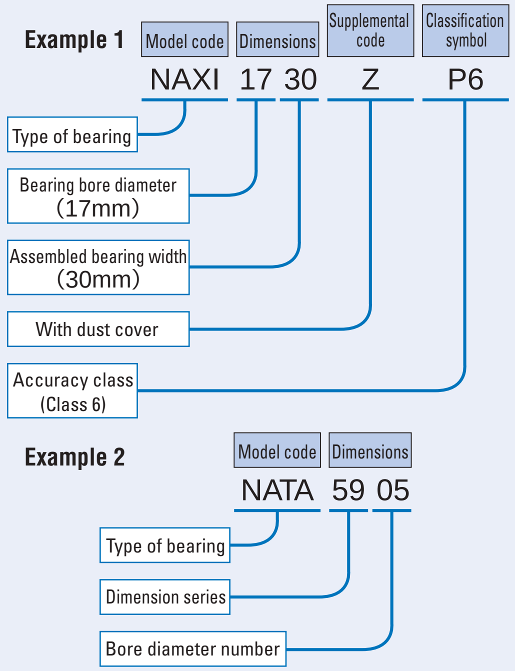
Needle Roller Bearings with Three-point Contact Ball Bearing

These bearings can withstand heavy radial loads and bi-directional axial loads at the same time during high-speed rotation.
Since the non-interchangeable inner rings are separated at the center of the ball raceway surface, they must be firmly tightened against the shaft in the axial direction. The axial clearance of this bearing is 0.1 ～ 0.3 mm, and like NATA59, the axial load should not exceed 25% of the radial load.

Identification Number

The identification number of Combined Type Needle Roller Bearings consists of a model code, dimensions, any supplemental codes and a classification symbol. Some examples are shown below.

Examples of identification number



Accuracy

Dimensional accuracy and rotational accuracy of Combined Type Needle Roller Bearings are based on Table 2 below and Tables 12 and 13 on page A31. The tolerances for the smallest single roller set bore diameter of bearings without inner ring are based on Table 14 on page A33. Thickness variations of thrust rings of NAX(I) and NBX(I) are based on Table 2.4 on page F5.
Bore diameter of the small width inner ring of NATB59 is made for a transition fit with k5 tolerance shaft.

Table 2 Tolerances

unit: mm

Item / Type of bearing	Dimension	Dimension symbol	Tolerance
NAX(I)(1) NBX(I)(1)	Bore dia. of bearing ring for thrust bearing	d_i	E7
	Assembled bearing width	L	0 − 0.25
	Bearing height of thrust bearing	H	0 − 0.20
NATB59	Width of inner ring	B	0 − 0.3

Note(1) Also applicable to bearings with dust cover

Clearance

Combined Type Needle Roller Bearings are manufactured to have the radial internal clearance CN shown in Table 18 on page A37.

Fit

The recommended fits for Combined Type Needle Roller Bearings are shown in Table 3.

Table 3 Recommended fits

Item / Type of bearing	Tolerance class		
	Shaft		Housing bore
	Without inner ring	With inner ring	
NAX(I)(1) NBX(I)(1)	h5, k5	k5	K6, M6
NATA59 NATB59	—	k5(2)	M6(2)

Notes(1) The housing bore for the thrust bearing must be machined to be more than 0.5 mm larger than the outside diameters D_1 and D_2 to ensure that it does not incur radial loads.
(2) If the fit is made tighter than specified in this table, radial loads will act upon the thrust bearing, limiting its function.

Lubrication

Grease is not prepacked in Combined Type Needle Roller Bearings, so perform proper lubrication for use. Operating without lubrication will increase the wear of the rolling contact surfaces and shorten the bearing life.

Oil Hole

The outer ring of Combined Type Needle Roller Bearings has an oil groove and an oil hole. When outer rings with multiple oil holes or inner rings with oil hole(s) are required, please contact IKO.

Rating Life

In Combined Type Needle Roller Bearings, caged needle roller bearings are subjected to radial loads while thrust bearings receive axial loads. Therefore, it is necessary to calculate their lives respectively (page A17).

Mounting

Fig.1 shows mounting examples of Combined Type Needle Roller Bearings. When applying preload to the NAX and NBX models, it is recommended that thrust raceway rings are not tightened directly with nuts, but are tightened using springs as shown in Fig. 2.
Mounting two NATA models symmetrically allows them to be subjected to two-way axial loads. When mounting these models, an axial clearance of 0.2 ～ 0.3 mm should be provided in the angular contact ball bearings so that radial loads are not applied to the angular contact ball bearings.
Dimensions related to mounting should be based on the table of dimensions.

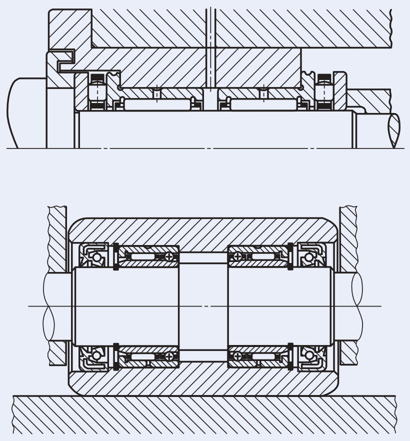


Fig.1 Mounting examples

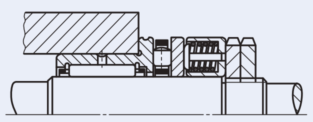
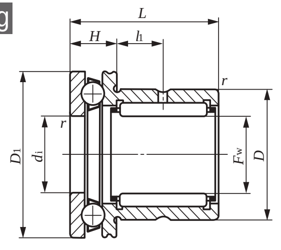


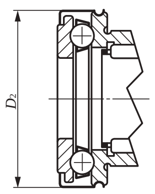
Fig.2 Mounting example when applying preload

COMBINED TYPE NEEDLE ROLLER BEARINGS

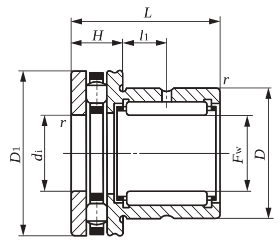
Needle Roller Bearings with Thrust Ball Bearing **Without Inner Ring**
Needle Roller Bearings with Thrust Roller Bearing **Without Inner Ring**



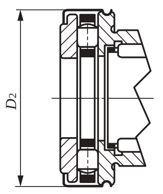
NAX



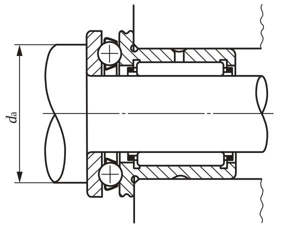
NAX ··· Z



NBX



NBX ··· Z



Shaft dia. 10 ー 70mm

Shaft dia. mm	Identification number	Mass (Ref.) g	With dust cover	Mass (Ref.) g		Mass (Ref.) g	With dust cover	Mass (Ref.) g
10	**NAX 1023**	38.5	**NAX 1023Z**	40	—	—	—	—
12	**NAX 1223**	43.5	**NAX 1223Z**	45.5	—	—	—	—
15	**NAX 1523**	47.5	**NAX 1523Z**	48.5	—	—	—	—
	—	—	—	—	**NBX 1523**	54	**NBX 1523Z**	55
17	**NAX 1725**	54	**NAX 1725Z**	56	—	—	—	—
	—	—	—	—	**NBX 1725**	61	**NBX 1725Z**	63
20	**NAX 2030**	85.5	**NAX 2030Z**	89	—	—	—	—
	—	—	—	—	**NBX 2030**	94	**NBX 2030Z**	97.5
25	**NAX 2530**	131	**NAX 2530Z**	135	—	—	—	—
	—	—	—	—	**NBX 2530**	143	**NBX 2530Z**	147
30	**NAX 3030**	145	**NAX 3030Z**	151	—	—	—	—
	—	—	—	—	**NBX 3030**	160	**NBX 3030Z**	166
35	**NAX 3530**	169	**NAX 3530Z**	176	—	—	—	—
	—	—	—	—	**NBX 3530**	186	**NBX 3530Z**	193
40	**NAX 4032**	219	**NAX 4032Z**	227	—	—	—	—
	—	—	—	—	**NBX 4032**	240	**NBX 4032Z**	248
45	**NAX 4532**	264	**NAX 4532Z**	273	—	—	—	—
	—	—	—	—	**NBX 4532**	293	**NBX 4532Z**	302
50	**NAX 5035**	287	**NAX 5035Z**	297	—	—	—	—
	—	—	—	—	**NBX 5035**	315	**NBX 5035Z**	325
60	**NAX 6040**	417	**NAX 6040Z**	454	—	—	—	—
	—	—	—	—	**NBX 6040**	501	**NBX 6040Z**	538
70	**NAX 7040**	555	**NAX 7040Z**	606	—	—		—

Notes(1) Minimum allowable value of chamfer dimension *r*

(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 70% of this value is allowable in the NAX series, and a maximum of 25% of this value is allowable in the NBX series.

Remarks1. The outer ring has an oil groove and an oil hole.

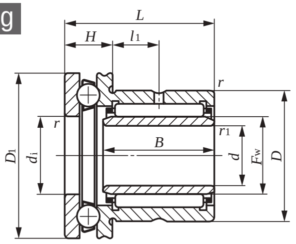
2. No grease is prepacked. Perform proper lubrication.

Boundary dimensions mm									Standard mounting dimension d_a	Basic dynamic load rating C		Basic static load rating C_0		Allowable rotational speed(2)
F_w	D	D_1	D_2	L	H	l_1	(1) $r_{s\,min}$	d_i	Min. mm	Radial N	Axial N	Radial N	Axial N	min^{-1}
10	19	24	25	23	9	6.5	0.3	10	18	8 230	10 000	9 190	11 100	9 500
12	21	26	27	23	9	6.5	0.3	12	20	9 250	9 670	11 200	11 100	9 000
15	24	28	29	23	9	6.5	0.3	15	23	12 300	9 930	14 900	12 200	8 500
15	24	28	29	23	9	6.5	0.3	15	26	12 300	10 200	14 900	23 900	14 000
17	26	30	31	25	9	8	0.3	17	25	12 900	10 800	16 300	14 500	8 500
17	26	30	31	25	9	8	0.3	17	28	12 900	11 400	16 300	28 600	13 000
20	30	35	36	30	10	10.5	0.3	20	29	17 600	14 200	25 400	19 700	7 500
20	30	35	36	30	10	10.5	0.3	20	33	17 600	19 000	25 400	48 700	11 000
25	37	42	43	30	11	9.5	0.6	25	35	20 000	19 600	32 100	29 700	7 000
25	37	42	43	30	11	9.5	0.6	25	40	20 000	22 700	32 100	60 700	9 000
30	42	47	48	30	11	9.5	0.6	30	40	25 100	20 400	40 100	33 600	6 500
30	42	47	48	30	11	9.5	0.6	30	45	25 100	27 400	40 100	81 000	8 000
35	47	52	53	30	12	9	0.6	35	45	26 900	21 200	46 200	37 600	6 000
35	47	52	53	30	12	9	0.6	35	50	26 900	29 100	46 200	91 100	7 000
40	52	60	61	32	13	10	0.6	40	52	29 400	26 900	54 100	50 000	5 500
40	52	60	61	32	13	10	0.6	40	57	29 400	41 700	54 100	133 000	6 000
45	58	65	66.5	32	14	9	0.6	45	57	31 000	27 900	60 200	55 100	5 000
45	58	65	66.5	32	14	9	0.6	45	62	31 000	40 800	60 200	133 000	5 500
50	62	70	71.5	35	14	10	0.6	50	62	42 200	28 800	83 400	60 100	4 500
50	62	70	71.5	35	14	10	0.6	50	67	42 200	43 300	83 400	148 000	5 000
60	72	85	86.5	40	17	12	1	60	75	47 500	41 400	103 000	89 700	4 000
60	72	85	86.5	40	17	12	1	60	82	47 500	64 600	103 000	224 000	4 000
70	85	95	96.5	40	18	11	1	70	85	55 500	43 100	120 000	101 000	3 500

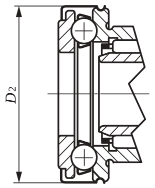
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

COMBINED TYPE NEEDLE ROLLER BEARINGS

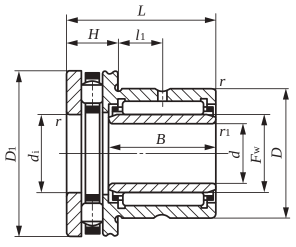
Needle Roller Bearings with Thrust Ball Bearing **With Inner Ring**
Needle Roller Bearings with Thrust Roller Bearing **With Inner Ring**



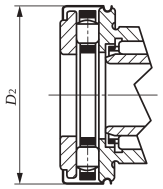
NAXI



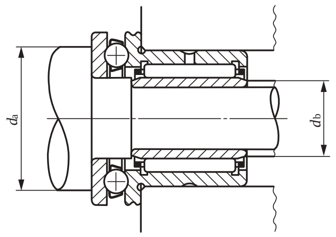
NAXI ··· Z



NBXI



NBXI ··· Z



Shaft dia. 7 – 60mm

Shaft dia. mm	Identification number											Boundary dimensions mm									Standard mounting dimensions mm		Basic dynamic load rating C		Basic static load rating C_0		Allowable rotational speed(2)	Assembled inner ring
		Mass (Ref.) g	With dust cover	Mass (Ref.) g		Mass (Ref.) g	With dust cover	Mass (Ref.) g	d	D	D_1	D_2	L	B	H	l_1	(1) $r_{s\,min}$	(1) $r_{1s\,min}$	F_w	d_i	d_a Min.	d_b	Radial N	Axial N	Radial N	Axial N	min^{-1}	
7	**NAXI 723**	43.5	**NAXI 723Z**	45	—	—	—	—	7	19	24	25	23	16	9	6.5	0.3	0.2	10	10	18	9	8 230	10 000	9 190	11 100	9 500	**LRT 71016**
9	**NAXI 923**	49.5	**NAXI 923Z**	51.5	—	—	—	—	9	21	26	27	23	16	9	6.5	0.3	0.3	12	12	20	11	9 250	9 670	11 200	11 100	9 000	**LRT 91216**
12	**NAXI 1223**	55.5	**NAXI 1223Z**	56.5	—	—	—	—	12	24	28	29	23	16.5	9	6.5	0.3	0.3	15	15	23	14	12 300	9 930	14 900	12 200	8 500	**LRT 121516**
	—	—	—	—	**NBXI 1223**	62	**NBXI 1223Z**	63	12	24	28	29	23	16.5	9	6.5	0.3	0.3	15	15	26	14	12 300	10 200	14 900	23 900	14 000	**LRT 121516**
14	**NAXI 1425**	63.5	**NAXI 1425Z**	65.5	—	—	—	—	14	26	30	31	25	17	9	8	0.3	0.3	17	17	25	16	12 900	10 800	16 300	14 500	8 500	**LRT 141717**
	—	—	—	—	**NBXI 1425**	70.5	**NBXI 1425Z**	72.5	14	26	30	31	25	17	9	8	0.3	0.3	17	17	28	16	12 900	11 400	16 300	28 600	13 000	**LRT 141717**
17	**NAXI 1730**	99	**NAXI 1730Z**	103	—	—	—	—	17	30	35	36	30	20.5	10	10.5	0.3	0.3	20	20	29	19	17 600	14 200	25 400	19 700	7 500	**LRT 172020**
	—	—	—	—	**NBXI 1730**	108	**NBXI 1730Z**	111	17	30	35	36	30	20.5	10	10.5	0.3	0.3	20	20	33	19	17 600	19 000	25 400	48 700	11 000	**LRT 172020**
20	**NAXI 2030**	159	**NAXI 2030Z**	163	—	—	—	—	20	37	42	43	30	20.5	11	9.5	0.6	0.3	25	25	35	24	20 000	19 600	32 100	29 700	7 000	**LRT 202520**
	—	—	—	—	**NBXI 2030**	171	**NBXI 2030Z**	175	20	37	42	43	30	20.5	11	9.5	0.6	0.3	25	25	40	24	20 000	22 700	32 100	60 700	9 000	**LRT 202520**
25	**NAXI 2530**	179	**NAXI 2530Z**	185	—	—	—	—	25	42	47	48	30	20.5	11	9.5	0.6	0.3	30	30	40	29	25 100	20 400	40 100	33 600	6 500	**LRT 253020**
	—	—	—	—	**NBXI 2530**	194	**NBXI 2530Z**	200	25	42	47	48	30	20.5	11	9.5	0.6	0.3	30	30	45	29	25 100	27 400	40 100	81 000	8 000	**LRT 253020**
30	**NAXI 3030**	208	**NAXI 3030Z**	215	—	—	—	—	30	47	52	53	30	20	12	9	0.6	0.3	35	35	45	34	26 900	21 200	46 200	37 600	6 000	**LRT 303520**
	—	—	—	—	**NBXI 3030**	225	**NBXI 3030Z**	232	30	47	52	53	30	20	12	9	0.6	0.3	35	35	50	34	26 900	29 100	46 200	91 100	7 000	**LRT 303520**
35	**NAXI 3532**	265	**NAXI 3532Z**	273	—	—	—	—	35	52	60	61	32	20	13	10	0.6	0.3	40	40	52	39	29 400	26 900	54 100	50 000	5 500	**LRT 354020**
	—	—	—	—	**NBXI 3532**	286	**NBXI 3532Z**	294	35	52	60	61	32	20	13	10	0.6	0.3	40	40	57	39	29 400	41 700	54 100	133 000	6 000	**LRT 354020**
40	**NAXI 4032**	315	**NAXI 4032Z**	324	—	—	—	—	40	58	65	66.5	32	20	14	9	0.6	0.3	45	45	57	44	31 000	27 900	60 200	55 100	5 000	**LRT 404520**
	—	—	—	—	**NBXI 4032**	344	**NBXI 4032Z**	353	40	58	65	66.5	32	20	14	9	0.6	0.3	45	45	62	44	31 000	40 800	60 200	133 000	5 500	**LRT 404520**
45	**NAXI 4535**	358	**NAXI 4535Z**	368	—	—	—	—	45	62	70	71.5	35	25	14	10	0.6	0.3	50	50	62	49	42 200	28 800	83 400	60 100	4 500	**LRT 455025**
	—	—	—	—	**NBXI 4535**	386	**NBXI 4535Z**	396	45	62	70	71.5	35	25	14	10	0.6	0.3	50	50	67	49	42 200	43 300	83 400	148 000	5 000	**LRT 455025**
50	**NAXI 5040**	582	**NAXI 5040Z**	619	—	—	—	—	50	72	85	86.5	40	25.5	17	12	1	1	60	60	75	59	47 500	41 400	103 000	89 700	4 000	**LRT 506025**
	—	—	—	—	**NBXI 5040**	666	**NBXI 5040Z**	703	50	72	85	86.5	40	25.5	17	12	1	1	60	60	82	59	47 500	64 600	103 000	224 000	4 000	**LRT 506025**
60	**NAXI 6040**	750	**NAXI 6040Z**	801	—	—	—	—	60	85	95	96.5	40	25.5	18	11	1	1	70	70	85	68	55 500	43 100	120 000	101 000	3 500	**LRT 607025**

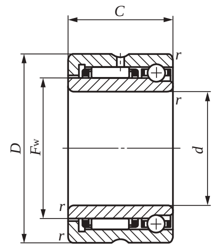
Notes(1) Minimum allowable value of chamfer dimension r or r_1
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 70% of this value is allowable in the NAXI series, and a maximum of 25% of this value is allowable in the NBXI series.

Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

COMBINED TYPE NEEDLE ROLLER BEARINGS

Needle Roller Bearings with Angular Contact Ball Bearing
Needle Roller Bearings with Three-point Contact Ball Bearing



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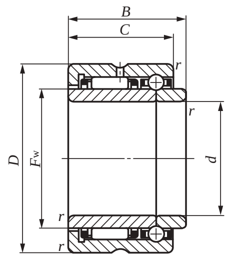
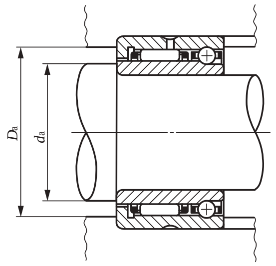
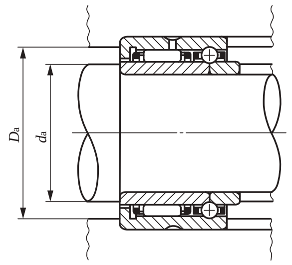


NATB59





Shaft dia. 15 ─ 70mm

Shaft dia. mm	Identification number				Boundary dimensions mm						Standard mounting dimensions mm		Basic dynamic load rating C		Basic static load rating C_0		Allowable rotational speed(2)
	Angular contact type	Mass (Ref.) g	Three-point contact type	Mass (Ref.) g	d	D	C	B	$r_{s\,\min}$(1)	F_w	d_a Min.	D_a Max.	Radial N	Axial N	Radial N	Axial N	min⁻¹
15	**NATA 5902**	50.5	**NATB 5902**	53	15	28	18	20	0.3	20	17	26	7 710	1 900	10 200	2 920	20 000
17	**NATA 5903**	55.5	**NATB 5903**	58.5	17	30	18	20	0.3	22	19	28	8 220	2 050	11 500	3 340	18 000
20	**NATA 5904**	111	**NATB 5904**	115	20	37	23	25	0.3	25	22	35	14 300	3 810	18 400	6 110	16 000
25	**NATA 5905**	131	**NATB 5905**	136	25	42	23	25	0.3	30	27	40	15 800	4 300	22 100	7 520	13 000
30	**NATA 5906**	151	**NATB 5906**	157	30	47	23	25	0.3	35	32	45	17 700	4 550	26 800	8 460	11 000
35	**NATA 5907**	250	**NATB 5907**	260	35	55	27	30	0.6	42	39	51	24 000	4 890	42 100	9 870	9 500
40	**NATA 5908**	355	**NATB 5908**	375	40	62	30	34	0.6	48	44	58	30 600	5 350	60 400	11 800	8 500
45	**NATA 5909**	410	**NATB 5909**	435	45	68	30	34	0.6	55	49	64	32 600	5 450	68 500	12 700	7 000
50	**NATA 5910**	420	**NATB 5910**	445	50	72	30	34	0.6	58	54	68	33 600	5 660	72 500	13 600	7 000
55	**NATA 5911**	585	**NATB 5911**	615	55	80	34	38	1	63	60	75	39 500	10 400	74 400	24 700	6 500
60	**NATA 5912**	625	**NATB 5912**	660	60	85	34	38	1	68	65	80	41 800	10 700	82 200	26 700	6 000
65	**NATA 5913**	665	**NATB 5913**	710	65	90	34	38	1	75	70	85	43 800	11 000	90 200	28 700	5 500
70	**NATA 5914**	1 070	**NATB 5914**	1 130	70	100	40	45	1	80	75	95	56 400	13 500	127 000	35 000	5 000

Notes(1) Minimum allowable value of chamfer dimension *r*
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

INNER RINGS

- **Inner Rings for Shell Type Needle Roller Bearings**
- **Inner Rings for General Usage**

Structure and Features

IKO Inner Rings are heat-treated and finished by grinding to a high degree of accuracy. In the case of needle roller bearings, normally, the shafts are heat-treated and finished by grinding, and used as the raceway surfaces. However, when it is impossible to make shaft surfaces according to the specified surface hardness or surface roughness, inner rings are used.

Inner rings include those for Shell Type Needle Roller Bearings and those for general use and are available in a variety of dimensions. When shafts move axially or seals are used adjacent to bearings, wide inner rings can be selected.

Inner rings can also be used economically as bushings without requiring any additional machining.

Types

For Inner Rings, the types shown in Table 1 are available.

Table 1.1 Inner Rings for Shell Type Needle Roller Bearings

Series		Model codes of assembled bearings
Metric series	IRT	TA…Z, TLA…Z TAM, TLAM, YT, YTL
Inch series	IRB	BA…Z, BHA…Z BAM, BHAM, YB, YBH

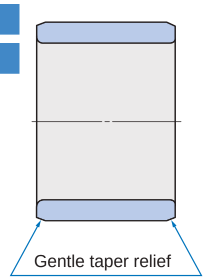
Remark For Inner Rings for Shell Type Needle Roller Bearings with Seal, please consult IKO.

Table 1.2 Inner Rings for General Usage

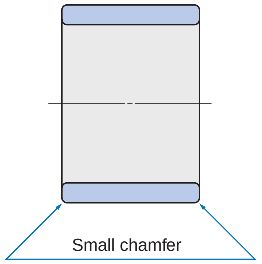
Series		Model codes of assembled bearings
Metric series	LRT	RNA 49, RNA 69 RNA 48, TAF, TR RNAF, NAX, NBX
	LRTZ	RNA 49…UU, RNA 69…UU GTR
Inch series	LRB	BR
	LRBZ…B	BR…UU

Shapes of Inner Rings

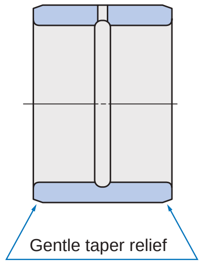
IRT
IRB
LRT



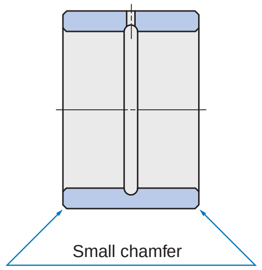
LRTZ



LRB



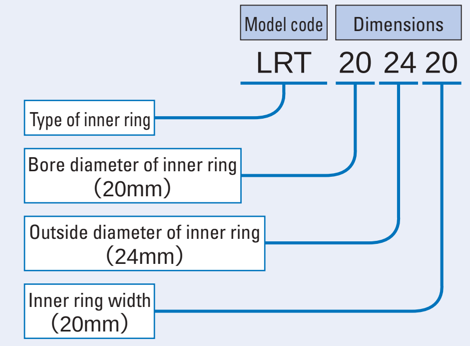
LRBZ…B



Identification number

The identification number of Inner Rings consists of a model code and dimensions. An example is shown below.

Example of identification number



Accuracy

Dimensional accuracy of Inner Rings is based on Table 2. Inner Rings for Shell Type Needle Roller Bearings are manufactured so that exact radial internal clearances can be obtained when assembled with Shell Type Needle Roller Bearings. Inner Rings for General Usage produce CN clearance when used in the assembled bearings shown in Table 1.2. LRB and LRBZ ⋯ B models produce the radial internal clearances shown in Table 4 on page D5.

When clearances other than CN clearance or accuracy other than Class 0 are required, please consult IKO.

Table 2 Tolerances for inner ring

Model code	Tolerance
IRT LRT, LRTZ	JIS Class 0 (See the table 12, page A31)
IRB	Based on Table 3
LRB LRBZ ⋯ B	Based on Table 4

Remark Tolerances of outside diameter of inner ring are based on Table 5.

Table 3 Tolerances of IRB

unit: μ m

d Nominal inside diameter of inner ring mm		Δ_{dmp} Single plane mean bore diameter deviation		Δ_{Bs} Deviation of a single inner ring width		K_{ia} Radial runout of assembled bearing inner ring
Over	Incl.	High	Low	High	Low	Max.
2.5	10	0	− 13	0	− 250	10
10	18	0	− 13	0	− 250	10
18	30	0	− 13	0	− 250	13
30	50	0	− 13	0	− 250	15
50	80	0	− 13	0	− 250	20

Table 4 Tolerances of LRB,LRBZ⋯B

unit: μ m

d Nominal inside diameter of inner ring mm		Δ_{dmp} Single plane mean bore diameter deviation		Δ_{Bs} Deviation of a single inner ring width		K_{ia} Radial runout of assembled bearing inner ring
Over	Incl.	High	Low	High	Low	Max.
−	19.050	0	− 10	0	− 130	10
19.050	30.162	0	− 13	0	− 130	13
30.162	50.800	0	− 13	0	− 130	15
50.800	82.550	0	− 15	0	− 130	20
82.550	120.650	0	− 20	0	− 130	25

Table 5 Tolerances of outside diameter of inner ring

unit: μ m

Model code	Tolerance
IRT	g5
IRB	0 ～− 13
LRT, LRTZ	Based on Table 6
LRB, LRBZ ⋯ B	Based on Table 7

Table 7 Tolerances of outside diameters of LRB and LRBZ ⋯ B

unit: μ m

Nominal outside diameter of inner ring mm		Tolerance	
Over	Incl.	High	Low
−	18.034	− 13	− 23
18.034	25.908	− 18	− 30
25.908	30.226	− 23	− 36
30.226	35.052	− 23	− 38
35.052	50.038	− 25	− 41
50.038	80.010	− 28	− 46
80.010	100.076	− 32	− 56
100.076	102.108	− 37	− 66

Fit

The recommended fits between Inner Rings and shafts are shown in Table 22 on page A42.

Oil Hole

The number of oil holes is shown in Table 8.

When Inner Rings with an oil hole are especially required for a model without an oil hole, attach an "OH" to the end of the identification number when ordering.

Example: LRT 202420 OH

For Inner Rings with multiple oil holes, please consult IKO.

Table 8 Number of oil holes

Bearing type			Bore diameter of inner ring d mm	Number of oil holes
For Shell Type Needle Roller Bearings	Metric series	IRT		0
	Inch series	IRB		0
For General Usage	Metric series	LRT		0
		LRTZ		0
	Inch series	LRB	$d \leqq 76.200$	1
			$76.200 < d$	2
		LRBZ ⋯ B		1

Remark Inner rings with an oil hole are provided with an oil groove.

Table 6 Tolerances of outside diameters for LRT and LRTZ (When the clearance is CN clearance)

unit: μ m

d Bore diameter of inner ring mm		F Outside diameter of inner ring mm $3 < F \leqq 6$		$6 < F \leqq 10$		$10 < F \leqq 18$		$18 < F \leqq 30$		$30 < F \leqq 50$		$50 < F \leqq 80$		$80 < F \leqq 120$		$120 < F \leqq 180$		$180 < F \leqq 250$		$250 < F \leqq 315$		$315 < F \leqq 400$		$400 < F \leqq 500$		d Bore diameter of inner ring mm	
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	Over	Incl.
−	24	− 10	− 27	− 7	− 23	− 4	− 18	0	− 12																	−	24
24	30							0	− 12	+ 5	− 4															24	30
30	40									0	− 9															30	40
40	50									− 5	− 19	0	− 11													40	50
50	65											− 10	− 21													50	65
65	80											− 10	− 26	− 4	− 17											65	80
80	100													− 14	− 27											80	100
100	120													− 14	− 32	− 7	− 22									100	120
120	140															− 17	− 37									120	140
140	160															− 27	− 52									140	160
160	180																	− 25	− 46							160	180
180	200																	− 40	− 66							180	200
200	225																	− 55	− 86							200	225
225	250																			− 54	− 87					225	250
250	280																			− 69	− 107					250	280
280	315																					− 68	− 107			280	315
315	355																					− 83	− 127			315	355
355	400																					− 128	− 182	− 122	− 172	355	400
400	450																							− 142	− 202	400	450
450	500																							− 152	− 222	450	500

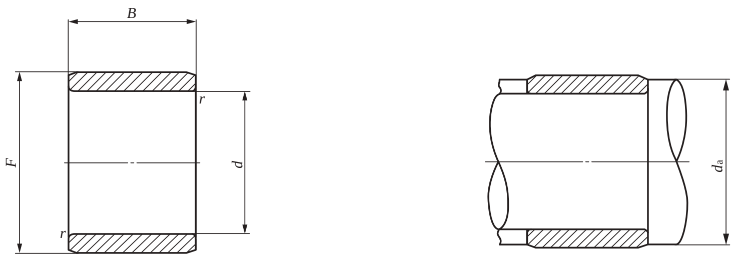
INNER RINGS

Inner Rings for Shell Type Needle Roller Bearings

Shaft dia. 7 ─ 17mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm				Standard mounting dimension mm		Assembled bearings		
			d	F	B	$r_{s\,min}$ (1)	d_a Min.	d_a Max.	TA ··· Z (TAM)	TLA ··· Z (TLAM)	YT YTL
7	**IRT 710**	3.2	7	10	10.5	0.3	9	9.7	**TA 1010Z**	**TLA 1010Z**	—
	IRT 712	3.9	7	10	12.5	0.3	9	9.7	**TA 1012Z**	**TLA 1012Z**	—
	IRT 715	4.8	7	10	15.5	0.3	9	9.7	**TA 1015Z**	**TLA 1015Z**	—
8	**IRT 810**	5.1	8	12	10.5	0.3	10	11	—	**TLA 1210Z**	**YTL 1210**
	IRT 812	6	8	12	12.5	0.3	10	11	**TA 1212Z**	**TLA 1212Z**	**YT 1212**
	IRT 815	7.5	8	12	15.5	0.3	10	11	**TA 1215Z**	—	—
10	**IRT 1012**	5.2	10	13	12.5	0.3	12	12.7	—	**TLA 1312Z**	—
	IRT 1012-2	7.2	10	14	12.5	0.3	12	13	—	**TLA 1412Z**	—
	IRT 1016-2	9.6	10	14	16.5	0.3	12	13	**TA 1416Z**	**TLA 1416Z**	—
	IRT 1020-2	11.9	10	14	20.5	0.3	12	13	**TA 1420Z**	—	—
	IRT 1010-1	7.9	10	15	10.5	0.3	12	14	**TA 1510Z**	—	—
	IRT 1012-1	9.4	10	15	12.5	0.3	12	14	**TA 1512Z**	**TLA 1512Z**	—
	IRT 1015-1	11.7	10	15	15.5	0.3	12	14	**TA 1515Z**	—	—
	IRT 1020-1	15.5	10	15	20.5	0.3	12	14	**TA 1520Z**	—	—
	IRT 1025-1	19.3	10	15	25.5	0.3	12	14	**TA 1525Z**	—	—
12	**IRT 1212**	6.1	12	15	12.5	0.3	14	14.5	**TA 1512Z**	**TLA 1512Z**	—
	IRT 1216	8.1	12	15	16.5	0.3	14	14.5	—	**TLA 1516Z**	—
	IRT 1222	11	12	15	22.5	0.3	14	14.5	—	**TLA 1522Z**	—
	IRT 1212-1	8.5	12	16	12.5	0.3	14	15	—	**TLA 1612Z**	—
	IRT 1216-1	11.2	12	16	16.5	0.3	14	15	**TA 1616Z**	**TLA 1616Z**	—
	IRT 1220-1	13.9	12	16	20.5	0.3	14	15	**TA 1620Z**	—	—
	IRT 1222-1	15.2	12	16	22.5	0.3	14	15	—	**TLA 1622Z**	—
	IRT 1215-2	13.6	12	17	15.5	0.3	14	16	**TA 1715Z**	—	**YT 1715**
	IRT 1220-2	18	12	17	20.5	0.3	14	16	**TA 1720Z**	—	—
	IRT 1225-2	22.5	12	17	25.5	0.3	14	16	**TA 1725Z**	—	**YT 1725**
15	**IRT 1512**	7.5	15	18	12.5	0.3	17	17.5	—	**TLA 1812Z**	—
	IRT 1513	8.1	15	18	13.5	0.3	17	17.5	**TA 1813Z**	—	—

Note(1) Minimum allowable value of chamfer dimension *r*
Remark No oil hole is provided.

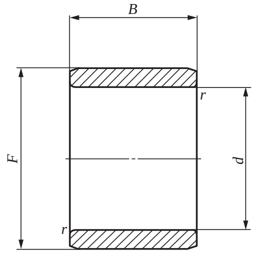


IRT

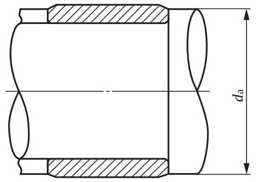
Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm				Standard mounting dimension mm		Assembled bearings		
			d	F	B	$r_{s\,min}$ (1)	d_a Min.	d_a Max.	TA ··· Z (TAM)	TLA ··· Z (TLAM)	YT YTL
15	**IRT 1515**	9.3	15	18	15.5	0.3	17	17.5	**TA 1815Z**	—	—
	IRT 1516	9.9	15	18	16.5	0.3	17	17.5	—	**TLA 1816Z**	—
	IRT 1517	10.5	15	18	17.5	0.3	17	17.5	**TA 1817Z**	—	—
	IRT 1519	11.7	15	18	19.5	0.3	17	17.5	**TA 1819Z**	—	—
	IRT 1520	12.3	15	18	20.5	0.3	17	17.5	**TA 1820Z**	—	—
	IRT 1525	15.2	15	18	25.5	0.3	17	17.5	**TA 1825Z**	—	—
	IRT 1516-1	13.6	15	19	16.5	0.3	17	18	**TA 1916Z**	—	—
	IRT 1520-1	16.8	15	19	20.5	0.3	17	18	**TA 1920Z**	—	—
	IRT 1515-2	16.4	15	20	15.5	0.3	17	19	**TA 2015Z**	—	**YT 2015**
	IRT 1520-2	21.5	15	20	20.5	0.3	17	19	**TA 2020Z** **TA 202820Z**	**TLA 2020Z**	**YT 202820**
	IRT 1525-2	27	15	20	25.5	0.3	17	19	**TA 2025Z**	—	**YT 2025**
	IRT 1530-2	32	15	20	30.5	0.3	17	19	**TA 2030Z**	**TLA 2030Z**	—
17	**IRT 1716**	11.1	17	20	16.5	0.3	19	19.5	—	**TLA 2016Z**	—
	IRT 1720	13.7	17	20	20.5	0.3	19	19.5	**TA 2020Z** **TA 202820Z**	**TLA 2020Z**	**YT 202820**
	IRT 1730	20.5	17	20	30.5	0.3	19	19.5	**TA 2030Z**	**TLA 2030Z**	—
	IRT 1716-1	15.1	17	21	16.5	0.3	19	20	**TA 2116Z**	—	**YT 2116**
	IRT 1720-1	18.8	17	21	20.5	0.3	19	20	**TA 2120Z**	—	**YT 2120**
	IRT 1710-2	12.4	17	22	10.5	0.3	19	21	**TA 2210Z**	—	—
	IRT 1715-2	18.3	17	22	15.5	0.3	19	21	**TA 2215Z**	—	—
	IRT 1716-2	19.4	17	22	16.5	0.3	19	21	**TA 223016Z**	**TLA 2216Z**	**YT 223016**
	IRT 1720-2	24	17	22	20.5	0.3	19	21	**TA 2220Z** **TA 223020Z**	**TLA 2220Z**	**YT 223020**
	IRT 1725-2	30	17	22	25.5	0.3	19	21	**TA 2225Z**	—	—
	IRT 1730-2	36	17	22	30.5	0.3	19	21	**TA 2230Z**	—	—

Note(1) Minimum allowable value of chamfer dimension *r*
Remark No oil hole is provided.

Inner Rings for Shell Type Needle Roller Bearings



IRT



Shaft dia. 20 – 45mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm				Standard mounting dimension mm		Assembled bearings		
			d	F	B	$r_{s\,min}$ (1)	d_a Min.	d_a Max.	TA···Z (TAM)	TLA···Z (TLAM)	YT YTL
20	**IRT 2016**	17.5	20	24	16.5	0.3	22	23	**TA 243216Z**	—	**YT 243216**
	IRT 2020	22	20	24	20.5	0.3	22	23	**TA 2420Z** **TA 243220Z**	—	**YT 243220**
	IRT 2028	30.5	20	24	28.5	0.3	22	23	**TA 2428Z**	—	**YT 2428**
	IRT 2010-1	14.3	20	25	10.5	0.3	22	24	**TA 2510Z**	—	**YT 2510**
	IRT 2015-1	21	20	25	15.5	0.3	22	24	**TA 2515Z**	—	**YT 2515**
	IRT 2020-1	28	20	25	20.5	0.3	22	24	**TA 2520Z**	**TLA 2520Z**	**YT 2520**
	IRT 2025-1	34.5	20	25	25.5	0.3	22	24	**TA 2525Z**	—	**YT 2525**
	IRT 2026-1	36	20	25	26.5	0.3	22	24	—	**TLA 2526Z**	**YTL 2526**
	IRT 2030-1	41.5	20	25	30.5	0.3	22	24	**TA 2530Z**	—	—
	IRT 2038-1	52.5	20	25	38.5	0.3	22	24	—	**TLAW 2538Z**	—
22	**IRT 2216**	19.1	22	26	16.5	0.3	24	25	**TA 2616Z**	—	**YT 2616**
	IRT 2220	24	22	26	20.5	0.3	24	25	**TA 2620Z**	—	**YT 2620**
	IRT 2220-1	37	22	28	20.5	0.3	24	27	**TA 2820Z**	**TLA 2820Z**	**YT 2820**
	IRT 2230-1	55.5	22	28	30.5	0.3	24	27	**TA 2830Z**	—	—
25	**IRT 2520**	26.5	25	29	20.5	0.3	27	28	**TA 2920Z**	—	**YT 2920**
	IRT 2530	40	25	29	30.5	0.3	27	28	**TA 2930Z**	—	—
	IRT 2515-1	25.5	25	30	15.5	0.3	27	29	**TA 3015Z**	—	—
	IRT 2520-1	34	25	30	20.5	0.3	27	29	**TA 3020Z**	**TLA 3020Z**	—
	IRT 2525-1	42.5	25	30	25.5	0.3	27	29	**TA 3025Z**	—	—
	IRT 2526-1	44	25	30	26.5	0.3	27	29	—	**TLA 3026Z**	—
	IRT 2530-1	50.5	25	30	30.5	0.3	27	29	**TA 3030Z**	—	—
	IRT 2538-1	64	25	30	38.5	0.3	27	29	—	**TLAW 3038Z**	—
28	**IRT 2820**	29.5	28	32	20.5	0.3	30	31	**TA 3220Z**	—	**YT 3220**
	IRT 2830	44	28	32	30.5	0.3	30	31	**TA 3230Z**	—	—
30	**IRT 3012**	24.5	30	35	12.5	0.6	34	34.5	**TA 3512Z**	**TLA 3512Z**	—
	IRT 3015	30.5	30	35	15.5	0.6	34	34.5	**TA 3515Z**	—	—

Note(1) Minimum allowable value of chamfer dimension r

Remark No oil hole is provided.

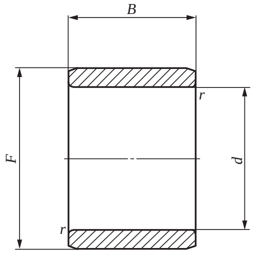
Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm				Standard mounting dimension mm		Assembled bearings		
			d	F	B	$r_{s\,min}$ (1)	d_a Min.	d_a Max.	TA···Z (TAM)	TLA···Z (TLAM)	YT YTL
30	**IRT 3020**	40	30	35	20.5	0.6	34	34.5	**TA 3520Z**	**TLA 3520Z**	—
	IRT 3025	50	30	35	25.5	0.6	34	34.5	**TA 3525Z**	—	—
	IRT 3030	60	30	35	30.5	0.6	34	34.5	**TA 3530Z**	—	—
32	**IRT 3220**	42.5	32	37	20.5	0.6	36	36.5	**TA 3720Z**	—	**YT 3720**
	IRT 3230	63.5	32	37	30.5	0.6	36	36.5	**TA 3730Z**	—	—
	IRT 3215-1	39.5	32	38	15.5	0.6	36	37	**TA 3815Z**	—	—
	IRT 3220-1	52	32	38	20.5	0.6	36	37	**TA 3820Z**	—	—
	IRT 3225-1	64.5	32	38	25.5	0.6	36	37	**TA 3825Z**	—	—
	IRT 3230-1	77.5	32	38	30.5	0.6	36	37	**TA 3830Z**	—	—
	IRT 3245-1	115	32	38	45.5	0.6	36	37	**TAW 3845Z**	—	—
35	**IRT 3515**	35	35	40	15.5	0.6	39	39.5	**TA 4015Z**	—	**YT 4015**
	IRT 3520	46.5	35	40	20.5	0.6	39	39.5	**TA 4020Z**	**TLA 4020Z**	—
	IRT 3525	58	35	40	25.5	0.6	39	39.5	**TA 4025Z**	—	**YT 4025**
	IRT 3530	69	35	40	30.5	0.6	39	39.5	**TA 4030Z**	—	—
	IRT 3540	91.5	35	40	40.5	0.6	39	39.5	**TA 4040Z**	—	—
40	**IRT 4020**	52.5	40	45	20.5	0.6	44	45.5	**TA 4520Z**	**TLA 4520Z**	**YT 4520**
	IRT 4025	65.5	40	45	25.5	0.6	44	45.5	**TA 4525Z**	—	**YT 4525**
	IRT 4030	78.5	40	45	30.5	0.6	44	45.5	**TA 4530Z**	—	—
	IRT 4040	104	40	45	40.5	0.6	44	45.5	**TA 4540Z**	—	—
45	**IRT 4512**	36	45	50	12.5	0.6	49	49.5	**TA 5012Z**	—	—
	IRT 4515	44.5	45	50	15.5	0.6	49	49.5	**TA 5015Z**	—	—
	IRT 4520	59	45	50	20.5	0.6	49	49.5	**TA 5020Z**	**TLA 5020Z**	—
	IRT 4525	73	45	50	25.5	0.6	49	49.5	**TA 5025Z**	**TLA 5025Z**	—
	IRT 4530	87.5	45	50	30.5	0.6	49	49.5	**TA 5030Z**	—	—
	IRT 4540	116	45	50	40.5	0.6	49	49.5	**TA 5040Z**	—	—
	IRT 4545	131	45	50	45.5	0.6	49	49.5	**TAW 5045Z**	—	—

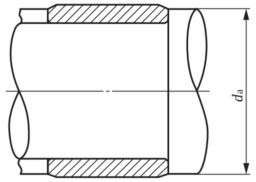
Note(1) Minimum allowable value of chamfer dimension r

Remark No oil hole is provided.

INNER RINGS

Inner Rings for Shell Type Needle Roller Bearings





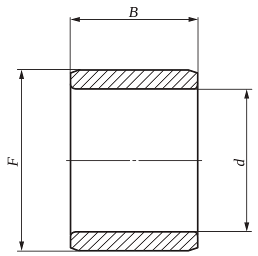
IRT

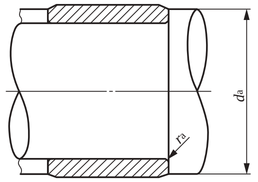
Shaft dia. 50 ─ 60mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ (1)	Standard mounting dimension mm d_a Min.	Max.	Assembled bearings TA…Z (TAM)	TLA…Z (TLAM)	YT YTL
50	**IRT 5020-1**	65	50	55	20.5	0.6	54	54.5	**TA 5520Z**	**TLA 5520Z**	—
	IRT 5025-1	81	50	55	25.5	0.6	54	54.5	**TA 5525Z**	**TLA 5525Z**	—
	IRT 5030-1	96.5	50	55	30.5	0.6	54	54.5	**TA 5530Z**	—	—
	IRT 5040-1	128	50	55	40.5	0.6	54	54.5	**TA 5540Z**	—	—
	IRT 5045-1	144	50	55	45.5	0.6	54	54.5	**TAW 5545Z**	—	—
	IRT 5050-1	160	50	55	50.5	0.6	54	54.5	**TAW 5550Z**	—	—
	IRT 5025	169	50	60	25.5	1.5	58	59	**TA 6025Z**	—	—
	IRT 5030	205	50	60	30.5	1.5	58	59	**TA 6030Z**	—	—
	IRT 5040	270	50	60	40.5	1.5	58	59	**TA 6040Z**	—	—
	IRT 5045	300	50	60	45.5	1.5	58	59	**TAW 6045Z**	—	—
	IRT 5050	335	50	60	50.5	1.5	58	59	**TAW 6050Z**	—	—
52	**IRT 5212**	86	52	62	12.5	1.5	60	60.5	**TA 6212Z**	—	—
55	**IRT 5525**	185	55	65	25.5	1.5	63	63.5	**TA 6525Z**	—	—
	IRT 5530	220	55	65	30.5	1.5	63	63.5	**TA 6530Z**	—	—
	IRT 5545	330	55	65	45.5	1.5	63	63.5	**TAW 6545Z**	—	—
	IRT 5550	365	55	65	50.5	1.5	63	63.5	**TAW 6550Z**	—	—
60	**IRT 6025**	200	60	70	25.5	1.5	68	68.5	**TA 7025Z**	—	—
	IRT 6030	240	60	70	30.5	1.5	68	68.5	**TA 7030Z**	—	—
	IRT 6040	320	60	70	40.5	1.5	68	68.5	**TA 7040Z**	—	—
	IRT 6050	395	60	70	50.5	1.5	68	68.5	**TAW 7050Z**	—	—

Note(1) Minimum allowable value of chamfer dimension *r*
Remark No oil hole is provided.

Inner Rings for Shell Type Needle Roller Bearings Inch Series





IRB

Shaft dia. 7.938 ─ 15.875mm

Shaft dia. mm (inch)	Identification number	Mass (Ref.) g	Boundary dimensions mm(inch) d	F	B	Standard mounting dimensions mm d_a Min.	Max.	$r_{as\,max}$ (1) Max.	Assembled bearings BA…Z (BAM)	BHA…Z (BHAM)	YB YBH
7.938 (5/16)	**IRB 58**	8	7.938 (5/16)	12.700 (1/2)	13.08	11.3	11.7	0.3	**BA 88Z**	**BHA 88Z**	**YB 88**
9.525 (3/8)	**IRB 68**	8.9	9.525 (3/8)	14.288 (9/16)	13.08	12.8	13.2	0.3	**BA 98Z**	**BHA 98Z**	**YB 98**
	IRB 68-1	12.6	9.525 (3/8)	15.875 (5/8)	13.08	12.8	14	0.3	**BA 108Z**	**BHA 108Z**	**YB 108** **YBH 108**
	IRB 612	13.2	9.525 (3/8)	14.288 (9/16)	19.43	12.8	13.2	0.3	**BA 912Z**	—	**YB 912**
	IRB 612-1	18.8	9.525 (3/8)	15.875 (5/8)	19.43	12.8	14	0.3	**BA 1012Z**	**BHA 1012Z**	**YB 1012**
11.112 (7/16)	**IRB 78**	10.1	11.112 (7/16)	15.875 (5/8)	13.08	14.4	14.8	0.3	**BA 108Z**	**BHA 108Z**	**YB 108** **YBH 108**
	IRB 712	15	11.112 (7/16)	15.875 (5/8)	19.43	14.4	14.8	0.3	**BA 1012Z**	**BHA 1012Z**	**YB 1012**
	IRB 714	17.4	11.112 (7/16)	15.875 (5/8)	22.60	14.4	14.8	0.3	**BA 1014Z**	—	—
	IRB 716	19.9	11.112 (7/16)	15.875 (5/8)	25.78	14.4	14.8	0.3	**BA 1016Z**	**BHA 1016Z**	—
12.700 (1/2)	**IRB 86**	8.5	12.700 (1/2)	17.462 (11/16)	9.90	16.9	16.9	0.3	**BA 116Z**	—	—
	IRB 88	11.2	12.700 (1/2)	17.462 (11/16)	13.08	16.9	16.9	0.3	**BA 118Z**	**BHA 118Z**	—
	IRB 812	16.7	12.700 (1/2)	17.462 (11/16)	19.43	16.9	16.9	0.3	**BA 1112Z**	**BHA 1112Z**	**YB 1112**
	IRB 88-1	15.8	12.700 (1/2)	19.050 (3/4)	13.08	16.9	17.5	0.6	**BA 128Z**	—	**YB 128**
	IRB 810-1	19.6	12.700 (1/2)	19.050 (3/4)	16.25	16.9	17.5	0.6	**BA 1210Z**	—	**YB 1210**
	IRB 812-1	23.5	12.700 (1/2)	19.050 (3/4)	19.43	16.9	17.5	0.6	**BA 1212Z**	**BHA 1212Z**	**YB 1212**
	IRB 814-1	27.5	12.700 (1/2)	19.050 (3/4)	22.60	16.9	17.5	0.6	**BA 1214Z**	—	—
	IRB 816-1	31	12.700 (1/2)	19.050 (3/4)	25.78	16.9	17.5	0.6	**BA 1216Z**	—	—
14.288 (9/16)	**IRB 98**	17.3	14.288 (9/16)	20.638 (13/16)	13.08	19	19.6	0.6	**BA 138Z**	**BHA 138Z**	**YB 138**
	IRB 910	21.5	14.288 (9/16)	20.638 (13/16)	16.25	19	19.6	0.6	**BA 1310Z**	**BHA 1310Z**	**YBH 1310**
	IRB 912	26	14.288 (9/16)	20.638 (13/16)	19.43	19	19.6	0.6	**BA 1312Z**	**BHA 1312Z**	**YBH 1312**
	IRB 914	30	14.288 (9/16)	20.638 (13/16)	22.60	19	19.6	0.6	**BA 1314Z**	—	—
	IRB 916	34.5	14.288 (9/16)	20.638 (13/16)	25.78	19	19.6	0.6	**BA 1316Z**	—	—
	IRB 920	43	14.288 (9/16)	20.638 (13/16)	32.13	19	19.6	0.6	**BA 1320Z**	—	—
15.875 (5/8)	**IRB 106**	14.5	15.875 (5/8)	22.225 (7/8)	9.90	20.7	21.2	0.6	**BA 146Z**	—	—
	IRB 108	18.9	15.875 (5/8)	22.225 (7/8)	13.08	20.7	21.2	0.6	**BA 148Z**	—	**YB 148**
	IRB 1012	28	15.875 (5/8)	22.225 (7/8)	19.43	20.7	21.2	0.6	**BA 1412Z**	**BHA 1412Z**	**YB 1412**

Note(1) Maximum allowable fillet corner radius of shaft
Remark No oil hole is provided.

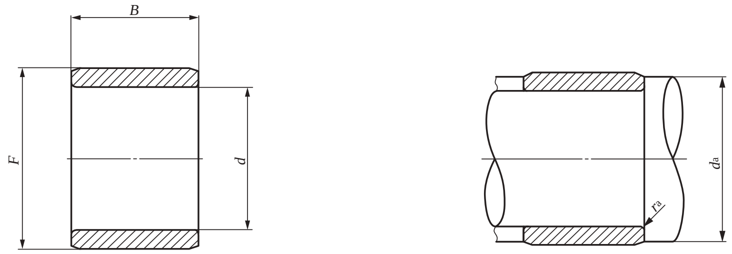
INNER RINGS

Inner Rings for Shell Type Needle Roller Bearings Inch Series

Shaft dia. 15.875 — 63.500mm

Shaft dia. mm (inch)	Identification number	Mass (Ref.) g	Boundary dimensions mm(inch)			Standard mounting dimensions mm			Assembled bearings		
			d	F	B	d_a Min.	d_a Max.	$r_{as\,max}$(1) Max.	BA···Z (BAM)	BHA···Z (BHAM)	YB YBH
15.875 (5/8)	**IRB 1014**	33	15.875 (5/8)	22.225 (7/8)	22.60	20.7	21.2	0.6	**BA 1414Z**	—	—
	IRB 1016	37.5	15.875 (5/8)	22.225 (7/8)	25.78	20.7	21.2	0.6	**BA 1416Z**	**BHA 1416Z**	**YB 1416**
	IRB 1022	51.5	15.875 (5/8)	22.225 (7/8)	35.30	20.7	21.2	0.6	**BA 1422Z**	—	—
17.462 (11/16)	**IRB 1110**	25.5	17.462 (11/16)	23.812 (15/16)	16.25	22.3	22.8	0.6	**BA 1510Z**	—	—
	IRB 1116	40.5	17.462 (11/16)	23.812 (15/16)	25.78	22.3	22.8	0.6	**BA 1516Z**	—	—
19.050 (3/4)	**IRB 128**	22	19.050 (3/4)	25.400 (1)	13.08	23.9	24.4	0.6	**BA 168Z**	**BHA 168Z**	**YB 168** **YBH 168**
	IRB 1212	33	19.050 (3/4)	25.400 (1)	19.43	23.9	24.4	0.6	**BA 1612Z**	**BHA 1612Z**	**YB 1612** **YBH 1612**
	IRB 1214	38.5	19.050 (3/4)	25.400 (1)	22.60	23.9	24.4	0.6	**BA 1614Z**	**BHA 1614Z**	—
	IRB 1216	43.5	19.050 (3/4)	25.400 (1)	25.78	23.9	24.4	0.6	**BA 1616Z**	**BHA 1616Z**	**YB 1616** **YBH 1616**
	IRB 1220	54.5	19.050 (3/4)	25.400 (1)	32.13	23.9	24.4	0.6	**BA 1620Z**	**BHA 1620Z**	—
20.638 (13/16)	**IRB 1316**	34	20.638 (13/16)	25.400 (1)	25.78	24.9	24.9	0.6	**BA 1616Z**	**BHA 1616Z**	**YB 1616** **YBH 1616**
22.225 (7/8)	**IRB 148**	25	22.225 (7/8)	28.575 (1 1/8)	13.08	27	27.5	0.6	**BA 188Z**	—	**YB 188**
	IRB 1412	37.5	22.225 (7/8)	28.575 (1 1/8)	19.43	27	27.5	0.6	**BA 1812Z**	**BHA 1812Z**	**YB 1812**
	IRB 1416	50	22.225 (7/8)	28.575 (1 1/8)	25.78	27	27.5	0.6	**BA 1816Z**	**BHA 1816Z**	**YB 1816**
	IRB 1420	62.5	22.225 (7/8)	28.575 (1 1/8)	32.13	27	27.5	0.6	**BA 1820Z**	**BHA 1820Z**	—
25.400 (1)	**IRB 168**	28.5	25.400 (1)	31.750 (1 1/4)	13.08	30	30.7	0.6	**BA 208Z**	**BHA 208Z**	—
	IRB 1610	35.5	25.400 (1)	31.750 (1 1/4)	16.25	30	30.7	0.6	**BA 2010Z**	—	**YB 2010**
	IRB 1612	42.5	25.400 (1)	31.750 (1 1/4)	19.43	30	30.7	0.6	**BA 2012Z**	**BHA 2012Z**	**YB 2012**
	IRB 1616	56	25.400 (1)	31.750 (1 1/4)	25.78	30	30.7	0.6	**BA 2016Z**	**BHA 2016Z**	**YB 2016**
	IRB 1620	70	25.400 (1)	31.750 (1 1/4)	32.13	30	30.7	0.6	**BA 2020Z**	**BHA 2020Z**	—
	IRB 168-1	36.5	25.400 (1)	33.338 (1 5/16)	13.08	30	32.1	0.6	**BA 218Z**	—	—
	IRB 1610-1	45.5	25.400 (1)	33.338 (1 5/16)	16.25	30	32.1	0.6	**BA 2110Z**	—	—
	IRB 1612-1	54.5	25.400 (1)	33.338 (1 5/16)	19.43	30	32.1	0.6	**BA 2112Z**	—	—

Note(1) Maximum allowable fillet corner radius of shaft
Remark No oil hole is provided.



IRB

Shaft dia. mm (inch)	Identification number	Mass (Ref.) g	Boundary dimensions mm(inch)			Standard mounting dimensions mm			Assembled bearings		
			d	F	B	d_a Min.	d_a Max.	$r_{as\,max}$(1) Max.	BA···Z (BAM)	BHA···Z (BHAM)	YB YBH
28.575 (1 1/8)	**IRB 188**	31.5	28.575 (1 1/8)	34.925 (1 3/8)	13.08	33.2	33.9	0.6	**BA 228Z**	**BHA 228Z**	**YB 228**
	IRB 1812	47	28.575 (1 1/8)	34.925 (1 3/8)	19.43	33.2	33.9	0.6	**BA 2212Z**	**BHA 2212Z**	**YB 2212**
	IRB 1816	62.5	28.575 (1 1/8)	34.925 (1 3/8)	25.78	33.2	33.9	0.6	**BA 2216Z**	**BHA 2216Z**	—
	IRB 1820	78	28.575 (1 1/8)	34.925 (1 3/8)	32.13	33.2	33.9	0.6	**BA 2220Z**	**BHA 2220Z**	**YB 2220**
31.750 (1 1/4)	**IRB 2010**	43	31.750 (1 1/4)	38.100 (1 1/2)	16.25	37	37.1	0.6	**BA 2410Z**	—	—
	IRB 2014	60	31.750 (1 1/4)	38.100 (1 1/2)	22.60	37	37.1	0.6	**BA 2414Z**	—	**YB 2414**
	IRB 2016	68.5	31.750 (1 1/4)	38.100 (1 1/2)	25.78	37	37.1	0.6	**BA 2416Z**	—	**YB 2416**
	IRB 2020	85.5	31.750 (1 1/4)	38.100 (1 1/2)	32.13	37	37.1	0.6	**BA 2420Z**	—	**YB 2420**
34.925 (1 3/8)	**IRB 2210**	47	34.925 (1 3/8)	41.275 (1 5/8)	16.25	40.2	40.2	0.6	**BA 2610Z**	—	**YB 2610**
	IRB 2220	93.5	34.925 (1 3/8)	41.275 (1 5/8)	32.13	40.2	40.2	0.6	**BA 2620Z**	—	—
36.512 (1 7/16)	**IRB 2316**	99	36.512 (1 7/16)	44.450 (1 3/4)	25.78	42.5	43.2	0.6	**BA 2816Z**	—	—
38.100 (1 1/2)	**IRB 2412**	62	38.100 (1 1/2)	44.450 (1 3/4)	19.43	43.3	43.4	0.6	**BA 2812Z**	—	—
	IRB 2416	81	38.100 (1 1/2)	44.450 (1 3/4)	25.78	43.3	43.4	0.6	**BA 2816Z**	—	**YB 2816**
	IRB 2424	121	38.100 (1 1/2)	44.450 (1 3/4)	38.48	43.3	43.4	0.6	**BA 2824Z**	**BHA 2824Z**	—
	IRB 248-1	64	38.100 (1 1/2)	47.625 (1 7/8)	13.08	44.5	45.5	1	**BA 308Z**	—	—
	IRB 2410-1	79.5	38.100 (1 1/2)	47.625 (1 7/8)	16.25	44.5	45.5	1	**BA 3010Z**	—	—
41.275 (1 5/8)	**IRB 2616**	136	41.275 (1 5/8)	50.800 (2)	25.78	47.5	48.5	1	**BA 3216Z**	—	—
	IRB 2628	235	41.275 (1 5/8)	50.800 (2)	44.83	47.5	48.5	1	**BAW 3228Z**	—	—
42.862 (1 11/16)	**IRB 2720**	146	42.862 (1 11/16)	50.800 (2)	32.13	48.5	49.5	0.6	**BA 3220Z**	— —	— —
47.625 (1 7/8)	**IRB 3016**	100	47.625 (1 7/8)	53.975 (2 1/8)	25.78	52.9	52.9	0.6	**BA 3416Z**	—	—
	IRB 3024	149	47.625 (1 7/8)	53.975 (2 1/8)	38.48	52.9	52.9	0.6	**BA 3424Z**	—	—
57.150 (2 1/4)	**IRB 3616**	183	57.150 (2 1/4)	66.675 (2 5/8)	25.78	63.5	64.5	1	**BA 4216Z**	— —	— —
63.500 (2 1/2)	**IRB 4016**	131	63.500 (2 1/2)	69.850 (2 3/4)	25.78	68.7	68.8	0.6	**BA 4416Z**	—	—
	IRB 4020	164	63.500 (2 1/2)	69.850 (2 3/4)	32.13	68.7	68.8	0.6	**BA 4420Z**	—	—

Note(1) Maximum allowable fillet corner radius of shaft
Remark No oil hole is provided.

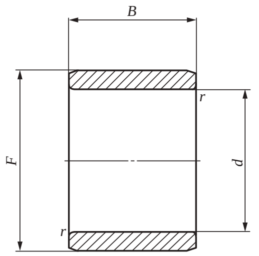
INNER RINGS

Inner Rings for General Usage

Shaft dia. 5 ― 20mm

Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm				Standard mounting dimension mm		Assembled bearings	
				d	F	B	$r_{s\,min}$ (1)	d_a Min.	Max.		
5	**LRT 5710**	—	1.4	5	7	10	0.15	6.2	6.7	**RNA 495**	
	LRT 5812	—	2.8	5	8	12	0.2	6.6	7.7	**TAF 81512**	
	LRT 5816	—	3.8	5	8	16	0.2	6.6	7.7	**TAF 81516**	
6	**LRT 6810**	—	1.7	6	8	10	0.15	7.2	7.7	**RNA 496**	
	LRT 6912	—	3.2	6	9	12	0.2	7.6	8.7	**TAF 91612**	
	LRT 6916	—	4.3	6	9	16	0.2	7.6	8.7	**TAF 91616**	
	LRT 61010	—	3.9	6	10	10	0.3	8	9.7	**RNAF 101710**	
7	**LRT 7910**	—	1.9	7	9	10	0.15	8.2	8.7	**RNA 497**	
	LRT 71012	—	3.6	7	10	12	0.2	8.6	9.7	**TAF 101712**	
	LRT 71012-1	—	3.6	7	10	12	0.3	9	9.7	**RNAF 102012**	
	LRT 71016	—	4.9	7	10	16	0.2	8.6	9.7	**TAF 101716**	**NAX 1023**
8	**LRT 81011**	—	2.4	8	10	11	0.2	9.6	9.9	**RNA 498**	
9	**LRT 91211**	—	3.1	9	12	11	0.3	11	11.5	**RNA 499**	
	LRT 91212	—	4.5	9	12	12	0.3	11	11.5	**TAF 121912**	**RNAF 122212**
	LRT 91216	—	6	9	12	16	0.3	11	11.5	**TAF 121916**	**NAX 1223**
10	**LRT 101412**	—	7	10	14	12	0.3	12	13	**RNAF 142612**	
	LRT 101413	—	7.5	10	14	13	0.3	12	13	**RNA 4900**	**RNAF 142213**
	—	**LRTZ 101414**	8.2	10	14	14	0.3	12	13	**RNA 4900 UU**	
	LRT 101416	—	9	10	14	16	0.3	12	13	**TAF 142216**	
	LRT 101420	—	11.5	10	14	20	0.3	12	13	**TAF 142220**	**RNAFW142220**
12	**LRT 121516**	—	8	12	15	16.5	0.3	14	14.5	**NAX 1523**	**NBX 1523**
	LRT 121612	—	8.5	12	16	12	0.3	14	15	**RNAF 162812**	
	LRT 121613	—	8.5	12	16	13	0.3	14	15	**RNA 4901**	**RNAF 162413**
	—	**LRTZ 121614**	9.6	12	16	14	0.3	14	15	**RNA 4901 UU**	
	LRT 121616	—	10.5	12	16	16	0.3	14	15	**TAF 162416**	
	LRT 121620	—	13.5	12	16	20	0.3	14	15	**TAF 162420**	**RNAFW162420**

Note(1) Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.



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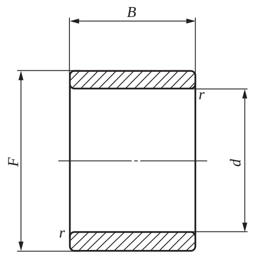

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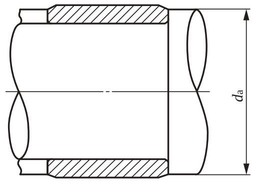
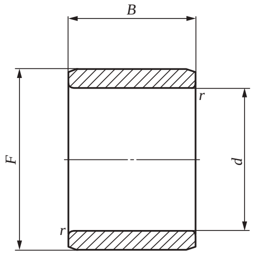


Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm				Standard mounting dimension mm		Assembled bearings	
				d	F	B	$r_{s\,min}$ (1)	d_a Min.	Max.		
12	**LRT 121622**	—	14.5	12	16	22	0.3	14	15	**RNA 6901**	
	—	**LRTZ 121623**	15.5	12	16	23	0.3	14	15	**RNA 6901 UU**	
14	**LRT 141717**	—	9.5	14	17	17	0.3	16	16.5	**NAX 1725**	**NBX 1725**
15	**LRT 151916**	—	12.5	15	19	16	0.3	17	18	**TAF 192716**	
	LRT 151920	—	16	15	19	20	0.3	17	18	**TAF 192720**	
	LRT 152012	—	12	15	20	12	0.3	17	19	**RNAF 203212**	
	LRT 152013	—	13.5	15	20	13	0.3	17	19	**RNA 4902**	**RNAF 202813**
	—	**LRTZ 152014**	14.5	15	20	14	0.3	17	19	**RNA 4902 UU**	
	LRT 152020	—	21.5	15	20	20.5	0.3	17	19	**TR 203320**	
	—	**LRTZ 152020**	21.5	15	20	20.5	0.3	17	19	**GTR 203320**	
	LRT 152023	—	24	15	20	23	0.3	17	19	**RNA 6902**	
	—	**LRTZ 152024**	25	15	20	24	0.3	17	19	**RNA 6902 UU**	
	LRT 152026	—	28	15	20	26	0.3	17	19	**RNAFW 202826**	
17	**LRT 172020**	—	13.5	17	20	20.5	0.3	19	19.5	**NAX 2030**	**NBX 2030**
	LRT 172116	—	14.5	17	21	16	0.3	19	20	**TAF 212916**	
	LRT 172120	—	18	17	21	20	0.3	19	20	**TAF 212920**	
	LRT 172213	—	15.5	17	22	13	0.3	19	21	**RNA 4903**	**RNAF 223013**
	—	**LRTZ 172214**	16.5	17	22	14	0.3	19	21	**RNA 4903 UU**	
	LRT 172216	—	19	17	22	16	0.3	19	21	**RNAF 223516**	
	LRT 172223	—	26.5	17	22	23	0.3	19	21	**RNA 6903**	
	—	**LRTZ 172224**	28	17	22	24	0.3	19	21	**RNA 6903 UU**	
	LRT 172225	—	30	17	22	25.5	0.3	19	21	**TR 223425**	
	—	**LRTZ 172225**	30	17	22	25.5	0.3	19	21	**GTR 223425**	
	LRT 172226	—	31	17	22	26	0.3	19	21	**RNAFW 223026**	
	LRT 172232	—	38	17	22	32	0.3	19	21	**RNAFW 223532**	
20	**LRT 202416**	—	16.5	20	24	16	0.3	22	23	**TAF 243216**	
	LRT 202420	—	20.5	20	24	20	0.3	22	23	**TAF 243220**	

Note(1) Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.

INNER RINGS

Inner Rings for General Usage



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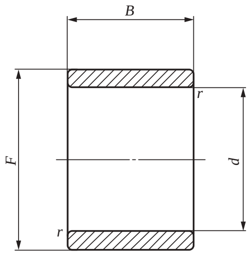

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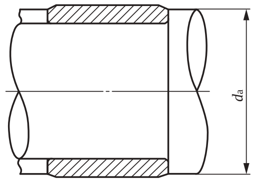


Shaft dia. 20 – 32mm

Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm				Standard mounting dimension mm		Assembled bearings	
				d	F	B	$r_{s\,min}$ (1)	d_a Min.	Max.		
20	**LRT 202516**	—	22	20	25	16	0.3	22	24	**RNAF 253716**	
	LRT 202517	—	23	20	25	17	0.3	22	24	**RNA 4904**	**RNAF 253517**
	—	**LRTZ 202518**	24	20	25	18	0.3	22	24	**RNA 4904 UU**	
	LRT 202520	—	28	20	25	20.5	0.3	22	24	**TR 253820**	**NAX 2530**
										NBX 2530	
	—	**LRTZ 202520**	28	20	25	20.5	0.3	22	24	**GTR 253820**	
	LRT 202525	—	35	20	25	25.5	0.3	22	24	**TR 253825**	
	—	**LRTZ 202525**	35	20	25	25.5	0.3	22	24	**GTR 253825**	
	LRT 202526	—	36	20	25	26	0.3	22	24	**RNAFW 253526**	
	LRT 202530	—	40.5	20	25	30	0.3	22	24	**RNA 6904**	
	—	**LRTZ 202531**	41.5	20	25	31	0.3	22	24	**RNA 6904 UU**	
	LRT 202532	—	44	20	25	32	0.3	22	24	**RNAFW 253732**	
22	**LRT 222616**	—	17.5	22	26	16	0.3	24	25	**TAF 263416**	
	LRT 222620	—	24	22	26	20	0.3	24	25	**TAF 263420**	
	LRT 222817	—	30.5	22	28	17	0.3	24	27	**RNA 49/22**	
	—	**LRTZ 222818**	32	22	28	18	0.3	24	27	**RNA 49/22 UU**	
	LRT 222830	—	55	22	28	30	0.3	24	27	**RNA 69/22**	
	—	**LRTZ 222831**	55	22	28	31	0.3	24	27	**RNA 69/22 UU**	
25	**LRT 252920**	—	25	25	29	20	0.3	27	28	**TAF 293820**	
	LRT 252930	—	38	25	29	30	0.3	27	28	**TAF 293830**	
	LRT 253016	—	28	25	30	16	0.3	27	29	**RNAF 304216**	
	LRT 253017	—	28.5	25	30	17	0.3	27	29	**RNA 4905**	**RNAF 304017**
	—	**LRTZ 253018**	29.5	25	30	18	0.3	27	29	**RNA 4905 UU**	
	LRT 253020	—	34	25	30	20.5	0.3	27	29	**NAX 3030**	**NBX 3030**
	LRT 253025	—	42	25	30	25.5	0.3	27	29	**TR 304425**	
	—	**LRTZ 253025**	42	25	30	25.5	0.3	27	29	**GTR 304425**	
	LRT 253026	—	44.5	25	30	26	0.3	27	29	**RNAFW 304026**	
	LRT 253030	—	49	25	30	30	0.3	27	29	**RNA 6905**	

Note(1) Minimum allowable value of chamfer dimension *r*
Remark No oil hole is provided.

Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm				Standard mounting dimension mm		Assembled bearings	
				d	F	B	$r_{s\,min}$ (1)	d_a Min.	Max.		
25	—	**LRTZ 253031**	51	25	30	31	0.3	27	29	**RNA 6905 UU**	
	LRT 253032	—	54	25	30	32	0.3	27	29	**RNAFW 304232**	
28	**LRT 283217**	—	24.5	28	32	17	0.3	30	31	**RNA 49/28**	
	—	**LRTZ 283218**	25.5	28	32	18	0.3	30	31	**RNA 49/28 UU**	
	LRT 283220	—	28.5	28	32	20	0.3	30	31	**TAF 324220**	
	LRT 283230	—	43	28	32	30	0.3	30	31	**RNA 69/28**	**TAF 324230**
	—	**LRTZ 283230**	43	28	32	30.5	0.3	30	31	**GTR 324530**	
	—	**LRTZ 283231**	44	28	32	31	0.3	30	31	**RNA 69/28 UU**	
30	**LRT 303516**	—	31.5	30	35	16	0.3	32	34	**RNAF 354716**	
	LRT 303517	—	33.5	30	35	17	0.3	32	34	**RNA 4906**	**RNAF 354517**
	—	**LRTZ 303518**	35	30	35	18	0.3	32	34	**RNA 4906 UU**	
	LRT 303520	—	38.5	30	35	20	0.3	32	34	**TAF 354520**	**NAX 3530**
										NBX 3530	
	LRT 303526	—	52	30	35	26	0.3	32	34	**RNAFW 354526**	
	LRT 303530	—	59	30	35	30	0.3	32	34	**RNA 6906**	**TAF 354530**
	LRT 303530-1	—	59	30	35	30.5	0.3	32	34	**TR 354830**	
	—	**LRTZ 303530**	59	30	35	30.5	0.3	32	34	**GTR 354830**	
	—	**LRTZ 303531**	61	30	35	31	0.3	32	34	**RNA 6906 UU**	
	LRT 303532	—	64	30	35	32	0.3	32	34	**RNAFW 354732**	
32	**LRT 323720**	—	43.5	32	37	20	0.3	34	36	**TAF 374720**	
	LRT 323730	—	63	32	37	30	0.3	34	36	**TAF 374730**	
	LRT 323830	—	77	32	38	30.5	0.6	36	37	**TR 385230**	
	—	**LRTZ 323830**	77	32	38	30.5	0.6	36	37	**GTR 385230**	
	LRT 324020	—	69	32	40	20	0.6	36	39	**RNA 49/32**	
	—	**LRTZ 324021**	72.5	32	40	21	0.6	36	39	**RNA 49/32 UU**	
	LRT 324036	—	123	32	40	36	0.6	36	39	**RNA 69/32**	
	—	**LRTZ 324037**	130	32	40	37	0.6	36	39	**RNA 69/32 UU**	

Note(1) Minimum allowable value of chamfer dimension *r*
Remark No oil hole is provided.

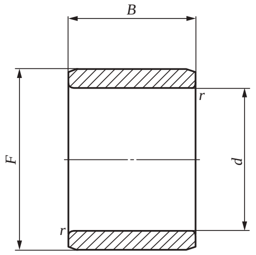
INNER RINGS

Inner Rings for General Usage

Shaft dia. 35 – 50mm

Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm				Standard mounting dimension mm		Assembled bearings
				d	F	B	$r_{s\,min}$ (1)	d_a Min.	Max.	
35	**LRT 354017**	—	39	35	40	17	0.3	37	39	**RNAF 405017**
	LRT 354020	—	46	35	40	20	0.3	37	39	**TAF 405020 RNAF 405520** **NAX 4032 NBX 4032**
	—	**LRTZ 354020**	46	35	40	20.5	0.6	39	39.5	**GTR 405520**
	LRT 354030	—	67	35	40	30	0.3	37	39	**TAF 405030**
	LRT 354034	—	78	35	40	34	0.3	37	39	**RNAFW 405034**
	LRT 354040	—	95	35	40	40	0.3	37	39	**RNAFW 405540**
	LRT 354220	—	65	35	42	20	0.6	39	41	**RNA 4907**
	—	**LRTZ 354221**	67	35	42	21	0.6	39	41	**RNA 4907 UU**
	LRT 354230	—	97	35	42	30.5	0.6	39	41	**TR 425630**
	—	**LRTZ 354230**	100	35	42	30.5	0.6	39	41	**GTR 425630**
	LRT 354236	—	120	35	42	36	0.6	39	41	**RNA 6907**
	—	**LRTZ 354237**	120	35	42	37	0.6	39	41	**RNA 6907 UU**
38	**LRT 384320**	—	47.5	38	43	20	0.3	40	42	**TAF 435320**
	LRT 384330	—	72	38	43	30	0.3	40	42	**TAF 435330**
40	**LRT 404517**	—	44.5	40	45	17	0.3	42	44	**RNAF 455517**
	LRT 404520	—	51	40	45	20	0.3	42	44	**TAF 455520 RNAF 456220** **NAX 4532 NBX 4532**
	LRT 404530	—	77	40	45	30	0.3	42	44	**TAF 455530**
	LRT 404530-1	—	77	40	45	30.5	0.6	44	44.5	**TR 455930**
	—	**LRTZ 404530**	77	40	45	30.5	0.6	44	44.5	**GTR 455930**
	LRT 404534	—	88	40	45	34	0.3	42	44	**RNAFW 455534**
	LRT 404540	—	105	40	45	40	0.3	42	44	**RNAFW 456240**
	LRT 404822	—	93	40	48	22	0.6	44	47	**RNA 4908**
	—	**LRTZ 404823**	95	40	48	23	0.6	44	47	**RNA 4908 UU**
	LRT 404840	—	165	40	48	40	0.6	44	47	**RNA 6908**
	—	**LRTZ 404841**	170	40	48	41	0.6	44	47	**RNA 6908 UU**

Note(1) Minimum allowable value of chamfer dimension *r*
Remark No oil hole is provided.



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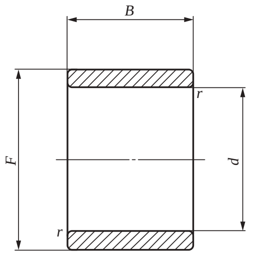

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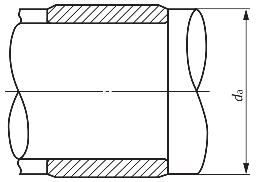
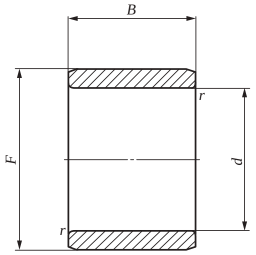


Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm				Standard mounting dimension mm		Assembled bearings
				d	F	B	$r_{s\,min}$ (1)	d_a Min.	Max.	
42	**LRT 424720**	—	54	42	47	20	0.3	44	46	**TAF 475720**
	LRT 424730	—	81	42	47	30	0.3	44	46	**TAF 475730**
	LRT 424830	—	100	42	48	30.5	0.6	46	47	**TR 486230**
	—	**LRTZ 424830**	100	42	48	30.5	0.6	46	47	**GTR 486230**
45	**LRT 455020**	—	58	45	50	20	0.3	47	49	**RNAF 506220**
	LRT 455025	—	71	45	50	25	0.3	47	49	**TAF 506225 NAX 5035** **NBX 5035**
	LRT 455030	—	90	45	50	30.5	0.6	49	49.5	**TR 506430**
	—	**LRTZ 455030**	90	45	50	30.5	0.6	49	49.5	**GTR 506430**
	LRT 455035	—	95	45	50	35	0.3	47	49	**TAF 506235**
	LRT 455040	—	115	45	50	40	0.3	47	49	**RNAFW 506240**
	LRT 455222	—	88	45	52	22	0.6	49	51	**RNA 4909**
	—	**LRTZ 455223**	93	45	52	23	0.6	49	51	**RNA 4909 UU**
	LRT 455240	—	165	45	52	40	0.6	49	51	**RNA 6909**
	—	**LRTZ 455241**	170	45	52	41	0.6	49	51	**RNA 6909 UU**
	LRT 455520	—	120	45	55	20	1	50	54	**RNAF 557220**
	LRT 455540	—	245	45	55	40	1	50	54	**RNAFW 557240**
50	**LRT 505520**	—	63	50	55	20	0.3	52	54	**RNAF 556820**
	LRT 505525	—	77	50	55	25	0.3	52	54	**TAF 556825**
	LRT 505535	—	110	50	55	35	0.3	52	54	**TAF 556835**
	LRT 505540	—	130	50	55	40	0.3	52	54	**RNAFW 556840**
	LRT 505822	—	116	50	58	22	0.6	54	57	**RNA 4910**
	—	**LRTZ 505823**	118	50	58	23	0.6	54	57	**RNA 4910 UU**
	LRT 505840	—	210	50	58	40	0.6	54	57	**RNA 6910**
	—	**LRTZ 505841**	215	50	58	41	0.6	54	57	**RNA 6910 UU**
	LRT 505845	—	235	50	58	45.5	1	55	57	**TR 587745**
	—	**LRTZ 505845**	235	50	58	45.5	1	55	57	**GTR 587745**
	LRT 506020	—	135	50	60	20	1	55	59	**RNAF 607820**

Note(1) Minimum allowable value of chamfer dimension *r*
Remark No oil hole is provided.

INNER RINGS

Inner Rings for General Usage



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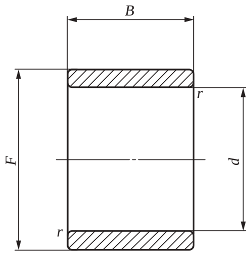

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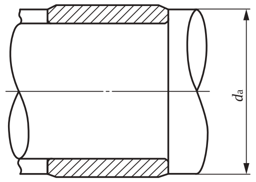


Shaft dia. 50 – 80mm

Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ (1)	Standard mounting dimension mm d_a Min.	Max.	Assembled bearings
50	LRT 506025	—	165	50	60	25.5	1	55	59	NAX 6040 NBX 6040
	LRT 506040	—	265	50	60	40	1	55	59	RNAFW 607840
55	LRT 556025	—	88	55	60	25	0.3	57	59	TAF 607225
	LRT 556035	—	120	55	60	35	0.3	57	59	TAF 607235
	LRT 556238	—	190	55	62	38.5	1	60	60.5	TR 628138
	—	LRTZ 556238	190	55	62	38.5	1	60	60.5	GTR 628138
	LRT 556325	—	145	55	63	25	1	60	61	RNA 4911
	—	LRTZ 556326	150	55	63	26	1	60	61	RNA 4911 UU
	LRT 556345	—	255	55	63	45	1	60	61	RNA 6911
	—	LRTZ 556346	260	55	63	46	1	60	61	RNA 6911 UU
	LRT 556530	—	220	55	65	30	1.5	63	63.5	RNAF 658530
	LRT 556560	—	435	55	65	60	1.5	63	63.5	RNAFW 658560
60	LRT 606825	—	150	60	68	25	0.6	64	66	TAF 688225
	LRT 606825-1	—	150	60	68	25	1	65	66	RNA 4912
	—	LRTZ 606826	160	60	68	26	1	65	66	RNA 4912 UU
	LRT 606835	—	210	60	68	35	0.6	64	66	TAF 688235
	LRT 606845	—	275	60	68	45	1	65	66	RNA 6912
	—	LRTZ 606846	280	60	68	46	1	65	66	RNA 6912 UU
	LRT 607025	—	195	60	70	25.5	1	65	68	NAX 7040
	LRT 607030	—	240	60	70	30	1.5	68	68.5	RNAF 709030
	LRT 607045	—	355	60	70	45.5	1	65	68	TR 708945
	—	LRTZ 607045	360	60	70	45.5	1	65	68	GTR 708945
	LRT 607060	—	480	60	70	60	1.5	68	68.5	RNAFW 709060
65	LRT 657225	—	145	65	72	25	1	70	70.5	RNA 4913
	—	LRTZ 657226	150	65	72	26	1	70	70.5	RNA 4913 UU
	LRT 657245	—	255	65	72	45	1	70	70.5	RNA 6913
	—	LRTZ 657246	265	65	72	46	1	70	70.5	RNA 6913 UU
	LRT 657335	—	235	65	73	35	1	70	71	TAF 739035
65	LRT 657530	—	260	65	75	30	1.5	73	73.5	RNAF 759530
	LRT 657560	—	520	65	75	60	1.5	73	73.5	RNAFW 759560
70	LRT 708025	—	225	70	80	25	1	75	78	TAF 809525
	LRT 708030	—	275	70	80	30	1	75	78	RNA 4914
	LRT 708030-1	—	275	70	80	30	1.5	78	78.5	RNAF 8010030
	—	LRTZ 708031	275	70	80	31	1	75	78	RNA 4914 UU
	LRT 708035	—	310	70	80	35	1	75	78	TAF 809535
	LRT 708054	—	490	70	80	54	1	75	78	RNA 6914
	—	LRTZ 708055	500	70	80	55	1	75	78	RNA 6914 UU
	LRT 708060	—	560	70	80	60	1.5	78	78.5	RNAFW 8010060
75	LRT 758345	—	350	75	83	45.5	1	80	81	TR 8310845
	—	LRTZ 758345	350	75	83	45.5	1	80	81	GTR 8310845
	LRT 758525	—	240	75	85	25	1	80	83	TAF 8510525
	LRT 758530	—	290	75	85	30	1	80	83	RNA 4915
	LRT 758530-1	—	290	75	85	30	1.5	83	83.5	RNAF 8510530
	—	LRTZ 758531	300	75	85	31	1	80	83	RNA 4915 UU
	LRT 758535	—	335	75	85	35	1	80	83	TAF 8510535
	LRT 758554	—	520	75	85	54	1	80	83	RNA 6915
	—	LRTZ 758555	530	75	85	55	1	80	83	RNA 6915 UU
80	LRT 809025	—	255	80	90	25	1	85	88	TAF 9011025
	LRT 809030	—	310	80	90	30	1	85	88	RNA 4916
	LRT 809030-1	—	310	80	90	30	1.5	88	88.5	RNAF 9011030
	—	LRTZ 809031	315	80	90	31	1	85	88	RNA 4916 UU
	LRT 809035	—	355	80	90	35	1	85	88	TAF 9011035
	LRT 809054	—	550	80	90	54	1	85	88	RNA 6916
	—	LRTZ 809055	560	80	90	55	1	85	88	RNA 6916 UU

Note(1) Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.

Note(1) Minimum allowable value of chamfer dimension r
Remark No oil hole is provided.

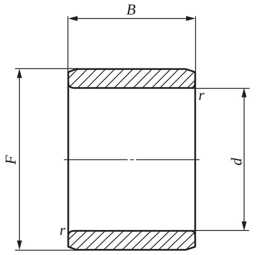
INNER RINGS

Inner Rings for General Usage

Shaft dia. 85 — 140mm

Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ (1)	Standard mounting dimension mm d_a Min.	d_a Max.	Assembled bearings
85	**LRT 859350**	—	440	85	93	50.5	1	90	91	**TR 9311850**
	—	**LRTZ 859350**	440	85	93	50.5	1	90	91	**GTR 9311850**
	LRT 859526	—	280	85	95	26	1	90	93	**TAF 9511526**
	LRT 859530	—	330	85	95	30	1.5	93	93.5	**RNAF 9511530**
	LRT 859536	—	390	85	95	36	1	90	93	**TAF 9511536**
	LRT 859545	—	490	85	95	45.5	1.5	93	93.5	**TR 9512045**
	—	**LRTZ 859545**	490	85	95	45.5	1.5	93	93.5	**GTR 9512045**
	LRT 8510035	—	575	85	100	35	1.1	91.5	98	**RNA 4917**
	—	**LRTZ 8510036**	605	85	100	36	1.1	91.5	98	**RNA 4917 UU**
	LRT 8510063	—	1 040	85	100	63	1.1	91.5	98	**RNA 6917**
	—	**LRTZ 8510064**	1 060	85	100	64	1.1	91.5	98	**RNA 6917 UU**
90	**LRT 9010026**	—	295	90	100	26	1	95	98	**TAF 10012026**
	LRT 9010030	—	355	90	100	30	1.5	98	98.5	**RNAF 10012030**
	LRT 9010036	—	415	90	100	36	1	95	98	**TAF 10012036**
	LRT 9010050	—	580	90	100	50.5	1.5	98	98.5	**TR 10012550**
	—	**LRTZ 9010050**	580	90	100	50.5	1.5	98	98.5	**GTR 10012550**
	LRT 9010535	—	610	90	105	35	1.1	96.5	103	**RNA 4918**
	—	**LRTZ 9010536**	630	90	105	36	1.1	96.5	103	**RNA 4918 UU**
	LRT 9010563	—	1 100	90	105	63	1.1	96.5	103	**RNA 6918**
	—	**LRTZ 9010564**	1 120	90	105	64	1.1	96.5	103	**RNA 6918 UU**
95	**LRT 9510526**	—	315	95	105	26	1	100	103	**TAF 10512526**
	LRT 9510536	—	430	95	105	36	1	100	103	**TAF 10512536**
	LRT 9511035	—	650	95	110	35	1.1	101.5	108	**RNA 4919**
	—	**LRTZ 9511036**	660	95	110	36	1.1	101.5	108	**RNA 4919 UU**
	LRT 9511063	—	1 160	95	110	63	1.1	101.5	108	**RNA 6919**
	—	**LRTZ 9511064**	1 180	95	110	64	1.1	101.5	108	**RNA 6919 UU**

Note(1) Minimum allowable value of chamfer dimension *r*
Remark No oil hole is provided.



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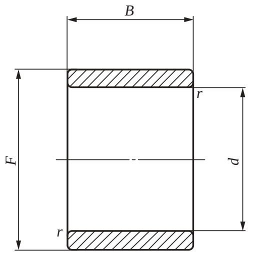

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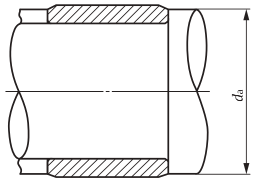


Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ (1)	Standard mounting dimension mm d_a Min.	d_a Max.	Assembled bearings
100	**LRT 10011030**	—	380	100	110	30	1	105	108	**TAF 11013030**
	LRT 10011040	—	500	100	110	40	1	105	108	**TAF 11013040**
	LRT 10011050	—	640	100	110	50.5	1.5	108	108.5	**TR 11013550**
	—	**LRTZ 10011050**	640	100	110	50.5	1.5	108	108.5	**GTR 11013550**
	LRT 10011540	—	770	100	115	40	1.1	106.5	113	**RNA 4920**
	—	**LRTZ 10011541**	780	100	115	41	1.1	106.5	113	**RNA 4920 UU**
105	**LRT 10511550**	—	670	105	115	50.5	1.5	113	113.5	**TR 11515350**
	—	**LRTZ 10511550**	670	105	115	50.5	1.5	113	113.5	**GTR 11515350**
110	**LRT 11012030**	—	410	110	120	30	1	115	118	**RNA 4822**
	LRT 11012540	—	840	110	125	40	1.1	116.5	123	**RNA 4922**
	—	**LRTZ 11012541**	870	110	125	41	1.1	116.5	123	**RNA 4922 UU**
120	**LRT 12013030**	—	450	120	130	30	1	125	128	**RNA 4824**
	LRT 12013545	—	1 030	120	135	45	1.1	126.5	133	**RNA 4924**
	—	**LRTZ 12013546**	1 050	120	135	46	1.1	126.5	133	**RNA 4924 UU**
125	**LRT 12514060**	—	1 460	125	140	60.5	1.5	133	138	**TR 14017860**
	—	**LRTZ 12514060**	1 460	125	140	60.5	1.5	133	138	**GTR 14017860**
130	**LRT 13014535**	—	860	130	145	35	1.1	136.5	143	**RNA 4826**
	LRT 13015050	—	1 670	130	150	50	1.5	138	148	**RNA 4926**
	—	**LRTZ 13015051**	1 720	130	150	51	1.5	138	148	**RNA 4926 UU**
135	**LRT 13515060**	—	1 560	135	150	60.5	1.5	143	148	**TR 15018860**
	—	**LRTZ 13515060**	1 560	135	150	60.5	1.5	143	148	**GTR 15018860**
140	**LRT 14015535**	—	930	140	155	35	1.1	146.5	153	**RNA 4828**
	LRT 14016050	—	1 790	140	160	50	1.5	148	158	**RNA 4928**
	—	**LRTZ 14016051**	1 830	140	160	51	1.5	148	158	**RNA 4928 UU**

Note(1) Minimum allowable value of chamfer dimension *r*
Remark No oil hole is provided.

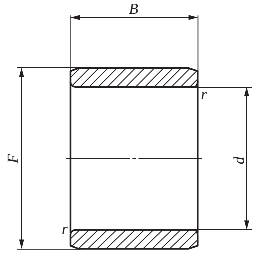
INNER RINGS

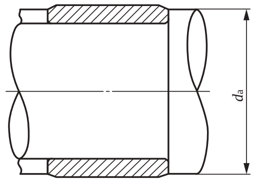
Inner Rings for General Usage

Shaft dia. 150 ─ 440mm

Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ (1)	Standard mounting dimension mm d_a Min.	Max.	Assembled bearings
150	LRT 15016540	—	1 130	150	165	40	1.1	156.5	163	RNA 4830
	LRT 15017060	—	2 290	150	170	60	2	159	168	RNA 4930
160	LRT 16017540	—	1 200	160	175	40	1.1	166.5	173	RNA 4832
	LRT 16018060	—	2 440	160	180	60	2	169	178	RNA 4932
170	LRT 17018545	—	1 420	170	185	45	1.1	176.5	183	RNA 4834
	LRT 17019060	—	2 580	170	190	60	2	179	188	RNA 4934
180	LRT 18019545	—	1 500	180	195	45	1.1	186.5	193	RNA 4836
	LRT 18020569	—	3 950	180	205	69	2	189	203	RNA 4936
190	LRT 19021050	—	2 380	190	210	50	1.5	198	208	RNA 4838
	LRT 19021569	—	4 200	190	215	69	2	199	213	RNA 4938
200	LRT 20022050	—	2 520	200	220	50	1.5	208	218	RNA 4840
	LRT 20022580	—	5 000	200	225	80	2.1	211	223	RNA 4940
220	LRT 22024050	—	2 750	220	240	50	1.5	228	238	RNA 4844
	LRT 22024580	—	5 500	220	245	80	2.1	231	243	RNA 4944
240	LRT 24026560	—	4 530	240	265	60	2	249	262	RNA 4848
	LRT 24026580	—	6 000	240	265	80	2.1	251	262	RNA 4948
260	LRT 26028560	—	4 930	260	285	60	2	269	282	RNA 4852
	LRT 260290100	—	9 900	260	290	100	2.1	271	287	RNA 4952
280	LRT 28030569	—	6 050	280	305	69	2	289	302	RNA 4856
	LRT 280310100	—	10 600	280	310	100	2.1	291	307	RNA 4956
300	LRT 30033080	—	9 100	300	330	80	2.1	311	327	RNA 4860
	LRT 300340118	—	18 000	300	340	118	3	313	337	RNA 4960
320	LRT 32035080	—	9 600	320	350	80	2.1	331	347	RNA 4864
	LRT 320360118	—	19 200	320	360	118	3	333	357	RNA 4964

Note(1) Minimum allowable value of chamfer dimension *r*
Remark No oil hole is provided.





LRT

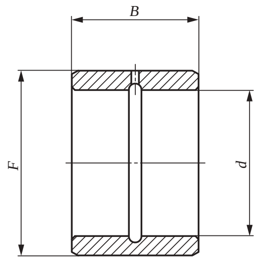
Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm d	F	B	$r_{s\,min}$ (1)	Standard mounting dimension mm d_a Min.	Max.	Assembled bearings
340	LRT 34037080	—	10 200	340	370	80	2.1	351	367	RNA 4868
	LRT 340380118	—	20 300	340	380	118	3	353	377	RNA 4968
360	LRT 36039080	—	10 800	360	390	80	2.1	371	387	RNA 4872
	LRT 360400118	—	21 500	360	400	118	3	373	397	RNA 4972
380	LRT 380415100	—	16 700	380	415	100	2.1	391	412	RNA 4876
	LRT 380430140	—	33 900	380	430	140	4	396	427	RNA 4976
400	LRT 400450140	—	35 600	400	450	140	4	416	447	RNA 4980
420	LRT 420470140	—	37 300	420	470	140	4	436	467	RNA 4984
440	LRT 440490160	—	44 100	440	490	160	4	456	487	RNA 4988

Note(1) Minimum allowable value of chamfer dimension *r*
Remark No oil hole is provided.

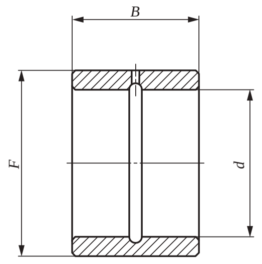
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

INNER RINGS

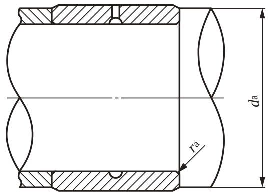
Inner Rings for General Usage Inch Series



LRB



LRBZ⋯B



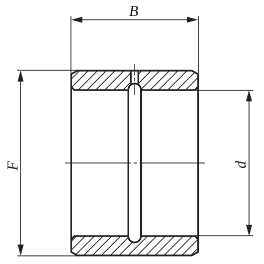
Shaft dia. 9.525 – 22.225mm

Shaft dia. mm (inch)	Identification number		Mass (Ref.) g	Boundary dimensions mm(inch) *d*	*F*	*B*	Standard mounting dimensions mm d_a Min.	d_a Max.	$r_{as\,max}$ (1) Max.	Assembled bearings
9.525 (3/8)	**LRB 61012**	—	18.5	9.525 (3/8)	15.875 (5/8)	19.300	14	14.5	0.6	**BR 101812**
	—	**LRBZ 61016 B**	25	9.525 (3/8)	15.875 (5/8)	25.650	14	14.5	0.6	**BR 101816UU**
12.700 (1/2)	**LRB 81212**	—	23.5	12.700 (1/2)	19.050 (3/4)	19.300	17.5	18	1	**BR 122012**
	LRB 81216	—	31	12.700 (1/2)	19.050 (3/4)	25.650	17.5	18	1	**BR 122016**
	—	**LRBZ 81216 B**	31	12.700 (1/2)	19.050 (3/4)	25.650	17.5	18	0.6	**BR 122016UU**
15.875 (5/8)	**LRB 101412**	—	28	15.875 (5/8)	22.225 (7/8)	19.300	21	21.2	1	**BR 142212**
	LRB 101416	—	37.5	15.875 (5/8)	22.225 (7/8)	25.650	21	21.2	1	**BR 142216**
	—	**LRBZ 101416 B**	37.5	15.875 (5/8)	22.225 (7/8)	25.650	21	21.2	0.6	**BR 142216UU**
19.050 (3/4)	**LRB 121612**	—	33	19.050 (3/4)	25.400 (1)	19.300	24	24.4	1	**BR 162412**
	LRB 121616	—	44	19.050 (3/4)	25.400 (1)	25.650	24	24.4	1	**BR 162416**
	—	**LRBZ 121616 B**	44	19.050 (3/4)	25.400 (1)	25.650	24	24.4	0.6	**BR 162416UU**
22.225 (7/8)	**LRB 141816**	—	50	22.225 (7/8)	28.575 (1 1/8)	25.650	27	27.5	1	**BR 182616**
	LRB 141820	—	62	22.225 (7/8)	28.575 (1 1/8)	32.000	27	27.5	1	**BR 182620**
	—	**LRBZ 141820 B**	62	22.225 (7/8)	28.575 (1 1/8)	32.000	27	27.5	0.6	**BR 182620UU**

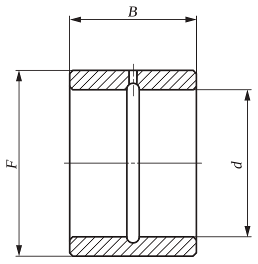
Note(1) Maximum allowable fillet corner radius of shaft
Remark LRB and LRBZ⋯B are provided with an oil groove and an oil hole.

INNER RINGS

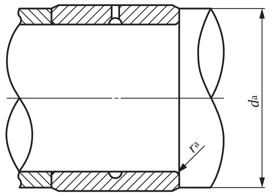
Inner Rings for General Usage **Inch Series**



LRB



LRBZ…B



Shaft dia. 25.400 — 38.100mm

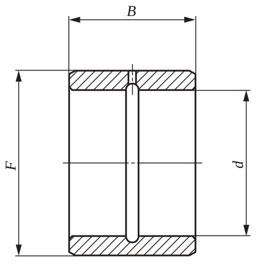
Shaft dia. mm (inch)	Identification number		Mass (Ref.) g	Boundary dimensions mm(inch) d	F	B	Standard mounting dimensions mm d_a Min.	d_a Max.	$r_{as\,max}$ (1) Max.	Assembled bearings
25.400 (1)	**LRB 162016**	—	56	25.400 (1)	31.750 (1 1/4)	25.650	30.5	30.7	1	**BR 202816**
	LRB 162020	—	72	25.400 (1)	31.750 (1 1/4)	32.000	30.5	30.7	1	**BR 202820**
	—	**LRBZ 162020 B**	72	25.400 (1)	31.750 (1 1/4)	32.000	30.5	30.7	0.6	**BR 202820UU**
28.575 (1 1/8)	**LRB 182216**	—	63	28.575 (1 1/8)	34.925 (1 3/8)	25.650	33.5	33.9	1	**BR 223016**
	LRB 182220	—	77	28.575 (1 1/8)	34.925 (1 3/8)	32.000	33.5	33.9	1	**BR 223020**
	—	**LRBZ 182220 B**	77	28.575 (1 1/8)	34.925 (1 3/8)	32.000	33.5	33.9	0.6	**BR 223020UU**
31.750 (1 1/4)	**LRB 202416**	—	71	31.750 (1 1/4)	38.100 (1 1/2)	25.650	37	37.1	1.5	**BR 243316**
	LRB 202420	—	86	31.750 (1 1/4)	38.100 (1 1/2)	32.000	37	37.1	1.5	**BR 243320**
	—	**LRBZ 202420 B**	86	31.750 (1 1/4)	38.100 (1 1/2)	32.000	37	37.1	0.6	**BR 243320UU**
34.925 (1 3/8)	**LRB 222616**	—	77	34.925 (1 3/8)	41.275 (1 5/8)	25.650	40.2	40.2	1.5	**BR 263516**
	LRB 222620	—	96	34.925 (1 3/8)	41.275 (1 5/8)	32.000	40.2	40.2	1.5	**BR 263520**
	—	**LRBZ 222620 B**	96	34.925 (1 3/8)	41.275 (1 5/8)	32.000	40.2	40.2	0.6	**BR 263520UU**
38.100 (1 1/2)	**LRB 242816**	—	80	38.100 (1 1/2)	44.450 (1 3/4)	25.650	43.3	43.4	1.5	**BR 283716**
	LRB 242820	—	100	38.100 (1 1/2)	44.450 (1 3/4)	32.000	43.3	43.4	1.5	**BR 283720** **BR 283820**
	LRB 243020	—	155	38.100 (1 1/2)	47.625 (1 7/8)	32.000	43.3	45	1.5	**BR 303920**
	—	**LRBZ 242820 B**	100	38.100 (1 1/2)	44.450 (1 3/4)	32.000	43.3	43.4	0.6	**BR 283720UU**
	—	**LRBZ 243020 B**	160	38.100 (1 1/2)	47.625 (1 7/8)	32.000	43.3	45	1	**BR 303920UU**

Note(1) Maximum allowable fillet corner radius of shaft
Remark LRB and LRBZ…B are provided with an oil groove and an oil hole.

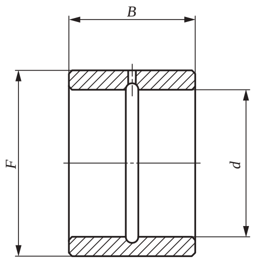
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

INNER RINGS

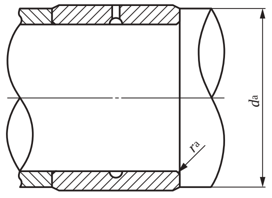
Inner Rings for General Usage **Inch Series**



LRB



LRBZ···B



Shaft dia. 41.275 — 63.500mm

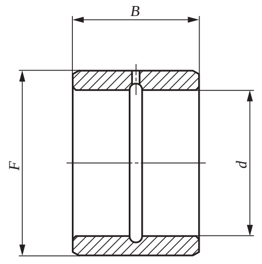
Shaft dia. mm (inch)	Identification number		Mass (Ref.) g	Boundary dimensions mm(inch) *d*	*F*	*B*	Standard mounting dimensions mm *d*a Min.	*d*a Max.	*r*as max(1) Max.	Assembled bearings
41.275 (1 5/8)	**LRB 263216**	—	135	41.275 (1 5/8)	50.800 (2)	25.650	48	49	1.5	**BR 324116**
	LRB 263220	—	170	41.275 (1 5/8)	50.800 (2)	32.000	48	49	1.5	**BR 324120**
	—	**LRBZ 263220 B**	170	41.275 (1 5/8)	50.800 (2)	32.000	48	49	1	**BR 324120UU**
44.450 (1 3/4)	**LRB 283624**	—	300	44.450 (1 3/4)	57.150 (2 1/4)	38.350	52.5	55	1.5	**BR 364824**
	LRB 283628	—	345	44.450 (1 3/4)	57.150 (2 1/4)	44.700	52.5	55	1.5	**BR 364828**
	—	**LRBZ 283628 B**	345	44.450 (1 3/4)	57.150 (2 1/4)	44.700	52.5	55	1.5	**BR 364828UU**
50.800 (2)	**LRB 324024**	—	335	50.800 (2)	63.500 (2 1/2)	38.350	58	61	2	**BR 405224**
	LRB 324028	—	390	50.800 (2)	63.500 (2 1/2)	44.700	58	61	2	**BR 405228**
	—	**LRBZ 324028 B**	390	50.800 (2)	63.500 (2 1/2)	44.700	58	61	1.5	**BR 405228UU**
57.150 (2 1/4)	**LRB 364424**	—	375	57.150 (2 1/4)	69.850 (2 3/4)	38.350	65	67	2	**BR 445624**
	LRB 364428	—	440	57.150 (2 1/4)	69.850 (2 3/4)	44.700	65	67	2	**BR 445628**
	—	**LRBZ 364428 B**	440	57.150 (2 1/4)	69.850 (2 3/4)	44.700	65	67	1.5	**BR 445628UU**
63.500 (2 1/2)	**LRB 404824**	—	410	63.500 (2 1/2)	76.200 (3)	38.350	71	73	2	**BR 486024**
	LRB 404828	—	480	63.500 (2 1/2)	76.200 (3)	44.700	71	73	2	**BR 486028**
	—	**LRBZ 404828 B**	480	63.500 (2 1/2)	76.200 (3)	44.700	71	73	1.5	**BR 486028UU**

Note(1) Maximum allowable fillet corner radius of shaft
Remark LRB and LRBZ···B are provided with an oil groove and an oil hole.

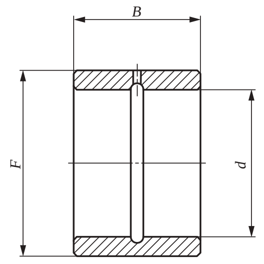
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

INNER RINGS

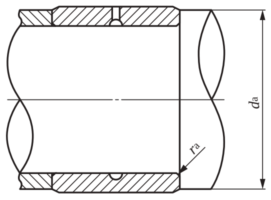
Inner Rings for General Usage Inch Series



LRB



LRBZ···B



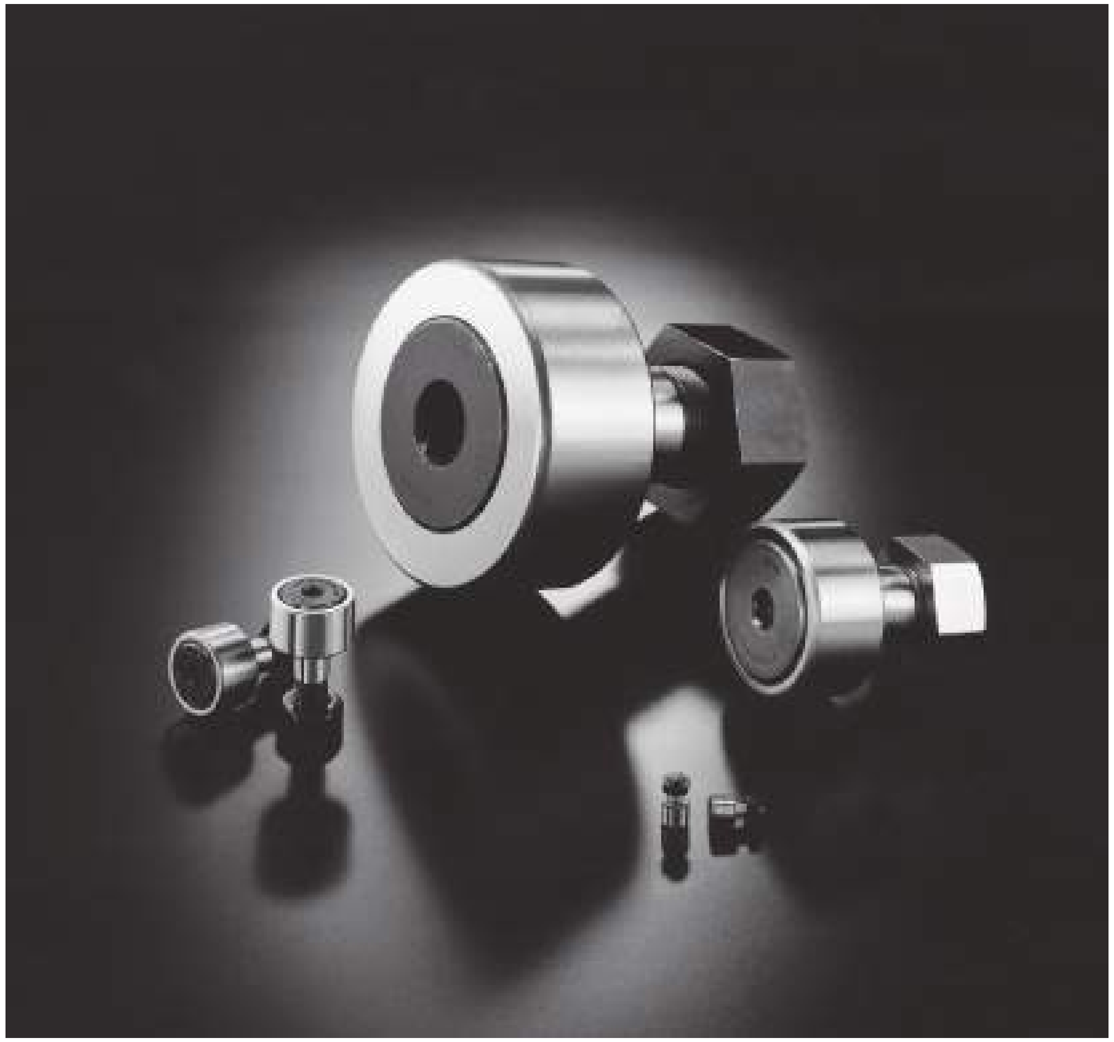
Shaft dia. 69.850 — 88.900mm

Shaft dia. mm (inch)	Identification number		Mass (Ref.) g	Boundary dimensions mm(inch) *d*	*F*	*B*	Standard mounting dimensions mm *d*a Min.	*d*a Max.	*r*as max (1) Max.	Assembled bearings
69.850 (2 3/4)	**LRB 445228**	—	530	69.850 (2 3/4)	82.550 (3 1/4)	44.700	77	79	2	**BR 526828**
	LRB 445232	—	600	69.850 (2 3/4)	82.550 (3 1/4)	51.050	77	79	2	**BR 526832**
	—	**LRBZ 445228 B**	530	69.850 (2 3/4)	82.550 (3 1/4)	44.700	77	79	1.5	**BR 526828UU**
76.200 (3)	**LRB 485632**	—	640	76.200 (3)	88.900 (3 1/2)	51.050	83.5	86	2	**BR 567232**
	—	**LRBZ 485632 B**	640	76.200 (3)	88.900 (3 1/2)	51.050	83.5	86	1.5	**BR 567232UU**
82.550 (3 1/4)	**LRB 526032**	—	690	82.550 (3 1/4)	95.250 (3 3/4)	51.050	91	93	2.5	**BR 607632**
	—	**LRBZ 526032 B**	690	82.550 (3 1/4)	95.250 (3 3/4)	51.050	91	93	1.5	**BR 607632UU**
88.900 (3 1/2)	**LRB 566432**	—	750	88.900 (3 1/2)	101.600 (4)	51.050	97	99	2.5	**BR 648032**

Note(1) Maximum allowable fillet corner radius of shaft
Remark LRB with inner ring bore diameter *d* of 76.200 mm or less and LRBZ···B are provided with an oil groove and an oil hole.
Other models are provided with an oil groove and two oil holes.

CAM FOLLOWERS

- Standard Type Cam Followers
- Stainless Steel Made Cam Followers
- Eccentric Type Cam Followers
- Solid Eccentric Stud Type Cam Followers
- Thrust Disk Type Cam Followers
- Centralized Lubrication Type Cam Followers
- Easy Mounting Type Cam Followers
- Cam Follower G
- C-Lube Cam Followers
- Miniature Type Cam Followers
- Stainless Steel Made Miniature Cam Followers
- Thrust Disk Type Miniature Cam Followers
- Cylindrical Roller Cam Followers
- Inch series Cam Followers



Structure and Features

IKO Cam Followers are bearings with a stud incorporating needle rollers in a thick walled outer ring. These bearings are designed for outer ring rotation, and have superior rotational performance with a small coefficient of friction and high load capacity.

As studs already have threads or steps, they are easy to mount.

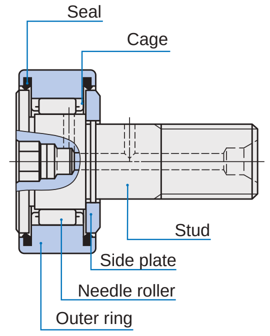
Cam Followers are follower bearings for cam mechanisms and linear motions and have high rigidity and high accuracy. They are, therefore, used widely for machine tools, industrial robots, electronic devices, and OA equipment.

Stainless steel made Cam Followers are superior in corrosion resistance and suitable for applications in environments where oil cannot be used or water splashed, and in clean rooms.

Structure of Cam Followers

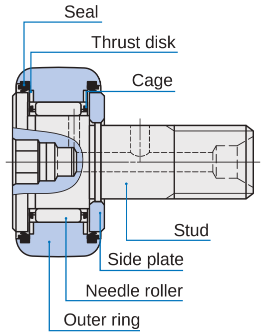
Standard Type Cam Follower(1)

CF···BUU



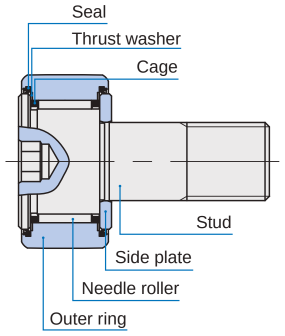
Thrust Disk Type Cam Follower

CF···WBUUR



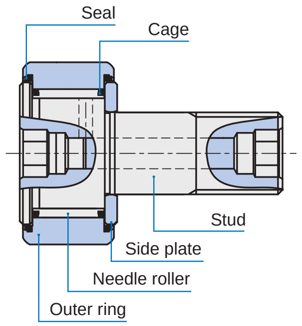
C-Lube Cam Followers(1)

CF···WBUUR/SG



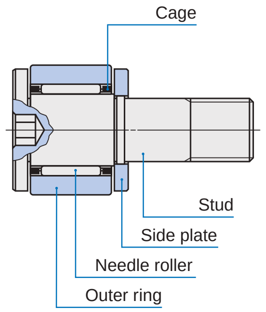
Standard Type Cam Follower CFKR

CFKR···UU



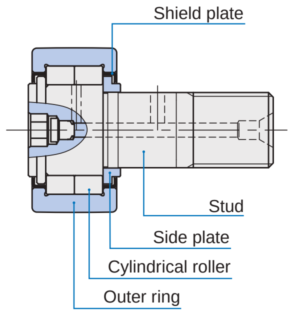
Miniature Type Cam Follower

CFS



Cylindrical Roller Cam Follower

NUCF···BR



Note(1) Thermosetting solid-type lubricant C-Lube fills inner space of the bearing.

Types

For Cam Followers, the types shown in Table 1 are available.

Table 1 Type of Cam Followers

Bearing Model			Item	With cage		Full complement	
				Crowned outer ring	Cylindrical outer ring	Crowned outer ring	Cylindrical outer ring
Standard Type Cam Follower CF···B CFKR	High carbon steel made	Stud Head Hex Hole	Shield type	CF ··· B R	CF ··· B	CF ···V B R	CF ··· V B
			Sealed type	CF ··· B UUR	CF ··· B UU	CF ···V B UUR	CF ··· V B UU
	Stainless steel made		Shield type	CF ···F B R	CF ···F B	—	—
			Sealed type	CF ···F B UUR	CF ···F B UU	—	—
	High carbon steel made	Double Hex Hole	Shield type	CFKR··· R	CFKR	CFKR···V R	CFKR··· V
			Sealed type	CFKR··· UUR	CFKR ··· UU	CFKR···V UUR	CFKR··· V UU
Eccentric Type Cam Followers CFE···B CFKRE	High carbon steel made	Stud Head Hex Hole	Shield type	CFE ··· B R	CFE ··· B	CFE ···V B R	CFE ··· V B
			Sealed type	CFE ··· B UUR	CFE ··· B UU	CFE ···V B UUR	CFE ··· V B UU
		Double Hex Hole	Shield type	CFKRE ··· R	CFKRE	CFKRE···V R	CFKRE··· V
			Sealed type	CFKRE ··· UUR	CFKRE ··· UU	CFKRE···V UUR	CFKRE··· V UU
Solid Eccentric Stud Type Cam Followers CFES···B	High carbon steel made	With hexagon hole	Shield type	CFES··· B R	CFES··· B	—	—
			Sealed type	CFES··· B UUR	CFES··· B UU	—	—
Thrust Disk Type Cam Followers CF···WB	High carbon steel made	With hexagon hole	Shield type	CF ··· WB R	—	—	—
			Sealed type	CF ··· WB UUR	—	—	—
	Stainless steel made		Shield type	CF ···F WB R	—	—	—
			Sealed type	CF ···F WB UUR	—	—	—
Centralized Lubrication Type Cam Followers CF-RU1, CF-FU1	High carbon steel made	With screwdriver slot	Sealed type	CF-RU1	CF-FU1	—	—
Easy Mounting Type Cam Followers CF-SFU···B	High carbon steel made	With hexagon hole	Sealed type	—	CF-SFU··· B	—	—
Cam Follower G CF···G	High carbon steel made	With hexagon hole	Shield type	—	CF ···G	—	—
C-Lube Cam Followers CF···WB···/SG	High carbon steel made	With hexagon hole	Sealed type	CF ···WB···/SG	—	—	—
Miniature Type Cam Followers CFS	High carbon steel made	With hexagon hole	Shield type	—	CFS	—	CFS ··· V
	Stainless steel made			—	CFS ···F	—	CFS ···F V
Thrust Disk Type Miniature Cam Followers CFS···W	High carbon steel made	With hexagon hole	Shield type	—	CFS ··· W	—	CFS ···WV
	Stainless steel made			—	CFS ···F W	—	—
Cylindrical Roller Cam Followers NUCF···B	High carbon steel made	With hexagon hole	Shield type	—	—	NUCF··· B R	—
Inch series Cam Followers CR	High carbon steel made	With hexagon hole	Shield type	CR ··· B R	CR ···B	CR ···V B R	CR ··· V B
			Sealed type	CR ··· B UUR	CR ···B UU	CR ···V B UUR	CR ··· V B UU
			Sealed type with ThrustDisk Seals™	—	—	CR ···V B S R	CR ··· V B S
		With screwdriver slot	Shield type	CR ··· R	CR	CR ···V R	CR ··· V
			Sealed type	CR ··· UUR	CR ··· UU	CR ···V UUR	CR ··· V UU
Inch series Cam Followers CRH···B	High carbon steel made	With hexagon hole	Shield type	—	—	CRH···V B R	CRH··· V B
			Sealed type	—	—	CRH···V B UUR	CRH··· V B UU

Standard Type Cam Followers

These are the basic type bearings in IKO Cam Follower series. Standard Type Cam Followers CF···B with stud diameters ranging from 3 mm to 30 mm are available, and are suitable for a wide range of applications.

Standard Type Cam Followers CFKR have sockets with hexagon holes on both stud ends, which allow mounting with a hexagon wrench from either side.

Eccentric Type Cam Followers

The eccentric stud can be rotated to create a uniform line, enabling easy adjustment for even load distribution across the outer ring outer surface.

Eccentricity is 0.4 (CFE) ～ 1.5 mm.

Solid Eccentric Stud Type Cam Followers

The eccentric stud can be rotated to create a uniform line, enabling easy adjustment for even load distribution across the outer ring outer surface.

These are eccentric cam followers with an integrated stud that can be mounted in the same mounting holes as those for Standard Type Cam Followers.

Eccentricity is from 0.25 mm to 0.6 mm.

Thrust Disk Type Cam Followers

The thrust disk seal, made of special synthetic resin with excellent abrasion and heat resistance, is incorporated in the sliding contact area between the shoulders of the outer ring and the stud head and side plate. This prevents friction and abrasion inside the bearing due to axial loads caused by mounting errors.

Centralized Lubrication Type Cam Followers

These bearings have one or two pipe-threaded holes in the stud. Thus, this series is suitable when centralized lubrication is required.

Easy Mounting Type Cam Followers

These bearings have a stepped tapered portion on the stud. When mounting the Cam Follower, it is easy to fix its location by tightening a set screw to the stepped portion. Thus, this type is suitable when a large number of Cam Followers are used in a machine such as a pallet changer.

C-Lube Cam Followers

These bearings are lubricated with a newly developed thermosetting solid-type lubricant which fills the inner space of the bearing. This lubricant provides long-term maintenance free.

Miniature Type Cam Followers

These are compactly designed bearings, incorporating very thin needle rollers in an outer ring with a small outside diameter. They are used in electronic devices, OA equipment, small index devices, etc.

Cylindrical Roller Cam Followers

These bearings are full complement type bearings incorporating double rows of full complement cylindrical rollers in the outer ring, and can withstand large radial loads. Additionally, the outer ring is guided by the outer ring shoulder and the end face of cylindrical rollers to the axial direction.

Inch series Cam Followers

Two types, CR and CRH, are available in the Inch series Cam Followers. Black oxide film treatment is made on CRH models.

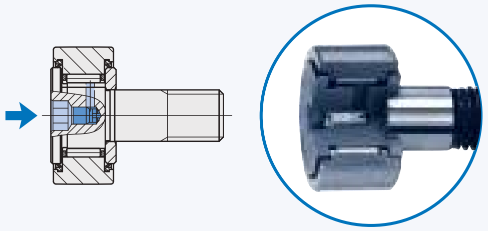
CR with ThrustDisk Seals™ prevents the ingress of foreign substances as well as friction and abrasion on the interior of the bearing caused by axial load generated due to mounting errors.

Lubrication method of Hex Head Cam Followers

〈Types〉**Standard Type, Eccentric Type, Solid Eccentric Stud Type, Thrust Disk Type, Easy Mounting Type, Cylindrical Roller Type.**

1 Way

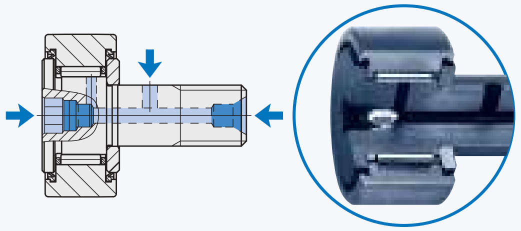
Stud dia. 5～10mm(1)



Re-greasing fitting is incorporated in the stud head.

3 Ways

Stud dia. 12～30mm



Grease nipple is incorporated in the stud head.

Remark : All Easy Mounting Type have a 1way port.

Note (1) CFKR and CFKRE can be lubricated from both head part and thread side. Also, a grease nipple is built into the stud head.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

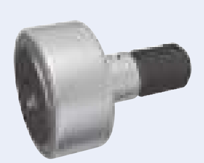
Internal Structures and Shapes

The Cam Follower series has various types, such as high carbon steel type, stainless steel type, caged type, full complement type, shield type, sealed type, type with crowned outer ring, type with cylindrical outer ring, etc.

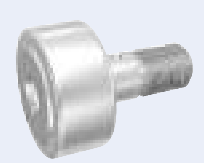
Type of material

In addition to high carbon steel products, stainless steel products are also available. Stainless steel products are suited for applications where oil cannot be used or where water splashes, and in cleanrooms.

《High carbon steel made》



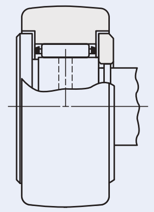
《Stainless steel made》



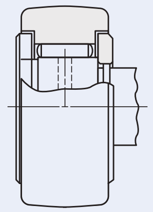
Roller guide method

Cam Followers include the caged type and the full complement type . The caged type has a small coefficient of friction and is suitable for high speed rotations, while the full complement type is suitable for heavy loads at low speed rotations.

《With cage》



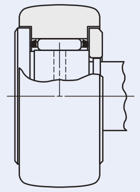
《Full complement》



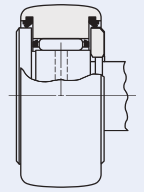
Seal structure

Available Cam Followers include the shield type, the sealed type, and type with ThrustDisk Seals™. In the shield type, labyrinths are formed by the narrow clearances between the outer ring and the stud flange, and between the outer ring and the side plate. The sealed type incorporates seals in the narrow clearances (the shield type labyrinths) to prevent the ingress of foreign substances. The sealed type with ThrustDisk Seals™ prevents grease leakage and the ingress of foreign substances into the bearing interior. It also prevents friction and abrasion on the interior of the bearing caused by axial load generated due to mounting errors.

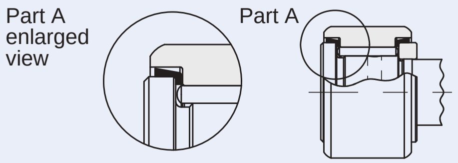
《Shield type》



《 Sealed type》



《Sealed type with ThrustDisk Seals™》 (1)

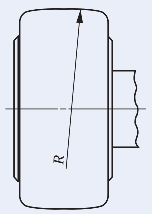


Notes(1) Applicable only to Inch Series Cam Followers CR (Stud Head Hex Hole)

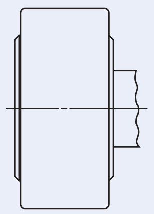
Shape of outer ring outside surface

The outside surface of the outer ring of Cam Followers, which makes direct contact with the mating cam guide surface, is either crowned or cylindrical. The crowned outer rings are effective in moderating the edge load due to mounting errors. The cylindrical outer rings have a large contact area with the mating cam guide surface, and are suitable for applications in which the applied load is large or the cam guide surface hardness is low.

《Crowned outer ring》



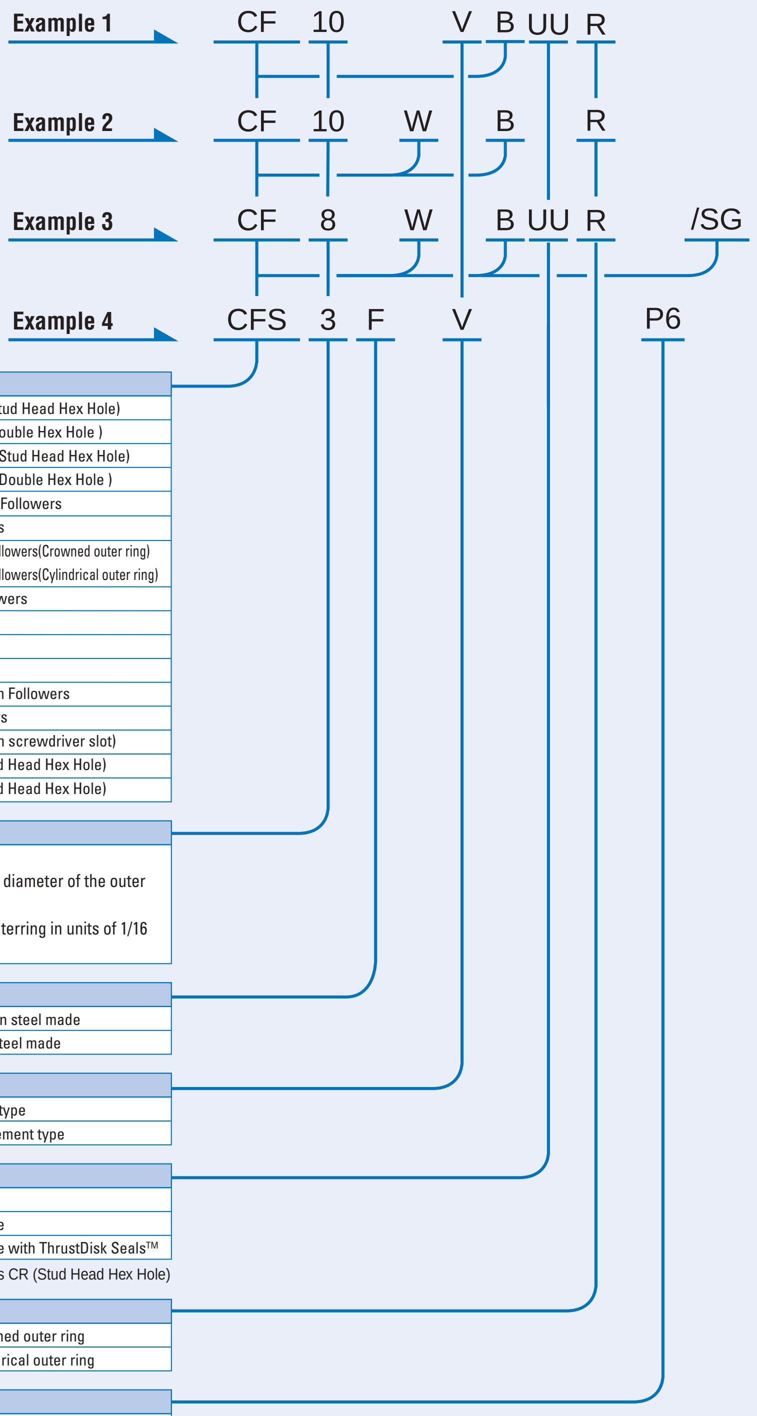
《Cylindrical outer ring》



Identification number

Some examples of the identification number of Cam Followers are shown below. For applicable material symbol, roller guide method, seal structure and shape of outer ring outside surface, refer dimension table of each series.

Examples of identification number



Example 1 CF 10 V B UU R

Example 2 CF 10 W B R

Example 3 CF 8 W B UU R /SG

Example 4 CFS 3 F V P6

Model code	
CF…B	Standard Type Cam Follower(Stud Head Hex Hole)
CFKR	Standard Type Cam Follower(Double Hex Hole)
CFE…B	Eccentric Type Cam Followers(Stud Head Hex Hole)
CFKRE	Eccentric Type Cam Followers(Double Hex Hole)
CFES…B	Solid Eccentric Stud Type Cam Followers
CF…WB	Thrust Disk Type Cam Followers
CF-RU1 CF-FU1	Centralized Lubrication Type Cam Followers(Crowned outer ring) Centralized Lubrication Type Cam Followers(Cylindrical outer ring)
CF-SFU…B	Easy Mounting Type Cam Followers
CF…G	Cam Follower G
CF…WB…/SG	C-Lube Cam Followers
CFS	Miniature Type Cam Followers
CFS…W	Thrust Disk Type Miniature Cam Followers
NUCF…B	Cylindrical Roller Cam Followers
CR	Inch series Cam Followers(With screwdriver slot)
CR…B	Inch series Cam Followers(Stud Head Hex Hole)
CRH…B	Inch series Cam Followers(Stud Head Hex Hole)

Size

The value indicates a stud diameter. (unit: mm)
For Double Hex Hole Cam Followers, the outside diameter of the outer ring is indicated.
In the inch series, the outside diameter of the outerring in units of 1/16 inch is indicated.

Material	
No symbol	High carbon steel made
F	Stainless steel made

Roller guide method	
No symbol	With cage type
V	Full complement type

Seal structure	
No symbol	Shield type
UU	Sealed type
S(1)	Sealed type with ThrustDisk Seals™

Notes(1) Applicable only to Inch Series Cam Followers CR (Stud Head Hex Hole)

Shape of outer ring outside surface	
R	With crowned outer ring
No symbol	With cylindrical outer ring

Classification symbol		
No symbol	Class 0	
P6	Class 6	Applicable to Miniature CFS series
P5	Class 5	
P4	Class 4	

Accuracy

The accuracy of Cam Followers is shown in Table 2, Table 3.1, Table 3.2 and Table 3.3. Cam Followers with special accuracy are also available. When they are required, please contact IKO.

Table 2 Tolerances

unit: μm

Series / Dimensions and symbols	Metric CF (1)		Miniature series CF	Inch series CF	
	Crowned outer ring	Cylindrical outer ring		Crowned outer ring	Cylindrical outer ring
Outside dia. of outer ring D	0 -50	See Table 3.1	See Table 3.2	0 -50	See Table 3.3
Stud dia. d_1	h7		h6	+25 0	
Width of outer ring C	0 -120		0 -120	0 -130	

Note(1) Applicable to Cam Followers other than Miniature Type Cam Followers and Inch Series Cam Followers.

Table 3.1 Tolerances and allowable values of outer rings (Metric CF cylindrical outer rings(1))

unit: μm

D Nominal outside dia. of outer ring mm		Δ_{Dmp} Single plane mean outside dia. deviation		V_{Dsp} Outside dia. variation in a single radial plane (Max.)	V_{Dmp} Mean outside dia. variation (Max.)	K_{ea} Radial runout of assembled bearing outer ring (Max.)
Over	Incl.	High	Low			
6	18	0	- 8	10	6	15
18	30	0	- 9	12	7	15
30	50	0	-11	14	8	20
50	80	0	-13	16	10	25
80	120	0	-15	19	11	35

Note(1) Applicable to Cam Followers other than Miniature Type Cam Followers and Inch Series Cam Followers.

Table 3.2 Tolerances and allowable values of outer rings (Miniature series CF)

unit: μm

Δ_{Dmp} Single plane mean outside dia. deviation								K_{ea} Radial runout of assembled bearing outer ring (Max.)			
Class 0		Class 6		Class 5		Class 4		Class 0	Class 6	Class 5	Class 4
High	Low	High	Low	High	Low	High	Low				
0	-8	0	-7	0	-5	0	-4	15	8	5	4

Table 3.3 Tolerances and allowable values of outer rings (Inch series CF cylindrical outer ring)

unit: μm

D Nominal outside dia. of outer ring mm		Δ_{Dmp} Single plane mean outside dia. deviation		V_{Dsp} Outside dia. variation in a single radial plane (Max.)	V_{Dmp} Mean outside dia. variation (Max.)	K_{ea} Radial runout of assembled bearing outer ring (Max.)
Over	Incl.	High	Low			
6	18	0	-25	10	6	15
18	30			12	7	15
30	50			14	8	20
50	80			16	10	25
80	120			19	11	35

Clearance

The radial internal clearances of Cam Followers are shown in Table 4.

Table 4 Radial internal clearance

unit: μm

Identification number (1)				Radial internal clearance	
Metric CF series (2)	Miniature CFS series CF (3)	Cylindrical Roller Cam Followers NUCF···B	Inch series CF	Min.	Max.
CF 3～CF 5	CFS1.4 ～CFS5	—	CR 8, CR 8-1, CRH 8-1, CRH 9	3	17
CF 6	CFS6	—	CR10, CR10-1, CRH10-1, CRH11	5	20
CF 8～CF12-1 CFKR22～CFKR32	—	—	CR12～CR22, CRH12～CRH22	5	25
CF16～CF20-1 CFKR35～CFKR52	—	—	CR24～CR36, CRH24～CRH36	10	30
CF24～CF30-2 CFKR62～CFKR90	—	—	CR48, CRH40～CRH56	10	40
—	—	—	CRH64	15	50
—	—	NUCF10 R～NUCF24 R	—	20	45
—	—	NUCF24-1R～NUCF30-2R	—	25	50

Note(1) Also applicable to full complement type, type with crowned outer ring, sealed type, and type with hexagon hole.
(2) Applicable to all Cam Followers other than Miniature Type Cam Followers, Cylindrical Roller Cam Followers and Inch Series Cam Followers.
(3) Applicable to all Miniature Type Cam Followers.

Fit

Tables 5 and 6 show recommended tolerances of mounting holes for Cam Follower studs. Since the Cam Follower is supported in a cantilever position, the mounting hole diameter should be prepared without play between the stud and the hole especially when heavy shock loads are applied.

Table 5 Recommended fit

Type	Tolerance class of mounting hole for stud
Metric CF	H7
Miniature series CF	H6
Cylindrical Roller Cam Followers	H7
Inch series CF	F7

Table 6 Dimensional tolerances of mounting hole

unit: μm

Nominal outside dia. of stud mm		F7		H6		H7	
Over	Incl.	Over	Incl.	Over	Incl.	Over	Incl.
—	3	+16	+ 6	+ 6	0	+10	0
3	6	+22	+10	+ 8	0	+12	0
6	10	+28	+13	+ 9	0	+15	0
10	18	+34	+16	+11	0	+18	0
18	30	+41	+20	+13	0	+21	0
30	50	+50	+25	+16	0	+25	0

Maximum Allowable Static Load

The applicable load on Cam Followers is, in some cases, limited by the bending strength and shear strength of the stud and the strength of the outer ring instead of the load rating of the needle roller bearing. Therefore, the maximum allowable static load that is limited by these strengths is specified.

Track Capacity

Track capacity is defined as the load which can be continuously applied on a Cam Follower placed on a steel cam guide surface without causing deformation or indentation on the cam guide surface when the outer ring of the Cam Follower makes contact with the mating cam guide surface (plane). The track capacities shown in Tables 7.1 and 7.2 are applicable when the hardness of the mating cam guide surface is 40HRC (Tensile strength 1250N/mm^2). When the hardness of the mating cam guide surface differs from 40HRC, the track capacity is obtained by multiplying the value by the track capacity factor shown in Table 8.

If lubrication between the outer ring and the mating cam guide surface is insufficient, seizure and/or wear may occur depending on the application. Therefore, attention must be paid to lubrication and surface roughness of the mating cam guide especially for high-speed rotations such as cam mechanisms.

For lubrication between the outer ring and the mating cam guide surface, C-Lube Unit for Cam Followers is recommended. (See page I20.)

Table 7.1 Track load capacity

unit: N

Type of bearing	Identification number with crowned outer ring	Track capacity	Identification number with cylindrical outer ring	Track capacity
Metric CF (1)	CF 3 R	542	CF 3	1 360
	CF 4 R	712	CF 4	1 790
	CF 5 R	794	CF 5	2 210
	CF 6 R	1 040	CF 6	3 400
	CF 8 R	1 330	CF 8	4 040
	CF10 R・CFKR22R	1 610	CF10 ・CFKR22	4 680
	CF10-1R・CFKR26R	2 030	CF10-1・CFKR26	5 530
	CF12 R・CFKR30R	2 470	CF12 ・CFKR30	7 010
	CF12-1R・CFKR32R	2 710	CF12-1・CFKR32	7 480
	CF16 R・CFKR35R	3 060	CF16 ・CFKR35	11 200
	CF18 R・CFKR40R	3 660	CF18 ・CFKR40	14 500
	CF20 R・CFKR52R	5 190	CF20 ・CFKR52	23 200
	CF20-1R・CFKR47R	4 530	CF20-1・CFKR47	21 000
	CF24 R・CFKR62R	6 580	CF24 ・CFKR62	34 300
	CF24-1R・CFKR72R	8 020	CF24-1・CFKR72	39 800
	CF30 R・CFKR80R	9 220	CF30 ・CFKR80	52 700
	CF30-1R・CFKR85R	9 990	CF30-1・CFKR85	56 000
	CF30-2R・CFKR90R	10 800	CF30-2・CFKR90	59 300
Miniature series CF (2)	—	—	CFS1.4	128
	—	—	CFS2	220
	—	—	CFS2.5	298
	—	—	CFS3	485
	—	—	CFS4	799
	—	—	CFS5	1 210
	—	—	CFS6	1 680

Notes(1) Applicable to Cam Followers other than Miniature Type Cam Followers and Inch Series Cam Followers.
(2) This table is applicable to all Miniature Type Cam Followers.

Table 7.2 Track capacity

unit: N

Type of bearing	Identification number with crowned outer ring	Track capacity	Identification number with cylindrical outer ring	Track capacity	Identification number with crowned outer ring	Track capacity	Identification number with cylindrical outer ring	Track capacity
Inch series CF (1)	CR 8 R	770	CR 8	2 140	—	—	—	—
	CR 8-1R	770	CR 8-1	2 360	CRH 8-1R	401	CRH 8-1	2 360
	—	—	—	—	CRH 9 R	469	CRH 9	2 650
	CR10 R	1 030	CR10	3 210	—	—	—	—
	CR10-1R	1 030	CR10-1	3 480	CRH10-1R	579	CRH10-1	3 480
	—	—	—	—	CRH11 R	658	CRH11	3 830
	CR12 R	1 340	CR12	4 500	CRH12 R	853	CRH12	4 500
	CR14 R	1 630	CR14	5 250	CRH14 R	1 050	CRH14	5 250
	CR16 R	1 970	CR16	7 280	CRH16 R	1 420	CRH16	7 280
	CR18 R	2 300	CR18	7 710	CRH18 R	1 660	CRH18	7 710
	CR20 R	2 680	CR20	10 700	CRH20 R	2 160	CRH20	10 700
	CR22 R	3 050	CR22	11 800	CRH22 R	2 450	CRH22	11 800
	CR24 R	3 410	CR24	15 400	CRH24 R	3 410	CRH24	15 400
	CR26 R	3 820	CR26	16 700	CRH26 R	3 820	CRH26	16 700
	CR28 R	4 210	CR28	21 000	CRH28 R	4 210	CRH28	21 000
	CR30 R	4 610	CR30	22 500	CRH30 R	4 610	CRH30	22 500
	CR32 R	5 050	CR32	30 900	CRH32 R	5 690	CRH32	30 900
	CR36 R	5 900	CR36	34 700	CRH36 R	6 640	CRH36	34 700
	—	—	—	—	CRH40 R	8 970	CRH40	45 000
	—	—	—	—	CRH44 R	10 200	CRH44	49 500
	—	—	CR48	64 300	CRH48 R	11 400	CRH48	64 300
	—	—	—	—	CRH52 R	12 700	CRH52	69 600
	—	—	—	—	CRH56 R	14 100	CRH56	87 000
	—	—	—	—	CRH64 R	16 800	CRH64	113 000

Notes(1) This table is applicable to all Inch series CF.

Table 8 Track capacity factor

Hardness HRC	Tensile strength N/mm^2	Track capacity factor	
		With crowned outer ring	With cylindrical outer ring
20	760	0.22	0.37
25	840	0.31	0.46
30	950	0.45	0.58
35	1 080	0.65	0.75
38	1 180	0.85	0.89
40	1 250	1.00	1.00
42	1 340	1.23	1.15
44	1 435	1.52	1.32
46	1 530	1.85	1.51
48	1 635	2.27	1.73
50	1 760	2.80	1.99
52	1 880	3.46	2.29
54	2 015	4.21	2.61
56	2 150	5.13	2.97
58	2 290	6.26	3.39

Allowable Rotational Speed

The allowable rotational speed of Cam Followers is affected by mounting and operating conditions. For d_1n values with only pure radial load applied, use the maximum values in Table 9 or lower as a guideline. Under actual operating conditions, use the recommended d_1n values in Table 9 as a guideline in consideration of the effect of axial loads.

For C-Lube Cam Followers, use a d_1n value of 10,000 or less as a guideline.

Table 9 d_1n values of Cam Followers(1)

Lubricant / Type	Grease		Oil	
	Maximum	Recommended	Maximum	Recommended
Caged type	84 000	8 400	140 000	14 000
Full complement type	42 000	4 200	70 000	7 000
Cylindrical Roller Cam Follower	66 000	6 600	110 000	11 000
C-Lube Cam Followers	10 000		10 000	

Note(1) d_1n value $= d_1 \times n$

where, d_1(2) : Stud diameter mm

n : Rotational speed min^{-1}

(2) For Eccentric Type Cam Followers, thread diameter G as shown in the dimension table is applicable.

Lubrication

Grease-prepacked Cam Followers are shown in Table 10. The lubricating grease prepacked in these bearings is ALVANIA GREASE S2 (Shell Lubricants Japan K.K.).

For Cam Followers without prepacked grease, grease should be packed through the oil hole in the stud for use. If they are used without grease, wear of rolling contact surfaces may take place, leading to a short bearing life.

Table 10 Bearings with prepacked grease

○ : Prepacked ×: Not prepacked

Series / Size of stud diameter d_1 (1) mm		Item	With cage				Full complement
			Shield type		Sealed type		
			With hexagon hole	With screwdriver slot	With hexagon hole	With screwdriver slot	
Standard Type Cam Follower	CF···B CFKR	3～ 5	○	–	○	–	–
Eccentric Type Cam Followers	CFE···B CFKRE	6～ 10					○
Solid Eccentric Stud Type Cam Followers	CFES···B	12～ 30	×				
Thrust Disk Type Cam Followers	CF···WB						
Centralized Lubrication Type Cam Followers	CF-RU1, CF-FU1		–	–	–	○	–
Easy Mounting Type Cam Followers	CF-SFU···B		–	–	○	–	–
Cam Follower G	CF···G		○	–	–	–	–
C-Lube Cam Followers	CF···WB···/SG(2)		–	–	×	–	–
Miniature Type Cam Followers	CFS CFS···W		○	–	–	–	○
Cylindrical Roller Cam Followers	NUCF···B		–	–	–	–	○
Inch series Cam Followers	CR, CR···B		○	○	○	○	○
	CRH···B		–	–	–	–	○

Notes(1) For Eccentric Type Cam Followers, thread diameter G as shown in the dimension table is applicable.

(2) C-Lube, a thermosetting solid-type lubricant, fills the inner space of the bearing.

Oil Hole

The position of oil hole is shown in Table 11.

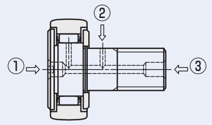
Perform greasing quietly by fitting a lubrication nozzle indicated in Table 12 to a straight type grease gun in JIS B 9808 and pressing the nozzle against the grease nipple or re-greasing fitting.

Due to their structures, lubrication is not possible for sizes 3 and 4 Standard Type Cam Followers CF···B, C-Lube Cam Followers, Cam Followers G and Miniature CFS series.

Table 11 Position of oil hole

○ : Oil hole is prepared.

Series / Size of stud diameter d_1 (1) mm			Oil hole position	① Head	② Stud outside surface	③ Stud end
Standard Type Cam Follower	CF···B		$d_1 < 5$	–	–	–
Eccentric Type Cam Followers	CFE···B		$5 \leqq d_1 \leqq 10$	○ (3)	–	–
Solid Eccentric Stud Type Cam Followers	CFES···B					
Thrust Disk Type Cam Followers	CF···WB		$10 < d_1$	○ (2)	○	○
Standard Type Cam Follower	CFKR		$d_1 \leqq 10$	○ (2)	–	○
Eccentric Type Cam Followers	CFKRE		$10 < d_1$	○ (2)	○	○
Centralized Lubrication Type Cam Followers	CF-RU1, CF-FU1(4)		$d_1 \leqq 12$	○	–	–
			$12 < d_1$	○	○	○
Easy Mounting Type Cam Followers	CF-SFU···B		$d_1 \leqq 10$	○ (3)	–	–
			$10 < d_1$	○ (5)	–	–
Cam Follower G	CF···G			–	–	–
C-Lube Cam Followers	CF···WB···/SG			–	–	–
Miniature Type Cam Followers	CFS CFS···W			–	–	–
Cylindrical Roller Cam Followers	NUCF···B		$d_1 \leqq 10$	○ (3)	–	–
			$10 < d_1$	○ (2)	○	○
Inch series Cam Followers	CR···B	With hexagon hole	$d_1 \leqq 6.35$	–	–	–
			$6.35 < d_1$	–	○	○
	CR	With screwdriver slot	$d_1 \leqq 6.35$	○	–	–
			$6.35 < d_1$	○	○	○
	CRH···B	With hexagon hole	$d_1 \leqq 7.938$	–	–	–
			$7.938 < d_1$	–	○	○



Notes(1) In case of Eccentric Type Cam Followers, thread diameter G shown in the table of dimensions is applicable in place of stud dia. and the oil hole on the outer surface of the stud cannot be used.

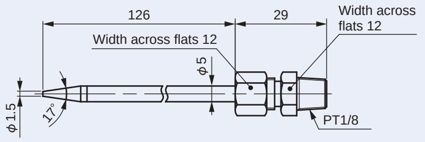
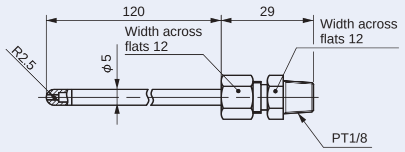
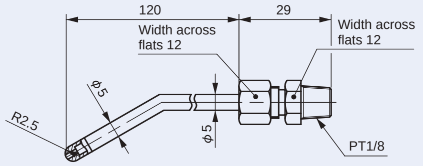
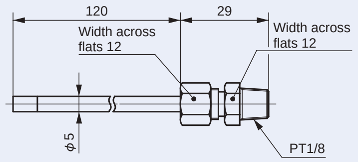
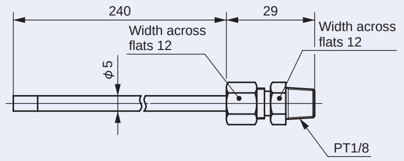
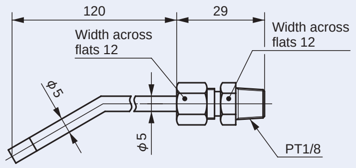
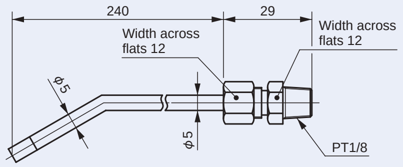
(2) Grease nipple is incorporated in the hexagon hole. Re-greasing can be made from the stud head and the stud end by press fitting a supplied grease nipple into the stud end. See page I4.

(3) Re-lubrication can be made from the re-greasing fitting that is inserted into the hexagon hole. See page I4.

(4) Tapped holes for oil connectors are provided at the stud end and hole of the head.

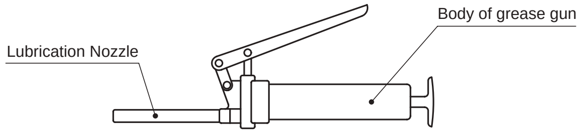
(5) Re-greasing can be made from the grease nipple in the hexagon hole.

Table 12 Type and Dimension of Lubrication Nozzles

Type	Dimension	Applicable grease nipple and re-grease fitting
A-5126T		NPF3(1) NPF6-1(1) Re-grease fitting(1)
A-5120R		NPF4-1(1) NPF6-1(1)
B-5120R		
A-5120V		NPT4-1 NPT6-1 NPB2 NPB3 NPB3-1 NPB4
A-5240V		
B-5120V		
B-5240V		

Note(1) HSP-3(Yamada Corporation)can be used for them.

Remark The above nozzles can be atached on the standard grease gun shown below. If required, please consult to IKO with type of lubrication nozzle.



Accessories

Cam Follower accessories are shown in Table 13. Grease nipple dimensions are shown in Table 14 and Table 15. Dimensions of plug for unused oil hole and dimensions of plug inserter are shown in Table 16. Nut dimensions are shown in Table 17 and Table 18.

Table 13 Accessories

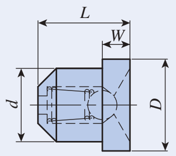
○ : Attached

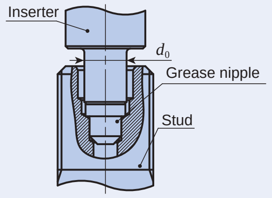
Series (1) Size of stud dia. d_1 mm \ Accessories				Grease nipple	Plug	Nut	Spring washer
Standard Type Cam Follower Eccentric Type Cam Followers Solid Eccentric Stud Type Cam Followers Thrust Disk Type Cam Followers	CF···B CFE···B CFES···B CF···WB		$d_1 \leqq 10$	–	–	○	–(2)
			$10 < d_1$	○	–	○	–(2)
Standard Type Cam Follower Eccentric Type Cam Followers	CFKR CFKRE			○	–	○	–(2)
Centralized Lubrication Type Cam Followers	CF-RU1, CF-FU1			–	–	○	–
Easy Mounting Type Cam Followers	CF-SFU···B			–	–	–	–
Cam Follower G	CF···G			–	–	○	–
C-Lube Cam Followers	CF···WB···/SG			–	–	○	–
Miniature Type Cam Followers	CFS, CFS···W			–	–	○	–
Cylindrical Roller Cam Followers	NUCF···B		$d_1 \leqq 10$	–	–	○	–
			$10 < d_1$	○	–	○	–
Inch series Cam Followers	CR···B	With hexagon hole	$d_1 \leqq 6.35$	–	–	○	–
			$6.35 < d_1$	○	○	○	–
	CR	With screwdriver slot	–	○	○	○	–
	CRH···B	With hexagon hole	$d_1 \leqq 7.938$	–	–	○	–
			$7.938 < d_1$	○	○	○	–

Notes (1) For Eccentric Type Cam Follower, thead diameter G is applied.
(2) Eccentric Type Cam Followers are supplied with spring washers.

Remark: The standard grease nipple (brass) is included in the Stainless Steel Made Cam Follower. When a stainless steel grease nipple is required, please contact IKO.

Table 14 Dimensions of grease nipple for Standard Type Cam Followers (1)





Identification number	Dimensions of grease nipple mm				Stud diameter d_1 (2)	Dimension of inserter mm
	d	D	L	W	mm	$d_0{}^{+0.05}_{-0.05}$
NPF3(3)	3	4	4.5	1.3	10	4.1
NPF4-1	4	5	5	1.5	12～16	5.3
NPF6-1	6	7	8	2	18～30	7.3

Notes (1) Applicable to Cam Followers other than Inch series Cam Followers.
(2) For Eccentric Type Cam Followers, thread diameter G as shown in the dimension table is applicable.
(3) Only applicable to Standard Type Cam Follower CFKR, and Eccentric Type Cam Follower CFKRE sizes 22 and 26.

Remark The same grease nipple as the accessory is integrated in the hexagon hole on the head.

Table 15 Dimensions of grease nipple for Inch series Cam Followers

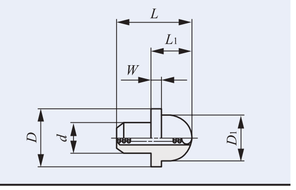
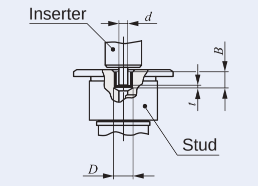
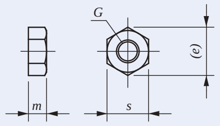
Identification number	Dimensions mm						Applicable Cam Followers	
	d	D	D_1	L	L_1	W		
NPB2	3.18	7.5	6	9	5.5	1.5	CR8 〜 CR10-1, CRH8-1 〜 CRH11	
NPB3	4.76	7.5	6	10	5.5	1.5	CR12 〜 CR22, CRH12 〜 CRH22	
NPB3-1	4.76	7.5	6	12.5	5.5	1.55	CR24 〜 CR36, CRH24 〜 CRH44	
NPB4	6.35	8	6	13	6	2	CR48, CRH48 〜 CRH64	

Table 16 Dimensions of plug for Inch series Cam Followers

Identification number	Dimensions of plug mm			Dimension of inserter mm	Applicable bearings (1)	
	D	t	B	$d\,^{0}_{-0.1}$		
USB2F	3.18	0.3	3.3	2.3	CR 8 〜CR10-1	
USB3F	4.76	0.4	4.3	3.7	CR12〜CR36, CRH12 〜CRH44	
USB4F	6.35	0.5	4.8	5.2	CR48, CRH48〜CRH64	

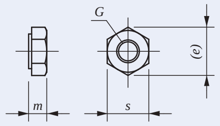
Note(1) Shows representative types.

Table 17 Metric series nut dimensions

Model of bearing	Stud diameter d_1(1)	Nut dimensions mm				
		G	m	s	e	
CF CFKR CFES CFE CFKRE CF···W CF-RU1 CF-FU1 CF···G CF···WB···/SG CFS CFS···W NUCF···B	1.4	M 1.4×0.3	1.1	3	3.25	
	2	M 2 ×0.4	1.6	4	4.6	
	2.5	M 2.5×0.45	2	5	5.8	
	3	M 3 ×0.5	2.4	5.5	6.4	
	4	M 4 ×0.7	3.2	7	8.1	
	5	M 5 ×0.8	4	8	9.2	
	6	M 6 ×1	5	10	11.5	
	8	M 8 ×1.25	6.5	13	15	
	10	M10 ×1.0(2) M10 ×1.25	8	17	19.6	
	12	M12 ×1.5	10	19	21.9	
	16	M16 ×1.5	13	24	27.7	
	18	M18 ×1.5	15	27	31.2	
	20	M20 ×1.5	16	30	34.6	
	24	M24 ×1.5	19	36	41.6	
	30	M30 ×1.5	24	46	53.1	

Note(1) For Eccentric Type Cam Followers, thread diameter G as shown in the dimension table is applicable.
Note(2) Applicable to Standard Type Cam Follower CFKR, and Eccentric Type Cam Follower CFKRE.

Table 18 Inch series nut dimensions

Model of bearing	Stud diameter d_1 (inch)	Nut dimensions mm				
		G UNF	m	s	e	
CR CRH	4.826	No.10-32	4	8	9.2	
	6.35 ($^{1}/_{4}$)	$^{1}/_{4}$-28	5.5	10	11.5	
	7.938 ($^{5}/_{16}$)	$^{5}/_{16}$-24	6.5	12	13.8	
	9.525 ($^{3}/_{8}$)	$^{3}/_{8}$-24	8	14	16.2	
	11.112 ($^{7}/_{16}$)	$^{7}/_{16}$-20	10	17	19.5	
	12.7 ($^{1}/_{2}$)	$^{1}/_{2}$-20	11	19	21.9	
	15.875 ($^{5}/_{8}$)	$^{5}/_{8}$-18	14	23	26.5	
	19.05 ($^{3}/_{4}$)	$^{3}/_{4}$-16	16	26	30	
	22.225 ($^{7}/_{8}$)	$^{7}/_{8}$-14	19	32	37	
	25.4 (1)	1 -14UNS	22	36	41.4	
	28.575 (1 $^{1}/_{8}$)	1 $^{1}/_{8}$-12	24	41	47.1	
	31.75 (1 $^{1}/_{4}$)	1 $^{1}/_{4}$-12	27	46	53.5	
	38.1 (1 $^{1}/_{2}$)	1 $^{1}/_{2}$-12	33	55	63.5	
	44.45 (1 $^{3}/_{4}$)	1 $^{3}/_{4}$-12UN	38	65	75.1	
	50.8 (2)	2 -12UN	44	75	86.6	

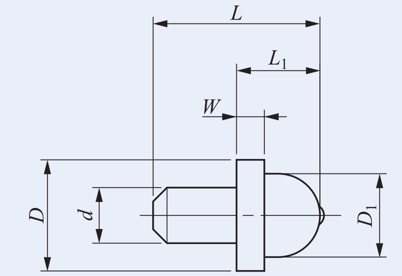
Special Specification

The grease nipple supplied with Metric series Cam Follower with hexagon socket as an accessory may be replaced with the NPT type grease nipple indicated in Table 19 upon your request. If required, please order with supplemental code, "/NP" at the end of identification number.

Example of Identification Number

CF 12 BUU ／ NP

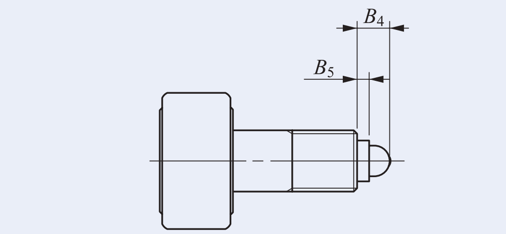
Table 19 Dimension of NPT type grease nipple



Code number	Dimension of grease nipple mm						Size of stud dia. d_1(1) mm
	d	D	D_1	L	L_1	W	
NPT4-1	4	8	6	12	6	2	12 〜 16
NPT6-1	6	8	6	14	8	4	18 〜 30

Note(1) For Eccentric Type Cam Follower CFE, thread diameter G is applied.
Remark Not applicable to Standard Type Cam Follower CFKR, and Eccentric Type Cam Follower CFKRE.

Table 20 Dimension of assembled NPT type grease nipple



Code number	Dimension mm		Size of stud dia. d_1(1) mm
	B_4	B_5	
NPT4-1	6	2	12 〜 16
NPT6-1	8	4	18 〜 30

Note(1) For Eccentric Type Cam Follower CFE, thread diameter G is applied.

Mounting

❶Make the center axis of the mounting hole perpendicular to the moving direction of the Cam Follower and match the side shoulder accurately with the seating surface indicated by dimension *f* in the table of dimensions. (See Fig. 1)
The chamfered mounting hole should be as small as possible (C0.5 or so).
When mounting Cam Followers, do not hit the flange head of the Cam Follower directly with a hammer, etc. This may lead to a bearing failure such as irregular rotation or cracking.
If the Cam Follower outer ring is not in good contact with the mating running surface then we recommend use of a crowned outer ring type.

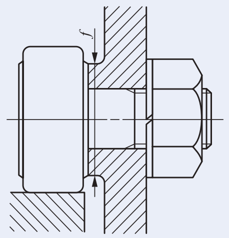


Fig. 1 Seating surface

❷The IKO mark on the flange head of the stud indicates the position of the oil hole on the raceway. Avoid locating the oil hole within the loading zone. This may lead to a short bearing life. (See Fig. 2.) The hole located in the middle part of the stud perpendicular to the stud center axis is used for greasing or locking.

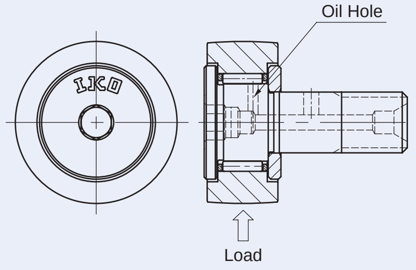


Fig. 2 Oil hole position and loading direction

❸When mounting Cam Followers, fix in place by holding the hexagon hole or screwdriver slot with a hex wrench or slotted screwdriver and use a wrench to tighten on a nut. (See Fig. 3)
If mounting by turning the hexagon hole or screwdriver slot itself, the hexagon hole or screwdriver slot of the Cam Follower may become damaged.

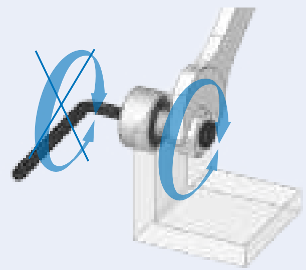


Fig. 3 Methods of mounting

❹When tightening the nut, the tightening torque should not exceed the values shown in the table of dimensions. If the tightening torque is too large, it is possible that the threaded portion of the stud will be broken. When there is a possibility of loosening, a special nut such as a lock nut, spring washer, or self-locking nut should be used.

❺When direct-fixing the Cam Follower without nuts for mounting as shown in Fig. 4, it may be difficult to achieve sufficient tightening torque. If the screw then loosens, stress may concentrate on the thread, causing the stud to break. Such a method is not recommended.

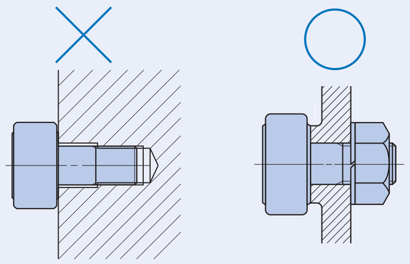


Fig. 4 Methods of mounting

❻Solid Eccentric Stud Type Cam Followers and Eccentric Type Cam Followers, are mounted in reference position where IKO mark on the head of stud is located as Fig.5. The outer ring position can be adjusted appropriately by turning the stud with a screwdriver or hexagon bar wrench using the screwdriver slot or hexagon hole of the stud head. The stud is fixed with a nut and a spring washer, etc. The tightening torque should not exceed the values of maximum tightening torque shown in the table of dimensions.
When shock loads are applied and the adjusted eccentricity has to be ensured, it is recommended to make holes in the housing, stud and eccentric collar, and fix the stud with a dowel pin as shown in Fig. 6. However, when the stud diameter is less than 8 mm (Eccentric collar diameter 11 mm), it is difficult to make a hole in the stud because the stud is through-hardened.

Operating Temperature Range

Operating temperature range of Cam Followers is -20°C ~ +120°C. However, note that the maximum allowable temperature varies in models shown in Table 21.

Table 21 Limitation of operating temperature range

Model	Stud diameter d_1 mm	With cage Shield type	With cage Sealed type	Full complement ThrustDisk Seals™
Miniature Type Cam Followers CFS Thrust Disk Type Miniature Cam Followers CFS … W	$d_1 = 2$	−20°C ~ 110°C(1)	–	–
Standard Type Cam Followers CF … B Thrust Disk Type Cam Followers CF … WB	$d_1 = 3,4$	−20°C ~ 110°C(1)	−20°C ~ 80°C	–
	$d_1 = 5$	−20°C ~ 120°C		
Standard Type Cam Followers / Stainless Steel Made CF … FB Thrust Disk Type Cam Followers / Stainless Steel Made CF … FWB	$3 \leqq d_1 \leqq 5$	−20°C ~ 110°C(1)	−20°C ~ 80°C	–
C-Lube Cam Followers CF … WB … /SG	$5 \leqq d_1 \leqq 20$	–	−15°C ~ 80°C(2)	–
Inch Series Cam Followers ThrustDisk Seals™ CR … VBS	$4.826 \leqq d_1 \leqq 22.225$	–	–	−20°C ~ 80°C

Notes(1) 100°C when used continuously.
(2) Below 60°C is recommended for long use.

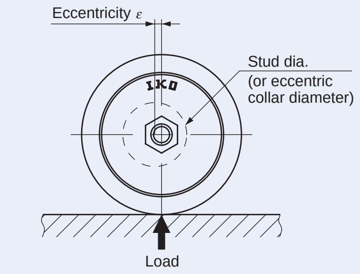


Fig. 5 Reference position for adjusting of Solid Eccentric Stud Type Cam Followers and Eccentric Type Cam Follwers

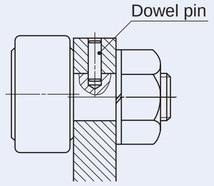


Fig. 6 Mounting example of Solid Eccentric Stud Type Cam Follower

❼The length of a mounting hole for Eccentric Type Cam Followers must be at least that of the *S* dimension in Fig. 7.

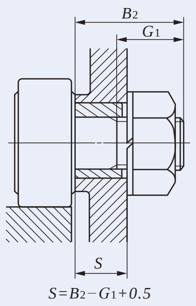
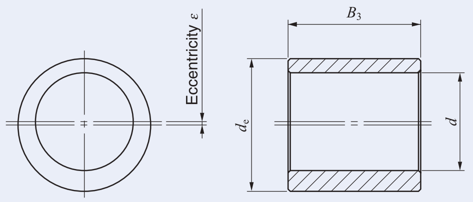


Fig. 7 Length of the mounting hole of Eccentric Type Cam Follower

❽Eccentric callor is available for Inch series Cam Followers.
Cam Followers with Eccentric collars, CRE are also available. If required, please consult with IKO.

Table 20 Eccentric collars for Inch series Cam Followers



unit: mm

Identifical number of collar	Outer diameter of collar de	Length of collar B_3	Eccentricity ε	Stud dia. d	Applicable Cam Followers
EB 8	6.350 (¼)	6.350 (¼)	0.250	4.826	CR 8 CR 8-1 (V)(B)(UU)(R)
EB10	9.525 (⅜)	9.525 (⅜)	0.380	6.350 (¼)	CR10 CR10-1 (V)(B)(UU)(R)
EB12	12.700 (½)	12.700 (½)	0.380	9.525 (⅜)	CR12 CR14 (V)(B)(UU)(R)
EB16	15.875 (⅝)	15.875 (⅝)	0.760	11.112 (7⁄16)	CR16 CR18 (V)(B)(UU)(R)
EB20	17.450	17.450	0.760	12.700 (½)	CR20 CR22 (V)(B)(UU)(R)
EB24	22.225 (⅞)	22.225 (⅞)	0.760	15.875 (⅝)	CR24 CR26 (V)(B)(UU)(R)
EB28	25.400 (1)	25.400 (1)	0.760	19.050 (¾)	CR28 CR30 (V)(B)(UU)(R)
EB32	30.150	30.150	0.760	22.225 (⅞)	CR32 CR36 (V)(B)(UU)(R)
EB48	44.450 (1 ¾)	44.450 (1 ¾)	1.520	31.750 (1 ¼)	CR48 VUU

❾For mounting Easy Mounting Type Cam Followers, it is recommended to fix the fixing screw from the upper side to the stepped portion of the stud. (See Fig. 8.)
While M5 - M6 screws are generally used as fixing screws, adjust the size used depending on the usage criteria.

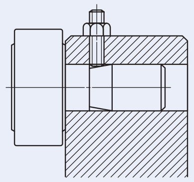


Fig. 8 Mounting example of Easy Mounting Type Cam Follower

Precaution For Use

❶Do not wash C-Lube Cam Follower with organic solvent and/or white kerosene, which have the ability of removing fat nor leave them in contact with the above agents.

❷To ensure normal rotation of the C-Lube Cam Follower, apply a load of 1% or over of the dynamic load rating at use.

Option Parts

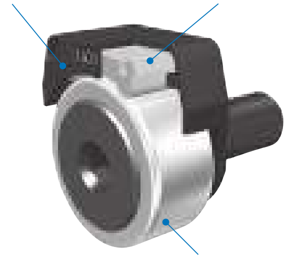
C-Lube Unit for Cam Followers

Structure and features

IKO C-Lube unit for Cam Follower is a lubrication part to be mounted on the Cam Follower and its integral capillary lubricating element has a lot of lubrication oil impregnated in it.
The capillary lubricating element is consecutive porous resin formed by sinter molding of fine resin powder and a lot of lubrication oil is impregnated in it by using the capillary action that occurs within the internal space.

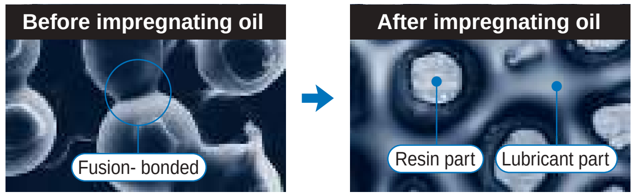
Regular lubrication is not needed as lubrication oil is supplied onto the outside diameter surface of the outer ring and mating guide surface (cam guide surface). The grease is not scattered and contamination of the surrounding environment is prevented.
The combination with IKO C-Lube cam follower (See Page I55) realizes maintenance-free cam follower inside and cam guide surface.

Structure of C-Lube Unit for Cam Followers



IKO C-Lube Cam Follower

Magnified photos of C-Lube

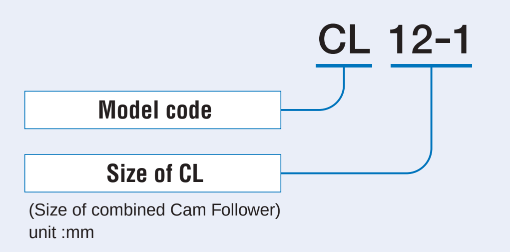


Resin particles are strongly fusion bonded.

Lubricant is retained in cavities amongst resin particles.

Identification number

The identification number example of IKO C-Lube Unit is shown below.



(Size of combined Cam Follower)
unit :mm

Allowable Rotational speed

The Rotational speed of IKO Cam Follower with C-Lube Unit should not exceeded d_1n=10,000 for reference.

$$d_1n=d_1 \times n$$

d_1 : Stud diameter of Cam Follower, mm
n : Rotational speed, min^{-1}

Minimum rotational angle

Lubricating oil is supplied to the whole external diameter surface of the outer ring. Accordingly, use the product in a condition in which the outer ring makes one or more turns.

Operating temperature

Allowable operating temperature range of IKO Cam Follower with C-Lube Unit is -15 to 80˚C.

Mounting

❶Set the C-Lube Unit perpendicularly to the center axis of Cam Follower and fix together with Cam Follower by tightening nut. (See Fig. 9.)

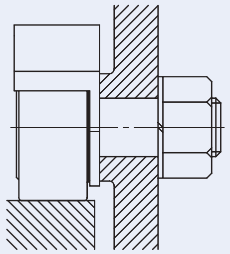


Fig. 9 Mounting of C-Lube Unit

❷Position of C-Lube Unit is adjustable. C-Lube Unit must be positioned avoiding loading direction. (See Fig. 10.)

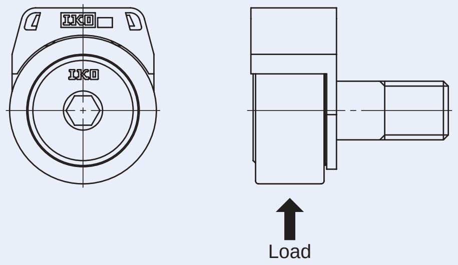


Fig. 10 Load direction of Cam Follwer

❸When tightening the nut, the tightening torque should not be exceeded the value maximum tightening torque on dimension table.
In case loosening of the nut is predicted due to vibration, using lock nut, spring washer and other special washer are recommended.

Precaution for use

❶Do not wash with organic solvent and/or white kerosene, which have the ability of removing fat nor leave them in contact with the above agents.

❷Do not apply a load onto the C-Lube Unit directly.

❸To ensure normal rotation of the Cam Follower, apply a load of 1% or over of the dynamic load rating at use.
Also, the outer ring needs to be rotate over a revolution to supply lubricant on entire outer diameter surface.

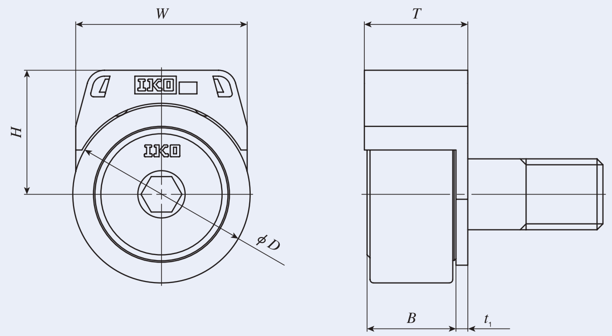
❹The maximum allowable load on IKO Cam Follower with C-Lube Unit is, 80% of the maximum allowable load of the needle bearing.
C-Lube Unit may be damaged and influenced to the smooth rotation and lubricating performance by excessive load.

❺After assembling C-Lube Unit and Cam Followers in the machine, please confirm that C-Lube unit provides oil correctly to the cam guide surface before actual operation.

❻Do not use in the environment which contamination of liquid and/or harmful foreign matter are expected.

❼Replace with new C-Lube Unit when inside oil finishes completely. Re-lubrication is not possible.

Table 21 Dimensions of C-Lube Unit for Cam Followers



Model number	Boundary Dimensions mm				Applicable Cam Followers		
	W	H	T	t_1	Model number (1)	Boundary Dimensions mm D	B
CL 5	12.4	10.7	12.1	1.5	CF 5 B	13	10
CL 6	15.4	12.6	14	1.5	CF 6 B	16	12.2 max
CL 8	18.4	14.2	14	1.5	CF 8 B	19	12.2 max
CL 10	21	17	15.5	2	CF 10 B CFKR 22	22	13.2 max
CL 10-1	21	19.2	15.5	2	CF 10-1 B CFKR 26	26	13.2 max
CL 12	29	21	17.5	2	CF 12 B CFKR 30	30	15.2 max
CL 12-1	29	22	17.5	2	CF 12-1 B CFKR 32	32	15.2 max
CL 16	33.8	27.4	23.4	2.5	CF 16 B CFKR 35	35	19.6 max
CL 18	38.8	30.4	25.4	2.5	CF 18 B CFKR 40	40	21.6 max
CL 20	45.8	38.4	29.9	3	CF 20 B CFKR 52	52	25.6 max
CL 20-1	45.8	35.4	29.9	3	CF 20-1 B CFKR 47	47	25.6 max

Note(1) Only representative identification numbers are shown in the table, but applicable to all Cam Followers other than Miniature Type Cam Followers and Inch Series Cam Followers.
It is recommended to use together with C-Lube Cam Followers in order to make maintenance-free more effective.

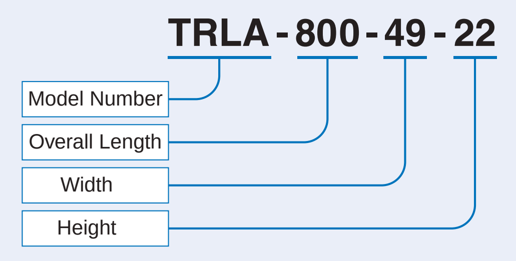
Remark Load on the Cam Follower with the C-Lube unit equipped must be up to 80% of the maximum allowable static load of the Cam Follower to be combined. For the maximum allowed static load of each Cam Follower, please see the dimension tables of respective models.

Option Parts

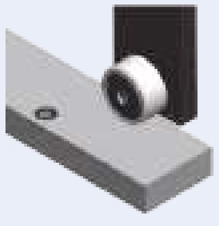
Way for Cam Follower

The accuracy of the mating cam guide that comes in contact with the outer ring of Cam Followers has a large influence on the guide performance of Cam Followers and machinery.
A specially designed high-precision Way for Cam Follower should be used in order to achieve sufficient performance from the Cam Followers. Fixed with bolts for simple assembly and available in 2 models - A type or B type - depending on the mounting direction.

Identification number



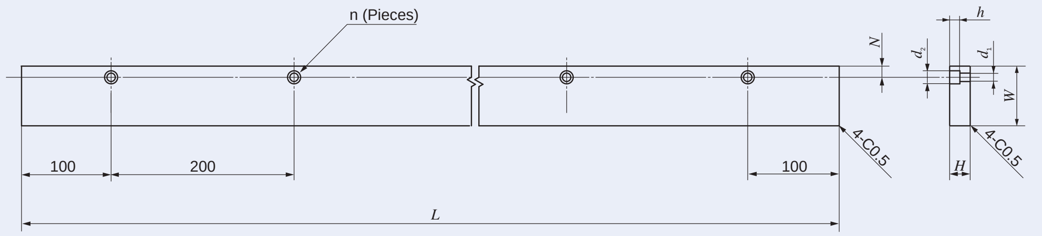
Model Types


《Way A Type》


《Way B Type》

Table of Dimensions

《Way A Type》

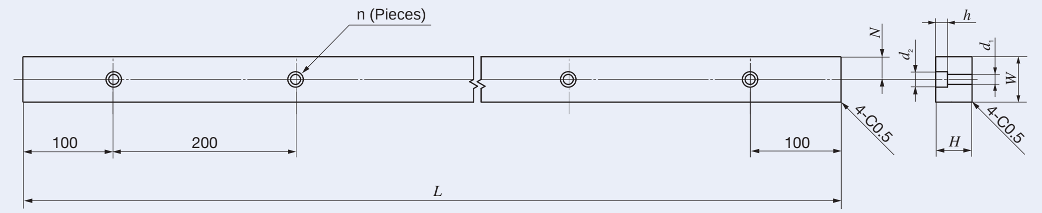


Material: SKS3 equivalent
Surface hardness: 40HRC or more

Identification number	Boundary Dimensions mm							Applicable Cam Followers
	$L_{(n)}$	W	H	N	d_1	d_2	h	
TRLA- 600-40-22	600(3)	40	22	12	9	14	11	Stud dia. 3~ 8mm
TRLA- 800-40-22	800(4)							
TRLA-1000-40-22	1000(5)							
TRLA- 600-49-22	600(3)	49						Stud dia.10~18mm
TRLA- 800-49-22	800(4)							
TRLA-1000-49-22	1000(5)							
TRLA- 600-64-22	600(3)	64						Stud dia.20~30mm
TRLA- 800-64-22	800(4)							
TRLA-1000-64-22	1000(5)							

Remark For other dimensions, please contact IKO.

《Way B Type》



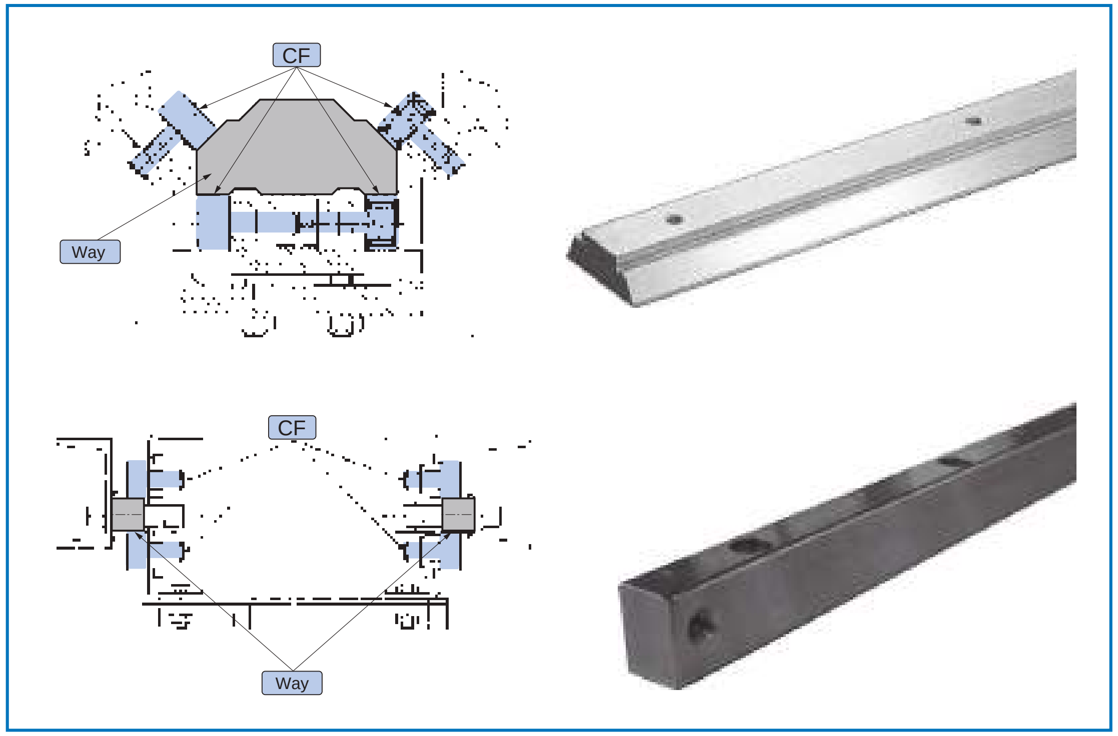
Material: SKS3 equivalent
Surface hardness: 40HRC or more

Identification number	Boundary Dimensions mm							Applicable Cam Followers
	$L_{(n)}$	W	H	N	d_1	d_2	h	
TRLB- 600-34-22	600(3)	34	22	17	9	14	11	Stud dia. 3~12mm
TRLB- 800-34-22	800(4)							
TRLB-1000-34-22	1000(5)							
TRLB- 600-50-40	600(3)	50	40	25	11	17	13	Stud dia.16~30mm
TRLB- 800-50-40	800(4)							
TRLB-1000-50-40	1000(5)							

Remark For other dimensions, please contact IKO.

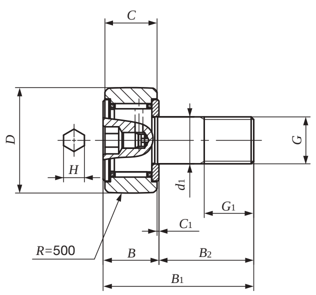
Introduction of Special Support Examples

Introducing special support examples for Ways for Cam Follower.
A variety of shapes are supported in addition to the special support examples. For details, please contact IKO.

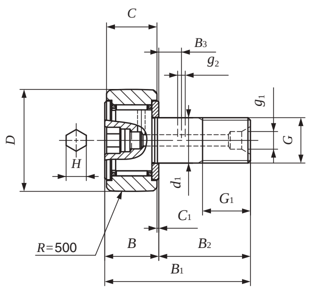


CAM FOLLOWERS

Standard Type Cam Followers CF···B With Cage/Stud Head Hex Hole



CF···BR
Stud dia d_1 3-10mm



CF···BR
Stud dia d_1 12-30mm

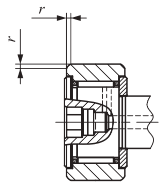
Stud dia. 3−30mm

Stud dia. mm	Identification number				Mass (Ref.) g	D	C	d_1	G
	Shield type		Sealed type						
	With crowned outer ring	With cylindrical outer ring	With crowned outer ring	With cylindrical outer ring					
3	CF 3 BR	CF 3 B	CF 3 BUUR	CF 3 BUU	4.3	10	7	3	M 3×0.5
4	CF 4 BR	CF 4 B	CF 4 BUUR	CF 4 BUU	7.4	12	8	4	M 4×0.7
5	CF 5 BR	CF 5 B	CF 5 BUUR	CF 5 BUU	10.3	13	9	5	M 5×0.8
6	CF 6 BR	CF 6 B	CF 6 BUUR	CF 6 BUU	18.5	16	11	6	M 6×1
8	CF 8 BR	CF 8 B	CF 8 BUUR	CF 8 BUU	28.5	19	11	8	M 8×1.25
	CF 8 BRM	CF 8 BM	CF 8 BUURM	CF 8 BUUM	28.5	19	11	8	M 8×1
10	CF 10 BR	CF 10 B	CF 10 BUUR	CF 10 BUU	45	22	12	10	M10×1.25
	CF 10 BRM	CF 10 BM	CF 10 BUURM	CF 10 BUUM	45	22	12	10	M10×1
	CF 10-1 BR	CF 10-1 B	CF 10-1 BUUR	CF 10-1 BUU	60	26	12	10	M10×1.25
	CF 10-1 BRM	CF 10-1 BM	CF 10-1 BUURM	CF 10-1 BUUM	60	26	12	10	M10×1
12	CF 12 BR	CF 12 B	CF 12 BUUR	CF 12 BUU	95	30	14	12	M12×1.5
	CF 12-1 BR	CF 12-1 B	CF 12-1 BUUR	CF 12-1 BUU	105	32	14	12	M12×1.5
16	CF 16 BR	CF 16 B	CF 16 BUUR	CF 16 BUU	170	35	18	16	M16×1.5
18	CF 18 BR	CF 18 B	CF 18 BUUR	CF 18 BUU	250	40	20	18	M18×1.5
20	CF 20 BR	CF 20 B	CF 20 BUUR	CF 20 BUU	460	52	24	20	M20×1.5
	CF 20-1 BR	CF 20-1 B	CF 20-1 BUUR	CF 20-1 BUU	385	47	24	20	M20×1.5
24	CF 24 BR	CF 24 B	CF 24 BUUR	CF 24 BUU	815	62	29	24	M24×1.5
	CF 24-1 BR	CF 24-1 B	CF 24-1 BUUR	CF 24-1 BUU	1 140	72	29	24	M24×1.5
30	CF 30 BR	CF 30 B	CF 30 BUUR	CF 30 BUU	1 870	80	35	30	M30×1.5
	CF 30-1 BR	CF 30-1 B	CF 30-1 BUUR	CF 30-1 BUU	2 030	85	35	30	M30×1.5
	CF 30-2 BR	CF 30-2 B	CF 30-2 BUUR	CF 30-2 BUU	2 220	90	35	30	M30×1.5

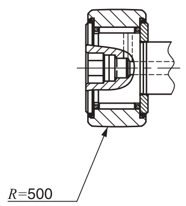
Note(1) Minimum allowable value of chamfer dimension r

Remarks1. Models with a stud diameter d_1 of 4 mm or less have no oil hole. For models with a stud dia. 5 to 10mm, oil hole (re-greasing fitting) is provided at the head. Other models are provided with an oil hole (grease nipple) at the head and an oil hole each on the outside surface and end surface of the stud.

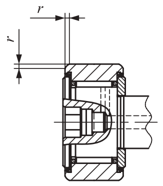
2. Shield type models with a stud diameter d_1 of 10mm or less and the sealed type models are provided with prepacked grease. Other models are not provided with prepacked grease. Perform proper lubrication for use.



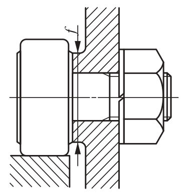
CF···B



CF···BUUR



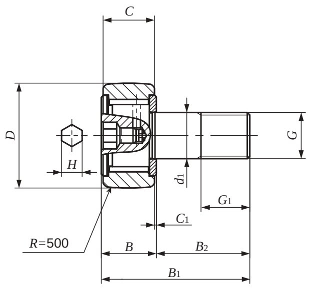
CF···BUU



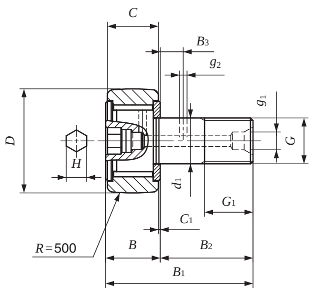
Boundary dimensions mm										Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
G_1	B	B_1	B_2	B_3	C_1	g_1	g_2	H	$r_{s\,min}$ (1)					
5	8	17	9	—	0.5	—	—	2	0.2	6.8	0.34	1 500	1 020	384
6	9	20	11	—	0.5	—	—	2.5	0.3	8.3	0.78	2 070	1 590	834
7.5	10	23	13	—	0.5	—	—	3	0.3	9.3	1.6	2 520	2 140	1 260
8	12.2max	28.2max	16	—	0.6	—	—	3	0.3	11	2.7	3 660	3 650	1 950
10	12.2max	32.2max	20	—	0.6	—	—	4	0.3	13	6.5	4 250	4 740	4 620
10	12.2max	32.2max	20	—	0.6	—	—	4	0.3	13	7.1	4 250	4 740	4 620
12	13.2max	36.2max	23	—	0.6	—	—	4	0.3	16	13.8	5 430	6 890	6 890
12	13.2max	36.2max	23	—	0.6	—	—	4	0.3	16	14.7	5 430	6 890	6 890
12	13.2max	36.2max	23	—	0.6	—	—	4	0.3	16	13.8	5 430	6 890	6 890
12	13.2max	36.2max	23	—	0.6	—	—	4	0.3	16	14.7	5 430	6 890	6 890
13	15.2max	40.2max	25	6	0.6	4	3	6	0.6	21	21.9	7 910	9 790	9 790
13	15.2max	40.2max	25	6	0.6	4	3	6	0.6	21	21.9	7 910	9 790	9 790
17	19.6max	52.1max	32.5	8	0.8	4	3	6	0.6	26	58.5	12 000	18 300	18 300
19	21.6max	58.1max	36.5	8	0.8	6	3	8	1	29	86.2	14 800	25 200	25 200
21	25.6max	66.1max	40.5	9	0.8	6	4	8	1	34	119	20 700	34 600	34 600
21	25.6max	66.1max	40.5	9	0.8	6	4	8	1	34	119	20 700	34 600	34 600
25	30.6max	80.1max	49.5	11	0.8	6	4	12	1	40	215	30 500	52 600	52 000
25	30.6max	80.1max	49.5	11	0.8	6	4	12	1	40	215	30 500	52 600	52 000
32	37 max	100 max	63	15	1	6	4	17	1	49	438	45 400	85 100	85 100
32	37 max	100 max	63	15	1	6	4	17	1	49	438	45 400	85 100	85 100
32	37 max	100 max	63	15	1	6	4	17	1	49	438	45 400	85 100	85 100

CAM FOLLOWERS

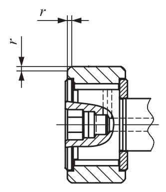
Standard Type Cam Followers CF···B Full Complement Type/Stud Head Hex Hole



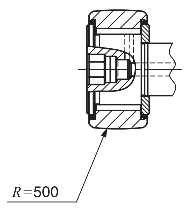
CF···VBR
Stud dia. d_1 6-10mm



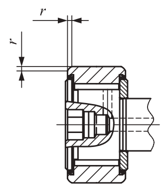
CF···VBR
Stud dia. d_1 12-30mm



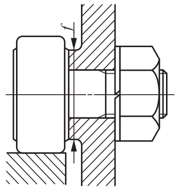
CF···VB



CF···VBUUR



CF···VBUU



Stud dia. 6—30mm

Stud dia.	Identification number				Mass (Ref.)				Boundary dimensions mm											Mounting dimension	Maximum tightening torque	Basic dynamic load rating	Basic static load rating	Maximum allowable static load
	Shield type		Sealed type																					
	With crowned outer ring	With cylindrical outer ring	With crowned outer ring	With cylindrical outer ring																				
mm					g	D	C	d_1	G	G_1	B max	B_1 max	B_2	B_3	C_1	g_1	g_2	H	$r_{s\min}$ (1)	f Min. mm	N-m	C N	C_0 N	N
6	CF 6 VBR	CF 6 VB	CF 6 VBUUR	CF 6 VBUU	19	16	11	6	M 6×1	8	12.2	28.2	16	—	0.6	—	—	3	0.3	11	2.7	6 980	8 500	1 950
8	CF 8 VBR	CF 8 VB	CF 8 VBUUR	CF 8 VBUU	29	19	11	8	M 8×1.25	10	12.2	32.2	20	—	0.6	—	—	4	0.3	13	6.5	8 170	11 200	4 620
	CF 8 VBRM	CF 8 VBM	CF 8 VBUURM	CF 8 VBUUM	29	19	11	8	M 8×1	10	12.2	32.2	20	—	0.6	—	—	4	0.3	13	7.1	8 170	11 200	4 620
10	CF 10 VBR	CF 10 VB	CF 10 VBUUR	CF 10 VBUU	46	22	12	10	M10×1.25	12	13.2	36.2	23	—	0.6	—	—	4	0.3	16	13.8	9 570	14 500	8 650
	CF 10 VBRM	CF 10 VBM	CF 10 VBUURM	CF 10 VBUUM	46	22	12	10	M10×1	12	13.2	36.2	23	—	0.6	—	—	4	0.3	16	14.7	9 570	14 500	8 650
	CF 10-1 VBR	CF 10-1 VB	CF 10-1 VBUUR	CF 10-1 VBUU	61	26	12	10	M10×1.25	12	13.2	36.2	23	—	0.6	—	—	4	0.3	16	13.8	9 570	14 500	8 650
	CF 10-1 VBRM	CF 10-1 VBM	CF 10-1 VBUURM	CF 10-1 VBUUM	61	26	12	10	M10×1	12	13.2	36.2	23	—	0.6	—	—	4	0.3	16	14.7	9 570	14 500	8 650
12	CF 12 VBR	CF 12 VB	CF 12 VBUUR	CF 12 VBUU	97	30	14	12	M12×1.5	13	15.2	40.2	25	6	0.6	4	3	6	0.6	21	21.9	13 500	19 700	13 200
	CF 12-1 VBR	CF 12-1 VB	CF 12-1 VBUUR	CF 12-1 VBUU	107	32	14	12	M12×1.5	13	15.2	40.2	25	6	0.6	4	3	6	0.6	21	21.9	13 500	19 700	13 200
16	CF 16 VBR	CF 16 VB	CF 16 VBUUR	CF 16 VBUU	173	35	18	16	M16×1.5	17	19.6	52.1	32.5	8	0.8	4	3	6	0.6	26	58.5	20 700	37 600	23 200
18	CF 18 VBR	CF 18 VB	CF 18 VBUUR	CF 18 VBUU	255	40	20	18	M18×1.5	19	21.6	58.1	36.5	8	0.8	6	3	8	1	29	86.2	25 300	51 300	31 100
20	CF 20 VBR	CF 20 VB	CF 20 VBUUR	CF 20 VBUU	465	52	24	20	M20×1.5	21	25.6	66.1	40.5	9	0.8	6	4	8	1	34	119	33 200	64 500	37 500
	CF 20-1 VBR	CF 20-1 VB	CF 20-1 VBUUR	CF 20-1 VBUU	390	47	24	20	M20×1.5	21	25.6	66.1	40.5	9	0.8	6	4	8	1	34	119	33 200	64 500	37 500
24	CF 24 VBR	CF 24 VB	CF 24 VBUUR	CF 24 VBUU	820	62	29	24	M24×1.5	25	30.6	80.1	49.5	11	0.8	6	4	12	1	40	215	46 600	92 000	52 000
	CF 24-1 VBR	CF 24-1 VB	CF 24-1 VBUUR	CF 24-1 VBUU	1 140	72	29	24	M24×1.5	25	30.6	80.1	49.5	11	0.8	6	4	12	1	40	215	46 600	92 000	52 000
30	CF 30 VBR	CF 30 VB	CF 30 VBUUR	CF 30 VBUU	1 870	80	35	30	M30×1.5	32	37	100	63	15	1	6	4	17	1	49	438	67 700	144 000	85 900
	CF 30-1 VBR	CF 30-1 VB	CF 30-1 VBUUR	CF 30-1 VBUU	2 030	85	35	30	M30×1.5	32	37	100	63	15	1	6	4	17	1	49	438	67 700	144 000	85 900
	CF 30-2 VBR	CF 30-2 VB	CF 30-2 VBUUR	CF 30-2 VBUU	2 220	90	35	30	M30×1.5	32	37	100	63	15	1	6	4	17	1	49	438	67 700	144 000	85 900

Note(1) Minimum allowable value of chamfer dimension r

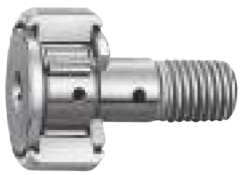
Remarks1. Models with a stud diameter d_1 of 10 mm or less have an oil hole (re-greasing fitting) at the head. Other models are provided with an oil hole (grease nipple) at the head and an oil hole each on the outside surface and end surface of the stud.

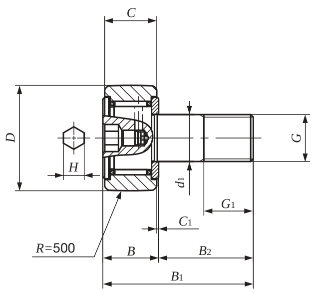
2. Provided with prepacked grease.

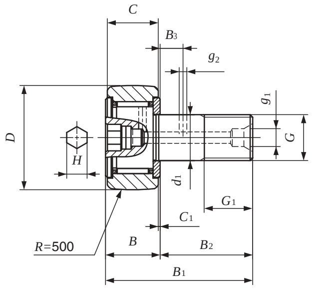
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

CAM FOLLOWERS

Standard Type Cam Followers CF…B / Stainless Steel Made With Cage/Stud Head Hex Hole



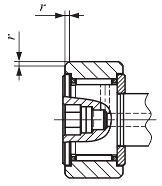




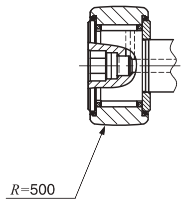
Stud dia. 3−20mm

CF…FBR
Stud dia. d_1 3-10mm

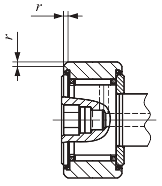
CF…FBR
Stud dia. d_1 12-20mm



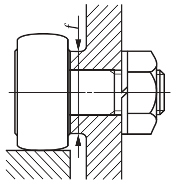
CF…FB



CF…FBUUR



CF…FBUU



Stud dia. mm	Identification number				Mass (Ref.) g						Boundary dimensions mm									Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
	Shield type With crowned outer ring	Shield type With cylindrical outer ring	Sealed type With crowned outer ring	Sealed type With cylindrical outer ring		D	C	d_1	G	G_1	B	B_1	B_2	B_3	C_1	g_1	g_2	H	$r_{s\,min}$ (1)					
3	**CF 3 FBR**	**CF 3 FB**	**CF 3 FBUUR**	**CF 3 FBUU**	4.3	10	7	3	M 3×0.5	5	8	17	9	—	0.5	—	—	2	0.2	6.8	0.34	1 200	813	384
4	**CF 4 FBR**	**CF 4 FB**	**CF 4 FBUUR**	**CF 4 FBUU**	7.4	12	8	4	M 4×0.7	6	9	20	11	—	0.5	—	—	2.5	0.3	8.3	0.78	1 650	1 270	834
5	**CF 5 FBR**	**CF 5 FB**	**CF 5 FBUUR**	**CF 5 FBUU**	10.3	13	9	5	M 5×0.8	7.5	10	23	13	—	0.5	—	—	3	0.3	9.3	1.6	1 930	1 730	1 260
6	**CF 6 FBR**	**CF 6 FB**	**CF 6 FBUUR**	**CF 6 FBUU**	18.5	16	11	6	M 6×1	8	12.2 max	28.2 max	16	—	0.6	—	—	3	0.3	11	2.7	2 930	2 920	1 950
8	**CF 8 FBR**	**CF 8 FB**	**CF 8 FBUUR**	**CF 8 FBUU**	28.5	19	11	8	M 8×1.25	10	12.2 max	32.2 max	20	—	0.6	—	—	4	0.3	13	6.5	3 400	3 790	3 790
10	**CF 10 FBR** **CF 10-1 FBR**	**CF 10 FB** **CF 10-1 FB**	**CF 10 FBUUR** **CF 10-1 FBUUR**	**CF 10 FBUU** **CF 10-1 FBUU**	45 60	22 26	12	10	M10×1.25	12	13.2 max	36.2 max	23	—	0.6	—	—	5	0.3	16	13.8	4 340	5 510	5 510
12	**CF 12 FBR** **CF 12-1 FBR**	**CF 12 FB** **CF 12-1 FB**	**CF 12 FBUUR** **CF 12-1 FBUUR**	**CF 12 FBUU** **CF 12-1 FBUU**	95 105	30 32	14	12	M12×1.5	13	15.2 max	40.2 max	25	6	0.6	4	3	6	0.6	21	21.9	6 330	7 830	7 830
16	**CF 16 FBR**	**CF 16 FB**	**CF 16 FBUUR**	**CF16 FBUU**	170	35	18	16	M16×1.5	17	19.6 max	52.1 max	32.5	8	0.8	4	3	6	0.6	26	58.5	9 620	14 700	14 700
18	**CF 18 FBR**	**CF 18 FB**	**CF 18 FBUUR**	**CF18 FBUU**	250	40	20	18	M18×1.5	19	21.6 max	58.1 max	36.5	8	0.8	6	3	8	1	29	86.2	11 800	20 200	20 200
20	**CF 20 FBR** **CF 20-1 FBR**	**CF 20 FB** **CF 20-1 FB**	**CF 20 FBUUR** **CF 20-1 FBUUR**	**CF 20 FBUU** **CF 20-1 FBUU**	460 385	52 47	24	20	M20×1.5	21	25.6 max	66.1 max	40.5	9	0.8	8	4	8	1	34	119	16 500	27 700	27 700

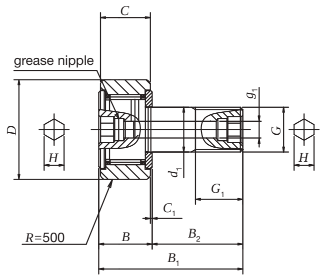
Note(1) Minimum allowable value of chamfer dimension r

Remarks1. Models with a stud diameter d_1 of 4 mm or less have no oil hole. For models with a stud dia. 5 to 10 mm, oil hole (re-greasing fitting) is provided at the head. Other models are provided with an oil hole (grease nipple) at the head and an oil hole each on the outside surface and end surface of the stud.

2. Shield type models with a stud diameter d_1 of 10 mm or less and the sealed type models are provided with prepacked grease. Other models are not provided with prepacked grease. Perform proper lubrication for use.

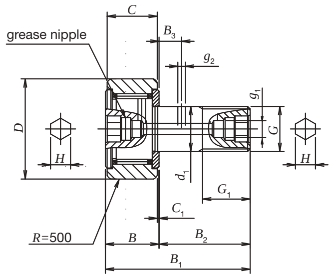
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Standard Type Cam Followers CFKR With Cage/Double Hex Hole

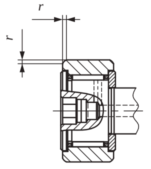


CFKR…R
Outside dia. of outer ring D 22, 26 mm

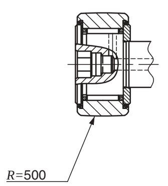
Stud dia. 10−30mm



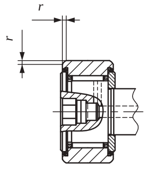
CFKR…R
Outside dia. of outer ring D 30 - 90 mm



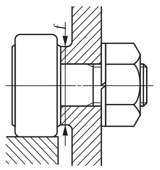
CFKR



CFKR…UUR



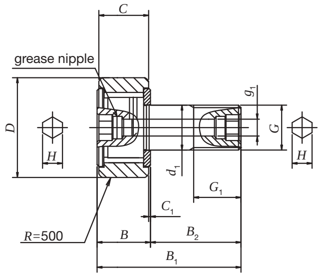
CFKR…UU



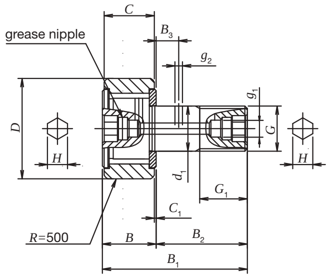
Stud diameter	Identification number(1)				Mass (Ref.)	Boundary dimensions mm														Mounting dimension	Maximum tightening torque	Basic dynamic load rating	Basic static load rating	Maximum allowable static load
	Shield type		Sealed type																					
mm	Crowned outer ring	Cylindrical outer ring	Crowned outer ring	Cylindrical outer ring	g	D	C	d_1	G	G_1	B max	B_1 max	B_2	B_3	C_1	g_1	g_2	H	$r_{s\,min}$(2)	f Min. mm	N·m	C N	C_0 N	N
10	CFKR 22 R CFKR 26 R	CFKR 22 CFKR 26	CFKR 22 UUR CFKR 26 UUR	CFKR 22 UU CFKR 26 UU	43 58	22 26	12	10	M10×1.0	12	13.2	36.2	23	—	0.6	3	—	5	0.3	16	13.0	5 430	6 890	6 890
12	CFKR 30 R CFKR 32 R	CFKR 30 CFKR 32	CFKR 30 UUR CFKR 32 UUR	CFKR 30 UU CFKR 32 UU	94 104	30 32	14	12	M12×1.5	13	15.2	40.2	25	6	0.6	4	3	6	0.6	21	21.9	7 910	9 790	9 790
16	CFKR 35 R	CFKR 35	CFKR 35 UUR	CFKR 35 UU	165	35	18	16	M16×1.5	17	19.6	52.1	32.5	8	0.8	4	3	8	0.6	26	58.5	12 000	18 300	18 300
18	CFKR 40 R	CFKR 40	CFKR 40 UUR	CFKR 40 UU	248	40	20	18	M18×1.5	19	21.6	58.1	36.5	8	0.8	6	3	8	1	29	86.2	14 800	25 200	25 200
20	CFKR 47 R CFKR 52 R	CFKR 47 CFKR 52	CFKR 47 UUR CFKR 52 UUR	CFKR 47 UU CFKR 52 UU	378 453	47 52	24	20	M20×1.5	21	25.6	66.1	40.5	9	0.8	6	4	10	1	34	119	20 700	34 600	34 600
24	CFKR 62 R CFKR 72 R	CFKR 62 CFKR 72	CFKR 62 UUR CFKR 72 UUR	CFKR 62 UU CFKR 72 UU	795 1 120	62 72	29	24	M24×1.5	25	30.6	80.1	49.5	11	0.8	6	4	14	1	40	215	30 500	52 600	52 000
30	CFKR 80 R CFKR 85 R CFKR 90 R	CFKR 80 CFKR 85 CFKR 90	CFKR 80 UUR CFKR 85 UUR CFKR 90 UUR	CFKR 80 UU CFKR 85 UU CFKR 90 UU	1 860 2 020 2 210	80 85 90	35	30	M30×1.5	32	37	100	63	15	1	6	4	14	1	49	438	45 400	85 100	85 100

Note(1) The identification number indicates the outer ring outside diameter.
(2) Minimum allowable value of chamfer dimension r.
Remark Grease is pre-packed if the stud diameter d_1 of the shield type is 10 mm or less or if the seal structure is the sealed type. Other models are not provided with pre-packed grease. Perform proper lubrication for use.

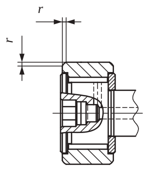
Standard Type Cam Followers CFKR Full Complement Type/Stud Head Hex Hole



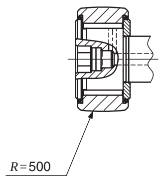
CFKR···VR
Outside dia. of outer ring D 22, 26 mm



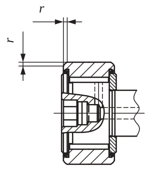
CFKR···VR
Outside dia. of outer ring D 30 - 90 mm



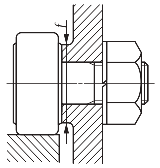
CFKR···V



CFKR···VUUR



CFKR···VUU

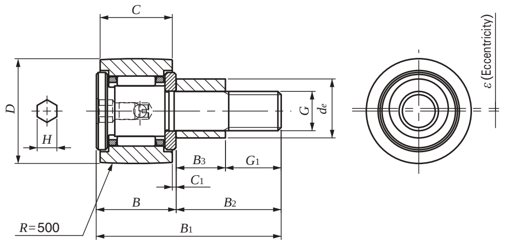


Stud dia.10 — 30mm

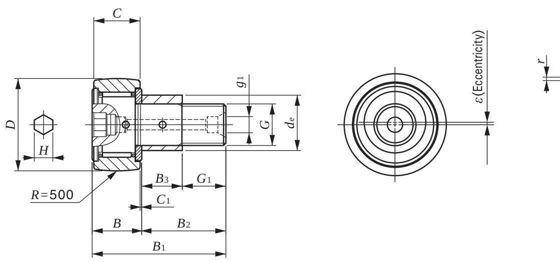
Stud diameter	Identification number(1)				Mass (Ref.)						Boundary dimensions mm									Mounting dimension	Maximum tightening torque	Basic dynamic load rating	Basic static load rating	Maximum allowable static load
	Shield type		Sealed type																					
mm	Crowned outer ring	Cylindrical outer ring	Crowned outer ring	Cylindrical outer ring	g	D	C	d_1	G	G_1	B max	B_1 max	B_2	B_3	C_1	g_1	g_2	H	$r_{s\,min}$ (2)	f Min. mm	N-m	C N	C_0 N	N
10	**CFKR 22 VR** **CFKR 26 VR**	**CFKR 22 V** **CFKR 26 V**	**CFKR 22 VUUR** **CFKR 26 VUUR**	**CFKR 22 VUU** **CFKR 26 VUU**	44 59	22 26	12	10	M10×1.0	12	13.2	36.2	23	—	0.6	3	—	5	0.3	16	13.0	9 570	14 500	7 920
12	**CFKR 30 VR** **CFKR 32 VR**	**CFKR 30 V** **CFKR 32 V**	**CFKR 30 VUUR** **CFKR 32 VUUR**	**CFKR 30 VUU** **CFKR 32 VUU**	96 106	30 32	14	12	M12×1.5	13	15.2	40.2	25	6	0.6	4	3	6	0.6	21	21.9	13 500	19 700	13 200
16	**CFKR 35 VR**	**CFKR 35 V**	**CFKR 35 VUUR**	**CFKR 35 VUU**	168	35	18	16	M16×1.5	17	19.6	52.1	32.5	8	0.8	4	3	8	0.6	26	58.5	20 700	37 600	23 200
18	**CFKR 40 VR**	**CFKR 40 V**	**CFKR 40 VUUR**	**CFKR 40 VUU**	253	40	20	18	M18×1.5	19	21.6	58.1	36.5	8	0.8	6	3	8	1	29	86.2	25 300	51 300	31 100
20	**CFKR 47 VR** **CFKR 52 VR**	**CFKR 47 V** **CFKR 52 V**	**CFKR 47 VUUR** **CFKR 52 VUUR**	**CFKR 47 VUU** **CFKR 52 VUU**	383 458	47 52	24	20	M20×1.5	21	25.6	66.1	40.5	9	0.8	6	4	10	1	34	119	33 200	64 500	37 500
24	**CFKR 62 VR** **CFKR 72 VR**	**CFKR 62 V** **CFKR 72 V**	**CFKR 62 VUUR** **CFKR 72 VUUR**	**CFKR 62 VUU** **CFKR 72 VUU**	800 1 120	62 72	29	24	M24×1.5	25	30.6	80.1	49.5	11	0.8	6	4	14	1	40	215	46 600	92 000	52 000
30	**CFKR 80 VR** **CFKR 85 VR** **CFKR 90 VR**	**CFKR 80 V** **CFKR 85 V** **CFKR 90 V**	**CFKR 80 VUUR** **CFKR 85 VUUR** **CFKR 90 VUUR**	**CFKR 80 VUU** **CFKR 85 VUU** **CFKR 90 VUU**	1 860 2 020 2 210	80 85 90	35	30	M30×1.5	32	37	100	63	15	1	6	4	14	1	49	438	67 700	144 000	85 900

Note(1) The identification number indicates the outer ring outside diameter.
(2) Minimum allowable value of chamfer dimension r.
Remark Provided with prepacked grease.

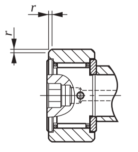
Eccentric Type Cam Followers CFE…B With Cage/Stud Head Hex Hole



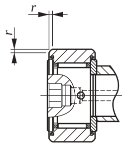
CFE…BR
Outside diameter of eccentric collar d_e 9-13mm



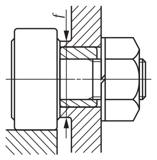
CFE…BR
Outside diameter of eccentric collar d_e 16-41mm



CFE…B



CFE…BUU



Outside diameter of eccentric collar 9−41mm

Outside diameter of eccentric collar mm	Identification number				Mass (Ref.) g	D	C	d_e	Boundary dimensions mm G	B_3	B max	B_1 max	B_2	C_1	g_1	G_1	H	$r_{s\min}$ (1)	Eccentricity ε	Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
	Shield type		Sealed type																					
	With crowned outer ring	With cylindrical outer ring	With crowned outer ring	With cylindrical outer ring																				
9	CFE 6 BR	CFE 6 B	CFE 6 BUUR	CFE 6 BUU	20.5	16	11	9	M 6×1	7.5	12.2	28.2	16	0.6	—	8.5	3	0.3	0.4	11	2.7	3 660	3 650	1 950
11	CFE 8 BR	CFE 8 B	CFE 8 BUUR	CFE 8 BUU	32	19	11	11	M 8×1.25	9.5	12.2	32.2	20	0.6	—	10.5	4	0.3	0.4	13	6.5	4 250	4 740	4 620
13	CFE 10 BR	CFE 10 B	CFE 10 BUUR	CFE 10 BUU	49.5	22	12	13	M10×1.25	10.5	13.2	36.2	23	0.6	—	12.5	4	0.3	0.4	16	13.8	5 430	6 890	6 890
	CFE 10-1 BR	CFE 10-1 B	CFE 10-1 BUUR	CFE 10-1 BUU	65	26	12	13	M10×1.25	10.5	13.2	36.2	23	0.6	—	12.5	4	0.3	0.4	16	13.8	5 430	6 890	6 890
16	CFE 12 BR	CFE 12 B	CFE 12 BUUR	CFE 12 BUU	105	30	14	16	M12×1.5	11.5	15.2	40.2	25	0.6	4	13.5	6	0.6	0.8	21	21.9	7 910	9 790	9 790
	CFE 12-1 BR	CFE 12-1 B	CFE 12-1 BUUR	CFE 12-1 BUU	115	32	14	16	M12×1.5	11.5	15.2	40.2	25	0.6	4	13.5	6	0.6	0.8	21	21.9	7 910	9 790	9 790
22	CFE 16 BR	CFE 16 B	CFE 16 BUUR	CFE 16 BUU	190	35	18	22	M16×1.5	15.5	19.6	52.1	32.5	0.8	4	17	6	0.6	0.8	26	58.5	12 000	18 300	18 300
24	CFE 18 BR	CFE 18 B	CFE 18 BUUR	CFE 18 BUU	280	40	20	24	M18×1.5	17.5	21.6	58.1	36.5	0.8	6	19	8	1	0.8	29	86.2	14 800	25 200	25 200
27	CFE 20 BR	CFE 20 B	CFE 20 BUUR	CFE 20 BUU	500	52	24	27	M20×1.5	19.5	25.6	66.1	40.5	0.8	6	21	8	1	0.8	34	119	20 700	34 600	34 600
	CFE 20-1 BR	CFE 20-1 B	CFE 20-1 BUUR	CFE 20-1 BUU	425	47	24	27	M20×1.5	19.5	25.6	66.1	40.5	0.8	6	21	8	1	0.8	34	119	20 700	34 600	34 600
33	CFE 24 BR	CFE 24 B	CFE 24 BUUR	CFE 24 BUU	895	62	29	33	M24×1.5	25.5	30.6	80.1	49.5	0.8	6	24	12	1	0.8	40	215	30 500	52 600	52 000
	CFE 24-1 BR	CFE 24-1 B	CFE 24-1 BUUR	CFE 24-1 BUU	1 220	72	29	33	M24×1.5	25.5	30.6	80.1	49.5	0.8	6	24	12	1	0.8	40	215	30 500	52 600	52 000
41	CFE 30 BR	CFE 30 B	CFE 30 BUUR	CFE 30 BUU	2 030	80	35	41	M30×1.5	32.5	37	100	63	1	6	30.5	17	1	1.5	49	438	45 400	85 100	85 100
	CFE 30-1 BR	CFE 30-1 B	CFE 30-1 BUUR	CFE 30-1 BUU	2 190	85	35	41	M30×1.5	32.5	37	100	63	1	6	30.5	17	1	1.5	49	438	45 400	85 100	85 100
	CFE 30-2 BR	CFE 30-2 B	CFE 30-2 BUUR	CFE 30-2 BUU	2 380	90	35	41	M30×1.5	32.5	37	100	63	1	6	30.5	17	1	1.5	49	438	45 400	85 100	85 100

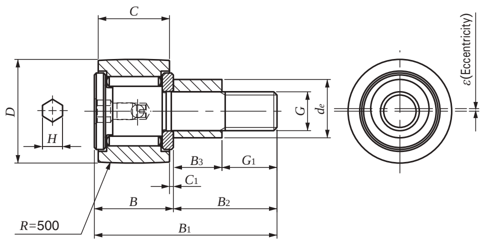
Note(1) Minimum allowable value of chamfer dimension r

Remarks1. Models with a thread diameter G of 10 mm or less have an oil hole (re-greasing fitting) at the head. Other models are provided with an oil hole (grease nipple) at the head and an oil hole on the end surface of the stud.

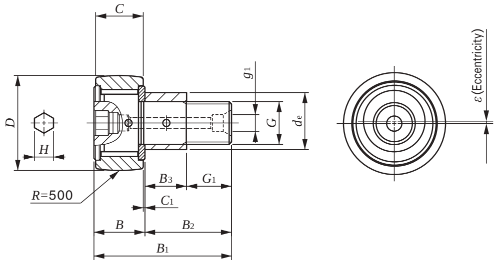
2. Shield type models with a stud thread diameter G of 10 mm or less and the sealed type models are provided with prepacked grease. Other models are not provided with prepacked grease. Perform proper lubrication for use.

CAM FOLLOWERS

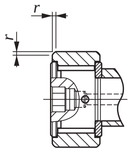
Eccentric Type Cam Followers CFE…B Full Complement Type/Stud Head Hex Hole



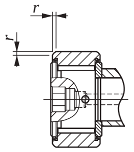
CFE…VBR
Outside diameter of eccentric collar d_e 9-13mm



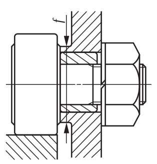
CFE…VBR
Outside diameter of eccentric collar d_e 16-41mm



CFE…VB



CFE…VBUU



Outside diameter of eccentric collar 9－41mm

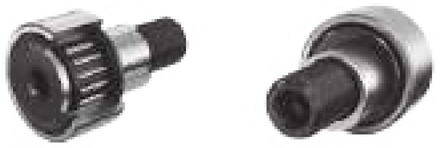
Outside diameter of eccentric collar mm	Identification number: Shield type		Sealed type		Mass (Ref.) g	D	C	d_e	Boundary dimensions mm: G	B_3	B max	B_1 max	B_2	C_1	g_1	G_1	H	$r_{s\,min}$ (1)	Eccentricity ε	Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
	With crowned outer ring	With cylindrical outer ring	With crowned outer ring	With cylindrical outer ring																				
9	**CFE 6 VBR**	**CFE 6 VB**	**CFE 6 VBUUR**	**CFE 6 VBUU**	21	16	11	9	M 6×1	7.5	12.2	28.2	16	0.6	—	8.5	3	0.3	0.4	11	2.7	6 980	8 500	1 950
11	**CFE 8 VBR**	**CFE 8 VB**	**CFE 8 VBUUR**	**CFE 8 VBUU**	32.5	19	11	11	M 8×1.25	9.5	12.2	32.2	20	0.6	—	10.5	4	0.3	0.4	13	6.5	8 170	11 200	4 620
13	**CFE 10 VBR**	**CFE 10 VB**	**CFE 10 VBUUR**	**CFE 10 VBUU**	50.5	22	12	13	M10×1.25	10.5	13.2	36.2	23	0.6	—	12.5	4	0.3	0.4	16	13.8	9 570	14 500	8 650
	CFE 10-1 VBR	**CFE 10-1 VB**	**CFE 10-1 VBUUR**	**CFE 10-1 VBUU**	66	26	12	13	M10×1.25	10.5	13.2	36.2	23	0.6	—	12.5	4	0.3	0.4	16	13.8	9 570	14 500	8 650
16	**CFE 12 VBR**	**CFE 12 VB**	**CFE 12 VBUUR**	**CFE 12 VBUU**	107	30	14	16	M12×1.5	11.5	15.2	40.2	25	0.6	4	13.5	6	0.6	0.8	21	21.9	13 500	19 700	13 200
	CFE 12-1 VBR	**CFE 12-1 VB**	**CFE 12-1 VBUUR**	**CFE 12-1 VBUU**	117	32	14	16	M12×1.5	11.5	15.2	40.2	25	0.6	4	13.5	6	0.6	0.8	21	21.9	13 500	19 700	13 200
22	**CFE 16 VBR**	**CFE 16 VB**	**CFE 16 VBUUR**	**CFE 16 VBUU**	193	35	18	22	M16×1.5	15.5	19.6	52.1	32.5	0.8	4	17	6	0.6	0.8	26	58.5	20 700	37 600	23 200
24	**CFE 18 VBR**	**CFE 18 VB**	**CFE 18 VBUUR**	**CFE 18 VBUU**	285	40	20	24	M18×1.5	17.5	21.6	58.1	36.5	0.8	6	19	8	1	0.8	29	86.2	25 300	51 300	31 100
27	**CFE 20 VBR**	**CFE 20 VB**	**CFE 20 VBUUR**	**CFE 20 VBUU**	505	52	24	27	M20×1.5	19.5	25.6	66.1	40.5	0.8	6	21	8	1	0.8	34	119	33 200	64 500	37 500
	CFE 20-1 VBR	**CFE 20-1 VB**	**CFE 20-1 VBUUR**	**CFE 20-1 VBUU**	430	47	24	27	M20×1.5	19.5	25.6	66.1	40.5	0.8	6	21	8	1	0.8	34	119	33 200	64 500	37 500
33	**CFE 24 VBR**	**CFE 24 VB**	**CFE 24 VBUUR**	**CFE 24 VBUU**	900	62	29	33	M24×1.5	25.5	30.6	80.1	49.5	0.8	6	24	12	1	0.8	40	215	46 600	92 000	52 000
	CFE 24-1 VBR	**CFE 24-1 VB**	**CFE 24-1 VBUUR**	**CFE 24-1 VBUU**	1 220	72	29	33	M24×1.5	25.5	30.6	80.1	49.5	0.8	6	24	12	1	0.8	40	215	46 600	92 000	52 000
41	**CFE 30 VBR**	**CFE 30 VB**	**CFE 30 VBUUR**	**CFE 30 VBUU**	2 030	80	35	41	M30×1.5	32.5	37	100	63	1	6	30.5	17	1	1.5	49	438	67 700	144 000	85 900
	CFE 30-1 VBR	**CFE 30-1 VB**	**CFE 30-1 VBUUR**	**CFE 30-1 VBUU**	2 190	85	35	41	M30×1.5	32.5	37	100	63	1	6	30.5	17	1	1.5	49	438	67 700	144 000	85 900
	CFE 30-2 VBR	**CFE 30-2 VB**	**CFE 30-2 VBUUR**	**CFE 30-2 VBUU**	2 380	90	35	41	M30×1.5	32.5	37	100	63	1	6	30.5	17	1	1.5	49	438	67 700	144 000	85 900

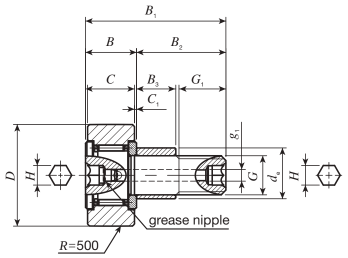
Note(1) Minimum allowable value of chamfer dimension *r*

Remarks1. Models with a thread diameter G of 10 mm or less have an oil hole (re-greasing fitting) at the head. Other models are provided with an oil hole (grease nipple) at the head and an oil hole on the end surface of the stud.

2. Provided with prepacked grease.

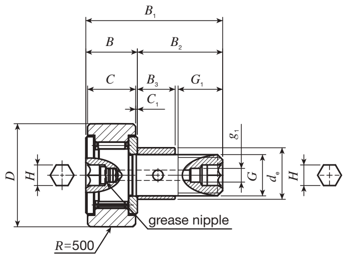
Eccentric Type Cam Followers CFKRE With Cage/Double Hex Hole



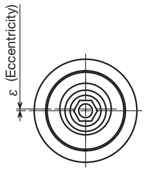


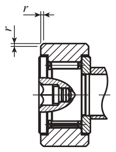
Outside diameter of eccentric collar 13−35mm

CFKRE⋯R
Outside diameter of eccentric collar d_e 13mm

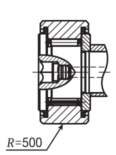


CFKRE⋯R
Outside diameter of eccentric collar d_e 15～35mm

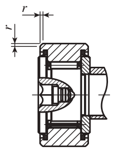




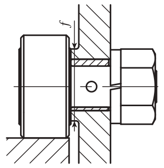
CFKRE



CFKRE⋯UUR



CFKRE⋯UU



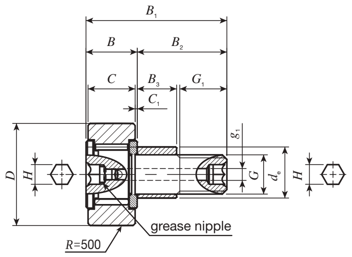
Outside diameter of eccentric collar mm	Identification number(1)				Mass (Ref.)				Boundary dimensions mm										Eccentricity	Mounting dimension	Maximum tightening torque	Basic dynamic load rating	Basic static load rating	Maximum allowable static load
	Shield type		Sealed type																					
	Crowned outer ring	Cylindrical outer ring	Crowned outer ring	Cylindrical outer ring	g	D	C	d_e	G	G_1	B max	B_1 max	B_2	B_3	C_1	g_1	H	(1) $r_{s\,min}$	ε	f Min. mm	N-m	C N	C_0 N	N
13	**CFKRE 22 R** **CFKRE 26 R**	**CFKRE 22** **CFKRE 26**	**CFKRE 22 UUR** **CFKRE 26 UUR**	**CFKRE 22 UU** **CFKRE 26 UU**	47 62	22 26	12	13	M10×1.0	12	13.2	36.2	23	10	0.6	3	5	0.3	0.5	16	13.0	5 430	6 890	6 890
15	**CFKRE 30 R** **CFKRE 32 R**	**CFKRE 30** **CFKRE 32**	**CFKRE 30 UUR** **CFKRE 32 UUR**	**CFKRE 30 UU** **CFKRE 32 UU**	100 110	30 32	14	15	M12×1.5	13	15.2	40.2	25	11	0.6	4	6	0.6	0.5	21	21.9	7 910	9 790	9 790
20	**CFKRE 35 R**	**CFKRE 35**	**CFKRE 35 UUR**	**CFKRE 35 UU**	177	35	18	20	M16×1.5	17	19.6	52.1	32.5	14	0.8	4	8	0.6	1	26	58.5	12 000	18 300	18 300
22	**CFKRE 40 R**	**CFKRE 40**	**CFKRE 40 UUR**	**CFKRE 40 UU**	264	40	20	22	M18×1.5	19	21.6	58.1	36.5	16	0.8	6	8	1	1	29	86.2	14 800	25 200	25 200
24	**CFKRE 47 R** **CFKRE 52 R**	**CFKRE 47** **CFKRE 52**	**CFKRE 47 UUR** **CFKRE 52 UUR**	**CFKRE 47 UU** **CFKRE 52 UU**	397 472	47 52	24	24	M20×1.5	21	25.6	66.1	40.5	18	0.8	6	10	1	1	34	119	20 700	34 600	34 600
28	**CFKRE 62 R** **CFKRE 72 R**	**CFKRE 62** **CFKRE 72**	**CFKRE 62 UUR** **CFKRE 72 UUR**	**CFKRE 62 UU** **CFKRE 72 UU**	823 1 150	62 72	29	28	M24×1.5	25	30.6	80.1	49.5	22	0.8	6	14	1	1	40	215	30 500	52 600	52 000
35	**CFKRE 80 R** **CFKRE 85 R** **CFKRE 90 R**	**CFKRE 80** **CFKRE 85** **CFKRE 90**	**CFKRE 80 UUR** **CFKRE 85 UUR** **CFKRE 90 UUR**	**CFKRE 80 UU** **CFKRE 85 UU** **CFKRE 90 UU**	1 920 2 080 2 270	80 85 90	35	35	M30×1.5	32	37	100	63	29	1	6	14	1	1.5	49	438	45 400	85 100	85 100

Note(1) The identification number indicates the outer ring outside diameter.
(2) Minimum allowable value of chamfer dimension r.

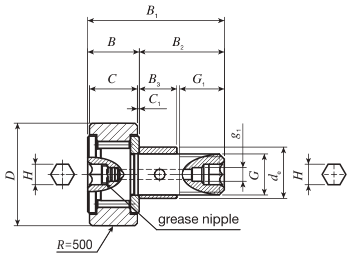
Remark Grease is pre-packed if the eccentric collar outer diameter de of the shield type is 13 mm or less or if the seal structure is the sealed type. Other models are not provided with pre-packed grease. Perform proper lubrication for use.

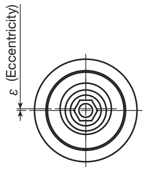
CAM FOLLOWERS

Eccentric Type Cam Followers CFKRE Full complement/Double Hex Hole

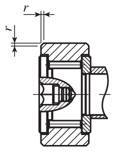


CFKRE…VR
Outside diameter of eccentric collar d_e 13mm

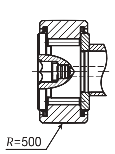




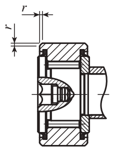
CFKRE…VR
Outside diameter of eccentric collar d_e 15～35mm



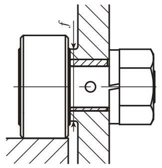
CFKRE…V



CFKRE…VUU



CFKRE…VUUR



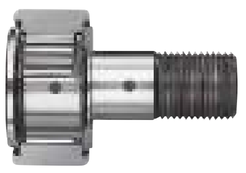
Outside diameter of eccentric collar 13－35mm

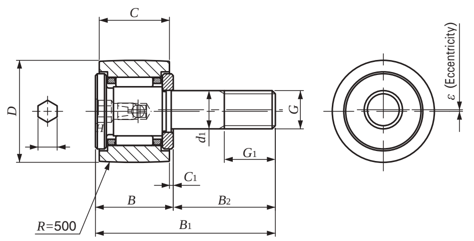
Outside diameter of eccentric collar mm	Identification number(1)				Mass (Ref.)					Boundary dimensions mm									Eccentricity	Mounting dimension	Maximum tightening torque	Basic dynamic load rating	Basic static load rating	Maximum allowable static load
	Shield type		Sealed type																					
	Crowned outer ring	Cylindrical outer ring	Crowned outer ring	Cylindrical outer ring	g	D	C	d_e	G	G_1	B max	B_1 max	B_2	B_3	C_1	g_1	H	(2) $r_{s\,min}$	ε	f Min. mm	N-m	C N	C_0 N	N
13	CFKRE 22 VR CFKRE 26 VR	CFKRE 22 V CFKRE 26 V	CFKRE 22 VUUR CFKRE 26 VUUR	CFKRE 22 VUU CFKRE 26 VUU	48 63	22 26	12	13	M10×1.0	12	13.2	36.2	23	10	0.6	3	5	0.3	0.5	16	13.0	9 570	14 500	7 920
15	CFKRE 30 VR CFKRE 32 VR	CFKRE 30 V CFKRE 32 V	CFKRE 30 VUUR CFKRE 32 VUUR	CFKRE 30 VUU CFKRE 32 VUU	101 111	30 32	14	15	M12×1.5	13	15.2	40.2	25	11	0.6	4	6	0.6	0.5	21	21.9	13 500	19 700	13 200
20	CFKRE 35 VR	CFKRE 35 V	CFKRE 35 VUUR	CFKRE 35 VUU	180	35	18	20	M16×1.5	17	19.6	52.1	32.5	14	0.8	4	8	0.6	1	26	58.5	20 700	37 600	23 200
22	CFKRE 40 VR	CFKRE 40 V	CFKRE 40 VUUR	CFKRE 40 VUU	269	40	20	22	M18×1.5	19	21.6	58.1	36.5	16	0.8	6	8	1	1	29	86.2	25 300	51 300	31 100
24	CFKRE 47 VR CFKRE 52 VR	CFKRE 47 V CFKRE 52 V	CFKRE 47 VUUR CFKRE 52 VUUR	CFKRE 47 VUU CFKRE 52 VUU	402 477	47 52	24	24	M20×1.5	21	25.6	66.1	40.5	18	0.8	6	10	1	1	34	119	33 200	64 500	37 500
28	CFKRE 62 VR CFKRE 72 VR	CFKRE 62 V CFKRE 72 V	CFKRE 62 VUUR CFKRE 72 VUUR	CFKRE 62 VUU CFKRE 72 VUU	828 1 150	62 72	29	28	M24×1.5	25	30.6	80.1	49.5	22	0.8	6	14	1	1	40	215	46 600	92 000	52 000
35	CFKRE 80 VR CFKRE 85 VR CFKRE 90 VR	CFKRE 80 V CFKRE 85 V CFKRE 90 V	CFKRE 80 VUUR CFKRE 85 VUUR CFKRE 90 VUUR	CFKRE 80 VUU CFKRE 85 VUU CFKRE 90 VUU	1 920 2 080 2 270	80 85 90	35	35	M30×1.5	32	37	100	63	29	1	6	14	1	1.5	49	438	67 700	144 000	85 900

Note(1) The identification number indicates the outer ring outside diameter.
(2) Minimum allowable value of chamfer dimension r.
Remark Grease is prepacked.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

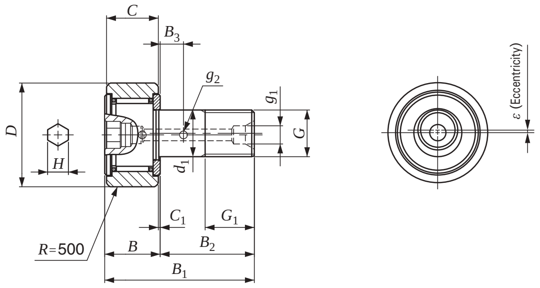
Solid Eccentric Stud Type Cam Followers With Cage/Stud Head Hex Hole



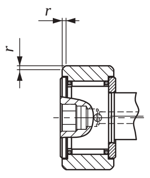


CFES···BR
Stud dia. d_1 6-10mm

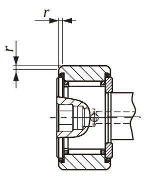
Stud dia. 6−18mm



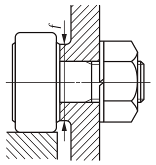
CFES···BR
Stud dia. d_1 12-18mm



CFES···B



CFES···BUU



Stud dia. mm	Identification number				Mass (Ref.) g	D	C	d_1
	Shield type		Sealed type					
	With crowned outer ring	With cylindrical outer ring	With crowned outer ring	With cylindrical outer ring				
6	**CFES 6 BR**	**CFES 6 B**	**CFES 6 BUUR**	**CFES 6 BUU**	18.5	16	11	6
8	**CFES 8 BR**	**CFES 8 B**	**CFES 8 BUUR**	**CFES 8 BUU**	28.5	19	11	8
10	**CFES 10 BR**	**CFES 10 B**	**CFES 10 BUUR**	**CFES 10 BUU**	45	22	12	10
	CFES 10-1 BR	**CFES 10-1 B**	**CFES 10-1 BUUR**	**CFES 10-1 BUU**	60	26	12	10
12	**CFES 12 BR**	**CFES 12 B**	**CFES 12 BUUR**	**CFES 12 BUU**	95	30	14	12
	CFES 12-1 BR	**CFES 12-1 B**	**CFES 12-1 BUUR**	**CFES 12-1 BUU**	105	32	14	12
16	**CFES 16 BR**	**CFES 16 B**	**CFES 16 BUUR**	**CFES 16 BUU**	170	35	18	16
18	**CFES 18 BR**	**CFES 18 B**	**CFES 18 BUUR**	**CFES 18 BUU**	250	40	20	18

Stud dia. mm	Boundary dimensions mm											Eccentricity ε	Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
	G	G_1	B max	B_1 max	B_2	B_3	C_1	g_1	g_2	H	$r_{s\,min}$ (1)						
6	M 6×1	8	12.2	28.2	16	—	0.6	—	—	3	0.3	0.25	11	2.7	3 660	3 650	1 980
8	M 8×1.25	10	12.2	32.2	20	—	0.6	—	—	4	0.3	0.25	13	6.5	4 250	4 740	4 670
10	M10×1.25	12	13.2	36.2	23	—	0.6	—	—	4	0.3	0.3	16	13.8	5 430	6 890	6 890
	M10×1.25	12	13.2	36.2	23	—	0.6	—	—	4	0.3	0.3	16	13.8	5 430	6 890	6 890
12	M12×1.5	13	15.2	40.2	25	6	0.6	4	3	6	0.6	0.4	21	21.9	7 910	9 790	9 790
	M12×1.5	13	15.2	40.2	25	6	0.6	4	3	6	0.6	0.4	21	21.9	7 910	9 790	9 790
16	M16×1.5	17	19.6	52.1	32.5	8	0.8	4	3	6	0.6	0.5	26	58.5	12 000	18 300	18 300
18	M18×1.5	19	21.6	58.1	36.5	8	0.8	6	3	8	1	0.6	29	86.2	14 800	25 200	25 200

Note(1) Minimum allowable value of chamfer dimension r

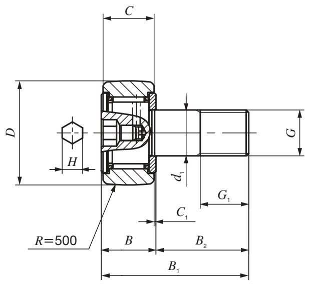
Remarks1. Models with a stud diameter d_1 of 10 mm or less have an oil hole (re-greasing fitting) at the head. Other models are provided with an oil hole (grease nipple) at the head and an oil hole each on the outside surface and end surface of the stud.

2. Shield type models with a stud diameter d_1 of 10 mm or less and the sealed type models are provided with prepacked grease. Other models are not provided with prepacked grease. Perform proper lubrication for use.

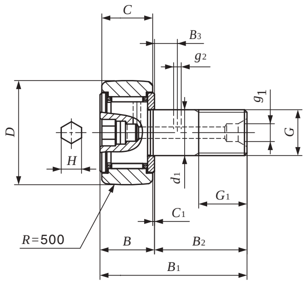
CAM FOLLOWERS

Thrust Disk Type Cam Followers With Cage/Stud Head Hex Hole

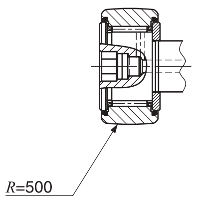
Stud dia. 3 — 20mm

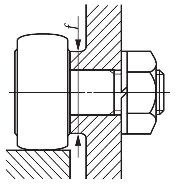


CF ⋯ WBR
Stud dia. d_1 3-10mm



CF ⋯ WBR
Stud dia. d_1 12-20mm





CF ⋯ WBUUR

Stud dia. mm	Identification number Shield type	Identification number Sealed type	Mass (Ref.) g	Boundary dimensions mm D	C	d_1	G	G_1	B	B_1	B_2	B_3	C_1	g_1	g_2	H	Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
3	**CF 3 WBR**	**CF 3 WBUUR**	4.3	10	7	3	M 3×0.5	5	8	17	9	—	0.5	—	—	2	6.8	0.34	1 500	1 020	384
4	**CF 4 WBR**	**CF 4 WBUUR**	7.4	12	8	4	M 4×0.7	6	9	20	11	—	0.5	—	—	2.5	8.3	0.78	2 070	1 590	834
5	**CF 5 WBR**	**CF 5 WBUUR**	10.3	13	9	5	M 5×0.8	7.5	10	23	13	—	0.5	—	—	3	9.3	1.6	2 520	2 140	1 260
6	**CF 6 WBR**	**CF 6 WBUUR**	18.5	16	11	6	M 6×1	8	12.2 max	28.2 max	16	—	0.6	—	—	3	11	2.7	3 660	3 650	1 950
8	**CF 8 WBR**	**CF 8 WBUUR**	28.5	19	11	8	M 8×1.25	10	12.2 max	32.2 max	20	—	0.6	—	—	4	13	6.5	4 250	4 740	4 620
10	**CF 10 WBR**	**CF 10 WBUUR**	45	22	12	10	M10×1.25	12	13.2 max	36.2 max	23	—	0.6	—	—	4	16	13.8	5 430	6 890	6 890
	CF 10-1 WBR	**CF 10-1 WBUUR**	60	26	12	10	M10×1.25	12	13.2 max	36.2 max	23	—	0.6	—	—	4	16	13.8	5 430	6 890	6 890
12	**CF 12 WBR**	**CF 12 WBUUR**	95	30	14	12	M12×1.5	13	15.2 max	40.2 max	25	6	0.6	4	3	6	21	21.9	7 910	9 790	9 790
	CF 12-1 WBR	**CF 12-1 WBUUR**	105	32	14	12	M12×1.5	13	15.2 max	40.2 max	25	6	0.6	4	3	6	21	21.9	7 910	9 790	9 790
16	**CF 16 WBR**	**CF 16 WBUUR**	170	35	18	16	M16×1.5	17	19.6 max	52.1 max	32.5	8	0.8	4	3	6	26	58.5	12 000	18 300	18 300
18	**CF 18 WBR**	**CF 18 WBUUR**	250	40	20	18	M18×1.5	19	21.6 max	58.1 max	36.5	8	0.8	6	3	8	29	86.2	14 800	25 200	25 200
20	**CF 20 WBR**	**CF 20 WBUUR**	460	52	24	20	M20×1.5	21	25.6 max	66.1 max	40.5	9	0.8	6	4	8	34	119	20 700	34 600	34 600
	CF 20-1 WBR	**CF 20-1 WBUUR**	385	47	24	20	M20×1.5	21	25.6 max	66.1 max	40.5	9	0.8	6	4	8	34	119	20 700	34 600	34 600

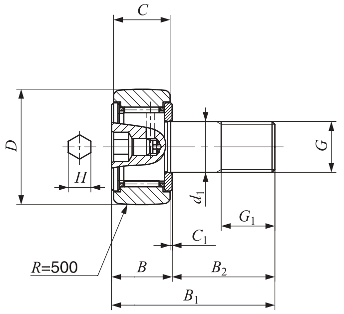
Remarks1. Models with a stud diameter d_1 of 4 mm or less have no oil hole. For Models with a stud dia. 5 to 10 mm, oil hole (re-greasing fitting) is provided at the head. Other models are provided with an oil hole (grease nipple) at the head and an oil hole each on the outside surface and end surface of the stud.

2. Shield type models with a stud diameter d_1 of 10 mm or less and the sealed type models are provided with prepacked grease. Other models are not provided with prepacked grease. Perform proper lubrication for use.

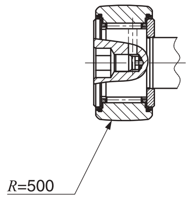
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

CAM FOLLOWERS

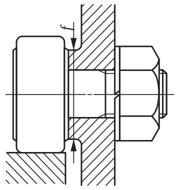
Thrust Disk Type Cam Followers / Stainless Steel Made With Cage/Stud Head Hex Hole



CF⋯FWBR



CF⋯FWBUUR



Stud dia. 3 − 5mm

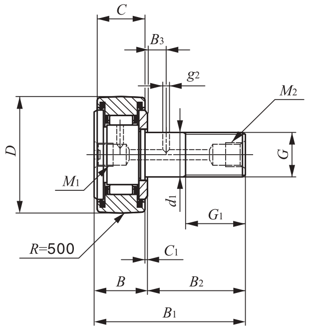
Stud dia. mm	Identification number Shield type	Identification number Sealed type	Mass (Ref.) g	Boundary dimensions mm D	C	d_1	G	G_1	B	B_1	B_2	B_3	C_1	g_1	g_2	H	Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
3	**CF 3 FWBR**	**CF 3 FWBUUR**	4.3	10	7	3	M 3×0.5	5	8	17	9	—	0.5	—	—	2	6.8	0.34	1 200	813	384
4	**CF 4 FWBR**	**CF 4 FWBUUR**	7.4	12	8	4	M 4×0.7	6	9	20	11	—	0.5	—	—	2.5	8.3	0.78	1 650	1 270	834
5	**CF 5 FWBR**	**CF 5 FWBUUR**	10.3	13	9	5	M 5×0.8	7.5	10	23	13	—	0.5	—	—	3	9.3	1.6	1 930	1 730	1 260

Remarks1. Models with a stud diameter d_1 of 4 mm or less have no oil hole. For Models with a stud dia. 5 mm, oil hole (re-greasing fitting) is provided at the head.

2. Provided with prepacked grease.

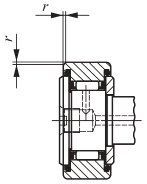
CAM FOLLOWERS

Centralized Lubrication Type Cam Followers With Cage/Stud Head Hex Hole

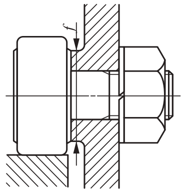


CF-RU1

Stud dia. 6－30mm



CF-FU1



Stud dia. mm	Identification number With crowned outer ring	Identification number With cylindrical outer ring	Mass (Ref.) g	Boundary dimensions mm D	C	d_1	G	G_1	B max	B_1 max	B_2	B_3	C_1	g_2	M_1	M_2	$r_{s\,min}$ (1)	Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
6	**CF-RU1- 6**	**CF-FU1- 6**	18.5	16	11	6	M 6×1	8	12.2	28.2	16	—	0.6	—	M6× 0.75	—	0.3	11	2.7	3 660	3 650	1 950
8	**CF-RU1- 8**	**CF-FU1- 8**	28.5	19	11	8	M 8×1.25	10	12.2	32.2	20	—	0.6	—			0.3	13	6.5	4 250	4 740	4 620
10	**CF-RU1-10** **CF-RU1-10-1**	**CF-FU1-10** **CF-FU1-10-1**	45 60	22 26	12 12	10 10	M10×1.25 M10×1.25	12 12	13.2 13.2	36.2 36.2	23 23	— —	0.6 0.6	— —			0.3 0.3	16 16	13.8 13.8	5 430 5 430	6 890 6 890	6 890 6 890
12	**CF-RU1-12** **CF-RU1-12-1**	**CF-FU1-12** **CF-FU1-12-1**	95 105	30 32	14 14	12 12	M12×1.5 M12×1.5	13 13	15.2 15.2	40.2 40.2	25 25	— —	0.6 0.6	— —			0.6 0.6	21 21	23.9 23.9	7 910 7 910	9 790 9 790	9 790 9 790
16	**CF-RU1-16**	**CF-FU1-16**	170	35	18	16	M16×1.5	17	19.6	52.1	32.5	8	0.8	3	PT 1/8	PT 1/8	0.6	26	58.5	12 000	18 300	18 300
18	**CF-RU1-18**	**CF-FU1-18**	250	40	20	18	M18×1.5	19	21.6	58.1	36.5	8	0.8	3			1	29	86.2	14 800	25 200	25 200
20	**CF-RU1-20** **CF-RU1-20-1**	**CF-FU1-20** **CF-FU1-20-1**	460 385	52 47	24 24	20 20	M20×1.5 M20×1.5	21 21	25.6 25.6	66.1 66.1	40.5 40.5	9 9	0.8 0.8	4 4			1 1	34 34	119 119	20 700 20 700	34 600 34 600	34 600 34 600
24	**CF-RU1-24** **CF-RU1-24-1**	**CF-FU1-24** **CF-FU1-24-1**	815 1 140	62 72	29 29	24 24	M24×1.5 M24×1.5	25 25	30.6 30.6	80.1 80.1	49.5 49.5	11 11	0.8 0.8	4 4			1 1	40 40	215 215	30 500 30 500	52 600 52 600	52 000 52 000
30	**CF-RU1-30** **CF-RU1-30-1** **CF-RU1-30-2**	**CF-FU1-30** **CF-FU1-30-1** **CF-FU1-30-2**	1 870 2 030 2 220	80 85 90	35 35 35	30 30 30	M30×1.5 M30×1.5 M30×1.5	32 32 32	37 37 37	100 100 100	63 63 63	15 15 15	1 1 1	4 4 4			1 1 1	49 49 49	438 438 438	45 400 45 400 45 400	85 100 85 100 85 100	85 100 85 100 85 100

Note(1) Minimum allowable value of chamfer dimension *r*

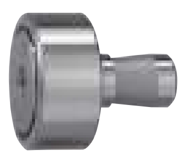
Remarks1. Models with a stud diameter d_1 of 12 mm or less are provided with a lubrication tapped hole on the stud head only. Other models are provided with one lubrication tapped hole each on the head and end surface of the stud.

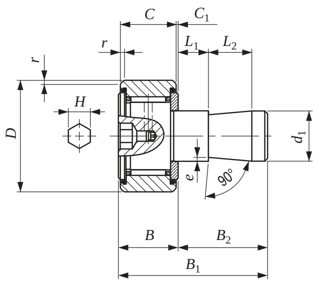
2. Provided with prepacked grease.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

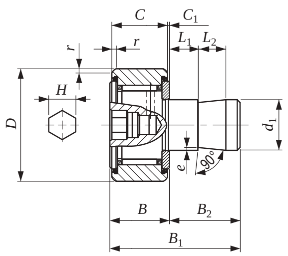
CAM FOLLOWERS

Easy Mounting Type Cam Followers **With Cage/Stud Head Hex Hole**



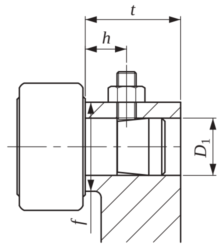


CF-SFU⋯B
Stud dia. d_1 6-10mm



CF-SFU⋯B
Stud dia. d_1 12-20mm

Stud dia. 6－20mm



Stud dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm												Mounting dimensions mm					Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
			D	C	d_1	B max	B_1 max	B_2	C_1	L_1	L_2	H	e	$r_{s\,min}$ (1)	D_1	Tolerance	t Min.	f Min.	h (Ref.)			
6	**CF-SFU- 6 B**	19.5	16	11	6	12.2	32	19.8	0.6	5	10	3	0.3	0.3	6	＋0.012 0	20	11	10	3 660	3 650	1 950
8	**CF-SFU- 8 B**	29	19	11	8	12.2	32	19.8	0.6	5	10	4	0.5	0.3	8	＋0.015 0	20	13	10	4 250	4 740	4 620
10	**CF-SFU-10 B**	44	22	12	10	13.2	33	19.8	0.6	5	10	4	0.5	0.3	10		20	16	10	5 430	6 890	6 890
	CF-SFU-10-1 B	59	26	12	10	13.2	33	19.8	0.6	5	10	4	0.5	0.3	10		20	16	10	5 430	6 890	6 890
12	**CF-SFU-12 B**	94	30	14	12	15.2	35	19.8	0.6	5	10	6	1	0.6	12	＋0.018 0	20	21	10	7 910	9 790	9 790
	CF-SFU-12-1 B	104	32	14	12	15.2	35	19.8	0.6	5	10	6	1	0.6	12		20	21	10	7 910	9 790	9 790
16	**CF-SFU-16 B**	164	35	18	16	19.6	44.5	24.9	0.8	10	10	6	1	0.6	16		25	26	15	12 000	18 300	18 300
18	**CF-SFU-18 B**	235	40	20	18	21.6	46.5	24.9	0.8	10	10	8	1	1	18		25	29	15	14 800	25 200	25 200
20	**CF-SFU-20 B**	435	52	24	20	25.6	50.5	24.9	0.8	10	10	8	1	1	20	＋0.021 0	25	34	15	20 700	34 600	34 600
	CF-SFU-20-1 B	360	47	24	20	25.6	50.5	24.9	0.8	10	10	8	1	1	20		25	34	15	20 700	34 600	34 600

Note(1) Minimum allowable value of chamfer dimension r

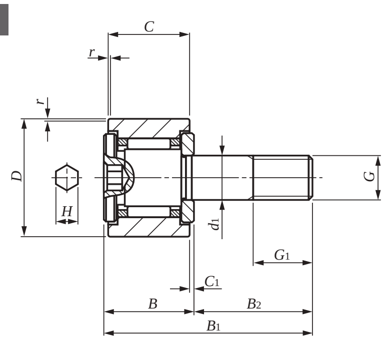
Remarks1. Models with a stud diameter d_1 of 10 mm or less have an oil hole (re-greasing fitting) at the head. Other models are provided with an oil hole (grease nipple) at the head.

2. Provided with prepacked grease.

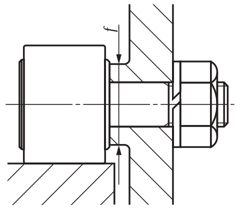
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

CAM FOLLOWERS

Cam Follower G With Cage/Stud Head Hex Hole



CF···G



Stud dia. 6 – 20mm

Stud dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm											Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
			D	C	d_1	G	G_1	B max	B_1 max	B_2	C_1	H	$r_{s\,min}$ (1)					
6	**CF 6 G**	19.5	16	11	6	M 6×1	8	12.2	28.2	16	0.6	3	0.3	11	2.7	3 660	3 650	1 950
8	**CF 8 G**	29.5	19	11	8	M 8×1.25	10	12.2	32.2	20	0.6	4	0.3	13	6.5	4 250	4 740	4 620
10	**CF 10 G**	47.5	22	12	10	M10×1.25	12	13.2	36.2	23	0.6	4	0.3	16	13.8	5 430	6 890	6 890
	CF 10-1 G	61.5	26	12	10	M10×1.25	12	13.2	36.2	23	0.6	4	0.3	16	13.8	5 430	6 890	6 890
12	**CF 12 G**	95.0	30	14	12	M12×1.5	13	15.2	40.2	25	0.6	6	0.6	21	23.9	7 910	9 790	9 790
	CF 12-1 G	105	32	14	12	M12×1.5	13	15.2	40.2	25	0.6	6	0.6	21	23.9	7 910	9 790	9 790
16	**CF 16 G**	175	35	18	16	M16×1.5	17	19.6	52.1	32.5	0.8	6	0.6	26	61.1	12 000	18 300	18 300
18	**CF 18 G**	255	40	20	18	M18×1.5	19	21.6	58.1	36.5	0.8	8	1	29	89.2	14 800	25 200	25 200
20	**CF 20 G**	470	52	24	20	M20×1.5	21	25.6	66.1	40.5	0.8	8	1	34	125	20 700	34 600	34 600
	CF 20-1 G	400	47	24	20	M20×1.5	21	25.6	66.1	40.5	0.8	8	1	34	125	20 700	34 600	34 600

Note(1) Minimum allowable value of chamfer dimension *r*.

Remarks1. This type of bearings cannot be re-lubricated due to the structure. If the environment requires re-lubrication, please use Standard Type Cam Followers.

2. Provided with prepacked grease.

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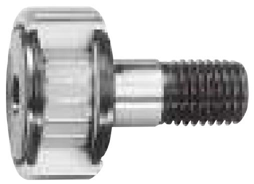
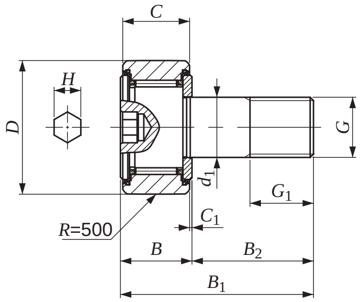
CFS
NUCF
CR

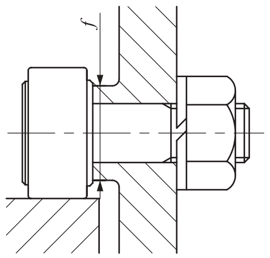
CAM FOLLOWERS

C-Lube Cam Followers **With Cage / Stud Head Hex Hole**





CF···WB···/SG



Stud dia. 5 — 20mm

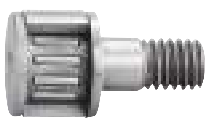
Stud dia.	Identification number	Mass (Ref.)	Boundary dimensions mm										Mounting dimension f Min.	Maximum tightening torque	Basic dynamic load rating C	Basic static load rating C_0	Maximum allowable static load
mm		g	D	C	d_1	G	G_1	B	B_1	B_2	C_1	H	mm	N-m	N	N	N
5	**CF 5 WBUUR/SG**	10.3	13	9	5	M 5×0.8	7.5	10	23	13	0.5	3	9.3	1.6	2 520	2 140	1 260
6	**CF 6 WBUUR/SG**	18.5	16	11	6	M 6×1	8	12.2 max	28.2 max	16	0.6	3	11	2.7	3 660	3 650	1 950
8	**CF 8 WBUUR/SG**	28.5	19	11	8	M 8×1.25	10	12.2 max	32.2 max	20	0.6	4	13	6.5	4 250	4 740	4 620
10	**CF 10 WBUUR/SG**	45	22	12	10	M10×1.25	12	13.2 max	36.2 max	23	0.6	4	16	13.8	5 430	6 890	6 890
	CF 10-1 WBUUR/SG	60	26	12	10	M10×1.25	12	13.2 max	36.2 max	23	0.6	4	16	13.8	5 430	6 890	6 890
12	**CF 12 WBUUR/SG**	95	30	14	12	M12×1.5	13	15.2 max	40.2 max	25	0.6	6	21	21.9	7 910	9 790	9 790
	CF 12-1 WBUUR/SG	105	32	14	12	M12×1.5	13	15.2 max	40.2 max	25	0.6	6	21	21.9	7 910	9 790	9 790
16	**CF 16 WBUUR/SG**	170	35	18	16	M16×1.5	17	19.6 max	52.1 max	32.5	0.8	6	26	58.5	12 000	18 300	18 300
18	**CF 18 WBUUR/SG**	250	40	20	18	M18×1.5	19	21.6 max	58.1 max	36.5	0.8	8	29	86.2	14 800	25 200	25 200
20	**CF 20 WBUUR/SG**	460	52	24	20	M20×1.5	21	25.6 max	66.1 max	40.5	0.8	8	34	119	20 700	34 600	34 600
	CF 20-1 WBUUR/SG	385	47	24	20	M20×1.5	21	25.6 max	66.1 max	40.5	0.8	8	34	119	20 700	34 600	34 600

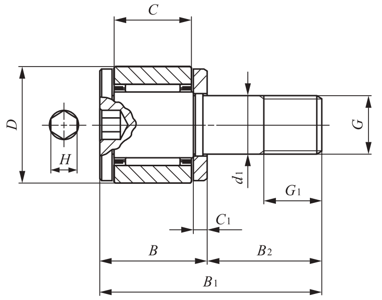
Remark This bearing cannot be re-lubricated as thermosetting solid-type lubricant C-Lube fills its inner space.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

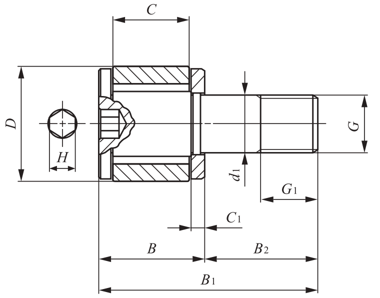
CAM FOLLOWERS

Miniature Type Cam Followers **With Cage/Stud Head Hex Hole**
Full Complement Type/Stud Head Hex Hole

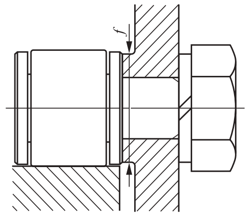




CFS



CFS…V



Stud dia. 2 – 6mm

Stud dia. mm	Identification number: With cage	Identification number: Full complement	Mass (Ref.) g	D mm	C mm	d_1 mm	G mm	G_1 mm	B mm	B_1 mm	B_2 mm	C_1 mm	H mm	Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
2	**CFS 2**	—	0.6	4.5	2.5	2	M2 ×0.4	2	4	8	4	0.7	0.9	4.3	9.1	288	202	202
	—	**CFS 2 V**	0.6	4.5	2.5	2	M2 ×0.4	2	4	8	4	0.7	0.9	4.3	9.1	768	734	229
2.5	**CFS 2.5**	—	1	5	3	2.5	M2.5 ×0.45	2.5	4.5	9.5	5	0.7	0.9	4.8	18.7	428	351	351
	—	**CFS 2.5 V**	1	5	3	2.5	M2.5 ×0.45	2.5	4.5	9.5	5	0.7	0.9	4.8	18.7	1 000	1 080	360
3	**CFS 3**	—	2	6	4	3	M3 ×0.5	3	5.5	11.5	6	0.7	1.3	5.8	33.5	629	611	484
	—	**CFS 3 V**	2	6	4	3	M3 ×0.5	3	5.5	11.5	6	0.7	1.3	5.8	33.5	1 420	1 790	484
4	**CFS 4**	—	4	8	5	4	M4 ×0.7	4	7	15	8	1.0	1.5	7.7	77.7	1 120	1 120	919
	—	**CFS 4 V**	4	8	5	4	M4 ×0.7	4	7	15	8	1.0	1.5	7.7	77.7	2 370	3 000	919
5	**CFS 5**	—	7	10	6	5	M5 ×0.8	5	8	18	10	1.0	2	9.6	158	1 570	1 850	1 570
	—	**CFS 5 V**	7	10	6	5	M5 ×0.8	5	8	18	10	1.0	2	9.6	158	3 180	4 700	1 570
6	**CFS 6**	—	13	12	7	6	M6 ×1	6	9.5	21.5	12	1.2	2.5	11.6	268	2 090	2 200	2 150
	—	**CFS 6 V**	13	12	7	6	M6 ×1	6	9.5	21.5	12	1.2	2.5	11.6	268	4 610	6 250	2 150

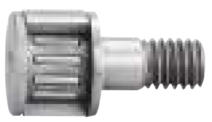
Remarks1. No oil hole is provided.
2. Provided with prepacked grease.

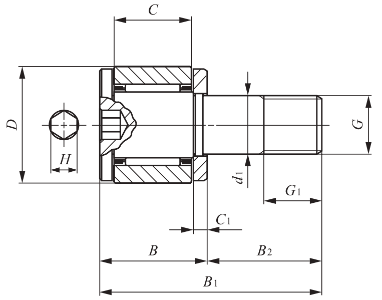
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

CAM FOLLOWERS

Miniature Type Cam Followers / Stainless Steel Made **With Cage/Stud Head Hex Hole**

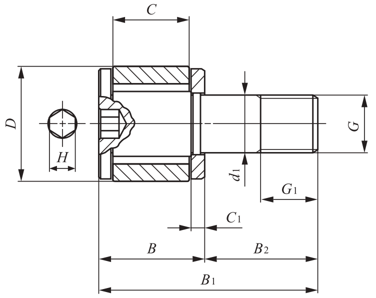
Full Complement Type/Stud Head Hex Hole



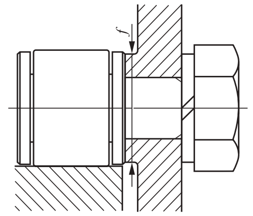


Stud dia. 2－6mm

CFS···F



CFS···FV



Stud dia. mm	Identification number With cage	Identification number Full complement	Mass (Ref.) g	Boundary dimensions mm D	C	d_1	G	G_1	B	B_1	B_2	C_1	H	Mounting dimension f Min. mm	Maximum tightening torque N-cm	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
2	CFS 2 F	—	0.6	4.5	2.5	2	M2 ×0.4	2	4	8	4	0.7	0.9	4.3	9.1	230	161	161
	—	CFS 2 FV	0.6	4.5	2.5	2	M2 ×0.4	2	4	8	4	0.7	0.9	4.3	9.1	614	587	229
2.5	CFS 2.5 F	—	1	5	3	2.5	M2.5 ×0.45	2.5	4.5	9.5	5	0.7	0.9	4.8	18.7	342	281	281
	—	CFS 2.5 FV	1	5	3	2.5	M2.5 ×0.45	2.5	4.5	9.5	5	0.7	0.9	4.8	18.7	800	862	360
3	CFS 3 F	—	2	6	4	3	M3 ×0.5	3	5.5	11.5	6	0.7	1.3	5.8	33.5	504	488	484
	—	CFS 3 FV	2	6	4	3	M3 ×0.5	3	5.5	11.5	6	0.7	1.3	5.8	33.5	1 140	1 430	484
4	CFS 4 F	—	4	8	5	4	M4 ×0.7	4	7	15	8	1.0	1.5	7.7	77.7	897	894	894
	—	CFS 4 FV	4	8	5	4	M4 ×0.7	4	7	15	8	1.0	1.5	7.7	77.7	1 900	2 400	919
5	CFS 5 F	—	7	10	6	5	M5 ×0.8	5	8	18	10	1.0	2	9.6	158	1 250	1 480	1 480
	—	CFS 5 FV	7	10	6	5	M5 ×0.8	5	8	18	10	1.0	2	9.6	158	2 540	3 760	1 570
6	CFS 6 F	—	13	12	7	6	M6 ×1	6	9.5	21.5	12	1.2	2.5	11.6	268	1 670	1 760	1 760
	—	CFS 6 FV	13	12	7	6	M6 ×1	6	9.5	21.5	12	1.2	2.5	11.6	268	3 690	5 000	2 150

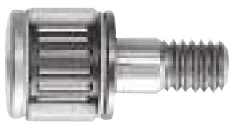
Remarks1. No oil hole is provided.
2. Provided with prepacked grease.

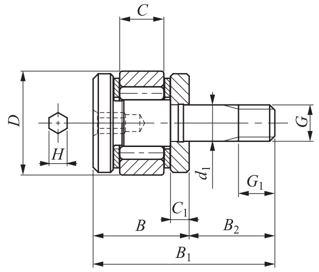
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Thrust Disk Type Miniature Cam Followers

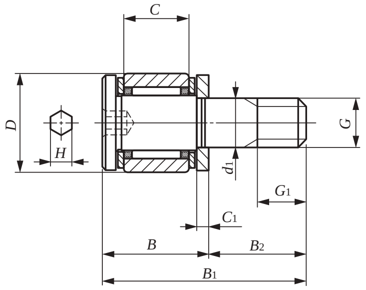
With Cage/Stud Head Hex Hole

Full Complement Type/Stud Head Hex Hole

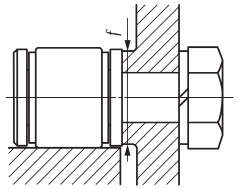




CFS1.4 WV



CFS… W



Stud dia. 1.4 – 6mm

Stud dia. mm	Identification number With cage	Identification number Full complement	Mass (Ref.) g	Boundary dimensions mm D	C	d_1	G	G_1	B	B_1	B_2	C_1	H	Mounting dimension f Min. mm	Maximum tightening torque N-cm	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
1.4	—	**CFS 1.4 WV**	0.35	4	1.7	1.4	M1.4 ×0.3	1.4	3.7	7	3.3	0.7	0.9	3.8	3.0	481	385	105
2	**CFS 2 W**	—	0.6	4.5	2.5	2	M2 ×0.4	2	4.5	8.5	4	0.7	0.9	4.3	9.1	288	202	194
2.5	**CFS 2.5 W**	—	1	5	3	2.5	M2.5 ×0.45	2.5	5	10	5	0.7	0.9	4.8	18.7	428	351	313
3	**CFS 3 W**	—	2	6	4	3	M3 ×0.5	3	6.5	12.5	6	0.7	1.3	5.8	33.5	629	611	399
4	**CFS 4 W**	—	4	8	5	4	M4 ×0.7	4	8	16	8	1	1.5	7.7	77.7	1120	1120	785
5	**CFS 5 W**	—	7	10	6	5	M5 ×0.8	5	9	19	10	1	2	9.6	158	1570	1850	1370
6	**CFS 6 W**	—	13	12	7	6	M6 ×1	6	10.5	22.5	12	1.2	2.5	11.6	268	2090	2200	1920

Remarks1. No oil hole is provided.
2. Provided with prepacked grease.

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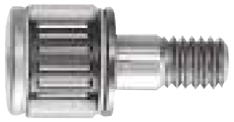
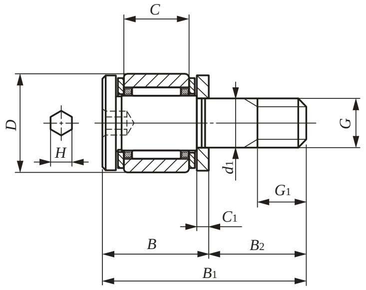
CF
CFKR
CFS
NUCF
CR

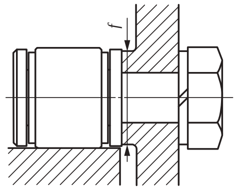
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Thrust Disk Type Miniature Cam Followers·Stainless Steel Made With Cage/Stud Head Hex Hole





CFS…FW



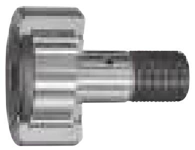
Stud dia. 2－6mm

Stud dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm										Mounting dimension f Min. mm	Maximum tightening torque N-cm	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
			D	C	d_1	G	G_1	B	B_1	B_2	C_1	H					
2	**CFS 2 FW**	0.6	4.5	2.5	2	M2 ×0.4	2	4.5	8.5	4	0.7	0.9	4.3	9.1	230	161	161
2.5	**CFS 2.5 FW**	1	5	3	2.5	M2.5 ×0.45	2.5	5	10	5	0.7	0.9	4.8	18.7	342	281	281
3	**CFS 3 FW**	2	6	4	3	M3 ×0.5	3	6.5	12.5	6	0.7	1.3	5.8	33.5	504	488	399
4	**CFS 4 FW**	4	8	5	4	M4 ×0.7	4	8	16	8	1.0	1.5	7.7	77.7	897	894	785
5	**CFS 5 FW**	7	10	6	5	M5 ×0.8	5	9	19	10	1.0	2	9.6	158	1 250	1 480	1 370
6	**CFS 6 FW**	13	12	7	6	M6 ×1	6	10.5	22.5	12	1.2	2.5	11.6	268	1 670	1 760	1 760

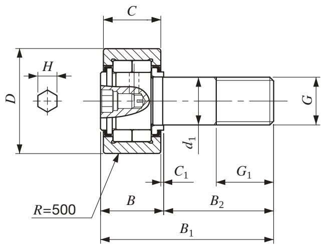
Remarks1. No oil hole is provided.
2. Provided with prepacked grease.

CAM FOLLOWERS

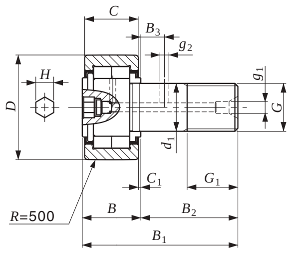
Cylindrical Roller Cam Followers Full Complement Type/Stud Head Hex Hole



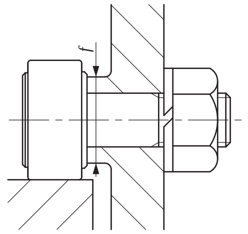
Stud dia. 10－30mm



NUCF⋯BR
Stud dia. d_1 10mm



NUCF⋯BR
Stud dia. d_1 12-30mm



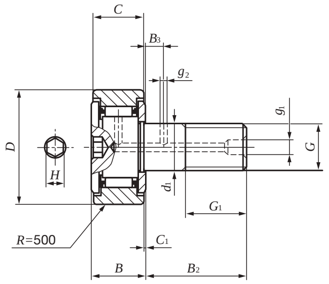
Stud dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm													Mounting dimension f Min. mm	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
			D	C	d_1	G	G_1	B max	B_1 max	B_2	B_3	C_1	g_1	g_2	H					
10	**NUCF 10 BR**	44	22	12	10	M10×1.25	12	13.2	36.2	23	—	0.6	—	—	4	12	13.8	10 400	11 500	5 300
	NUCF 10-1 BR	58	26	12	10	M10×1.25	12	13.2	36.2	23	—	0.6	—	—	4	12	13.8	10 400	11 500	9 210
12	**NUCF 12 BR**	86	30	14	12	M12×1.5	13	15.2	40.2	25	6	0.6	4	3	6	17	21.9	14 000	13 400	5 650
	NUCF 12-1 BR	97	32	14	12	M12×1.5	13	15.2	40.2	25	6	0.6	4	3	6	17	21.9	14 000	13 400	9 040
16	**NUCF 16 BR**	167	35	18	16	M16×1.5	17	19.6	52.1	32.5	8	0.8	4	3	6	20	58.5	23 400	27 300	11 800
18	**NUCF 18 BR**	244	40	20	18	M18×1.5	19	21.6	58.1	36.5	8	0.8	6	3	8	22	86.2	25 200	30 900	20 300
20	**NUCF 20 BR**	457	52	24	20	M20×1.5	21	25.6	66.1	40.5	9	0.8	6	4	8	31	119	43 100	58 100	30 000
	NUCF 20-1 BR	384	47	24	20	M20×1.5	21	25.6	66.1	40.5	9	0.8	6	4	8	27	119	38 900	49 000	27 200
24	**NUCF 24 BR**	789	62	29	24	M24×1.5	25	30.6	80.1	49.5	11	0.8	6	4	12	38	215	58 200	75 300	35 200
	NUCF 24-1 BR	1 020	72	29	24	M24×1.5	25	30.6	80.1	49.5	11	0.8	6	4	12	44	215	63 900	88 800	57 000
30	**NUCF 30 BR**	1 600	80	35	30	M30×1.5	32	37	100	63	15	1	6	4	17	45	438	90 300	121 000	98 300
	NUCF 30-2 BR	1 970	90	35	30	M30×1.5	32	37	100	63	15	1	6	4	17	45	438	90 300	121 000	98 300

Remarks1. For models with a stud diameter d_1 of 10mm, oil hole (re-greasing fitting) is provided at the head. Other models are provided with an oil hole (grease nipple) at the head and an oil hole each on the outside surface and end surface of the stud.
2. Provided with prepacked grease.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

CAM FOLLOWERS

Inch Series Cam Followers With Cage/Stud Head Hex Hole



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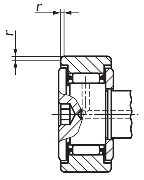

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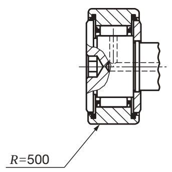

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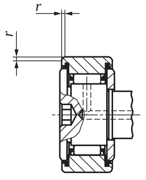

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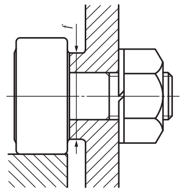


Stud dia. 4.826 – 22.225mm

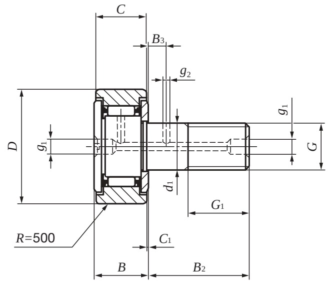
Stud dia. mm (inch)	Identification number Shield type With crowned outer ring	Identification number Shield type With cylindrical outer ring	Identification number Sealed type With crowned outer ring	Identification number Sealed type With cylindrical outer ring	Mass (Ref.) g	D	C	d_1	G UNF	G_1	B max	B_2	B_3	C_1	g_1	g_2	H	r	Mounting dimension f Min. mm(inch)	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N
4.826	CR 8 BR	CR 8 B	CR 8 BUUR	CR 8 BUU	9	12.700 (1/2)	8.731 (11/32)	4.826	No.10-32	6.350 (1/4)	10.2 (0.40)	12.700 (1/2)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	0.397 (1/64)	8.334 (21/64)	1.4	2 520	2 140
	CR 8-1 BR	CR 8-1 B	CR 8-1 BUUR	CR 8-1 BUU	10	12.700 (1/2)	9.525 (3/8)	4.826	No.10-32	6.350 (1/4)	10.9 (0.43)	15.875 (5/8)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	0.397 (1/64)	8.334 (21/64)	1.4	2 520	2 140
6.350 (1/4)	CR 10 BR	CR 10 B	CR 10 BUUR	CR 10 BUU	19	15.875 (5/8)	10.319 (13/32)	6.350 (1/4)	1/4 - 28	7.938 (5/16)	11.8 (0.46)	15.875 (5/8)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	0.397 (1/64)	11.509 (29/64)	3.4	3 650	3 670
	CR 10-1 BR	CR 10-1 B	CR 10-1 BUUR	CR 10-1 BUU	21	15.875 (5/8)	11.112 (7/16)	6.350 (1/4)	1/4 - 28	7.938 (5/16)	12.5 (0.49)	19.050 (3/4)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	0.397 (1/64)	11.509 (29/64)	3.4	3 650	3 670
9.525 (3/8)	CR 12 BR	CR 12 B	CR 12 BUUR	CR 12 BUU	35	19.050 (3/4)	12.700 (1/2)	9.525 (3/8)	3/8 - 24	9.525 (3/8)	14.2 (0.56)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	0.794 (1/32)	13.494 (17/32)	10.8	4 420	5 110
	CR 14 BR	CR 14 B	CR 14 BUUR	CR 14 BUU	46	22.225 (7/8)	12.700 (1/2)	9.525 (3/8)	3/8 - 24	9.525 (3/8)	14.2 (0.56)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	0.794 (1/32)	15.081 (19/32)	10.8	4 790	5 810
11.112 (7/16)	CR 16 BR	CR 16 B	CR 16 BUUR	CR 16 BUU	73	25.400 (1)	15.875 (5/8)	11.112 (7/16)	7/16 - 20	12.700 (1/2)	17.3 (0.68)	25.400 (1)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	6.350 (1/4)	1.191 (3/64)	17.859 (45/64)	17.4	8 810	10 800
	CR 18 BR	CR 18 B	CR 18 BUUR	CR 18 BUU	99	28.575 (1 1/8)	15.875 (5/8)	11.112 (7/16)	7/16 - 20	12.700 (1/2)	17.3 (0.68)	25.400 (1)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	6.350 (1/4)	1.588 (1/16)	19.050 (3/4)	17.4	9 180	11 600
12.700 (1/2)	CR 20 BR	CR 20 B	CR 20 BUUR	CR 20 BUU	132	31.750 (1 1/4)	19.050 (3/4)	12.700 (1/2)	1/2 - 20	15.875 (5/8)	20.4 (0.80)	31.750 (1 1/4)	7.938 (5/16)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	6.350 (1/4)	1.588 (1/16)	21.828 (55/64)	27.7	14 200	16 000
	CR 22 BR	CR 22 B	CR 22 BUUR	CR 22 BUU	157	34.925 (1 3/8)	19.050 (3/4)	12.700 (1/2)	1/2 - 20	15.875 (5/8)	20.4 (0.80)	31.750 (1 1/4)	7.938 (5/16)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	6.350 (1/4)	1.588 (1/16)	21.828 (55/64)	27.7	14 200	16 000
15.875 (5/8)	CR 24 BR	CR 24 B	CR 24 BUUR	CR 24 BUU	225	38.100 (1 1/2)	22.225 (7/8)	15.875 (5/8)	5/8 - 18	19.050 (3/4)	23.6 (0.93)	38.100 (1 1/2)	9.525 (3/8)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	26.196 (1 3/64)	55.7	18 600	24 300
	CR 26 BR	CR 26 B	CR 26 BUUR	CR 26 BUU	260	41.275 (1 5/8)	22.225 (7/8)	15.875 (5/8)	5/8 - 18	19.050 (3/4)	23.6 (0.93)	38.100 (1 1/2)	9.525 (3/8)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	26.196 (1 3/64)	55.7	18 600	24 300
19.050 (3/4)	CR 28 BR	CR 28 B	CR 28 BUUR	CR 28 BUU	365	44.450 (1 3/4)	25.400 (1)	19.050 (3/4)	3/4 - 16	22.225 (7/8)	26.8 (1.06)	44.450 (1 3/4)	11.112 (7/16)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	32.543 (1 9/32)	100	25 100	38 200
	CR 30 BR	CR 30 B	CR 30 BUUR	CR 30 BUU	410	47.625 (1 7/8)	25.400 (1)	19.050 (3/4)	3/4 - 16	22.225 (7/8)	26.8 (1.06)	44.450 (1 3/4)	11.112 (7/16)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	32.543 (1 9/32)	100	25 100	38 200
22.225 (7/8)	CR 32 BR	CR 32 B	CR 32 BUUR	CR 32 BUU	615	50.800 (2)	31.750 (1 1/4)	22.225 (7/8)	7/8 - 14	25.400 (1)	33.5 (1.32)	50.800 (2)	12.700 (1/2)	0.794 (1/32)	4.762 (3/16)	4.762 (3/16)	11.112 (7/16)	1.588 (1/16)	37.306 (1 15/32)	162	32 500	63 900
	CR 36 BR	CR 36 B	CR 36 BUUR	CR 36 BUU	750	57.150 (2 1/4)	31.750 (1 1/4)	22.225 (7/8)	7/8 - 14	25.400 (1)	33.5 (1.32)	50.800 (2)	12.700 (1/2)	0.794 (1/32)	4.762 (3/16)	4.762 (3/16)	11.112 (7/16)	1.588 (1/16)	37.306 (1 15/32)	162	32 500	63 900

Remarks1. Models with a stud diameter d_1 of 6.35 mm or less have no oil hole. Other models are provided with one oil hole each on the outside surface and end surface of the stud.
2. Provided with prepacked grease.
3. For the maximum allowable static load, please contact IKO.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

CAM FOLLOWERS

Inch Series Cam Followers With Cage/With Screwdriver Slot



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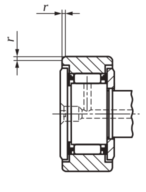

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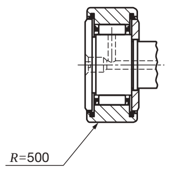

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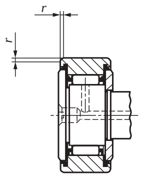

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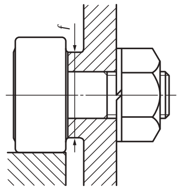
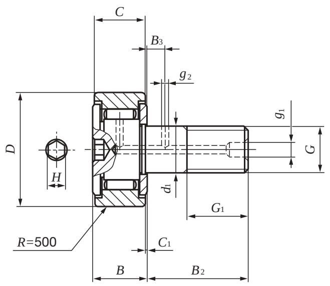


Stud dia. 4.826 ─ 22.225mm

Stud dia. mm (inch)	Identification number				Mass (Ref.)						Boundary dimensions mm(inch)							Mounting dimension f Min. mm(inch)	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N
	Shield type		Sealed type																		
	With crowned outer ring	With cylindrical outer ring	With crowned outer ring	With cylindrical outer ring	g	D	C	d_1	G UNF	G_1	B max	B_2	B_3	C_1	g_1	g_2	r				
4.826	CR 8 R	CR 8	CR 8 UUR	CR 8 UU	9	12.700 (1/2)	8.731 (11/32)	4.826	No.10-32	6.350 (1/4)	10.2 (0.40)	12.700 (1/2)	— (—)	0.794 (1/32)	*3.175 (1/8)	— (—)	0.397 (1/64)	8.334 (21/64)	1.4	2 520	2 140
	CR 8-1 R	CR 8-1	CR 8-1 UUR	CR 8-1 UU	10	12.700 (1/2)	9.525 (3/8)	4.826	No.10-32	6.350 (1/4)	10.9 (0.43)	15.875 (5/8)	— (—)	0.794 (1/32)	*3.175 (1/8)	— (—)	0.397 (1/64)	8.334 (21/64)	1.4	2 520	2 140
6.350 (1/4)	CR 10 R	CR 10	CR 10 UUR	CR 10 UU	19	15.875 (5/8)	10.319 (13/32)	6.350 (1/4)	1/4 - 28	7.938 (5/16)	11.8 (0.46)	15.875 (5/8)	— (—)	0.794 (1/32)	*3.175 (1/8)	— (—)	0.397 (1/64)	11.509 (29/64)	3.4	3 650	3 670
	CR 10-1 R	CR 10-1	CR 10-1 UUR	CR 10-1 UU	21	15.875 (5/8)	11.112 (7/16)	6.350 (1/4)	1/4 - 28	7.938 (5/16)	12.5 (0.49)	19.050 (3/4)	— (—)	0.794 (1/32)	*3.175 (1/8)	— (—)	0.397 (1/64)	11.509 (29/64)	3.4	3 650	3 670
9.525 (3/8)	CR 12 R	CR 12	CR 12 UUR	CR 12 UU	35	19.050 (3/4)	12.700 (1/2)	9.525 (3/8)	3/8 - 24	9.525 (3/8)	14.2 (0.56)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	0.794 (1/32)	13.494 (17/32)	10.8	4 420	5 110
	CR 14 R	CR 14	CR 14 UUR	CR 14 UU	46	22.225 (7/8)	12.700 (1/2)	9.525 (3/8)	3/8 - 24	9.525 (3/8)	14.2 (0.56)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	0.794 (1/32)	15.081 (19/32)	10.8	4 790	5 810
11.112 (7/16)	CR 16 R	CR 16	CR 16 UUR	CR 16 UU	73	25.400 (1)	15.875 (5/8)	11.112 (7/16)	7/16 - 20	12.700 (1/2)	17.3 (0.68)	25.400 (1)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	1.191 (3/64)	17.859 (45/64)	17.4	8 810	10 800
	CR 18 R	CR 18	CR 18 UUR	CR 18 UU	99	28.575 (1 1/8)	15.875 (5/8)	11.112 (7/16)	7/16 - 20	12.700 (1/2)	17.3 (0.68)	25.400 (1)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	1.588 (1/16)	19.050 (3/4)	17.4	9 180	11 600
12.700 (1/2)	CR 20 R	CR 20	CR 20 UUR	CR 20 UU	132	31.750 (1 1/4)	19.050 (3/4)	12.700 (1/2)	1/2 - 20	15.875 (5/8)	20.4 (0.80)	31.750 (1 1/4)	7.938 (5/16)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	1.588 (1/16)	21.828 (55/64)	27.7	14 200	16 000
	CR 22 R	CR 22	CR 22 UUR	CR 22 UU	157	34.925 (1 3/8)	19.050 (3/4)	12.700 (1/2)	1/2 - 20	15.875 (5/8)	20.4 (0.80)	31.750 (1 1/4)	7.938 (5/16)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	1.588 (1/16)	21.828 (55/64)	27.7	14 200	16 000
15.875 (5/8)	CR 24 R	CR 24	CR 24 UUR	CR 24 UU	225	38.100 (1 1/2)	22.225 (7/8)	15.875 (5/8)	5/8 - 18	19.050 (3/4)	23.6 (0.93)	38.100 (1 1/2)	9.525 (3/8)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	1.588 (1/16)	26.196 (1 3/64)	55.7	18 600	24 300
	CR 26 R	CR 26	CR 26 UUR	CR 26 UU	260	41.275 (1 5/8)	22.225 (7/8)	15.875 (5/8)	5/8 - 18	19.050 (3/4)	23.6 (0.93)	38.100 (1 1/2)	9.525 (3/8)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	1.588 (1/16)	26.196 (1 3/64)	55.7	18 600	24 300
19.050 (3/4)	CR 28 R	CR 28	CR 28 UUR	CR 28 UU	365	44.450 (1 3/4)	25.400 (1)	19.050 (3/4)	3/4 - 16	22.225 (7/8)	26.8 (1.06)	44.450 (1 3/4)	11.112 (7/16)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	1.588 (1/16)	32.543 (1 9/32)	100	25 100	38 200
	CR 30 R	CR 30	CR 30 UUR	CR 30 UU	410	47.625 (1 7/8)	25.400 (1)	19.050 (3/4)	3/4 - 16	22.225 (7/8)	26.8 (1.06)	44.450 (1 3/4)	11.112 (7/16)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	1.588 (1/16)	32.543 (1 9/32)	100	25 100	38 200
22.225 (7/8)	CR 32 R	CR 32	CR 32 UUR	CR 32 UU	615	50.800 (2)	31.750 (1 1/4)	22.225 (7/8)	7/8 - 14	25.400 (1)	33.5 (1.32)	50.800 (2)	12.700 (1/2)	0.794 (1/32)	4.762 (3/16)	4.762 (3/16)	1.588 (1/16)	37.306 (1 15/32)	162	32 500	63 900
	CR 36 R	CR 36	CR 36 UUR	CR 36 UU	750	57.150 (2 1/4)	31.750 (1 1/4)	22.225 (7/8)	7/8 - 14	25.400 (1)	33.5 (1.32)	50.800 (2)	12.700 (1/2)	0.794 (1/32)	4.762 (3/16)	4.762 (3/16)	1.588 (1/16)	37.306 (1 15/32)	162	32 500	63 900

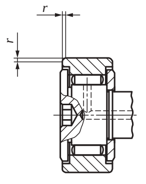
Remarks
1. Models with a stud diameter d_1 of 6.35 mm or less (marked *) are provided with an oil hole on the stud head only. Other models are provided with one oil hole each on the head, outside surface and end surface of the stud.
2. Provided with prepacked grease.
3. For the maximum allowable static load, please contact IKO.

Inch Series Cam Followers Full Complement Type/Stud Head Hex Hole



CR…VBR

Stud dia. 4.826 – 22.225mm



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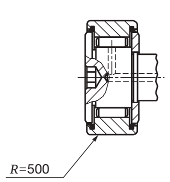

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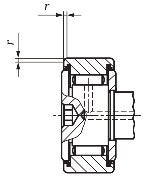

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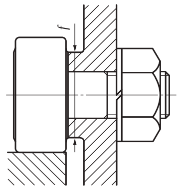


Stud dia. mm (inch)	Identification number				Mass (Ref.)	Boundary dimensions mm(inch)				
	Shield type		Sealed type							
	With crowned outer ring	With cylindrical outer ring	With crowned outer ring	With cylindrical outer ring	g	D	C	d_1	G UNF	G_1
4.826	CR 8 VBR	CR 8 VB	CR 8 VBUUR	CR 8 VBUU	9	12.700 (1/2)	8.731 (11/32)	4.826	No.10-32	6.350 (1/4)
	CR 8-1 VBR	CR 8-1VB	CR 8-1 VBUUR	CR 8-1 VBUU	10	12.700 (1/2)	9.525 (3/8)	4.826	No.10-32	6.350 (1/4)
6.350 (1/4)	CR 10 VBR	CR 10 VB	CR 10 VBUUR	CR 10 VBUU	19	15.875 (5/8)	10.319 (13/32)	6.350 (1/4)	1/4 - 28	7.938 (5/16)
	CR 10-1 VBR	CR 10-1VB	CR 10-1 VBUUR	CR 10-1 VBUU	21	15.875 (5/8)	11.112 (7/16)	6.350 (1/4)	1/4 - 28	7.938 (5/16)
9.525 (3/8)	CR 12 VBR	CR 12 VB	CR 12 VBUUR	CR 12 VBUU	36	19.050 (3/4)	12.700 (1/2)	9.525 (3/8)	3/8 - 24	9.525 (3/8)
	CR 14 VBR	CR 14 VB	CR 14 VBUUR	CR 14 VBUU	47	22.225 (7/8)	12.700 (1/2)	9.525 (3/8)	3/8 - 24	9.525 (3/8)
11.112 (7/16)	CR 16 VBR	CR 16 VB	CR 16 VBUUR	CR 16 VBUU	74	25.400 (1)	15.875 (5/8)	11.112 (7/16)	7/16 - 20	12.700 (1/2)
	CR 18 VBR	CR 18 VB	CR 18 VBUUR	CR 18 VBUU	101	28.575 (1 1/8)	15.875 (5/8)	11.112 (7/16)	7/16 - 20	12.700 (1/2)
12.700 (1/2)	CR 20 VBR	CR 20 VB	CR 20 VBUUR	CR 20 VBUU	137	31.750 (1 1/4)	19.050 (3/4)	12.700 (1/2)	1/2 - 20	15.875 (5/8)
	CR 22 VBR	CR 22 VB	CR 22 VBUUR	CR 22 VBUU	160	34.925 (1 3/8)	19.050 (3/4)	12.700 (1/2)	1/2 - 20	15.875 (5/8)
15.875 (5/8)	CR 24 VBR	CR 24 VB	CR 24 VBUUR	CR 24 VBUU	230	38.100 (1 1/2)	22.225 (7/8)	15.875 (5/8)	5/8 - 18	19.050 (3/4)
	CR 26 VBR	CR 26 VB	CR 26 VBUUR	CR 26 VBUU	265	41.275 (1 5/8)	22.225 (7/8)	15.875 (5/8)	5/8 - 18	19.050 (3/4)
19.050 (3/4)	CR 28 VBR	CR 28 VB	CR 28 VBUUR	CR 28 VBUU	372	44.450 (1 3/4)	25.400 (1)	19.050 (3/4)	3/4 - 16	22.225 (7/8)
	CR 30 VBR	CR 30 VB	CR 30 VBUUR	CR 30 VBUU	418	47.625 (1 7/8)	25.400 (1)	19.050 (3/4)	3/4 - 16	22.225 (7/8)
22.225 (7/8)	CR 32 VBR	CR 32 VB	CR 32 VBUUR	CR 32 VBUU	627	50.800 (2)	31.750 (1 1/4)	22.225 (7/8)	7/8 - 14	25.400 (1)
	CR 36 VBR	CR 36 VB	CR 36 VBUUR	CR 36 VBUU	759	57.150 (2 1/4)	31.750 (1 1/4)	22.225 (7/8)	7/8 - 14	25.400 (1)

Boundary dimensions mm(inch)								Mounting dimension f Min.	Maximum tightening torque	Basic dynamic load rating C	Basic static load rating C_0
B max	B_2	B_3	C_1	g_1	g_2	H	r	mm(inch)	N-m	N	N
10.2 (0.40)	12.700 (1/2)	– (–)	0.794 (1/32)	– (–)	– (–)	3.175 (1/8)	0.397 (1/64)	8.334 (21/64)	1.4	4 260	4 750
10.9 (0.43)	15.875 (5/8)	– (–)	0.794 (1/32)	– (–)	– (–)	3.175 (1/8)	0.397 (1/64)	8.334 (21/64)	1.4	4 710	5 410
11.8 (0.46)	15.875 (5/8)	– (–)	0.794 (1/32)	– (–)	– (–)	3.175 (1/8)	0.397 (1/64)	11.509 (29/64)	3.4	5 830	7 660
12.5 (0.49)	19.050 (3/4)	– (–)	0.794 (1/32)	– (–)	– (–)	3.175 (1/8)	0.397 (1/64)	11.509 (29/64)	3.4	6 340	8 530
14.2 (0.56)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	0.794 (1/32)	13.494 (17/32)	10.8	8 710	12 300
14.2 (0.56)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	0.794 (1/32)	15.081 (19/32)	10.8	8 710	12 300
17.3 (0.68)	25.400 (1)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	6.350 (1/4)	1.191 (3/64)	17.859 (45/64)	17.4	13 100	22 700
17.3 (0.68)	25.400 (1)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	6.350 (1/4)	1.588 (1/16)	19.050 (3/4)	17.4	13 100	22 700
20.4 (0.80)	31.750 (1 1/4)	7.938 (5/16)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	6.350 (1/4)	1.588 (1/16)	21.828 (55/64)	27.7	23 600	31 700
20.4 (0.80)	31.750 (1 1/4)	7.938 (5/16)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	6.350 (1/4)	1.588 (1/16)	21.828 (55/64)	27.7	23 600	31 700
23.6 (0.93)	38.100 (1 1/2)	9.525 (3/8)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	26.196 (1 3/64)	55.7	28 200	40 100
23.6 (0.93)	38.100 (1 1/2)	9.525 (3/8)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	26.196 (1 3/64)	55.7	28 200	40 100
26.8 (1.06)	44.450 (1 3/4)	11.112 (7/16)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	32.543 (1 9/32)	100	35 300	55 600
26.8 (1.06)	44.450 (1 3/4)	11.112 (7/16)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	32.543 (1 9/32)	100	35 300	55 600
33.5 (1.32)	50.800 (2)	12.700 (1/2)	0.794 (1/32)	4.762 (3/16)	4.762 (3/16)	11.112 (7/16)	1.588 (1/16)	37.306 (1 15/32)	162	45 700	80 600
33.5 (1.32)	50.800 (2)	12.700 (1/2)	0.794 (1/32)	4.762 (3/16)	4.762 (3/16)	11.112 (7/16)	1.588 (1/16)	37.306 (1 15/32)	162	45 700	80 600

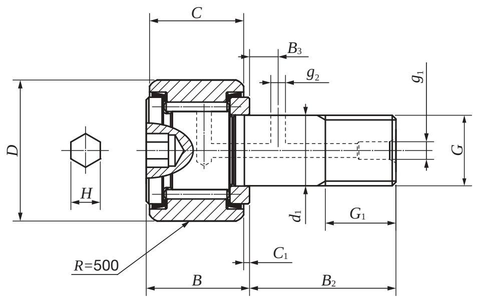
Remarks1. Models with a stud diameter d_1 of 6.35 mm or less have no oil hole. Other models are provided with one oil hole each on the outside surface and end surface of the stud.
2. Provided with prepacked grease.
3. For the maximum allowable static load, please contact IKO.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

CAM FOLLOWERS

Inch Series Cam Followers Full Complement Type/Stud Head Hex Hole

Stud dia. 4.826 – 22.225mm



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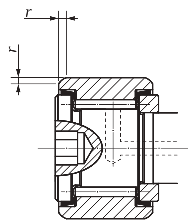

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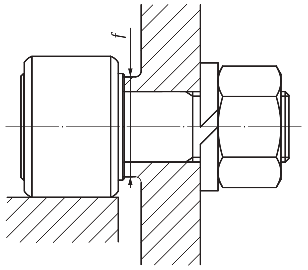


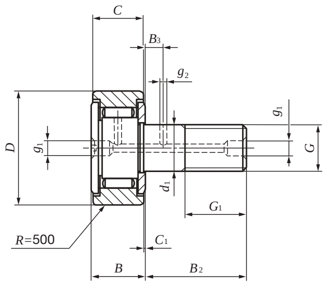
Stud dia. mm (inch)	Identification number Sealed type with ThrustDisk Seals™ With crowned outer ring	With cylindrical outer ring	Mass (Ref.) g	D	C	d_1	G UNF	G_1	B max	B_2	Boundary dimensions mm(inch) B_3	C_1	g_1	g_2	H	r	Mounting dimension f Min. mm(inch)	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N
4.826	CR 8 VBSR	CR 8 VBS	9	12.700 (1/2)	8.731 (11/32)	4.826	No.10-32	6.350 (1/4)	10.2 (0.40)	12.700 (1/2)	— (−)	0.794 (1/32)	— (−)	— (−)	3.175 (1/8)	0.397 (1/64)	8.334 (21/64)	1.4	3 790	4 100
	CR 8-1 VBSR	CR 8-1 VBS	10	12.700 (1/2)	9.525 (3/8)	4.826	No.10-32	6.350 (1/4)	10.9 (0.43)	15.875 (5/8)	— (−)	0.794 (1/32)	— (−)	— (−)	3.175 (1/8)	0.397 (1/64)	8.334 (21/64)	1.4	4 260	4 750
6.350 (1/4)	CR 10 VBSR	CR 10 VBS	19	15.875 (5/8)	10.319 (13/32)	6.350 (1/4)	1/4-28	7.938 (5/16)	11.8 (0.46)	15.875 (5/8)	— (−)	0.794 (1/32)	— (−)	— (−)	3.175 (1/8)	0.397 (1/64)	11.509 (29/64)	3.4	5 310	6 780
	CR 10-1 VBSR	CR 10-1 VBS	21	15.875 (5/8)	11.112 (7/16)	6.350 (1/4)	1/4-28	7.938 (5/16)	12.5 (0.49)	19.050 (3/4)	— (−)	0.794 (1/32)	— (−)	— (−)	3.175 (1/8)	0.397 (1/64)	11.509 (29/64)	3.4	5 830	7 660
9.525 (3/8)	CR 12 VBSR	CR 12 VBS	34	19.050 (3/4)	12.700 (1/2)	9.525 (3/8)	3/8-24	9.525 (3/8)	14.2 (0.56)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	0.794 (1/32)	13.494 (17/32)	10.8	7 400	11 100
	CR 14 VBSR	CR 14 VBS	45	22.225 (7/8)	12.700 (1/2)	9.525 (3/8)	3/8-24	9.525 (3/8)	14.2 (0.56)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	0.794 (1/32)	15.081 (19/32)	10.8	7 400	11 100
11.112 (7/16)	CR 16 VBSR	CR 16 VBS	73	25.400 (1)	15.875 (5/8)	11.112 (7/16)	7/16-20	12.700 (1/2)	17.3 (0.68)	25.400 (1)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	6.350 (1/4)	1.191 (3/64)	17.859 (45/64)	17.4	12,000	20,300
	CR 18 VBSR	CR 18 VBS	100	28.575 (1 1/8)	15.875 (5/8)	11.112 (7/16)	7/16-20	12.700 (1/2)	17.3 (0.68)	25.400 (1)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	6.350 (1/4)	1.588 (1/16)	19.050 (3/4)	17.4	12,000	20,300
12.700 (1/2)	CR 20 VBSR	CR 20 VBS	136	31.750 (1 1/4)	19.050 (3/4)	12.700 (1/2)	1/2-20	15.875 (5/8)	20.4 (0.80)	31.750 (1 1/4)	7.938 (5/16)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	6.350 (1/4)	1.588 (1/16)	21.828 (55/64)	27.7	22,000	29,000
	CR 22 VBSR	CR 22 VBS	159	34.925 (1 3/8)	19.050 (3/4)	12.700 (1/2)	1/2-20	15.875 (5/8)	20.4 (0.80)	31.750 (1 1/4)	7.938 (5/16)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	6.350 (1/4)	1.588 (1/16)	21.828 (55/64)	27.7	22,000	29,000
15.875 (5/8)	CR 24 VBSR	CR 24 VBS	230	38.100 (1 1/2)	22.225 (7/8)	15.875 (5/8)	5/8-18	19.050 (3/4)	23.6 (0.93)	38.100 (1 1/2)	9.525 (3/8)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	26.196 (1 3/64)	55.7	26,400	36,900
	CR 26 VBSR	CR 26 VBS	265	41.275 (1 5/8)	22.225 (7/8)	15.875 (5/8)	5/8-18	19.050 (3/4)	23.6 (0.93)	38.100 (1 1/2)	9.525 (3/8)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	26.196 (1 3/64)	55.7	26,400	36,900
19.050 (3/4)	CR 28 VBSR	CR 28 VBS	368	44.450 (1 3/4)	25.400 (1)	19.050 (3/4)	3/4-16	22.225 (7/8)	26.8 (1.06)	44.450 (1 3/4)	11.112 (7/16)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	32.543 (1 9/32)	100	32,200	49,500
	CR 30 VBSR	CR 30 VBS	413	47.625 (1 7/8)	25.400 (1)	19.050 (3/4)	3/4-16	22.225 (7/8)	26.8 (1.06)	44.450 (1 3/4)	11.112 (7/16)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	7.938 (5/16)	1.588 (1/16)	32.543 (1 9/32)	100	32,200	49,500
22.225 (7/8)	CR 32 VBSR	CR 32 VBS	620	50.800 (2)	31.750 (1 1/4)	22.225 (7/8)	7/8-14	25.400 (1)	33.5 (1.32)	50.800 (2)	12.700 (1/2)	0.794 (1/32)	4.762 (3/16)	4.762 (3/16)	11.112 (7/16)	1.588 (1/16)	37.306 (1 15/32)	162	42,600	73,700
	CR 36 VBSR	CR 36 VBS	753	57.150 (2 1/4)	31.750 (1 1/4)	22.225 (7/8)	7/8-14	25.400 (1)	33.5 (1.32)	50.800 (2)	12.700 (1/2)	0.794 (1/32)	4.762 (3/16)	4.762 (3/16)	11.112 (7/16)	1.588 (1/16)	37.306 (1 15/32)	162	42,600	73,700

Remarks1. Models with a stud diameter d_1 of 6.35 mm or less have no oil hole. Other models are provided with one oil hole each on the outside surface and end surface of the stud.
2. Provided with prepacked grease.
3. For the maximum allowable static load, please contact IKO.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

CAM FOLLOWERS

Inch Series Cam Followers Full Complement Type/With Screwdriver Slot



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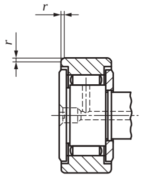

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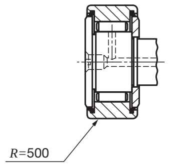

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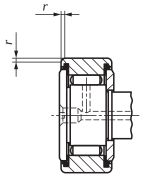

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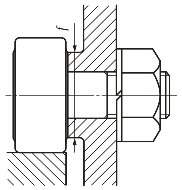


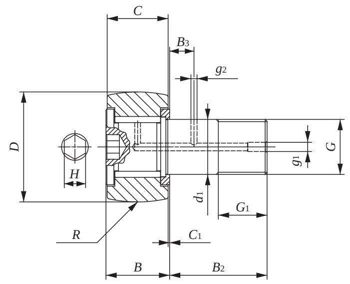
Stud dia. 4.826 – 31.750mm

Stud dia. mm (inch)	Identification number				Mass (Ref.)						Boundary dimensions mm(inch)							Mounting dimension f	Maximum tightening torque	Basic dynamic load rating C	Basic static load rating C_0
	Shield type		Sealed type																		
	With crowned outer ring	With cylindrical outer ring	With crowned outer ring	With cylindrical outer ring	g	D	C	d_1	G UNF	G_1	B max	B_2	B_3	C_1	g_1	g_2	r	Min. mm(inch)	N-m	N	N
4.826	**CR 8 VR**	**CR 8 V**	**CR 8 VUUR**	**CR 8 VUU**	9	12.700 (1/2)	8.731 (11/32)	4.826	No.10-32	6.350 (1/4)	10.2 (0.40)	12.700 (1/2)	— (—)	0.794 (1/32)	*3.175 (1/8)	— (—)	0.397 (1/64)	8.334 (21/64)	1.4	4 260	4 750
	CR 8-1 VR	**CR 8-1 V**	**CR 8-1 VUUR**	**CR 8-1 VUU**	10	12.700 (1/2)	9.525 (3/8)	4.826	No.10-32	6.350 (1/4)	10.9 (0.43)	15.875 (5/8)	— (—)	0.794 (1/32)	*3.175 (1/8)	— (—)	0.397 (1/64)	8.334 (21/64)	1.4	4 710	5 410
6.350 (1/4)	**CR 10 VR**	**CR 10 V**	**CR 10 VUUR**	**CR 10 VUU**	19	15.875 (5/8)	10.319 (13/32)	6.350 (1/4)	1/4 - 28	7.938 (5/16)	11.8 (0.46)	15.875 (5/8)	— (—)	0.794 (1/32)	*3.175 (1/8)	— (—)	0.397 (1/64)	11.509 (29/64)	3.4	5 830	7 660
	CR 10-1 VR	**CR 10-1 V**	**CR 10-1 VUUR**	**CR 10-1 VUU**	21	15.875 (5/8)	11.112 (7/16)	6.350 (1/4)	1/4 - 28	7.938 (5/16)	12.5 (0.49)	19.050 (3/4)	— (—)	0.794 (1/32)	*3.175 (1/8)	— (—)	0.397 (1/64)	11.509 (29/64)	3.4	6 340	8 530
9.525 (3/8)	**CR 12 VR**	**CR 12 V**	**CR 12 VUUR**	**CR 12 VUU**	36	19.050 (3/4)	12.700 (1/2)	9.525 (3/8)	3/8 - 24	9.525 (3/8)	14.2 (0.56)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	0.794 (1/32)	13.494 (17/32)	10.8	8 710	12 300
	CR 14 VR	**CR 14 V**	**CR 14 VUUR**	**CR 14 VUU**	47	22.225 (7/8)	12.700 (1/2)	9.525 (3/8)	3/8 - 24	9.525 (3/8)	14.2 (0.56)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	0.794 (1/32)	15.081 (19/32)	10.8	8 710	12 300
11.112 (7/16)	**CR 16 VR**	**CR 16 V**	**CR 16 VUUR**	**CR 16 VUU**	74	25.400 (1)	15.875 (5/8)	11.112 (7/16)	7/16 - 20	12.700 (1/2)	17.3 (0.68)	25.400 (1)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	1.191 (3/64)	17.859 (45/64)	17.4	13 100	22 700
	CR 18 VR	**CR 18 V**	**CR 18 VUUR**	**CR 18 VUU**	101	28.575 (1 1/8)	15.875 (5/8)	11.112 (7/16)	7/16 - 20	12.700 (1/2)	17.3 (0.68)	25.400 (1)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	1.588 (1/16)	19.050 (3/4)	17.4	13 100	22 700
12.700 (1/2)	**CR 20 VR**	**CR 20 V**	**CR 20 VUUR**	**CR 20 VUU**	137	31.750 (1 1/4)	19.050 (3/4)	12.700 (1/2)	1/2 - 20	15.875 (5/8)	20.4 (0.80)	31.750 (1 1/4)	7.938 (5/16)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	1.588 (1/16)	21.828 (55/64)	27.7	23 600	31 700
	CR 22 VR	**CR 22 V**	**CR 22 VUUR**	**CR 22 VUU**	160	34.925 (1 3/8)	19.050 (3/4)	12.700 (1/2)	1/2 - 20	15.875 (5/8)	20.4 (0.80)	31.750 (1 1/4)	7.938 (5/16)	0.794 (1/32)	4.762 (3/16)	3.175 (1/8)	1.588 (1/16)	21.828 (55/64)	27.7	23 600	31 700
15.875 (5/8)	**CR 24 VR**	**CR 24 V**	**CR 24 VUUR**	**CR 24 VUU**	230	38.100 (1 1/2)	22.225 (7/8)	15.875 (5/8)	5/8 - 18	19.050 (3/4)	23.6 (0.93)	38.100 (1 1/2)	9.525 (3/8)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	1.588 (1/16)	26.196 (1 3/64)	55.7	28 200	40 100
	CR 26 VR	**CR 26 V**	**CR 26 VUUR**	**CR 26 VUU**	265	41.275 (1 5/8)	22.225 (7/8)	15.875 (5/8)	5/8 - 18	19.050 (3/4)	23.6 (0.93)	38.100 (1 1/2)	9.525 (3/8)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	1.588 (1/16)	26.196 (1 3/64)	55.7	28 200	40 100
19.050 (3/4)	**CR 28 VR**	**CR 28 V**	**CR 28 VUUR**	**CR 28 VUU**	372	44.450 (1 3/4)	25.400 (1)	19.050 (3/4)	3/4 - 16	22.225 (7/8)	26.8 (1.06)	44.450 (1 3/4)	11.112 (7/16)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	1.588 (1/16)	32.543 (1 9/32)	100	35 300	55 600
	CR 30 VR	**CR 30 V**	**CR 30 VUUR**	**CR 30 VUU**	418	47.625 (1 7/8)	25.400 (1)	19.050 (3/4)	3/4 - 16	22.225 (7/8)	26.8 (1.06)	44.450 (1 3/4)	11.112 (7/16)	0.794 (1/32)	4.762 (3/16)	3.969 (5/32)	1.588 (1/16)	32.543 (1 9/32)	100	35 300	55 600
22.225 (7/8)	**CR 32 VR**	**CR 32 V**	**CR 32 VUUR**	**CR 32 VUU**	627	50.800 (2)	31.750 (1 1/4)	22.225 (7/8)	7/8 - 14	25.400 (1)	33.5 (1.32)	50.800 (2)	12.700 (1/2)	0.794 (1/32)	4.762 (3/16)	4.762 (3/16)	1.588 (1/16)	37.306 (1 15/32)	162	45 700	80 600
	CR 36 VR	**CR 36 V**	**CR 36 VUUR**	**CR 36 VUU**	759	57.150 (2 1/4)	31.750 (1 1/4)	22.225 (7/8)	7/8 - 14	25.400 (1)	33.5 (1.32)	50.800 (2)	12.700 (1/2)	0.794 (1/32)	4.762 (3/16)	4.762 (3/16)	1.588 (1/16)	37.306 (1 15/32)	162	45 700	80 600
31.750 (1 1/4)	—	—	—	**CR 48 VUU**	1 960	76.200 (3)	44.450 (1 3/4)	31.750 (1 1/4)	1 1/4 - 12	31.750 (1 1/4)	46.4 (1.83)	63.500 (2 1/2)	15.875 (5/8)	1.588 (1/16)	6.350 (1/4)	4.762 (3/16)	2.381 (3/32)	51.991 (2 3/64)	500	77 600	172 000

Remarks
1. Models with a stud diameter d_1 of 6.35 mm or less (marked *) are provided with an oil hole on the stud head only. Other models are provided with one oil hole each on the head, outside surface and end surface of the stud.
2. Provided with prepacked grease.
3. For the maximum allowable static load, please contact IKO.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Inch Series Heavy Duty Cam Followers Full Complement Type/Stud Head Hex Hole



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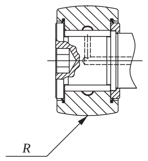

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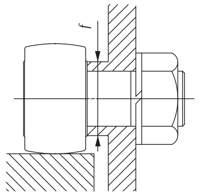


Stud dia. 6.350－50.800mm

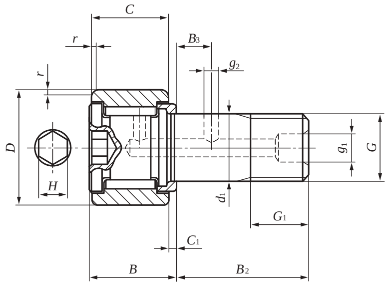
Stud dia. mm (inch)	Identification number: Shield type With crowned outer ring	Identification number: Sealed type With crowned outer ring	Mass (Ref.) g	D	C	d_1	G UNF	G_1	B max	B_2	B_3	C_1	g_1	g_2	H	R	Mounting dimension f Min. mm(inch)	Maximum tightening torque N-m	Basic dynamic load rating C N	Basic static load rating C_0 N
6.350 (1/4)	**CRH 8-1 VBR**	**CRH 8-1 VBUUR**	12	12.700 (1/2)	9.525 (3/8)	6.350 (1/4)	1/4-28	6.350 (1/4)	11.1 (0.44)	15.875 (5/8)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	180 (7)	8.334 (21/64)	3.4	4 710	5 410
	CRH 9 VBR	**CRH 9 VBUUR**	15	14.288 (9/16)	9.525 (3/8)	6.350 (1/4)	1/4-28	6.350 (1/4)	11.1 (0.44)	15.875 (5/8)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	180 (7)	8.334 (21/64)	3.4	4 710	5 410
7.938 (5/16)	**CRH 10-1 VBR**	**CRH 10-1 VBUUR**	23	15.875 (5/8)	11.112 (7/16)	7.938 (5/16)	5/16-24	7.938 (5/16)	12.8 (0.50)	19.050 (3/4)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	200 (8)	11.112 (7/16)	6.8	6 340	8 530
	CRH 11 VBR	**CRH 11 VBUUR**	27	17.462 (11/16)	11.112 (7/16)	7.938 (5/16)	5/16-24	7.938 (5/16)	12.8 (0.50)	19.050 (3/4)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	200 (8)	11.112 (7/16)	6.8	6 340	8 530
11.112 (7/16)	**CRH 12 VBR**	**CRH 12 VBUUR**	39	19.050 (3/4)	12.700 (1/2)	11.112 (7/16)	7/16-20	9.525 (3/8)	14.6 (0.57)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	250 (10)	13.494 (17/32)	17.6	8 710	12 300
	CRH 14 VBR	**CRH 14 VBUUR**	49	22.225 (7/8)	12.700 (1/2)	11.112 (7/16)	7/16-20	9.525 (3/8)	14.6 (0.57)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	250 (10)	13.494 (17/32)	17.6	8 710	12 300
15.875 (5/8)	**CRH 16 VBR**	**CRH 16 VBUUR**	93	25.400 (1)	15.875 (5/8)	15.875 (5/8)	5/8-18	12.700 (1/2)	17.9 (0.70)	25.400 (1)	6.350 (1/4)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	6.350 (1/4)	300 (12)	18.256 (23/32)	57.8	13 100	22 700
	CRH 18 VBR	**CRH 18 VBUUR**	109	28.575 (1 1/8)	15.875 (5/8)	15.875 (5/8)	5/8-18	12.700 (1/2)	17.9 (0.70)	25.400 (1)	6.350 (1/4)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	6.350 (1/4)	300 (12)	18.256 (23/32)	57.8	13 100	22 700
19.050 (3/4)	**CRH 20 VBR**	**CRH 20 VBUUR**	176	31.750 (1 1/4)	19.050 (3/4)	19.050 (3/4)	3/4-16	15.875 (5/8)	21.0 (0.83)	31.750 (1 1/4)	7.938 (5/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	6.350 (1/4)	360 (14)	24.209 (61/64)	103	23 600	31 700
	CRH 22 VBR	**CRH 22 VBUUR**	200	34.925 (1 3/8)	19.050 (3/4)	19.050 (3/4)	3/4-16	15.875 (5/8)	21.0 (0.83)	31.750 (1 1/4)	7.938 (5/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	6.350 (1/4)	360 (14)	24.209 (61/64)	103	23 600	31 700
22.225 (7/8)	**CRH 24 VBR**	**CRH 24 VBUUR**	296	38.100 (1 1/2)	22.225 (7/8)	22.225 (7/8)	7/8-14	19.050 (3/4)	24.3 (0.96)	38.100 (1 1/2)	9.525 (3/8)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	7.938 (5/16)	500 (20)	26.988 (1 1/16)	162	28 200	40 100
	CRH 26 VBR	**CRH 26 VBUUR**	329	41.275 (1 5/8)	22.225 (7/8)	22.225 (7/8)	7/8-14	19.050 (3/4)	24.3 (0.96)	38.100 (1 1/2)	9.525 (3/8)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	7.938 (5/16)	500 (20)	26.988 (1 1/16)	162	28 200	40 100
25.400 (1)	**CRH 28 VBR**	**CRH 28 VBUUR**	463	44.450 (1 3/4)	25.400 (1)	25.400 (1)	1-14 UNS	22.225 (7/8)	27.4 (1.08)	44.450 (1 3/4)	11.112 (7/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	7.938 (5/16)	500 (20)	32.941 (1 19/64)	258	35 300	55 600
	CRH 30 VBR	**CRH 30 VBUUR**	508	47.625 (1 7/8)	25.400 (1)	25.400 (1)	1-14 UNS	22.225 (7/8)	27.4 (1.08)	44.450 (1 3/4)	11.112 (7/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	7.938 (5/16)	500 (20)	32.941 (1 19/64)	258	35 300	55 600
28.575 (1 1/8)	**CRH 32 VBR**	**CRH 32 VBUUR**	722	50.800 (2)	31.750 (1 1/4)	28.575 (1 1/8)	1 1/8-12	25.400 (1)	34.2 (1.35)	50.800 (2)	12.700 (1/2)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	11.112 (7/16)	600 (24)	37.306 (1 15/32)	356	45 700	80 600
	CRH 36 VBR	**CRH 36 VBUUR**	858	57.150 (2 1/4)	31.750 (1 1/4)	28.575 (1 1/8)	1 1/8-12	25.400 (1)	34.2 (1.35)	50.800 (2)	12.700 (1/2)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	11.112 (7/16)	600 (24)	37.306 (1 15/32)	356	45 700	80 600
31.750 (1 1/4)	**CRH 40 VBR**	**CRH 40 VBUUR**	1 260	63.500 (2 1/2)	38.100 (1 1/2)	31.750 (1 1/4)	1 1/4-12	28.575 (1 1/8)	40.0 (1.57)	57.150 (2 1/4)	14.288 (9/16)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	12.700 (1/2)	760 (30)	40.878 (1 39/64)	500	61 400	116 000
	CRH 44 VBR	**CRH 44 VBUUR**	1 460	69.850 (2 3/4)	38.100 (1 1/2)	31.750 (1 1/4)	1 1/4-12	28.575 (1 1/8)	40.0 (1.57)	57.150 (2 1/4)	14.288 (9/16)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	12.700 (1/2)	760 (30)	40.878 (1 39/64)	500	61 400	116 000
38.100 (1 1/2)	**CRH 48 VBR**	**CRH 48 VBUUR**	2 100	76.200 (3)	44.450 (1 3/4)	38.100 (1 1/2)	1 1/2-12	31.750 (1 1/4)	46.4 (1.83)	63.500 (2 1/2)	15.875 (5/8)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	19.050 (3/4)	760 (30)	51.991 (2 3/64)	892	77 600	172 000
	CRH 52 VBR	**CRH 52 VBUUR**	2 380	82.550 (3 1/4)	44.450 (1 3/4)	38.100 (1 1/2)	1 1/2-12	31.750 (1 1/4)	46.4 (1.83)	63.500 (2 1/2)	15.875 (5/8)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	19.050 (3/4)	760 (30)	51.991 (2 3/64)	892	77 600	172 000
44.450 (1 3/4)	**CRH 56 VBR**	**CRH 56 VBUUR**	3 240	88.900 (3 1/2)	50.800 (2)	44.450 (1 3/4)	1 3/4-12UN	34.925 (1 3/8)	52.8 (2.08)	69.850 (2 3/4)	17.462 (11/16)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	19.050 (3/4)	760 (30)	59.928 (2 23/64)	1450	111 000	239 000
50.800 (2)	**CRH 64 VBR**	**CRH 64 VBUUR**	4 960	101.600 (4)	57.150 (2 1/4)	50.800 (2)	2-12 UN	38.100 (1 1/2)	59.4 (2.34)	88.900 (3 1/2)	19.050 (3/4)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	19.050 (3/4)	760 (30)	64.691 (2 35/64)	2190	142 000	317 000

Remarks1. Models with a stud diameter d_1 of 7.938 mm or less have no oil hole. Other models are provided with one oil hole each on the outside surface and end surface of the stud.
2. Provided with prepacked grease.
3. For the maximum allowable static load, please contact IKO.

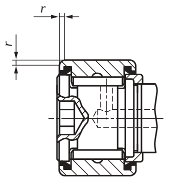
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

CAM FOLLOWERS

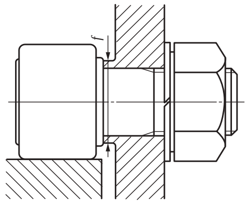
Inch Series Heavy Duty Cam Followers Full Complement Type/Stud Head Hex Hole



CRH…VB



CRH…VBUU



Stud dia. 6.350 ─ 50.800mm

Stud dia. mm (inch)	Identification number		Mass (Ref.)	Boundary dimensions mm(inch)													Mounting dimension	Maximum tightening torque	Basic dynamic load rating C	Basic static load rating C_0
	Shield type With cylindrical outer ring	Sealed type With cylindrical outer ring	g	D	C	d_1	G UNF	G_1	B max	B_2	B_3	C_1	g_1	g_2	H	r	f Min. mm(inch)	N-m	N	N
6.350 (1/4)	CRH 8-1 VB	CRH 8-1 VBUU	12	12.700 (1/2)	9.525 (3/8)	6.350 (1/4)	1/4 - 28	6.350 (1/4)	11.1 (0.44)	15.875 (5/8)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	0.397 (1/64)	8.334 (21/64)	3.4	4 710	5 410
	CRH 9 VB	CRH 9 VBUU	15	14.288 (9/16)	9.525 (3/8)	6.350 (1/4)	1/4 - 28	6.350 (1/4)	11.1 (0.44)	15.875 (5/8)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	0.397 (1/64)	8.334 (21/64)	3.4	4 710	5 410
7.938 (5/16)	CRH 10-1 VB	CRH 10-1 VBUU	23	15.875 (5/8)	11.112 (7/16)	7.938 (5/16)	5/16 - 24	7.938 (5/16)	12.8 (0.50)	19.050 (3/4)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	0.397 (1/64)	11.112 (7/16)	6.8	6 340	8 530
	CRH 11 VB	CRH 11 VBUU	27	17.462 (11/16)	11.112 (7/16)	7.938 (5/16)	5/16 - 24	7.938 (5/16)	12.8 (0.50)	19.050 (3/4)	— (—)	0.794 (1/32)	— (—)	— (—)	3.175 (1/8)	0.397 (1/64)	11.112 (7/16)	6.8	6 340	8 530
11.112 (7/16)	CRH 12 VB	CRH 12 VBUU	39	19.050 (3/4)	12.700 (1/2)	11.112 (7/16)	7/16 - 20	9.525 (3/8)	14.6 (0.57)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	0.794 (1/32)	13.494 (17/32)	17.6	8 710	12 300
	CRH 14 VB	CRH 14 VBUU	49	22.225 (7/8)	12.700 (1/2)	11.112 (7/16)	7/16 - 20	9.525 (3/8)	14.6 (0.57)	22.225 (7/8)	6.350 (1/4)	0.794 (1/32)	4.762 (3/16)	2.381 (3/32)	4.762 (3/16)	0.794 (1/32)	13.494 (17/32)	17.6	8 710	12 300
15.875 (5/8)	CRH 16 VB	CRH 16 VBUU	93	25.400 (1)	15.875 (5/8)	15.875 (5/8)	5/8 - 18	12.700 (1/2)	17.9 (0.70)	25.400 (1)	6.350 (1/4)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	6.350 (1/4)	1.191 (3/64)	18.256 (23/32)	57.8	13 100	22 700
	CRH 18 VB	CRH 18 VBUU	109	28.575 (1 1/8)	15.875 (5/8)	15.875 (5/8)	5/8 - 18	12.700 (1/2)	17.9 (0.70)	25.400 (1)	6.350 (1/4)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	6.350 (1/4)	1.588 (1/16)	18.256 (23/32)	57.8	13 100	22 700
19.050 (3/4)	CRH 20 VB	CRH 20 VBUU	176	31.750 (1 1/4)	19.050 (3/4)	19.050 (3/4)	3/4 - 16	15.875 (5/8)	21.0 (0.83)	31.750 (1 1/4)	7.938 (5/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	6.350 (1/4)	1.588 (1/16)	24.209 (61/64)	103	23 600	31 700
	CRH 22 VB	CRH 22 VBUU	200	34.925 (1 3/8)	19.050 (3/4)	19.050 (3/4)	3/4 - 16	15.875 (5/8)	21.0 (0.83)	31.750 (1 1/4)	7.938 (5/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	6.350 (1/4)	1.588 (1/16)	24.209 (61/64)	103	23 600	31 700
22.225 (7/8)	CRH 24 VB	CRH 24 VBUU	296	38.100 (1 1/2)	22.225 (7/8)	22.225 (7/8)	7/8 - 14	19.050 (3/4)	24.3 (0.96)	38.100 (1 1/2)	9.525 (3/8)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	7.938 (5/16)	1.588 (1/16)	26.988 (1 1/16)	162	28 200	40 100
	CRH 26 VB	CRH 26 VBUU	329	41.275 (1 5/8)	22.225 (7/8)	22.225 (7/8)	7/8 - 14	19.050 (3/4)	24.3 (0.96)	38.100 (1 1/2)	9.525 (3/8)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	7.938 (5/16)	1.588 (1/16)	26.988 (1 1/16)	162	28 200	40 100
25.400 (1)	CRH 28 VB	CRH 28 VBUU	463	44.450 (1 3/4)	25.400 (1)	25.400 (1)	1- 14 UNS	22.225 (7/8)	27.4 (1.08)	44.450 (1 3/4)	11.112 (7/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	7.938 (5/16)	1.588 (1/16)	32.941 (1 19/64)	258	35 300	55 600
	CRH 30 VB	CRH 30 VBUU	508	47.625 (1 7/8)	25.400 (1)	25.400 (1)	1- 14 UNS	22.225 (7/8)	27.4 (1.08)	44.450 (1 3/4)	11.112 (7/16)	1.588 (1/16)	4.762 (3/16)	2.381 (3/32)	7.938 (5/16)	1.588 (1/16)	32.941 (1 19/64)	258	35 300	55 600
28.575 (1 1/8)	CRH 32 VB	CRH 32 VBUU	722	50.800 (2)	31.750 (1 1/4)	28.575 (1 1/8)	1 1/8 - 12	25.400 (1)	34.2 (1.35)	50.800 (2)	12.700 (1/2)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	11.112 (7/16)	1.588 (1/16)	37.306 (1 15/32)	356	45 700	80 600
	CRH 36 VB	CRH 36 VBUU	858	57.150 (2 1/4)	31.750 (1 1/4)	28.575 (1 1/8)	1 1/8 - 12	25.400 (1)	34.2 (1.35)	50.800 (2)	12.700 (1/2)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	11.112 (7/16)	1.588 (1/16)	37.306 (1 15/32)	356	45 700	80 600
31.750 (1 1/4)	CRH 40 VB	CRH 40 VBUU	1 260	63.500 (2 1/2)	38.100 (1 1/2)	31.750 (1 1/4)	1 1/4 - 12	28.575 (1 1/8)	40.0 (1.57)	57.150 (2 1/4)	14.288 (9/16)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	12.700 (1/2)	2.381 (3/32)	40.878 (1 39/64)	500	61 400	116 000
	CRH 44 VB	CRH 44 VBUU	1 460	69.850 (2 3/4)	38.100 (1 1/2)	31.750 (1 1/4)	1 1/4 - 12	28.575 (1 1/8)	40.0 (1.57)	57.150 (2 1/4)	14.288 (9/16)	1.588 (1/16)	4.762 (3/16)	3.175 (1/8)	12.700 (1/2)	2.381 (3/32)	40.878 (1 39/64)	500	61 400	116 000
38.100 (1 1/2)	CRH 48 VB	CRH 48 VBUU	2 100	76.200 (3)	44.450 (1 3/4)	38.100 (1 1/2)	1 1/2 - 12	31.750 (1 1/4)	46.4 (1.83)	63.500 (2 1/2)	15.875 (5/8)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	19.050 (3/4)	2.381 (3/32)	51.991 (2 3/64)	892	77 600	172 000
	CRH 52 VB	CRH 52 VBUU	2 380	82.550 (3 1/4)	44.450 (1 3/4)	38.100 (1 1/2)	1 1/2 - 12	31.750 (1 1/4)	46.4 (1.83)	63.500 (2 1/2)	15.875 (5/8)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	19.050 (3/4)	2.381 (3/32)	51.991 (2 3/64)	892	77 600	172 000
44.450 (1 3/4)	CRH 56 VB	CRH 56 VBUU	3 240	88.900 (3 1/2)	50.800 (2)	44.450 (1 3/4)	1 3/4 - 12UN	34.925 (1 3/8)	52.8 (2.08)	69.850 (2 3/4)	17.462 (11/16)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	19.050 (3/4)	2.381 (3/32)	59.928 (2 23/64)	1 450	111 000	239 000
50.800 (2)	CRH 64 VB	CRH 64 VBUU	4 960	101.600 (4)	57.150 (2 1/4)	50.800 (2)	2- 12 UN	38.100 (1 1/2)	59.4 (2.34)	88.900 (3 1/2)	19.050 (3/4)	1.588 (1/16)	6.350 (1/4)	3.175 (1/8)	19.050 (3/4)	2.381 (3/32)	64.691 (2 35/64)	2 190	142 000	317 000

Remarks1. Models with a stud diameter d_1 of 7.938 mm or less have no oil hole. Other models are provided with one oil hole each on the outside surface and end surface of the stud.
2. Provided with prepacked grease.
3. For the maximum allowable static load, please contact IKO.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

ROLLER FOLLOWERS

- ●Separable Roller Followers
- ●Non-separable Roller Followers
  - High carbon steel made
  - Stainless steel made
- ●C-Lube Roller Followers
- ●Cylindrical Roller Followers

Structure and Features

IKO Roller Followers are bearings designed for outer ring rotation, in which needle rollers are incorporated in a thick walled outer ring. Both crowned and cylindrical outer rings are available. The outer rings run directly on mating cam guide surfaces, and the crowned outer ring is effective in relieving the edge load caused by mounting errors. The cylindrical outer ring, on the other hand, has a large contact area with the mating cam guide surface and is suitable for applications involving large loads or low cam guide surface hardness.

In Roller Followers, there are two types of bearings available, the caged type and the full complement type. The caged type is useful for applications at high-speed rotation. The full complement type, on the other hand, is suitable for heavy-load applications at low-speed rotation or oscillating motions.

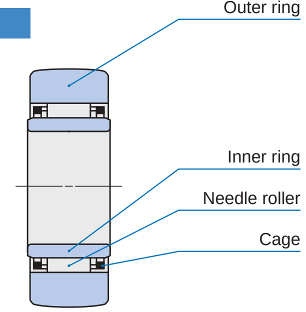
Roller Followers include separable and non-separable types. Also, in addition to the open type, shield type and sealed type are available. The clearances between the side plates and outer ring of the shield type are narrow, and form labyrinths. In the sealed type, special synthetic rubber seals are assembled in these clearances, and they are effective in preventing penetration of dust and dirt.

These bearings are available in a variety of types to suit almost any kind of application. They are widely used for cam mechanisms and for linear motions of conveying equipment.

Structures of Roller Followers

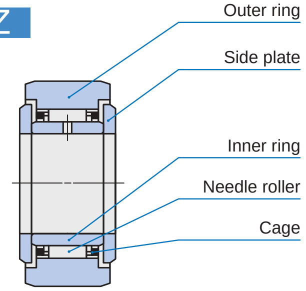
Structure of Separable Roller Follower

NAST···R



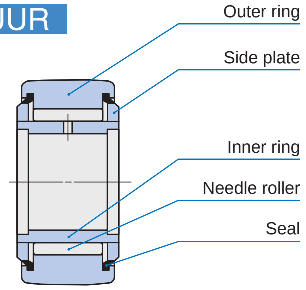
Structure of Separable Roller Follower

NAST···ZZ



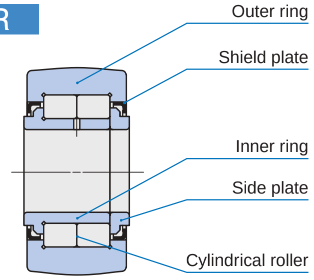
Structure of Non-separable Roller Follower

NART···VUUR



Structure of Cylindrical Roller Follower

NURT···R



Types

In Roller Followers, types shown in Table 1 are available.

Table 1 Type of Roller Followers

Type				With cage		Full complement type	
				Crowned outer ring	Cylindrical outer ring	Crowned outer ring	Cylindrical outer ring
Metric series	Separable Roller Followers RNAST, NAST	Without inner ring	Open type	RNAST ··· R	RNAST	—	—
		With inner ring	Open type	NAST ··· R	NAST	—	—
			Shield type	NAST ··· ZZ R	NAST ··· ZZ	—	—
			Sealed type	NAST ··· ZZUUR	NAST ··· ZZUU	—	—
	Non-separable Roller Followers NART	High carbon steel made	Shield type	NART ··· R	—	NART ··· V R	—
			Sealed type	NART ··· UU R	—	NART ··· VUUR	—
		Stainless steel made	Shield type	NART ··· F R	—	—	—
			Sealed type	NART ··· FUU R	—	—	—
	C-Lube Roller Followers NART···/SG		Sealed type	NART ··· UUR/SG	—	—	—
	Cylindrical Roller Followers NURT		Shield type	—	—	NURT ··· R	NURT
Inch series	Non-separable Roller Followers CRY		Shield type Sealed type	— —	— —	CRY ··· V R CRY ··· VUUR	CRY ··· V CRY ··· VUU

Separable Roller Followers

These bearings are assembled by combining an outer ring, inner ring and Needle Roller Cage, which can be separated from one another. Thus, handling is easy. Oil lubrication is also easy, making them suitable for high-speed rotations.
There are two types: type without inner ring RNAST and type with inner ring NAST. The type with inner ring includes open type, shield type, and sealed type.

Non-separable Roller Followers

These non-separable type bearings have side plates fixed on both sides of the inner ring, and include the caged type and the full complement type. Both shield type and sealed type are available. As well, these bearings also offer a highly corrosion-resistant stainless steel specification, of which the products are suitable for applications where rust prevention oil is not preferred, such as in cleanroom environments.
Inch series Non-separable Roller Followers are full complement type bearings with black oxide surface treatment.

C-Lube Roller Followers

These Roller Followers are lubricated with C-Lube, an IKO original thermosetting solid-type lubricant which fills the inner space of the bearing. C-Lube is lubricant made of a lot of lubricant and fine particles of super-high molecular polyolefin that are solidified by heat treatment. As the bearing rotates, the lubricant oozes out onto the raceway in proper quantities, maintaining the lubrication performance for a long period of time.

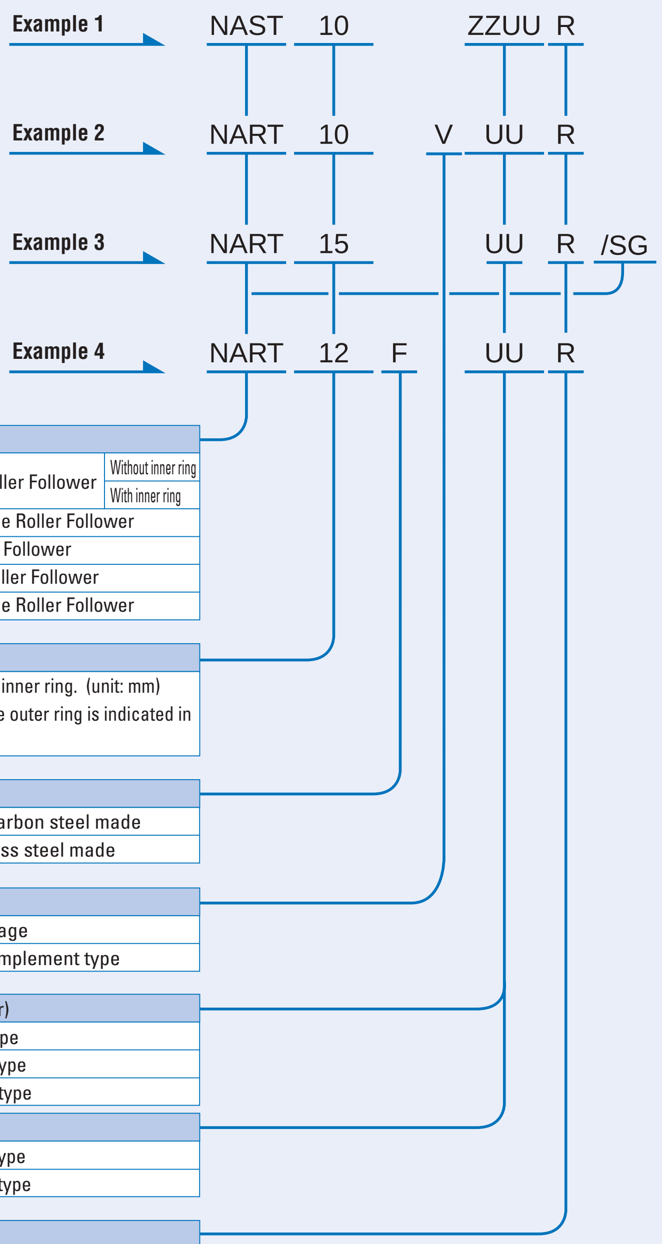
Cylindrical Roller Followers

These bearings are full complement type bearings incorporating double rows of full complement cylindrical rollers in the outer ring, and can withstand large radial loads.
Additionally, the outer ring is guided by the outer ring shoulder and the end face of cylindrical rollers to the axial direction.

Identification Number

Some examples of the identification number of Roller Followers are shown below.

Examples of identification number



Example 1 NAST 10 ZZUU R

Example 2 NART 10 V UU R

Example 3 NART 15 UU R /SG

Example 4 NART 12 F UU R

Model code			
Metric series	RNAST	Separable Roller Follower	Without inner ring
	NAST		With inner ring
	NART	Non-separable Roller Follower	
	NART···/SG	C-Lube Roller Follower	
	NURT	Cylindrical Roller Follower	
Inch series	CRY	Non-separable Roller Follower	

Size
The size indicates the bore diameter of the inner ring. (unit: mm) In the inch series, the outer diameter of the outer ring is indicated in units of 1/16 inch.

Type of material	
No symbol	High carbon steel made
F(1)	Stainless steel made

Roller guide method	
No symbol	With cage
V	Full complement type

Seal structure (Separable Roller Follower)	
No symbol	Open type
ZZ	Shield type
ZZUU	Sealed type

Seal structure (Other Roller Follower)	
No symbol	Shield type
UU	Sealed type

Shape of outer ring outside surface	
R	With crowned outer ring
No symbol	With cylindrical outer ring

Note(1) Applicable to Non-separable Roller Followers only

Accuracy

Dimensional accuracy and rotational accuracy of Roller Followers are based on Tables 2, 3 and 4. Tolerances for the smallest single roller set bore diameter of Separable Roller Followers are shown in Table 5. Roller Followers with special accuracy can also be manufactured. Please contact IKO.

Table 2 Tolerances

unit: μ m

Series / Dimensions and symbols		Metric series: Crowned outer ring	Metric series: Cylindrical outer ring	Inch series: Crowned outer ring	Inch series: Cylindrical outer ring
Bore dia. of inner ring d	$d \leqq 19.05$	See Table 3.		+ 5 − 10	+ 5 − 10
	$19.05 < d$			+ 2 − 12	
Outside dia. of outer ring D		0 − 50	See Table 4.	0 − 50	0 − 25
Width of outer ring C		0 − 120		0 − 130	
Width of inner ring B	Separable Roller Follower	0 − 120		−	
Width of bearing B	Non-separable Roller Follower	h12	−	+ 130 − 250	
	Cylindrical Roller Follower		h12		
Roller set bore dia. F_w	Separable Roller Follower	See Table 5.		−	

Table 3 Tolerances and allowable values of inner rings (Metric series)

unit: μ m

d Nominal bore dia. mm		Δ_{dmp} Single plane mean bore dia. deviation		V_{dp} Bore dia. variation in a single radial plane	V_{dmp} Mean bore dia. variation	K_{ia} Radial runout of assembled bearing inner ring	V_{Bs} Width variation
Over	Incl.	High	Low	(Max.)	(Max.)	(Max.)	(Max.)
2.5	10	0	− 8	10	6	10	15
10	18	0	− 8	10	6	10	20
18	30	0	− 10	13	8	13	20
30	50	0	− 12	15	9	15	20

Table 4 Tolerances and allowable values of outer rings (Metric series)

unit: μ m

D Nominal outside dia. of outer ring mm		Δ_{Dmp} Single plane mean outside dia. deviation		V_{Dp} (1) Outside dia. variation in a single radial plane	V_{Dmp} (1) Mean outside dia. variation	K_{ea} (1) Radial runout of assembled bearing outer ring	V_{Cs} Width variation
Over	Incl.	High	Low	(Max.)	(Max.)	(Max.)	(Max.)
6	18	0	− 8	10	6	15	Same as the tolerance values of V_{Bs} for d of the inner of the same bearing
18	30	0	− 9	12	7	15	
30	50	0	− 11	14	8	20	
50	80	0	− 13	16	10	25	
80	120	0	− 15	19	11	35	

Note(1) Also applicable to the inch series.

Table 5 Tolerances of smallest single roller set bore diameter $F_{ws\ min}$

unit: μ m

F_w Nominal roller set bore diameter mm		$\Delta_{Fws\ min}$ Deviation of smallest single roller set bore diameter	
Over	Incl.	High	Low
6	10	+ 22	+ 13
10	18	+ 27	+ 16
18	30	+ 33	+ 20
30	50	+ 41	+ 25
50	80	+ 49	+ 30

Clearance

Radial internal clearances of Roller Followers are based on Table 6.

Table 6 Radial internal clearance

unit: μ m

Identification number(1)				Radial internal clearance	
Metric series			Inch series		
Separable Roller Followers	Non-separable Roller Followers(2)	Cylindrical Roller Followers	Non-separable Roller Followers	Min.	Max.
NAST 6R	NART 5R	−	−	5	20
NAST 8R～NAST12R	NART 6R～NART12R	−	−	5	25
NAST15R～NAST25R	NART15R～NART20R	−	−	10	30
NAST30R～NAST40R	NART25R～NART40R	−	−	10	40
NAST45R, NAST50R	NART45R, NART50R	−	−	15	50
−	−	NURT15R～NURT30-1R	−	20	45
−	−	NURT35R～NURT40-1R	−	25	50
−	−	NURT45R～NURT50-1R	−	30	60
−	−	−	CRY12R～CRY56R	35	60
−	−	−	CRY64R	45	70

Note(1) Also applicable to the full complement type, cylindrical outer ring type, shield type and sealed type.
(2) Also applicable to C-Lube Roller Followers.

Fit

Roller Followers are generally used under the loading conditions in which the load direction is fixed in relation to the inner ring and rotates in relation to the outer ring. The recommended fits for shafts are shown in Table 7. Those for the inch series are shown in the dimension table.

Table 7 Recommended fit (Metric series)

Type		Tolerance class of shaft
Separable Roller Followers	without inner ring	k5, k6
	with inner ring	g6, h6
Non-separable Roller Followers(1)		
Cylindrical Roller Followers		

Note(1) Also applicable to C-Lube Roller Followers.

Maximum allowable static load

The load that is applicable to Roller Followers is, in some cases, determined by the strength of the outer ring rather than by the load rating of the needle roller bearing. Therefore, the maximum allowable load that is limited by the strength of outer ring is specified.

Track Capacity

Track capacity is defined as the load that can be continuously applied on a Roller Follower placed on a steel cam guide surface without causing deformation and indentation on the cam guide surface when the outer ring of the Roller Follower makes contact with the mating cam guide surface (plane). The track capacities shown in Tables 8.1 and 8.2 are applicable when the hardness of the mating cam guide surface is 40HRC (Tensile strength 1250N/mm^2). When the hardness of the mating cam guide surface differs from 40HRC, the track capacity is obtained by multiplying the value by the track capacity factor shown in Table 9.

If lubrication between the outer ring and the mating cam guide surface is insufficient, seizure and/or wear may occur depending on the application. Therefore, pay attention to lubrication and surface roughness of the mating cam guide especially in the case of high-speed rotation such as for cam mechanisms.

Table 8.1 Track capacity (Metric series)

unit: N

Roller Followers with crowned outer ring				Roller Followers with cylindrical outer ring					
Identification number(1)			Track capacity	Identification number	Track capacity	Identification number(2)	Track capacity	Identification number	Track capacity
Separable Roller Followers	Non-separable (3) Roller Followers	Cylindrical Roller Followers							
RNAST 5R	NART 5R	—	1 040	RNAST 5	2 310	—	—	—	—
(R)NAST 6R	NART 6R	—	1 330	(R)NAST 6	3 550	NAST 6ZZ	3 550	—	—
(R)NAST 8R	NART 8R	—	1 850	(R)NAST 8	3 980	NAST 8ZZ	4 490	—	—
(R)NAST10R	NART10R	—	2 470	(R)NAST10	5 610	NAST10ZZ	6 890	—	—
(R)NAST12R	NART12R	—	2 710	(R)NAST12	5 990	NAST12ZZ	7 350	—	—
(R)NAST15R	NART15R	NURT15 R	3 060	(R)NAST15	6 550	NAST15ZZ	8 030	NURT15	11 500
—	—	NURT15-1R	3 910	—	—	—	—	NURT15-1	13 700
(R)NAST17R	NART17R	NURT17 R	3 660	(R)NAST17	10 900	NAST17ZZ	11 700	NURT17	13 600
—	—	NURT17-1R	4 530	—	—	—	—	NURT17-1	16 000
(R)NAST20R	NART20R	NURT20 R	4 530	(R)NAST20	12 800	NAST20ZZ	13 800	NURT20	20 000
—	—	NURT20-1R	5 190	—	—	—	—	NURT20-1	22 100
(R)NAST25R	NART25R	NURT25 R	5 190	(R)NAST25	14 100	NAST25ZZ	15 300	NURT25	22 100
—	—	NURT25-1R	6 580	—	—	—	—	NURT25-1	26 400
(R)NAST30R	NART30R	NURT30 R	6 580	(R)NAST30	22 100	NAST30ZZ	22 100	NURT30	31 600
—	—	NURT30-1R	8 020	—	—	—	—	NURT30-1	36 700
(R)NAST35R	NART35R	NURT35 R	8 020	(R)NAST35	25 700	NAST35ZZ	25 700	NURT35	36 700
—	—	NURT35-1R	9 220	—	—	—	—	NURT35-1	40 800
(R)NAST40R	NART40R	NURT40 R	9 220	(R)NAST40	26 900	NAST40ZZ	30 300	NURT40	44 200
—	—	NURT40-1R	10 800	—	—	—	—	NURT40-1	49 700
(R)NAST45R	NART45R	NURT45 R	9 990	(R)NAST45	28 500	NAST45ZZ	32 200	NURT45	47 000
—	—	NURT45-1R	12 400	—	—	—	—	NURT45-1	55 300
(R)NAST50R	NART50R	NURT50 R	10 800	(R)NAST50	30 200	NAST50ZZ	34 000	NURT50	49 700
—	—	NURT50-1R	14 000	—	—	—	—	NURT50-1	60 800

Notes(1) Also applicable to the full complement type, shield type, and sealed type. (3) Also applicable to C-Lube Roller Followers.
(2) Also applicable to the sealed type.

Table 8.2 Track capacity (Inch series)

unit: N

Crowned outer ring		Cylindrical outer ring	
Identification number(1)	Track capacity	Identification number(1)	Track capacity
CRY12R	853	CRY12	4 490
CRY14R	1 050	CRY14	5 240
CRY16R	1 420	CRY16	7 270
CRY18R	1 660	CRY18	7 700
CRY20R	2 160	CRY20	10 700
CRY22R	2 450	CRY22	11 800
CRY24R	3 410	CRY24	15 400
CRY26R	3 820	CRY26	16 700
CRY28R	4 210	CRY28	21 000
CRY30R	4 610	CRY30	22 500
CRY32R	5 690	CRY32	30 800
CRY36R	6 640	CRY36	34 700
CRY40R	8 970	CRY40	44 900
CRY44R	10 200	CRY44	49 400
CRY48R	11 400	CRY48	64 300
CRY52R	12 700	CRY52	69 600
CRY56R	14 100	CRY56	87 000
CRY64R	16 800	CRY64	113 000

Note(1) Also applicable to the sealed type.

Table 9 Track capacity factor

Hardness HRC	Tensile strength N/mm^2	Track capacity factor	
		Crowned outer ring	Cylindrical outer ring
20	760	0.22	0.37
25	840	0.31	0.46
30	950	0.45	0.58
35	1 080	0.65	0.75
38	1 180	0.85	0.89
40	1 250	1.00	1.00
42	1 340	1.23	1.15
44	1 435	1.52	1.32
46	1 530	1.85	1.51
48	1 635	2.27	1.73
50	1 760	2.80	1.99
52	1 880	3.46	2.29
54	2 015	4.21	2.61
56	2 150	5.13	2.97
58	2 290	6.26	3.39

Allowable Rotational Speed

The allowable rotational speed of Roller Followers is affected by mounting and operating conditions. For *dn* values with only pure radial load applied, use the maximum values in Table 10 or less as a guideline.

Under actual operating conditions, use the recommended *dn* values in Table 10 as a guideline in consideration of the effect of axial loads.

For use with oscillating rotation, use a C-Lube Roller Follower *dn* value of 8,000 or less as a guideline. For use with one-way or continuous rotation, please consult IKO.

Table 10 *dn* values of Roller Followers(1)

Type \ Lubricant	Grease		Oil	
	Maximum	Recommended	Maximum	Recommended
Caged type	84 000	8 400	140 000	14 000
Full complement type	42 000	4 200	70 000	7 000
Cylindrical Roller Follower	72 000	7 200	120 000	12 000
C-Lube Roller Followers	8 000		8 000	

Note(1) dn value $= d \times n$
where, d : Bore diameter of bearing mm
n : Rotational speed min^{-1}

Lubrication

In Sealed Type Roller Followers, Heavy Duty Type Roller Followers and Inch series Roller Followers, ALVANIA GREASE S2 (Shell Lubricants Japan K.K.) is prepacked as the lubricating grease.

For Roller Followers without prepacked grease, grease or oil should be supplied through the oil hole of the inner ring for use. If they are used without lubrication, wear of rolling contact surfaces may take place, leading to a short bearing life.

Oil Hole

Open Type Separable Roller Followers have no oil hole. Inner rings of other types of Metric series Roller Followers have an oil hole. Inch series inner rings have an oil groove and an oil hole.

Mounting

❶In case of shield and sealed types, match the side surface correctly to the mating seating surface indicated by the dimension *a* shown in the dimension table, and fix them. (See Fig. 1.)

❷When mounting Roller Followers, pay special attention to avoid locating the oil hole of the inner ring within the loading zone. This may lead to a short bearing life. (See Fig. 2.)

❸When mounting Sealed Type Separable Roller Followers, do not cause the side plates to come off. If they come off, set them again in place taking care to avoid damaging the seal lips.

❹In case of Roller Followers without an inner ring, the shaft requires heat treatment and grinding finish. The recommended surface hardness of the shaft is 58～64HRC, and the recommended roughness of the shaft is 0.2μmR_a or less.
Also, the outer ring and cage are guided by side surfaces of the mounting parts. Therefore, it is recommended that the side surfaces of the mounting parts be finished by grinding or at least by machining.(See Fig. 3.)

❺In Non-separable Roller Followers, the side plates are press-fitted. Therefore, when mounting the Roller Followers, do not push the side plates/outer rings.
Pushing on the side plates or outer rings may cause unsatisfactory product performance.

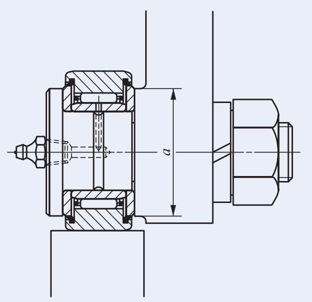


Fig. 1 Mating seating dimension "*a*"

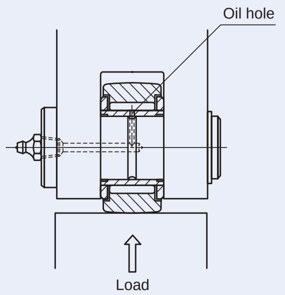


Fig. 2 Position of oil hole and load direction

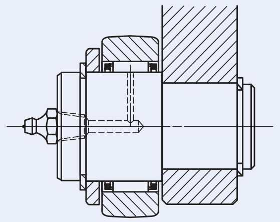
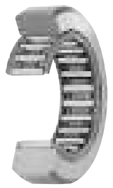
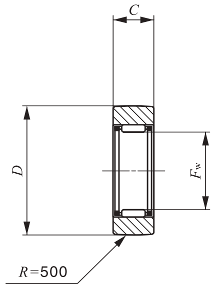


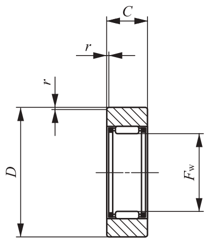
Fig. 3 Mounting example of Roller Follower without inner ring

Separable Roller Followers, Open Type With Cage/Without Inner Ring





RNAST···R



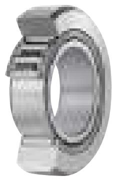
RNAST

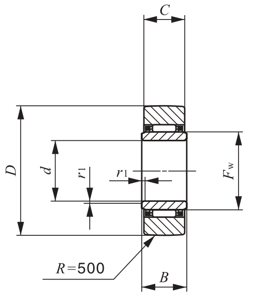
Shaft dia. 7 ─ 60mm

Shaft dia. mm	Identification number Open type Crowned outer ring	Identification number Open type Cylindrical outer ring	Mass (Ref.) g	Boundary dimensions mm F_w	D	C	$r_{s\,min}$ (1)	Basic dynamic load rating C N	Basic static load rating C_0 N
7	RNAST 5 R	RNAST 5	8.9	7	16	7.8	0.3	2 710	2 390
10	RNAST 6 R	RNAST 6	13.9	10	19	9.8	0.3	4 160	4 550
12	RNAST 8 R	RNAST 8	23.5	12	24	9.8	0.6	5 650	5 890
14	RNAST 10 R	RNAST 10	42.5	14	30	11.8	1	9 790	9 680
16	RNAST 12 R	RNAST 12	49.5	16	32	11.8	1	10 500	10 900
20	RNAST 15 R	RNAST 15	50	20	35	11.8	1	12 400	14 300
22	RNAST 17 R	RNAST 17	90	22	40	15.8	1	17 600	20 900
25	RNAST 20 R	RNAST 20	135	25	47	15.8	1	19 400	24 500
30	RNAST 25 R	RNAST 25	152	30	52	15.8	1	20 800	28 400
38	RNAST 30 R	RNAST 30	255	38	62	19.8	1	30 500	45 400
42	RNAST 35 R	RNAST 35	375	42	72	19.8	1	32 400	50 600
50	RNAST 40 R	RNAST 40	420	50	80	19.8	1.5	35 900	61 100
55	RNAST 45 R	RNAST 45	460	55	85	19.8	1.5	37 400	66 400
60	RNAST 50 R	RNAST 50	500	60	90	19.8	1.5	38 900	71 700

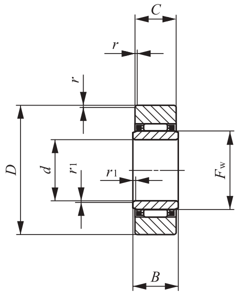
Note(1) Minimum allowable value of chamfer dimension *r*
Remarks1. No oil hole is provided.
2. Not provided with prepacked grease. Perform proper lubrication for use.

Separable Roller Followers, Open Type With Cage/With Inner Ring





NAST···R



NAST

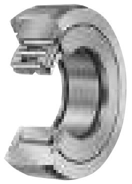
Shaft dia. 6 ─ 50mm

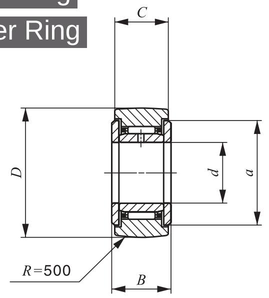
Shaft dia. mm	Identification number Open type Crowned outer ring	Identification number Open type Cylindrical outer ring	Mass (Ref.) g	Boundary dimensions mm d	D	B	C	$r_{s\,min}$ (1)	$r_{1s\,min}$ (1)	F_w	Basic dynamic load rating C N	Basic static load rating C_0 N	Assembled inner ring
6	NAST 6 R	NAST 6	17.8	6	19	10	9.8	0.3	0.3	10	4 160	4 550	LRT 61010 S
8	NAST 8 R	NAST 8	28	8	24	10	9.8	0.6	0.3	12	5 650	5 890	LRT 81210 S
10	NAST 10 R	NAST 10	49.5	10	30	12	11.8	1	0.3	14	9 790	9 680	LRT 101412 S
12	NAST 12 R	NAST 12	58	12	32	12	11.8	1	0.3	16	10 500	10 900	LRT 121612 S
15	NAST 15 R	NAST 15	62	15	35	12	11.8	1	0.3	20	12 400	14 300	LRT 152012 S
17	NAST 17 R	NAST 17	109	17	40	16	15.8	1	0.3	22	17 600	20 900	LRT 172216 S
20	NAST 20 R	NAST 20	157	20	47	16	15.8	1	0.3	25	19 400	24 500	LRT 202516 S
25	NAST 25 R	NAST 25	180	25	52	16	15.8	1	0.3	30	20 800	28 400	LRT 253016 S
30	NAST 30 R	NAST 30	320	30	62	20	19.8	1	0.6	38	30 500	45 400	LRT 303820 S
35	NAST 35 R	NAST 35	440	35	72	20	19.8	1	0.6	42	32 400	50 600	LRT 354220 S
40	NAST 40 R	NAST 40	530	40	80	20	19.8	1.5	1	50	35 900	61 100	LRT 405020 S
45	NAST 45 R	NAST 45	580	45	85	20	19.8	1.5	1	55	37 400	66 400	LRT 455520 S
50	NAST 50 R	NAST 50	635	50	90	20	19.8	1.5	1	60	38 900	71 700	LRT 506020 S

Note(1) Minimum allowable value of chamfer dimension *r* or r_1
Remarks1. No oil hole is provided.
2. Not provided with prepacked grease. Perform proper lubrication for use.

ROLLER FOLLOWERS

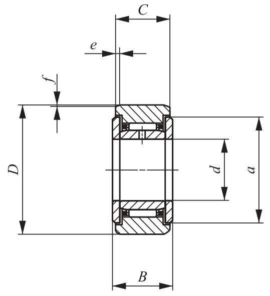
Separable Roller Followers, Shield Type With Cage/With Inner Ring
Separable Roller Followers, Sealed Type With Cage/With Inner Ring



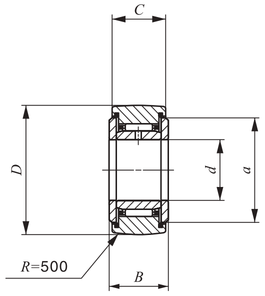


Shaft dia. 6 ─ 50mm

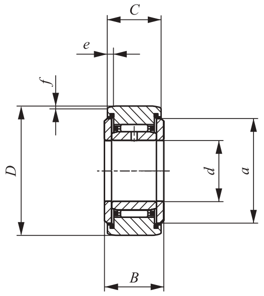
NAST ··· ZZR



NAST ··· ZZ



NAST ··· ZZUUR



NAST ··· ZZUU

Shaft dia. mm	Identification number				Mass (Ref.) g	Boundary dimensions mm							Basic dynamic load rating C N	Basic static load rating C_0 N
	Shield type		Sealed type											
	Crowned outer ring	Cylindrical outer ring	Crowned outer ring	Cylindrical outer ring		d	D	B	C	a	e	f		
6	**NAST 6 ZZR**	**NAST 6 ZZ**	**NAST 6 ZZUUR**	**NAST 6 ZZUU**	24.5	6	19	14	13.8	14	2.5	0.8	4 160	4 550
8	**NAST 8 ZZR**	**NAST 8 ZZ**	**NAST 8 ZZUUR**	**NAST 8 ZZUU**	39	8	24	14	13.8	17.5	2.5	0.8	5 650	5 890
10	**NAST 10 ZZR**	**NAST 10 ZZ**	**NAST 10 ZZUUR**	**NAST 10 ZZUU**	65	10	30	16	15.8	23.5	2.5	0.8	9 790	9 680
12	**NAST 12 ZZR**	**NAST 12 ZZ**	**NAST 12 ZZUUR**	**NAST 12 ZZUU**	75	12	32	16	15.8	25.5	2.5	0.8	10 500	10 900
15	**NAST 15 ZZR**	**NAST 15 ZZ**	**NAST 15 ZZUUR**	**NAST 15 ZZUU**	83	15	35	16	15.8	29	2.5	0.8	12 400	14 300
17	**NAST 17 ZZR**	**NAST 17 ZZ**	**NAST 17 ZZUUR**	**NAST 17 ZZUU**	135	17	40	20	19.8	32.5	3	1	17 600	20 900
20	**NAST 20 ZZR**	**NAST 20 ZZ**	**NAST 20 ZZUUR**	**NAST 20 ZZUU**	195	20	47	20	19.8	38	3	1	19 400	24 500
25	**NAST 25 ZZR**	**NAST 25 ZZ**	**NAST 25 ZZUUR**	**NAST 25 ZZUU**	225	25	52	20	19.8	43	3	1	20 800	28 400
30	**NAST 30 ZZR**	**NAST 30 ZZ**	**NAST 30 ZZUUR**	**NAST 30 ZZUU**	400	30	62	25	24.8	50.5	4	1.2	30 500	45 400
35	**NAST 35 ZZR**	**NAST 35 ZZ**	**NAST 35 ZZUUR**	**NAST 35 ZZUU**	550	35	72	25	24.8	53.5	4	1.2	32 400	50 600
40	**NAST 40 ZZR**	**NAST 40 ZZ**	**NAST 40 ZZUUR**	**NAST 40 ZZUU**	710	40	80	26	25.8	61.5	4	1.2	35 900	61 100
45	**NAST 45 ZZR**	**NAST 45 ZZ**	**NAST 45 ZZUUR**	**NAST 45 ZZUU**	760	45	85	26	25.8	66.5	4	1.2	37 400	66 400
50	**NAST 50 ZZR**	**NAST 50 ZZ**	**NAST 50 ZZUUR**	**NAST 50 ZZUU**	830	50	90	26	25.8	76	4	1.2	38 900	71 700

Remarks1. The inner ring has an oil hole.
2. The sealed type is provided with prepacked grease. The shield type is not provided with prepacked grease. Perform proper lubrication for use.

I
NAST
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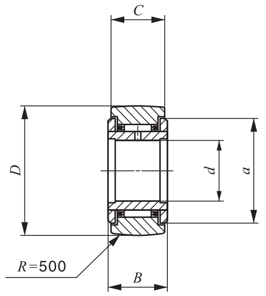
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

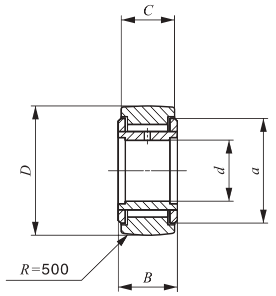
ROLLER FOLLOWERS

Non-separable Roller Followers · **With Cage/With Inner Ring**
High carbon steel made **Full Complement Type/With Inner Ring**

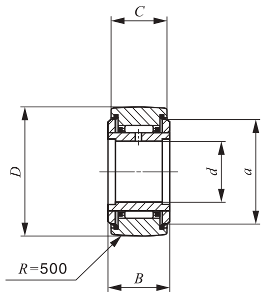
Shaft dia. 5 – 40mm



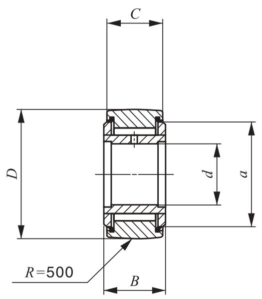
NART ··· R



NART ··· VR



NART ··· UUR



NART ··· VUUR

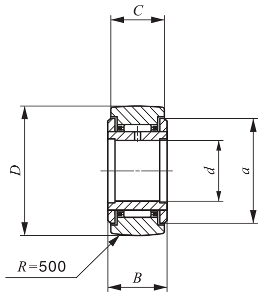
Shaft dia. mm	Identification number: Shield type, Crowned outer ring, With cage	Full complement	Sealed type, Crowned outer ring, With cage	Full complement	Mass (Ref.) g	Boundary dimensions mm d	D	B	C	a	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
5	NART 5 R	—	NART 5 UUR	—	14.5	5	16	12	11	12	3 650	3 680	3 680
	—	NART 5 VR	—	NART 5 VUUR	15.1	5	16	12	11	12	6 810	8 370	7 310
6	NART 6 R	—	NART 6 UUR	—	20.5	6	19	12	11	14	4 250	4 740	4 740
	—	NART 6 VR	—	NART 6 VUUR	21.5	6	19	12	11	14	7 690	10 300	10 300
8	NART 8 R	—	NART 8 UUR	—	41.5	8	24	15	14	17.5	5 640	5 900	5 900
	—	NART 8 VR	—	NART 8 VUUR	42.5	8	24	15	14	17.5	11 800	15 600	15 600
10	NART 10 R	—	NART 10 UUR	—	64.5	10	30	15	14	23.5	8 030	7 540	7 540
	—	NART 10 VR	—	NART 10 VUUR	66.5	10	30	15	14	23.5	15 600	18 100	17 500
12	NART 12 R	—	NART 12 UUR	—	71	12	32	15	14	25.5	8 580	8 470	8 470
	—	NART 12 VR	—	NART 12 VUUR	73	12	32	15	14	25.5	16 800	20 500	18 600
15	NART 15 R	—	NART 15 UUR	—	102	15	35	19	18	29	13 700	16 400	16 400
	—	NART 15 VR	—	NART 15 VUUR	106	15	35	19	18	29	25 200	36 400	24 000
17	NART 17 R	—	NART 17 UUR	—	149	17	40	21	20	32.5	17 600	21 000	21 000
	—	NART 17 VR	—	NART 17 VUUR	155	17	40	21	20	32.5	32 000	46 300	33 100
20	NART 20 R	—	NART 20 UUR	—	250	20	47	25	24	38	23 000	30 700	30 700
	—	NART 20 VR	—	NART 20 VUUR	255	20	47	25	24	38	41 600	67 300	67 300
25	NART 25 R	—	NART 25 UUR	—	285	25	52	25	24	43	24 700	35 400	35 400
	—	NART 25 VR	—	NART 25 VUUR	295	25	52	25	24	43	45 500	79 100	79 100
30	NART 30 R	—	NART 30 UUR	—	470	30	62	29	28	50.5	33 600	51 400	51 400
	—	NART 30 VR	—	NART 30 VUUR	485	30	62	29	28	50.5	59 900	110 000	92 500
35	NART 35 R	—	NART 35 UUR	—	640	35	72	29	28	53.5	35 700	57 400	57 400
	—	NART 35 VR	—	NART 35 VUUR	655	35	72	29	28	53.5	63 100	121 000	121 000
40	NART 40 R	—	NART 40 UUR	—	845	40	80	32	30	61.5	44 900	81 500	81 500
	—	NART 40 VR	—	NART 40 VUUR	865	40	80	32	30	61.5	76 300	164 000	164 000

Remarks1. The inner ring has an oil hole.
2. The sealed type is provided with prepacked grease. The shield type is not provided with prepacked grease. Perform proper lubrication for use.

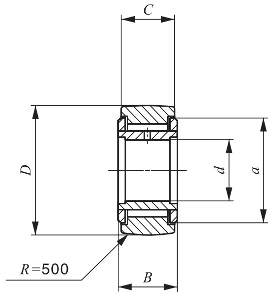
ROLLER FOLLOWERS

Non-separable Roller Followers · **With Cage/With Inner Ring**

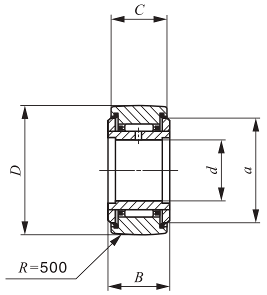
High carbon steel made **Full Complement Type/With Inner Ring**



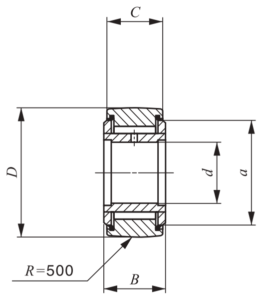
NART ··· R



NART ··· VR



NART ··· UUR



NART ··· VUUR

Shaft dia. 45 ─ 50mm

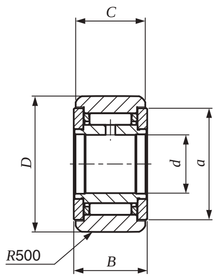
Shaft dia. mm	Identification number				Mass (Ref.) g	Boundary dimensions mm					Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
	Shield type Crowned outer ring		Sealed type Crowned outer ring										
	With cage	Full complement	With cage	Full complement		d	D	B	C	a			
45	**NART 45 R**	—	**NART 45 UUR**	—	915	45	85	32	30	66.5	46 800	88 600	88 600
	—	**NART 45 VR**	—	**NART 45 VUUR**	935	45	85	32	30	66.5	80 300	181 000	181 000
50	**NART 50 R**	—	**NART 50 UUR**	—	980	50	90	32	30	76	48 600	95 600	95 600
	—	**NART 50 VR**	—	**NART 50 VUUR**	1 010	50	90	32	30	76	84 300	198 000	198 000

Remarks1. The inner ring has an oil hole.

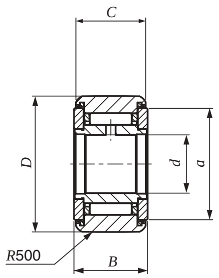
2. The sealed type is provided with prepacked grease. The shield type is not provided with prepacked grease. Perform proper lubrication for use.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Non-separable Roller Followers · Stainless Steel Made With Cage/With Inner Ring



NART ··· FR



NART ··· FUUR

Shaft dia. 5 – 30mm

Shaft dia. mm	Identification number		Mass (Ref.)	Boundary dimensions mm					Basic dynamic load rating	Basic static load rating	Maximum allowable static load
	Shield type	Sealed type	g	d	D	B	C	a	C N	C_0 N	N
5	**NART 5 FR**	**NART 5 FUUR**	13	5	16	12	11	12	2 930	2 920	2 920
6	**NART 6 FR**	**NART 6 FUUR**	19	6	19	12	11	14	3 400	3 790	3 790
8	**NART 8 FR**	**NART 8 FUUR**	39	8	24	15	14	17.5	4 340	5 510	5 510
10	**NART 10 FR**	**NART 10 FUUR**	61	10	30	15	14	22.5	6 330	7 830	7 830
12	**NART 12 FR**	**NART 12 FUUR**	67	12	32	15	14	25.5	6 510	8 400	8 400
15	**NART 15 FR**	**NART 15 FUUR**	99	15	35	19	18	27.5	9 620	14 700	14 700
17	**NART 17 FR**	**NART 17 FUUR**	146	17	40	21	20	31	11 800	20 200	20 200
20	**NART 20 FR**	**NART 20 FUUR**	241	20	47	25	24	36.5	16 500	27 700	27 700
25	**NART 25 FR**	**NART 25 FUUR**	269	25	52	25	24	43	19 800	28 300	28 300
30	**NART 30 FR**	**NART 30 FUUR**	447	30	62	29	28	50	26 900	41 200	41 200

Remarks1. The inner ring has an oil hole.
2. The sealed type is provided with prepacked grease. The shield type is not provided with prepacked grease. Perform proper lubrication for use.

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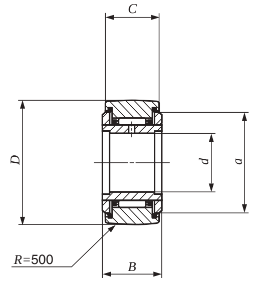
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

C-Lube Roller Followers With Cage/With Inner Ring



NART ⋯ UUR/SG

Shaft dia. 5 – 20mm

Shaft dia. mm	Identification number Sealed type	Mass (Ref.) g	Boundary dimensions mm *d*	*D*	*B*	*C*	*a*	Basic dynamic load rating *C* N	Basic static load rating C_0 N	Maximum allowable static load N
5	**NART 5 UUR / SG**	14.5	5	16	12	11	12	3 650	3 680	3 680
6	**NART 6 UUR / SG**	20.5	6	19	12	11	14	4 250	4 740	4 740
8	**NART 8 UUR / SG**	41.5	8	24	15	14	17.5	5 640	5 900	5 900
10	**NART 10 UUR / SG**	64.5	10	30	15	14	23.5	8 030	7 540	7 540
12	**NART 12 UUR / SG**	71	12	32	15	14	25.5	8 580	8 470	8 470
15	**NART 15 UUR / SG**	102	15	35	19	18	29	13 700	16 400	16 400
17	**NART 17 UUR / SG**	149	17	40	21	20	32.5	17 600	21 000	21 000
20	**NART 20 UUR / SG**	250	20	47	25	24	38	23 000	30 700	30 700

Remark　This bearing cannot be re-lubricated as thermosetting solid-type lubricant C-Lube fills its inner space.

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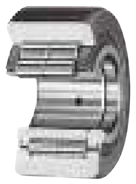
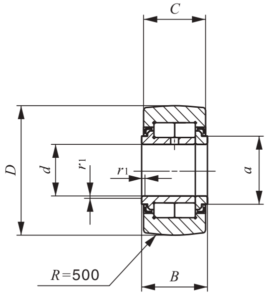
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

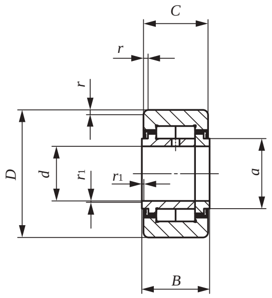
ROLLER FOLLOWERS

Cylindrical Roller Followers Full Complement Type/With Inner Ring





NURT ··· R



NURT

Shaft dia. 15 – 50mm

Shaft dia. mm	Identification number		Mass (Ref.) g	Boundary dimensions mm							Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
	Crowned outer ring	Cylindrical outer ring		d	D	B	C	a	$r_{s\,min}$(1)	$r_{1s\,min}$(1)			
15	**NURT 15 R**	**NURT 15**	100	15	35	19	18	20	0.6	0.3	23 400	27 300	11 800
	NURT 15-1 R	**NURT 15-1**	160	15	42	19	18	20	0.6	0.3	23 400	27 300	27 300
17	**NURT 17 R**	**NURT 17**	147	17	40	21	20	22	1	0.3	25 200	30 900	20 300
	NURT 17-1 R	**NURT 17-1**	222	17	47	21	20	22	1	0.3	25 200	30 900	30 900
20	**NURT 20 R**	**NURT 20**	245	20	47	25	24	27	1	0.3	38 900	49 000	27 200
	NURT 20-1 R	**NURT 20-1**	321	20	52	25	24	27	1	0.3	38 900	49 000	49 000
25	**NURT 25 R**	**NURT 25**	281	25	52	25	24	31	1	0.3	43 100	58 100	30 000
	NURT 25-1 R	**NURT 25-1**	450	25	62	25	24	31	1	0.3	43 100	58 100	58 100
30	**NURT 30 R**	**NURT 30**	466	30	62	29	28	38	1	0.3	58 200	75 300	35 200
	NURT 30-1 R	**NURT 30-1**	697	30	72	29	28	38	1	0.3	58 200	75 300	75 300
35	**NURT 35 R**	**NURT 35**	630	35	72	29	28	44	1	0.6	63 900	88 800	57 000
	NURT 35-1 R	**NURT 35-1**	840	35	80	29	28	44	1	0.6	63 900	88 800	88 800
40	**NURT 40 R**	**NURT 40**	817	40	80	32	30	49	1	0.6	86 500	122 000	75 300
	NURT 40-1 R	**NURT 40-1**	1 130	40	90	32	30	49	1	0.6	86 500	122 000	122 000
45	**NURT 45 R**	**NURT 45**	883	45	85	32	30	53	1	0.6	91 500	135 000	78 700
	NURT 45-1 R	**NURT 45-1**	1 400	45	100	32	30	53	1	0.6	91 500	135 000	135 000
50	**NURT 50 R**	**NURT 50**	950	50	90	32	30	58	1	0.6	96 300	148 000	82 100
	NURT 50-1 R	**NURT 50-1**	1 690	50	110	32	30	58	1	0.6	96 300	148 000	148 000

Note(1) Minimum allowable value of chamfer dimension r or r_1

Remarks1. The inner ring has an oil hole.

2. Provided with prepacked grease.

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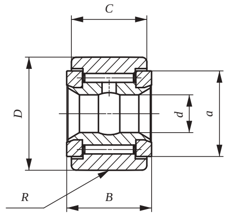
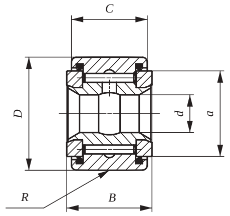
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

ROLLER FOLLOWERS

Non-separable Roller Followers, Inch Series Full Complement Type / With Inner Ring



CRY…VR



CRY…VUUR

Shaft dia. 6.350 – 31.750mm

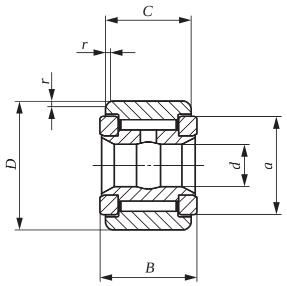
Shaft dia. mm (inch)	Identification number		Mass (Ref.) g	Boundary dimensions mm(inch)						Shaft dia. mm						Basic dynamic load rating *C* N	Basic static load rating *C*₀ N
	Shield type Crowner outer ring	Sealed type Crowned outer ring		*d*	*D*	*B*	*C*	*a*	*R*	Push fit		Drive fit		Press fit			
										Min.	Max.	Min.	Max.	Min.	Max.		
6.350 (1/4)	**CRY 12 VR**	**CRY 12 VUUR**	24	6.350 (1/4)	19.050 (3/4)	14.288(0.5625)	12.700 (1/2)	14.4(0.567)	250 (10)	6.332	6.342	6.348	6.358	6.353	6.363	8 710	12 300
	CRY 14 VR	**CRY 14 VUUR**	34	6.350 (1/4)	22.225 (7/8)	14.288(0.5625)	12.700 (1/2)	14.4(0.567)	250 (10)	6.332	6.342	6.348	6.358	6.353	6.363	8 710	12 300
7.938 (5/16)	**CRY 16 VR**	**CRY 16 VUUR**	56	7.938 (5/16)	25.400 (1)	17.463(0.6875)	15.875 (5/8)	19.6(0.772)	300 (12)	7.920	7.930	7.935	7.945	7.940	7.950	13 100	22 700
	CRY 18 VR	**CRY 18 VUUR**	72	7.938 (5/16)	28.575 (1 1/8)	17.463(0.6875)	15.875 (5/8)	19.6(0.772)	300 (12)	7.920	7.930	7.935	7.945	7.940	7.950	13 100	22 700
9.525 (3/8)	**CRY 20 VR**	**CRY 20 VUUR**	103	9.525 (3/8)	31.750 (1 1/4)	20.638(0.8125)	19.050 (3/4)	25.0(0.984)	360 (14)	9.507	9.517	9.523	9.533	9.528	9.538	23 600	31 700
	CRY 22 VR	**CRY 22 VUUR**	128	9.525 (3/8)	34.925 (1 3/8)	20.638(0.8125)	19.050 (3/4)	25.0(0.984)	360 (14)	9.507	9.517	9.523	9.533	9.528	9.538	23 600	31 700
11.112 (7/16)	**CRY 24 VR**	**CRY 24 VUUR**	176	11.112 (7/16)	38.100 (1 1/2)	23.813(0.9375)	22.225 (7/8)	28.8(1.134)	500 (20)	11.095	11.105	11.110	11.120	11.115	11.125	28 200	40 100
	CRY 26 VR	**CRY 26 VUUR**	210	11.112 (7/16)	41.275 (1 5/8)	23.813(0.9375)	22.225 (7/8)	28.8(1.134)	500 (20)	11.095	11.105	11.110	11.120	11.115	11.125	28 200	40 100
12.700 (1/2)	**CRY 28 VR**	**CRY 28 VUUR**	276	12.700 (1/2)	44.450 (1 3/4)	26.988(1.0625)	25.400 (1)	32.7(1.287)	500 (20)	12.682	12.692	12.698	12.708	12.708	12.718	35 300	55 600
	CRY 30 VR	**CRY 30 VUUR**	321	12.700 (1/2)	47.625 (1 7/8)	26.988(1.0625)	25.400 (1)	32.7(1.287)	500 (20)	12.682	12.692	12.698	12.708	12.708	12.718	35 300	55 600
15.875 (5/8)	**CRY 32 VR**	**CRY 32 VUUR**	442	15.875 (5/8)	50.800 (2)	33.338(1.3125)	31.750 (1 1/4)	36.0(1.417)	600 (24)	15.857	15.867	15.873	15.883	15.883	15.893	45 700	80 600
	CRY 36 VR	**CRY 36 VUUR**	575	15.875 (5/8)	57.150 (2 1/4)	33.338(1.3125)	31.750 (1 1/4)	36.0(1.417)	600 (24)	15.857	15.867	15.873	15.883	15.883	15.893	45 700	80 600
19.050 (3/4)	**CRY 40 VR**	**CRY 40 VUUR**	835	19.050 (3/4)	63.500 (2 1/2)	39.688(1.5625)	38.100 (1 1/2)	43.3(1.705)	760 (30)	19.032	19.042	19.048	19.058	19.058	19.068	61 400	116 000
	CRY 44 VR	**CRY 44 VUUR**	1 031	19.050 (3/4)	69.850 (2 3/4)	39.688(1.5625)	38.100 (1 1/2)	43.3(1.705)	760 (30)	19.032	19.042	19.048	19.058	19.058	19.068	61 400	116 000
25.400 (1)	**CRY 48 VR**	**CRY 48 VUUR**	1 370	25.400 (1)	76.200 (3)	46.038(1.8125)	44.450 (1 3/4)	54.0(2.125)	760 (30)	25.377	25.390	25.397	25.410	25.408	25.420	77 600	172 000
	CRY 52 VR	**CRY 52 VUUR**	1 640	25.400 (1)	82.550 (3 1/4)	46.038(1.8125)	44.450 (1 3/4)	54.0(2.125)	760 (30)	25.377	25.390	25.397	25.410	25.408	25.420	77 600	172 000
28.575 (1 1/8)	**CRY 56 VR**	**CRY 56 VUUR**	2 160	28.575 (1 1/8)	88.900 (3 1/2)	52.388(2.0625)	50.800 (2)	61.9(2.437)	760 (30)	28.522	28.565	28.572	28.585	28.583	28.595	111 000	239 000
31.750 (1 1/4)	**CRY 64 VR**	**CRY 64 VUUR**	3 190	31.750 (1 1/4)	101.600 (4)	58.738(2.3125)	57.150 (2 1/4)	71.0(2.797)	760 (30)	31.727	31.740	31.747	31.760	31.758	31.770	142 000	317 000

Remarks1. The inner ring has an oil groove and an oil hole.
2. Provided with prepacked grease.

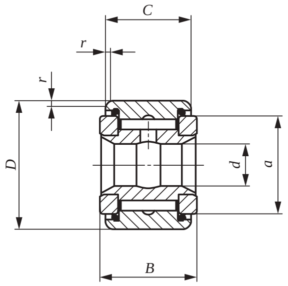
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

ROLLER FOLLOWERS

Non-separable Roller Followers, Inch Series Full Complement Type /With Inner Ring



CRY…V



CRY…VUU

Shaft dia. 6.350 ─ 31.750mm

Shaft dia. mm (inch)	Identification number: Shield type Cylindrical outer ring	Identification number: Sealed type Cylindrical outer ring	Mass (Ref.) g	Boundary dimensions mm(inch): *d*	*D*	*B*	*C*	*a*	*r*	Shaft dia. mm: Push fit Min.	Push fit Max.	Drive fit Min.	Drive fit Max.	Press fit Min.	Press fit Max.	Basic dynamic load rating *C* N	Basic static load rating C_0 N
6.350 (1/4)	**CRY 12 V**	**CRY 12 VUU**	24	6.350 (1/4)	19.050 (3/4)	14.288(0.5625)	12.700 (1/2)	14.4(0.567)	0.794 (1/32)	6.332	6.342	6.348	6.358	6.353	6.363	8 710	12 300
	CRY 14 V	**CRY 14 VUU**	34	6.350 (1/4)	22.225 (7/8)	14.288(0.5625)	12.700 (1/2)	14.4(0.567)	0.794 (1/32)	6.332	6.342	6.348	6.358	6.353	6.363	8 710	12 300
7.938 (5/16)	**CRY 16 V**	**CRY 16 VUU**	56	7.938 (5/16)	25.400 (1)	17.463(0.6875)	15.875 (5/8)	19.6(0.772)	1.191 (3/64)	7.920	7.930	7.935	7.945	7.940	7.950	13 100	22 700
	CRY 18 V	**CRY 18 VUU**	72	7.938 (5/16)	28.575 (1 1/8)	17.463(0.6875)	15.875 (5/8)	19.6(0.772)	1.588 (1/16)	7.920	7.930	7.935	7.945	7.940	7.950	13 100	22 700
9.525 (3/8)	**CRY 20 V**	**CRY 20 VUU**	103	9.525 (3/8)	31.750 (1 1/4)	20.638(0.8125)	19.050 (3/4)	25.0(0.984)	1.588 (1/16)	9.507	9.517	9.523	9.533	9.528	9.538	23 600	31 700
	CRY 22 V	**CRY 22 VUU**	128	9.525 (3/8)	34.925 (1 3/8)	20.638(0.8125)	19.050 (3/4)	25.0(0.984)	1.588 (1/16)	9.507	9.517	9.523	9.533	9.528	9.538	23 600	31 700
11.112 (7/16)	**CRY 24 V**	**CRY 24 VUU**	176	11.112 (7/16)	38.100 (1 1/2)	23.813(0.9375)	22.225 (7/8)	28.8(1.134)	1.588 (1/16)	11.095	11.105	11.110	11.120	11.115	11.125	28 200	40 100
	CRY 26 V	**CRY 26 VUU**	210	11.112 (7/16)	41.275 (1 5/8)	23.813(0.9375)	22.225 (7/8)	28.8(1.134)	1.588 (1/16)	11.095	11.105	11.110	11.120	11.115	11.125	28 200	40 100
12.700 (1/2)	**CRY 28 V**	**CRY 28 VUU**	276	12.700 (1/2)	44.450 (1 3/4)	26.988(1.0625)	25.400 (1)	32.7(1.287)	1.588 (1/16)	12.682	12.692	12.698	12.708	12.708	12.718	35 300	55 600
	CRY 30 V	**CRY 30 VUU**	321	12.700 (1/2)	47.625 (1 7/8)	26.988(1.0625)	25.400 (1)	32.7(1.287)	1.588 (1/16)	12.682	12.692	12.698	12.708	12.708	12.718	35 300	55 600
15.875 (5/8)	**CRY 32 V**	**CRY 32 VUU**	442	15.875 (5/8)	50.800 (2)	33.338(1.3125)	31.750 (1 1/4)	36.0(1.417)	1.588 (1/16)	15.857	15.867	15.873	15.883	15.883	15.893	45 700	80 600
	CRY 36 V	**CRY 36 VUU**	575	15.875 (5/8)	57.150 (2 1/4)	33.338(1.3125)	31.750 (1 1/4)	36.0(1.417)	1.588 (1/16)	15.857	15.867	15.873	15.883	15.883	15.893	45 700	80 600
19.050 (3/4)	**CRY 40 V**	**CRY 40 VUU**	835	19.050 (3/4)	63.500 (2 1/2)	39.688(1.5625)	38.100 (1 1/2)	43.3(1.705)	2.381 (3/32)	19.032	19.042	19.048	19.058	19.058	19.068	61 400	116 000
	CRY 44 V	**CRY 44 VUU**	1 031	19.050 (3/4)	69.850 (2 3/4)	39.688(1.5625)	38.100 (1 1/2)	43.3(1.705)	2.381 (3/32)	19.032	19.042	19.048	19.058	19.058	19.068	61 400	116 000
25.400 (1)	**CRY 48 V**	**CRY 48 VUU**	1 370	25.400 (1)	76.200 (3)	46.038(1.8125)	44.450 (1 3/4)	54.0(2.125)	2.381 (3/32)	25.377	25.390	25.397	25.410	25.408	25.420	77 600	172 000
	CRY 52 V	**CRY 52 VUU**	1 640	25.400 (1)	82.550 (3 1/4)	46.038(1.8125)	44.450 (1 3/4)	54.0(2.125)	2.381 (3/32)	25.377	25.390	25.397	25.410	25.408	25.420	77 600	172 000
28.575 (1 1/8)	**CRY 56 V**	**CRY 56 VUU**	2 160	28.575 (1 1/8)	88.900 (3 1/2)	52.388(2.0625)	50.800 (2)	61.9(2.437)	2.381 (3/32)	28.522	28.565	28.572	28.585	28.583	28.595	111 000	239 000
31.750 (1 1/4)	**CRY 64 V**	**CRY 64 VUU**	3 190	31.750 (1 1/4)	101.600 (4)	58.738(2.3125)	57.150 (2 1/4)	71.0(2.797)	2.381 (3/32)	31.727	31.740	31.747	31.760	31.758	31.770	142 000	317 000

Remarks1. The inner ring has an oil groove and an oil hole.
2. Provided with prepacked grease.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

CROSSED ROLLER BEARINGS

- ●High Rigidity Type Crossed Roller Bearings V
- ●Mounting Holed Type High Rigidity Crossed Roller Bearings V
- ●Standard Type Crossed Roller Bearings
- ●Super Slim Type Crossed Roller Bearings
- ●Mounting Holed Type Super Slim Crossed Roller Bearings
- ●Slim Type Crossed Roller Bearings

Structure and Features

IKO Crossed Roller Bearings are compact bearings with their rollers alternately crossed at right angles to each other between inner and outer rings. They can take loads from any directions at the same time such as radial, thrust and moment loads. The rollers make line-contact with raceway surfaces, and, therefore, elastic deformation due to bearing loads is very small.

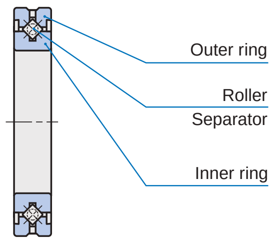
These bearings are widely used in the rotating parts of industrial robots, machine tools, medical equipment, etc., which require compactness, high rigidity and high rotational accuracy.

In addition, bearings made of stainless steel or those with inner and outer rings provided with mounting holes are also available on request. Please contact IKO.

Structure of Crossed Roller Bearings

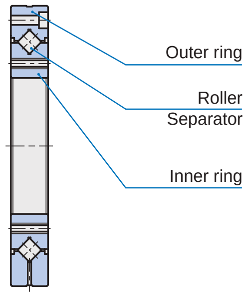
High Rigidity Type Crossed Roller Bearings V

CRBHV⋯A



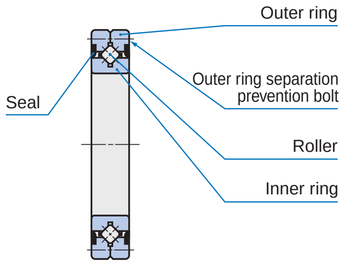
Mounting Holed Type High Rigidity Crossed Roller Bearings V

CRBFV⋯A



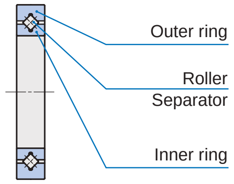
Standard Type Crossed Roller Bearings

CRB⋯UU



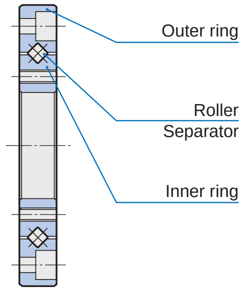
Super Slim Type Crossed Roller Bearings

CRBT⋯A



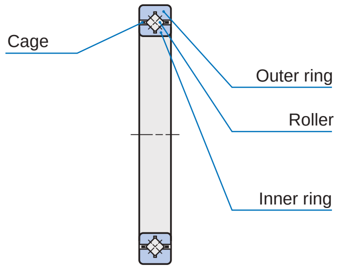
Mounting Holed Type Super Slim Crossed Roller Bearings

CRBTF⋯A



Slim Type Crossed Roller Bearings

CRBS



J
CRBHV
CRBFV
CRB(C)
CRBT
CRBTF
CRBS

Types

Crossed Roller Bearings are available in the types shown in Table 1.

Table 1 Crossed Roller Bearing Type

Type		With Cage	With Separator	Full Complement
High Rigidity Type Crossed Roller Bearings CRBHV	Open type	—	CRBHV···A	—
	Sealed type	—	CRBHV···AUU	—
Mounting Holed Type High Rigidity Crossed Roller Bearings V CRBFV	Open type	—	CRBFV ···A	—
	Sealed type	—	CRBFV ···AUU	—
Standard Type Crossed Roller Bearings CRBC, CRB	Open type	CRBC	—	CRB
	Sealed type	CRBC···UU	—	CRB··· UU
Super Slim Type Crossed Roller Bearings CRBT	Open type	—	CRBT ···A	—
Mounting Holed Type Super Slim Crossed Roller Bearings CRBTF	Open type	—	CRBTF ···A	—
Slim Type Crossed Roller Bearings CRBS	Open type	CRBS	—	CRBS···V
	Sealed type	—	CRBS ···AUU	CRBS···VUU

High Rigidity Type Crossed Roller Bearings V

Both inner and outer rings have a solid one-piece construction. Therefore, high accuracy and high rigidity are achieved, and mounting errors can be minimized. As separators are incorporated between the cylindrical rollers for smooth rotation, these bearings are suitable for applications where rotational speed is comparatively high.

Mounting Holed Type High Rigidity Crossed Roller Bearings

Mounting holes are prepared on outer ring and inner ring providing easy mounting together with high rigidity and high accuracy.

Standard Type Crossed Roller Bearings

The outer ring is made of two split pieces, which are bolted together to prevent separation during transportation or mounting. So, handling is easy.

Super Slim Type Crossed Roller Bearings

This Type is extremely compact bearing having 5.5mm of sectional height and 5mm of width. Separators are incorporated between Cylindrical rollers for smooth rotation. These compactness, lightness and smoothness contribute downsizing of the machine and saving driving power.

Mounting Holed Type Super Slim Crossed Roller Bearings

These bearings are extremely compact and lightweight at a width of just 5 mm, with both outer and inner rings integrated (non-separable), and mounting holes in the rings for easy mounting to equipment.

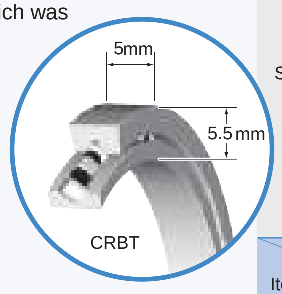
Slim Type Crossed Roller Bearings

These bearings are slim bearings having a small outside diameter, in comparison with the bore diameter, and a narrow width. The type with cage and the type with separator provide smooth rotation and are suitable for applications where rotational speed is comparatively high.

Features of Super Slim Type Crossed Roller Bearing CRBT

The world's thinnest roller type!
Very low cross sectional height of 5.5 mm

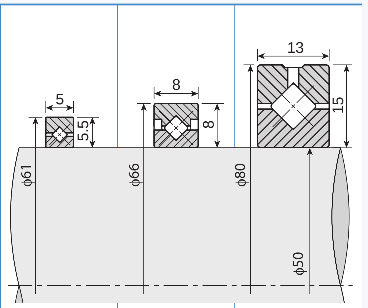
The cross sectional height is reduced by 69% in comparison with CRBS, which was the thinnest before (bearing bore diameter 50 mm). The width is also as small as 5 mm and the cross sectional area is reduced by 43% in comparison with conventional products.



Significant weight saving by 38% in comparison with conventional types was realized

Weight reduction is thoroughly pursued. The mass ratio is 0.38 and significant weight saving was realized in comparison with conventional slim type CRBS (bearing bore diameter 50 mm).

■Comparison of bearing bore diameter 50 mm

Series / Item		Super Slim CRBT505A	Slim CRBS508	High rigidity CRBHV5013A
Sectional shape				
Outer diameter	mm	61	66	80
Width	mm	5	8	13
Sectional height	mm	5.5	8	15
C	N	2280	4900	17300
C_0	N	3200	6170	20900
Mass	g	32.3	84	290
Compared with CRBHV		0.11	0.29	1.00
Compared with CRBS		0.38	1.00	3.45

Features of Mounting Holed Type Crossed Roller Bearings CRBFV, CRBTF

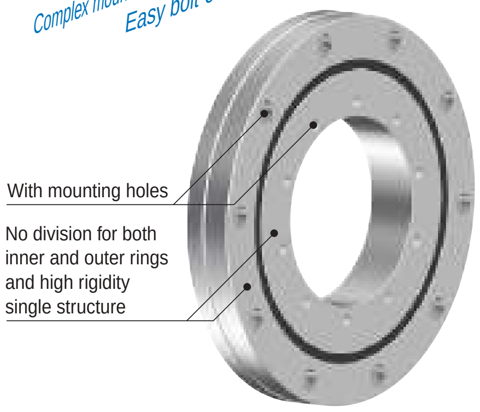
High rigidity and high accuracy

The single structure to reduce the mounting errors is adopted for both inner and outer rings. Further, mounting holes for direct fixing on mating mounting surface are available. So high rigidity and high accuracy guide can be easily realized, being less subject to the structure of the housing and the accuracy.

Contributing to miniaturization

It can be easily mounted to a device with bolts without need for housing and fixing plate, so surrounding parts of the bearing can be made compact.
Further, it allows for reduction of the number of parts and assembly processes, which contributes to miniaturization and weight saving of devices.

Complex mounting structure is not required
Easy bolt-on installation



Single structure for both inner and outer rings!

Mounting Holed Type High Rigidity Crossed Roller Bearing V
Mounting Holed Type Super Slim Crossed Roller Bearings

CRBFV, CRBTF

LCL Crossed Roller Bearings

Neither grease nor oil

World's first Liquid Crystal Lubricant

Liquid Crystal Lubricants are completely different from greases composed of base oils and thickeners. **These are composed only of liquid crystal compounds, forming a new type of lubricant never seen before.** Conventional grease base oils lubricate using dissimilar molecules, causing difficulties with adhesion to metal surfaces and evaporation. Liquid Crystal Lubricant forms molecular aggregates, improving adhesion to metal surfaces and minimizing evaporation. The Liquid Crystal Lubricant used in LCL Crossed Roller Bearings is the world's first Liquid Crystal Lubricant for bearings, achieving excellent lubrication functionality even under high contact pressure during rolling contact and succeeding in creating revolutionary new functions.

Features of LCL Crossed Roller Bearings

Superior load durability

Long-term durability exceeds 7 times that of fluorine grease at room temperature and atmospheric pressure.

Excellent outgas properties

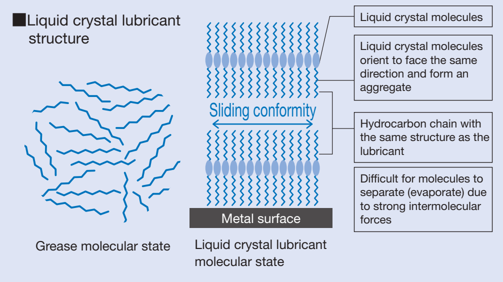
The outgassing characteristics in high vacuum environments show excellent performance even at high temperatures.

Minimizes lubricant evaporation

There is zero mass loss even at 100°C. Liquid Crystal Lubricants have no loss due to evaporation.

Low rotational torque

The rotational torque is lower than that of fluorine grease or lithium soap-based grease.



LCL Crossed Roller Bearings are individually made to order.
If needed, please contact IKO.

Internal Structures and Shapes

Various types are lined up in Crossed Roller Bearing series, including the type with cage, the type with separator, open type, sealed type, etc.

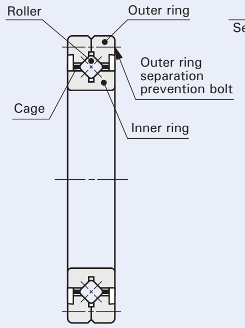
Roller guide method

Crossed Roller Bearings include the type with cage, type with separator and full complement type. The type with cage and the type with separator have a small coefficient of friction and are suitable for comparatively high speed rotations, while the full complement type is suitable for heavy load applications at low speed rotations.

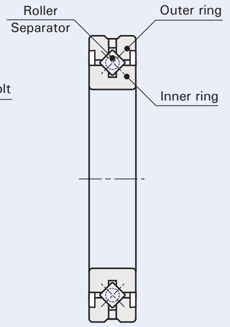
Seal structure

Crossed Roller Bearings include the open type and sealed type. The sealed type bearing incorporates seals made of special synthetic rubber that have excellent sealing performance against dust and dirt penetration and grease leakage. However, excess grease may be discharged during initial operations.

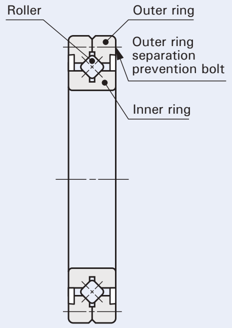
《With Cage》



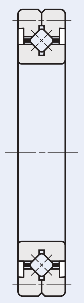
《With Separator》



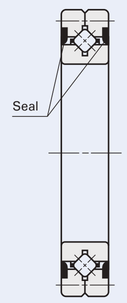
《Full complement》



《Open type》



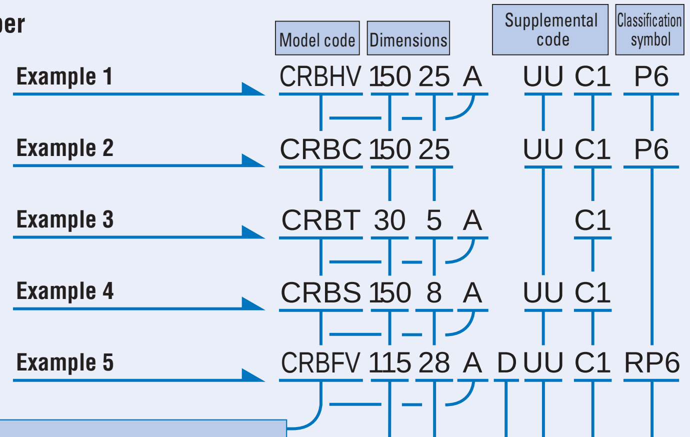
《Sealed type》



Identification number

The identification number of Crossed Roller Bearings consists of a model code, dimensions, any supplemental codes and a classification symbol. Some examples are shown below.

Examples of identification number



Model code	
CRBHV ···A	High Rigidity Type Crossed Roller Bearings V (With Separator)
CRBFV ···A	Mounting Holed Type High Rigidity Crossed Roller Bearings V (With Separator)
CRBC	Standard Type Crossed Roller Bearings (With Cage)
CRB	Standard Type Crossed Roller Bearings (Full complement)
CRBT ···A	Super Slim Type Crossed Roller Bearings (With Separator)
CRBTF ···A	Mounting Holed Type Super Slim Crossed Roller Bearings (With Separator)
CRBS	Slim Type Crossed Roller Bearings (With Cage)
CRBS ···A	Slim Type Crossed Roller Bearings (With Separator)
CRBS ···V	Slim Type Crossed Roller Bearings (Full complement)

Dimension
The dimension indicates the bore diameter of the bearing. (unit : mm)
The dimension indicates the bearing width. (unit : mm)

Supplemental code - 1(1)	
T	With female threaded mounting holes on the inner ring
No symbol	With counter-bored mounting holes on both inner ring and outer ring in the same direction.
D	With counter-bored mounting holes on both inner ring and outer ring in the opposite direction.

Note(1) Applicable to Mounting Holed Type Crossed Roller Bearings. Note that with female threaded mounting holes on the inner ring (T) is only applicable for Mounting Holed Type Super Slim Crossed Roller Bearings.

Supplemental code - 2		
No symbol	Open type	For application, please see table 2.
UU	Sealed type	
U	One side sealed type	

Supplemental code - 3	
T1 : T1 clearance	For application, please see table 3.
C1 : C1 clearance	
C2 : C2 clearance	
No symbol : Normal clearance	

Classification symbol		
No symbol	Accuracy class 0	For application, please see table 4.
P6	Accuracy class 6	
P5	Accuracy class 5	
P4	Accuracy class 4	
P2	Accuracy class 2	
RP6	Rotational accuracy class 6	
RP5	Rotational accuracy class 5	
RP4	Rotational accuracy class 4	
RP2	Rotational accuracy class 2	

Rotational accuracy class···classes specifying accuracy standards for only rotational accuracy (radial runout, axial runout).

Table 2 Seal Specification

Model code	No Symbol	UU	U
CRBHV ··· A	○	○	–
CRBFV ··· A	○	○	–
CRBC	○	○	○
CRB	○	○	○
CRBT ··· A	○	–	–
CRBTF ··· A	○	–	–
CRBS	○	–	–
CRBS ··· A	–	○	○
CRBS ··· V	○	○	○

Table 3 Clearance Specification

Model code	T1	C1	C2	No Symbol
CRBHV ··· A	○	○	○	–
CRBFV ··· A	○	○	○	–
CRBC	○	○	○	–
CRB	○	○	○	–
CRBT ··· A	–	○	–	–
CRBTF ··· A	–	○	–	–
CRBS	○	○	–	○
CRBS ··· A	○	○	–	○
CRBS ··· V	○	○	–	○

Table 4 Accuracy Class

Model code	No Symbol	P6 RP6	P5 RP5	P4 RP4	P2 RP2
CRBHV ··· A	○	○	○	○	○
CRBFV ··· A	○	○	○	○	○
CRBC	○	○	○	○	○
CRB	○	○	○	○	○
CRBT ··· A	○	–	–	–	–
CRBTF ··· A	○	–	–	–	–
CRBS	○	–	–	–	–
CRBS ··· A	○	–	–	–	–
CRBS ··· V	○	–	–	–	–

Dynamic Equivalent Load

The direction of basic dynamic load rating of Crossed Roller Bearing is the radial direction. When a load in any direction other than the direction of basic dynamic load rating or a complex load is applied, calculate the dynamic equivalent load to calculate the rating life.

$$P_r = X\left(F_r + \frac{2M}{D_{pw}}\right) + YF_a \quad \cdots\cdots\cdots\cdots(1)$$

where, P_r : Dynamic equivalent radial load, N
F_r : Radial load, N
F_a : Axial load, N
M : Moment, N-mm
D_{pw} : Pitch circle diameter of roller set, mm
$\left(D_{pw} \fallingdotseq \frac{d+D}{2}\right)$
X : Radial load factor (Refer to Table 5.)
Y : Axial load factor (Refer to Table 5.)

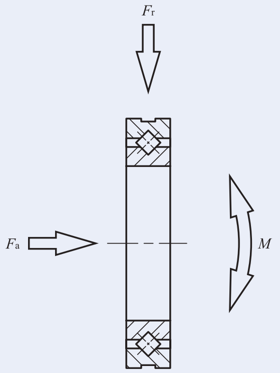


Fig. 1 Load direction

Table 5 Radial load factor and axial load factor

Conditions	X	Y
$\dfrac{F_a}{F_r + 2M/D_{pw}} \leqq 1.5$	1	0.45
$\dfrac{F_a}{F_r + 2M/D_{pw}} > 1.5$	0.67	0.67

Static Equivalent Load

The direction of basic static load rating of Crossed Roller Bearing is the radial direction. When a load in any direction other than the direction of basic static load rating or a complex load is applied, calculate the static equivalent load to calculate the static safety factor.

$$P_{0r} = F_r + \frac{2M}{D_{pw}} + 0.44\,F_a \quad \cdots\cdots\cdots\cdots(2)$$

where, P_{0r} : Static equivalent radial load, N
F_r : Radial load, N
F_a : Axial load, N
M : Moment, N-mm
D_{pw} : Pitch circle diameter of roller set, mm
$\left(D_{pw} \fallingdotseq \frac{d+D}{2}\right)$

Accuracy

The accuracy of Crossed Roller Bearings, Mounting Holed Type Super Slim Crossed Roller Bearings, Slim Type Crossed Roller Bearings and Mounting Holed Type High Rigidity Crossed Roller Bearings V is shown below in Table 6 - 10.2.

Bearings with special accuracy are also options. Please consult IKO.

Table 6 Tolerances and allowable values of inner rings and tolerances of outer ring width

unit: μ m

d Nominal bore diameter mm		Δ_{dmp} (1) Single plane mean bore dia. deviation								Δ_{Bs} Deviation of a single inner ring width		Δ_{Cs} (2) Deviation of a single outer ring width		K_{ia} Radial run-out of assembled bearing inner ring					S_{ia} Assembled bearing inner ring face run-out with raceway				
		Class 0 RP6-2		P6		P5		P4						Class 0	P6 RP6	P5 RP5	P4 RP4	P2 RP2	Class 0	P6 RP6	P5 RP5	P4 RP4	P2 RP2
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low										
18	30	0	−10	0	− 8	0	− 6	0	− 5	0	− 75	0	−100	13	8	4	3	2.5	13	8	4	3	2.5
30	50	0	−12	0	−10	0	− 8	0	− 6	0	− 75	0	−100	15	10	5	4	2.5	15	10	5	4	2.5
50	80	0	−15	0	−12	0	− 9	0	− 7	0	− 75	0	−100	20	10	5	4	2.5	20	10	5	4	2.5
80	120	0	−20	0	−15	0	−10	0	− 8	0	− 75	0	−100	25	13	6	5	2.5	25	13	6	5	2.5
120	150	0	−25	0	−18	0	−13	0	−10	0	−100	0	−120	30	18	8	6	2.5	30	18	8	6	2.5
150	180	0	−25	0	−18	0	−13	0	−10	0	−100	0	−120	30	18	8	6	5	30	18	8	6	5
180	250	0	−30	0	−22	0	−15	0	−12	0	−100	0	−120	40	20	10	8	5	40	20	10	8	5
250	315	0	−35	0	−25	0	−18	–	–	0	−120	0	−150	50	25	13	10	7	50	25	13	10	7
315	400	0	−40	0	−30	0	−23	–	–	0	−150	0	−200	60	30	15	12	8	60	30	15	12	8
400	500	0	−45	0	−35	–	–	–	–	0	−150	0	−200	65	35	18	14	10	65	35	18	14	10
500	630	0	−50	0	−40	–	–	–	–	0	−150	0	−200	70	40	20	16	12	70	40	20	16	12
630	800	0	−75	–	–	–	–	–	–	0	−150	0	−200	80	50	25	20	15	80	50	25	20	15

Notes(1) For accuracy class P2 and other classes without a numerical description, the highest grade numerical value among the lower accuracy classes in the same nominal bore diameter range is applied.
(2) For High Rigidity Type Crossed Roller Bearings V, the tolerances for deviation of a single inner ring width are applicable to those of a single outer ring width.
Remark The accuracy specified in this table is not applicable to Mounting Holed Type Super Slim Crossed Roller Bearings, Slim Type Crossed Roller Bearings, and Mounting Holed Type High Rigidity Crossed Roller Bearings V.

Table 7 Tolerances and allowable values of outer ring

unit: μ m

D Nominal outside diameter mm		Δ_{Dmp} (1) Single plane mean outside dia. deviation								K_{ea} Radial run-out of assembled bearing outer ring					S_{ea} Assembled bearing outer ring face run-out with raceway				
		Class 0 RP6-2		P6		P5		P4		Class 0	P6 RP6	P5 RP5	P4(2) RP4	P2(2) RP2	Class 0	P6 RP6	P5 RP5	P4(2) RP4	P2(2) RP2
Over	Incl.	High	Low	High	Low	High	Low	High	Low										
30	50	0	− 11	0	− 9	0	− 7	0	− 6	20	10	7	5	2.5	20	10	7	5	2.5
50	80	0	− 13	0	−11	0	− 9	0	− 7	25	13	8	5	4	25	13	8	5	4
80	120	0	− 15	0	−13	0	−10	0	− 8	35	18	10	6	5	35	18	10	6	5
120	150	0	− 18	0	−15	0	−11	0	− 9	40	20	11	7	5	40	20	11	7	5
150	180	0	− 25	0	−18	0	−13	0	−10	45	23	13	8	5	45	23	13	8	5
180	250	0	− 30	0	−20	0	−15	0	−11	50	25	15	10	7	50	25	15	10	7
250	315	0	− 35	0	−25	0	−18	0	−13	60	30	18	11	7	60	30	18	11	7
315	400	0	− 40	0	−28	0	−20	–	–	70	35	20	–	–	70	35	20	–	–
400	500	0	− 45	0	−33	0	−23	–	–	80	40	23	–	–	80	40	23	–	–
500	630	0	− 50	0	−38	0	−28	–	–	100	50	25	–	–	100	50	25	–	–
630	800	0	− 75	0	−45	–	–	–	–	120	60	30	–	–	120	60	30	–	–
800	1000	0	−100	0	−60	–	–	–	–	120	75	35	–	–	120	75	35	–	–
1000	1030	0	−125	–	–	–	–	–	–	120	75	35	–	–	120	75	35	–	–

Notes(1) For accuracy class P2 and other classes without a numerical description, the highest grade numerical value among the lower accuracy classes in the same nominal bore diameter range is applied.
(2) P4 and P2 apply to High Rigidity Type Crossed Roller Bearings V. For Standard Type Crossed Roller Bearings, the tolerance values for P5 are applicable to P4 and P2.
Remark The accuracy specified in this table is not applicable to Mounting Holed Type Super Slim Crossed Roller Bearings, Slim Type Crossed Roller Bearings, and Mounting Holed Type High Rigidity Crossed Roller Bearings V.

Table 8 Tolerances and allowable values of Mounting Holed Type Super Slim Crossed Roller Bearings

unit: μ m

d Nominal bore diameter mm	Δ_{dmp} Single plane mean bore dia. deviation High	 Low	Δ_{Dmp} Single plane mean outside dia. deviation High	 Low	Δ_{Bs} and Δ_{Cs} Deviations of a single inner ring width and outer ring width High	 Low	K_{ia} and S_{ia} Radial and axial run-out of assembled bearing inner ring	K_{ea} and S_{ea} Radial and axial run-out of assembled bearing outer ring
10	0	− 8(− 8)	0	− 9(− 11)	0	− 75	10(13)	15(20)
15	0	− 8	0	− 9	0	− 75	10	15
20	0	− 10(− 10)	0	− 11(− 13)	0	− 75	13(13)	20(20)
30	0	− 10(− 10)	0	− 11(− 13)	0	− 75	13(15)	20(25)
40	0	− 12(− 12)	0	− 13(− 13)	0	− 75	15(15)	25(25)
50	0	− 12	0	− 13	0	− 75	15	25

Remark The values in ( ) represent that of Mounting Holed Type Super Slim Crossed Roller Bearings.

Table 9 Tolerances and allowable values of Slim Type Crossed Roller Bearings

unit: μ m

d Nominal bore diameter mm	Δ_{dmp} Single plane mean bore dia. deviation High	 Low	Δ_{Dmp} Single plane mean outside dia. deviation High	 Low	Δ_{Bs} and Δ_{Cs} Deviations of a single inner ring width and outer ring width High	 Low	K_{ia} and S_{ia} Radial and axial run-out of assembled bearing inner ring	K_{ea} and S_{ea} Radial and axial run-out of assembled bearing outer ring
50	0	− 15	0	− 13	0	− 127	13	13
60	0	− 15	0	− 13	0	− 127	13	13
70	0	− 15	0	− 15	0	− 127	15	15
80	0	− 20	0	− 15	0	− 127	15	15
90	0	− 20	0	− 15	0	− 127	15	15
100	0	− 20	0	− 15	0	− 127	15	15
110	0	− 20	0	− 20	0	− 127	20	20
120	0	− 25	0	− 20	0	− 127	20	20
130	0	− 25	0	− 25	0	− 127	25	25
140	0	− 25	0	− 25	0	− 127	25	25
150	0	− 25	0	− 25	0	− 127	25	25
160	0	− 25	0	− 25	0	− 127	25	25
170	0	− 25	0	− 30	0	− 127	25	25
180	0	− 30	0	− 30	0	− 127	30	30
190	0	− 30	0	− 30	0	− 127	30	30
200	0	− 30	0	− 30	0	− 127	30	30

Table 10.1 Tolerances and allowable values of inner rings of Mounting Holed Type High Rigidity Crossed Roller Bearings V

unit: μ m

d Nominal bore diameter mm		Δ_{dmp} Single plane mean bore dia. deviation								Δ_{Bs} Deviation of a single inner ring width		K_{ia} Radial run-out of assembled bearing inner ring					S_{ia} Assembled bearing inner ring face run-out with raceway				
		Class 0 RP6-2		P6		P5		P4, P2				Class	P6	P5	P4	P2	Class	P6	P5	P4	P2
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	0	RP6	RP5	RP4	RP2	0	RP6	RP5	RP4	RP2
−	20	0	− 10	0	− 8	0	− 6	0	− 5	0	− 75	13	8	4	3	2.5	13	8	4	3	2.5
20	30	0	− 10	0	− 8	0	− 6	0	− 5	0	− 75	15	10	5	4	2.5	15	10	5	4	2.5
30	35	0	− 12	0	− 10	0	− 8	0	− 6	0	− 75	15	10	5	4	2.5	15	10	5	4	2.5
35	50	0	− 12	0	− 10	0	− 8	0	− 6	0	− 75	20	10	5	4	2.5	20	10	5	4	2.5
50	65	0	− 15	0	− 12	0	− 9	0	− 7	0	− 75	20	10	5	4	2.5	20	10	5	4	2.5
65	80	0	− 15	0	− 12	0	− 9	0	− 7	0	− 75	25	13	6	5	2.5	25	13	6	5	2.5
80	100	0	− 20	0	− 15	0	− 10	0	− 8	0	− 75	25	13	6	5	2.5	25	13	6	5	2.5
100	120	0	− 20	0	− 15	0	− 10	0	− 8	0	− 75	30	18	8	6	2.5	30	18	8	6	2.5

Table 10.2 Tolerances and allowable values of outer rings of Mounting Holed Type High Rigidity Crossed Roller Bearings V

unit: μ m

D Nominal outside diameter mm		Δ_{Dmp} Single plane mean outside dia. deviation								Δ_{Cs} Deviation of a single outer ring width		K_{ea} Radial run-out of assembled bearing outer ring					S_{ea} Assembled bearing outer ring face run-out with raceway				
		Class 0 RP6-2		P6		P5		P4, P2				Class	P6	P5	P4	P2	Class	P6	P5	P4	P2
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	0	RP6	RP5	RP4	RP2	0	RP6	RP5	RP4	RP2
50	60	0	− 13	0	− 11	0	− 9	0	− 7	0	− 75	20	10	7	5	2.5	20	10	7	5	2.5
60	80	0	− 13	0	− 11	0	− 9	0	− 7	0	− 75	25	13	8	5	4	25	13	8	5	4
80	95	0	− 15	0	− 13	0	− 10	0	− 8	0	− 75	25	13	8	5	4	25	13	8	5	4
95	120	0	− 15	0	− 13	0	− 10	0	− 8	0	− 75	35	18	10	6	5	35	18	10	6	5
120	140	0	− 18	0	− 15	0	− 11	0	− 9	0	− 75	35	18	10	6	5	35	18	10	6	5
140	150	0	− 18	0	− 15	0	− 11	0	− 9	0	− 75	40	20	11	7	5	40	20	11	7	5
150	165	0	− 25	0	− 18	0	− 13	0	− 10	0	− 75	40	20	11	7	5	40	20	11	7	5
165	180	0	− 25	0	− 18	0	− 13	0	− 10	0	− 75	45	23	13	8	5	45	23	13	8	5
180	210	0	− 30	0	− 20	0	− 15	0	− 11	0	− 75	45	23	13	8	5	45	23	13	8	5
210	240	0	− 30	0	− 20	0	− 15	0	− 11	0	− 75	50	25	15	10	7	50	25	15	10	7

Clearance

The radial internal clearances of Crossed Roller Bearings, Mounting Holed Type Super Slim Crossed Roller Bearings, Slim Type Crossed Roller Bearings and Mounting Holed Type High Rigidity Crossed Roller Bearings V are shown below in Table 11.1-11.4.

Table 11.1 Radial internal clearances

unit: μ m

d Nominal bore diameter mm		Radial internal clearance T1		 C1		 C2	
Over	Incl.	Min.	Max.	Min.	Max.	Min.	Max.
−	30	− 10	0	0	10	10	20
30	40	− 10	0	0	10	10	20
40	50	− 10	0	0	10	10	25
50	65	− 10	0	0	10	10	25
65	80	− 10	0	0	15	15	30
80	100	− 10	0	0	15	15	35
100	120	− 15	0	0	15	15	35
120	140	− 15	0	0	20	20	45
140	160	− 15	0	0	20	20	50
160	200	− 15	0	0	20	20	50
200	250	− 20	0	0	25	25	60
250	315	− 20	0	0	25	25	60
315	400	− 25	0	0	30	30	70
400	500	− 30	0	0	40	40	85
500	630	− 30	0	0	50	50	100
630	710	− 30	0	0	60	60	120
710	800	− 40	0	0	70	70	140

Remark Not applicable to (Mounting Holed Type) Super Slim Crossed Roller Bearings, Slim Type Crossed Roller Bearings and Mounting Holed Type High Rigidity Crossed Roller Bearings V.

Table 11.2 Radial internal clearances for Mounting Holed Type Super Slim Crossed Roller Bearings

unit: μ m

d Nominal bore diameter of bearing mm	Radial internal clearance C1 Min.	 Max.
10	0	15
15	0	15
20	0	15
30	0	15
40	0	15
50	0	15

Table 11.3 Radial internal clearances of Slim Type Crossed Roller Bearings

unit: μ m

d Nominal bore diameter mm	Radial internal clearance T1 Min.	 Max.	 C1 Min.	 Max.	 Normal Min.	 Max.
50	− 8	0	0	15	30	56
60	− 8	0	0	15	30	56
70	− 8	0	0	15	30	56
80	− 8	0	0	15	41	66
90	− 8	0	0	15	41	66
100	− 8	0	0	15	41	66
110	− 8	0	0	15	41	66
120	− 8	0	0	15	51	76
130	− 8	0	0	15	51	76
140	− 8	0	0	15	51	76
150	− 8	0	0	15	51	76
160	− 10	0	0	20	51	76
170	− 10	0	0	20	51	76
180	− 10	0	0	20	61	86
190	− 10	0	0	20	61	86
200	− 10	0	0	20	61	86

Table 11.4 Radial internal clearances of Mounting Holed Type High Rigidity Crossed Roller Bearings V

unit: μ m

d Nominal bore diameter mm		Radial internal clearance					
		T1		C1		C2	
Over	Incl.	Min.	Max.	Min.	Max.	Min.	Max.
–	20	− 10	0	0	10	10	20
20	25	− 10	0	0	10	10	20
25	35	− 10	0	0	10	10	25
35	65	− 10	0	0	15	15	30
65	80	− 10	0	0	15	15	35
80	95	− 15	0	0	15	15	35
95	110	− 15	0	0	20	20	45
110	125	− 15	0	0	20	20	50

Fit

The standard fits of Crossed Roller Bearings are shown in Table 12.1, and recommended fits for Slim Type Crossed Roller Bearings with normal clearances are shown in Table 12.2. For Super Slim Type Crossed Roller Bearings, it is recommended to use a slight interference fit adjusted to the actual measured dimensions. For large bearings, fit based on the actual measured dimensions of the bearings is recommended, and fit allowance should be chosen as small as possible in accordance with the tolerance class given in Table 12.1. When complex loads or shock loads are applied or when high rotational accuracy and rigidity of the bearing are required, it is recommended to use a slight interference fit adjusted to the actual measured dimensions for both inner and outer rings.

For the interference fit, the radial internal clearance after the fit decreases by approximately 70% to 90% of the interference amount. To avoid excessive preload due to fit, it is recommended to use a slight interference fit adjusted to the actual measured dimensions for both T1 and C1 clearances.

Table 12.1 Recommended fits for Crossed Roller Bearings under normal load

Radial internal clearance	Tolerance class			
	Inner ring rotating load		Outer ring rotating load	
	Shaft	Housing bore	Shaft	Housing bore
C1 clearance	h5	H7	g5	J7 (1)
C2 clearance	j5	H7	g5	J7 (1)

Note(1) It is recommended that a slight interference fit adjusted to the actual measured dimensions of the bearing is used.

Table 12.2 Recommended fits for Slim Type Crossed Roller Bearings with normal clearances

(Dimensional tolerances of shaft and housing bore)

unit: μ m

d Nominal bore diameter mm	Inner ring rotating load				Outer ring rotating load			
	Shaft		Housing bore		Shaft		Housing bore	
	High	Low	High	Low	High	Low	High	Low
50	+ 15	0	+ 13	0	− 15	− 30	− 13	− 25
60	+ 15	0	+ 13	0	− 15	− 30	− 13	− 25
70	+ 15	0	+ 15	0	− 15	− 30	− 15	− 30
80	+ 20	0	+ 15	0	− 20	− 40	− 15	− 30
90	+ 20	0	+ 15	0	− 20	− 40	− 15	− 30
100	+ 20	0	+ 15	0	− 20	− 40	− 15	− 30
110	+ 20	0	+ 20	0	− 20	− 40	− 20	− 40
120	+ 25	0	+ 20	0	− 25	− 50	− 20	− 40
130	+ 25	0	+ 25	0	− 25	− 50	− 25	− 50
140	+ 25	0	+ 25	0	− 25	− 50	− 25	− 50
150	+ 25	0	+ 25	0	− 25	− 50	− 25	− 50
160	+ 25	0	+ 25	0	− 25	− 50	− 25	− 50
170	+ 25	0	+ 30	0	− 25	− 50	− 30	− 60
180	+ 30	0	+ 30	0	− 30	− 60	− 30	− 60
190	+ 30	0	+ 30	0	− 30	− 60	− 30	− 60
200	+ 30	0	+ 30	0	− 30	− 60	− 30	− 60

Allowable rotational speed

Allowable rotational speeds of Crossed Roller Bearings are affected by mounting and operating conditions. The values in general operation are shown in Table 13.

Table 13 $d_m n$ values (1) of Crossed Roller Bearings

Type \ Lubricant		Grease	Oil
With cage or with separator	Open type	75 000	150 000
	Sealed type	60 000	–
Full complement	Open type	50 000	75 000
	Sealed type	40 000	–

Note(1) · $d_m n$ value $= d_m \times n$
where, d_m : Mean value of bearing bore and outside diameters, mm
n : Number of rotations per minute, min^{-1}

Rotational torque

Rotational torque of IKO Crossed Roller Bearings are lower than that of plain bearings and the difference between the static torque and the dynamic (kinetic) torque is small. Therefore, these bearings minimize power consumption and operating temperature rise of machinery and increase the overall efficiency of machines.

The rotational torque is affected by many factors, but the following equations can be used expediently.

$$T = \mu P_{0r} \frac{D_{pw}}{2}$$

where, T : Rotational torque, N·mm
μ : Friction coefficient (Approx. 0.010)
P_{0r} : Static equivalent radial load, N
D_{pw} : Pitch circle diameter, mm

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

Lubrication

These bearings are generally lubricated with grease. Grease is supplied through the clearance between the inner ring and the outer ring.

Grease specification is shown in Table 14, ALVANIA GREASE EP2 (Shell Lubricants Japan K.K.) is prepacked as the lubricating grease.

For bearings without prepacked grease, supply grease or oil for use. Operating without grease or oil will increase the wear of the rolling contact surfaces and cause a short bearing life.

When using a special grease, carefully examine the grease properties and contents such as base oil viscosity and extreme pressure additives. In this case, please contact IKO.

Table 14 Bearings with prepacked grease

○ : With prepacked grease × : Without prepacked grease

Model code	Seal specification		
	Open type (No symbol)	Sealed type (UU)	One side sealed type (U)
CRBHV··· A	×	○	–
CRBFV··· A	×	○	–
CRBC	×	○	×
CRB	×	○	×
CRBT ··· A	○	–	–
CRBTF ··· A	○	–	–
CRBS	×	–	–
CRBS ··· A	–	○	×
CRBS ··· V	×	○	×

Oil Hole

For Crossed Roller Bearings, oil holes and oil grooves can be provided on bearing rings if requested. Not applicable to the Super Slim Type (Mounting Holed Type). When an oil hole is required on the outer ring, attach "-OH" before the clearance symbol in the identification number. When an oil hole and an oil groove are required on the outer ring, attach "-OG" at the same place in the identification number. For an oil hole on the inner ring, attach "/OH", and for an oil hole and an oil groove on the inner ring, attach "/OG", at the same place in the identification number. High Rigidity Type Crossed Roller Bearings V and Mounting Holed Type High Rigidity Type Crossed Roller Bearings V have an oil groove and two oil holes on the outer ring as standard. Table 15 shows availability of oil holes for each bearing type.

Table 15 Oil holes

Bearing type	Oil hole code			
	/nOH	/nOG	-nOH	-nOG
CRBHV ··· A	○	○	–	–(1)
CRBFV ··· A	–	–	–	–(1)
CRBC	○	○	○	○
CRB	○	○	○	○
CRBT ··· A	–	–	–	–
CRBTF ··· A	–	–	–	–
CRBS	○	–	○	–
CRBS ··· A	○	–	○	–
CRBS ··· V	○	–	○	–

Notes(1) CRBHV ··· A and CRBFV ··· A are provided with an oil groove and two oil holes on the outer ring.
Remark n denotes the number of oil holes not exceeding 4. For one oil hole, number is not indicated.
When preparing multiple oil holes, please contact IKO.

Example 1 When the inner ring has 4 oil holes
CRBC 10020 / 4OH C1
4 Oil holes
In inner ring

Example 2 When the outer ring has a single oil hole
CRBC 10020 - OH C1
1 Oil hole
In outer ring

Operating Temperature Range

The operating temperature range for Crossed Roller Bearings is －20℃～＋120℃ . However, the maximum allowable temperature for types with separator and with seal is ＋110℃ , and ＋100℃ when they are continuously operated.

Mounting

When the rigidity of the mounting parts is not sufficient, stress concentration will occur at the contact area between the rollers and raceways, and the bearing performance will be deteriorated significantly.
Therefore, it is necessary to carefully examine the rigidity of housing and the strength of fixing bolts when a large moment will be applied.
The shoulder height diameters (d_a and D_a) that are related to mounting should certainly satisfy the values shown in the dimension tables. When these dimensions are incorrect, deformations of inner and outer rings will occur and the bearing performance will be deteriorated remarkably.

1. Other than Mounting Holed Type Crossed Roller Bearings

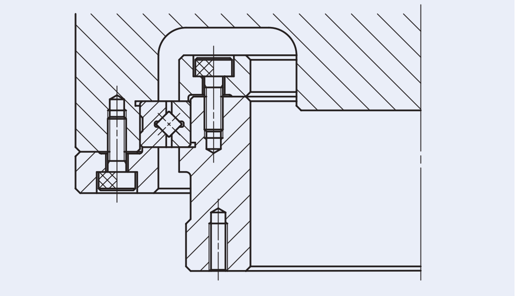


Fig. 2 Mounting example

❶The inner and outer rings should be securely fixed in the axial direction by using fixing plates, etc. Recommended thickness of the fixing plate is 1/2 or more of the bearing width B. The dimensions in the axial direction of the housing bore and the fixing plates should be determined to get a secure fixing while considering the dimension of bearing width which is given a minus tolerance. (See Fig.2)

❷The depth of the housing bore is recommended to be equal to or larger than the bearing width.

❸Separation prevention bolts for the outer ring of Standard Type Crossed Roller Bearings are provided to prevent separation of two halves of the outer ring during transportation or mounting. When mounting, they should be loosened slightly.

❹High Rigidity Type Crossed Roller Bearings V, Super Slim Type Crossed Roller Bearings and Slim Type Crossed Roller Bearings have a plug for hole for inserting rollers. When mounting the bearings, locate the plug at a position that is not included in the maximum loading zone. The plug location can be found by the pin pressed at the side of the outer ring.

2. Mounting Holed Type High Rigidity Crossed Roller Bearings V, Mounting Holed Type Super Slim Crossed Roller Bearings

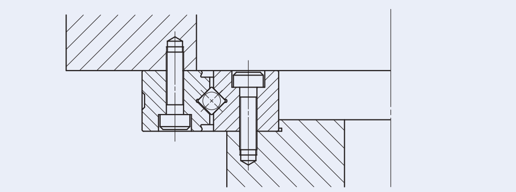


Fig. 3 Example of direct mounting to the mating surface of Mounting Holed Type High Rigidity Crossed Roller Bearings V

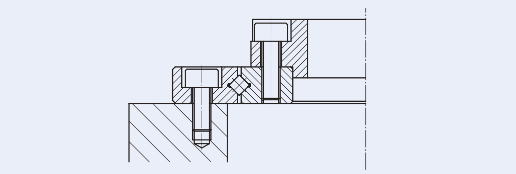


Fig. 4 Example of direct mounting to the mating surface of Mounting Holed Type Super Slim Crossed Roller Bearings

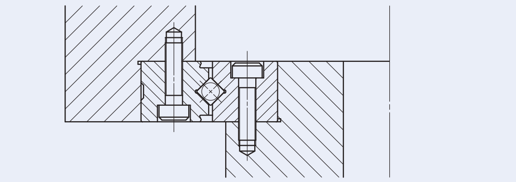


Fig. 5 Example of mounting to the housing of Mounting Holed Type High Rigidity Crossed Roller Bearings V

❶Mounting Holed Type High Rigidity Crossed Roller Bearings V, Mounting Holed Type Super Slim Crossed Roller Bearings can be mounted directly to the mounting surface by fixing bolts. (See Fig. 3, Fig. 4)

❷If large number of radial load and/or moment is expected, it is recommended to prepare flange part. (See Fig.5)

❸Mounting Holed Type High Rigidity Crossed Roller Bearings V, Mounting Holed Type Super Slim Crossed Roller Bearings have a plug for hole for inserting cylindrical rollers. When mounting the bearings, locate the plug at a position that is not included in the maximum loading zone. The plug location can be found by the pin pressed at the side of the outer ring.

Tightening torque of mounting bolts

The standard tightening torque values for Mounting Holed Type High Rigidity Crossed Roller Bearings V, Mounting Holed Type Super Slim Crossed Roller Bearings mounting bolts are shown in Table 16. When machines or equipment are subjected to severe vibration, shock, large fluctuating load, or moment load, the bolts should be tightened with a torque 1.2 to 1.5 times higher than the standard torque values shown.
If the mating member material is cast iron or aluminum, reduce the tightening torque depending on the strength characteristics of the mating member material.
Please do not tighten with too much torque as abnormal frictional torque or short life may occur.

Table 16 Tightening torque of mounting bolts

Bolt size	Tightening torque N・m
M2.5 × 0.45	0.58
M3 × 0.5	1.7
M4 × 0.7	4.0
M5 × 0.8	7.9
M8 × 1.25	32

Above values are for Carbon steel bolt (Strength division 12.9)

Double Row Angular Contact Roller Bearing

We manufacture Double Row Angular Contact Roller Bearings to order. If needed, please contact IKO.
Double Row Angular Contact Roller Bearings have a large number of cylindrical rollers with a large contact area with a raceway and an excellent load capability, between the inner and outer rings arranged in a double row of raceways. This underpins even higher rigidity and lower torque than High Rigidity Type Crossed Roller Bearings V.
The mounting holes in both inner and outer rings facilitate installation to your machines and equipment. Further, the integrated structure (non split) constructed in both inner and outer rings can avoid installation errors, yielding extra-high-rigidity and high-accuracy guiding performance without being affected by other peripheral structures such as housing or pressure plate.
For lubrication, use the two oil holes on the outer ring outer surface shown in Fig. 6.

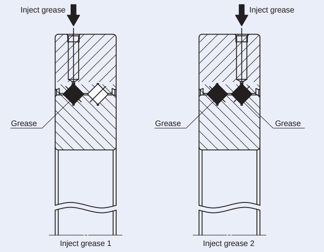


Fig. 6 Grease

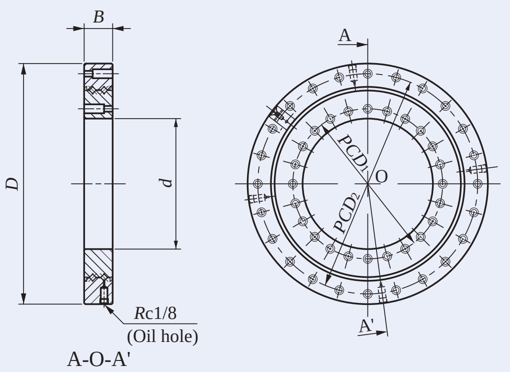
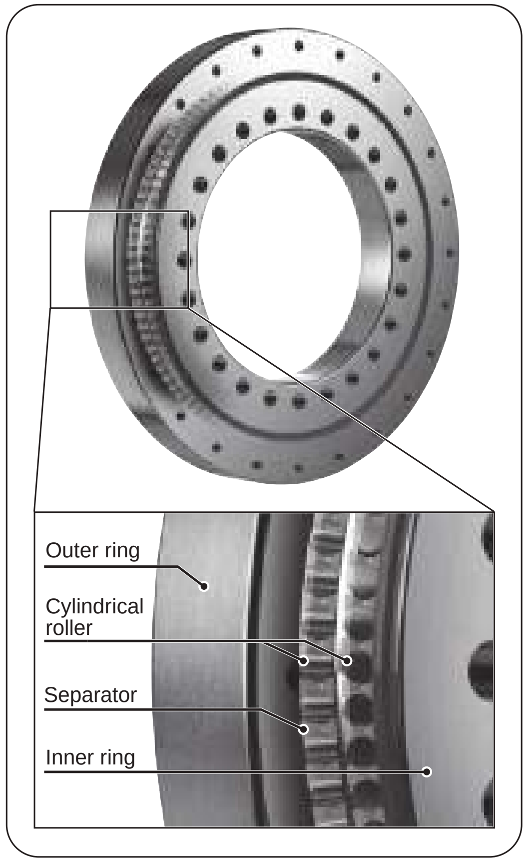


Fig. 7 Manufacturing example

Table 17 Example of manufacturing dimensions

Boundary dimensions mm						Basic dynamic load rating C N	Basic static load rating C_0 N
d	D	B	$r_{\min}$	PCD_1	PCD_2		
160	295	35	2	184	270	60 300	167 000
210	380	40	2.5	240	350	108 000	313 000
350	540	50	2.5	385	505	235 000	725 000

Structure of Double-acting Angular Roller Bearing



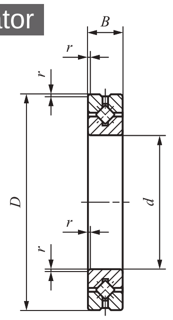
CROSSED ROLLER BEARINGS

High Rigidity Type Crossed Roller Bearings V

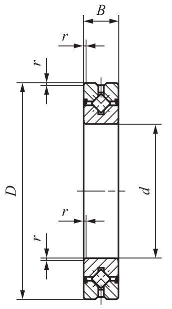
Open Type/With Separator

Sealed Type/With Separator

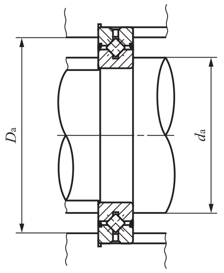
Shaft dia. 20 ─ 300mm



CRBHV ··· A



CRBHV ··· AUU



Shaft dia. mm	Identification number High Rigidity Type Crossed Roller Bearings V Open Type	Sealed Type	Mass (Ref.) kg	Boundary dimensions mm d	D	B	$r_{\min}$ (1)	Mounting dimensions mm d_a	D_a	Basic dynamic load rating C N	Basic static load rating C_0 N
20	**CRBHV 208 A**	**CRBHV 208 A UU**	0.04	20	36	8	0.3	24	31	2 910	2 430
25	**CRBHV 258 A**	**CRBHV 258 A UU**	0.05	25	41	8	0.3	29	36	3 120	2 810
30	**CRBHV 3010 A**	**CRBHV 3010 A UU**	0.12	30	55	10	0.3	36.5	48.5	7 600	8 370
35	**CRBHV 3510 A**	**CRBHV 3510 A UU**	0.13	35	60	10	0.3	41.5	53.5	7 900	9 130
40	**CRBHV 4010 A**	**CRBHV 4010 A UU**	0.15	40	65	10	0.3	46.5	58.5	8 610	10 600
45	**CRBHV 4510 A**	**CRBHV 4510 A UU**	0.16	45	70	10	0.3	51.5	63.5	8 860	11 300
50	**CRBHV 5013 A**	**CRBHV 5013 A UU**	0.29	50	80	13	0.6	56	74	17 300	20 900
60	**CRBHV 6013 A**	**CRBHV 6013 A UU**	0.33	60	90	13	0.6	66	84	18 800	24 300
70	**CRBHV 7013 A**	**CRBHV 7013 A UU**	0.38	70	100	13	0.6	76	94	20 100	27 700
80	**CRBHV 8016 A**	**CRBHV 8016 A UU**	0.74	80	120	16	0.6	88	112	32 100	43 400
90	**CRBHV 9016 A**	**CRBHV 9016 A UU**	0.81	90	130	16	0.6	98	122	33 100	46 800
100	**CRBHV 10020 A**	**CRBHV 10020 A UU**	1.45	100	150	20	0.6	110	140	50 900	72 200
110	**CRBHV 11020 A**	**CRBHV 11020 A UU**	1.56	110	160	20	0.6	120	150	52 400	77 400
120	**CRBHV 12025 A**	**CRBHV 12025 A UU**	2.62	120	180	25	1	132	168	73 400	108 000
130	**CRBHV 13025 A**	**CRBHV 13025 A UU**	2.82	130	190	25	1	142	178	75 900	115 000
140	**CRBHV 14025 A**	**CRBHV 14025 A UU**	2.96	140	200	25	1	152	188	81 900	130 000
150	**CRBHV 15025 A**	**CRBHV 15025 A UU**	3.16	150	210	25	1	162	198	84 300	138 000
200	**CRBHV 20025 A**	**CRBHV 20025 A UU**	4.00	200	260	25	1	212	248	92 300	169 000
250	**CRBHV 25025 A**	**CRBHV 25025 A UU**	4.97	250	310	25	1.5	262	298	102 000	207 000
300	**CRBH 30025 A**	**CRBH 30025 A UU**	5.29	300	360	25	1.5	312	348	112 000	245 000

Note(1) Minimum allowable single value of chamfer dimension *r*

Remarks1. The outer ring has an oil groove and two oil holes.

2. No grease is prepacked for Open Type. Perform proper lubrication. Grease is prepacked for Sealed Type.

3. If one side sealed type are needed, please contact IKO.

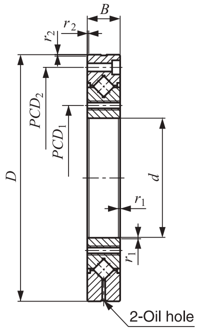
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Mounting Holed Type High Rigidity Crossed Roller Bearings V

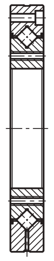
Open Type/With Separator

Sealed Type/With Separator

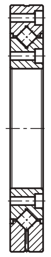
Shaft dia. 10 ─ 115mm



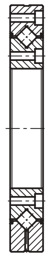
CRBFV ··· AT



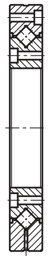
CRBFV ··· ATUU



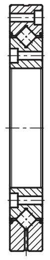
CRBFV ··· A



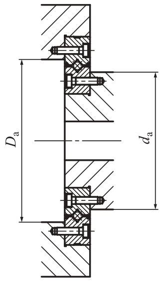
CRBFV ··· AUU

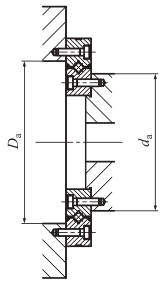


CRBFV ··· AD



CRBFV ··· ADUU





Shaft dia. mm	Identification number Mounting Holed Type High Rigidity Crossed Roller Bearing V: Open Type	Identification number Mounting Holed Type High Rigidity Crossed Roller Bearing V: Sealed Type	Mass (Ref.) kg	Boundary dimensions mm: d	D	B	$r_{1\min}$ (1)	$r_{2\min}$ (1)	Mounting holes mm: PCD_1	Inner ring Mounting holes	PCD_2	Outer ring Mounting holes	Mounting dimensions mm: d_a	D_a	Basic dynamic load rating C N	Basic static load rating C_0 N
10	CRBFV 108 AT	CRBFV 108 AT UU	0.12	10	52	8	0.3	0.3	16	4-M3 through	42	6-ϕ3.4 through ϕ6.5 counter bore depth 3.3	24	31	2 910	2 430
20	CRBFV 2012 AT	CRBFV 2012 AT UU	0.31	20	70	12	0.3	0.3	28	6-M3 through	57	6-ϕ3.4 through ϕ6.5 counter bore depth 3.3	36.5	48.5	7 600	8 370
25	CRBFV 2512 AT	CRBFV 2512 AT UU	0.40	25	80	12	0.6	0.6	35	6-M3 through	67	6-ϕ3.4 through ϕ6.5 counter bore depth 3.3	46.5	58.5	8 610	10 600
35	CRBFV 3515 AT	CRBFV 3515 AT UU	0.66	35	95	15	0.6	0.6	45	8-M4 through	83	8-ϕ4.5 through ϕ8 counter bore depth 4.4	56	74	17 300	20 900
55	CRBFV 5515 AT	CRBFV 5515 AT UU	0.96	55	120	15	0.6	0.6	65	8-M5 through	105	8-ϕ5.5 through ϕ9.5 counter bore depth 5.4	76	94	20 100	27 700
80	CRBFV 8022 AT	CRBFV 8022 AT UU	2.63	80	165	22	0.6	1	97	10-M5 through	148	10-ϕ5.5 through ϕ9.5 counter bore depth 5.4	107	137	51 100	72 000
	CRBFV 8022 A	CRBFV 8022 A UU	2.60							10- ϕ 5.5 through ϕ 9.5 counter bore depth 5.4						
	CRBFV 8022 AD	CRBFV 8022 AD UU														
90	CRBFV 9025 AT	CRBFV 9025 AT UU	4.83	90	210	25	1.5	1.5	112	12-M8 through	187	12-ϕ9 through ϕ14 counter bore depth 12	132	168	73 400	108 000
	CRBFV 9025 A	CRBFV 9025 A UU	4.67							12- ϕ 9 through ϕ 14 counter bore depth 12						
	CRBFV 9025 AD	CRBFV 9025 AD UU														
115	CRBFV 11528 AT	CRBFV 11528 AT UU	6.81	115	240	28	1.5	1.5	139	12-M8 through	217	12-ϕ9 through ϕ14 counter bore depth 13.5	162	198	84 300	138 000
	CRBFV 11528 A	CRBFV 11528 A UU	6.63							12- ϕ 9 through ϕ 14 counter bore depth 13.5						
	CRBFV 11528 AD	CRBFV 11528 AD UU														

Note(1) Minimum allowable single value of chamfer diameter r_1 and r_2.

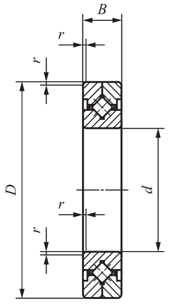
Remarks1. The outer ring has an oil groove and two oil holes.
2. No grease is prepacked for Open Type. Perform proper lubrication. Grease is prepacked for Sealed Type.
3. If one side sealed type are needed, please contact IKO.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

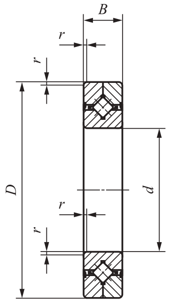
CROSSED ROLLER BEARINGS

Standard Type Crossed Roller Bearings

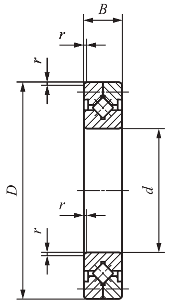
Open Type/With Cage
Open Type/Full Complement Type
Sealed Type/With Cage
Sealed Type/Full Complement Type



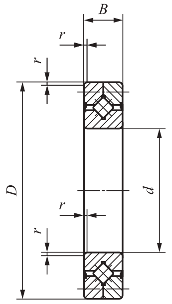
CRBC



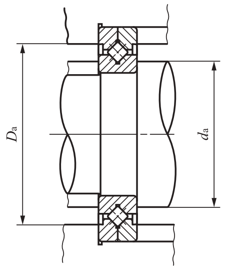
CRBC ··· UU



CRB



CRB ··· UU



Shaft dia. 30 — 200mm

Shaft dia. mm	Identification number				Mass (Ref.) kg	Boundary dimensions mm			r_{min} (1)	Mounting dimensions mm		CRBC		CRB	
	With Cage		Full complement									Basic dynamic load rating C N	Basic static load rating C_0 N	Basic dynamic load rating C N	Basic static load rating C_0 N
	Open Type	Sealed Type	Open Type	Sealed Type		d	D	B		d_a	D_a				
30	**CRBC 3010**	**CRBC 3010 UU**	**CRB 3010**	**CRB 3010 UU**	0.12	30	55	10	0.3	34	44	3 830	4 130	5 290	6 350
40	**CRBC 4010**	**CRBC 4010 UU**	**CRB 4010**	**CRB 4010 UU**	0.15	40	65	10	0.3	44	54	4 280	5 140	5 980	8 040
50	**CRBC 5013**	**CRBC 5013 UU**	**CRB 5013**	**CRB 5013 UU**	0.29	50	80	13	0.6	55	71	10 700	12 600	14 200	18 400
60	**CRBC 6013**	**CRBC 6013 UU**	**CRB 6013**	**CRB 6013 UU**	0.33	60	90	13	0.6	64	81	11 600	14 600	15 400	21 500
70	**CRBC 7013**	**CRBC 7013 UU**	**CRB 7013**	**CRB 7013 UU**	0.38	70	100	13	0.6	75	91	12 300	16 700	17 000	25 500
80	**CRBC 8016**	**CRBC 8016 UU**	**CRB 8016**	**CRB 8016 UU**	0.74	80	120	16	0.6	86	107	18 200	25 500	24 300	37 500
90	**CRBC 9016**	**CRBC 9016 UU**	**CRB 9016**	**CRB 9016 UU**	0.81	90	130	16	1	98	118	19 400	28 600	25 900	42 100
100	**CRBC 10020**	**CRBC 10020 UU**	**CRB 10020**	**CRB 10020 UU**	1.45	100	150	20	1	108	134	31 500	45 100	39 400	61 100
110	**CRBC 11020**	**CRBC 11020 UU**	**CRB 11020**	**CRB 11020 UU**	1.56	110	160	20	1	118	144	33 500	50 700	41 200	66 700
120	**CRBC 12025**	**CRBC 12025 UU**	**CRB 12025**	**CRB 12025 UU**	2.62	120	180	25	1.5	132	164	47 700	70 500	59 900	95 400
130	**CRBC 13025**	**CRBC 13025 UU**	**CRB 13025**	**CRB 13025 UU**	2.82	130	190	25	1.5	140	172	49 200	74 800	61 000	99 800
140	**CRBC 14025**	**CRBC 14025 UU**	**CRB 14025**	**CRB 14025 UU**	2.96	140	200	25	1.5	151	183	50 700	79 200	64 100	108 000
150	**CRBC 15025**	**CRBC 15025 UU**	**CRB 15025**	**CRB 15025 UU**	3.16	150	210	25	1.5	160	192	53 800	87 700	65 000	113 000
	CRBC 15030	**CRBC 15030 UU**	**CRB 15030**	**CRB 15030 UU**	5.30	150	230	30	1.5	166	202	69 200	108 000	85 900	144 000
200	**CRBC 20025**	**CRBC 20025 UU**	**CRB 20025**	**CRB 20025 UU**	4.00	200	260	25	2	208	239	60 200	110 000	75 300	148 000
	CRBC 20030	—	**CRB 20030**	—	6.70	200	280	30	2	218	262	108 000	178 000	133 000	234 000
	CRBC 20035	—	**CRB 20035**	—	9.58	200	295	35	2	221	274	137 000	215 000	168 000	282 000

Note(1) Minimum allowable single value of chamfer dimension *r*
Remarks1. No oil hole is provided.
2. No grease is prepacked for Open Type. Perform proper lubrication. Grease is prepacked for Sealed Type.

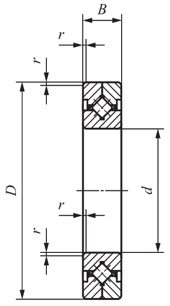
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

CROSSED ROLLER BEARINGS

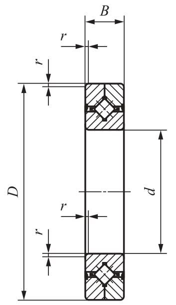
Standard Type Crossed Roller Bearings

Open Type/With Cage | Open Type/Full Complement Type

Sealed Type/With Cage | Sealed Type/Full Complement Type



CRBC 25025
CRBC 30025



CRBC 25025UU
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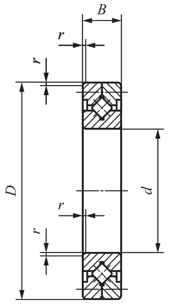
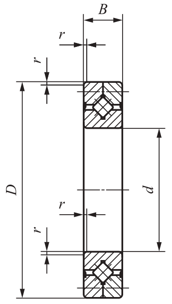
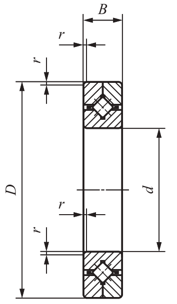


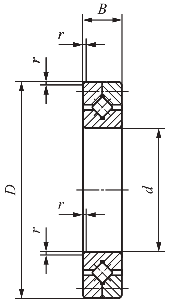
CRB 25025
CRB 30025



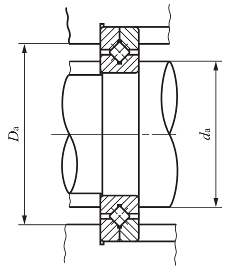
CRB 25025UU
CRB 30025UU



CRBC



CRB



Shaft dia. 250 – 800mm

Shaft dia.	Identification number				Mass (Ref.)	Boundary dimensions mm				Mounting dimensions mm		CRBC		CRB	
	With Cage		Full complement									Basic dynamic load rating	Basic static load rating	Basic dynamic load rating	Basic static load rating
mm	Open Type	Sealed Type	Open Type	Sealed Type	kg	d	D	B	$r_{\min}$ (1)	d_a	D_a	C N	C_0 N	C N	C_0 N
250	**CRBC 25025**	**CRBC 25025 UU**	**CRB 25025**	**CRB 25025 UU**	4.97	250	310	25	2.5	259	290	67 200	136 000	83 900	183 000
	CRBC 25030	—	**CRB 25030**	—	8.10	250	330	30	2.5	265	310	116 000	208 000	146 000	283 000
	CRBC 25040	—	**CRB 25040**	—	14.8	250	355	40	2.5	271	330	179 000	299 000	215 000	382 000
300	**CRBC 30025**	**CRBC 30025 UU**	**CRB 30025**	**CRB 30025 UU**	5.88	300	360	25	2.5	310	341	73 800	162 000	91 900	217 000
	CRBC 30035	—	**CRB 30035**	—	13.4	300	395	35	2.5	318	372	163 000	299 000	205 000	408 000
	CRBC 30040	—	**CRB 30040**	—	17.2	300	405	40	2.5	321	381	194 000	351 000	235 000	451 000
400	**CRBC 40035**	—	**CRB 40035**	—	14.5	400	480	35	2.5	414	457	133 000	300 000	165 000	400 000
	CRBC 40040	—	**CRB 40040**	—	23.5	400	510	40	2.5	423	483	222 000	455 000	270 000	590 000
	CRBC 40070	—	**CRB 40070**	—	72.4	400	580	70	2.5	430	532	470 000	811 000	576 000	1 060 000
500	**CRBC 50040**	—	**CRB 50040**	—	26.0	500	600	40	2.5	517	573	212 000	497 000	259 000	648 000
	CRBC 50050	—	**CRB 50050**	—	41.7	500	625	50	2.5	531	592	247 000	561 000	306 000	747 000
	CRBC 50070	—	**CRB 50070**	—	86.1	500	680	70	2.5	530	633	536 000	1 020 000	653 000	1 330 000
600	**CRBC 60040**	—	**CRB 60040**	—	30.6	600	700	40	3	621	676	231 000	581 000	287 000	774 000
	CRBC 60070	—	**CRB 60070**	—	102	600	780	70	3	630	734	591 000	1 230 000	700 000	1 540 000
	CRBC 600120	—	**CRB 600120**	—	274	600	870	120	3	643	817	1 250 000	2 210 000	1 490 000	2 800 000
700	**CRBC 70045**	—	**CRB 70045**	—	46.5	700	815	45	3	730	785	250 000	681 000	313 000	917 000
	CRBC 70070	—	**CRB 70070**	—	115	700	880	70	3	731	834	630 000	1 390 000	766 000	1 810 000
	CRBC 700150	—	**CRB 700150**	—	478	700	1 020	150	3	751	953	1 660 000	3 010 000	1 980 000	3 820 000
800	**CRBC 80070**	—	**CRB 80070**	—	109	800	950	70	4	831	907	417 000	1 090 000	513 000	1 440 000
	CRBC 800100	—	**CRB 800100**	—	247	800	1 030	100	4	840	972	936 000	2 040 000	1 140 000	2 640 000

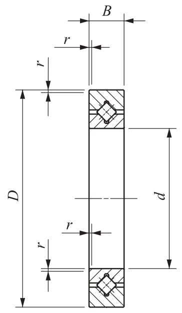
Note(1) Minimum allowable single value of chamfer dimension *r*

Remarks1. No oil hole is provided.
2. No grease is prepacked for Open Type. Perform proper lubrication. Grease is prepacked for Sealed Type.

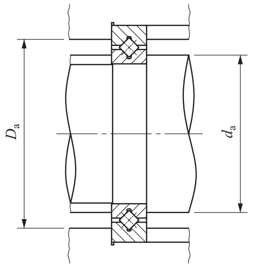
Super Slim Type Crossed Roller Bearings

Open Type/With Separator

Shaft dia. 10 ─ 50mm



CRBT⋯A



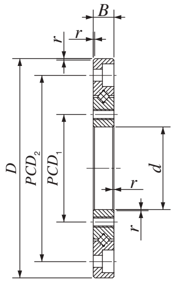
Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm				Mounting dimensions mm		Basic dynamic load rating	Basic static load rating
			d	D	B	r_{min} (1)	d_a	D_a	C N	C_0 N
10	**CRBT 105 A**	9.0	10	21	5	0.15	12.5	17	1 120	811
15	**CRBT 155 A**	11.9	15	26	5	0.15	17.5	22	1 320	1 110
20	**CRBT 205 A**	14.8	20	31	5	0.15	22.5	27	1 400	1 290
30	**CRBT 305 A**	20.7	30	41	5	0.15	32.5	37	1 770	1 970
40	**CRBT 405 A**	26.5	40	51	5	0.15	42.5	47	2 000	2 520
50	**CRBT 505 A**	32.3	50	61	5	0.15	52.5	57	2 280	3 200

Note(1) Minimum allowable single value of chamfer dimension *r* .
Remarks1. No oil hole is provided.
2. Grease is prepacked.

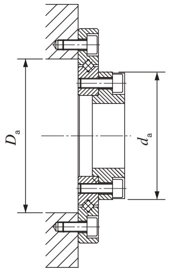
CROSSED ROLLER BEARINGS

Mounting Holed Type Super Slim Crossed Roller Bearings Open type/With Separator

Shaft dia 10 – 40mm



CRBTF···A



Shaft dia.	Identification number	Mass (Ref.)	Boundary dimensions mm				Mounting holes mm				Mounting dimensions mm		Basic dynamic load rating C	Basic static load rating C_0
							Inner ring		Outer ring					
mm		g	d	D	B	(1) $r_{\min}$	PCD_1	Mounting holes	PCD_a	Mounting holes	d_a	D_a	N	N
10	**CRBTF 105 AT**	46	10	43	5	0.15	16	6-M2.5 through	35	6-ϕ2.9 through ϕ5.5 counter bore depth 2.8	21.5	28	1 500	1 410
20	**CRBTF 205 AT**	66	20	53	5	0.15	26	6-M2.5 through	45	6-ϕ2.9 through ϕ5. 5 counter bore depth 2.8	31.5	38	1 890	2 150
30	**CRBTF 305 AT**	83	30	63	5	0.15	36	8-M2.5 through	55	8-ϕ2.9 through ϕ5.5 counter bore depth 2.8	41.5	47.5	2 140	2 750
40	**CRBTF 405 AT**	103	40	73	5	0.15	46	8-M2.5 through	65	8-ϕ2.9 through ϕ5.5 counter bore depth 2.8	51.5	58	2 440	3 490

Note(1) Minimum allowable single value of chamfer dimension *r* .

Remarks1. No oil hole is provided.

2. Grease is prepacked.

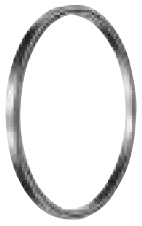
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

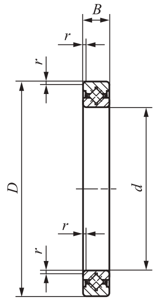
CROSSED ROLLER BEARINGS

Slim Type Crossed Roller Bearings

Open Type/With Cage **Open Type/Full Complement Type**

Sealed Type/With Separator **Sealed Type/Full Complement Type**





CRBS

Shaft dia. 50 — 200mm

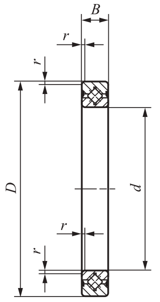
Shaft dia. mm	Identification number With Cage Open Type	 With Separator Sealed Type	Full complement Open Type	 Sealed Type	Mass (Ref.) g
50	**CRBS 508**	**CRBS 508 A UU**	**CRBS 508 V**	**CRBS 508 V UU**	84
60	**CRBS 608**	**CRBS 608 A UU**	**CRBS 608 V**	**CRBS 608 V UU**	94
70	**CRBS 708**	**CRBS 708 A UU**	**CRBS 708 V**	**CRBS 708 V UU**	108
80	**CRBS 808**	**CRBS 808 A UU**	**CRBS 808 V**	**CRBS 808 V UU**	122
90	**CRBS 908**	**CRBS 908 A UU**	**CRBS 908 V**	**CRBS 908 V UU**	135
100	**CRBS 1008**	**CRBS 1008 A UU**	**CRBS 1008 V**	**CRBS 1008 V UU**	152
110	**CRBS 1108**	**CRBS 1108 A UU**	**CRBS 1108 V**	**CRBS 1108 V UU**	163
120	**CRBS 1208**	**CRBS 1208 A UU**	**CRBS 1208 V**	**CRBS 1208 V UU**	184
130	**CRBS 1308**	**CRBS 1308 A UU**	**CRBS 1308 V**	**CRBS 1308 V UU**	199
140	**CRBS 1408**	**CRBS 1408 A UU**	**CRBS 1408 V**	**CRBS 1408 V UU**	205
150	**CRBS 1508**	**CRBS 1508 A UU**	**CRBS 1508 V**	**CRBS 1508 V UU**	220
160	**CRBS 16013**	**CRBS 16013 A UU**	**CRBS 16013 V**	**CRBS 16013 V UU**	620
170	**CRBS 17013**	**CRBS 17013 A UU**	**CRBS 17013 V**	**CRBS 17013 V UU**	675
180	**CRBS 18013**	**CRBS 18013 A UU**	**CRBS 18013 V**	**CRBS 18013 V UU**	710
190	**CRBS 19013**	**CRBS 19013 A UU**	**CRBS 19013 V**	**CRBS 19013 V UU**	740
200	**CRBS 20013**	**CRBS 20013 A UU**	**CRBS 20013 V**	**CRBS 20013 V UU**	780

Note(1) Minimum allowable single value of chamfer dimension *r*

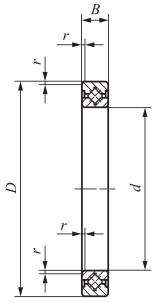
(2) No grease is prepacked. Perform proper lubrication.

(3) Grease is prepacked.

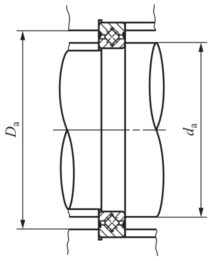
Remark No oil hole is provided.



CRBS ··· AUU
··· VUU



CRBS ··· V



Boundary dimensions mm d	 D	 B	 r_{min} (1)	Mounting dimensions mm d_a	 D_a	**CRBS**(2) With cage Basic dynamic load rating C N	 Basic static load rating C_0 N	**CRBS···AUU**(3) With Separator Basic dynamic load rating C N	 Basic static load rating C_0 N	**CRBS···V**(2) **CRBS···VUU**(3) Full complement Basic dynamic load rating C N	 Basic static load rating C_0 N
50	66	8	0.4	54	61	4 900	6 170	4 680	5 810	6 930	9 800
60	76	8	0.4	64	71	5 350	7 310	5 350	7 310	7 600	11 700
70	86	8	0.4	74	81	5 740	8 440	5 740	8 440	8 190	13 600
80	96	8	0.4	84	91	6 130	9 590	6 130	9 590	8 790	15 500
90	106	8	0.4	94	101	6 490	10 700	6 490	10 700	9 310	17 400
100	116	8	0.4	104	111	6 850	11 900	6 530	11 100	9 850	19 300
110	126	8	0.4	114	121	7 160	13 000	6 850	12 300	10 300	21 200
120	136	8	0.4	124	131	7 530	14 100	7 070	13 000	10 900	23 000
130	146	8	0.4	134	141	7 860	15 300	7 270	13 800	11 200	24 600
140	156	8	0.4	144	151	8 060	16 400	7 510	14 900	11 700	26 800
150	166	8	0.4	154	161	8 350	17 500	7 810	16 000	12 100	28 700
160	186	13	0.6	166	179	20 300	39 900	19 400	37 700	26 900	58 200
170	196	13	0.6	176	189	20 900	42 200	20 000	39 900	27 800	61 600
180	206	13	0.6	186	199	21 500	44 600	21 900	45 700	28 600	65 200
190	216	13	0.6	196	209	22 100	46 900	22 900	49 200	29 300	68 600
200	226	13	0.6	206	219	22 500	49 300	23 300	51 600	30 000	72 200

J
CRBHV
CRBFV
CRB(C)
CRBT
CRBTF
CRBS

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SPHERICAL BUSHINGS

- ●Steel-on-steel Spherical Bushings
- ●Maintenance-free Spherical Bushings

Structure and Features

IKO Spherical Bushings are self-aligning spherical plain bushings that have inner and outer rings with spherical sliding surfaces, and can take a large radial load and a bi-directional axial load at the same time. There are many types of Spherical Bushings, but they are basically divided into steel-on-steel types and maintenance-free types according to the kind of sliding surfaces.

Steel-on-steel Spherical Bushings have inner and outer rings of high carbon chromium bearing steel, of which sliding surfaces are phosphate-treated and then dry-coated with molybdenum disulfide (MoS_2). They can, therefore, operate with low torque, and have excellent wear resistance and large load capacity. They are especially suitable for applications where there are alternate loads and shock loads. They have wide applications mainly in industrial and construction machinery.

Maintenance-free Spherical Bushings consist of an outer ring which has a special PTFE liner reinforced with copper alloy meshes on the sliding surface, and a spherical inner ring of which sliding surface has a hard chromium plating. Creep deformation due to compressive load is small, and wear resistance is superior. Thus, they are maintenance-free and can be used for extended periods of time without re-lubrication. They are especially suitable in cases where fixed directional loads are applied and are used mainly in food processing machines and construction machinery and in other applications in which the use of oil is undesirable or lubrication is not possible.

Types

Spherical Bushings are available in various types shown in Table 1.

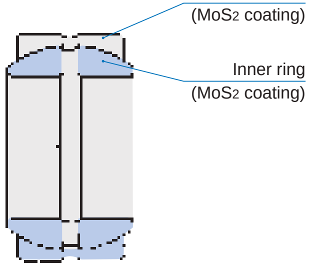
Table 1 Type of bearing

Type / Series	Steel-on-steel		Maintenance-free	
	Without seals	With seals	Without seals	With seals
Metric	SB	—	GE ··· EC	GE ··· EC-2RS
	SB ··· A	—		
	GE ··· E, ES	GE ··· ES-2RS		
	GE ··· G, GS	GE ··· GS-2RS		
Inch	SBB	SBB ··· -2RS	—	—

Structures of Spherical Bushings

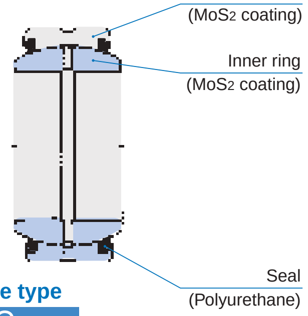
Steel-on-steel type

SB···A



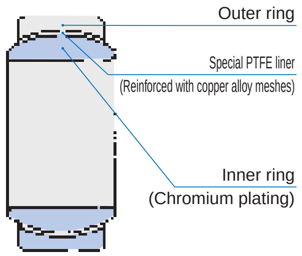
Steel-on-steel type

GE···ES-2RS



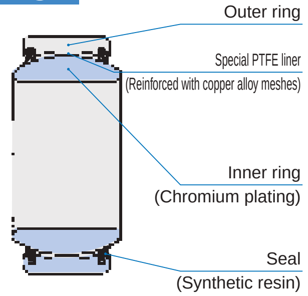
Maintenance-free type

GE···EC



Maintenance-free type

GE···EC-2RS



K
SB
GE
SBB

Steel-on-steel Spherical Bushings SB

These bushings have an outer ring split into halves. The split outer ring and the inner ring are held together by a snap ring placed in the groove around the outer periphery of the outer ring.

Steel-on-steel Spherical Bushings SB ··· A

These bushings have an outer ring split only at one position, and therefore, the outer and inner rings will not separate. Handling before mounting and mounting to the housing are simple. The boundary dimensions are the same as those of the SB type.Therefore, SB and SB ··· A types are dimensionally interchangeable, but the radial internal clearances of the SB ··· A type are smaller than those of the SB type.

Steel-on-steel Spherical Bushings GE ··· E, GE ··· ES

The dimension series of these types conform to ISO standards and they can be used internationally. The outer ring is split at one position. The GE ··· E and GE ··· ES types are available. These are classified by bushing size.

The GE ··· ES type can be provided with seals, which are double-lip type polyurethane seals effective for prevention against grease leakage and dust penetration. The sealed type is indicated by the suffix "-2RS" at the end of the identification number.

Steel-on-steel Spherical Bushings GE ··· G, GE ··· GS

As compared with the GE ··· E and GE ··· ES types, these bushings have larger load capacities and larger permissible tilting angles. The dimension series also conform to ISO standards, and they can be used internationally. The outer ring is split at one position. The GE ··· G and GE ··· GS types are available. They are classified by bushing size.

The GE ··· GS type can be provided with seals, which are double-lip type polyurethane seals effective for prevention against grease leakage and dust penetration. The sealed type is indicated by the suffix "-2RS" at the end of the identification number.

Steel-on-steel Spherical Bushings SBB

These are inch series bushings. The outer ring is split at one position.

These bushings can be provided with seals, which are double-lip type polyurethane seals effective for prevention against grease leakage and dust penetration. The sealed type is indicated by the suffix "-2RS" at the end of the identification number.

Maintenance-free Spherical Bushings GE ··· EC

These bushings have the same boundary dimensions as the GE ··· ES type and can be used internationally. A special PTFE liner reinforced with copper alloy meshes is used on the sliding surface. Therefore, creep deformation due to compressive loads is small, and wear resistance is superior. These bushings are used as maintenance-free bushings.

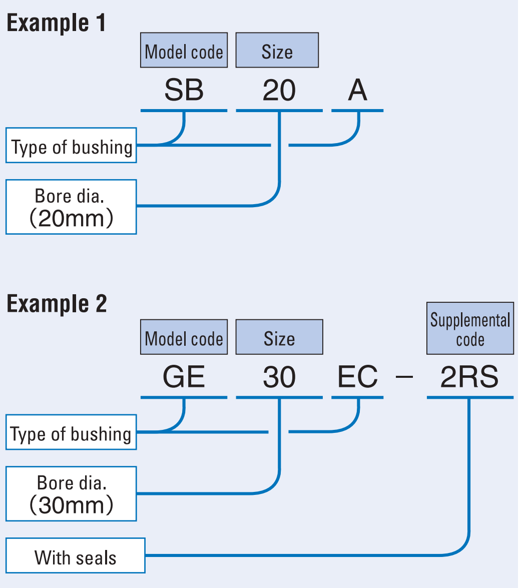
These bushings can be provided with synthetic resin seals which are effective in preventing dust penetration. They are indicated by the suffix "-2RS" at the end of the identification number.

Spherical Bushings with superior rust prevention properties, which can be used in a corrosive environment or in an environment where water splashes, are also available on request. Please consult IKO.

Identification number

The identification number of Spherical Bushings consists of a model code, a size and any supplemental codes. Examples are shown below.

Examples of identification number



Accuracy

The tolerances of Steel-on-steel Spherical Bushings of the metric series is shown in Table 2.

The tolerances of the GE type are applicable to bushings before splitting the outer ring and after surface treatment.

The tolerances of the SB and SB···A types are applicable to bushings before splitting the outer ring and before surface treatment.

The tolerances of the GE···EC type are applicable to bushings before splitting the outer ring.

The tolerances of the Spherical Bushings of the inch series are shown in Table 3. The tolerances of the bore diameter are applicable to bushings after surface treatment, while other tolerances are applicable to bushings before splitting the outer ring and before surface treatment.

Although minor dimensional changes may occur during surface treatment, they have negligible influence on the overall performance.

Table 2 Tolerances of inner and outer rings of metric series (JIS Class 0) unit: μm

d or D (1) Nominal bore dia. or outside dia. mm		Δ_{dmp} Single plane mean bore dia. deviation		Δ_{Dmp} Single plane mean outside dia. deviation		Δ_{Bs} or Δ_{Cs} Deviation of a single inner ring width or outer ring width	
Over	Incl.	High	Low	High	Low	High	Low
2.5	6	0	− 8	—	—	0	− 120
6	18	0	− 8	0	− 8	0	− 120
18	30	0	− 10	0	− 9	0	− 120
30	50	0	− 12	0	− 11	0	− 120
50	80	0	− 15	0	− 13	0	− 150
80	120	0	− 20	0	− 15	0	− 200
120	150	0	− 25	0	− 18	0	− 250
150	180	0	− 25	0	− 25	0	− 250
180	250	0	− 30	0	− 30	0	− 300
250	315	0	− 35	0	− 35	0	− 350
315	400	0	− 40	0	− 40	0	− 400
400	500	0	− 45	0	− 45	0	− 450

Note(1) d for Δ_{dmp}, Δ_{Bs} and Δ_{Cs} and D for Δ_{Dmp}, respectively.

Table 3 Tolerances of inner and outer rings of inch series SBB unit: μm

d or D (1) Nominal bore dia. or outside dia. mm		Δ_{dmp} Single plane mean bore dia. deviation		Δ_{Dmp} Single plane mean outside dia. deviation		Δ_{Bs} or Δ_{Cs} Deviation of a single inner ring width or outer ring width	
Over	Incl.	High	Low	High	Low	High	Low
—	50.800	0	− 13	0	− 13	0	− 130
50.800	76.200	0	− 15	0	− 15	0	− 130
76.200	80.962	0	− 20	0	− 15	0	− 130
80.962	120.650	0	− 20	0	− 20	0	− 130
120.650	152.400	0	− 25	0	− 25	0	− 130
152.400	177.800	—	—	0	− 25	0	− 130
177.800	222.250	—	—	0	− 30	0	− 130

Note(1) d for Δ_{dmp}, Δ_{Bs} and Δ_{Cs} and D for Δ_{Dmp}, respectively.

Clearance

The radial internal clearances of Spherical Bushings are the values before splitting the outer ring, and are shown in Tables 4, 5 and 6. The radial internal clearances of the inch series are shown in the dimension table.

Clearances other than these can also be prepared on request. Please consult IKO.

Table 4 Radial internal clearance of SB and SB ··· A types (Steel-on-steel) unit: μm

d Nominal bore dia. mm	SB type		SB ··· A type	
	Min.	Max.	Min.	Max.
12	70	125	32	68
15			40	82
20	75	140		
22			50	100
25				
30				
35	85	150		
40			60	120
45				
50				
55	90	160		
60			72	142
65				
70	95	170		
75				
80				
85	100	185	85	165
90				
95				
100				
110	110	200		
115				
120				
130	120	215	100	192
150				

Table 5 Radial internal clearance of GE type (Steel-on-steel)

unit: μm

d Nominal bore dia. mm		Radial internal clearance	
GE…E GE…ES	GE…G GE…GS	Min.	Max.
4 5 6 8 10 12	– – – 6 8 10	32	68
15 17 20	12 15 17	40	82
25 30 35	20 25 30	50	100
40 45 50 60	35 40 45 50	60	120
70 80 90	60 70 80	72	142
100 110 120 140	90 100 110 120	85	165
160 180 200 220 240	140 160 180 200 220	100	192
260 280 300	240 260 280	110	214

Remark Also applicable to bushings with seals.

Table 6 Radial internal clearance of GE ··· EC type (Maintenance-free)

unit: μm

d Nominal bore dia. mm	Radial internal clearance	
	Min.	Max.
15 17 20	0	40
25 30 35	0	50
40 45 50 60	0	60
70	0	72

Remark Also applicable to bushings with seals.

Fit

The recommended fits for Spherical Bushings are shown in Tables 7 and 8.

Table 7 Recommended fits for Steel-on-steel Spherical Bushings

Condition	Tolerance class	
	Shaft	Housing bore
Normal operation	h6, j6	H7, J7
With directionally indeterminate load	m6, n6	M7, N7

Remark N7 tolerance is recommended for light metal housings.

Table 8 Recommended fits for Maintenance-free Spherical Bushings

Tolerance class of shaft	Tolerance class of housing bore
h6, j6	H7, J7, K7

Remark K7 tolerance is recommended for light metal housings.

Selection of Spherical Bushings

Selection between the steel-on-steel type and the maintenance-free type is made considering the operating conditions such as load, lubrication, temperature, and sliding velocity.

Load capacity

❶ Dynamic load capacity

The dynamic load capacity C_d is the maximum allowable load that can be applied on a spherical bushing under oscillating motion. It is obtained on the basis of the contact pressure on the spherical surfaces. The dynamic load capacity is also used for calculating the life of spherical bushings.

The recommended value of bushing load is obtained by multiplying the dynamic load capacity C_d by a numerical factor, which differs depending on the bushing type and the load condition. A guideline for selection is shown in Table 9.

Table 9 Guide for determination of load

Type of bushing	Load direction	
	Constant	Alternate
Steel-on-steel	$\leqq 0.3C_d$	$\leqq 0.6C_d$
Maintenance-free	$\leqq C_d$	$\leqq 0.5C_d$

When the magnitude of load exceeds the value given in Table 9, please consult IKO.

The dynamic load capacity C_{dt} considering the influence of bushing temperature can be obtained from the following equation using the temperature factor.

$$C_{dt}=f_t\,C_d \quad \cdots\cdots\cdots\cdots(1)$$

where, C_{dt} : Dynamic load capacity considering temperature increase N

f_t : Temperature factor (Refer to Table 10.)

C_d : Dynamic load capacity N (Refer to the dimension tables.)

Table 10 Temperature factor f_t

Type of bushing		Temperature ℃					
		−30 +80	+80 +90	+90 +100	+100 +120	+120 +150	+150 +180
Steel-on-steel	Without seals	1	1	1	1	1	0.7
	With seals	1	–	–	–	–	–
Maintenance-free	Without seals	1	1	0.9	0.75	0.55	–
	With seals	1	–	–	–	–	–

❷ Static load capacity

The static load capacity C_s is the maximum static load that can be applied on the spherical bushing without breaking inner and outer rings or causing any permanent deformation severe enough to render the bushing unusable.

It must be noted that if the magnitude of the applied load becomes comparable to the static load capacity of bushing, the stresses in the shaft or housing may also reach to their limits. This possibility must be taken into consideration in the design.

Equivalent radial load

Spherical Bushings can take radial and axial loads at the same time. When the magnitude and direction of loads are constant, the equivalent radial load can be obtained from the following equation.

$$P=F_r+YF_a \quad \cdots\cdots\cdots\cdots(2)$$

where, P : Equivalent radial load N

F_r : Radial load N

F_a : Axial load N

Y : Axial load factor (Refer to Table 11.)

Table 11 Axial load factor Y

F_a/F_r / Type of bushing	0.1	0.2	0.3	0.4	0.5	>0.5
Steel-on-steel	1	2	3	4	5	Unusable
Maintenance-free	1	2	3	Unusable		

Life

The life of Spherical Bushings is defined as the total number of oscillating motions before the bushings cannot be operated normally because of wear, increase in internal clearance, increase in sliding torque, rise of operating temperature, etc.

As the actual life is affected by many factors such as the material of the sliding surface, the magnitude and direction of load, lubrication, sliding velocity, etc., the calculated life can be used as a practical measure of expected service life.

❶ Life of Steel-on-steel spherical bushings

[1] Confirmation of pV value

Before attempting to calculate the life, make sure that the operating conditions are within the permissible range by referring to the pV diagram in Fig.1.

When the operating conditions are out of the permissible range, please consult IKO.

The contact pressure p and the sliding velocity V are obtained from the following equations.

$$p=\frac{100P}{C_{dt}} \quad \cdots\cdots\cdots\cdots(3)$$

$$V=5.82\times10^{-4}d_k\beta f \quad \cdots\cdots\cdots\cdots(4)$$

where, p : Contact pressure N/mm²

P : Equivalent radial load N (Refer to equation (2).)

C_{dt} : Dynamic load capacity considering temperature increase N (Refer to equation (1).)

V : Sliding velocity mm/s

d_k : Sphere diameter mm (Refer to the dimension tables.)

2β : Oscillating angle degrees (Refer to Fig.2.) when $\beta<5°$, $\beta=5$ when rotating, $\beta=90$

f : Number of oscillations per minute min⁻¹

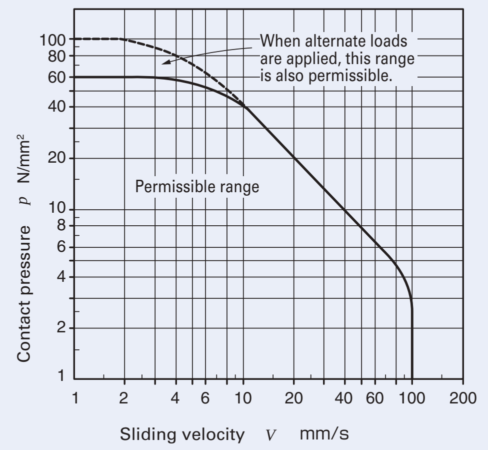


Fig.1 pV diagram of Steel-on-steel spherical bushings

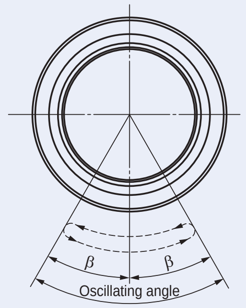


Fig.2 Oscillating angle

[2] Life calculation

The life of steel-on-steel spherical bushings can be calculated from the following equations.

$$G = \frac{3.18 b_1 b_2 b_3}{\sqrt{d_k}\,\beta}\left(\frac{C_{dt}}{P}\right)^2 \times 10^5 \cdots\cdots\cdots\cdots\cdots (5)$$

$$L_h = \frac{G}{60f} \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (6)$$

where, G : Life (Total number of oscillations)
b_1 : Load directional factor (Refer to Table 12.)
b_2 : Lubrication factor (Refer to Table 13.)
b_3 : Sliding velocity factor (Refer to Fig.3.)
C_{dt} : Dynamic load capacity considering temperature increase N (Refer to equation (1).)
P : Equivalent radial load N (Refer to equation (2).)
L_h : Life in hours h
f : Number of oscillations per minute min^{-1}

Table 12 Load directional factor b_1 (Steel-on-steel)

Load direction	Constant	Alternate
Load directional factor b_1	1	5

Table 13 Lubrication factor b_2

Periodical lubrication	None	Regular
Lubrication factor b_2	1	15

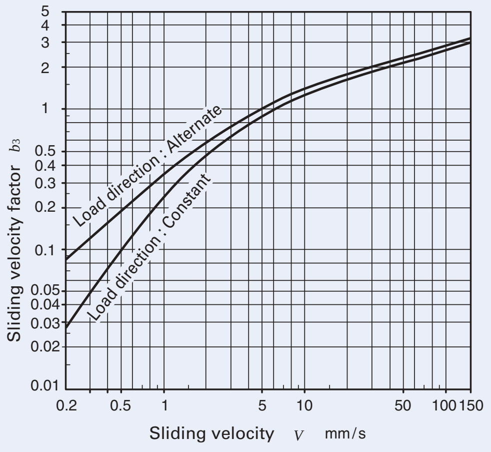


Fig.3 Sliding velocity factor

❷ Life of Maintenance-free spherical bushings

[1] Confirmation of pV value

Before attempting to calculate the life, make sure that the operating conditions are within the permissible range by referring to the pV diagram in Fig.4.

When the operating conditions are out of the permissible range, please consult IKO.

The contact pressure p and the sliding velocity V are obtained from equations (3) and (4) shown on page K6.

[2] Life calculation

The life of maintenance-free spherical bushings is obtained from the total sliding distance S which is given in Fig.5 for the contact pressure p obtained from equation (3).

The total number of oscillations and life in hours can be obtained from the following equations.

$$G = 16.67 \times b_1 \frac{Sf}{V} \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (7)$$

$$L_h = \frac{G}{60f} \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (8)$$

where, G : Life (Total number of oscillations)
b_1 : Load directional factor (Refer to Table 14.)
S : Total sliding distance m (Refer to Fig.5.)
f : Number of oscillations per minute min^{-1}
V : Sliding velocity mm/s
L_h : Life in hours h

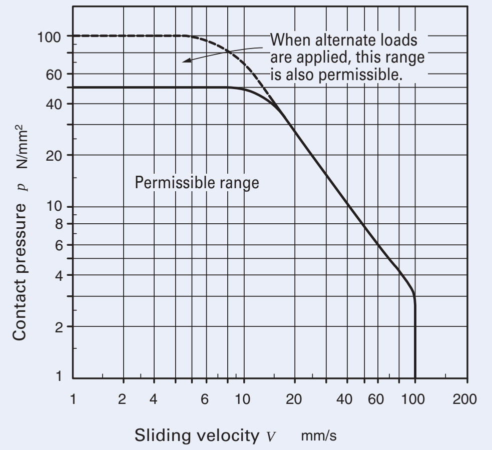


Fig.4 pV diagram of Maintenance-free spherical bushings

Table 14 Load directional factor b_1 (Maintenance-free)

Load direction	Constant	Alternate
Load directional factor b_1	1	0.2 (1)

Note(1) This value is applicable when the load changes comparatively slowly. When the load changes rapidly, please consult IKO, as the factor degreases sharply.

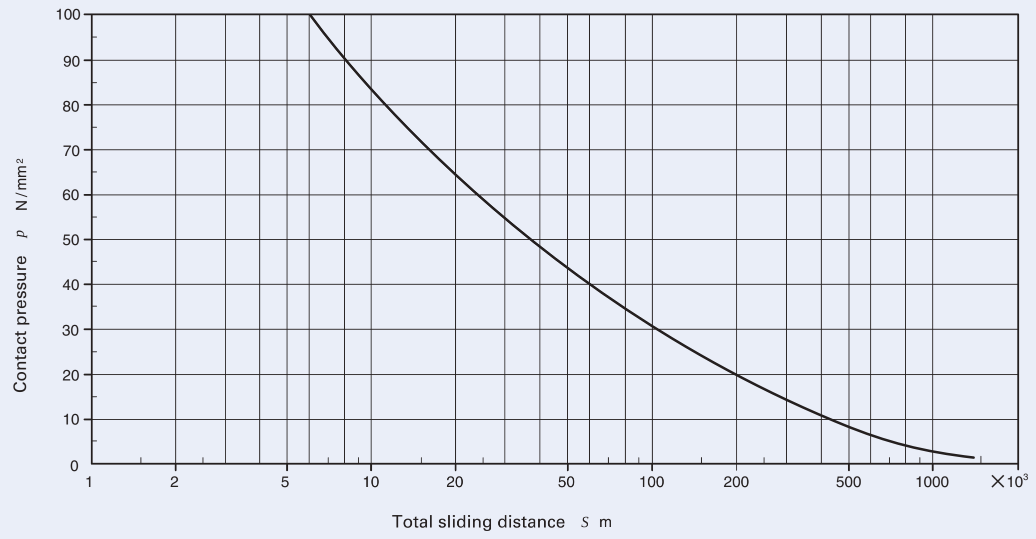


Fig.5 Total sliding distance against contact pressure of Maintenance-free spherical bushings

Lubrication

Steel-on-steel Spherical Bushings require periodic grease lubrication as a general rule. During initial operation, it is recommended to shorten the lubrication interval. Lithium soap based grease (NLGI consistency No.2) containing molybdenum disulfide (MoS2) is widely used as the lubrication grease. For Maintenance-free Spherical Bushings, lubrication is not required. However, supplying lithium soap based grease before operation can extend the life of the Spherical Bushing. Also, to protect the bearing from foreign substances and corrosion, it is effective to fill the area around the bearing with grease.

Oil Hole

The number of oil holes on inner and outer rings is shown in Table 15.

Table 15 Number of oil holes on inner and outer rings

Bushing type			Number of oil holes on inner and outer rings
Steel-on-steel Spherical Bushings	Metric series	GE···E GE···G	0
		SB, SB···A GE···ES, GE···GS	2
	Inch series	SBB	2
Maintenance-free Spherical Bushings	Metric series	GE···EC	0

Remark Types with oil holes are also provided with oil grooves on inner and outer rings.

Operating Temperature Range

The operating temperature range for Spherical Bushings with seals is -30˚C～+80˚C.
The maximum allowable temperature for Spherical Bushings without seals is +180˚C for the steel-on-steel type and +150˚C for the maintenance-free type.

Precautions for Use

Design of shaft

When the load is large, sliding may occur between the shaft and the inner ring bore of bushing. For such cases, it is necessary to prepare the shaft with a hardness of 58HRC or greater and surface roughness of 0.8 μmR_a or less.
Furthermore, attention must be paid to the strength of shaft because the shear and/or bending stresses in the shaft may surpass the allowable values even when the load is below the static load capacity of Spherical Bushings.

Design of housing

The housing should have sufficient rigidity to avoid harmful deformation under load.
When the housing shown in Fig.6 is used, it should be designed with sufficient strength as follows.

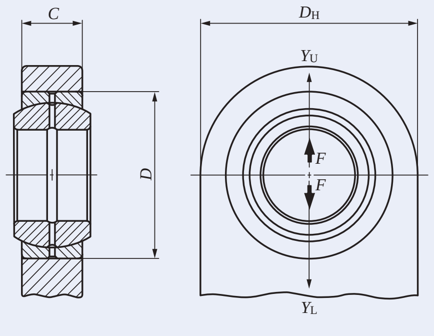


Fig.6 Shape of housing

① When the load acts in the Y_L direction;
Select the housing material considering the compressive stress obtained from the following equation.

$$\sigma_1 = \frac{F}{CD} \cdots\cdots(9)$$

where, σ_1 : Maximum compressive stress occurring in the housing bore N/mm²
F : Applied load N
C : Width of outer ring and housing mm
D : Outside diameter of outer ring mm

❷ When the load acts in the Yu direction ;
Select the housing material considering the tensile stress obtained from the following equation.

$$\sigma_2 = \frac{F}{C\ (D_H - D)}\, k \cdots\cdots(10)$$

where, σ_2 : Maximum tensile stress occurring in the housing bore N/mm²
F : Applied load N
C : Width of outer ring and housing mm
D_H : Outside diameter of housing mm
D : Outside diameter of outer ring mm
k : Stress concentration factor (Refer to Fig.7.)

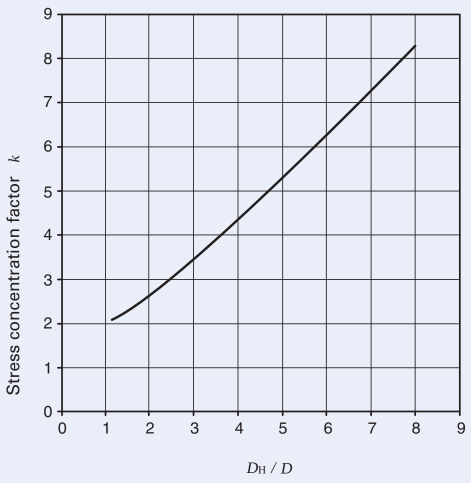


Fig.7 Stress concentration factor

Mounting

❶When mounting Spherical Bushings, pay attention to the location of the split plane of the outer ring. Set the split plane at right angles to the direction of load to avoid the application of load to the split plane as shown in Fig. 8.
❷The shoulder dimensions of shaft and housing are shown in the dimension tables.

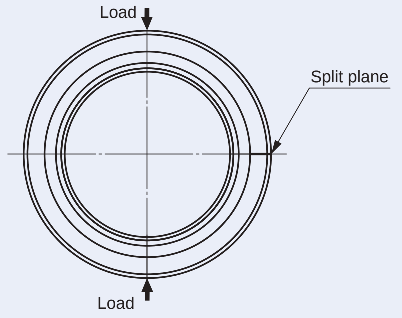
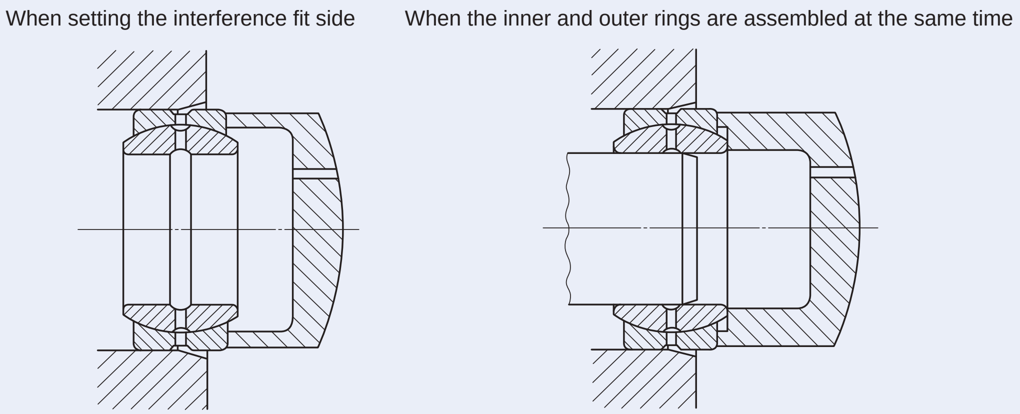


Fig.8 Relationship between the split plane and the loading direction


When setting the interference fit side

When the inner and outer rings are assembled at the same time

Fig.9 Mounting method

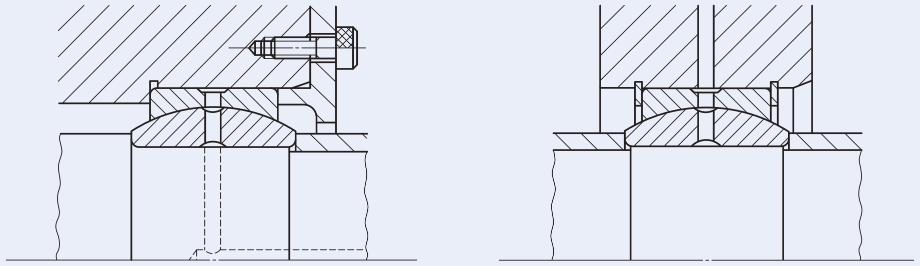
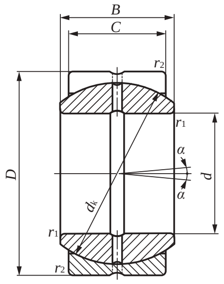


Fig.10 Mounting examples

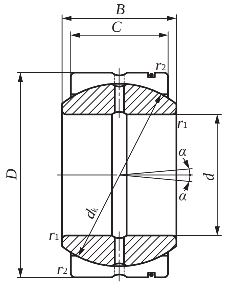
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SPHERICAL BUSHINGS

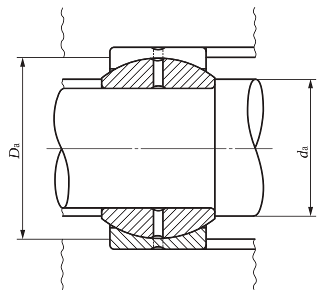
Steel-on-steel Spherical Bushings



SB···A



SB



Shaft dia. 12 ─ 100mm

Shaft dia. mm	Identification number		Mass (Ref.) kg	Boundary dimensions mm						Permissible tilting angle degree	Mounting dimensions mm				Dynamic load capacity	Static load capacity
				d	D	B	C	d_k	$r_{s\ min}$(1)	α	d_a Min.	d_a Max.(2)	D_a Max.	D_a Min.	C_d N	C_s N
12	**SB 12A**	**SB 122211**	0.019	12	22	11	9	18	0.3	7	14	14	19.5	17	15 900	95 300
15	**SB 15A**	**SB 152613**	0.028	15	26	13	11	22	0.3	6	17.5	17.5	23.5	21	23 700	142 000
20	**SB 20A**	**SB 203216**	0.053	20	32	16	14	28	0.3	4	22.5	23	29.5	26	38 400	231 000
22	**SB 22A**	**SB 223719**	0.085	22	37	19	16	32	0.3	6	24.5	25.5	34.5	30	50 200	301 000
25	**SB 25A**	**SB 254221**	0.116	25	42	21	18	36	0.3	5	27.5	29	39.5	34	63 500	381 000
30	**SB 30A**	**SB 305027**	0.225	30	50	27	23	45	0.6	6	34.5	36	45.5	42	101 000	609 000
35	**SB 35A**	**SB 355530**	0.300	35	55	30	26	50	0.6	5	39.5	40	50.5	46.5	127 000	765 000
40	**SB 40A**	**SB 406233**	0.375	40	62	33	28	55	0.6	6	44	44	57.5	51.5	151 000	906 000
45	**SB 45A**	**SB 457236**	0.600	45	72	36	31	62	0.6	5	49.5	50.5	67.5	58	188 000	1 130 000
50	**SB 50A**	**SB 508042**	0.870	50	80	42	36	72	0.6	5	54.5	58.5	75.5	67	254 000	1 530 000
55	**SB 55A**	**SB 559047**	1.26	55	90	47	40	80	0.6	5	59.5	64.5	85.5	74.5	314 000	1 880 000
60	**SB 60A**	**SB 6010053**	1.70	60	100	53	45	90	0.6	6	64.5	72.5	95.5	83.5	397 000	2 380 000
65	**SB 65A**	**SB 6510555**	2.05	65	105	55	47	94	0.6	5	69.5	76	100.5	87	433 000	2 600 000
70	**SB 70A**	**SB 7011058**	2.22	70	110	58	50	100	0.6	5	74.5	81.5	105.5	93	490 000	2 940 000
75	**SB 75A**	**SB 7512064**	3.02	75	120	64	55	110	0.6	5	79.5	89.5	115.5	102	593 000	3 560 000
80	**SB 80A**	**SB 8013070**	3.98	80	130	70	60	120	0.6	5	84.5	97.5	125.5	112	706 000	4 240 000
85	**SB 85A**	**SB 8513574**	4.29	85	135	74	63	125	0.6	6	89.5	100.5	130.5	116	772 000	4 630 000
90	**SB 90A**	**SB 9014076**	4.71	90	140	76	65	130	0.6	5	94.5	105.5	135.5	121	829 000	4 970 000
95	**SB 95A**	**SB 9515082**	6.05	95	150	82	70	140	0.6	5	99.5	113.5	145.5	130	961 000	5 770 000
100	**SB 100A**	**SB 10016088**	7.42	100	160	88	75	150	1	5	105.5	121.5	154.5	139	1 100 000	6 620 000

Notes(1) Minimum allowable value of chamfer dimensions r_1 and r_2

(2) When Spherical Bushings are used with full tilting angle, the shaft shoulder dimesion must be less than the maximum value of d_a.

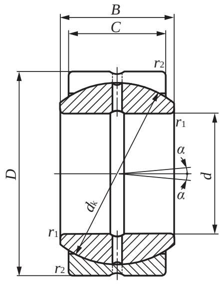
Remarks1. The inner ring and the outer ring have an oil groove and two oil holes, respectively.

2. No grease is prepacked. Perform proper lubrication.

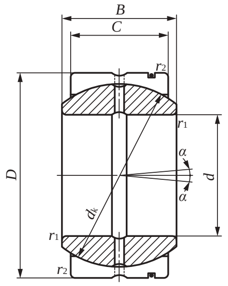
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SPHERICAL BUSHINGS

Steel-on-steel Spherical Bushings



SB···A



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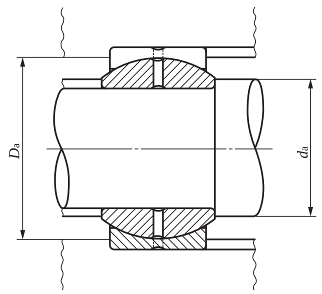


Shaft dia. 110 — 150mm

Shaft dia. mm	Identification number		Mass (Ref.) kg	Boundary dimensions mm d	D	B	C	d_k	$r_{s\ min}$ (1)	Permissible tilting angle degree α	Mounting dimensions mm d_a Min.	d_a Max.(2)	D_a Max.	D_a Min.	Dynamic load capacity C_d N	Static load capacity C_s N
110	**SB 110A**	**SB 11017093**	8.55	110	170	93	80	160	1	5	115.5	130	164.5	149	1 260 000	7 530 000
115	**SB 115A**	**SB 11518098**	10.3	115	180	98	85	165	1	5	120.5	132.5	174.5	152	1 380 000	8 250 000
120	**SB 120A**	**SB 120190105**	12.4	120	190	105	90	175	1	5	125.5	140	184.5	162	1 540 000	9 270 000
130	**SB 130A**	**SB 130200110**	13.8	130	200	110	95	185	1	5	135.5	148.5	194.5	171	1 720 000	10 300 000
150	**SB 150A**	**SB 150220120**	17.0	150	220	120	105	205	1	5	155.5	166	214.5	189	2 110 000	12 700 000

Notes(1) Minimum allowable value of chamfer dimensions r_1 and r_2

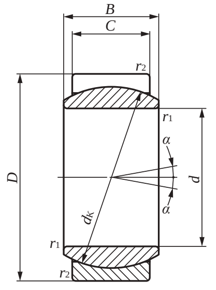
(2) When Spherical Bushings are used with full tilting angle, the shaft shoulder dimension must be less than the maximum value of d_a.

Remarks1. The inner ring and the outer ring have an oil groove and two oil holes, respectively.

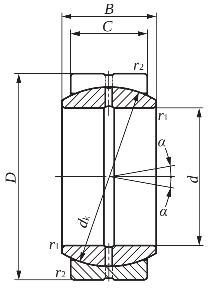
2. No grease is prepacked. Perform proper lubrication.

SPHERICAL BUSHINGS

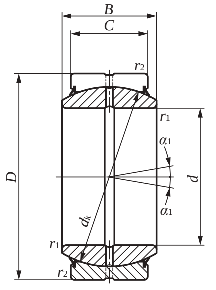
Steel-on-steel Spherical Bushings



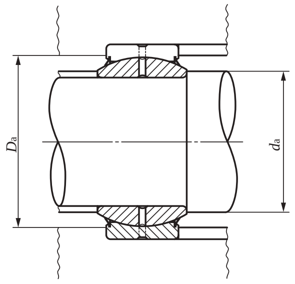
GE⋯E



GE⋯ES



GE⋯ES-2RS



Shaft dia. 4 — 100mm

Shaft dia.	Identification number		Mass (Ref.)	Boundary dimensions mm							Permissible tilting angle degree		Mounting dimensions mm				Dynamic load capacity	Static load capacity
mm	Without seals	With seals	kg	d	D	B	C	d_k	$r_{1s\,min}$(1)	$r_{2s\,min}$(1)	α	α_1	d_a Min.	d_a Max.(2)	D_a Max.	D_a Min.	C_d N	C_s N
4	GE 4E	—	0.003	4	12	5	3	8	0.3	0.3	16	—	6	6	9.5	8	2 350	14 100
5	GE 5E	—	0.004	5	14	6	4	10	0.3	0.3	13	—	7.5	8	11.5	10	3 920	23 500
6	GE 6E	—	0.004	6	14	6	4	10	0.3	0.3	13	—	8	8	11.5	10	3 920	23 500
8	GE 8E	—	0.008	8	16	8	5	13	0.3	0.3	15	—	10	10	13.5	13	6 370	38 200
10	GE 10E	—	0.012	10	19	9	6	16	0.3	0.3	12	—	12.5	13	16.5	15.5	9 410	56 500
12	GE 12E	—	0.017	12	22	10	7	18	0.3	0.3	11	—	14.5	15	19.5	17	12 400	74 100
15	GE 15ES	GE 15ES-2RS	0.032	15	26	12	9	22	0.3	0.3	8	5	17.5	18	23.5	22.5	19 400	117 000
17	GE 17ES	GE 17ES-2RS	0.049	17	30	14	10	25	0.3	0.3	10	7	19.5	20.5	27.5	26	24 500	147 000
20	GE 20ES	GE 20ES-2RS	0.065	20	35	16	12	29	0.3	0.3	9	6	22.5	24	32.5	30.5	34 100	205 000
25	GE 25ES	GE 25ES-2RS	0.115	25	42	20	16	35.5	0.6	0.6	7	4	29	29	37.5	37	55 700	334 000
30	GE 30ES	GE 30ES-2RS	0.160	30	47	22	18	40.7	0.6	0.6	6	4	34	34	42.5	41.5	71 800	431 000
35	GE 35ES	GE 35ES-2RS	0.258	35	55	25	20	47	0.6	1	6	4	39.5	39.5	49.5	48	92 200	553 000
40	GE 40ES	GE 40ES-2RS	0.315	40	62	28	22	53	0.6	1	7	4	44.5	45	56.5	54.5	114 000	686 000
45	GE 45ES	GE 45ES-2RS	0.413	45	68	32	25	60	0.6	1	7	4	49.5	50.5	62.5	60	147 000	883 000
50	GE 50ES	GE 50ES-2RS	0.560	50	75	35	28	66	0.6	1	6	4	54.5	56	69.5	66	181 000	1 090 000
60	GE 60ES	GE 60ES-2RS	1.10	60	90	44	36	80	1	1	6	3	65.5	66.5	84.5	79	282 000	1 690 000
70	GE 70ES	GE 70ES-2RS	1.54	70	105	49	40	92	1	1	6	4	75.5	77.5	99.5	91	361 000	2 170 000
80	GE 80ES	GE 80ES-2RS	2.29	80	120	55	45	105	1	1	6	4	85.5	89	114.5	103	463 000	2 780 000
90	GE 90ES	GE 90ES-2RS	2.82	90	130	60	50	115	1	1	5	3	95.5	98	124.5	112	564 000	3 380 000
100	GE 100ES	GE 100ES-2RS	4.43	100	150	70	55	130	1	1	7	5	105.5	109.5	144.5	127	701 000	4 210 000

Notes(1) Minimum allowable value of chamfer dimensions r_1 and r_2

(2) When Spherical Bushings are used with full tilting angle, the shaft shoulder dimension must be less than the maximum value of d_a.

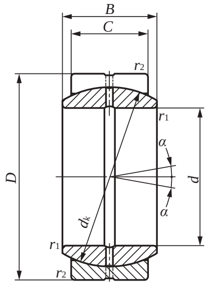
Remarks1. GE⋯E has no oil hole. Others are provided with an oil groove and two oil holes on the inner ring and outer ring, respectively.

2. No grease is prepacked. Perform proper lubrication.

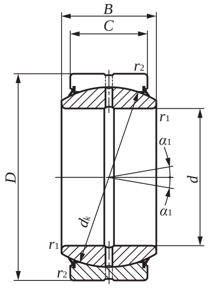
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SPHERICAL BUSHINGS

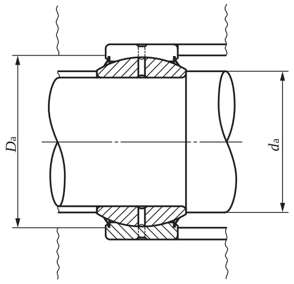
Steel-on-steel Spherical Bushings



GE···ES



GE···ES-2RS



Shaft dia. 110 ─ 300mm

Shaft dia.	Identification number		Mass (Ref.)	Boundary dimensions mm							Permissible tilting angle degree		Mounting dimensions mm				Dynamic load capacity	Static load capacity
													d_a		D_a		C_d	C_s
mm	Without seals	With seals	kg	d	D	B	C	d_k	$r_{1s\ min}$ (1)	$r_{2s\ min}$ (1)	α	α_1	Min.	Max.(2)	Max.	Min.	N	N
110	**GE 110ES**	**GE 110ES-2RS**	4.94	110	160	70	55	140	1	1	6	4	115.5	121	154.5	138	755 000	4 530 000
120	**GE 120ES**	**GE 120ES-2RS**	8.12	120	180	85	70	160	1	1	6	4	125.5	135.5	174.5	154	1 100 000	6 590 000
140	**GE 140ES**	**GE 140ES-2RS**	11.4	140	210	90	70	180	1	1	7	5	145.5	155.5	204.5	176	1 240 000	7 410 000
160	**GE 160ES**	**GE 160ES-2RS**	14.4	160	230	105	80	200	1	1	8	6	165.5	170	224.5	195	1 570 000	9 410 000
180	**GE 180ES**	**GE 180ES-2RS**	18.9	180	260	105	80	225	1.1	1.1	6	5	187	199	253	221	1 770 000	10 600 000
200	**GE 200ES**	**GE 200ES-2RS**	28.1	200	290	130	100	250	1.1	1.1	7	6	207	213.5	283	244	2 450 000	14 700 000
220	**GE 220ES**	**GE 220ES-2RS**	36.1	220	320	135	100	275	1.1	1.1	8	6	227	239.5	313	269	2 700 000	16 200 000
240	**GE 240ES**	**GE 240ES-2RS**	40.4	240	340	140	100	300	1.1	1.1	8	6	247	265	333	296	2 940 000	17 700 000
260	**GE 260ES**	**GE 260ES-2RS**	52.0	260	370	150	110	325	1.1	1.1	7	6	267	288	363	320	3 510 000	21 000 000
280	**GE 280ES**	**GE 280ES-2RS**	66.0	280	400	155	120	350	1.1	1.1	6	5	287	313.5	393	345	4 120 000	24 700 000
300	**GE 300ES**	**GE 300ES-2RS**	76.0	300	430	165	120	375	1.1	1.1	7	6	307	336.5	423	371	4 410 000	26 500 000

Notes(1) Minimum allowable value of chamfer dimensions r_1 and r_2

(2) When Spherical Bushings are used with full tilting angle, the shaft shoulder dimension must be less than the maximum value of d_a.

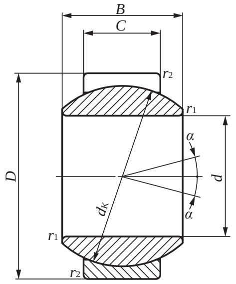
Remarks1. The inner ring and the outer ring have an oil groove and two oil holes, respectively.

2. No grease is prepacked. Perform proper lubrication.

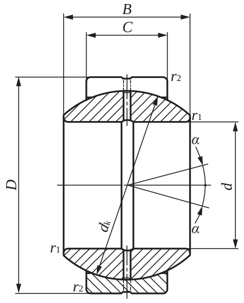
K
SB
GE
SBB

SPHERICAL BUSHINGS

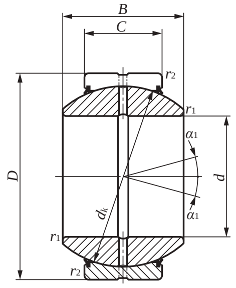
Steel-on-steel Spherical Bushings



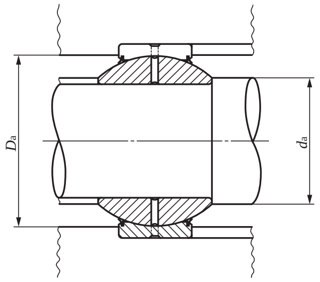
GE⋯G



GE⋯GS



GE⋯GS-2RS



Shaft dia. 6 ─ 120mm

Shaft dia. mm	Identification number		Mass (Ref.) kg	Boundary dimensions mm							Permissible tilting angle degree		Mounting dimensions mm				Dynamic load capacity	Static load capacity
	Without seals	With seals		d	D	B	C	d_k	$r_{1s\,min}$(1)	$r_{2s\,min}$(1)	α	α_1	d_a Min.	d_a Max.(2)	D_a Max.	D_a Min.	C_d N	C_s N
6	**GE 6G**	—	0.010	6	16	9	5	13	0.3	0.3	21	—	8.5	9	13.5	13	6 370	38 200
8	**GE 8G**	—	0.015	8	19	11	6	16	0.3	0.3	21	—	10.5	11.5	16.5	15.5	9 410	56 500
10	**GE 10G**	—	0.022	10	22	12	7	18	0.3	0.3	18	—	12.5	13	19.5	17	12 400	74 100
12	**GE 12G**	—	0.041	12	26	15	9	22	0.3	0.3	18	—	14.5	16	23.5	21	19 400	117 000
15	**GE 15GS**	**GE 15GS-2RS**	0.059	15	30	16	10	25	0.3	0.3	16	13	17.5	19	27.5	26	24 500	147 000
17	**GE 17GS**	**GE 17GS-2RS**	0.083	17	35	20	12	29	0.3	0.3	19	16	19.5	21	32.5	30.5	34 100	205 000
20	**GE 20GS**	**GE 20GS-2RS**	0.155	20	42	25	16	35.5	0.3	0.6	17	16	22.5	25	37.5	37	55 700	334 000
25	**GE 25GS**	**GE 25GS-2RS**	0.215	25	47	28	18	40.7	0.6	0.6	17	15	29.5	29.5	42.5	41.5	71 800	431 000
30	**GE 30GS**	**GE 30GS-2RS**	0.330	30	55	32	20	47	0.6	1	17	16	34	34	49.5	48	92 200	553 000
35	**GE 35GS**	**GE 35GS-2RS**	0.400	35	62	35	22	53	0.6	1	16	15	39.5	39.5	56.5	54.5	114 000	686 000
40	**GE 40GS**	**GE 40GS-2RS**	0.515	40	68	40	25	60	0.6	1	17	14	44.5	44.5	62.5	60	147 000	883 000
45	**GE 45GS**	**GE 45GS-2RS**	0.660	45	75	43	28	66	0.6	1	15	13	49.5	50	69.5	66	181 000	1 090 000
50	**GE 50GS**	**GE 50GS-2RS**	1.50	50	90	56	36	80	0.6	1	17	16	54.5	57	84.5	79	282 000	1 690 000
60	**GE 60GS**	**GE 60GS-2RS**	2.05	60	105	63	40	92	1	1	17	15	65.5	67	99.5	91	361 000	2 170 000
70	**GE 70GS**	**GE 70GS-2RS**	3.00	70	120	70	45	105	1	1	16	14	75.5	78	114.5	103	463 000	2 780 000
80	**GE 80GS**	**GE 80GS-2RS**	3.60	80	130	75	50	115	1	1	14	13	85.5	87	124.5	112	564 000	3 380 000
90	**GE 90GS**	**GE 90GS-2RS**	5.41	90	150	85	55	130	1	1	15	14	95.5	98	144.5	127	701 000	4 210 000
100	**GE 100GS**	**GE 100GS-2RS**	6.15	100	160	85	55	140	1	1	14	12	105.5	111	154.5	138	755 000	4 530 000
110	**GE 110GS**	**GE 110GS-2RS**	9.70	110	180	100	70	160	1	1	12	11	115.5	124.5	174.5	154	1 100 000	6 590 000
120	**GE 120GS**	**GE 120GS-2RS**	15.5	120	210	115	70	180	1	1	16	15	125.5	138.5	204.5	176	1 240 000	7 410 000

Notes(1) Minimum allowable value of chamfer dimensions r_1 and r_2

(2) When Spherical Bushings are used with full tilting angle, the shaft shoulder dimension must be less than the maximum value of d_a.

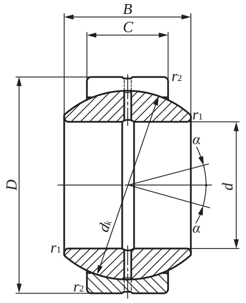
Remarks1. GE⋯G has no oil hole. Others are provided with an oil groove and two oil holes on the inner ring and outer ring, respectively.

2. No grease is prepacked. Perform proper lubrication.

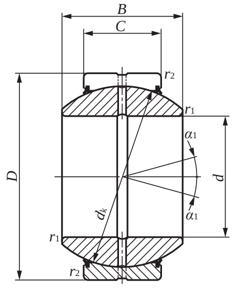
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SPHERICAL BUSHINGS

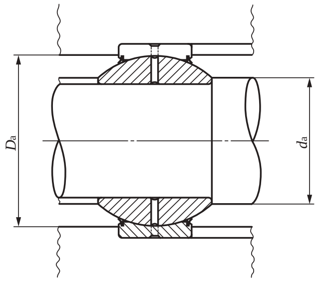
Steel-on-steel Spherical Bushings



GE···GS



GE···GS-2RS



Shaft dia. 140 — 280mm

Shaft dia. mm	Identification number		Mass (Ref.) kg	Boundary dimensions mm							Permissible tilting angle degree		Mounting dimensions mm				Dynamic load capacity	Static load capacity
	Without seals	With seals		d	D	B	C	d_k	$r_{1s\,min}$(1)	$r_{2s\,min}$(1)	α	α_1	d_a Min.	d_a Max.(2)	D_a Max.	D_a Min.	C_d N	C_s N
140	**GE 140GS**	**GE 140GS-2RS**	19.2	140	230	130	80	200	1	1	16	15	145.5	152	224.5	195	1 570 000	9 410 000
160	**GE 160GS**	**GE 160GS-2RS**	25.4	160	260	135	80	225	1	1.1	16	14	165.5	180	253	221	1 770 000	10 600 000
180	**GE 180GS**	**GE 180GS-2RS**	34.7	180	290	155	100	250	1.1	1.1	14	13	187	196	283	244	2 450 000	14 700 000
200	**GE 200GS**	**GE 200GS-2RS**	43.8	200	320	165	100	275	1.1	1.1	15	14	207	220	313	269	2 700 000	16 200 000
220	**GE 220GS**	**GE 220GS-2RS**	51.3	220	340	175	100	300	1.1	1.1	16	14	227	243.5	333	296	2 940 000	17 700 000
240	**GE 240GS**	**GE 240GS-2RS**	66.1	240	370	190	110	325	1.1	1.1	15	14	247	263.5	363	320	3 510 000	21 000 000
260	**GE 260GS**	**GE 260GS-2RS**	81.8	260	400	205	120	350	1.1	1.1	15	14	267	283.5	393	345	4 120 000	24 700 000
280	**GE 280GS**	**GE 280GS-2RS**	97.4	280	430	210	120	375	1.1	1.1	15	14	287	310.5	423	371	4 410 000	26 500 000

Notes(1) Minimum allowable value of chamfer dimensions r_1 and r_2

(2) When Spherical Bushings are used with full tilting angle, the shaft shoulder dimension must be less than the maximum value of d_a.

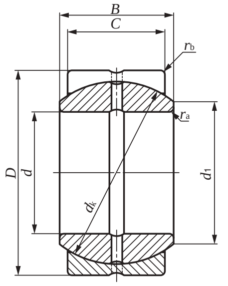
Remarks1. The inner ring and the outer ring have an oil groove and two oil holes, respectively.

2. No grease is prepacked. Perform proper lubrication.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SPHERICAL BUSHINGS

Steel-on-steel Spherical Bushings Inch Series



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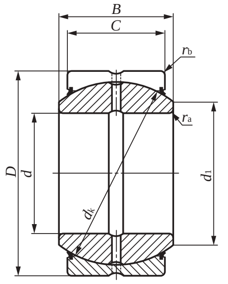
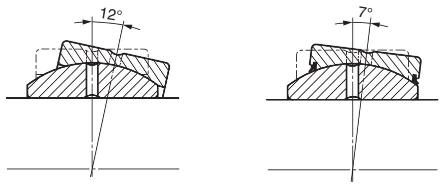


SBB···-2RS



Permissible tilting angle

SBB　SBB···-2RS

Shaft dia. 12.700 ─ 63.500mm

Shaft dia. mm (inch)	Identification number Without seal	Identification number With seals	Mass (Ref.) kg	Boundary dimensions mm(inch) d	D	B	C	d_k	Radial internal clearance mm Min./Max.	Mounting dimensions mm d_1	$r_{as\ max}$ (1) Max.	$r_{bs\ max}$ (1) Max.	Dynamic load capacity C_d N	Static load capacity C_s N
12.700 **(1/2)**	**SBB 8**	—	0.020	12.700 (1/2)	22.225 (7/8)	11.10(.437)	9.52(.375)	18 (.709)	0.05/0.15	14.0	0.2	0.6	16 800	101 000
15.875 **(5/8)**	**SBB 10**	—	0.036	15.875 (5/8)	26.988 (1 1/16)	13.89(.547)	11.91(.469)	23 (.906)	0.05/0.15	17.9	0.2	0.8	26 900	161 000
19.050 **(3/4)**	**SBB 12**	**SBB 12-2RS**	0.057	19.050 (3/4)	31.750 (1 1/4)	16.66(.656)	14.27(.562)	27.5(1.083)	0.08/0.18	21.4	0.6	*0.8	38 500	231 000
22.225 **(7/8)**	**SBB 14**	**SBB 14-2RS**	0.088	22.225 (7/8)	36.512 (1 7/16)	19.43(.765)	16.66(.656)	32 (1.260)	0.08/0.18	25.0	0.6	*0.8	52 300	314 000
25.400 **(1)**	**SBB 16**	**SBB 16-2RS**	0.125	25.400 (1)	41.275 (1 5/8)	22.22(.875)	19.05(.750)	36 (1.417)	0.08/0.18	28.0	0.6	*0.8	67 300	404 000
31.750 **(1 1/4)**	**SBB 20**	**SBB 20-2RS**	0.234	31.750 (1 1/4)	50.800 (2)	27.76(1.093)	23.80(.937)	45 (1.772)	0.08/0.18	35.1	0.6	0.8	105 000	630 000
34.925 **(1 3/8)**	**SBB 22**	**SBB 22-2RS**	0.349	34.925 (1 3/8)	55.562 (2 3/16)	30.15(1.187)	26.19(1.031)	49 (1.929)	0.08/0.18	38.5	0.6	0.8	126 000	755 000
38.100 **(1 1/2)**	**SBB 24**	**SBB 24-2RS**	0.424	38.100 (1 1/2)	61.912 (2 7/16)	33.32(1.312)	28.58(1.125)	55 (2.165)	0.08/0.18	43.3	0.6	0.8	154 000	925 000
44.450 **(1 3/4)**	**SBB 28**	**SBB 28-2RS**	0.649	44.450 (1 3/4)	71.438 (2 13/16)	38.89(1.531)	33.32(1.312)	64 (2.520)	0.08/0.18	50.4	0.6	0.8	209 000	1 250 000
50.800 **(2)**	**SBB 32**	**SBB 32-2RS**	0.939	50.800 (2)	80.962 (3 3/16)	44.45(1.750)	38.10(1.500)	73 (2.874)	0.08/0.18	57.6	0.6	0.8	273 000	1 640 000
57.150 **(2 1/4)**	**SBB 36**	**SBB 36-2RS**	1.32	57.150 (2 1/4)	90.488 (3 9/16)	50.01(1.969)	42.85(1.687)	82 (3.228)	0.10/0.20	64.9	0.6	0.8	345 000	2 070 000
63.500 **(2 1/2)**	**SBB 40**	**SBB 40-2RS**	1.85	63.500 (2 1/2)	100.012 (3 15/16)	55.55(2.187)	47.62(1.875)	91 (3.583)	0.10/0.20	72.0	0.6	0.8	425 000	2 550 000

Note(1)　Maximum allowable corner radius of the shaft or housing

Remarks1.　The value with mark * is applicable to types without seals. For types with seals, the value is 0.4 mm.

2.　The inner ring and the outer ring have an oil groove and two oil holes, respectively.

3.　No grease is prepacked. Perform proper lubrication.

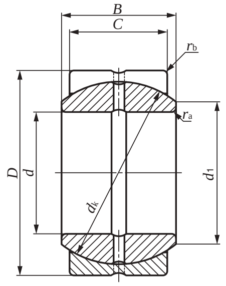
K

SB
GE
SBB

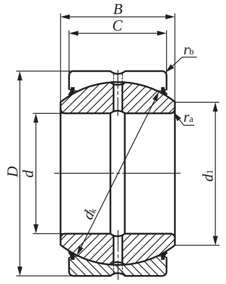
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SPHERICAL BUSHINGS

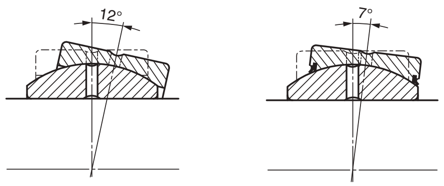
Steel-on-steel Spherical Bushings **Inch Series**



SBB



SBB···-2RS



Permissible tilting angle

SBB SBB···-2RS

Shaft dia. 69.850 – 152.400mm

Shaft dia. mm (inch)	Identification number		Mass (Ref.) kg	Boundary dimensions mm(inch)					Radial internal clearance mm Min./Max.	Mounting dimensions mm			Dynamic load capacity	Static load capacity
	Without seal	With seals		d	D	B	C	d_k		d_1	$r_{as\ max}$ (1) Max.	$r_{bs\ max}$ (1) Max.	C_d N	C_s N
69.850 (2¾)	**SBB 44**	**SBB 44-2RS**	2.44	69.850 (2¾)	111.125 (4⅜)	61.11(2.406)	52.37(2.062)	100(3.937)	0.10 ／ 0.20	79.0	0.6	0.8	514 000	3 080 000
76.200 (3)	**SBB 48**	**SBB 48-2RS**	3.12	76.200 (3)	120.650 (4¾)	66.68(2.625)	57.15(2.250)	110(4.331)	0.10 ／ 0.20	86.5	0.6	0.8	616 000	3 700 000
82.550 (3¼)	**SBB 52**	**SBB 52-2RS**	3.92	82.550 (3¼)	130.175 (5⅛)	72.24(2.844)	61.90(2.437)	119(4.685)	0.13 ／ 0.23	94.1	0.6	0.8	722 000	4 330 000
88.900 (3½)	**SBB 56**	**SBB 56-2RS**	4.83	88.900 (3½)	139.700 (5½)	77.77(3.062)	66.68(2.625)	128(5.039)	0.13 ／ 0.23	101.6	0.6	0.8	837 000	5 020 000
95.250 (3¾)	**SBB 60**	**SBB 60-2RS**	5.87	95.250 (3¾)	149.225 (5⅞)	83.34(3.281)	71.42(2.812)	137(5.394)	0.13 ／ 0.23	108.4	0.6	0.8	960 000	5 760 000
101.600 (4)	**SBB 64**	**SBB 64-2RS**	7.07	101.600 (4)	158.750 (6¼)	88.90(3.500)	76.20(3.000)	146(5.748)	0.13 ／ 0.23	115.8	0.6	0.8	1 090 000	6 550 000
107.950 (4¼)	**SBB 68**	**SBB 68-2RS**	8.46	107.950 (4¼)	168.275 (6⅝)	94.46(3.719)	80.95(3.187)	155(6.102)	0.13 ／ 0.23	122.6	0.8	1.1	1 230 000	7 380 000
114.300 (4½)	**SBB 72**	**SBB 72-2RS**	9.94	114.300 (4½)	177.800 (7)	100.00(3.937)	85.72(3.375)	164(6.457)	0.13 ／ 0.23	129.8	0.8	1.1	1 380 000	8 270 000
120.650 (4¾)	**SBB 76**	**SBB 76-2RS**	11.6	120.650 (4¾)	187.325 (7⅜)	105.56(4.156)	90.47(3.562)	173(6.811)	0.13 ／ 0.23	136.8	0.8	1.1	1 530 000	9 210 000
127.000 (5)	**SBB 80**	**SBB 80-2RS**	13.5	127.000 (5)	196.850 (7¾)	111.12(4.375)	95.25(3.750)	183(7.205)	0.13 ／ 0.23	144.9	0.8	1.1	1 710 000	10 300 000
152.400 (6)	**SBB 96**	**SBB 96-2RS**	17.6	152.400 (6)	222.250 (8¾)	120.65(4.750)	104.78(4.125)	207(8.150)	0.13 ／ 0.23	167.5	0.8	1.1	2 130 000	12 800 000

Note(1) Maximum allowable corner radius of the shaft or housing

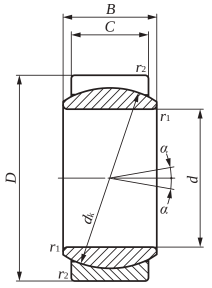
Remarks1. The inner ring and the outer ring have an oil groove and two oil holes, respectively.

2. No grease is prepacked. Perform proper lubrication.

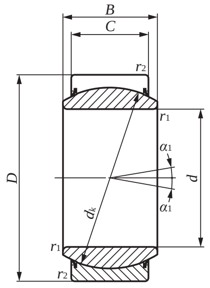
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SPHERICAL BUSHINGS

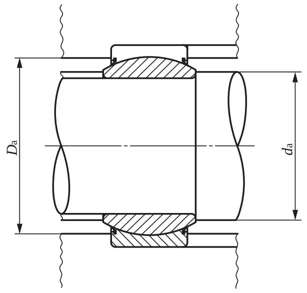
Maintenance-free Spherical Bushings



GE···EC



GE···EC-2RS



Shaft dia. 15 ー 70mm

Shaft dia. mm	Identification number		Mass (Ref.) kg	Boundary dimensions mm							Permissible tilting angle degree		Mounting dimensions mm				Dynamic load capacity C_d N	Static load capacity C_s N
	Without seals	With seals		d	D	B	C	d_k	$r_{1s\,min}$ (1)	$r_{2s\,min}$ (1)	α	α_1	d_a Min.	d_a Max.(2)	D_a Max.	D_a Min.		
15	**GE 15EC**	—	0.032	15	26	12	9	22	0.3	0.3	8	—	17.5	18	23.5	21.5	19 400	48 500
17	**GE 17EC**	—	0.049	17	30	14	10	25	0.3	0.3	10	—	19.5	20.5	27.5	24.5	24 500	61 300
20	**GE 20EC**	—	0.065	20	35	16	12	29	0.3	0.3	9	—	22.5	24	32.5	28	34 100	85 300
25	**GE 25EC**	—	0.115	25	42	20	16	35.5	0.6	0.6	7	—	29	29	37.5	34	55 700	139 000
30	**GE 30EC**	**GE 30EC-2RS**	0.160	30	47	22	18	40.7	0.6	0.6	6	4	34	34	42.5	41.5	71 800	180 000
35	—	**GE 35EC-2RS**	0.258	35	55	25	20	47	0.6	1	—	4	39.5	39.5	49.5	48	92 200	230 000
40	—	**GE 40EC-2RS**	0.315	40	62	28	22	53	0.6	1	—	4	44.5	45	56.5	54.5	114 000	286 000
45	—	**GE 45EC-2RS**	0.413	45	68	32	25	60	0.6	1	—	4	49.5	50.5	62.5	60	147 000	368 000
50	—	**GE 50EC-2RS**	0.560	50	75	35	28	66	0.6	1	—	4	54.5	56	69.5	66	181 000	453 000
60	—	**GE 60EC-2RS**	1.10	60	90	44	36	80	1	1	—	3	65.5	66.5	84.5	79	282 000	706 000
70	—	**GE 70EC-2RS**	1.54	70	105	49	40	92	1	1	—	4	75.5	77.5	99.5	91	361 000	902 000

Notes(1) Minimum allowable value of chamfer dimensions r_1 and r_2

(2) When Spherical Bushings are used with full tilting angle, the shaft shoulder dimension must be less than the maximum value of d_a.

Remark No oil hole is provided.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

PILLOBALLS

- **PILLOBALL Spherical Bushings - Insert Type**
- **PILLOBALL Rod Ends - Insert Type**
- **PILLOBALL Rod Ends - Die-cast Type**
- **PILLOBALL Rod Ends - Maintenance-free Type**

Structure and Features

IKO PILLOBALLs are compact self-aligning spherical bushings that can support a large radial load and a bi-directional axial load at the same time.

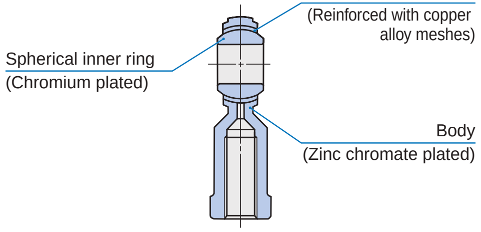
These bushings are classified by sliding surface types, namely, insert type, die-cast type and maintenance-free type. In the insert type, a spherical inner ring makes contact with the special copper alloy bushing with superior run-in properties. In the die-cast type, a spherical inner ring makes direct contact with the bore surface of the body of special zinc die-cast alloy. In the maintenance-free type, a spherical inner ring makes contact with the special PTFE liner of maintenance-free type. Thus, a smooth rotational and oscillatory motion can be achieved with superior anti-wear and loading properties in each type.

PILLOBALL Rod Ends have either a female thread in the body or a male thread on the body, and they can be easily assembled onto machines.

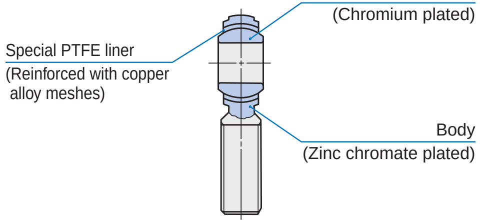
PILLOBALLs are used in control and link mechanisms in machine tools, textile machines, packaging machines, etc. The maintenance-free type is especially suitable for loading in one direction and is the best choice for machines in which oil must be avoided such as food processing machines, or machines which cannot be re-lubricated.

Structures of maintenance-free type PILLOBALLs

PHS···EC

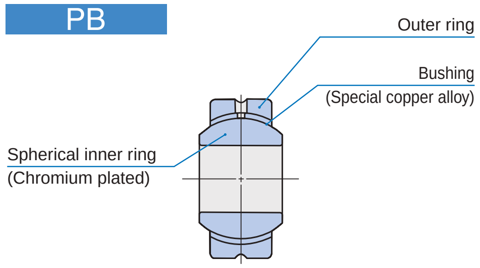


POS···EC

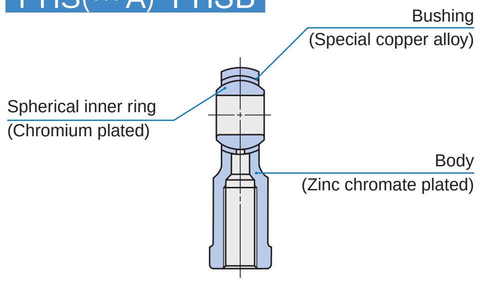


Structures of lubrication type PILLOBALLs

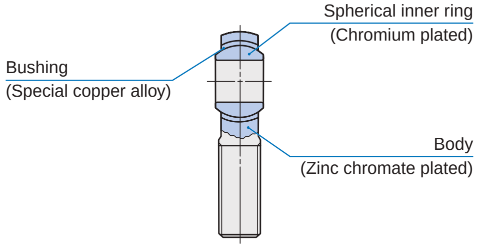
PB



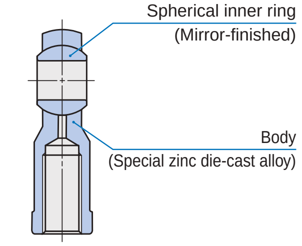
PHS(··· A)・PHSB



POS(··· A)・POSB



PHSA



Types

In PILLOBALLs, the types shown in Table 1 are available.

Table 1 Type

Type	Lubrication type			Maintenance-free type	
	Spherical Bushings	Rod end		Rod end	
		female thread	male thread	female thread	male thread
Insert type	PB	PHS(···A) · PHSB	POS(···A) · POSB	PHS···EC	POS···EC
Die-cast type	—	PHSA	—		

Lubrication Type PILLOBALL Spherical Bushings Insert Type PB

This type has superior anti-wear properties and high rigidity. It consists of a spherical inner ring, an outer ring, and a bushing of special copper alloy with superior run-in properties inserted in between. The spherical surface of the inner ring is chromium plated after heat treatment and grinding. This type is assembled with a shaft and a housing.

When especially large radial and/or axial loads are applied, Spherical Bushings with molybdenum disulfide (M_oS_2) treated inner and outer rings are recommended. (See page K1.)

Lubrication Type PILLOBALL Rod Ends Insert Type PHS(···A), POS(···A), PHSB and POSB

This type has superior wear-resistant and corrosion-resistant properties as well as high rigidity. It consists of a spherical inner ring of which the spherical surface is chromium plated after heat treatment and grinding, a body with a zinc chromate plated outer surface, and an inserted bushing of special copper alloy having superior run-in properties. PHS, which has a female thread in the body, and POS, which has a male thread on the body, are available. For PHS and POS sizes 5 to 18, an A is appended after the dimensions as a model code.

Lubrication Type PILLOBALL Rod Ends Die-cast Type PHSA

The spherical inner ring of this type is mirror-finished after heat treatment and is built in a body of special zinc die-cast alloy. The sliding surfaces of the inner ring and body are in close contact with each other. Thus, this type is an economical rod end with superior anti-wear and loading properties.

Maintenance-free Type PILLOBALL Rod Ends PHS···EC, POS···EC

This type has superior anti-corrosion properties as the body is zinc chromate treated and the spherical inner ring is chromium plated on the sphere surface after heat treatment and grinding.

A special PTFE liner, reinforced with copper alloy meshes, which is superior in anti-wear properties with little creep deformation is used for lining on the sliding surface of the body, and this type is maintenance-free.

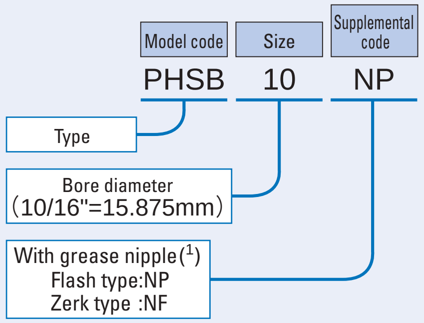
PHS···EC, which has a female thread in the body, and POS···EC, which has a male thread on the body, are available.

Identification number

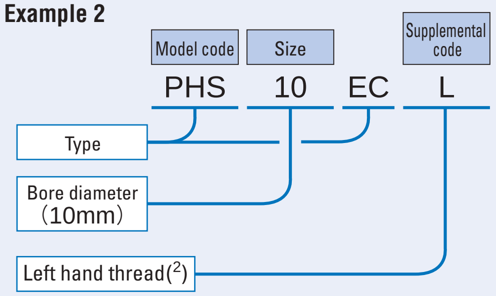
The identification number of PILLOBALLs consists of a model code, a size and any supplemental codes as shown in the examples.

Examples of identification number

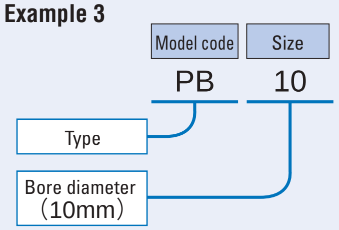
Example 1



Example 2



Example 3



Notes(1) Shapes of grease nipple are shown in Fig.1. In case of no indication of grease nipple type, grease nipple is not prepared.

(2) Right hand thread is indicated with no code.

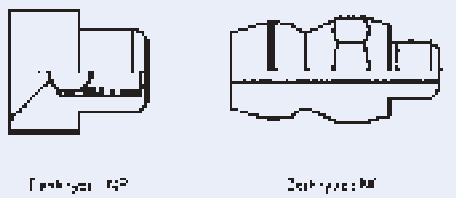


Fig. 1 Shapes of grease nipple

Accuracy

The accuracy of PILLOBALLs is shown in Tables 2 and 3. The maximum radial internal clearance of the insert type is 0.035 mm.

Table 2 Tolerance unit: mm

Type	Dimension	Dimension symbol	Tolerance
PB	Bore dia. of inner ring	d	H7
	Outside dia. of outer ring	D	h6
	Width of inner ring	B	0 − 0.1
	Width of outer ring	C	± 0.1
PHS(···A) POS(···A) PHS···EC POS···EC	Bore dia. of inner ring	d	H7
	Width of inner ring	B	0 − 0.1
PHSB POSB	Bore dia. of inner ring	d	+ 0.038 − 0.013
	Width of inner ring	B_1	0 − 0.127
PHSA	Bore dia. of inner ring	d	+ 0.063 − 0.012
	Width of inner ring	B	See Table 3.

Table 3 Tolerance of width B of inner ring of PHSA type unit: mm

d Nominal bore dia. of inner ring		Δ_{Bs} Deviation of a single inner ring width	
Over	Incl.	High	Low
—	14	0	− 0.2
14	20	0	− 0.3
20	22	0	− 0.4

Fit

Recommended fits for PILLOBALLs are shown in Table 4.

Table 4 Recommended fits

Condition	Tolerance class	
	Shaft	Housing bore(1)
Normal operation	h7	H7
Directionally indeterminate loading	n6, p6	N7

Note(1) This is applicable to PILLOBALL Spherical Bushings, Insert type.

Selection of PILLOBALL

Load capacities of PILLOBALLs are determined based on the allowable contact pressure on sliding surfaces and the strength of body for each type. Thus, a suitable type and size should be selected based on the dynamic load capacity C_d and static load capacity C_s shown in the dimension tables.

Load capacity

❶ Dynamic load capacity

The dynamic load capacity C_d is obtained on the basis of the contact pressure on the sliding surface. The dynamic load capacity is used for calculating the life.

The dynamic load capacity considering temperature increase is obtained from the following equation using the temperature factor, which is a correction factor for the effect of PILLOBALL temperature.

$$C_{dt}=f_t\,C_d \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots(1)$$

where, C_{dt} : Dynamic load capacity considering temperature increase, N

f_t : Temperature factor (Refer to Table 5.)

C_d : Dynamic load capacity, N (Refer to the dimension tables.)

Table 5 Temperature factor f_t

Type	Temperature ℃					
	− 30 + 80	+ 80 + 90	+ 90 + 100	+ 100 + 120	+ 120 + 150	+ 150 + 180
PB PHS(···A), POS(···A) PHSB, POSB	1	1	1	1	1	0.7
PHS···EC POS···EC	1	1	0.9	0.75	0.55	—

❷ Static load capacity

The static load capacity C_s is the maximum static load that can be applied on the PILLOBALL without breaking the inner ring or outer ring of the PILLOBALL Spherical Bushing (or the inner ring or body of the PILLOBALL Rod End), and without causing severe permanent deformation that will make the PILLOBALL unusable.

Maximum Operating Load

The recommended value of bushing load is obtained by multiplying the dynamic load capacity C_d by a numerical factor, which differs depending on the bushing type and load condition. For PILLOBALL Rod Ends, the static load capacity C_s must also be considered in determining the applicable bushing load.
Table 6 shows the guidelines for maximum operating load of PILLOBALLs. When axial loads are added in addition to radial loads, bending stress occurs in the body. Pay attention to this bending stress.

Table 6 Maximum operating load

Type	Load direction	
	Constant	Alternate
PB	$\leqq 0.3C_d$	$\leqq 0.6C_d$
PHS(…A), POS(…A), PHSB, POSB	$\leqq 0.3C_d$	$\leqq 0.2C_s$
PHSA	$\leqq 0.16C_s$	
PHS…EC, POS…EC	$\leqq 0.3C_s$	$\leqq 0.2C_s$

Remark C_d is the dynamic load capacity and C_s is the static load capacity.

Equivalent radial load

PILLOBALLs can take radial and axial loads at the same time. When the magnitude and direction of loads are constant, the equivalent radial load can be obtained by the following equation.

$$P = F_r + YF_a \cdots\cdots (2)$$

where, P : Equivalent radial load, N
F_r : Radial load, N
F_a : Axial load, N
Y : Axial load factor (Refer to Table 7.)

Table 7 Axial load factor Y

F_a/F_r Type	0.1	0.2	0.3	0.4	0.5	>0.5
PB PHS(…A), POS(…A) PHSB, POSB	1	2	3	4	5	Unusable
PHS…EC POS…EC	1	2	3	Unusable		

Life

The life of PILLOBALLs is defined as the total number of oscillating motions during which the PILLOBALLs can be operated without failure or malfunction due to wear, increase in internal clearance, increase in sliding torque and operating temperature, etc.

As the actual life is affected by many factors such as the material of the sliding surface, the magnitude and direction of load, lubrication, sliding velocity, etc., the calculated life can be used as a measure of expected service life.

❶ Life of lubrication type PILLOBALLs
PB・PHS(…A)・POS(…A)・PHSB・POSB

[1] Confirmation of pV value

Before attempting to calculate the life, make sure that the operating conditions are within the permissible range by referring to the pV diagram in Fig.2.
When the operating conditions are out of the permissible range, please consult IKO.
The contact pressure p and the sliding velocity V are obtained from the following equations.

$$p = \frac{50P}{C_{dt}} \cdots\cdots (3)$$

$$V = 5.82 \times 10^{-4} d_k \beta f \cdots\cdots (4)$$

where, p : Contact pressure, N/mm²
P : Equivalent radial load, N
(Refer to equation (2).)
C_{dt} : Dynamic load capacity considering temperature increase, N
(Refer to equation (1).)
V : Sliding velocity, mm/s
d_k : Sphere diameter, mm
(Refer to the dimensional tables.)
2β : Oscillating angle degrees (Refer to Fig.3.)
when $\beta < 5^\circ$, $\beta = 5$
when rotating, $\beta = 90$
f : Number of oscillations per minute, min^{-1}

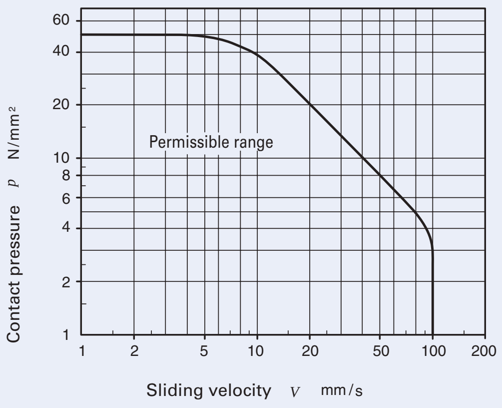
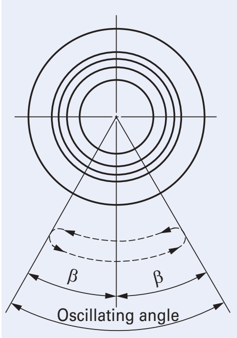


Fig. 2 pV diagram of lubrication type PILLOBALLs



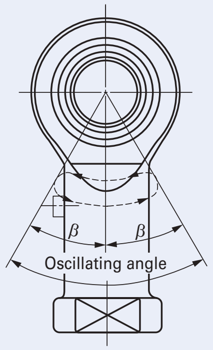


Fig. 3 Oscillating angle

[2] Life calculation

The life of lubrication type PILLOBALLs can be calculated by the following equations.

$$G = \frac{3.18 b_1 b_2 b_3}{\sqrt{d_k \beta}} \left(\frac{C_{dt}}{P} \right)^2 \times 10^5 \cdots\cdots (5)$$

$$L_h = \frac{G}{60f} \cdots\cdots (6)$$

where, G : Life (Total number of oscillations)
b_1 : Load directional factor (Refer to Table 8.)
b_2 : Lubrication factor (Refer to Table 8.)
b_3 : Sliding velocity factor (Refer to Fig. 4.)
C_{dt} : Dynamic load capacity considering temperature increase, N
(Refer to equation (1).)
P : Equivalent radial load, N
(Refer to equation (2).)
L_h : Life in hours, h
f : Number of oscillations per minute, min^{-1}

Table 8 Load directional factor b_1 and lubrication factor b_2 for lubrication type PILLOBALLs

Load directional factor b_1		Lubrication factor b_2	
Load direction		Periodical lubrication	
Constant	Alternate	None	Regular
1	5	1	15

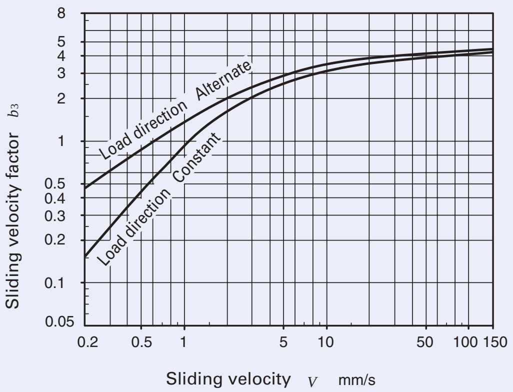


Fig. 4 Sliding velocity factor for lubrication type PILLOBALLs

❷ Life of maintenance-free type PILLOBALLs PHS…EC・POS…EC

[1] Confirmation of pV value

Before attempting to calculate the life, make sure that the operating conditions are within the permissible range by referring to the pV diagram in Fig.5.
When the operating conditions are out of the permissible range, please consult IKO.
The contact pressure p and sliding velocity V are obtained from equations (3) and (4) on page K6.

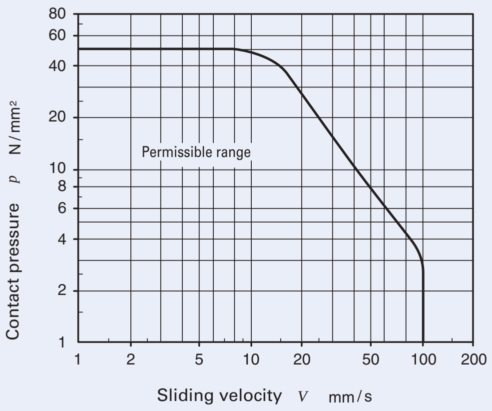


Fig. 5 pV diagram for maintenance-free type PILLOBALL Rod Ends

[2] Life calculation

The life of maintenance-free type PILLOBALL Rod Ends is obtained from the total sliding distance S which is given in Fig.5 for the contact pressure p obtained from equation (3).

The total number of oscillations and life in hours can be obtained from the following equations.

$$G = 16.67 \times b_1 \times \frac{Sf}{V} \cdots\cdots\cdots\cdots (7)$$

$$L_h = \frac{G}{60f} \cdots\cdots\cdots\cdots (8)$$

where, G : Life (Total number of oscillations)
b_1 : Load directional factor (Refer to Table 9.)
S : Total sliding distance m
f : Number of oscillations per minute min^{-1}
V : Sliding velocity mm/s
L_h : Life in hours h

Table 9 Load directional factor for maintenance-free type PILLOBALLs b_1

Load direction	Constant	Alternate
Load directional factor b_1	1	0.2(1)

Note(1) This value is applicable when the load changes comparatively slowly. When the load changes rapidly, please consult IKO, as the factor degreases sharply.

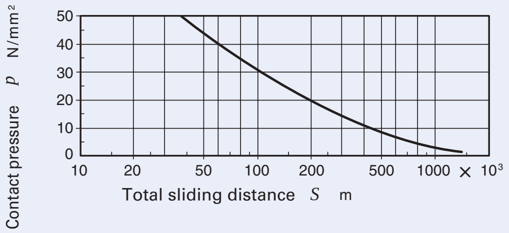


Fig. 6 Contact pressure and total sliding distance for maintenance-free type PILLOBALL Rod Ends

Lubrication

Maintenance-free type PILLOBALL Rod Ends have a sliding surface lined with a self-lubricating lining. Therefore, they can be used without lubrication.

Lubrication type PILLOBALLs are not provided with prepacked grease. Perform proper lubrication for use. Operating without lubrication will increase the wear of the sliding contact surfaces and cause seizure.

Oil Hole and Grease Nipple

Table 10 shows the specifications of oil hole and grease nipple on the outer ring or body. Further, lubrication nozzle models compatible with the grease nipple are shown in Table 11.

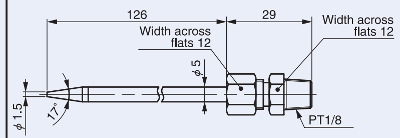
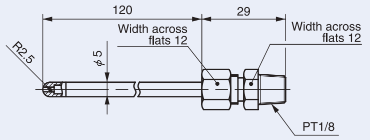
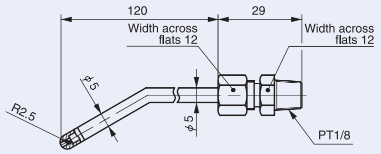
For PILLOBALLs without an oil hole and grease nipple, apply grease directly on the spherical surface.

Table 10 Specifications of oil hole and grease nipple

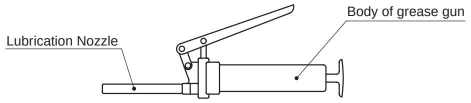
Type	Bore diameter of inner ring d mm	Specification
PB		1 oil hole + oil groove
PHS(…A)	$d \leqq 4$	None
	$4 < d$	With grease nipple
POS(…A)	$d \leqq 4$	None
	$4 < d \leqq 6$	1 oil hole
	$6 < d$	With grease nipple
PHSB · POSB		None(1)
PHSA		With grease nipple
PHS…EC, POS…EC		None

Note(1) Grease Nipple is available for size 4 or larger with supplemental code.

Table 11 Types and Dimension of Lubrication Nozzles

Type	Dimension
A-5126T	
A-5120R	
B-5120R	

Remark HSP-3(Yamada Corporation)can be used for them.
The above nozzles can be atached on the standard grease gun shown below.



Operating Temperature Range

The maximum allowable temperature for Lubrication type PILLOBALLs is +180˚C for the insert type and +80˚C for the die-cast type.

The maximum allowable temperature for Maintenance-free type PILLOBALL Rod Ends is +150˚C.

Precautions for Use

❶ Tightening depth

The recommended tightening depth of the screw into the PILLOBALL Rod End body is shown below.

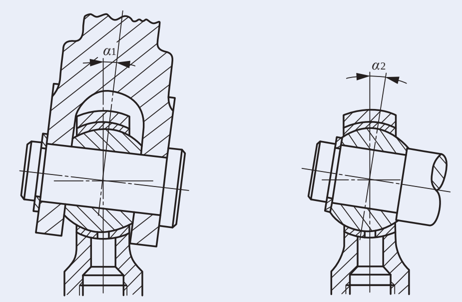
Insert type and maintenance-free type: 1.25 times the nominal thread dia. or more.

Die-cast type: 2 times the nominal thread dia. or more.

❷ Allowable tilting angle

The allowable tilting angle differs depending on the mounting structure as shown in Table 12 and Table 13.

Table 12 Allowable tilting angle



unit: degree

d Bore diameter mm	PB(1), PHS(…A), POS(…A) PHS…EC, POS…EC		PHSA	
	α_1	α_2	α_1	α_2
3	7	13	–	–
4	7	13	–	–
5	8	13	7	13
6	8	13	7	13
8	8	14	8	14
10	8	14	8	14
12	8	13	8	13
14	10	16	9	16
16	9	15	9	15
18	9	15	9	15
20	9	15	9	15
22	10	15	9	15
25	9	15	–	–
28	9	15	–	–
30	10	17	–	–

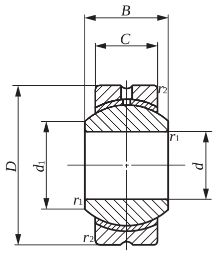
Note(1) In the case of the PB series, α_2 is applicable in general.

Table 13 Allowable tilting angle for inch series

unit: degree

With female thread	With male thread	α_1	α_2
PHSB 2	POSB 2	8	16
PHSB 2.5	POSB 2.5	7	12
PHSB 3	POSB 3	6	10
PHSB 4	POSB 4	7	13
PHSB 5	POSB 5	6	10
PHSB 6	POSB 6	6	11
PHSB 7	POSB 7	7	11
PHSB 8	POSB 8	6	9
PHSB 10	POSB 10	7	11
PHSB 12	POSB 12	6	10
PHSB 16	POSB 16	7	14

Lubrication Type PILLOBALL Spherical Bushings Insert Type



PB

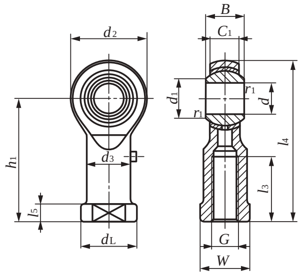
Identification number	Mass (Ref.) g	Boundary dimensions mm							Dynamic load capacity C_d N	Static load capacity C_s N
		d	D	C	B	d_1	$r_{s\,min}$ (1)	Ball dia. mm (inch)		
PB 5	8.5	5	16	6	8	7.7	0.2	11.112 (7/16)	3 270	7 850
PB 6	13	6	18	6.75	9	9	0.2	12.700 (1/2)	4 200	10 100
PB 8	24	8	22	9	12	10.4	0.2	15.875 (5/8)	7 010	16 800
PB 10	39	10	26	10.5	14	12.9	0.2	19.050 (3/4)	9 810	23 500
PB 12	58	12	30	12	16	15.4	0.2	22.225 (7/8)	13 100	31 400
PB 14	84	14	34	13.5	19	16.9	0.3	25.400 (1)	16 800	40 400
PB 16	111	16	38	15	21	19.4	0.3	28.575 (1 1/8)	21 000	50 400
PB 18	160	18	42	16.5	23	21.9	0.3	31.750 (1 1/4)	25 700	61 600
PB 20	210	20	46	18	25	24.4	0.3	34.925 (1 3/8)	30 800	74 000
PB 22	265	22	50	20	28	25.8	0.3	38.100 (1 1/2)	37 400	89 700
PB 25	390	25	56	22	31	29.6	0.6	42.862 (1 11/16)	46 200	111 000
PB 28	410	28	62	25	35	32.3	0.6	47.625 (1 7/8)	58 400	140 000
PB 30	610	30	66	25	37	34.8	0.6	50.800 (2)	62 300	149 000

Note(1) Minimum allowable value of chamfer dimensions r_1 and r_2

Remarks1. The outer ring has an oil groove and an oil hole.

2. No grease is prepacked. Perform proper lubrication.

Lubrication Type PILLOBALL Rod Ends Insert Type/With Female Thread



PHS(···A)

Identification number	Mass (Ref.) g	Boundary dimensions mm															Dynamic load capacity C_d N	Static load capacity C_s N
		d	Thread G	d_2	C_1	B	d_1	l_4	h_1	l_3	l_5	W	d_3	d_L	r_{1smin} (1)	Ball dia. mm (inch)		
PHS 3	5.7	3	M 3×0.5	12	4.5	6	5.2	27	21	10	3	5.5	5	6.5	0.2	7.938 (5/16)	1 750	3 670
PHS 4	11.9	4	M 4×0.7	14	5.3	7	6.5	31	24	12	4	8	8	9.5	0.2	9.525 (3/8)	2 480	4 680
PHS 5A	16.5	5	M 5×0.8	16	6	8	7.7	35	27	14	4	9	9	11	0.2	11.112 (7/16)	3 270	5 730
PHS 6A	25	6	M 6×1	18	6.75	9	9	39	30	14	5	11	10	13	0.2	12.700 (1/2)	4 200	6 910
PHS 8A	43	8	M 8×1.25	22	9	12	10.4	47	36	17	5	14	12.5	16	0.2	15.875 (5/8)	7 010	10 200
PHS 10A	72	10	M10×1.5	26	10.5	14	12.9	56	43	21	6.5	17	15	19	0.2	19.050 (3/4)	9 810	13 300
PHS 12A	107	12	M12×1.75	30	12	16	15.4	65	50	24	6.5	19	17.5	22	0.2	22.225 (7/8)	13 100	16 900
PHS 14A	160	14	M14×2	34	13.5	19	16.9	74	57	27	8	22	20	25	0.2	25.400 (1)	16 800	20 900
PHS 16A	210	16	M16×2	38	15	21	19.4	83	64	33	8	22	22	27	0.2	28.575 (1 1/8)	21 000	25 400
PHS 18A	295	18	M18×1.5	42	16.5	23	21.9	92	71	36	10	27	25	31	0.2	31.750 (1 1/4)	25 700	30 200
PHS 20	380	20	M20×1.5	46	18	25	24.4	100	77	40	10	30	27.5	34	0.2	34.925 (1 3/8)	30 800	35 500
PHS 22	490	22	M22×1.5	50	20	28	25.8	109	84	43	12	32	30	37	0.2	38.100 (1 1/2)	37 400	41 700
PHS 25	750	25	M24×2	60	22	31	29.6	124	94	48	12	36	33.5	42	0.6	42.862 (1 11/16)	46 200	72 700
PHS 28	950	28	M27×2	66	25	35	32.3	136	103	53	12	41	37	46	0.6	47.625 (1 7/8)	58 400	87 000
PHS 30	1 130	30	M30×2	70	25	37	34.8	145	110	56	15	41	40	50	0.6	50.800 (2)	62 300	92 200

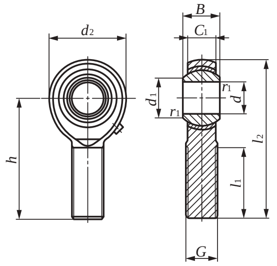
Note(1) Minimum allowable value of chamfer dimension r_1

Remarks1. Neither oil hole nor grease nipple is provided for PHS with an inner ring bore diameter d of 4 mm or less. For others, a grease nipple is provided on the body.

2. No grease is prepacked. Perform proper lubrication.

3. When a metric fine thread specification for inner ring bore deameter d of 8 mm to 14 mm is required, please contact IKO.

Lubrication Type PILLOBALL Rod Ends Insert Type/With Male Thread



POS(…A)

Identification number	Mass (Ref.) g	Boundary dimensions mm d	Thread G	d_2	C_1	B	d_1	l_2	h	l_1	$r_{1s\,min}$ (1)	Ball dia. mm (inch)	Dynamic load capacity C_d N	Static load capacity C_s N
POS 3	5.0	3	M 3×0.5	12	4.5	6	5.2	33	27	15	0.2	7.938 (5/16)	1 750	1 220
POS 4	8.1	4	M 4×0.7	14	5.3	7	6.5	37	30	17	0.2	9.525 (3/8)	2 480	2 060
POS 5A	12.5	5	M 5×0.8	16	6	8	7.7	41	33	20	0.2	11.112 (7/16)	3 270	3 340
POS 6A	19	6	M 6×1	18	6.75	9	9	45	36	22	0.2	12.700 (1/2)	4 200	4 730
POS 8A	32	8	M 8×1.25	22	9	12	10.4	53	42	25	0.2	15.875 (5/8)	7 010	8 640
POS 10A	54	10	M10×1.5	26	10.5	14	12.9	61	48	29	0.2	19.050 (3/4)	9 810	13 300
POS 12A	85	12	M12×1.75	30	12	16	15.4	69	54	33	0.2	22.225 (7/8)	13 100	16 900
POS 14A	126	14	M14×2	34	13.5	19	16.9	77	60	36	0.2	25.400 (1)	16 800	20 900
POS 16A	185	16	M16×2	38	15	21	19.4	85	66	40	0.2	28.575 (1 1/8)	21 000	25 400
POS 18A	260	18	M18×1.5	42	16.5	23	21.9	93	72	44	0.2	31.750 (1 1/4)	25 700	30 200
POS 20	340	20	M20×1.5	46	18	25	24.4	101	78	47	0.2	34.925 (1 3/8)	30 800	35 500
POS 22	435	22	M22×1.5	50	20	28	25.8	109	84	51	0.2	38.100 (1 1/2)	37 400	41 700
POS 25	650	25	M24×2	60	22	31	29.6	124	94	57	0.6	42.862 (1 11/16)	46 200	72 700
POS 28	875	28	M27×2	66	25	35	32.3	136	103	62	0.6	47.625 (1 7/8)	58 400	87 000
POS 30	1 070	30	M30×2	70	25	37	34.8	145	110	66	0.6	50.800 (2)	62 300	92 200

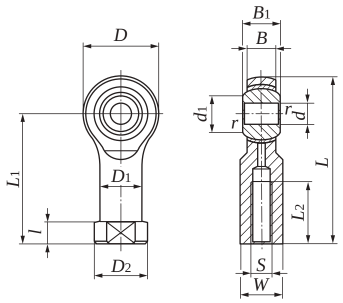
Note(1) Minimum allowable value of chamfer dimension r_1

Remarks1. Neither oil hole nor grease nipple is provided for POS with an inner ring bore diameter d of 4 mm or less. For those with an inner ring bore diameter d of 5 to 6 mm, an oil hole is provided on the body. For others, a grease nipple is provided on the body.

2. No grease is prepacked. Perform proper lubrication.

3. When a metric fine thread specification for inner ring bore deameter d of 8 mm to 14 mm is required, please contact IKO.

Inch series PILLOBALL Rod Ends Insert Type/With Female Thread



PHSB

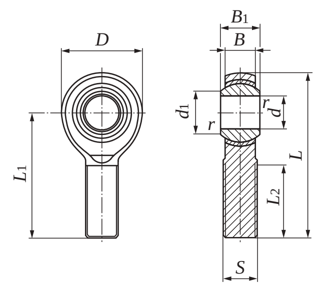
Identification number	Mass (Ref.) g	Boundary dimensions mm(inch) d	Thread S class 3B	D	B	B_1	d_1	L	l	L_1	L_2	W	D_1	D_2	$r_{s\,min}$ (1)	Ball dia. mm (inch)	Dynamic load capacity C_d N	Static load capacity C_s N
PHSB 2	6.8	3.175 (.1250)	-32UNC (.1380)	11.91 (.469)	4.75 (.187)	6.35 (.250)	4.75 (.187)	26.57 (1.046)	4.75 (.187)	20.62 (.812)	9.53 (.375)	6.35 (.250)	6.35 (.250)	7.92 (.312)	0.3 (.012)	7.938 (5/16)	1 850	5 840
PHSB 2.5	11	3.967 (.1562)	-32UNC (.1640)	14.27 (.562)	5.56 (.219)	7.14 (.281)	6.32 (.249)	29.36 (1.156)	4.75 (.187)	22.23 (.875)	9.53 (.375)	7.14 (.281)	7.14 (.281)	8.74 (.344)	0.3 (.012)	9.525 (3/8)	2 600	8 210
PHSB 3	14	4.826 (.1900)	-32UNF (.1900)	15.88 (.625)	6.35 (.250)	7.92 (.312)	7.77 (.306)	34.93 (1.375)	4.75 (.187)	26.97 (1.062)	14.27 (.562)	7.92 (.312)	7.92 (.312)	10.31 (.406)	0.3 (.012)	11.112 (7/16)	3 460	9 090
PHSB 4	23	6.350 (.2500)	-28UNF (.2500)	19.05 (.750)	7.14 (.281)	9.53 (.375)	9.02 (.355)	42.85 (1.687)	4.75 (.187)	33.32 (1.312)	19.05 (.750)	9.53 (.375)	9.53 (.375)	11.89 (.468)	0.5 (.020)	13.097 (33/64)	4 590	13 200
PHSB 5	36	7.938 (.3125)	-24UNF (.3125)	22.23 (.875)	8.74 (.344)	11.10 (.437)	11.35 (.447)	46.02 (1.812)	4.75 (.187)	34.93 (1.375)	19.05 (.750)	11.10 (.437)	11.10 (.437)	12.70 (.500)	0.5 (.020)	15.875 (5/8)	6 800	16 500
PHSB 6	59	9.525 (.3750)	-24UNF (.3750)	25.40 (1.000)	10.31 (.406)	12.70 (.500)	13.13 (.517)	53.98 (2.125)	6.35 (.250)	41.28 (1.625)	23.80 (.937)	14.27 (.562)	14.27 (.562)	17.45 (.687)	0.5 (.020)	18.256 (23/32)	9 230	21 600
PHSB 7	82	11.112 (.4375)	-20UNF (.4375)	28.58 (1.125)	11.10 (.437)	14.27 (.562)	14.88 (.586)	60.33 (2.375)	6.35 (.250)	46.02 (1.812)	26.97 (1.062)	15.88 (.625)	15.88 (.625)	19.05 (.750)	0.5 (.020)	20.638 (13/16)	11 200	26 100
PHSB 8	132	12.700 (.5000)	-20UNF (.5000)	33.32 (1.312)	12.70 (.500)	15.88 (.625)	17.73 (.698)	70.64 (2.781)	6.35 (.250)	53.98 (2.125)	30.15 (1.187)	19.05 (.750)	19.05 (.750)	22.23 (.875)	0.5 (.020)	23.812 (15/16)	14 800	36 200
PHSB 10	191	15.875 (.6250)	-18UNF (.6250)	38.10 (1.500)	14.27 (.562)	19.05 (.750)	21.31 (.839)	82.55 (3.250)	7.92 (.312)	63.50 (2.500)	38.10 (1.500)	22.23 (.875)	22.23 (.875)	25.40 (1.000)	0.5 (.020)	28.575 (1 1/8)	20 000	39 300
PHSB 12	286	19.050 (.7500)	-16UNF (.7500)	44.45 (1.750)	17.45 (.687)	22.23 (.875)	24.84 (.978)	95.25 (3.750)	7.92 (.312)	73.03 (2.875)	44.45 (1.750)	25.40 (1.000)	25.40 (1.000)	28.58 (1.125)	0.5 (.020)	33.338 (1 5/16)	28 500	55 000
PHSB 16	998	25.400 (1.0000)	-12UNF (1.2500)	69.85 (2.750)	25.40 (1.000)	34.93 (1.375)	32.23 (1.269)	139.70 (5.500)	11.07 (.436)	104.78 (4.125)	53.98 (2.125)	38.10 (1.500)	38.10 (1.500)	44.45 (1.750)	0.5 (.020)	47.625 (1 7/8)	59 300	86 800

Note(1) r_s min stands for minimum allowable value of chamfer r.

Remark No grease is prepacked. Perform proper lubrication.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Inch series PILLOBALL Rod Ends Insert Type/With Male Thread

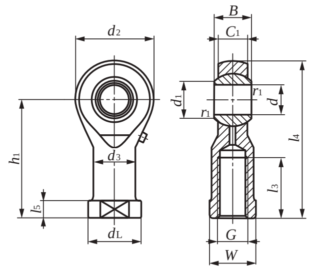


POSB

Identification number	Mass (Ref.)	Boundary dimensions mm(inch)											Dynamic load capacity C_d	Static load capacity C_s
	g	d	Thread S class 3A	D	B	B_1	d_1	L	L_1	L_2	$r_{s\,min}$ (1)	Ball dia. mm (inch)	N	N
POSB 2	5.4	3.175 (.1250)	-32UNC (.1380)	11.91 (.469)	4.75 (.187)	6.35 (.250)	4.75 (.187)	29.77 (1.172)	23.80 (.937)	12.70 (.500)	0.3 (.012)	7.938 (5/16)	1 850	2 160
POSB 2.5	9.1	3.967 (.1562)	-32UNC (.1640)	14.27 (.562)	5.56 (.219)	7.14 (.281)	6.32 (.249)	35.71 (1.406)	28.58 (1.125)	15.88 (.625)	0.3 (.012)	9.525 (3/8)	2 600	3 370
POSB 3	14	4.826 (.1900)	-32UNF (.1900)	15.88 (.625)	6.35 (.250)	7.92 (.312)	7.77 (.306)	39.70 (1.563)	31.75 (1.250)	19.05 (.750)	0.3 (.012)	11.112 (7/16)	3 460	4 850
POSB 4	23	6.350 (.2500)	-28UNF (.2500)	19.05 (.750)	7.14 (.281)	9.53 (.375)	9.02 (.355)	49.20 (1.937)	39.67 (1.562)	25.40 (1.000)	0.5 (.020)	13.097 (33/64)	4 590	8 870
POSB 5	36	7.938 (.3125)	-24UNF (.3125)	22.23 (.875)	8.74 (.344)	11.10 (.437)	11.35 (.447)	58.72 (2.312)	47.63 (1.875)	31.75 (1.250)	0.5 (.020)	15.875 (5/8)	6 800	14 200
POSB 6	54	9.525 (.3750)	-24UNF (.3750)	25.40 (1.000)	10.31 (.406)	12.70 (.500)	13.13 (.517)	61.93 (2.438)	49.23 (1.938)	31.75 (1.250)	0.5 (.020)	18.256 (23/32)	9 230	21 600
POSB 7	77	11.112 (.4375)	-20UNF (.4375)	28.58 (1.125)	11.10 (.437)	14.27 (.562)	14.88 (.586)	68.28 (2.688)	53.98 (2.125)	34.93 (1.375)	0.5 (.020)	20.638 (13/16)	11 200	26 100
POSB 8	122	12.700 (.5000)	-20UNF (.5000)	33.32 (1.312)	12.70 (.500)	15.88 (.625)	17.73 (.698)	78.59 (3.094)	61.93 (2.438)	38.10 (1.500)	0.5 (.020)	23.812 (15/16)	14 800	36 200
POSB 10	186	15.875 (.6250)	-18UNF (.6250)	38.10 (1.500)	14.27 (.562)	19.05 (.750)	21.31 (.839)	85.73 (3.375)	66.68 (2.625)	41.28 (1.625)	0.5 (.020)	28.575 (1 1/8)	20 000	39 300
POSB 12	295	19.050 (.7500)	-16UNF (.7500)	44.45 (1.750)	17.45 (.687)	22.23 (.875)	24.84 (.978)	95.25 (3.750)	73.03 (2.875)	44.45 (1.750)	0.5 (.020)	33.338 (1 5/16)	28 500	55 000
POSB 16	1 129	25.400 (1.0000)	-12UNF (1.2500)	69.85 (2.750)	25.40 (1.000)	34.93 (1.375)	32.23 (1.269)	139.70 (5.500)	104.78 (4.125)	53.98 (2.125)	0.5 (.020)	47.625 (1 7/8)	59 300	112 000

Note(1) r_s min stands for minimum allowable value of chamfer r.
Remark No grease is prepacked. Perform proper lubrication.

Lubrication Type PILLOBALL Rod Ends Die-cast Type/With Female Thread

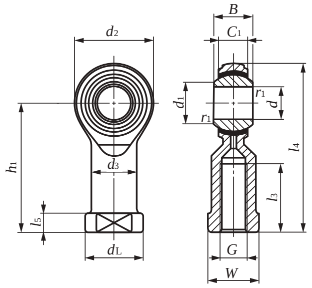


PHSA

Identification number	Mass (Ref.)	Boundary dimensions mm															Static load capacity C_s
	g	d	Thread G	d_2	C_1	B	d_1	l_4	h_1	l_3	l_5	W	d_3	d_L	$r_{1s\,min}$ (1)	Ball dia. mm (inch)	N
PHSA 5	17	5	M 5×0.8	17	6	8	7.7	35.5	27	16	4	9	9	11	0.2	11.112 (7/16)	5 470
PHSA 6	25	6	M 6×1	19.5	6.75	9	9	39.7	30	16	5	11	10	13	0.2	12.700 (1/2)	6 760
PHSA 8	45	8	M 8×1.25	24	9	12	10.4	48	36	19	5	14	12.5	16	0.2	15.875 (5/8)	10 200
PHSA 10	70	10	M10×1.5	28	10.5	14	12.9	57	43	23	6.5	17	15	19	0.2	19.050 (3/4)	13 100
PHSA 12	105	12	M12×1.75	32	12	16	15.4	66	50	27	6.5	19	17.5	22	0.2	22.225 (7/8)	16 400
PHSA 14	155	14	M14×2	36	13.5	19	16.9	75	57	30	8	22	20	25	0.3	25.400 (1)	20 000
PHSA 16	190	16	M16×2	40	15	21	19.4	84	64	36	8	22	22	27	0.3	28.575 (1 1/8)	23 900
PHSA 18	290	18	M18×1.5	45	16.5	23	21.9	93.5	71	40	10	27	25	31	0.3	31.750 (1 1/4)	28 800
PHSA 20	400	20	M20×1.5	49	18	25	24.4	101.5	77	43	10	30	27.5	34	0.3	34.925 (1 3/8)	33 400
PHSA 22	500	22	M22×1.5	54	20	28	25.8	111	84	47	12	32	30	37	0.3	38.100 (1 1/2)	40 400

Note(1) Minimum allowable value of chamfer dimension r_1
Remarks1. A grease nipple is provided on the body.
2. No grease is prepacked. Perform proper lubrication.
3. When a metric fine thread specification for inner ring bore deameter d of 8 mm to 14 mm is required, please contact IKO.

Maintenance-free Type PILLOBALL Rod Ends With Female Thread



PHS···EC

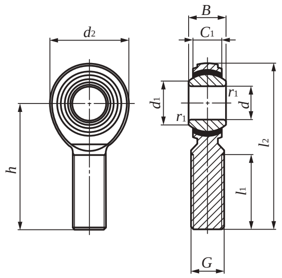
Identification number	Mass (Ref.)	Boundary dimensions mm															Dynamic load capacity C_d	Static load capacity C_s
	g	d	Thread G	d_2	C_1	B	d_1	l_4	h_1	l_3	l_5	W	d_3	d_L	$r_{1s\,min}$ (1)	Ball dia. mm (inch)	N	N
PHS 3EC	5.7	3	M 3×0.5	12	4.5	6	5.2	27	21	10	3	5.5	5	6.5	0.2	7.938 (5/16)	3 500	2 480
PHS 4EC	11.9	4	M 4×0.7	14	5.3	7	6.5	31	24	12	4	8	8	9.5	0.2	9.525 (3/8)	4 950	3 260
PHS 5EC	16.5	5	M 5×0.8	16	6	8	7.7	35	27	12.5	4	9	9	11	0.2	11.112 (7/16)	6 540	4 010
PHS 6EC	25	6	M 6×1	18	6.75	9	9	39	30	13.5	5	11	10	13	0.2	12.700 (1/2)	8 410	4 940
PHS 8EC	43	8	M 8×1.25	22	9	12	10.4	47	36	16	5	14	12.5	16	0.2	15.875 (5/8)	14 000	7 760
PHS 10EC	72	10	M10×1.5	26	10.5	14	12.9	56	43	19.5	6.5	17	15	19	0.2	19.050 (3/4)	19 600	10 500
PHS 12EC	107	12	M12×1.75	30	12	16	15.4	65	50	24	6.5	19	17.5	22	0.2	22.225 (7/8)	26 200	13 700
PHS 14EC	160	14	M14×2	34	13.5	19	16.9	74	57	27	8	22	20	25	0.2	25.400 (1)	33 600	17 200
PHS 16EC	210	16	M16×2	38	15	21	19.4	83	64	33	8	22	22	27	0.2	28.575 (1 1/8)	42 000	21 100
PHS 18EC	295	18	M18×1.5	42	16.5	23	21.9	92	71	36	10	27	25	31	0.2	31.750 (1 1/4)	51 400	25 100
PHS 20EC	380	20	M20×1.5	46	18	25	24.4	100	77	40	10	30	27.5	34	0.2	34.925 (1 3/8)	61 600	30 000
PHS 22EC	490	22	M22×1.5	50	20	28	25.8	109	84	41	12	32	30	37	0.2	38.100 (1 1/2)	74 700	36 400

Note(1) Minimum allowable value of chamfer dimension r_1

Remarks1. Neither oil hole nor grease nipple is provided.

2. When a metric fine thread specification for inner ring bore deameter d of 8 mm to 14 mm is required, please contact IKO.

Maintenance-free Type PILLOBALL Rod Ends With Male Thread



POS···EC

Identification number	Mass (Ref.)	Boundary dimensions mm											Dynamic load capacity C_d	Static load capacity C_s
	g	d	Thread G	d_2	C_1	B	d_1	l_2	h	l_1	$r_{1s\,min}$ (1)	Ball dia. mm (inch)	N	N
POS 3EC	5.0	3	M 3×0.5	12	4.5	6	5.2	33	27	15	0.2	7.938 (5/16)	3 500	1 220
POS 4EC	8.1	4	M 4×0.7	14	5.3	7	6.5	37	30	17	0.2	9.525 (3/8)	4 950	2 060
POS 5EC	12.5	5	M 5×0.8	16	6	8	7.7	41	33	20	0.2	11.112 (7/16)	6 540	3 340
POS 6EC	19	6	M 6×1	18	6.75	9	9	45	36	22	0.2	12.700 (1/2)	8 410	4 730
POS 8EC	32	8	M 8×1.25	22	9	12	10.4	53	42	25	0.2	15.875 (5/8)	14 000	7 760
POS 10EC	54	10	M10×1.5	26	10.5	14	12.9	61	48	29	0.2	19.050 (3/4)	19 600	10 500
POS 12EC	85	12	M12×1.75	30	12	16	15.4	69	54	33	0.2	22.225 (7/8)	26 200	13 700
POS 14EC	126	14	M14×2	34	13.5	19	16.9	77	60	36	0.2	25.400 (1)	33 600	17 200
POS 16EC	185	16	M16×2	38	15	21	19.4	85	66	40	0.2	28.575 (1 1/8)	42 000	21 100
POS 18EC	260	18	M18×1.5	42	16.5	23	21.9	93	72	44	0.2	31.750 (1 1/4)	51 400	25 100
POS 20EC	340	20	M20×1.5	46	18	25	24.4	101	78	47	0.2	34.925 (1 3/8)	61 600	30 000
POS 22EC	435	22	M22×1.5	50	20	28	25.8	109	84	51	0.2	38.100 (1 1/2)	74 700	36 400

Note(1) Minimum allowable value of chamfer dimension r_1

Remarks1. Neither oil hole nor grease nipple is provided.

2. When a metric fine thread specification for inner ring bore deameter d of 8 mm to 14 mm is required, please contact IKO.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

L-BALLS

- ●L-Balls
- ●L-Ball Dust Cover

Structure and Features

IKO L-Balls are self-aligning rod-ends consisting of a special zinc die-cast alloy body and a studded ball which has its axis at right angles to the body.
They can perform tilting movement, oscillating movement and rotation with low torque, and transmit power smoothly due to uniform clearance between the sliding surfaces.
Their superior wear resistance assures stable accuracy for long periods of time, and maintenance is simple. They are very economical bearings.
For these reasons, they are widely used in link mechanisms in automobiles, construction machinery, farm and packaging machines, etc.

Types

L-Balls are available in various types as shown in Table 1.

Table 1 Type of L-Balls

Type	L-Ball		L-Ball dust cover
Model code	LHSA	LHS	PRC

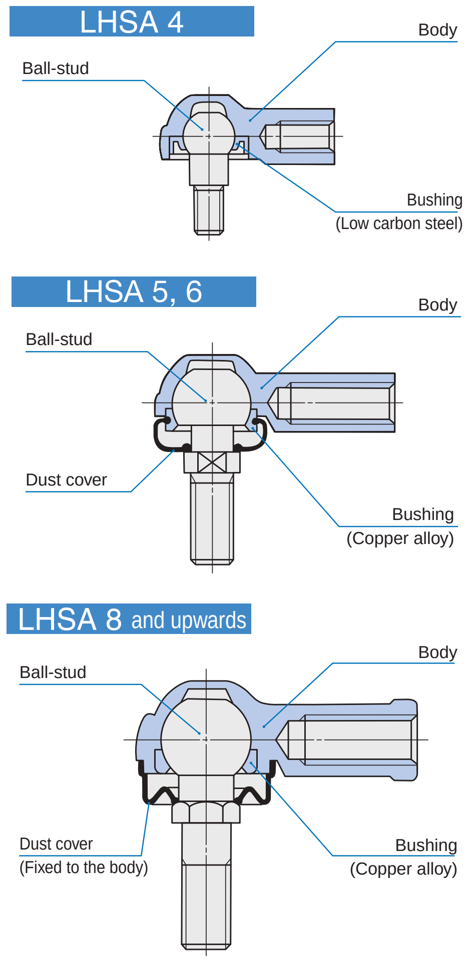
L-Ball LHSA

These are compact rod-ends in which the spherical part of the ball-stud are held by the special zinc die-cast alloy body. There is a dust cover on the stud side and good quality lithium soap base grease is prepacked. They can be run for long periods of time without re-lubrication and have excellent lubrication and anti-dust properties.
As shown in the structural drawing, these rod-ends are classified into 3 types by size. In addition, the ball-studs of LHSA 10 and lower are formed in one solid body, but those of LHSA 12 and higher, which are used under large loads, have the stud friction-welded to a high precision steel ball to give greater resistance to wear.

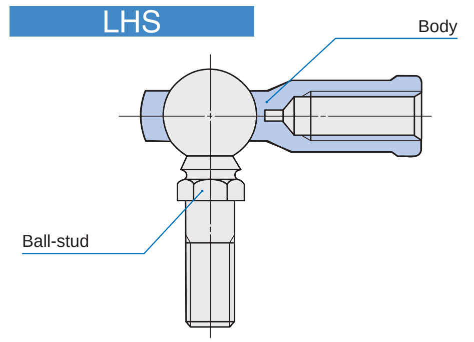
L-Ball LHS

These rod-ends have a friction-welded ball-stud, and a special zinc die-cast alloy body which houses the spherical surface of the high precision steel ball. There is an almost complete contact across the sliding surfaces, and the uniform clearance guarantees a stable bearing life.
An L-Ball dust cover can be attached to these rod-ends. If the rod-ends are lubricated with lithium soap base grease, they have excellent lubrication and anti-dust properties and can run for long periods of time without re-lubrication.
When the L-Ball LHS is delivered with a dust cover on request, lithium soap base grease is prepacked.

Structures of L-Ball LHSA



Structure of L-Ball LHS



L-Ball Dust Cover PRC

This is for the L-Ball LHS series. It is made of special synthetic rubber which has excellent resistance to oil and ozone. The cover offers very effective dust protection and prevents grease leakage.

Identification Number

The identification number of L-Balls consists of a model code, a size and any supplemental codes as shown in the examples.

Examples of identification number

Example 1 (Female thread of the body : In case of right-hand threaded)

Model code	Size
LHSA	8

Type

Size of thread (M8)

Example 2 (Female thread of the body : In case of left threaded)

Model code	Size	Supplemental code
LHSA	8	L

Left-handed thread

Example 3 (when a dust cover PRC is attached to LHS)

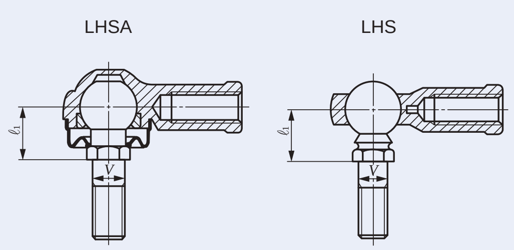
Model code	Size	Supplemental code
LHS	8	D

With dust cover

Accuracy

The accuracy of L-Balls is shown in Table 2.

Table 2 Tolerance



unit: mm

Type	Dimension symbol	Tolerance
LHSA	ℓ_1	± 0.5
	V	0 − 0.2 (1)
LHS	ℓ_1	± 0.4
	V	h9

Note (1) This dimensional tolerance applies to LHSA 5 and higher.

Selection of L-Balls

The static load capacity and maximum operating load of L-Balls are determined in consideration of the strength of the ball stud and the body. Accordingly, L-Balls are selected on the basis of the static load capacity C_s shown in the dimension table and the maximum operating load shown in Table 3.

Static load capacity

The static load capacity C_s shown in the dimension table represents the allowable axial force F which is determined by the mechanical strength of the ball-stud at the section 'A' under the bending moment due to the force F as illustrated in Fig. 1. If F increases beyond the static load capacity, deformation will begin at A, leading to breakage.

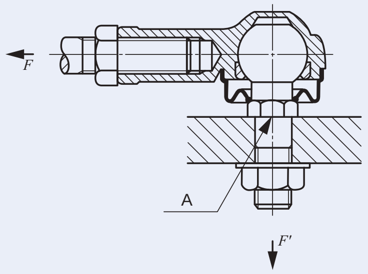


Fig. 1

Maximum operating load

The strength of the body must also be taken into consideration when L-Balls are operated in a high-temperature or low-temperature atmosphere or receive repetitive loads of long duration or shock loads. A guideline for maximum operating load of L-Balls is shown in Table 3. When the fixing bolt in the main body is fixed and a load is applied in the direction of F', the bending stress in the fixing bolt must be taken into consideration.

Table 3 Maximum operating load

unit: N

Identification number	Maximum operating load	Identification number	Maximum operating load
LHSA 4	840	LHS 5	880
LHSA 5	1 180	LHS 6	1 080
LHSA 6	1 080	LHS 8	1 630
LHSA 8	1 900	LHS10	2 100
LHSA10	2 170	LHS12	2 620
LHSA10M	2 170	LHS14	3 190
LHSA12	2 790	LHS16	3 820
LHSA14	3 540	LHS18	4 610
—	—	LHS20	5 340
—	—	LHS22	6 460

Lubrication

LHSA is prepacked with lubricating grease ALVANIA GREASE S2 (Shell Lubricants Japan K.K.). LHS is not provided with prepacked grease. Perform proper lubrication.

Operating LHS without lubrication will increase the wear of the sliding contact surface or cause seizure.

Operating Temperature Range

The maximum allowable temperature for L-Balls is +80℃ .

Precautions for Use

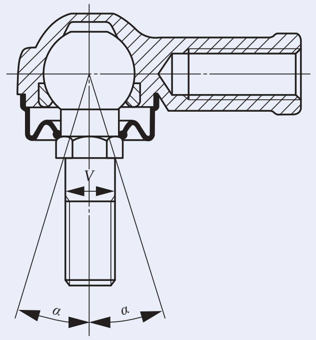
❶ **Tightening depth**

It is recommended that the tightening depth of the screw into the body is more than twice the nominal diameter of thread.

❷ **Allowable tilting angle**

The allowable tilting angle is shown in Table 4.

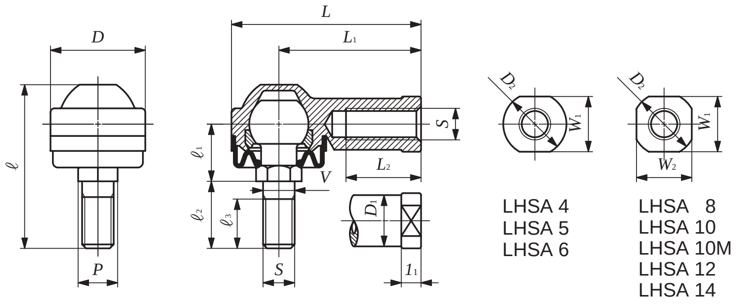
Table 4 Allowable tilting angle



unit: degree

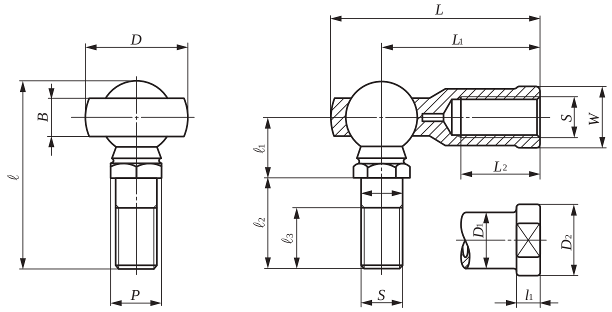
Nominal dia. mm V	LHSA α	LHS α
4	15	—
5	17	15
6	17	17
8	18	18
10	19	19
12	19	19
14	20	20
16	—	20
18	—	21
20	—	20
22	—	21

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch



Identification number	Mass (Ref.)	Boundary dimensions mm																	Static load capacity
	g	Thread S	V	D	L	L_1	L_2	l_1	W_1	W_2	D_1	D_2	ℓ	P	ℓ_1	ℓ_2	ℓ_3	Ball dia.	C_s N
LHSA 4	11	M 4×0.7	*4	14	25	18	8	4	8	—	8	10	19.5	⁑5.5	7	7	5	8	880
LHSA 5	27	M 5×0.8	5	17	38.5	30	16	5	10	—	10	12	32.5	8	12	13	10	11.112	1 180
LHSA 6	27	M 6×1	6	19	39.5	30	16	5	10	—	10	12	32.5	8	12	13	10	11.112	1 670
LHSA 8	64	M 8×1.25	8	24	48	36	19	5	14	14	13	16	41.5	10	14.5	17	12.5	15	4 380
LHSA 10	106	M10×1.25	10	28	57	43	23	6.5	17	17	15	19	49	12	16	21	17	19.05	7 400
LHSA 10M	106	M10×1.5	10	28	57	43	23	6.5	17	17	15	19	49	12	16	21	17	19.05	7 400
LHSA 12	180	M12×1.75	12	34	67	50	27	6.5	19	19	17.5	22	64	14	20	30	20	22.225	9 900
LHSA 14	260	M14×2	14	38	76	57	30	8	22	22	20	25	72	17	22.5	33.5	22	25.4	14 600

Remarks1. The item marked * is manufactured with a neck diameter of ϕ3.4. The item marked ⁑ is manufactured with a diameter of ϕ5.5 instead of a width across flats.
2. Provided with prepacked grease.



LHS

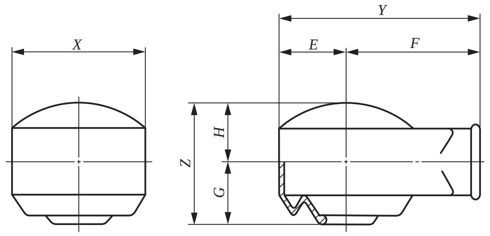
Identification number	Mass (Ref.)	Boundary dimensions mm																	Static load capacity
	g	Thread S	V	D	B	L	L_1	L_2	l_1	W	D_1	D_2	ℓ	P	ℓ_1	ℓ_2	ℓ_3	Ball dia.	C_s N
LHS 5	22	M 5×0.8	5	17	6	35.5	27	16	4	9	9	11	30.5	8	10	15	11	11.112	2 080
LHS 6	32	M 6×1	6	19.5	6.75	39.7	30	16	5	11	10	13	36.5	10	11.5	18.5	14	12.7	3 290
LHS 8	60	M 8×1.25	8	24	9	48	36	19	5	14	12.5	16	44	11	14.5	21.5	15	15.875	4 900
LHS 10	102	M10×1.5	10	28	10.5	57	43	23	6.5	17	15	19	52.5	13	17	26	18	19.05	7 640
LHS 12	160	M12×1.75	12	32	12	66	50	27	6.5	19	17.5	22	61	17	20	30	20	22.225	12 400
LHS 14	227	M14×2	14	36	13.5	75	57	30	8	22	20	25	69	17	22.5	33.5	22	25.4	14 600
LHS 16	300	M16×2	16	40	15	84	64	36	8	22	22	27	74	19	24.5	35.5	23	28.575	19 500
LHS 18	445	M18×1.5	18	45	16.5	93.5	71	40	10	27	25	31	84	22	27.5	40.5	25	31.75	25 600
LHS 20	580	M20×1.5	20	49	18	101.5	77	43	10	30	27.5	34	90.5	24	30	43	27	34.925	31 600
LHS 22	765	M22×1.5	22	54	20	111	84	47	12	32	30	37	99	27	32.5	47.5	30	38.1	39 800

Remark No grease is prepacked. Perform proper lubrication.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

L-BALL

L-Ball Dust Cover



PRC

Identification number	Boundary dimensions mm						
	X	Y	E	F	Z	G	H
PRC 5	20	29	10	19	16	8	8
PRC 6	22	31	11	20	19	9.5	9.5
PRC 8	27	38.5	13.5	25	24	12	12
PRC 10	31	45.5	15.5	30	27	14	13
PRC 12	36	53	18	35	32	16.5	15.5
PRC 14	40	60	20	40	36.5	19	17.5
PRC 16	44	68	22	46	40	20.5	19.5
PRC 18	49	74.5	24.5	50	46	23.5	22.5
PRC 20	54	82	27	55	50	25.5	24.5
PRC 22	59	89.5	29.5	60	53.5	27.5	26

K
LHSA
LHS

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SUPER FLEXIBLE NOZZLES

Structure and Features

IKO Super Flexible Nozzle is a compact nozzle for use on a machine tool to supply and spray cutting oil exactly at the required positions.

The angle of the nozzle can be changed easily and freely. Therefore, oil supply can be concentrated upon the working area, and cooling and lubrication can be performed effectively. As a result, cutting resistance is reduced and superior finish is obtained, achieving high machining accuracy. Also, tool life is longer.

The Super Flexible Nozzle is used in many places such as at the spindle end of Machining Center and at the tool holder of N/C lathe.

The features of Super Flexible Nozzle are as follows.

❶A spherical bushing is incorporated to adjust the tilting angle of nozzle easily.

❷The Super Flexible Nozzle is compact in size, and the design on parts around the spindle and tool can be made simple.

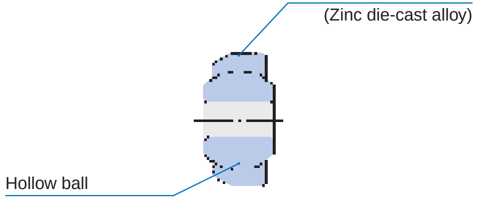
❸The nozzle length is short, and winding of cutting chips around the nozzle will not occur.

❹By using a number of Super Flexible Nozzles, cutting oil can be supplied and cutting chips can be removed more effectively.

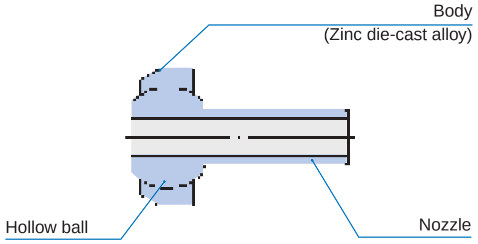
❺The press fitting type and screw fitting type are available. The press fitting type is economical.

Structures of Super Flexible Nozzles

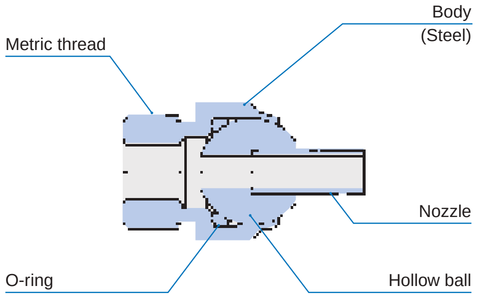
SNA [Without nozzle]



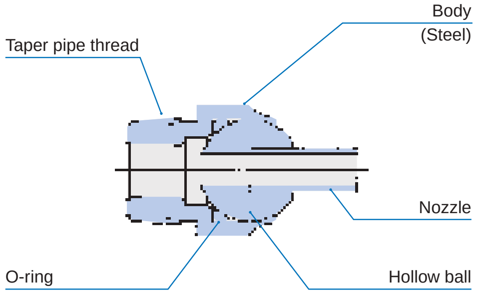
SNA [With nozzle]



SNM



SNPT



Types

Super Flexible Nozzles shown in Table 1 are available.

Table 1 Type of Super Flexible Nozzle

Type		Model code
Press fitting type	Without nozzle	SNA
	With nozzle	
Screw fitting type	With metric threads	SNM
	With taper pipe threads	SNPT

Identification Number

The identification number of Super Flexible Nozzle consists of a model code and a size. An example is shown as follows.

Example of identification number

Model code | Size

SNM 10−20

Type of nozzle

Nozzle bore or thread size: (M10×1.25)

Dimension from shoulder surface to nozzle top:※ (20mm)

※In case of press fitting type without nozzle, this dimension is not indicated.

Precautions for Use

When the press fitting type Super Flexible Nozzle is used, a ϕ 15 (H8) $^{+0.027}_{\ \ 0}$ bore for fitting hole must be prepared and fitting is made from the 30° chamfered end of the outer body. In this case, the body portion should be pushed for press fitting.

When the screw fitting type Super Flexible Nozzle is used and prevention of oil leakage from the fitting part is required, it is recommended to wind sealing tape on the thread portion or use rubber packing for the shoulder face of the outer body.

The direction of lubrication can be adjusted by inserting a screwdriver, etc. in the bore of the nozzle.

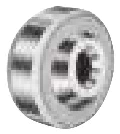
Special Specifications

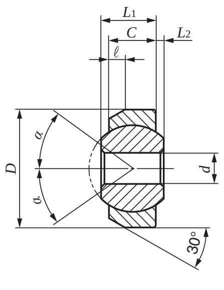
Super Flexible Nozzles with special length are also available. In this case, specify the necessary nozzle length in units of 1 mm, but do not exceed the maximum length shown in the dimension table as "L".

Super Flexible Nozzles with curved nozzle end or with special bore diameter are also available. In this case, please contact IKO by preparing a drawing or sketch with necessary specifications.

SUPER FLEXIBLE NOZZLE

Press Fitting Type Without Nozzle

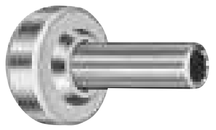


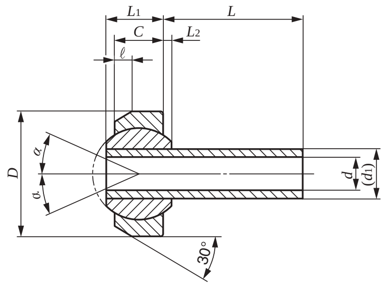


SNA

Identification number	Boundary dimensions mm						Ball dia.	Allowable tilting angle
	d	D	L_1	L_2	C	ℓ	mm (inch)	α degree
SNA 4	4	15	7	1	6	2	11.112 (7⁄16)	36
SNA 6	6							24

Press Fitting Type With Nozzle





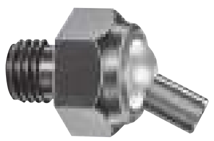
SNA

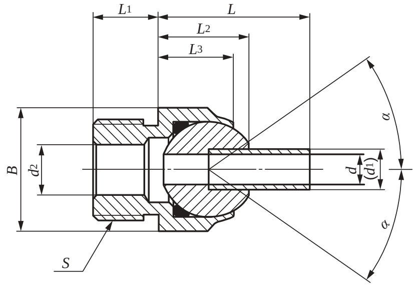
Identification number	Boundary dimensions mm								Ball dia.	Allowable tilting angle
	d	D	L	L_1	L_2	C	ℓ	d_1	mm (inch)	α degree
SNA 3-*L*	3	15	6 15 32	7	1	6	2	6	11.112 (7⁄16)	24
SNA 4-*L*	4		6 16 40							

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

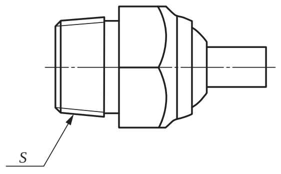
SUPER FLEXIBLE NOZZLE

Screw Fitting Type





SNM



SNPT

Identification number	Boundary dimensions mm										Ball dia.	Allowable tilting angle
	d	Thread S	L	L_1	L_2	L_3	d_1	d_2	Width across flats B	Width across corners (Ref.)	mm (inch)	α degree
SNM 10-*L*	4	M10×1.25	20 40 60	9	13	10.5	6	6	17	19.6	12.700 (1/2)	35
SNPT 1/4-*L*		PT 1/4										
SNM 20-*L*	6	M20×1.5	30 50 70	13	18	15	8	10	24	27.7	19.050 (3/4)	
SNPT 3/8-*L*		PT 3/8										
SNM 24-*L*	8	M24×2.0	40 60 80	18	23	19	10	12	32	37	25.400 (1)	
SNPT 1/2-*L*		PT 1/2										

PARTS FOR NEEDLE ROLLER BEARINGS

- ●Seals for Needle Roller Bearings
- ●Cir-clips for Needle Roller Bearings
- ●Needle Rollers

Seals for Needle Roller Bearings

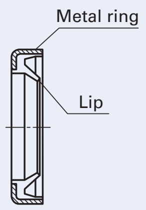
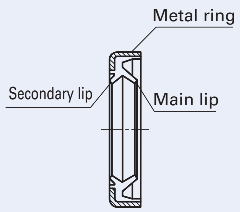
Features

IKO Seals for Needle Roller Bearings have a low sectional height and consist of a sheet metal ring and special synthetic rubber.
As these seals are manufactured to the same sectional height as IKO Needle Roller Bearings, grease leakage and the penetration of foreign particles can be effectively prevented by fitting them directly to the sides of combinable bearings shown in the dimension table.
When fitting seals to needle roller bearings with inner ring, wide inner rings (see page H2) must be used, as shown in the mounting examples.

Types

Seals for Needle Roller Bearings are available as shown in Table1.

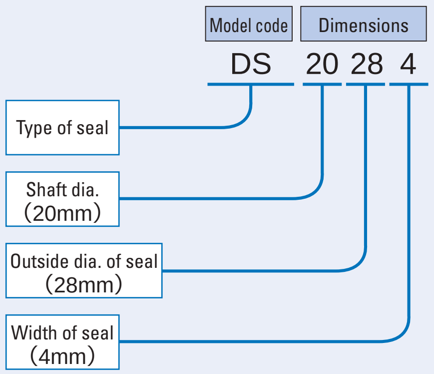
Table 1 Seal type

Type	Single lip	Double lips
Structure		
Model code	OS	DS

Identification Number

The identification number of Seals for Needle Roller Bearings consists of a model code and dimensions. An example of an identification number is shown as follows.

Example of identification number



Accuracy

Tolerances of Seals for Needle Roller Bearings are based on JIS B 2402-1.
Tolerances of outside diameter and width are based on Tables 2 and 3, respectively.

Table 2 Tolerance of outside diameter

unit: mm

Nominal outside diameter		Tolerance	
Over	Incl.	High	Low
–	30	+ 0.09	+ 0.04
30	50	+ 0.11	+ 0.05
50	80	+ 0.14	+ 0.06
80	120	+ 0.17	+ 0.08

Table 3 Tolerance of width

unit: mm

Nominal size of width		Tolerance	
Over	Incl.	High	Low
–	6	+ 0.2	− 0.2
6	10	+ 0.3	− 0.3

Precautions for Use

❶For the single lip OS type, the lip has to face inward when using the seal to prevent grease leakage, and outward to prevent the penetration of foreign particles.
The DS type of double-lips is effective for prevention of grease leakage and dust penetration. However, when the main purpose is to prevent grease leakage, the main lip should face inward, and when used mainly to prevent dust penetration, it should face outward.

❷The permissible temperature range is -20 ～ +100℃ .
For use at higher or lower temperatures, a special seal is required. Please contact IKO for further information.

❸The limiting peripheral speed of shaft depends on the conditions of use, but is normally 6 to 8 m/s.
Double this speed is possible if the conditions (lubrication, temperature, shaft finish, etc.) are good.

Mounting

When inserting the shaft, damage to the lip should be prevented by chamfering the end of the shaft, as shown in the upper part of Fig. 1. When this cannot be performed, a mounting bushing should be used, as shown in the lower part of Fig.1.
When press fitting the seal to the housing, do not strike it directly, but fit it gently, using a suitable tool.
To prevent early wear and heat generation at the seal surface, it is necessary to thickly coat the tip of the lip for the OS type, or to fill the space between the two lips for the DS type, with bearing grease.

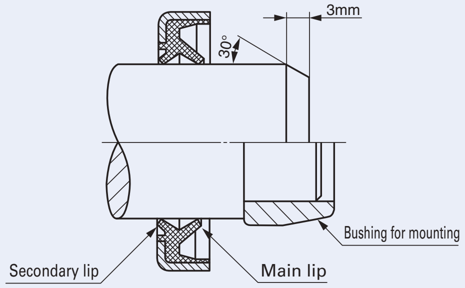


Fig.1

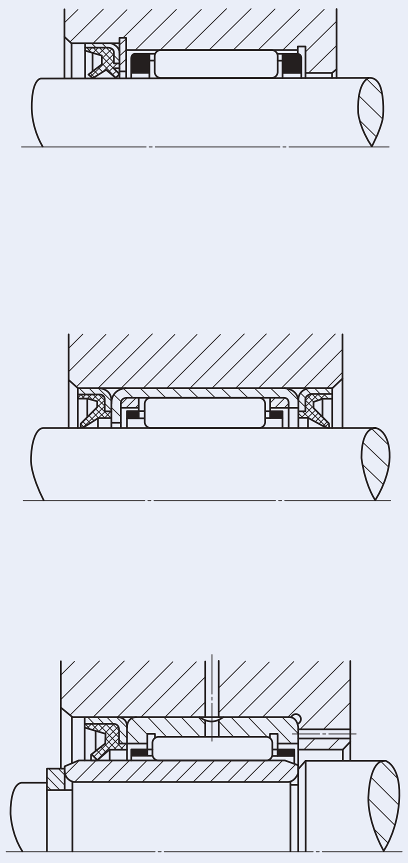
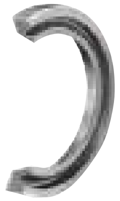
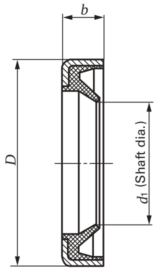


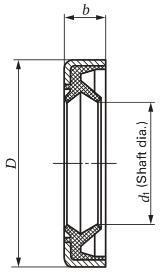
Fig.2 Mounting examples

SEALS FOR NEEDLE ROLLER BEARINGS





OS

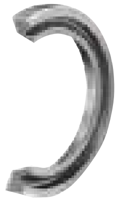


DS

Shaft dia. 6 — 15mm

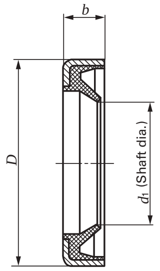
Shaft dia. mm	Identification number		Boundary dimensions mm			Combinable bearings			
	Single lip	Double lips	d_1	D	b	TA···Z YT TLA···Z YTL	RNA TR TAF GTR	RNAF	NAX NBX
6	OS 6102.5	—	6	10	2.5	TLA 69Z	—	—	—
7	OS 7112.5	—	7	11	2.5	TLA 79Z	—	—	—
8	OS 8123	—	8	12	3	TLA 810Z	—	—	—
	OS 8153	— —	8	15	3	TA 810Z TA 815Z TA 820Z YT 810	RNA 496 TAF 81512 TAF 81516	RNAF 81510	—
9	OS 9133	—	9	13	3	TLA 910Z TLA 912Z	—	—	—
	OS 9163	—	9	16	3	TA 912Z TA 916Z YT 912	TAF 91612 TAF 91616	—	—
10	OS 10143	—	10	14	3	TLA 1010Z TLA 1012Z TLA 1015Z	—	—	—
	OS 10173	—	10	17	3	TA 1010Z TA 1012Z TA 1015Z TA 1020Z	TAF 101712 TAF 101716	RNAF 101710	—

Shaft dia. mm	Identification number		Boundary dimensions mm			Combinable bearings			
	Single lip	Double lips	d_1	D	b	TA···Z YT TLA···Z YTL	RNA TR TAF GTR	RNAF	NAX NBX
12	OS 12163	—	12	16	3	TLA 1210Z YTL 1210	—	—	—
	OS 12183	—	12	18	3	TLA 1212Z	—	—	—
	OS 12193	—	12	19	3	TA 1212Z TA 1215Z TA 1220Z TA 1225Z YT 1212	TAF 121912 TAF 121916	—	—
13	OS 13193	—	13	19	3	TLA 1312Z	—	—	—
14	OS 14203	DS 14203	14	20	3	TLA 1412Z TLA 1416Z	—	—	—
	OS 14223	DS 14223	14	22	3	TA 1416Z TA 1420Z	RNA 4900 TAF 142216 TAF 142220	RNAF 142213 RNAFW 142220	—
15	OS 15213	DS 15213	15	21	3	TLA 1512Z TLA 1516Z TLA 1522Z	—	—	—
	OS 15223	DS 15223	15	22	3	TA 1510Z TA 1512Z TA 1515Z TA 1520Z TA 1525Z	—	—	—
	OS 15235	DS 15235	15	23	5	—	TAF 152316 TAF 152320	RNAF 152313 RNAFW 152320	—

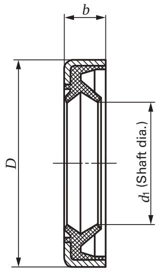


Shaft dia. 16 ー 19mm

Shaft dia. mm	Identification number		Boundary dimensions mm			Combinable bearings			
	Single lip	Double lips	d_1	D	b	TA···Z YT TLA···Z YTL	RNA TR TAF GTR	RNAF	NAX NBX
16	**OS 16223**	**DS 16223**	16	22	3	**TLA 1612Z** **TLA 1616Z** **TLA 1622Z**	—	—	—
	OS 16243	**DS 16243**	16	24	3	**TA 1616Z** **TA 1620Z**	**RNA 4901** **RNA 6901** **TAF 162416** **TAF 162420**	**RNAF 162413** **RNAFW 162420**	—
	OS 16285	**DS 16285**	16	28	5	—	—	**RNAF 162812**	—
17	**OS 17233**	**DS 17233**	17	23	3	**TLA 1712Z**	—	—	—
	OS 17243	**DS 17243**	17	24	3	**TA 1715Z** **TA 1720Z** **TA 1725Z** **YT 1715** **YT 1725**	—	—	—
	OS 17253	**DS 17253**	17	25	3	—	**TAF 172516** **TAF 172520**	**RNAF 172513** **RNAFW 172520**	—



OS

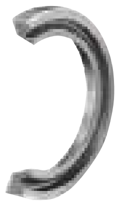


DS

Shaft dia. mm	Identification number		Boundary dimensions mm			Combinable bearings			
	Single lip	Double lips	d_1	D	b	TA···Z YT TLA···Z YTL	RNA TR TAF GTR	RNAF	NAX NBX
18	**OS 18243**	**DS 18243**	18	24	3	**TLA 1812Z** **TLA 1816Z**	—	—	—
	OS 18253	**DS 18253**	18	25	3	**TA 1813Z** **TA 1815Z** **TA 1817Z** **TA 1819Z** **TA 1820Z** **TA 1825Z**	—	—	—
	OS 18264	**DS 18264**	18	26	4	—	**RNA 49/14** **TAF 182616** **TAF 182620**	**RNAF 182613** **RNAFW 182620**	—
19	**OS 19274**	—	19	27	4	**TA 1916Z** **TA 1920Z**	**TAF 192716** **TAF 192720**	—	—

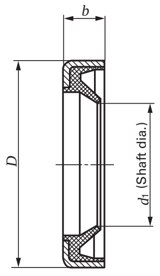
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SEALS FOR NEEDLE ROLLER BEARINGS



Shaft dia. 20 — 24mm

Shaft dia. mm	Identification number		Boundary dimensions mm			Combinable bearings			
	Single lip	Double lips	d_1	D	b	TA···Z YT TLA···Z YTL	RNA TR TAF GTR	RNAF	NAX NBX
20	**OS 20264**	**DS 20264**	20	26	4	**TLA 2012Z** **TLA 2016Z** **TLA 2020Z** **TLA 2030Z**	—	—	—
	OS 20274	**DS 20274**	20	27	4	**TA 2015Z** **TA 2020Z** **TA 2025Z** **TA 2030Z** **YT 2015** **YT 2025**	—	—	—
	OS 20284	**DS 20284**	20	28	4	**TA 202820Z** **YT 202820**	**RNA 4902** **RNA 6902** **TAF 202816** **TAF 202820**	**RNAF 202813** **RNAFW 202826**	—
	OS 20304	**DS 20304**	20	30	4	—	—	—	**NAX 2030** **NBX 2030**
	OS 20324	**DS 20324**	20	32	4	—	—	**RNAF 203212** **RNAFW 203224**	—
	OS 20326	**DS 20326**	20	32	6	—	—	**RNAF 203212** **RNAFW 203224**	—
21	**OS 21294**	**DS 21294**	21	29	4	**TA 2116Z** **TA 2120Z** **YT 2116** **YT 2120**	**TAF 212916** **TAF 212920**	—	—



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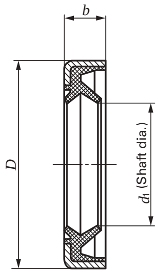
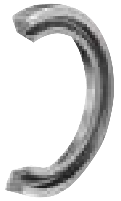
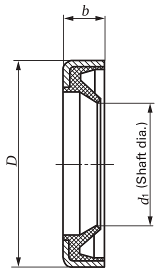


DS

Shaft dia. mm	Identification number		Boundary dimensions mm			Combinable bearings			
	Single lip	Double lips	d_1	D	b	TA···Z YT TLA···Z YTL	RNA TR TAF GTR	RNAF	NAX NBX
22	**OS 22284**	**DS 22284**	22	28	4	**TLA 2212Z** **TLA 2216Z** **TLA 2220Z**	—	—	—
	OS 22294	—	22	29	4	**TA 2210Z** **TA 2215Z** **TA 2220Z** **TA 2225Z** **TA 2230Z**	—	—	—
	OS 22304	**DS 22304**	22	30	4	**TA 223016Z** **TA 223020Z** **YT 223016** **YT 223020**	**RNA 4903** **RNA 6903** **TAF 223016** **TAF 223020**	**RNAF 223013** **RNAFW 223026**	—
24	**OS 24314**	**DS 24314**	24	31	4	**TA 2420Z** **TA 2428Z** **YT 2428**	—	—	—
	OS 24324	**DS 24324**	24	32	4	**TA 243216Z** **TA 243220Z** **YT 243216** **YT 243220**	**TAF 243216** **TAF 243220**	—	—





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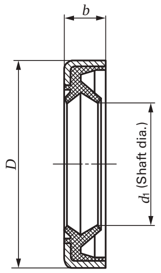


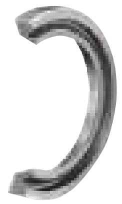
DS

Shaft dia. 25 ─ 29mm

Shaft dia. mm	Identification number		Boundary dimensions mm			Combinable bearings			
	Single lip	Double lips	d_1	D	b	TA···Z YT TLA···Z YTL	RNA TR TAF GTR	RNAF	NAX NBX
25	OS 25324	DS 25324	25	32	4	TLA 2512Z TLA 2516Z TLA 2520Z TLA 2526Z TLAW 2538Z YTL 2526	—	—	—
	OS 25334	DS 25334	25	33	4	TA 2510Z TA 2515Z TA 2520Z TA 2525Z TA 2530Z YT 2510 YT 2515 YT 2520 YT 2525	TAF 253316 TAF 253320	—	—
	OS 25356	DS 25356	25	35	6	—	—	RNAF 253517 RNAFW 253526	—
	OS 25376	DS 25376	25	37	6	—	RNA 4904 RNA 6904	RNAF 253716 RNAFW 253732	NAX 2530 NBX 2530
26	OS 26344	DS 26344	26	34	4	TA 2616Z TA 2620Z YT 2616 YT 2620	TAF 263416 TAF 263420	—	—

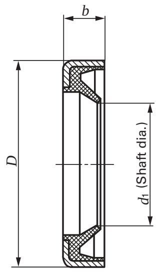
Shaft dia. mm	Identification number		Boundary dimensions mm			Combinable bearings			
	Single lip	Double lips	d_1	D	b	TA···Z YT TLA···Z YTL	RNA TR TAF GTR	RNAF	NAX NBX
28	OS 28354	DS 28354	28	35	4	TLA 2816Z TLA 2820Z	—	—	—
	OS 28374	DS 28374	28	37	4	TA 2820Z TA 2830Z YT 2820	TAF 283720 TAF 283730	—	—
	OS 28396	DS 28396	28	39	6	—	RNA 49/22 RNA 69/22	—	—
	OS 28406	DS 28406	28	40	6	—	—	RNAF 284016 RNAFW 284032	—
29	OS 29384	DS 29384	29	38	4	TA 2920Z TA 2930Z YT 2920	TAF 293820 TAF 293830	—	—

L
OS
DS

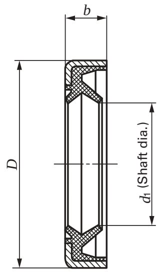


Shaft dia. 30 ─ 38mm

Shaft dia. mm	Identification number		Boundary dimensions mm			Combinable bearings			
	Single lip	Double lips	d_1	D	b	TA⋯Z YT TLA⋯Z YTL	RNA TR TAF GTR	RNAF	NAX NBX
30	**OS 30374**	**DS 30374**	30	37	4	**TLA 3012Z** **TLA 3016Z** **TLA 3018Z** **TLA 3020Z** **TLA 3026Z** **TLAW 3038Z**	—	—	—
	OS 30404	**DS 30404**	30	40	4	**TA 3013Z** **TA 3015Z** **TA 3020Z** **TA 3025Z** **TA 3030Z**	**TAF 304020** **TAF 304030**	**RNAF 304017** **RNAFW 304026**	—
	OS 30426	**DS 30426**	30	42	6	—	**RNA 4905** **RNA 6905**	**RNAF 304216** **RNAFW 304232**	**NAX 3030** **NBX 3030**
32	**OS 32424**	**DS 32424**	32	42	4	**TA 3220Z** **TA 3230Z** **YT 3220**	**TAF 324220** **TAF 324230**	—	—
	OS 32456	**DS 32456**	32	45	6	—	**RNA 49/28** **RNA 69/28** **GTR 324530**	—	—



OS

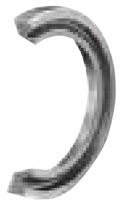


DS

Shaft dia. mm	Identification number		Boundary dimensions mm			Combinable bearings			
	Single lip	Double lips	d_1	D	b	TA⋯Z YT TLA⋯Z YTL	RNA TR TAF GTR	RNAF	NAX NBX
35	**OS 35424**	**DS 35424**	35	42	4	**TLA 3512Z** **TLA 3516Z** **TLA 3520Z**	—	—	—
	OS 35454	**DS 35454**	35	45	4	**TA 3512Z** **TA 3515Z** **TA 3520Z** **TA 3525Z** **TA 3530Z**	**TAF 354520** **TAF 354530**	**RNAF 354517** **RNAFW 354526**	—
	OS 35476	**DS 35476**	35	47	6	—	**RNA 4906** **RNA 6906**	**RNAF 354716** **RNAFW 354732**	**NAX 3530** **NBX 3530**
37	**OS 37474**	**DS 37474**	37	47	4	**TA 3720Z** **TA 3730Z** **YT 3720**	**TAF 374720** **TAF 374730**	—	—
38	**OS 38484**	**DS 38484**	38	48	4	**TA 3815Z** **TA 3820Z** **TA 3825Z** **TA 3830Z** **TAW 3845Z**	**TAF 384820** **TAF 384830**	—	—
	OS 38506	**DS 38506**	38	50	6	—	—	—	—

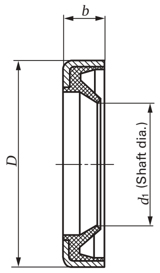
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SEALS FOR NEEDLE ROLLER BEARINGS



Shaft dia. 40 — 50mm

Shaft dia. mm	Identification number		Boundary dimensions mm			Combinable bearings			
	Single lip	Double lips	d_1	D	b	TA···Z YT TLA···Z YTL	RNA TR TAF GTR	RNAF	NAX NBX
40	**OS 40474**	**DS 40474**	40	47	4	**TLA 4012Z** **TLA 4016Z** **TLA 4020Z**	—	—	—
	OS 40504	**DS 40504**	40	50	4	**TA 4015Z** **TA 4020Z** **TA 4025Z** **TA 4030Z** **TA 4040Z** **YT 4015** **YT 4025**	**TAF 405020** **TAF 405030**	**RNAF 405017** **RNAFW 405034**	—
	OS 40526	**DS 40526**	40	52	6	—	**RNA 49/32** **RNA 69/32**	—	**NAX 4032** **NBX 4032**
	OS 40556	**DS 40556**	40	55	6	—	**TR 405520** **GTR 405520**	**RNAF 405520** **RNAFW 405540**	—
42	**OS 42557**	**DS 42557**	42	55	7	—	**RNA 4907** **RNA 6907**	—	—



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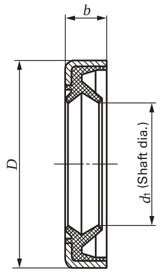
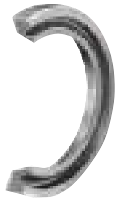


DS

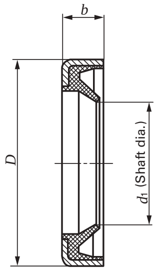
Shaft dia. mm	Identification number		Boundary dimensions mm			Combinable bearings			
	Single lip	Double lips	d_1	D	b	TA···Z YT TLA···Z YTL	RNA TR TAF GTR	RNAF	NAX NBX
45	**OS 45524**	**DS 45524**	45	52	4	**TLA 4516Z** **TLA 4520Z**	—	—	—
	OS 45554	**DS 45554**	45	55	4	**TA 4520Z** **TA 4525Z** **TA 4530Z** **TA 4540Z** **YT 4520** **YT 4525**	**TAF 455520** **TAF 455530**	**RNAF 455517** **RNAFW 455534**	—
	OS 45627	**DS 45627**	45	62	7	—	—	**RNAF 456220** **RNAFW 456240**	—
48	**OS 48627**	**DS 48627**	48	62	7	—	**RNA 4908** **RNA 6908** **TR 486230** **GTR 486230**	—	—
50	**OS 50584**	**DS 50584**	50	58	4	**TLA 5020Z** **TLA 5025Z**	—	—	—
	OS 50624	**DS 50624**	50	62	4	**TA 5012Z** **TA 5015Z** **TA 5020Z** **TA 5025Z** **TA 5030Z** **TA 5040Z** **TAW 5045Z**	**TAF 506225** **TAF 506235**	**RNAF 506220** **RNAFW 506240**	**NAX 5035** **NBX 5035**
	OS 50657	**DS 50657**	50	65	7	—	**RNA 49/42**	**RNAF 506520** **RNAFW 506540**	—

SEALS FOR NEEDLE ROLLER BEARINGS



Shaft dia. 52 ─ 72mm

Shaft dia. mm	Identification number Single lip	Double lips	Boundary dimensions mm d_1	D	b	Combinable bearings TA⋯Z YT TLA⋯Z YTL	RNA TR TAF GTR	RNAF	NAX NBX
52	**OS 52687**	**DS 52687**	52	68	7	—	**RNA 4909** **RNA 6909**	—	—
55	**OS 55674**	**DS 55674**	55	67	4	**TA 5520Z** **TA 5525Z** **TA 5530Z** **TA 5540Z** **TAW 5545Z** **TAW 5550Z**	—	—	—
	OS 55687	**DS 55687**	55	68	7	—	**TAF 556825** **TAF 556835**	**RNAF 556820** **RNAFW 556840**	—
	OS 55727	—	55	72	7	—	—	**RNAF 557220** **RNAFW 557240**	—
58	**OS 58727**	**DS 58727**	58	72	7	—	**RNA 4910** **RNA 6910**	—	—
60	**OS 60724**	**DS 60724**	60	72	4	**TA 6025Z** **TA 6030Z** **TA 6040Z** **TAW 6045Z** **TAW 6050Z**	**TAF 607225** **TAF 607235**	—	**NAX 6040** **NBX 6040**
	OS 60787	**DS 60787**	60	78	7	—	—	**RNAF 607820** **RNAFW 607840**	—
62	**OS 62744**	**DS 62744**	62	74	4	**TA 6212Z**	—	—	—
63	**OS 63807**	**DS 63807**	63	80	7	—	**RNA 4911** **RNA 6911**	—	—



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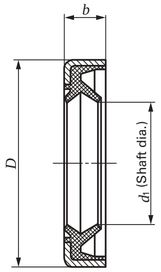


DS

Shaft dia. mm	Identification number Single lip	Double lips	Boundary dimensions mm d_1	D	b	Combinable bearings TA⋯Z YT TLA⋯Z YTL	RNA TR TAF GTR	RNAF	NAX NBX
65	**OS 65774**	**DS 65774**	65	77	4	**TA 6525Z** **TA 6530Z** **TAW 6545Z** **TAW 6550Z**	—	—	—
	OS 65857	**DS 65857**	65	85	7	—	—	**RNAF 658530** **RNAFW 658560**	—
68	**OS 68857**	**DS 68857**	68	85	7	—	**RNA 4912** **RNA 6912**	—	—
70	**OS 70824**	**DS 70824**	70	82	4	**TA 7025Z** **TA 7030Z** **TA 7040Z** **TAW 7050Z** **YT 7025** **YT 7030** **YT 7040**	—	—	—
	OS 70907	**DS 70907**	70	90	7	—	—	**RNAF 709030** **RNAFW 709060**	—
72	**OS 72907**	**DS 72907**	72	90	7	—	**RNA 4913** **RNA 6913**	—	

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Cir-clips for Needle Roller Bearings

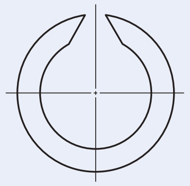
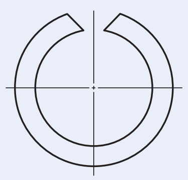
Features

IKO Cir-clips for Needle Roller Bearings have been specially designed for needle roller bearings on which, in many cases, generally available Cir-clips cannot be used. They have a low sectional height and are very rigid. They are made of spring steel.
There are Cir-clips for shafts and for bores, and they are used for positioning to prevent bearing movement in the axial direction.

Types

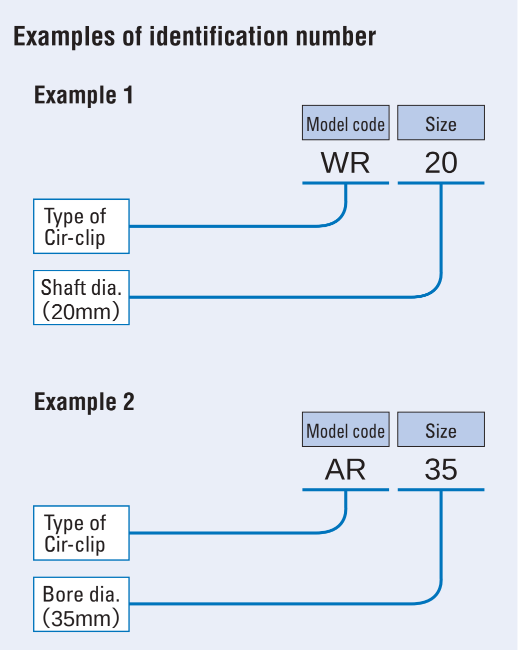
Cir-clips for Needle Roller Bearings are available as shown in Table. 1.

Table 1 Type of Cir-clip

Type	For shaft	For bore
Shape		
Model code	WR	AR

Identification number

The identification number of Cir-clips consists of a model code and a size as shown below.



Examples of identification number

Example 1

Example 2

Allowable Rotational Speed

Cir-clips for Needle Roller Bearings are fixed in the groove with a certain amount of pressure on the bottom of the groove. In the case of Cir-clips for shaft WR type, the centrifugal force causes a decrease in the gripping pressure. Therefore, when using them at high rotational speeds, it is necessary to first check the allowable rotational speed shown in Fig.1.

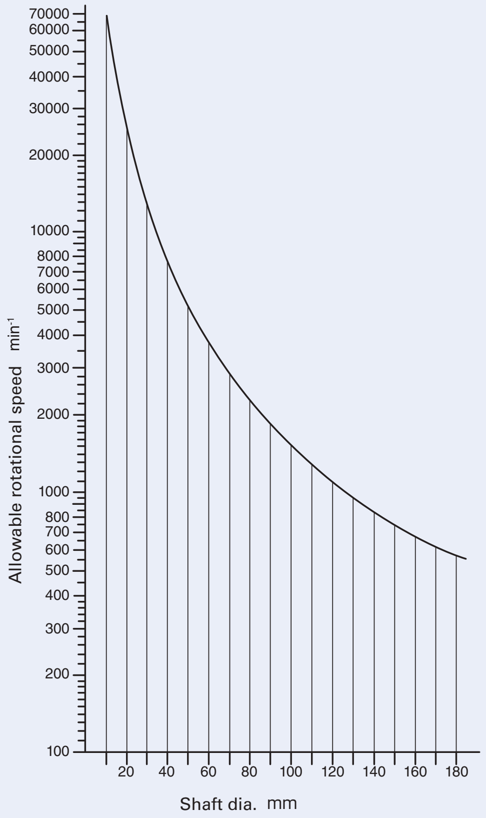


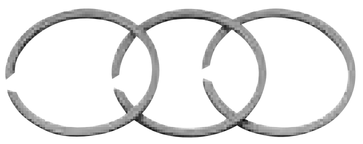
Fig.1 Allowable rotational speed

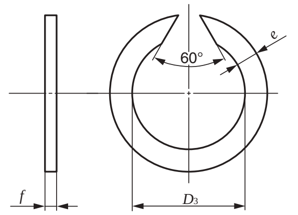
Mounting

The mounting dimensions for Cir-clips for Needle Roller Bearings are shown in the dimension table.
When using these Cir-clips to restrict the movement of the needle roller cage in the axial direction, it is recommended that a spacer be used between the Cir-clip and the cage. Spacers are not required at low rotational speeds.
When it is difficult to reach Cir-clips with dismounting tools and disassembly is difficult, or when the frequency of dismounting is high, it is necessary to consider the use of a retaining ring (JIS B 2804), although they have a higher sectional height.

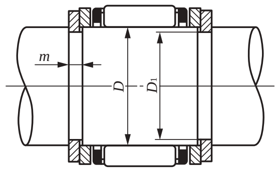
CIR-CLIPS FOR NEEDLE ROLLER BEARINGS

For Shaft





WR



$m = f + 0.1$mm(min.)

Shaft dia. 4 – 390mm

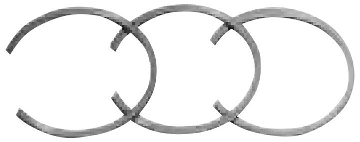
Identification number	Boundary dimensions mm					
	Shaft dia. D	D_3 (Max.)	e	f	Groove dia. D_1	Tolerance
WR 4	4	3.7	0.8	0.5	3.8	0 −0.09
WR 5	5	4.7	1	0.5	4.8	
WR 6	6	5.6	1.1	0.7	5.7	
WR 7	7	6.5	1.2	0.7	6.7	
WR 8	8	7.4	1.3	1	7.6	
WR 9	9	8.4	1.3	1	8.6	
WR 10	10	9.4	1.3	1	9.6	
WR 11	11	10.2	1.3	1	10.5	0 −0.11
WR 12	12	11.2	1.3	1	11.5	
WR 13	13	12.1	1.3	1	12.5	
WR 14	14	13.1	1.5	1.2	13.5	
WR 15	15	14	1.75	1.2	14.4	
WR 16	16	15	1.75	1.2	15.4	
WR 17	17	16	1.75	1.2	16.4	
WR 18	18	17	1.75	1.2	17.4	
WR 19	19	17.9	1.75	1.2	18.4	0 −0.13
WR 20	20	18.7	1.75	1.2	19.2	
WR 21	21	19.7	1.75	1.2	20.2	
WR 22	22	20.7	1.75	1.2	21.2	
WR 23	23	21.7	1.75	1.2	22.2	
WR 24	24	22.5	1.75	1.2	23	
WR 25	25	23.5	1.75	1.2	24	
WR 26	26	24.5	1.75	1.2	25	
WR 28	28	26.5	2.3	1.5	27	
WR 29	29	27.5	2.3	1.5	28	
WR 30	30	28.5	2.3	1.5	29	
WR 32	32	30.2	2.3	1.5	30.8	0 −0.16
WR 35	35	33.2	2.3	1.5	33.8	
WR 36	36	34.2	2.3	1.5	34.8	
WR 37	37	35.2	2.3	1.5	35.8	
WR 38	38	36.2	2.3	1.5	36.8	
WR 40	40	37.8	2.3	1.5	38.5	

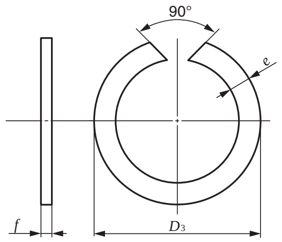
Identification number	Boundary dimensions mm					
	Shaft dia. D	D_3 (Max.)	e	f	Groove dia. D_1	Tolerance
WR 42	42	39.8	2.3	1.5	40.5	0 −0.16
WR 43	43	40.8	2.3	1.5	41.5	
WR 45	45	42.8	2.3	1.5	43.5	
WR 47	47	44.8	2.3	1.5	45.5	
WR 50	50	47.8	2.3	1.5	48.5	
WR 52	52	49.8	2.3	1.5	50.5	0 −0.19
WR 55	55	52.6	2.3	1.5	53.5	
WR 60	60	57.6	2.3	1.5	58.5	
WR 63	63	60.6	2.3	1.5	61.5	
WR 65	65	62.6	2.3	1.5	63.5	
WR 68	68	65.4	2.8	2	66.2	
WR 70	70	67.4	2.8	2	68.2	
WR 75	75	72.4	2.8	2	73.2	
WR 80	80	77.4	2.8	2	78.2	
WR 82	82	79.3	3.4	2.5	80.2	0 −0.22
WR 85	85	82	3.4	2.5	83	
WR 90	90	87	3.4	2.5	88	
WR 95	95	92	3.4	2.5	93	
WR 100	100	97	3.4	2.5	98	
WR 105	105	101.7	3.4	2.5	102.7	
WR 110	110	106.7	3.4	2.5	107.7	
WR 115	115	111.7	3.4	2.5	112.7	
WR 120	120	116.7	3.4	2.5	117.7	
WR 125	125	121.7	3.4	2.5	122.7	0 −0.25
WR 130	130	126.7	3.4	2.5	127.7	
WR 135	135	131.6	4	2.5	132.4	
WR 140	140	136.6	4	2.5	137.4	
WR 145	145	141.6	4	2.5	142.4	
WR 150	150	146.6	4	2.5	147.4	
WR 155	155	151.6	4	2.5	152.4	
WR 160	160	156.6	4	2.5	157.4	
WR 165	165	161.6	4	2.5	162.4	

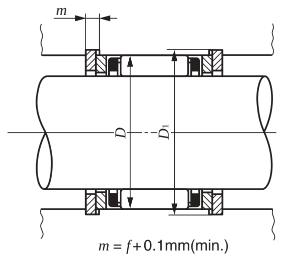
Identification number	Boundary dimensions mm					
	Shaft dia. D	D_3 (Max.)	e	f	Groove dia. D_1	Tolerance
WR 170	170	166.6	4	2.5	167.4	0 −0.25
WR 175	175	171.6	4	2.5	172.4	
WR 180	180	175.6	5	3	177	
WR 185	185	180.6	5	3	182	0 −0.29
WR 190	190	185.6	5	3	187	
WR 195	195	190.6	5	3	192	
WR 200	200	195.6	5	3	197	
WR 210	210	205.6	5	3	207	
WR 220	220	215.6	5	3	217	
WR 230	230	225.6	5	3	227	
WR 240	240	235.6	5	3	237	
WR 260	260	253	7.5	4	255	0 −0.32
WR 265	265	258	7.5	4	260	
WR 270	270	263	7.5	4	265	
WR 280	280	273	7.5	4	275	
WR 285	285	278	7.5	4	280	
WR 300	300	293	7.5	4	295	
WR 305	305	298	7.5	4	300	
WR 320	320	313	7.5	4	315	
WR 330	330	323	7.5	4	325	0 −0.36
WR 340	340	333	7.5	4	335	
WR 350	350	343	7.5	4	345	
WR 360	360	353	7.5	4	355	
WR 370	370	363	7.5	4	365	
WR 390	390	383	7.5	4	385	

CIR-CLIPS FOR NEEDLE ROLLER BEARINGS

For Bore







$m = f + 0.1$mm(min.)

AR

Bore dia. 7 ─ 440mm

Identification number	Boundary dimensions mm					
	Bore dia. D	D_3 (Min.)	e	f	Groove dia. D_1	Groove dia. Tolerance
AR 7	7	7.5	1	0.8	7.3	+0.09 0
AR 8	8	8.5	1	0.8	8.3	
AR 9	9	9.5	1.1	0.8	9.3	
AR 10	10	10.6	1.2	0.8	10.4	+0.11 0
AR 11	11	11.6	1.3	1	11.4	
AR 12	12	12.7	1.3	1	12.4	
AR 13	13	13.8	1.3	1	13.5	
AR 14	14	14.8	1.3	1	14.5	
AR 15	15	15.8	1.3	1	15.5	
AR 16	16	16.8	1.6	1.2	16.5	
AR 17	17	17.8	1.6	1.2	17.5	
AR 18	18	18.9	1.75	1.2	18.5	+0.13 0
AR 19	19	19.9	1.75	1.2	19.6	
AR 20	20	21	1.75	1.2	20.6	
AR 21	21	22	1.75	1.2	21.6	
AR 22	22	23	1.75	1.2	22.6	
AR 23	23	24	1.75	1.2	23.6	
AR 24	24	25.2	1.75	1.2	24.8	
AR 25	25	26.2	1.75	1.2	25.8	
AR 26	26	27.2	1.75	1.2	26.8	
AR 27	27	28.2	1.75	1.2	27.8	
AR 28	28	29.2	1.75	1.2	28.8	
AR 29	29	30.2	1.75	1.2	29.8	
AR 30	30	31.4	2.3	1.5	31	+0.16 0
AR 31	31	32.4	2.3	1.5	32	
AR 32	32	33.4	2.3	1.5	33	
AR 33	33	34.4	2.3	1.5	34	
AR 34	34	35.4	2.3	1.5	35	
AR 35	35	36.4	2.3	1.5	36	
AR 37	37	38.8	2.3	1.5	38.2	
AR 38	38	39.8	2.3	1.5	39.2	
AR 39	39	40.8	2.3	1.5	40.2	

Identification number	Boundary dimensions mm					
	Bore dia. D	D_3 (Min.)	e	f	Groove dia. D_1	Groove dia. Tolerance
AR 40	40	41.8	2.3	1.5	41.2	+0.16 0
AR 42	42	43.8	2.3	1.5	43.2	
AR 43	43	44.8	2.3	1.5	44.2	
AR 44	44	45.8	2.3	1.5	45.2	
AR 45	45	46.8	2.3	1.5	46.2	
AR 47	47	48.8	2.3	1.5	48.2	
AR 48	48	49.8	2.3	1.5	49.2	
AR 50	50	51.8	2.3	1.5	51.2	+0.19 0
AR 52	52	54.3	2.3	1.5	53.5	
AR 53	53	55.3	2.3	1.5	54.5	
AR 55	55	57.3	2.3	1.5	56.5	
AR 57	57	59.3	2.3	1.5	58.5	
AR 58	58	60.3	2.3	1.5	59.5	
AR 60	60	62.3	2.3	1.5	61.5	
AR 62	62	64.3	2.3	1.5	63.5	
AR 65	65	67.3	2.3	1.5	66.5	
AR 68	68	70.3	2.3	1.5	69.5	
AR 70	70	72.3	2.3	1.5	71.5	
AR 72	72	74.6	2.8	2	73.8	
AR 73	73	75.6	2.8	2	74.8	
AR 75	75	77.6	2.8	2	76.8	
AR 76	76	78.6	2.8	2	77.8	
AR 78	78	80.6	2.8	2	79.8	
AR 80	80	82.6	2.8	2	81.8	+0.22 0
AR 81	81	83.6	2.8	2	82.8	
AR 82	82	84.6	2.8	2	83.8	
AR 83	83	85.6	2.8	2	84.8	
AR 85	85	87.6	2.8	2	86.8	
AR 86	86	88.6	2.8	2	87.8	
AR 88	88	91	3.4	2.5	90	
AR 90	90	93	3.4	2.5	92	
AR 92	92	95	3.4	2.5	94	

Identification number	Boundary dimensions mm					
	Bore dia. D	D_3 (Min.)	e	f	Groove dia. D_1	Groove dia. Tolerance
AR 93	93	96	3.4	2.5	95	+0.22 0
AR 95	95	98	3.4	2.5	97	
AR 97	97	100	3.4	2.5	99	
AR 98	98	101	3.4	2.5	100	
AR 100	100	103	3.4	2.5	102	
AR 102	102	105.3	3.4	2.5	104.3	
AR 103	103	106.3	3.4	2.5	105.3	
AR 105	105	108.3	3.4	2.5	107.3	
AR 107	107	110.3	3.4	2.5	109.3	
AR 108	108	111.3	3.4	2.5	110.3	
AR 110	110	113.3	3.4	2.5	112.3	
AR 112	112	115.3	3.4	2.5	114.3	
AR 113	113	116.3	3.4	2.5	115.3	
AR 115	115	118.3	3.4	2.5	117.3	
AR 117	117	120.3	3.4	2.5	119.3	
AR 118	118	121.3	3.4	2.5	120.3	+0.25 0
AR 120	120	123.3	3.4	2.5	122.3	
AR 123	123	126.3	3.4	2.5	125.3	
AR 125	125	128.3	3.4	2.5	127.3	
AR 127	127	130.3	3.4	2.5	129.3	
AR 130	130	133.3	3.4	2.5	132.3	
AR 133	133	136.3	3.4	2.5	135.3	
AR 135	135	138.3	3.4	2.5	137.3	
AR 137	137	140.3	3.4	2.5	139.3	
AR 140	140	143.6	4	2.5	142.6	
AR 143	143	146.6	4	2.5	145.6	
AR 145	145	148.6	4	2.5	147.6	
AR 150	150	153.6	4	2.5	152.6	
AR 153	153	156.6	4	2.5	155.6	
AR 160	160	163.6	4	2.5	162.6	
AR 163	163	166.6	4	2.5	165.6	
AR 165	165	168.6	4	2.5	167.6	

Identification number	Boundary dimensions mm					
	Bore dia. D	D_3 (Min.)	e	f	Groove dia. D_1	Groove dia. Tolerance
AR 170	170	173.6	4	2.5	172.6	+0.25 0
AR 173	173	176.6	4	2.5	175.6	
AR 175	175	178.6	4	2.5	177.6	
AR 180	180	183.6	4	2.5	182.6	
AR 183	183	186.6	4	2.5	185.6	+0.29 0
AR 190	190	194.5	5	3	193	
AR 195	195	199.5	5	3	198	
AR 200	200	204.5	5	3	203	
AR 205	205	209.5	5	3	208	
AR 210	210	214.5	5	3	213	
AR 215	215	219.5	5	3	218	
AR 220	220	224.5	5	3	223	
AR 225	225	229.5	5	3	228	
AR 230	230	234.5	5	3	233	
AR 235	235	239.5	5	3	238	
AR 240	240	244.5	5	3	243	+0.32 0
AR 245	245	249.5	5	3	248	
AR 250	250	254.5	5	3	253	
AR 260	260	267	7.5	4	265	
AR 270	270	277	7.5	4	275	
AR 280	280	287	7.5	4	285	
AR 300	300	307	7.5	4	305	
AR 320	320	327	7.5	4	325	+0.36 0
AR 325	325	332	7.5	4	330	
AR 355	355	362	7.5	4	360	
AR 375	375	382	7.5	4	380	
AR 395	395	402	7.5	4	400	
AR 415	415	422	7.5	4	420	+0.4 0
AR 420	420	427	7.5	4	425	
AR 440	440	447	7.5	4	445	

Needle Rollers

Features

IKO Needle Rollers are made of high carbon chromium bearing steel. They are rigid and highly accurate and are finished to a hardness of 58HRC or more (See Table 1.) and a surface roughness of 0.1 μmR_a or less.

These needle rollers are widely used as rolling elements for bearings, and also as pins and shafts.

Please contact IKO, if Needle Rollers made of stainless steel are required.

Table 1 Hardness

Nominal diameter D_w mm		Hardness	
Over	Incl.	HRC	HV
—	3	(60 ～ 67)	697 ～ 900
3	—	58 ～ 66	(653 ～ 865)

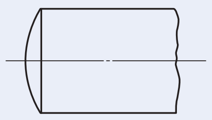
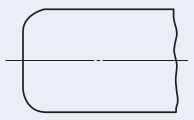
Remarks1. Hardness is flat surface hardness.
2. The values in parentheses are converted values for reference.

End Shapes

Needle Rollers come in spherical and flat end shapes, as shown in Table 2.

Please contact IKO, if other shapes are required.

Table 2 Shapes of ends

Type	Spherical end	Flat end
Shapes		
Symbol	A	F

Accuracy

The dimensional accuracy of Needle Rollers conforms to JIS B 1506 (Rolling bearings-Rollers), and is shown in Table 3.

The selective classification for the mean diameter tolerance is shown in Table 4. The selective classification rollers according to Table 4 can be provided as requested.

Table 3 Dimensional accuracy of needle rollers unit: μ m

Class	Diameter variation in a single radial plane (1) V_{Dwp} (Max.)	Circularity (1) Δ_R (Max.)	Gauge lot diameter variation (1) V_{DwL} (Max.)	Deviation of a single length (2) Δ_{Lws}
2	1	1	2	h13
3	1.5	1.5	3	h13
5	2	2.5	5	h13

Notes(1) Applicable to the measurement at the center of roller length

(2) Tolerance is based on the classification according to the nominal length L_w.

Remark Any measured diameter along the total length of roller must not be larger than the actual maximum diameter at the center of roller length by the amount exceeding the values given below.

0.5 μ m for Class 2
0.8 μ m for Class 3
1 μ m for Class 5

Table 4 Classification of needle rollers unit: μ m

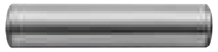
Classification symbol	Tolerance for mean dia.
C 3	0 ～ − 3
B 2	0 ～ − 2
B 4	− 2 ～ − 4
B 6	− 4 ～ − 6
B 8	− 6 ～ − 8
B10	− 8 ～ − 10

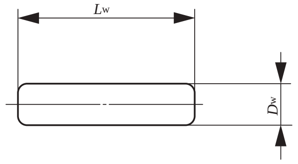
Use as Full-complement Bearings

For normal rotation, Needle Roller Bearings with cage are most suitable, but for low rotational speeds and for oscillating movement, full-complement bearings are also used.

If Needle Rollers are combined with a shaft and a housing which have been hardened and ground to form a suitable raceway surface, the combined assembly can be used as a full-complement bearing which has a large load capacity and a low sectional height. (See page A44, Design of shaft and housing.)

Normally in this case, the radial clearance is made a little larger than that of a bearing with cage and the circumferential clearance is made to be approximately 1/10 of the diameter of needle rollers. When the bearing is used under severe conditions, please contact IKO for further information.





Roller dia. 1 — 6mm

Nominal dimensions mm		Mass (Ref.)
D_w	L_w	g
1	5.8	0.03
	6.8	0.04
	7.8	0.05
	9.8	0.06
1.5	5.8	0.08
	6.8	0.09
	7.8	0.1
	9.8	0.13
	11.8	0.16
	13.8	0.18
2	6.8	0.16
	7.8	0.19
	9.8	0.23
	11.8	0.28
	13.8	0.33
	15.8	0.38
	17.8	0.42
	19.8	0.47
2.5	7.8	0.29
	9.8	0.36
	11.8	0.44
	13.8	0.51
	15.8	0.59
	17.8	0.66
	19.8	0.73
	21.8	0.81
	23.8	0.88
3	9.8	0.52
	11.8	0.63
	13.8	0.74
	15.8	0.84
	17.8	0.95
	19.8	1.06
	21.8	1.16
	23.8	1.27
	25.8	1.38
	27.8	1.48
	29.8	1.59
3.5	11.8	0.86
	13.8	1
	15.8	1.15
	17.8	1.29
	19.8	1.44
	21.8	1.58
	23.8	1.73
	25.8	1.88
	27.8	2.1
	29.8	2.2
	31.8	2.3
	34.8	2.5
4	11.8	1.12
	13.8	1.31
	15.8	1.5
	17.8	1.69
	19.8	1.88
	21.8	2.1
	23.8	2.3
	25.8	2.5
	27.8	2.6
	29.8	2.8
	31.8	3
	34.8	3.3
	37.8	3.6
	39.8	3.8
4.5	17.8	2.1
	19.8	2.4
	21.8	2.6
	23.8	2.9
	25.8	3.1
	29.8	3.6
	31.8	3.8
	34.8	4.2
	37.8	4.5
	39.8	4.8
	44.8	5.4
5	15.8	2.3
	17.8	2.6
	19.8	2.9
	21.8	3.2
	23.8	3.5
	25.8	3.8
	27.8	4.1
	29.8	4.4
	31.8	4.7
	34.8	5.2
	37.8	5.6
	39.8	5.9
	49.8	7.4
6	17.8	3.9
	19.8	4.3
	21.8	4.8
	23.8	5.2
	25.8	5.5
	27.8	6
	29.8	6.4
	34.8	7.5
	39.8	8.6
	49.8	10.8
	59.8	13

Remark For the names of the needle rollers, nominal dimensions are used.
Needle Rollers other than those shown in the dimension table can also be manufactured. Please contact IKO for further information.

MISCELLANEOUS TABLES

MISCELLANEOUS TABLES

● Conversion Table of Units

Comparison table between SI units (system of international units), CGS units and gravitational system of units

Item / System of units	Length	Mass	Time	Acceleration	Force	Stress	Pressure	Energy	Power	Temperature	Viscosity	Kinematic viscosity	Magnetic flux	Magnetic flux density	Magnetic field intensity
SI units	m	kg	s	m/s^2	N	Pa	Pa	J	W	K	Pa･s	m^2/s	Wb	T	A/m
CGS units	cm	g	s	Gal	dyn	dyn/cm^2	dyn/cm^2	erg	erg/s	°C	P	St	Mx	Gs	Oe
Grav. units	m	kgf･s^2/m	s	m/s^2	kgf	kgf/m^2	kgf/m^2	kgf･m	kgf･m/s	°C	kgf･s/m^2	m^2/s	—	—	—

Conversion rates into SI units

Item	Unit name	Symbol	Conversion rate into SI	SI unit name	Symbol
Angle	Degree	°	π/180	Radian	rad
	Minute	′	π/10 800		
	Second	″	π/648 000		
Length	Meter	m	1	Meter	m
	Micronmeter	µ	10^{-6}		
	Angstrom	Å	10^{-10}		
	X-ray unit		$\approx 1.002\ 08 \times 10^{-13}$		
	Nautical mile	n mile	1852		
Area	Square meter	m^2	1	Square meter	m^2
	Are	a	10^2		
	Hectare	ha	10^4		
Volume	Cubic meter	m^3	1	Cubic meter	m^3
	Liter	l, L	10^{-3}		
Mass	Kilogram	kg	1	Kilogram	kg
	Ton	t	10^3		
	Atomic mass unit	u	$\approx 1.660\ 57 \times 10^{-27}$		
Time	Second	s	1	Second	s
	Minute	min	60		
	Hour	h	3 600		
	Day	d	86 400		
Velocity	Meter per second	m/s	1	Meter per second	m/s
	Knot	kn	1 852/3 600		
Frequency and number of oscillations per time	Cycle	s^{-1}	1	Hertz	Hz
Rotational speed	Rotation per minute	min^{-1}	1/60	Per second	s^{-1}
Angular velocity	Radian per second	rad/s	1	Radian per second	rad/s
Acceleration	Meter per square second	m/s^2	1	Meter per square second	m/s^2
	G	G	9.806 65		
Force	Kilogram force	kgf	9.806 65	Newton	N
	Ton force	tf	9 806.65		
	Dyne	dyn	10^{-5}		
Moment of force	Kilogram force-meter	kgf･m	9.806 65	Newton-meter	N･m
Stress and pressure	Kilogram force per square meter	kgf/m^2	9.806 65	Pascal	Pa
	Kilogram force per square centimeter	kgf/cm^2	$9.806\ 65 \times 10^4$		
	Kilogram force per square millimeter	kgf/mm^2	$9.806\ 65 \times 10^6$		

Item	Unit name	Symbol	Conversion rate into SI	SI unit name	Symbol
Pressure	Hydro-column meter	mH$_2$O	9 806.65	Pascal	Pa
	Mercurial column millimeter	mmHg	101 325/760		
	Torr	Torr	101 325/760		
	Atmosphere	atm	101 325		
	Bar	bar	10^5		
Energy	Erg	erg	10^{-7}	Joule	J
	IT calorie	cal$_{\mathrm{IT}}$	4.186 8		
	Kilogram force - meter	kgf･m	9.806 65		
	Kilowatt hour	kW･h	3.600×10^6		
	Horse power hour (French)	PS･h	$\approx 2.647\ 79 \times 10^6$		
	Electron volt	eV	$\approx 1.602\ 19 \times 10^{-19}$		
Power	Watt	W	1	Watt	W
	Horse power (French)	PS	≈735.5		
	Kilogram force -meter per second	kgf･m/s	9.806 65		
Viscosity	Poise	P	10^{-1}	Pascal-second	Pa･s
	Centipoise	cP	10^{-3}		
	Kilogram force-second per square meter	kgf･s/m^2	9.806 65		
Kinematic viscosity	Stokes	St	10^{-4}	Square meter per second	m^2/s
	Centistokes	cSt	10^{-6}		
Temperature	Degree	°C	+273.15	Kelvin	K
Radioactivity	Curie	Ci	3.7×10^{10}	Becquerel	Bq
Exposure dose	Roentgen	R	2.58×10^{-4}	Coulomb per kilogram	C/kg
Absorbed dose	Rad	rad	10^{-2}	Gray	Gy
Dose equivalent	Rem	rem	10^{-2}	Sievert	Sv
Magnetic flux	Maxwell	Mx	10^{-8}	Weber	Wb
Magnetic flux density	Gamma	γ	10^{-9}	Tesla	T
	Gauss	Gs	10^{-4}		
Magnetic field intensity	Oersted	Oe	$10^3/4\pi$	Ampere per meter	A/m
Quantity of electricity	Coulomb	C	1	Coulomb	C
Electric potential difference	Volt	V	1	Volt	V
Electrostatic capacity	Farad	F	1	Farad	F
(Electric) resistance	Ohm	Ω	1	Ohm	Ω
(Electric) conductance	Siemens	S	1	Siemens	S
Inductance	Henry	H	1	Henry	H
Current	Ampere	A	1	Ampere	A

Inch-mm Conversion Table

1 inch = 25.4 mm

inch		0″	1″	2″	3″	4″	5″	6″	7″	8″
Fraction	Decimal									
	0		25.400	50.800	76.200	101.600	127.000	152.400	177.800	203.200
1 / 64″	0.015625	0.397	25.797	51.197	76.597	101.997	127.397	152.797	178.197	203.597
1 / 32″	0.031250	0.794	26.194	51.594	76.994	102.394	127.794	153.194	178.594	203.994
3 / 64″	0.046875	1.191	26.591	51.991	77.391	102.791	128.191	153.591	178.991	204.391
1 / 16″	0.062500	1.588	26.988	52.388	77.788	103.188	128.588	153.988	179.388	204.788
5 / 64″	0.078125	1.984	27.384	52.784	78.184	103.584	128.984	154.384	179.784	205.184
3 / 32″	0.093750	2.381	27.781	53.181	78.581	103.981	129.381	154.781	180.181	205.581
7 / 64″	0.109375	2.778	28.178	53.578	78.978	104.378	129.778	155.178	180.578	205.978
1 / 8″	0.125000	3.175	28.575	53.975	79.375	104.775	130.175	155.575	180.975	206.375
9 / 64″	0.140625	3.572	28.972	54.372	79.772	105.172	130.572	155.972	181.372	206.772
5 / 32″	0.156250	3.969	29.369	54.769	80.169	105.569	130.969	156.369	181.769	207.169
11 / 64″	0.171875	4.366	29.766	55.166	80.566	105.966	131.366	156.766	182.166	207.566
3 / 16″	0.187500	4.762	30.162	55.562	80.962	106.362	131.762	157.162	182.562	207.962
13 / 64″	0.203125	5.159	30.559	55.959	81.359	106.759	132.159	157.559	182.959	208.359
7 / 32″	0.218750	5.556	30.956	56.356	81.756	107.156	132.556	157.956	183.356	208.756
15 / 64″	0.234375	5.953	31.353	56.753	82.153	107.553	132.953	158.353	183.753	209.153
1 / 4″	0.250000	6.350	31.750	57.150	82.550	107.950	133.350	158.750	184.150	209.550
17 / 64″	0.265625	6.747	32.147	57.547	82.947	108.347	133.747	159.147	184.547	209.947
9 / 32″	0.281250	7.144	32.544	57.944	83.344	108.744	134.144	159.544	184.944	210.344
19 / 64″	0.296875	7.541	32.941	58.341	83.741	109.141	134.541	159.941	185.341	210.741
5 / 16″	0.312500	7.938	33.338	58.738	84.138	109.538	134.938	160.338	185.738	211.138
21 / 64″	0.328125	8.334	33.734	59.134	84.534	109.934	135.334	160.734	186.134	211.534
11 / 32″	0.343750	8.731	34.131	59.531	84.931	110.331	135.731	161.131	186.531	211.931
23 / 64″	0.359375	9.128	34.528	59.928	85.328	110.728	136.128	161.528	186.928	212.328
3 / 8″	0.375000	9.525	34.925	60.325	85.725	111.125	136.525	161.925	187.325	212.725
25 / 64″	0.390625	9.922	35.322	60.722	86.122	111.522	136.922	162.322	187.722	213.122
13 / 32″	0.406250	10.319	35.719	61.119	86.519	111.919	137.319	162.719	188.119	213.519
27 / 64″	0.421875	10.716	36.116	61.516	86.916	112.316	137.716	163.116	188.516	213.916
7 / 16″	0.437500	11.112	36.512	61.912	87.312	112.712	138.112	163.512	188.912	214.312
29 / 64″	0.453125	11.509	36.909	62.309	87.709	113.109	138.509	163.909	189.309	214.709
15 / 32″	0.468750	11.906	37.306	62.706	88.106	113.506	138.906	164.306	189.706	215.106
31 / 64″	0.484375	12.303	37.703	63.103	88.503	113.903	139.303	164.703	190.103	215.503
1 / 2″	0.500000	12.700	38.100	63.500	88.900	114.300	139.700	165.100	190.500	215.900

1 inch = 25.4 mm

inch		0″	1″	2″	3″	4″	5″	6″	7″	8″
Fraction	Decimal									
33 / 64″	0.515625	13.097	38.497	63.897	89.297	114.697	140.097	165.497	190.897	216.297
17 / 32″	0.531250	13.494	38.894	64.294	89.694	115.094	140.494	165.894	191.294	216.694
35 / 64″	0.546875	13.891	39.291	64.691	90.091	115.491	140.891	166.291	191.691	217.091
9 / 16″	0.562500	14.288	39.688	65.088	90.488	115.888	141.288	166.688	192.088	217.488
37 / 64″	0.578125	14.684	40.084	65.484	90.884	116.284	141.684	167.084	192.484	217.884
19 / 32″	0.593750	15.081	40.481	65.881	91.281	116.681	142.081	167.481	192.881	218.281
39 / 64″	0.609375	15.478	40.878	66.278	91.678	117.078	142.478	167.878	193.278	218.678
5 / 8″	0.625000	15.875	41.275	66.675	92.075	117.475	142.875	168.275	193.675	219.075
41 / 64″	0.640625	16.272	41.672	67.072	92.472	117.872	143.272	168.672	194.072	219.472
21 / 32″	0.656250	16.669	42.069	67.469	92.869	118.269	143.669	169.069	194.469	219.869
43 / 64″	0.671875	17.066	42.466	67.866	93.266	118.666	144.066	169.466	194.866	220.266
11 / 16″	0.687500	17.462	42.862	68.262	93.662	119.062	144.462	169.862	195.262	220.662
45 / 64″	0.703125	17.859	43.259	68.659	94.059	119.459	144.859	170.259	195.659	221.059
23 / 32″	0.718750	18.256	43.656	69.056	94.456	119.856	145.256	170.656	196.056	221.456
47 / 64″	0.734375	18.653	44.053	69.453	94.853	120.253	145.653	171.053	196.453	221.853
3 / 4″	0.750000	19.050	44.450	69.850	95.250	120.650	146.050	171.450	196.850	222.250
49 / 64″	0.765625	19.447	44.847	70.247	95.647	121.047	146.447	171.847	197.247	222.647
25 / 32″	0.781250	19.844	45.244	70.644	96.044	121.444	146.844	172.244	197.644	223.044
51 / 64″	0.796875	20.241	45.641	71.041	96.441	121.841	147.241	172.641	198.041	223.441
13 / 16″	0.812500	20.638	46.038	71.438	96.838	122.238	147.638	173.038	198.438	223.838
53 / 64″	0.828125	21.034	46.434	71.834	97.234	122.634	148.034	173.434	198.834	224.234
27 / 32″	0.843750	21.431	46.831	72.231	97.631	123.031	148.431	173.831	199.231	224.631
55 / 64″	0.859375	21.828	47.228	72.628	98.028	123.428	148.828	174.228	199.628	225.028
7 / 8″	0.875000	22.225	47.625	73.025	98.425	123.825	149.225	174.625	200.025	225.425
57 / 64″	0.890625	22.622	48.022	73.422	98.822	124.222	149.622	175.022	200.422	225.822
29 / 32″	0.906250	23.019	48.419	73.819	99.219	124.619	150.019	175.419	200.819	226.219
59 / 64″	0.921875	23.416	48.816	74.216	99.616	125.016	150.416	175.816	201.216	226.616
15 / 16″	0.937500	23.812	49.212	74.612	100.012	125.412	150.812	176.212	201.612	227.012
61 / 64″	0.953125	24.209	49.609	75.009	100.409	125.809	151.209	176.609	202.009	227.409
31 / 32″	0.968750	24.606	50.006	75.406	100.806	126.206	151.606	177.006	202.406	227.806
63 / 64″	0.984375	25.003	50.403	75.803	101.203	126.603	152.003	177.403	202.803	228.203

Hardness Conversion Table (Reference)

Rockwell C scale hardness Load 1471N HRC	Vickers' hardness HV	Brinell hardness		Rockwell hardness		Shore hardness HS
		Standard ball	Tungsten carbide ball	A scale Load 588.4N Diamond circular cone	B scale Load 980.7N 1/16" ball	
68	940	—	—	85.6	—	97
67	900	—	—	85.0	—	95
66	865	—	—	84.5	—	92
65	832	—	(739)	83.9	—	91
64	800	—	(722)	83.4	—	88
63	772	—	(705)	82.8	—	87
62	746	—	(688)	82.3	—	85
61	720	—	(670)	81.8	—	83
60	697	—	(654)	81.2	—	81
59	674	—	(634)	80.7	—	80
58	653	—	615	80.1	—	78
57	633	—	595	79.6	—	76
56	613	—	577	79.0	—	75
55	595	—	560	78.5	—	74
54	577	—	543	78.0	—	72
53	560	—	525	77.4	—	71
52	544	(500)	512	76.8	—	69
51	528	(487)	496	76.3	—	68
50	513	(475)	481	75.9	—	67
49	498	(464)	469	75.2	—	66
48	484	451	455	74.7	—	64
47	471	442	443	74.1	—	63
46	458	432	432	73.6	—	62
45	446	421	421	73.1	—	60
44	434	409	409	72.5	—	58
43	423	400	400	72.0	—	57
42	412	390	390	71.5	—	56
41	402	381	381	70.9	—	55
40	392	371	371	70.4	—	54
39	382	362	362	69.9	—	52
38	372	353	353	69.4	—	51
37	363	344	344	68.9	—	50
36	354	336	336	68.4	(109.0)	49
35	345	327	327	67.9	(108.5)	48
34	336	319	319	67.4	(108.0)	47
33	327	311	311	66.8	(107.5)	46
32	318	301	301	66.3	(107.0)	44
31	310	294	294	65.8	(106.0)	43
30	302	286	286	65.3	(105.5)	42
29	294	279	279	64.7	(104.5)	41
28	286	271	271	64.3	(104.0)	41
27	279	264	264	63.8	(103.0)	40
26	272	258	258	63.3	(102.5)	38
25	266	253	253	62.8	(101.5)	38
24	260	247	247	62.4	(101.0)	37
23	254	243	243	62.0	100.0	36
22	248	237	237	61.5	99.0	35
21	243	231	231	61.0	98.5	35
20	238	226	226	60.5	97.8	34
(18)	230	219	219	—	96.7	33
(16)	222	212	212	—	95.5	32
(14)	213	203	203	—	93.9	31
(12)	204	194	194	—	92.3	29
(10)	196	187	187	—	90.7	28
(8)	188	179	179	—	89.5	27
(6)	180	171	171	—	87.1	26
(4)	173	165	165	—	85.5	25
(2)	166	158	158	—	83.5	24
(0)	160	152	152	—	81.7	24

Tolerance of Shaft Diameter

Nominal Diameter mm		b12		c12		d6		e6		e12		f5		f6		g5	
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
—	3	−140	−240	−60	−160	−20	−26	−14	−20	−14	−114	−6	−10	−6	−12	−2	−6
3	6	−140	−260	−70	−190	−30	−38	−20	−28	−20	−140	−10	−15	−10	−18	−4	−9
6	10	−150	−300	−80	−230	−40	−49	−25	−34	−25	−175	−13	−19	−13	−22	−5	−11
10	18	−150	−330	−95	−275	−50	−61	−32	−43	−32	−212	−16	−24	−16	−27	−6	−14
18	30	−160	−370	−110	−320	−65	−78	−40	−53	−40	−250	−20	−29	−20	−33	−7	−16
30	40	−170	−420	−120	−370	−80	−96	−50	−66	−50	−300	−25	−36	−25	−41	−9	−20
40	50	−180	−430	−130	−380												
50	65	−190	−490	−140	−440	−100	−119	−60	−79	−60	−360	−30	−43	−30	−49	−10	−23
65	80	−200	−500	−150	−450												
80	100	−220	−570	−170	−520	−120	−142	−72	−94	−72	−422	−36	−51	−36	−58	−12	−27
100	120	−240	−590	−180	−530												
120	140	−260	−660	−200	−600	−145	−170	−85	−110	−85	−485	−43	−61	−43	−68	−14	−32
140	160	−280	−680	−210	−610												
160	180	−310	−710	−230	−630												
180	200	−340	−800	−240	−700	−170	−199	−100	−129	−100	−560	−50	−70	−50	−79	−15	−35
200	225	−380	−840	−260	−720												
225	250	−420	−880	−280	−740												
250	280	−480	−1000	−300	−820	−190	−222	−110	−142	−110	−630	−56	−79	−56	−88	−17	−40
280	315	−540	−1060	−330	−850												
315	355	−600	−1170	−360	−930	−210	−246	−125	−161	−125	−695	−62	−87	−62	−98	−18	−43
355	400	−680	−1250	−400	−970												
400	450	−760	−1390	−440	−1070	−230	−270	−135	−175	−135	−765	−68	−95	−68	−108	−20	−47
450	500	−840	−1470	−480	−1110												

unit : μm

g6		h5		h6		h7		h8		h9		h10		h11		Nominal Diameter mm	
High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	Over	Incl.
−2	−8	0	−4	0	−6	0	−10	0	−14	0	−25	0	−40	0	−60	—	3
−4	−12	0	−5	0	−8	0	−12	0	−18	0	−30	0	−48	0	−75	3	6
−5	−14	0	−6	0	−9	0	−15	0	−22	0	−36	0	−58	0	−90	6	10
−6	−17	0	−8	0	−11	0	−18	0	−27	0	−43	0	−70	0	−110	10	18
−7	−20	0	−9	0	−13	0	−21	0	−33	0	−52	0	−84	0	−130	18	30
−9	−25	0	−11	0	−16	0	−25	0	−39	0	−62	0	−100	0	−160	30	40
																40	50
−10	−29	0	−13	0	−19	0	−30	0	−46	0	−74	0	−120	0	−190	50	65
																65	80
−12	−34	0	−15	0	−22	0	−35	0	−54	0	−87	0	−140	0	−220	80	100
																100	120
−14	−39	0	−18	0	−25	0	−40	0	−63	0	−100	0	−160	0	−250	120	140
																140	160
																160	180
−15	−44	0	−20	0	−29	0	−46	0	−72	0	−115	0	−185	0	−290	180	200
																200	225
																225	250
−17	−49	0	−23	0	−32	0	−52	0	−81	0	−130	0	−210	0	−320	250	280
																280	315
−18	−54	0	−25	0	−36	0	−57	0	−89	0	−140	0	−230	0	−360	315	355
																355	400
−20	−60	0	−27	0	−40	0	−63	0	−97	0	−155	0	−250	0	−400	400	450
																450	500

Nominal Diameter mm		h12		h13		js5		j5		js6		j6		j7		k5	
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
—	3	0	−100	0	−140	+2	−2	+2	−2	+3	−3	+4	−2	+6	−4	+4	0
3	6	0	−120	0	−180	+2.5	−2.5	+3	−2	+4	−4	+6	−2	+8	−4	+6	+1
6	10	0	−150	0	−220	+3	−3	+4	−2	+4.5	−4.5	+7	−2	+10	−5	+7	+1
10	18	0	−180	0	−270	+4	−4	+5	−3	+5.5	−5.5	+8	−3	+12	−6	+9	+1
18	30	0	−210	0	−330	+4.5	−4.5	+5	−4	+6.5	−6.5	+9	−4	+13	−8	+11	+2
30	40	0	−250	0	−390	+5.5	−5.5	+6	−5	+8	−8	+11	−5	+15	−10	+13	+2
40	50																
50	65	0	−300	0	−460	+6.5	−6.5	+6	−7	+9.5	−9.5	+12	−7	+18	−12	+15	+2
65	80																
80	100	0	−350	0	−540	+7.5	−7.5	+6	−9	+11	−11	+13	−9	+20	−15	+18	+3
100	120																
120	140	0	−400	0	−630	+9	−9	+7	−11	+12.5	−12.5	+14	−11	+22	−18	+21	+3
140	160																
160	180																
180	200	0	−460	0	−720	+10	−10	+7	−13	+14.5	−14.5	+16	−13	+25	−21	+24	+4
200	225																
225	250																
250	280	0	−520	0	−810	+11.5	−11.5	+7	−16	+16	−16	+16	−16	+26	−26	+27	+4
280	315																
315	355	0	−570	0	−890	+12.5	−12.5	+7	−18	+18	−18	+18	−18	+29	−28	+29	+4
355	400																
400	450	0	−630	0	−970	+13.5	−13.5	+7	−20	+20	−20	+20	−20	+31	−32	+32	+5
450	500																

unit : μm

k6		m5		m6		n5		n6		p6		Nominal Diameter mm	
High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	Over	Incl.
+6	0	+6	+2	+8	+2	+8	+4	+10	+4	+12	+6	—	3
+9	+1	+9	+4	+12	+4	+13	+8	+16	+8	+20	+12	3	6
+10	+1	+12	+6	+15	+6	+16	+10	+19	+10	+24	+15	6	10
+12	+1	+15	+7	+18	+7	+20	+12	+23	+12	+29	+18	10	18
+15	+2	+17	+8	+21	+8	+24	+15	+28	+15	+35	+22	18	30
+18	+2	+20	+9	+25	+9	+28	+17	+33	+17	+42	+26	30	40
												40	50
+21	+2	+24	+11	+30	+11	+33	+20	+39	+20	+51	+32	50	65
												65	80
+25	+3	+28	+13	+35	+13	+38	+23	+45	+23	+59	+37	80	100
												100	120
+28	+3	+33	+15	+40	+15	+45	+27	+52	+27	+68	+43	120	140
												140	160
												160	180
+33	+4	+37	+17	+46	+17	+51	+31	+60	+31	+79	+50	180	200
												200	225
												225	250
+36	+4	+43	+20	+52	+20	+57	+34	+66	+34	+88	+56	250	280
												280	315
+40	+4	+46	+21	+57	+21	+62	+37	+73	+37	+98	+62	315	355
												355	400
+45	+5	+50	+23	+63	+23	+67	+40	+80	+40	+108	+68	400	450
												450	500

Tolerance of Housing Bore Diameter

unit : μm

Nominal Diameter mm		B12		E7		E11		E12		F6		F7		G6		G7	
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
—	3	+240	+140	+24	+14	+74	+14	+114	+14	+12	+6	+16	+6	+8	+2	+12	+2
3	6	+260	+140	+32	+20	+95	+20	+140	+20	+18	+10	+22	+10	+12	+4	+16	+4
6	10	+300	+150	+40	+25	+115	+25	+175	+25	+22	+13	+28	+13	+14	+5	+20	+5
10	18	+330	+150	+50	+32	+142	+32	+212	+32	+27	+16	+34	+16	+17	+6	+24	+6
18	30	+370	+160	+61	+40	+170	+40	+250	+40	+33	+20	+41	+20	+20	+7	+28	+7
30	40	+420	+170	+75	+50	+210	+50	+300	+50	+41	+25	+50	+25	+25	+9	+34	+9
40	50	+430	+180														
50	65	+490	+190	+90	+60	+250	+60	+360	+60	+49	+30	+60	+30	+29	+10	+40	+10
65	80	+500	+200														
80	100	+570	+220	+107	+72	+292	+72	+422	+72	+58	+36	+71	+36	+34	+12	+47	+12
100	120	+590	+240														
120	140	+660	+260	+125	+85	+335	+85	+485	+85	+68	+43	+83	+43	+39	+14	+54	+14
140	160	+680	+280														
160	180	+710	+310														
180	200	+800	+340	+146	+100	+390	+100	+560	+100	+79	+50	+96	+50	+44	+15	+61	+15
200	225	+840	+380														
225	250	+880	+420														
250	280	+1000	+480	+162	+110	+430	+110	+630	+110	+88	+56	+108	+56	+49	+17	+69	+17
280	315	+1060	+540														
315	355	+1170	+600	+182	+125	+485	+125	+695	+125	+98	+62	+119	+62	+54	+18	+75	+18
355	400	+1250	+680														
400	450	+1390	+760	+198	+135	+535	+135	+765	+135	+108	+68	+131	+68	+60	+20	+83	+20
450	500	+1470	+840														

H6		H7		H8		H9		H10		H11		JS6		J6		Nominal Diameter mm	
High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	Over	Incl.
+6	0	+10	0	+14	0	+25	0	+40	0	+60	0	+3	−3	+2	−4	—	3
+8	0	+12	0	+18	0	+30	0	+48	0	+75	0	+4	−4	+5	−3	3	6
+9	0	+15	0	+22	0	+36	0	+58	0	+90	0	+4.5	−4.5	+5	−4	6	10
+11	0	+18	0	+27	0	+43	0	+70	0	+110	0	+5.5	−5.5	+6	−5	10	18
+13	0	+21	0	+33	0	+52	0	+84	0	+130	0	+6.5	−6.5	+8	−5	18	30
+16	0	+25	0	+39	0	+62	0	+100	0	+160	0	+8	−8	+10	−6	30	40
																40	50
+19	0	+30	0	+46	0	+74	0	+120	0	+190	0	+9.5	−9.5	+13	−6	50	65
																65	80
+22	0	+35	0	+54	0	+87	0	+140	0	+220	0	+11	−11	+16	−6	80	100
																100	120
+25	0	+40	0	+63	0	+100	0	+160	0	+250	0	+12.5	−12.5	+18	−7	120	140
																140	160
																160	180
+29	0	+46	0	+72	0	+115	0	+185	0	+290	0	+14.5	−14.5	+22	−7	180	200
																200	225
																225	250
+32	0	+52	0	+81	0	+130	0	+210	0	+320	0	+16	−16	+25	−7	250	280
																280	315
+36	0	+57	0	+89	0	+140	0	+230	0	+360	0	+18	−18	+29	−7	315	355
																355	400
+40	0	+63	0	+97	0	+155	0	+250	0	+400	0	+20	−20	+33	−7	400	450
																450	500

Nominal Diameter mm		JS7		J7		K5		K6		K7		M6		M7		N6	
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
—	3	+5	−5	+4	−6	0	−4	0	−6	0	−10	−2	−8	−2	−12	−4	−10
3	6	+6	−6	+6	−6	0	−5	+2	−6	+3	−9	−1	−9	0	−12	−5	−13
6	10	+7	−7	+8	−7	+1	−5	+2	−7	+5	−10	−3	−12	0	−15	−7	−16
10	18	+9	−9	+10	−8	+2	−6	+2	−9	+6	−12	−4	−15	0	−18	−9	−20
18	30	+10	−10	+12	−9	+1	−8	+2	−11	+6	−15	−4	−17	0	−21	−11	−24
30	40	+12	−12	+14	−11	+2	−9	+3	−13	+7	−18	−4	−20	0	−25	−12	−28
40	50																
50	65	+15	−15	+18	−12	+3	−10	+4	−15	+9	−21	−5	−24	0	−30	−14	−33
65	80																
80	100	+17	−17	+22	−13	+2	−13	+4	−18	+10	−25	−6	−28	0	−35	−16	−38
100	120																
120	140	+20	−20	+26	−14	+3	−15	+4	−21	+12	−28	−8	−33	0	−40	−20	−45
140	160																
160	180																
180	200	+23	−23	+30	−16	+2	−18	+5	−24	+13	−33	−8	−37	0	−46	−22	−51
200	225																
225	250																
250	280	+26	−26	+36	−16	+3	−20	+5	−27	+16	−36	−9	−41	0	−52	−25	−57
280	315																
315	355	+28	−28	+39	−18	+3	−22	+7	−29	+17	−40	−10	−46	0	−57	−26	−62
355	400																
400	450	+31	−31	+43	−20	+2	−25	+8	−32	+18	−45	−10	−50	0	−63	−27	−67
450	500																

unit : μm

N7		P6		P7		R7		S7		Nominal Diameter mm	
High	Low	High	Low	High	Low	High	Low	High	Low	Over	Incl.
−4	−14	−6	−12	−6	−16	−10	−20	−14	−24	—	3
−4	−16	−9	−17	−8	−20	−11	−23	−15	−27	3	6
−4	−19	−12	−21	−9	−24	−13	−28	−17	−32	6	10
−5	−23	−15	−26	−11	−29	−16	−34	−21	−39	10	18
−7	−28	−18	−31	−14	−35	−20	−41	−27	−48	18	30
−8	−33	−21	−37	−17	−42	−25	−50	−34	−59	30	40
										40	50
−9	−39	−26	−45	−21	−51	−30	−60	−42	−72	50	65
						−32	−62	−48	−78	65	80
−10	−45	−30	−52	−24	−59	−38	−73	−58	−93	80	100
						−41	−76	−66	−101	100	120
−12	−52	−36	−61	−28	−68	−48	−88	−77	−117	120	140
						−50	−90	−85	−125	140	160
						−53	−93	−93	−133	160	180
−14	−60	−41	−70	−33	−79	−60	−106	−105	−151	180	200
						−63	−109	−113	−159	200	225
						−67	−113	−123	−169	225	250
−14	−66	−47	−79	−36	−88	−74	−126	−138	−190	250	280
						−78	−130	−150	−202	280	315
−16	−73	−51	−87	−41	−98	−87	−144	−169	−226	315	355
						−93	−150	−187	−244	355	400
−17	−80	−55	−95	−45	−108	−103	−166	−209	−272	400	450
						−109	−172	−229	−292	450	500

N-lbf Conversion Table

1N = 0.224809 lbf 1lbf = 4.44822 N

N		lbf	N		lbf	N		lbf
4.448	1	0.225	151.24	34	7.643	298.03	67	15.062
8.896	2	0.450	155.69	35	7.868	302.48	68	15.287
13.345	3	0.674	160.14	36	8.093	306.93	69	15.512
17.793	4	0.899	164.58	37	8.318	311.38	70	15.737
22.241	5	1.124	169.03	38	8.543	315.82	71	15.961
26.689	6	1.349	173.48	39	8.768	320.27	72	16.186
31.138	7	1.574	177.93	40	8.992	324.72	73	16.411
35.586	8	1.798	182.38	41	9.217	329.17	74	16.636
40.034	9	2.023	186.83	42	9.442	333.62	75	16.861
44.482	10	2.248	191.27	43	9.667	338.06	76	17.085
48.930	11	2.473	195.72	44	9.892	342.51	77	17.310
53.379	12	2.698	200.17	45	10.116	346.96	78	17.535
57.827	13	2.923	204.62	46	10.341	351.41	79	17.760
62.275	14	3.147	209.07	47	10.566	355.86	80	17.985
66.723	15	3.372	213.51	48	10.791	360.31	81	18.210
71.171	16	3.597	217.96	49	11.016	364.75	82	18.434
75.620	17	3.822	222.41	50	11.240	369.20	83	18.659
80.068	18	4.047	226.86	51	11.465	373.65	84	18.884
84.516	19	4.271	231.31	52	11.690	378.10	85	19.109
88.964	20	4.496	235.76	53	11.915	382.55	86	19.334
93.413	21	4.721	240.20	54	12.140	386.99	87	19.558
97.861	22	4.946	244.65	55	12.364	391.44	88	19.783
102.31	23	5.171	249.10	56	12.589	395.89	89	20.008
106.76	24	5.395	253.55	57	12.814	400.34	90	20.233
111.21	25	5.620	258.00	58	13.039	404.79	91	20.458
115.65	26	5.845	262.44	59	13.264	409.24	92	20.682
120.10	27	6.070	266.89	60	13.489	413.68	93	20.907
124.55	28	6.295	271.34	61	13.713	418.13	94	21.132
129.00	29	6.519	275.79	62	13.938	422.58	95	21.357
133.45	30	6.744	280.24	63	14.163	427.03	96	21.582
137.89	31	6.969	284.69	64	14.388	431.48	97	21.806
142.34	32	7.194	289.13	65	14.613	435.93	98	22.031
146.79	33	7.419	293.58	66	14.837	440.37	99	22.256

How to use : For example, to convert 20 N into lbf, find the number 20 in the center of the first column. By referring to the lbf column on the right, it will be found that 20 N equals 4.496 lbf.
To convert 20 lbf into N, refer to the N column on the left and it will be found that 20 lbf equals 88.964 N.

N-kgf Conversion Table

1N = 0.1019716 kgf 1kgf = 9.80665 N

N		kgf	N		kgf	N		kgf
9.8066	1	0.1020	333.43	34	3.4670	657.05	67	6.8321
19.613	2	0.2039	343.23	35	3.5690	666.85	68	6.9341
29.420	3	0.3059	353.04	36	3.6710	676.66	69	7.0360
39.227	4	0.4079	362.85	37	3.7729	686.47	70	7.1380
49.033	5	0.5099	372.65	38	3.8749	696.27	71	7.2400
58.840	6	0.6118	382.46	39	3.9769	706.08	72	7.3420
68.647	7	0.7138	392.27	40	4.0789	715.89	73	7.4439
78.453	8	0.8158	402.07	41	4.1808	725.69	74	7.5459
88.260	9	0.9177	411.88	42	4.2828	735.50	75	7.6479
98.066	10	1.0197	421.69	43	4.3848	745.31	76	7.7498
107.87	11	1.1217	431.49	44	4.4868	755.11	77	7.8518
117.68	12	1.2237	441.30	45	4.5887	764.92	78	7.9538
127.49	13	1.3256	451.11	46	4.6907	774.73	79	8.0558
137.29	14	1.4276	460.91	47	4.7927	784.53	80	8.1577
147.10	15	1.5296	470.72	48	4.8946	794.34	81	8.2597
156.91	16	1.6315	480.53	49	4.9966	804.15	82	8.3617
166.71	17	1.7335	490.33	50	5.0986	813.95	83	8.4636
176.52	18	1.8355	500.14	51	5.2006	823.76	84	8.5656
186.33	19	1.9375	509.95	52	5.3025	833.57	85	8.6676
196.13	20	2.0394	519.75	53	5.4045	843.37	86	8.7696
205.94	21	2.1414	529.56	54	5.5065	853.18	87	8.8715
215.75	22	2.2434	539.37	55	5.6084	862.99	88	8.9735
225.55	23	2.3453	549.17	56	5.7104	872.79	89	9.0755
235.36	24	2.4473	558.98	57	5.8124	882.60	90	9.1774
245.17	25	2.5493	568.79	58	5.9144	892.41	91	9.2794
254.97	26	2.6513	578.59	59	6.0163	902.21	92	9.3814
264.78	27	2.7532	588.40	60	6.1183	912.02	93	9.4834
274.59	28	2.8552	598.21	61	6.2203	921.83	94	9.5853
284.39	29	2.9572	608.01	62	6.3222	931.63	95	9.6873
294.20	30	3.0591	617.82	63	6.4242	941.44	96	9.7893
304.01	31	3.1611	627.63	64	6.5262	951.25	97	9.8912
313.81	32	3.2631	637.43	65	6.6282	961.05	98	9.9932
323.62	33	3.3651	647.24	66	6.7301	970.86	99	10.0952

How to use : For example, to convert 20 N into kgf, find the number 20 in the center of the first column. By referring to the kgf column on the right, it will be found that 20 N equals 2.0394 kgf.
To convert 20 kgf into N, refer to the N column on the left and it will be found that 20 kgf equals 196.13 N.

Temperature Conversion Table

$C = \frac{5}{9}(F-32)$ $F = 32+\frac{9}{5}C$

℃		℉	℃		℉	℃		℉	℃		℉
-73.3	-100	-148.0	-2.2	28	82.4	16.1	61	141.8	34.4	94	201.2
-62.2	- 80	-112.0	-1.7	29	84.2	16.7	62	143.6	35.0	95	203.0
-51.1	- 60	- 76.0	-1.1	30	86.0	17.2	63	145.4	35.6	96	204.8
-40.0	- 40	- 40.0	-0.6	31	87.8	17.8	64	147.2	36.1	97	206.6
-28.9	- 20	- 4.0	0	32	89.6	18.3	65	149.0	36.7	98	208.4
-17.8	0	32.0	0.6	33	91.4	18.9	66	150.8	37.2	99	210.2
-17.2	1	33.8	1.1	34	93.2	19.4	67	152.6	37.8	100	212
-16.7	2	35.6	1.7	35	95.0	20.0	68	154.4	43.3	110	230
-16.1	3	37.4	2.2	36	96.8	20.6	69	156.2	48.9	120	248
-15.6	4	39.2	2.8	37	98.6	21.1	70	158.0	54.4	130	266
-15.0	5	41.0	3.3	38	100.4	21.7	71	159.8	60.0	140	284
-14.4	6	42.8	3.9	39	102.2	22.2	72	161.6	65.6	150	302
-13.9	7	44.6	4.4	40	104.0	22.8	73	163.4	71.1	160	320
-13.3	8	46.4	5.0	41	105.8	23.3	74	165.2	76.7	170	338
-12.8	9	48.2	5.6	42	107.6	23.9	75	167.0	82.2	180	356
-12.2	10	50.0	6.1	43	109.4	24.4	76	168.8	87.8	190	374
-11.7	11	51.8	6.7	44	111.2	25.0	77	170.6	93.3	200	392
-11.1	12	53.6	7.2	45	113.0	25.6	78	172.4	121.1	250	482
-10.6	13	55.4	7.8	46	114.8	26.1	79	174.2	149	300	572
-10.0	14	57.2	8.3	47	116.6	26.7	80	176.0	177	350	662
- 9.4	15	59.0	8.9	48	118.4	27.2	81	177.8	204	400	752
- 8.9	16	60.8	9.4	49	120.2	27.8	82	179.6	232	450	842
- 8.3	17	62.6	10.0	50	122.0	28.3	83	181.4	260	500	932
- 7.8	18	64.4	10.6	51	123.8	28.9	84	183.2	288	550	1022
- 7.2	19	66.2	11.1	52	125.6	29.4	85	185.0	316	600	1112
- 6.7	20	68.0	11.7	53	127.4	30.0	86	186.8	343	650	1202
- 6.1	21	69.8	12.2	54	129.2	30.6	87	188.6	371	700	1292
- 5.6	22	71.6	12.8	55	131.0	31.1	88	190.4	399	750	1382
- 5.0	23	73.4	13.3	56	132.8	31.7	89	192.2	427	800	1472
- 4.4	24	75.2	13.9	57	134.6	32.2	90	194.0	454	850	1562
- 3.9	25	77.0	14.4	58	136.4	32.8	91	195.8	482	900	1652
- 3.3	26	78.8	15.0	59	138.2	33.3	92	197.6	510	950	1742
- 2.8	27	80.6	15.6	60	140.0	33.9	93	199.4	538	1000	1832

How to use : For example, to convert 20℃ into ℉, find the number 20 in the center of the first column. By referring the ℉ column on the right, it will be found that 20℃ equals 68.0℉.
To convert 20℉ into ℃, refer to the ℃ column on the left and it will be found that 20℉ equals -6.7℃.

Grease names and the characteristics (Reference)

Sort	Name	Supplier	Thickener of metallic soap	Con-sistency	Dropping point (℃)	Service range(¹) (℃)	Remarks
General purpose	ALVANIA GREASE S1	SHELL LUBRICANTS JAPAN	Li	323	182	−35～+120	General, Centralized greasing
	ALVANIA GREASE S2	SHELL LUBRICANTS JAPAN	Li	283	185	−25～+120	General, Centralized greasing
	ALVANIA GREASE S3	SHELL LUBRICANTS JAPAN	Li	242	185	−20～+135	General
	DAPHNE GREASE MP NO.2	IDEMITSU	Li	276	195	−20～+120	General
	COSMO GREASE DYNAMAX No.2	COSMO	Li	280	188	−20～+120	General
	MULTINOC GREASE 2	JXTG NIPPON OIL & ENERGY	Li	278	212	−30～+125	General
Low temperature	ALVANIA GREASE RA-J	SHELL LUBRICANTS JAPAN	Li	252	183	−40～+130	Low temperature
	BEACON 325	EMG LUBRICANTS	Li	280	193	(+160) −60～+120	Low temperature, Low torque
	ISOFLEX LDS 18 SPECIAL A	KLÜBER	Li	280	≧185	−60～+130	Low temperature, High speed,Extreme pressure
	ISOFLEX SUPER LDS 18	KLÜBER	Li	280	≧185	−60～+130	Low temperature, High speed,Low noise
	LT GREASE No.2	JXTG NIPPON OIL & ENERGY	Li	275	181	−50～+150	Low temperature
Wide temperature range	TEMPREX N3	EMG LUBRICANTS	Li Complex	235	≧300	(+200) −20～+160	Wide temperature range, High temperature
	AEROSHELL GREASE 7	SHELL LUBRICANTS JAPAN	Microgel	288	≧260	−73～+149	Wide temperature range, Low temperature
	MULTEMP PS No.2	KYODO YUSHI	Li	275	190	−50～+130	Wide temperature range, For low temperature & low noise
	MULTEMP SRL	KYODO YUSHI	Li	242	192	−50～+150	Wide temperature range, For low temperature & low noise
	MULTINOC WIDE No.2	JXTG NIPPON OIL & ENERGY	Li+special Na	247	203	−40～+135	Wide temperature range
Extreme pressure	ALVANIA EP GREASE 2	SHELL LUBRICANTS JAPAN	Li	276	187	−20～+110	Extreme pressure, Centralized greasing
	MOLYKOTE BR2-PLUS	TORAY/DOW CORNING	Li	265	185	−30～+150	With MoS_2, Extreme pressure
	MOLUB-ALLOY #777-2	CASTROL	Li	280	182	0～+135	With MoS_2, Extreme pressure
Others	G 40M	SHIN-ETSU	Li	260	≧200	−30～+200	Wide temperatur range, Superior at high temperature with stable anti-oxidation and water proof, Chemically inert
	G 40H	SHIN-ETSU	Li	220	≧200	−30～+200	Wide temperatur range, Superior at high temperature with stable anti-oxidation and water proof, Chemically inert
	KRYTOX 240AD	CHEMOURS	Fluorinated	275	None	−30～+288	Stabl at high temperature, Chemically inert, Anti-solvent
	BARRIERTA L55/2	KLÜBER	Fluorinated	No.2	None	(+250) −35～+220	General, Low evaporation at high temperature, Chemically inert
	BARRIERTA IMI/V	KLÜBER	Fluorinated	No.2	None	−50～+220	For high vacuum
	DOLIUM GREASE R	SHELL LUBRICANTS JAPAN	Polyurea	281	249	−30～+150	Heat resistant, Superior at high temperature with stable anti-oxidation
	STAMINA GREASE RL2	SHELL LUBRICANTS JAPAN	Polyurea	268	271	−20～+180	Heat resistant, Superior at high temperature with stable anti-oxidation

Note(¹) : Figures in parentheses show the maximum allowable temperature in very short time operation, and they are not applicable for continuous operation.

Remark When using these products, see individual manufacturer's catalogs.

IKO Linear Motion Rolling Guide Series, Configuration of General Catalog

IKO Linear Motion Rolling Guide Series General Catalog Consists of **BLUE** (CAT-1587E) and **RED** (CAT-1588E), the two volumes.

BLUE


IKO LINEAR MOTION ROLLING GUIDE BLUE

LINEAR WAYS

CAT-1587E

【Models】

● Rail Guide Type
  Endless Linear Motion Type

RED


IKO LINEAR MOTION ROLLING GUIDE RED

LINEAR WAYS

CAT-1588E

【Models】

● Rail Guide Type
  Limited Linear Motion Type

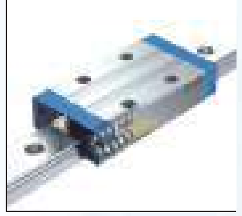
● Shaft Guide Type
  Endless Linear Motion Type
  Limited Linear Motion Type + Rolling Motion Type

● Flat Guide Type
  Endless Linear Motion Type
  Limited Linear Motion Type

C-Lube Linear Way ML
Linear Way L
ML · LWL

C-Lube Linear Way MLV
MLV

C-Lube Linear Way MV
MV

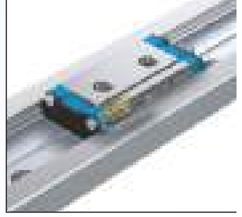


C-Lube Linear Way ME
Linear Way E
ME · LWE

C-Lube Linear Way MH
Linear Way H
MH · LWH

Linear Way F
LWF

C-Lube Linear Way MUL
Linear Way U
MUL · LWU



C-Lube
Linear Roller Way Super MX
Linear Roller Way Super X
MX · LRX

Linear Roller Way X
LRWX

Linear Way Module
LWLM · LRWM

Rail Guide Type
Crossed Roller Way
CRW(G)(…H)
CRWU(G)

Rail Guide Type
Linear Slide Unit
BWU·BSP(G)
BSU…A

Shaft Guide Type
Linear Ball Spline
MAG·LSAG

Shaft Guide Type
Linear Bushing
LMG · LM · LMS

Shaft Guide Type
Stroke Rotary Bushing
ST · STSI · BG

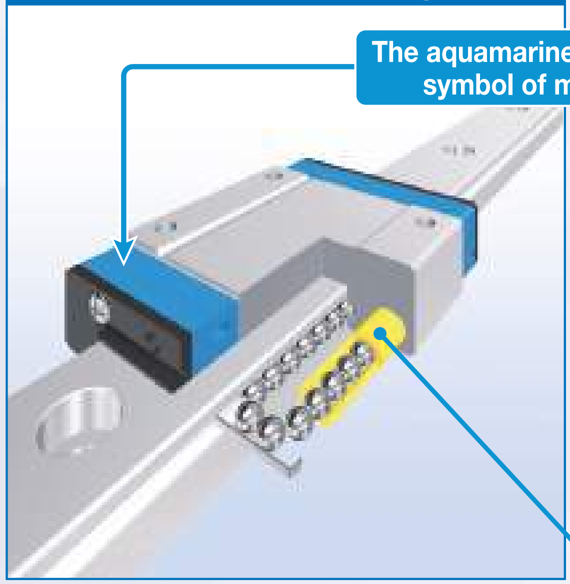
Flat Guide Type
Roller Way & Flat Roller Cage
RW · SR · GSN
FT·FTW…A

Oil Minimum
IKO Gentle to The Earth

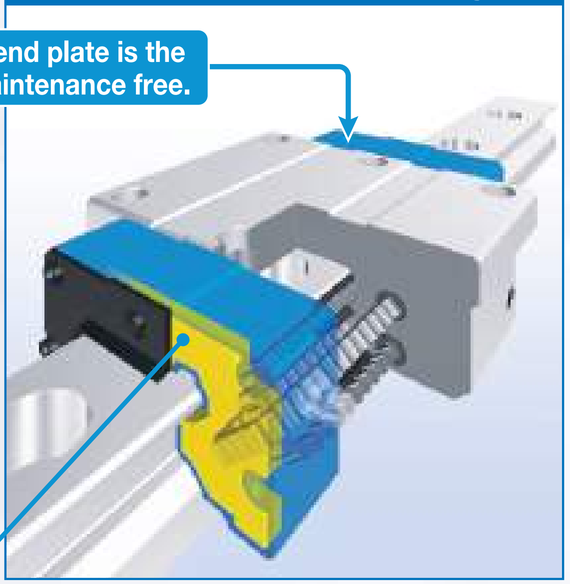
Features of C-Lube Linear Way and C-Lube Linear Roller Way

Original and world's first structure with [C-Lube]

C-Lube Linear Way



C-Lube Linear Roller Way

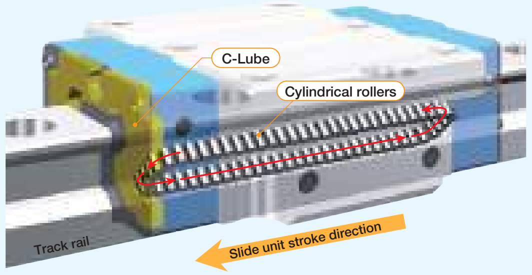


The aquamarine end plate is the symbol of maintenance free.

C-Lube integrated

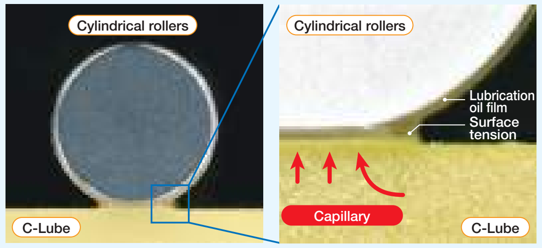
Lubrication oil is carried through circulation of rolling elements

The lubrication oil is supplied directly to the rolling elements, not to the track rail.
When rolling elements make contact with the capillary lubricating element integrated with the circulation path of slide unit rolling elements, the lubrication oil is supplied to surfaces of rolling elements and carried to the loading area through circulation of rolling elements.
This results in adequate lubrication oil being properly maintained in the loading area and lubrication performance will last for a long time.



Lubrication oil is directly supplied to surfaces of the rolling elements

The surface of capillary lubricating element is always covered with the lubrication oil.
Lubrication oil is continuously supplied to the surface of rolling elements by surface tension in the contact of capillary lubricating element surface and rolling elements.
On the surface of capillary lubricating element with which the rolling elements make contact, new lubrication oil is always supplied from the other sections.



Long term maintenance free is realized with oil impregnated with C-Lube only !!

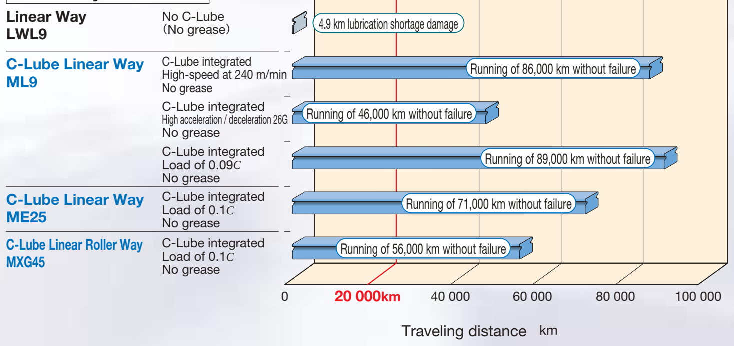
IKO C-Lube Maintenance-free

Maintenance free

This endures running over 20,000 km without oil feeding with lubrication oil in the C-Lube only.
Furthermore, grease is pre-packed in the slide unit so long term maintenance free can be realized.

Maintenance free is achieved until the end of device life[*1] *!*

Durability test result



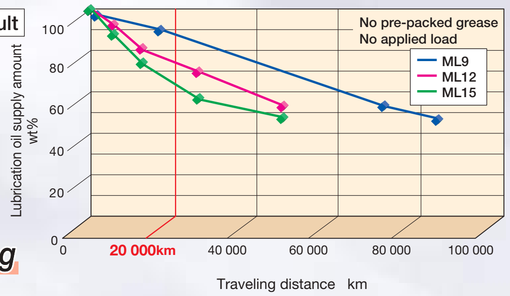
[*1] Typical device life is assumed. Re-greasing may be necessary depending on use conditions.

Eco-friendly

As lubrication oil in C-Lube is supplied by the amount necessary to maintain lubrication performance of the rolling guide, the consumption of lubrication oil is reduced and lubrication performance is maintained even when it run for a long period.

Eco-friendly specification reducing usage of lubrication oil!

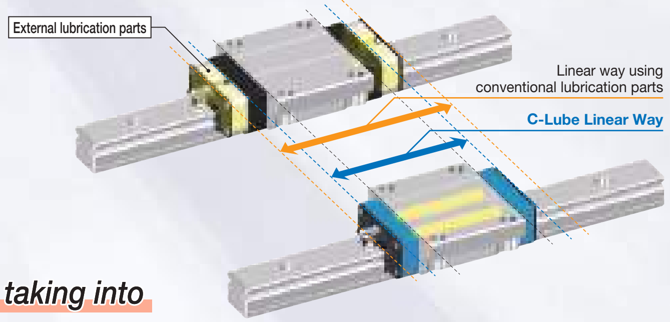
Oil supply test result



Compact

As C-Lube Linear Way and C-Lube Linear Roller Way are integrated with lubrication part C-Lube, their slide units are not long unlike types with external lubrication parts.
Replacement of conventional parts is easy free from constraints of mounting space and stroke length.

Compact design taking into account compactness!

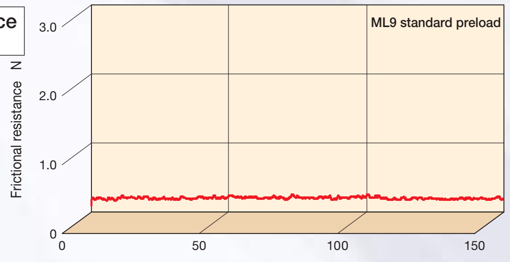


Smooth

C-Lube Linear Way and C-Lube Linear Roller Way do not generate slide resistance unlike lubrication parts external to the slide unit that make contact with the track rail.
Driving force follow-up property is superior and energy is saved by improvement of accuracy and reduction of friction loss.

Light and smooth motion is achieved!

Frictional resistance test result



A variety of models and size variations

Ball Type Miniature Series

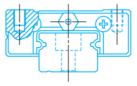
C-Lube Linear Way ML
C-Lube Linear Way MLV
Linear Way L

Thanks to the structure with two rows of balls to contact with the way at four points, stable accuracy and rigidity can be achieved even in applications where load has variable direction and size or complex load is applied, despite its very small body.

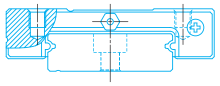
Micro Linear Way L

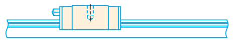
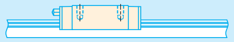
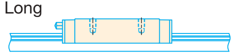
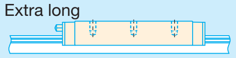
As the lineup of track rail width from 1 mm to 6 mm is available, you can select an optimal product for the specifications of your machine and device. For LWL1, world's smallest size is realized: track rail width of 1 mm, slide unit width of 4 mm and assembly height of 2.5 mm.

Standard type
ML
LWL



Wide type
MLF
LWLF



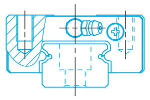
Length of slide unit	
C	Short 
No symbol	Standard 
G	Long 
L	Extra long 

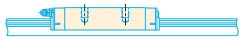
Size	
Standard type	1, 2, 3, 5, 7, 9, 12, 15, 20, 25
Wide type	4, 6, 10, 14, 18, 24, 30, 42

Ball Type Low Profile/Light Weight Series

C-Lube Linear Way MV

Despite its extra low profile and extra light weight, this linear motion rolling guide has the maximum load rating among the ball types while achieving high load capacity.



Length of slide unit
Standard 

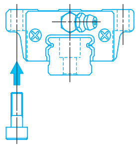
Size
20, 25, 30

Ball Type Compact Series

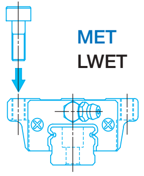
C-Lube Linear Way ME
Linear Way E
Low Decibel Linear Way E

Versatile linear motion rolling guide that has achieved utility pursuing compactness in every aspect. Low decibel types with resin separator to prevent direct contact between balls are also available.

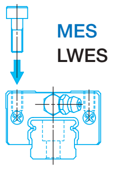
Flange type
mounting from bottom
ME
LWE

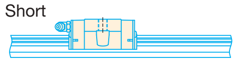
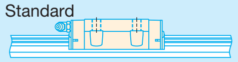
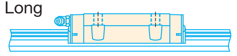


Flange type
mounting from top
MET
LWET



Block type
mounting from top
MES
LWES



Length of slide unit	
C	Short 
No symbol	Standard 
G	Long 

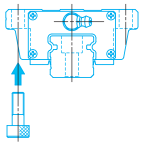
Size
15, 20, 25, 30, 35, 45

Ball Type High Rigidity Series

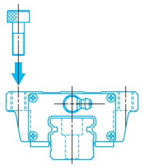
C-Lube Linear Way MH
Linear Way H

High rigidity linear motion rolling guides designed to evenly support high load capacity by incorporating large-diameter balls. Stable accuracy and rigidity can be achieved even in applications where load with variable direction and size and complex load are applied.

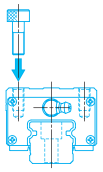
Flange type
mounting from bottom
MH
LWH



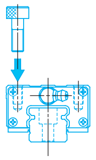
Flange type
mounting from top(1)
MHT
LWHT

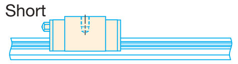
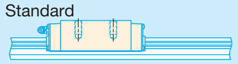
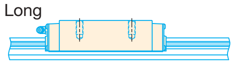
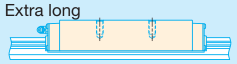


Block type
mounting from top
MHD
LWHD



Compact block type
mounting from top
MHS
LWHS



Length of slide unit	
C	Short 
No symbol	Standard 
G	Long 
L	Extra long 

Size
8, 10, 12, 15, 20, 25, 30, 35, 45, 55, 65

Note (1) Some models may be mounted from bottom.

Models and Size Variations

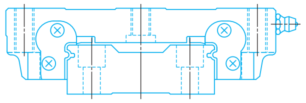
A variety of models and size variations

Ball Type Wide Type Series

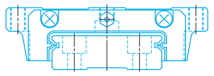
Linear Way F

As wide track rail is used and the distance between the load points is long, this is a linear motion rolling guide suitable to single-row use due to the structure resistant to across-the-width moment load. It is also resistant to complex load.

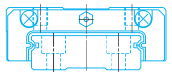
Flange type
mounting from top / bottom
LWFH

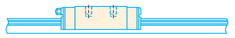


Flange type
mounting from top / bottom
LWFF



Block type
mounting from top
LWFS



Length of slide unit	
No symbol	Standard 

Size	
LWFH	40,60,90
LWFF	33,37,42,69
LWFS	33,37,42

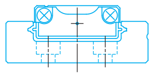
Ball Type U-Shaped Track Rail Series

C-Lube Linear Way MUL

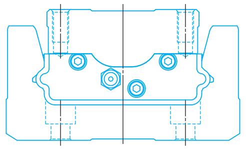
Linear Way U

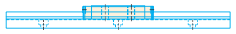
Linear motion rolling guide of the structure with way inside the track rail of U-shaped section and slide unit therein. With the U-shaped track rail, rigidity against the track rail moment load and torsion is significantly improved.

Small type
MUL
LWUL



Standard type
LWU



Length of slide unit	
No symbol	Standard 

Size	
MUL	25, 30
LWUL	25, 30
LWU	40, 50, 60, 86, 100, 130

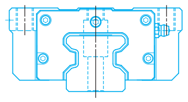
Roller Type

C-Lube Linear Roller Way Super MX

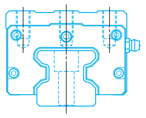
Linear Roller Way Super X

Linear motion rolling guide that has achieved the highest level of performance in all characteristics utilizing the roller's superior characteristic, such as rigidity, load capacity, running accuracy and vibration damping property. With extra long unit with the maximum slide unit length, load capacity and rigidity are improved and running performance with super high accuracy is realized.

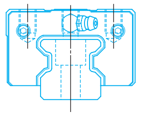
Flange type
mounting from top / bottom
MX(1)
LRX(1)



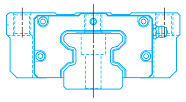
Block type
mounting from top
MXD
LRXD



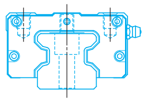
Compact block type
mounting from top
MXS
LRXS



Low profile flange type
mounting from top
MXN

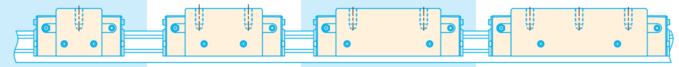


Low profile block type
mounting from top
MXNS



Note (1) Size 20 series allows only for mounting from top and model mounting from bottom is MXH and LRXH.

Length of slide unit			
C	No symbol	G	L
Short	Standard	Long	Extra long



Size
10, 12, 15, 20, 25, 30, 35, 45, 55, 65, 85, 100

Four-row roller guide of world's smallest size
Track rail width of 10 mm

Super high rigidity
Super high load capacity
High running performance
Excellent frictional characteristics

Stainless steel made
LRXD10…SL

Mechatronics Series

TU Series

IKO **Precision Positioning Table TU** is a compact and slim positioning table with good load balance and high resistance to complex loads, in which the side table is arranged inside the U-shape track rail. Six types with a track rail width of 25～130mm are available. Each slide table length can be selected as required. Different table specifications including ball screw, motor, sensor, etc. can be selected. This allows each user to configure the most suitable positioning table for each application.

Abundant options meet diversified market needs such as a motor loopback specification, table with bellows, table with bridge cover, and table finished by black chrome surface treatment.

Linear Motor Table LT

The IKO **Linear Motor Table LT** is a compact and lightweight direct-drive positioning table with a very small sectional height in which an AC servo-motor and an optional linear scale are integrated in a moving table and a bed made of aluminum alloy.

The IKO **Linear Motor Table LT** employs a C-shaped magnet yoke, and a coil board is sandwiched between two stator magnets. It provides a high thrust of 450N though its height is only 40 mm. The moving table is as light as 1.5 kg but provides high thrust. It permits high acceleration and deceleration exceeding 10 G. (In the case of LT150 CG.) Also, High Thrust Series **LT···H** outputs 900N thrust.

Using advanced servo technology, this product achieves high static stability and high-speed stability.

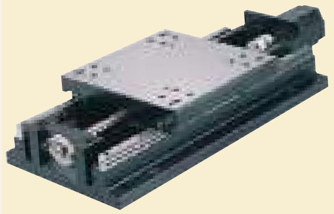
Long-stroke Series

- ● Standard type which has been practically used in many fields.
- ● Stable characteristics in parallel use together with Linear Way

TSL···M

High-rigidity Series

- ● High reliability and high accuracy with component parts strictly selected
- ● High rigidity and large mounting weight



TSLH···M · CTLH···M

Super Precision Series

- ● XY configuration available for advanced inspection stage
- ● High positioning accuracy realized with IKO Roller technology and full closed loop controlling

TX···M CTX···M

Compact Series

- ● Compact structure with a small sectional height
- ● High reliability and high accuracy achieved by using Crossed Roller Way

TS · CT

High-speed Long Stroke Series

- ● High-speed type using a timing belt drive
- ● Stable and high traveling performance in parallel use together with Linear Way

TSLB

Precision Positioning Table

- ● Light weight precision positioning table made of high-strength aluminum alloy.
- ● Built-in C-Lube for long-term maintenance-free service.

TE···B

Micro Precision Positioning Table

- ● Very compact positioning table that is 20mm high(sectional) and 17mm wide driven by a ground ball screw.
- ● +/-0.5micron repeatability is achieved with 60 mm stroke length.

TM

Nano Linear

- ● Direct drive type with high speed and high response
- ● Maximum thrust of 25 N achieved with a sectional height of 14 mm

NT···V

Alignment Stage Direct Drive

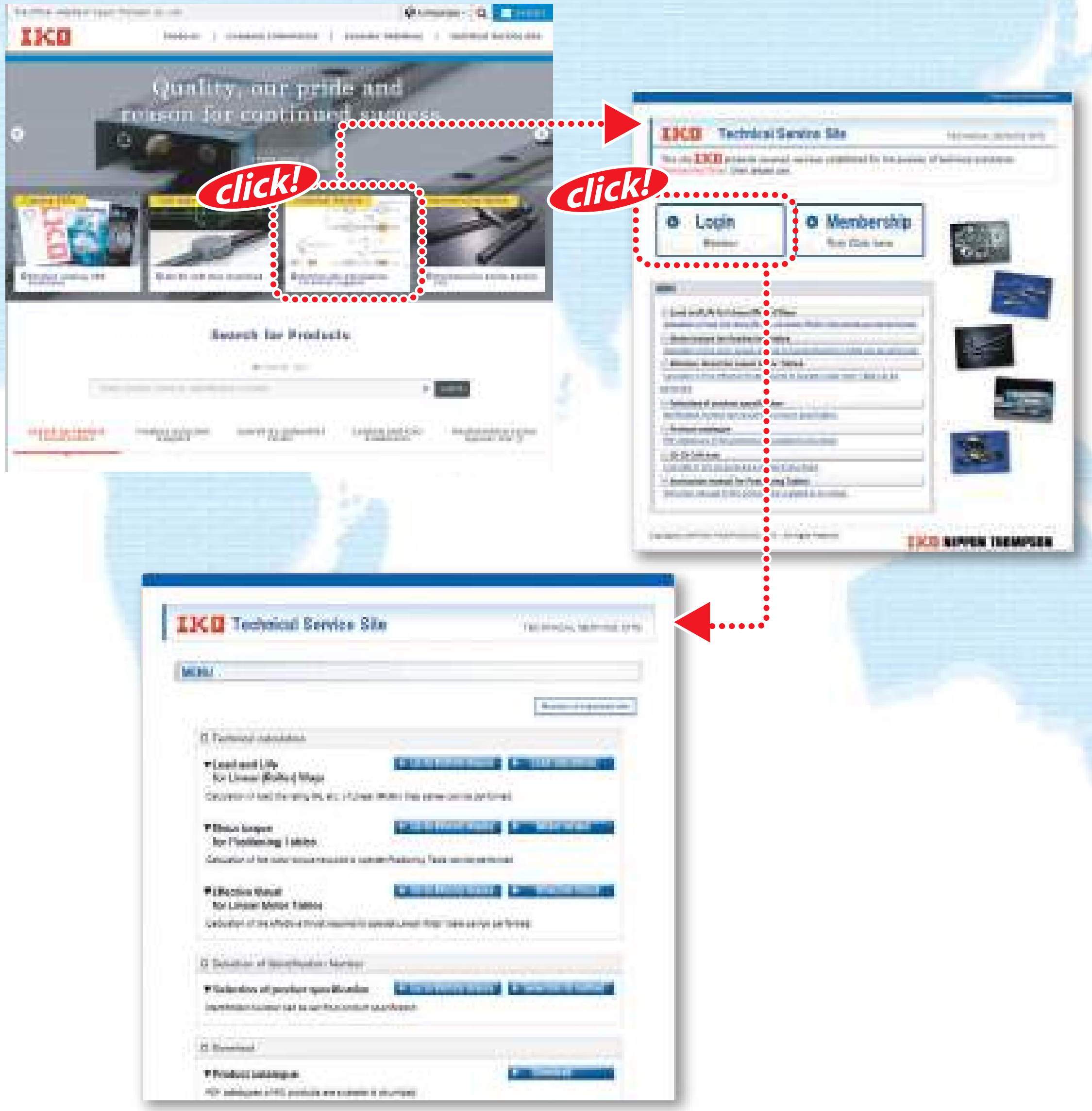
- ● Ultra compact XY θ stage contributing to space saving
- ● High resolution and response realized with optical scale

SA···DE

IKO Introduction of Technical Service Site

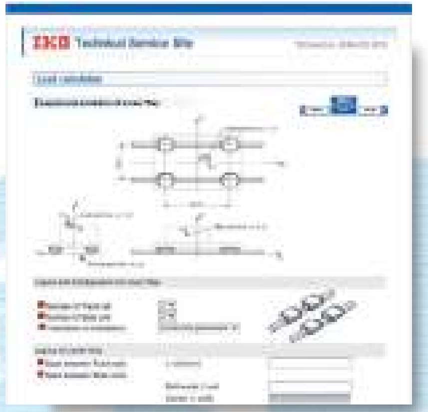
"IKO Technical Service Site" can be accessed from our home page. The site provides various tools for selecting Linear Ways and Linear Roller Ways. Please utilize these tools for assistance when selecting products. Additionally the site also provides CAD data and product catalogs for the Needle Series, Linear Motion Rolling Guide Series, and Mechatronics Series for download. Please utilize them to improve your design efficiency.

https://www.ikont.co.jp/eg/



1. Technical calculations

For Linear Way/Linear Roller Way load and life calculation, you can obtain the calculated load and the rating life by entering the operating conditions.
Also you can derive the motor torque required for operation and the effective thrust force during operation in the sections of motor torque calculation and calculation of effective thrust force of linear motor tables respectively, and output the calculation results in PDF format, as well as save the histories.



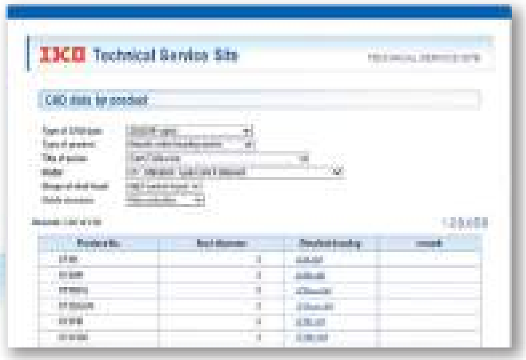
2. Selection of Identification Number

By selecting such specification as model code, dimensions, part code, material code, preload symbol, classification symbol, interchangeable code and supplemental code of Linear ways/Linear roller ways, you can easily specify the identification number used for ordering.
Also you can browse the CAD data of the selected products, calculate the load, and output the selection results in PDF format, as well as save the histories.

3. Downloading CAD data

2-dimensional CAD data (DXF file)

There are two types of figures, brief figure and detailed figure. The brief figure shows only the external view lines, and the detailed figure shows the detailed lines. The drawing consists of three drawings: front view, side view and plain view. The scale shows only the original size (1:1), and it does not show dimension lines.



3-dimensional CAD data

It is linked to the mechanical parts CAD library "PART community". Entering the rail dimension and option contents to the detail, you can view the 2D/3D CAD data suitable for the specification for free of charge.

4. Downloading Catalog and Operation Manual

You can download product catalogs of needle series, linear motion rolling guide series and mechatronics series, operation manuals of precision positioning tables and various electrical components in PDF format, as well as support software for precision positioning tables. If you would like a copy of our catalog, please visit the IKO official website and apply for the catalog, or contact our regional office or sales office nearby.

Index of Model Codes

Index of Model Codes

M

Index of Model Codes

Index of Model Codes

Oil Minimum

IKO Gentle to The Earth

Nippon Thompson Co., Ltd. is working to develop global environment-friendly products.
It is committed to developing products that make its customers' machinery and
equipment more reliable, thereby contributing to preserving the global environment.
This development stance manifests well in the keyword "**Oil Minimum.**"
Our pursuit of Oil Minimum has led to the creation of
IKO's proprietary family of lubricating parts as "C-Lube."

- IKO Linear Motion Rolling Guides are manufactured through a control system that alleviates their impact on the global environment to meet the quality requirements of ISO 14001 in compliance with the quality requirements level of ISO 9001 for quality improvement.
- The standard products listed in this catalog comply with the specifications of the ten hazardous materials cited in the European RoHS Directive.

IKO Products Underpin Sustain Technology Leaps

Nippon Thompson Co., Ltd. was the first Japanese manufacturer to develop needle bearings on its own and has since expanded into the arena of linear motion rolling guides (Linear Motion Series and Mechatro Series) on the support of its advanced expertise. The company now offers a vast assortment of ingenious products, including the world's first C-Lube Maintenance-Free Series, to address increasingly diversified customer needs and thus sustain technology leaps.

C-Lube Maintenance-Free Series Products Evolving from the "Oil Minimum" Concept

We have developed lubricating parts impregnated with a large amount of lubricant as C-Lube Series to save the customer's oiling management workload and built them into bearings and linear motion rolling guides.
The C-Lube Series not only keeps products maintenance-free for long by giving them an optimal and minimal amount of a lubricant for an extended period of time but also contributes greatly to preserving the global environment.

Needle Roller Bearings

Needle Bearings
Machine elements essential to any industry

Linear Motion Rolling Guide Series

Linear Motion Rolling Guides/Linear Motion Series
Available in broad sizes, from minimum to extra-large

Mechatronics Series

Linear Motion Rolling Guides/Mechatro Series
A merger of precision machining expertise and electronics

NIPPON THOMPSON CO., LTD.
CAT-1594E AKA
Printed in China 2022.08

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Recognizing that conservation of the global environment is the top-priority challenge for the world's population, Nippon Thompson will conduct its activities with consideration of the environment as a corporate social responsibility, reduce its negative impact on the environment, and help foster a rich global environment.

ISO 9001 & 14001 Quality system registration certificate

ISO 9001 Certified
ISO 14001 Certified

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General Explanation

Nippon Thompson Co., Ltd. is a bearing manufacturer that launched the technical development of needle roller bearings for the first time in Japan and is proud of the high quality level and abundant varieties of its products.

Needle roller bearings are bearings for rotary motion that incorporate needle-shaped thin rollers instead of ordinary bearing balls or rollers. Compared with other rolling bearings, they are small-sized and lightweight but have a large load capacity. They are widely used with high reliability in the fields of automobiles, industrial machinery, OA equipment, etc. as resource-saving type bearings that make the whole machine compact.

Characteristics of Needle Roller Bearings

Bearings can be classified into two main types, namely rolling bearings and sliding bearings. Rolling bearings can be subdivided further into ball bearings and roller bearings according to the rolling elements.
IKO Needle Roller Bearings are high-precision rolling bearings with a low sectional height, incorporating needle rollers as the rolling element. They have the following features.

Merits of Rolling Bearings

Compared with sliding bearings, rolling bearings have the following merits:

❶ Static and kinetic friction is low.

Since the difference between static friction and kinetic friction is small and the frictional coefficient is also small, drive units or machines can be made more compact and lightweight, saving machine costs and power consumption.

❷ Stable accuracy can be maintained for long periods.

Owing to less wear, stable accuracy can be maintained for long periods.

❸ Machine reliability is improved.

Since the bearing life can be estimated based on rolling fatigue, machine reliability is improved.

❹ Lubrication is simplified.

Since grease lubrication is sufficient in most cases, lubrication can be simplified for easy maintenance.

Merits of Needle Roller Bearings

Compared with other rolling bearings, IKO Needle Roller Bearings have the following advantages:

❶ With a low sectional height, they can withstand heavy loads.

Since they have a low sectional height compared with other rolling bearings and yet can withstand heavy loads, machines can be made more compact and lightweight, thus saving costs.

❷ Rotating torque is small, improving mechanical efficiency.

Since the rotating radius is small, the rotating torque is also small under the same frictional conditions, thus improving mechanical efficiency.

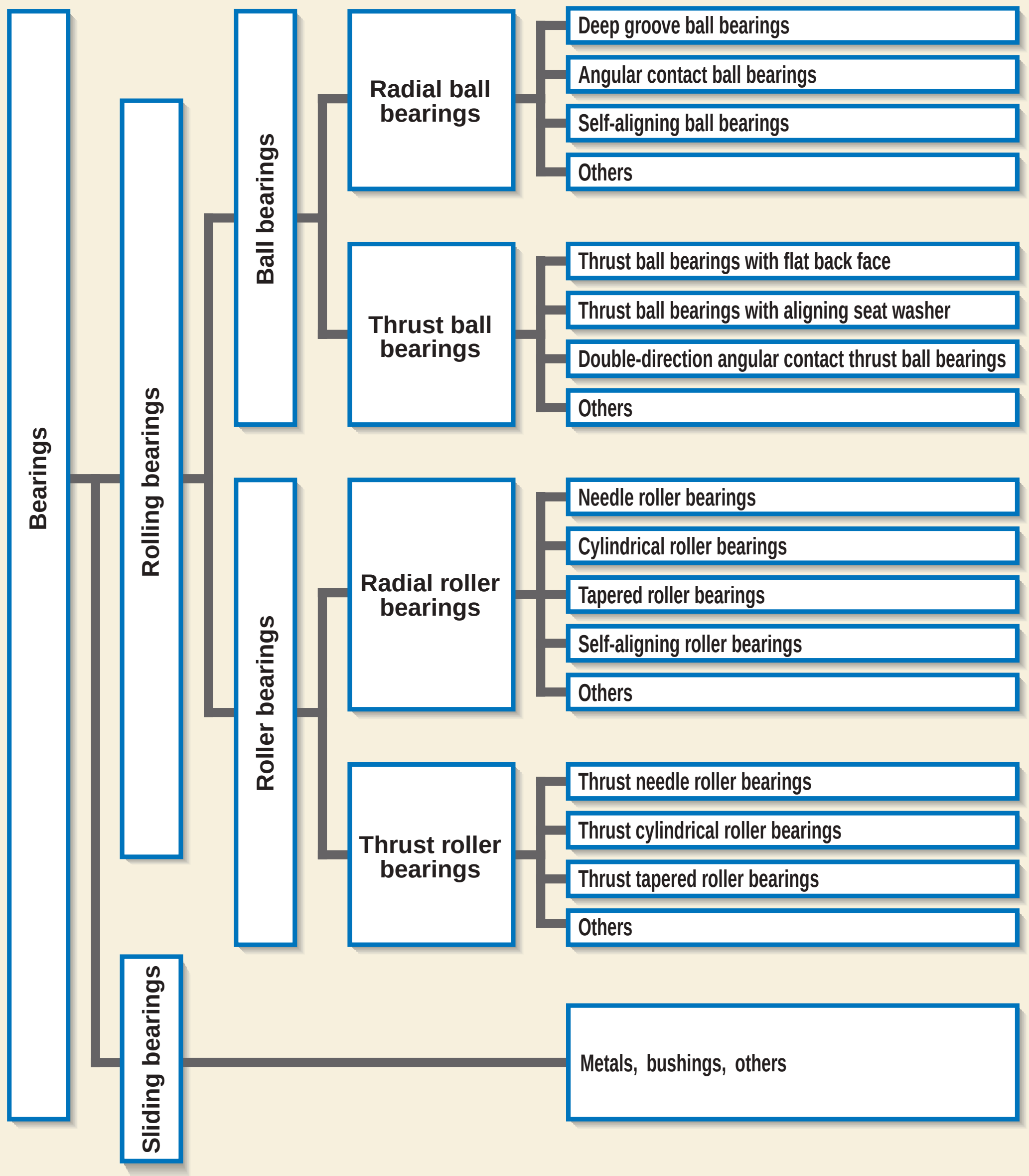
❸ Inertia is minimized.

Since the bearing volume and weight are small, the moment of inertia of the bearing is minimized when it is put in motion.

❹ Most suited to oscillating motions.

Many rolling elements are arranged at a small spacing pitch, and this configuration is most suited to oscillating motions.

Classification of bearings



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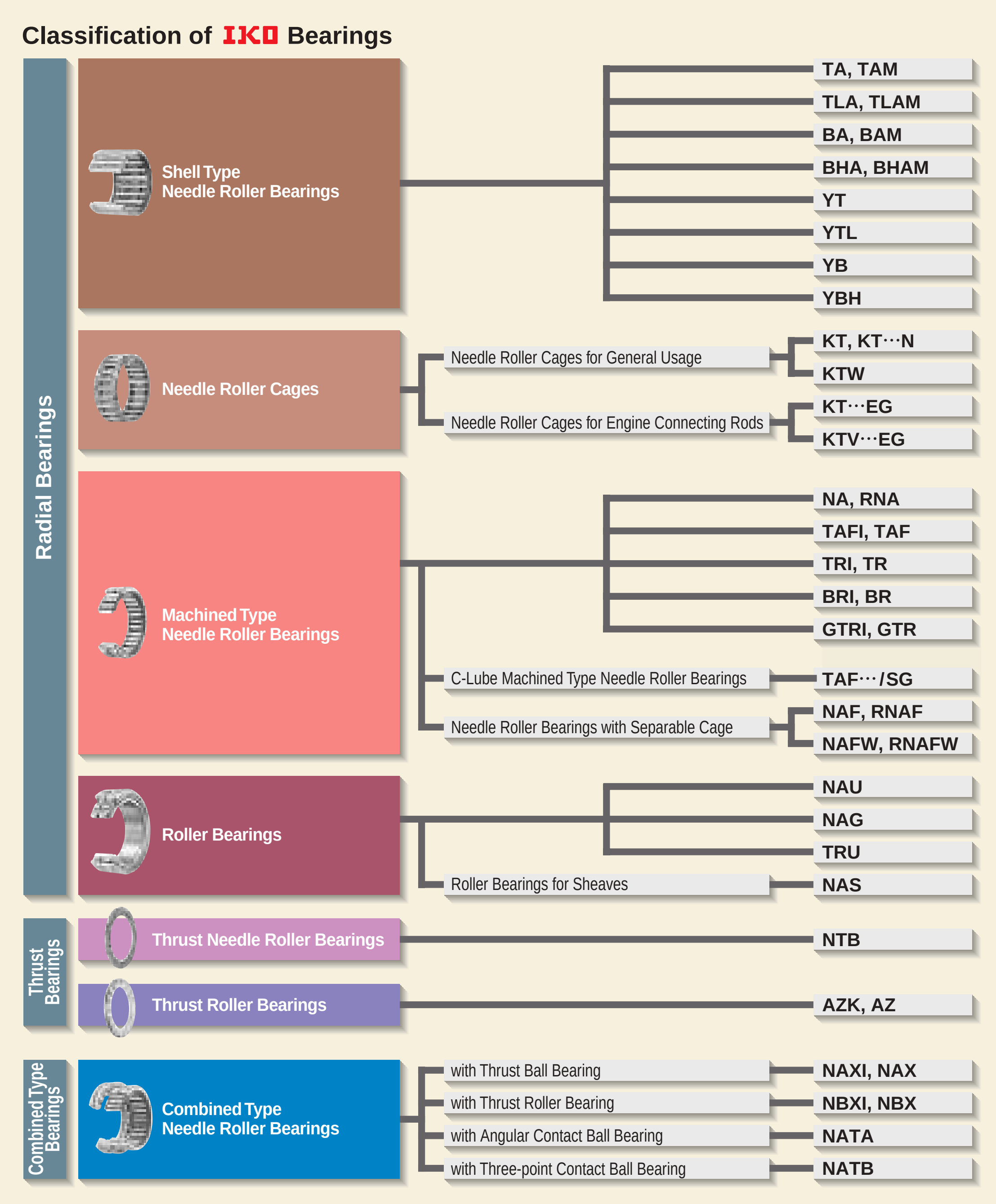
M

Types and Features of Bearings

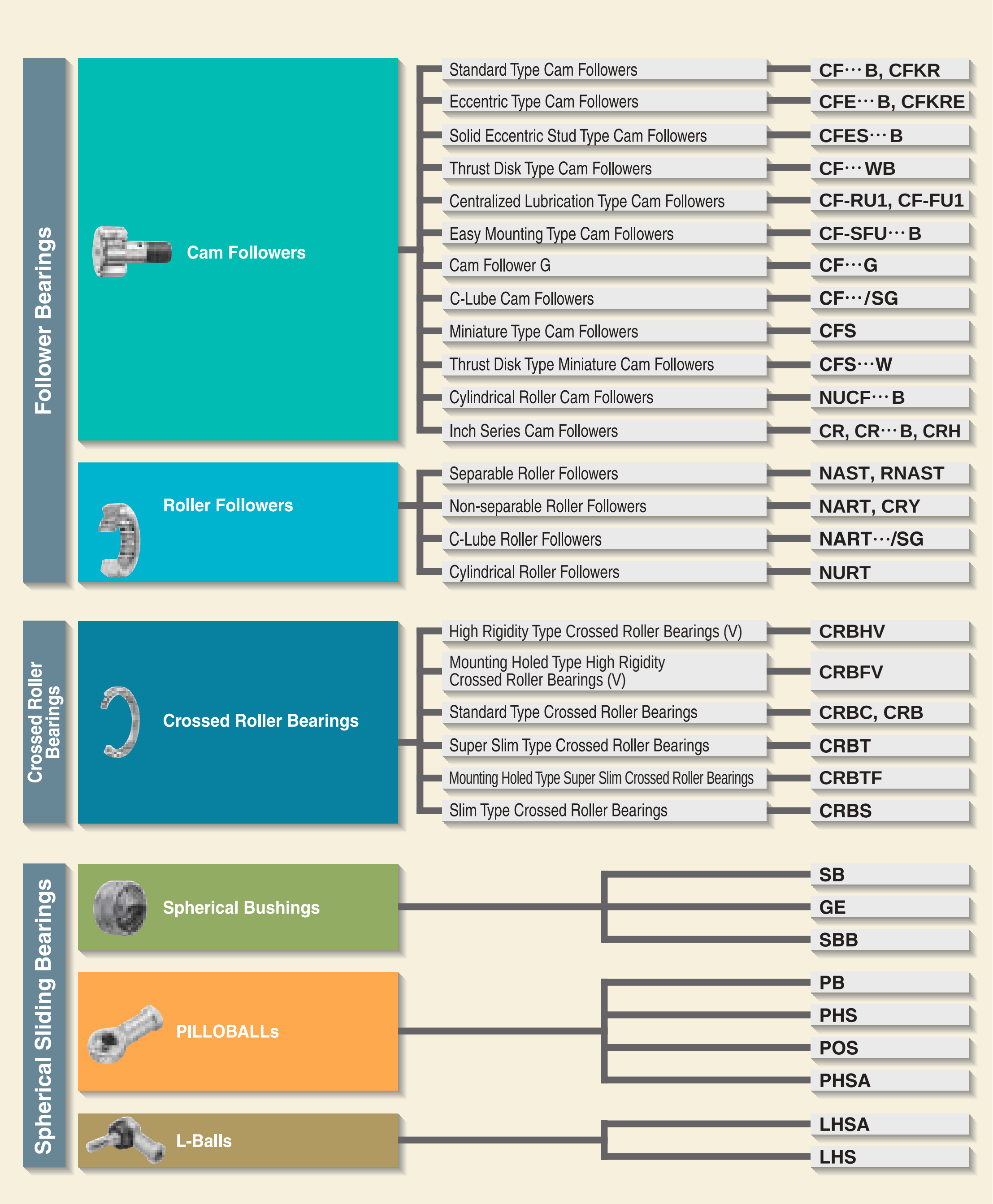
IKO Bearings can be roughly classified into radial bearings and thrust bearings according to applicable load direction. Radial Bearings are grouped into Shell Type Needle Roller Bearings, Machined Type Needle Roller Bearings, and various other types. Thrust Bearings are grouped into Thrust Needle Roller Bearings and Thrust Roller Bearings. Follower Bearings that are used for cam mechanisms and linear motion are grouped into Cam Followers and Roller Followers.



Classification of IKO Bearings

Radial Bearings	**Shell Type Needle Roller Bearings**		**TA, TAM**
			TLA, TLAM
			BA, BAM
			BHA, BHAM
			YT
			YTL
			YB
			YBH
	Needle Roller Cages	Needle Roller Cages for General Usage	**KT, KT···N**
			KTW
		Needle Roller Cages for Engine Connecting Rods	**KT···EG**
			KTV···EG
	Machined Type Needle Roller Bearings		**NA, RNA**
			TAFI, TAF
			TRI, TR
			BRI, BR
			GTRI, GTR
		C-Lube Machined Type Needle Roller Bearings	**TAF···/SG**
		Needle Roller Bearings with Separable Cage	**NAF, RNAF**
			NAFW, RNAFW
	Roller Bearings		**NAU**
			NAG
			TRU
		Roller Bearings for Sheaves	**NAS**
Thrust Bearings	**Thrust Needle Roller Bearings**		**NTB**
	Thrust Roller Bearings		**AZK, AZ**
Combined Type Bearings	**Combined Type Needle Roller Bearings**	with Thrust Ball Bearing	**NAXI, NAX**
		with Thrust Roller Bearing	**NBXI, NBX**
		with Angular Contact Ball Bearing	**NATA**
		with Three-point Contact Ball Bearing	**NATB**

Crossed Roller Bearings are special shape bearings that can simultaneously receive loads in all directions with a single bearing.
Beings other than rolling bearings, such as self-aligning Spherical Bushings that can support radial loads and axial loads and PILLOBALLs and L-Balls that are used for link mechanisms, are also available.



Follower Bearings	**Cam Followers**	Standard Type Cam Followers	**CF···B, CFKR**
		Eccentric Type Cam Followers	**CFE···B, CFKRE**
		Solid Eccentric Stud Type Cam Followers	**CFES···B**
		Thrust Disk Type Cam Followers	**CF···WB**
		Centralized Lubrication Type Cam Followers	**CF-RU1, CF-FU1**
		Easy Mounting Type Cam Followers	**CF-SFU···B**
		Cam Follower G	**CF···G**
		C-Lube Cam Followers	**CF···/SG**
		Miniature Type Cam Followers	**CFS**
		Thrust Disk Type Miniature Cam Followers	**CFS···W**
		Cylindrical Roller Cam Followers	**NUCF···B**
		Inch Series Cam Followers	**CR, CR···B, CRH**
	Roller Followers	Separable Roller Followers	**NAST, RNAST**
		Non-separable Roller Followers	**NART, CRY**
		C-Lube Roller Followers	**NART···/SG**
		Cylindrical Roller Followers	**NURT**
Crossed Roller Bearings	**Crossed Roller Bearings**	High Rigidity Type Crossed Roller Bearings (V)	**CRBHV**
		Mounting Holed Type High Rigidity Crossed Roller Bearings (V)	**CRBFV**
		Standard Type Crossed Roller Bearings	**CRBC, CRB**
		Super Slim Type Crossed Roller Bearings	**CRBT**
		Mounting Holed Type Super Slim Crossed Roller Bearings	**CRBTF**
		Slim Type Crossed Roller Bearings	**CRBS**
Spherical Sliding Bearings	**Spherical Bushings**		**SB**
			GE
			SBB
	PILLOBALLs		**PB**
			PHS
			POS
			PHSA
	L-Balls		**LHSA**
			LHS

Shell Type Needle Roller Bearings

Shell Type Needle Roller Bearings are lightweight with the lowest sectional height among needle roller bearings with outer ring, because they employ a shell type outer ring made from a thin special-steel plate which is accurately drawn, carburized and quenched.
Since these bearings are press-fitted into the housing, no axial positioning fixtures are required. They are ideal for use in mass-produced articles that require economy.

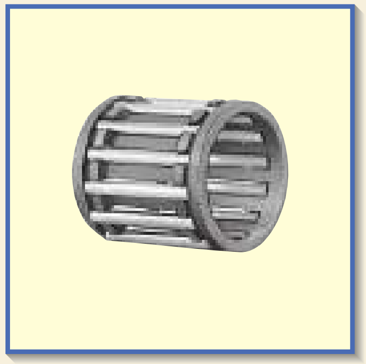
Radial Bearings Page B1

Needle Roller Cages for General Usage

Needle Roller Cages for General Usage are bearings that display excellent rotational performance. Their specially shaped cages with high rigidity and accuracy, precisely guide the needle rollers.
Since needle rollers with extremely small dimensional variations in diameter are incorporated and retained, Needle Roller Cages for General Usage are useful in small spaces when combined with shafts and housing bores that are heat treated and accurately ground as raceway surfaces.

Radial Bearing Page C1

Needle Roller Cages for Engine Connecting Rods



Needle Roller Gages for Engine Connecting Rods are used for motor cycles, small motor vehicles, outboard marines, snow mobiles, general-purpose engines, high-speed compressors, etc. that are operated under extremely severe and complex operating conditions such as heavy shock loads, high speeds, high temperatures, and stringent lubrication.
Needle Roller Cages for Engine Connecting Rods are lightweight and have high load ratings and high rigidity as well as superior wear resistance.

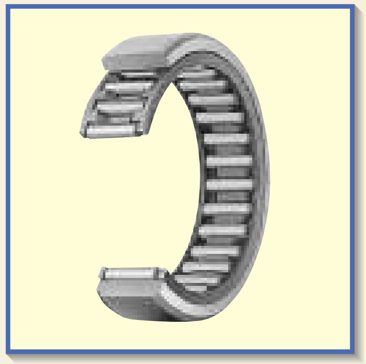
Radial Bearing Page C17

Machined Type Needle Roller Bearings

Machined Type Needle Roller Bearings have an outer ring made by machining, heat treatment, and grinding. The outer ring has stable high rigidity and can be easily used even for light alloy housings.
These bearings are available in various types and optimally selectable for different conditions such as heavy loads, high-speed rotation and low-speed rotation. They are most suitable for general-purpose applications.

Radial Bearing Page D1

Needle Roller Bearings with Separable Cage



In Needle Roller Bearings with Separable Cage, the inner ring, outer ring and Needle Roller Cage are combined, and they can be separated easily. This type has a simple structure with high accuracy. In addition, the radial clearance can be freely selected by choosing an assembly combination.
These bearings have excellent rotational performance, because Needle Roller Cages are used.

Radial Bearing Page D79

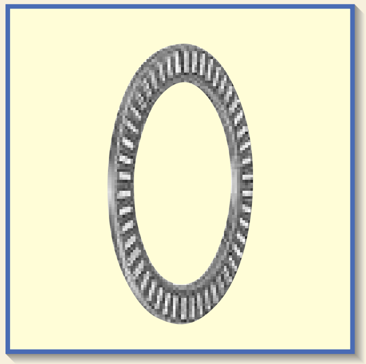
Roller Bearings

Roller Bearings, in which rollers are incorporated in double rows, are non-separable heavy-duty bearings. They can withstand not only radial loads but axial loads as well, which are supported at the contacts between the shoulders of inner and outer rings and the end faces of rollers. Therefore, they are most suitable for use at the fixing side of a shaft.

Radial Bearing Page E1

A
B
C
D
E
F
G
H
I
J
K
L
M

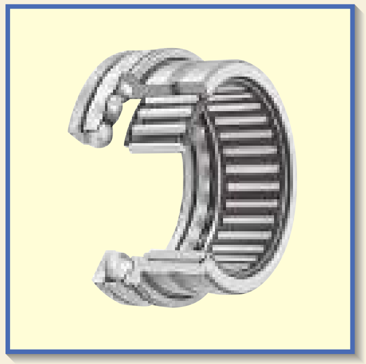
Thrust Bearings



Thrust Bearings consist of a precisely made cage and rollers, and can receive axial loads. They have high rigidity and high load capacities and can be used in small spaces.
Thrust Needle Roller Bearings use needle rollers, while Thrust Roller Bearings use cylindrical rollers.

Thrust Bearing Page F1

Combined Type Needle Roller Bearings



Combined Type Needle Roller Bearings are combinations of a radial bearing and a thrust bearing. Caged Needle Roller Bearings are used as radial bearings and Thrust Ball Bearings or Thrust Roller Bearings are used as thrust bearings.
They can be subjected to radial loads and axial loads simultaneously.

Combined Type Bearing Page G1

Inner Rings

Inner Rings are heat-treated and finished by grinding to a high degree of accuracy and are used for Needle Roller Bearings.
In the case of Needle Roller Bearings, normally the shafts are heat-treated and finished by grinding and used as raceway surfaces. However, when it is impossible to make shaft surfaces according to the specified surface hardness or surface roughness, Inner Rings are used.

Component part Page H1

Cam Followers

Cam Followers are bearings with a stud incorporating needle rollers in a thick walled outer ring.
They are designed for outer ring rotation, and the outer rings run directly on mating cam guide surfaces.
Various types of Cam Followers are available. They are widely used as follower bearings for cam mechanisms and for linear motions.

Follower Bearing Page I1

Roller Followers

Roller Followers are bearings in which needle rollers are incorporated in a thick walled outer ring.
These bearings are designed for outer ring rotation, and the outer rings run directly on mating cam guide surfaces.
They are used as follower bearings for cam mechanisms and for linear motions.

Follower Bearing Page I81

Crossed Roller Bearings

Crossed Roller Bearings are high-rigidity and compact bearings with their cylindrical rollers alternately crossed at right angles to each other between inner and outer rings. A single Crossed Roller Bearing can take loads from any directions at the same time such as radial, thrust, and moment loads.
These bearings are widely used in the rotating parts of industrial robots, machine tools, medical equipment, etc. which require compactness, high rigidity and high rotational accuracy.

Crossed Roller Bearing Page J1

A
B
C
D
E
F
G
H
I
J
K
L
M

Spherical Bushings

Spherical Bushings are self-aligning spherical plain bushings, which have inner and outer rings with spherical sliding surfaces. They can take a large radial load and a bi-directional axial load at the same time.

They are divided into steel-on-steel types that are suitable for applications where there are alternate loads or shock loads, and maintenance-free types which require no lubrication.

Spherical Sliding Bearing Page K1

PILLOBALLs

PILLOBALLs are compact self-aligning spherical plain bushings which can support a large radial load and a bi-directional axial load at the same time.

PILLOBALL Rod Ends have either a female thread in the body or a male thread on the body, so they can be easily assembled onto machines.

PILLOBALLs are used in control and link mechanisms in machine tools, textile machines, packaging machines, etc.

Spherical Sliding Bearing Page K29

L-Balls

L-Balls are self-aligning rod-ends consisting of a special zinc die-cast alloy body and a studded ball which has its axis at right-angles to the body.

They can perform tilting movement and rotation with low torque, and transmit power smoothly due to the uniform clearance between the sliding surfaces.

They are used in link mechanisms in automobiles, construction machinery, farm and packaging machines, etc.

Spherical Sliding Bearing Page K45

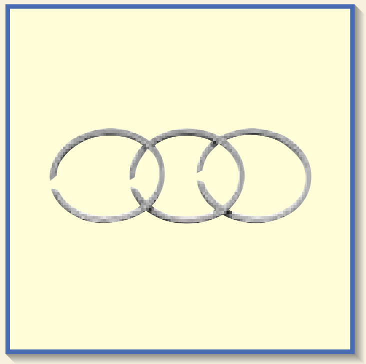
Seals for Needle Roller Bearings

Seals for Needle Roller Bearings have a low sectional height and consist of a sheet metal ring and special synthetic rubber.

As these seals are manufactured to the same sectional height as Needle Roller Bearings, grease leakage and the penetration of foreign particles can be effectively prevented by fitting them directly to the sides of combinable bearings.

Component Part Page L1

Cir-clips for Needle Roller Bearings

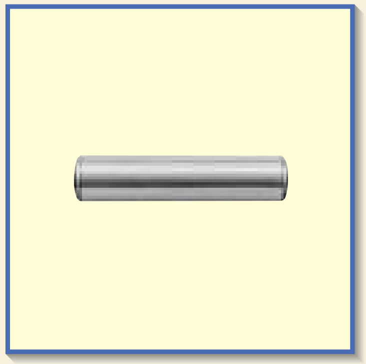


Cir-clips for Needle Roller Bearings have been specially designed for needle roller bearings on which, in many cases, generally available Cir-clips cannot be used. They have a low sectional height and are very rigid.

There are Cir-clips for shafts and for bores, and they are used for positioning to prevent bearing movement in the axial direction.

Component Part Page L17

Needle Rollers

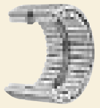


Needle Rollers are used for needle roller bearings and are rigid and highly accurate.

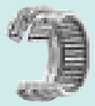
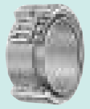
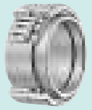
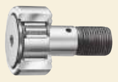
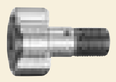
These needle rollers are widely used as rolling elements for bearings, and also as pins and shafts.

Component Part Page L23

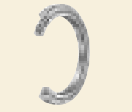
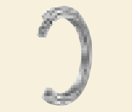
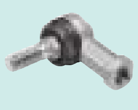
Features of IKO Bearings

Bearing series		Appearance	Direction of motion	Load direction and capacity	Allowable rotational speed	Friction	Sectional height	Reference page
Shell Type Needle Roller Bearings	Caged type		↻	↓↑	○	○	◎	B1～
	Full complement type		↻	↓↑	△	△	◎	
Needle Roller Cages	For general usage		↻	⇩⇧	◎	◎	◎	C1～
	For engine connecting rods		↻	⇩⇧	◎	◎	◎	C17～
Machined Type Needle Roller Bearings	Caged type		↻	⇩⇧	○	◎	○	D1～
	Full complement type		↻	⬇⬆	△	△	○	
Needle Roller Bearings with Separable Cage	Caged type		↻	⇩⇧	◎	◎	○	D79～
Roller Bearings	Caged type		↻	⇩⇧ ←→	○	○	○	E1～
	Full complement type		↻	⇩⇧ ←→	△	△	○	
	For sheaves		↻	⬇⬆ ←→	△	△	△	

Symbol ↻ Rotation ⤳ Oscillating motion ↓ Radial load ← Axial load ↓ Light load ⇩ Medium load ⬇ Heavy load ◎ Especially excellent ○ Excellent △ Normal

Bearing series		Appearance	Direction of motion	Load direction and capacity	Allowable rotational speed	Friction	Sectional height	Reference page
Thrust Bearings	Needle roller bearings		↻	⇦	○	○	◎	F1～
	Roller bearings		↻	⬅	○	○	○	
Combined Type Needle Roller Bearings	With thrust ball bearing		↻	⇩⇧ ⇦	○	○	△	G1～
	With thrust roller bearing		↻	⇩⇧ ⬅	○	○	△	
	With angular contact ball bearing		↻	⇩⇧ ←	○	○	○	
	With three-point contact ball bearing		↻	⇩⇧ ←→	○	○	○	
Cam Followers	Caged type		↻	⇩⇧	○	○	△	I1～
	Full complement type		↻	⬇⬆	△	△	△	
Roller Followers	Separable caged type		↻	⇩⇧	○	○	△	I81～
	Non-separable caged type		↻	⇩⇧	○	○	△	
	Non-separable full complement type		↻	⬇⬆	△	△	△	

Features of IKO Bearings

Bearing series		Appearance	Direction of motion	Load direction and capacity	Allowable rotational speed	Friction	Sectional height	Reference page
Crossed Roller Bearings	Caged type, Separator type		↻	⇕⇔	△	○	○	J1～
	Full complement type		↻	⬍⬌	△	△	○	
	Slim type		↻	↕↔	△	○	◎	
Spherical Bushings	Steel-on-steel type		↻⇜	⬍⇔	△	△	△	K1～
	Maintenance-free type		↻⇜	⇕↔	△	△	△	
PILLOBALLs	Insert type, Lubrication type		↻⇜	⇕↔	△	△	△	K29～
	Die-casting type, Lubrication type		↻⇜	⇕↔	△	△	△	
	Maintenance-free type		↻⇜	⇕↔	△	△	△	
L-Balls	Lubrication type		↻⇜	⇕↔	△	△	△	K45～

Symbol ↻ Rotation ⇜ Oscillating motion ↓ Radial load ← Axial load ↓ Light load ⇩ Medium load ⬇ Heavy load ◎ Especially excellent ○ Excellent △ Normal

Outline of Bearing Selection

IKO Bearings are available in many types and sizes. To obtain satisfactory bearing performance in machines and equipment, it is essential to select the most suitable bearing by carefully studying the requirements for the application. Although there is no particular procedure or rule for bearing selection, an example of a commonly adopted procedure is shown in the figure below.

An example of procedure for bearing selection

Step		
1 ***Confirmation of requirements and operating conditions***	● Identify the machine and place where the bearing is to be used. ● Confirm the requirements for bearings such as required bearing performance, and also confirm the operating conditions and special environment conditions.	
2 ***Selection of bearing type***	● Select the bearing type suitable for the operating conditions by considering load direction and magnitude, rigidity, friction, allowable rotational speed, bearing space, etc.	See page A5
3 ***Selection of bearing dimensions***	● Select the bearing dimensions by calculating bearing load, life, static safety factor, etc.	See page A17
4 ***Selection of accuracy class, etc.***	● Select the accuracy as required by the machine or equipment.	See page A30
5 ***Selection of radial clearance and fit***	● Select the radial clearance considering the fit, temperature, rotational speed, inclination of the inner and outer rings, etc.	See page A37
6 ***Determination of bearing dimensions, accuracy, radial clearance and fit***		
7 ***Selection of lubrication and dust-proof methods***	● Select oil or grease lubrication. ● After selection of lubricant, in case of oil lubrication, select the oil application method. ● Select the sealing method according to the lubricant.	See page A49
8 ***Design of surrounding part***	● Design the surrounding part based on how to mount or dismount and based on mounting dimensions.	See page A57
9 ***Determination of final specifications of the bearing and the surrounding part***		

Basic Dynamic Load Rating and Life

Life

Rolling bearings will suffer damage due to various causes during service. Damage such as abnormal wear, seizure, and cracks is caused by improper use, including incorrect mounting, lack of oil, dust intrusion and so on, and can be avoided by remedying these causes. However, bearings will eventually be damaged due to fatigue-flaking even if used properly. When a bearing rotates under load, the raceways and the rolling elements are subjected to repeated stresses concentrated on the part close to the surface. Fatigue, therefore, occurs in the surface layer, producing damage in the form of scaling. This is called flaking (spalling). When this occurs, the bearing can no longer be used.

Bearing Life

Bearing life is defined as the total number of revolutions (or total service hours at a constant rotational speed) before a sign of the first flaking appears on the rolling surface of raceway or rolling elements. However, even when bearings of the same size, structure, material and heat treatment are subjected to the same conditions, the bearing lives will show variation (See Fig. 1.). This results from the statistical nature of the fatigue phenomenon.
In selecting a bearing, it is incorrect to take an average life for all bearings as the design standard. It is more practical to consider a bearing life that is reliable for the greater proportion of bearings used. Therefore, the basic rating life defined in the following is used.

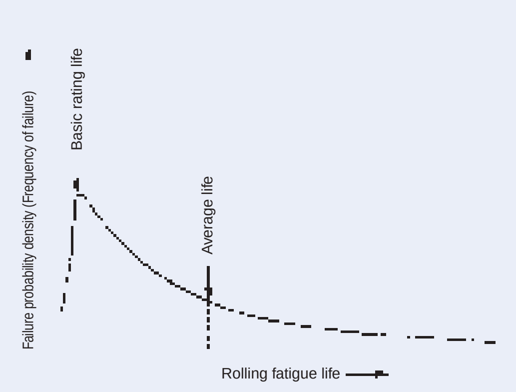


Fig. 1 Variation of rolling fatigue life

Basic rating life

The basic rating life is defined as the total number of revolutions that 90% of a group of identical bearings can be operated individually under the same conditions free from any material damage caused by rolling fatigue.
For rotation at a constant rotational speed, the basic rating life can be represented by the total service hours.

Basic dynamic load rating

The basic dynamic load rating is defined as the constant radial load (in the case of radial bearings) or the constant axial load acting along the bearing central axis (in the case of thrust bearings) that allows a basic rating life of 1,000,000 revolutions.

Calculation of rating life

The relationship among the basic rating life, basic dynamic load rating and dynamic equivalent load (bearing load) of rolling bearings is as follows:

$$L_{10}=\left(\frac{C}{P}\right)^{p} \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots(1)$$

where, L_{10} : Basic rating life, 10^6 rev.
C : Basic dynamic load rating, N
P : Dynamic equivalent load, N
p : Exponent, Roller bearing: 10/3
Ball bearing: 3

Accordingly, when the rotational speed per minute is given, the basic rating life is represented as the total service hours according to the following equations:

$$L_{h}=\frac{10^{6}L_{10}}{60n}=500\,f_{h}^{\;p} \cdots\cdots\cdots\cdots\cdots\cdots(2)$$

$$f_{h}=f_{n}\frac{C}{P} \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots(3)$$

$$f_{n}=\left(\frac{33.3}{n}\right)^{1/p} \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots(4)$$

where, L_h : Basic rating life represented by service hours, h
n : Rotational speed, min^{-1}
f_h : Life factor
f_n : Velocity factor

In addition, the rating life can be calculated by obtaining f_h and f_n from the life calculation scales of Fig. 2.

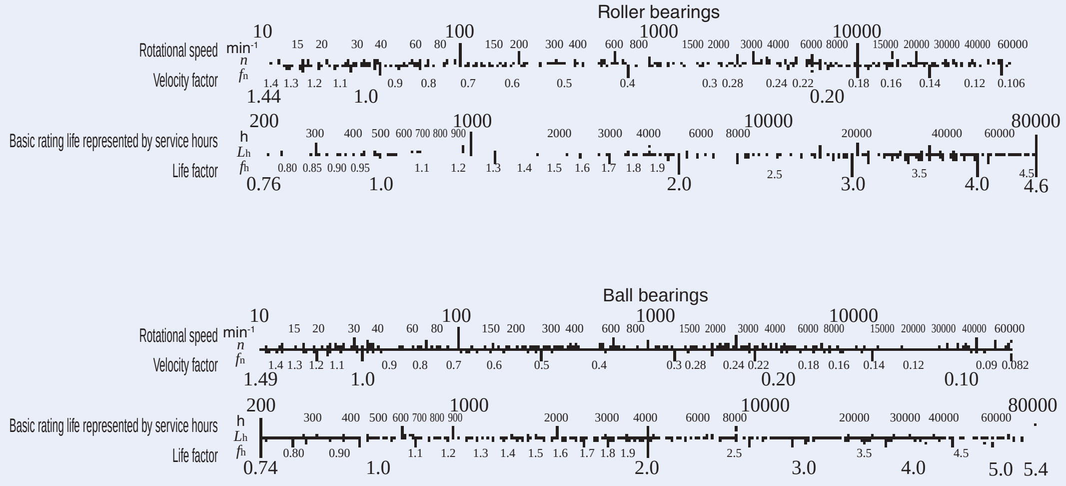


Fig. 2 Scales for rating life calculation

Bearing life factors for various machines

The required life of the bearing must be determined according to the machine in which the bearing is to be used and the operating conditions.
Table 1 shows reference values of life factors for selecting a bearing for each machine.

Table 1 Life factor of bearings f_h for various machines

Operating conditions	Machine and life factor f_h				
	～3	2～4	3～5	4～7	6～
Occasional or short term usage	・Power tools	・Agricultural machines			
Infrequent usage but requiring reliable operation		・Construction machinery	・Conveyors ・Elevators		
Intermittent operation but for comparatively long periods	・Roll neck of rolling mills	・Small motors ・Deck cranes ・General cargo cranes ・Passenger cars	・Factory motors ・Machine tools ・General gear units ・Printing machines	・Crane sheaves ・Compressors ・Important gear units	
Operated in excess of 8 hours per day or continuously for an extended time		・Escalators	・Centrifugal separators ・Blowers ・Wood working machines ・Plastic extruding machines		・Paper making machines
Continuous use for 24 hours and accidental stops not allowed					・Water supply equipment ・Power station equipment

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Life of oscillating bearing

The life of an oscillating bearing can be obtained from equation (5).

$$L_{OC} = \frac{90}{\theta}\left(\frac{C}{P}\right)^{p} \cdots\cdots\cdots\cdots (5)$$

where, L_{OC} : Basic rating life of oscillating bearing, 10^6 cycles

2θ : Oscillating angle, deg. (See Fig.3)

P : Dynamic equivalent load, N

Therefore, when the oscillating frequency $n_1$min^{-1} is given, the basic rating life as represented by total oscillating hours can be obtained by substituting n_1 for n in equation (2) on page A17.

When 2θ is small, an oil film cannot be formed easily between the contact surfaces of the raceway and the rolling elements. This may cause fretting corrosion. In this case, please consult IKO.

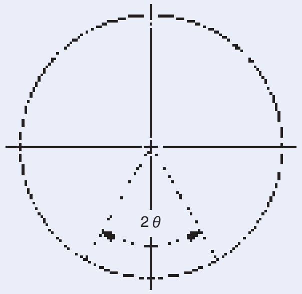


Fig. 3 Oscillating motion

Corrected rating life

When a rolling bearing is used in ordinary applications, the basic rating life can be calculated by equations (1) and (2) mentioned previously.

This basic rating life applies to bearings which require a reliability of 90%, have ordinary bearing properties being made of materials of ordinary quality for rolling bearings, and are used under ordinary operating conditions.

In some applications, however, it is necessary to obtain a rating life that applies to bearings which require high reliability, have special bearing properties or are used under special operating conditions. The corrected rating life for these special cases can be obtained from the following equation by using the bearing life adjustment factors a_1, a_2 and a_3, respectively.

$$L_{na} = a_1 a_2 a_3 L_{10} \cdots\cdots\cdots\cdots (6)$$

where, L_{na} : Corrected rating life, 10^6 rev.

a_1 : Life adjustment factor for reliability

a_2 : Life adjustment factor for special bearing properties

a_3 : Life adjustment factor for operating conditions

Life adjustment factor for reliability a_1

The reliability of rolling bearings is defined as the proportion of bearings having a life equal to or greater than a certain specified value when a group of identical bearings are operated under identical conditions. With respect to individual bearings, it refers to the probability of the life of a bearing being equal to or greater than a certain specified value.

The corrected rating life for a reliability of (100-n)% can be obtained using equation (6). Table 2 shows the values of the life adjustment factor a_1 for various reliabilities.

Table 2 Life adjustment factor for reliability a_1

Reliability %	L_n	a_1
90	L_{10}	1
95	L_5	0.62
96	L_4	0.53
97	L_3	0.44
98	L_2	0.33
99	L_1	0.21

Life adjustment factor for special bearing properties a_2

The bearing life is extended or shortened according to the quality of the material, the manufacturing technology of the bearing and its internal design. For these special bearing life properties, the life is corrected by the life adjustment factor for special bearing properties a_2.

The table of dimensions for IKO Bearings shows the values of the basic dynamic load rating which are determined taking into consideration the fact that bearing life has been extended by improved quality of materials and advances in manufacturing technologies. Therefore, the bearing life is calculated using equation (6) usually assuming $a_2 = 1$.

Life adjustment factor for operating conditions a_3

This factor helps take into account the effects of operating conditions, especially lubrication on the bearing. The bearing life is limited by the phenomenon of fatigue which occurs, in general, beneath surfaces subjected to repeated stresses. Under good lubrication conditions where the rolling element and raceway surfaces are completely separated by an oil film and surface damage can be disregarded, a_3 is set to be 1. However, when conditions of lubrication are not good, namely, when the viscosity of the lubricating oil is low or the peripheral speed of the rolling elements is especially low, and so on, $a_3 < 1$ is used.

On the other hand, when lubrication is especially good, a value of $a_3 > 1$ can be used. When lubrication is not good and $a_3 < 1$ is used, the life adjustment factor a_2 cannot generally exceed 1.

When selecting a bearing according to the basic dynamic load rating, it is recommended that a suitable value for reliability factor a_1 is chosen for each application. The selection should be made using the (C/P) or f_h values determined by machine type and based upon the actual conditions of lubrication, temperature, mounting, etc., which have already been experienced and observed in the same type of machines.

Limiting conditions

These bearing life equations are applicable only when the bearing is mounted and lubricated normally without intrusion of foreign materials and not used under extreme operating conditions.

Unless these conditions are satisfied, the life may be shortened. For example, it is necessary to separately consider the effects of bearing mounting errors, excessive deformation of housing and shaft, centrifugal force acting on rolling elements at high-speed revolution, excessive preload, especially large radial internal clearance of radial bearings, etc.

When the dynamic equivalent load exceeds 1/2 of the basic dynamic load rating, the life equations may not be applicable.

Correction of basic dynamic load rating for temperature and hardness

Temperature factor

The operating temperature for each bearing is determined according to its material and structure. If special heat treatment is performed, bearings can be used at temperatures higher than +150°C. As the allowable contact stress gradually decreases when the bearing temperature exceeds 150°C, the basic dynamic load rating is lowered and can be obtained by the following equation:

$$C_t = f_t\, C \cdots\cdots\cdots\cdots (7)$$

where, C_t : Basic dynamic load rating considering temperature rise, N

f_t : Temperature factor (See Fig. 4.)

C : Basic dynamic load rating, N

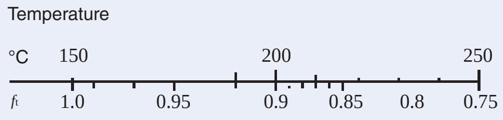


Fig. 4 Temperature factor

Further, if the bearing is used at high temperature, i.e. 120°C or above, the amount of dimensional displacement gets larger. So special heat treatment is necessary. If needed, please contact IKO.

Hardness factor

When the shaft or housing is used as the raceway surface instead of the inner or outer ring, the surface hardness of the part used as the raceway surface should be 58 ～ 64HRC.

If it is less than 58HRC, the basic dynamic load rating is lowered and can be obtained by the following equation:

$$C_H = f_H\, C \cdots\cdots\cdots\cdots (8)$$

where, C_H : Basic dynamic load rating considering hardness, N

f_H : Hardness factor (See Fig. 5.)

C : Basic dynamic load rating N

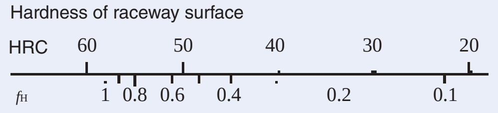


Fig. 5 Hardness factor

Basic Static Load Rating and Static Safety Factor

Basic static load rating

When a bearing at rest sustains a heavy load or a bearing rotating at a relatively low speed receives a heavy shock load, the contact stress may exceed a certain limiting value, producing a local permanent deformation in the raceways or the rolling elements, and subsequently causing noise or vibration or lowering the rotating performance. The basic static load rating is, therefore, determined as a guideline for the maximum allowable load for the bearing at rest, under which the permanent deformation will not exceed a certain limit value, and the lowering of the rotating performance will not occur. Its definition is given as follows.

The basic static load rating is the static load that gives the contact stress shown in Table 3 at the center of the contact area of the rolling element and the raceway receiving the maximum load. A radial load constant in direction and magnitude is used in the case of radial bearings, while an axial load constant in magnitude acting along the bearing central axis is used in the case of thrust bearings.

Table 3

Type of bearing	Contact stress MPa
Roller bearings	4 000
Self-aligning ball bearings	4 600
Other ball bearings	4 200

Static safety factor

The basic static load rating gives the theoretical allowable limit of the static equivalent load. Normally, this limit is corrected by considering the operating conditions and the requirements for the bearing. The correction factor, namely, the static safety factor f_s is defined as in the following equation and its general values are shown in Table 4.

$$f_s = \frac{C_0}{P_0} \quad \cdots\cdots(9)$$

where, C_0 : Basic static load rating, N
P_0 : Static equivalent load, N

Table 4 Static safety factor

Operating conditions of the bearing	f_s
When high rotational accuracy is required	≧ 3
For ordinary operation conditions	≧ 1.5
For ordinary operation conditions not requiring very smooth rotation When there is almost no rotation	≧ 1

In case of Shell Type Needle Roller Bearings of which outer ring is drawn from a thin steel plate and then carburized and quenched, it is necessary to use a static safety factor of 3 or more.

Calculation of Bearing Loads

The loads acting on bearings include the weight of the machine parts supported by the bearings, the weight of the rotating body, loads produced when operating the machine, loads by belts or gears transmitting power, and various other loads.

These loads can be divided into radial loads perpendicular to the central axis of the bearings and axial loads parallel to the central axis, and they act independently or in combination with other loads. In addition, the magnitude of vibration or shocks on the bearings varies depending on the application of the machine. Thus, theoretically calculated loads may not always be accurate and have to be corrected by multiplying various empirical factors to obtain the actual bearing loads.

Load distribution to bearings

Table 5 shows examples of calculations where static loads are acting in radial direction.

Load factor

Although radial loads and axial loads can be obtained by calculation, it is not unusual for the actual bearing loads to exceed the calculated loads, due to vibration and shocks produced when operating the machine. The actual bearing load is obtained from the following equation, by multiplying the calculated load by the load factor:

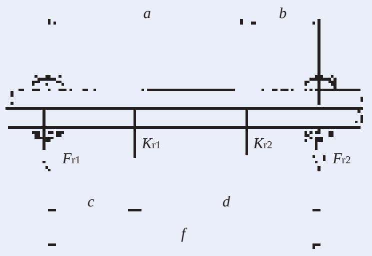
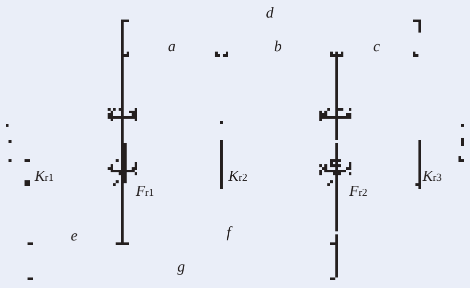
$$F = f_w F_c \quad \cdots\cdots(10)$$

where, F : Bearing load, N
f_w : Load factor (See Table 6.)
F_c : Theoretically calculated load, N

Table 6 Load factor

Operating conditions	Example	f_w
Smooth operation without shocks	Electric motors, Air conditioning equipment, Measuring instruments, Machine tools	1 ～1.2
Ordinary operation	Reduction gearboxes, Vehicles, Textile machinery, Paper making machinery	1.2～1.5
Operation subjected to vibration and shocks	Rolling mills, Rock crushers, Construction machinery	1.5～3

Table 5 Load distribution to bearings

Example	Bearing load
	$F_{r1} = \dfrac{dK_{r1} + bK_{r2}}{f}$ $F_{r2} = \dfrac{cK_{r1} + aK_{r2}}{f}$
	$F_{r1} = \dfrac{gK_{r1} + bK_{r2} - cK_{r3}}{f}$ $F_{r2} = \dfrac{aK_{r2} + dK_{r3} - eK_{r1}}{f}$

Bearing loads in case of belt or chain transmission

When power is transmitted by a belt or chain, the load acting on the pulley or sprocket wheel is obtained from the following equations:

$$T = 9550000\,\frac{H}{n} \quad \cdots\cdots (11)$$

$$K_t = \frac{T}{R} \quad \cdots\cdots (12)$$

where, T : Torque acting on pulley or sprocket wheel, N-mm
K_t : Effective transmitting force of belt or chain, N
H : Transmitting power, kW
n : Rotational speed, min^{-1}
R : Effective radius of pulley or sprocket wheel, mm

For belt transmission, the load K_r acting on the pulley shaft is obtained from the following equation, multiplying the effective transmitting force K_t by the belt factor f_b shown in Table 7.

$$K_r = f_b K_t \quad \cdots\cdots (13)$$

Table 7 Belt factor

Type of belt	f_b
V-belts	2 ～2.5
Timing belts	1.3～2
Plain belts (with tension pulley)	2.5～3
Plain belts	4 ～5

In the case of chain transmission, a value of 1.2 to 1.5 is taken as the chain factor corresponding to f_b. The load acting on the sprocket wheel shaft is obtained from equation (13) in the same manner as the belt transmission.

Bearing loads in case of gear transmission

When power is transmitted by gears, the force acting on the gears varies according to the type of gear. Spur gears produce radial loads only, but helical gears, bevel gears and worm gears produce axial loads in addition to radial loads. Taking the simplest case of spur gears as an example, the bearing load is obtained from the following equations:

$$T = 9550000\,\frac{H}{n} \quad \cdots\cdots (14)$$

$$K_t = \frac{T}{R} \quad \cdots\cdots (15)$$

$$K_s = K_t \tan\theta \quad \cdots\cdots (16)$$

$$K_c = \sqrt{K_t^2 + K_s^2} = K_t \sec\theta \quad \cdots\cdots (17)$$

where, T : Torque applied to gear, N-mm
K_t : Tangential force acting on gear, N
K_s : Radial force acting on gear, N
K_c : Resultant normal force on gear tooth surface, N
H : Transmitting power, kW
n : Rotational speed, min^{-1}
R : Pitch circle radius of drive gear, mm
θ : Pressure angle of gear, deg.

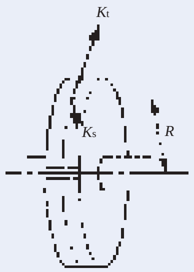


Fig. 6

In this case, the resultant normal force on the tooth surface acts as the radial force to the shaft and the magnitude of vibration or shocks varies depending on the accuracy and surface finish of the gear. Therefore, the radial load K_r applied to the shaft is obtained from the following equation, multiplying the resultant normal force K_c on gear tooth surface by the gear factor f_z shown in Table 8.

$$K_r = f_z\,K_c \quad \cdots\cdots (18)$$

Table 8 Gear factor

Type of gear	f_z
Precision gears (Pitch error and form error: Less than 0.02mm)	1.05～1.1
Ordinary machined gears (Pitch error and form error: 0.02～0.1mm)	1.1 ～1.3

Mean equivalent load corresponding to fluctuating load

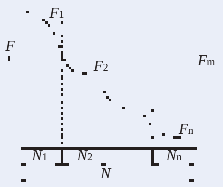
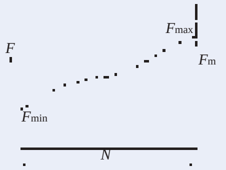
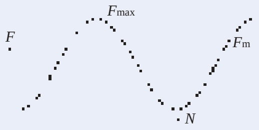
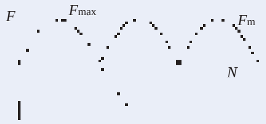
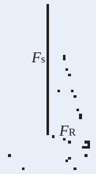
When the load applied to the bearing fluctuates, the bearing life is calculated by using the mean equivalent load F_m, which is a constant load that will give the bearing a life equal to that produced under the fluctuating load. The mean equivalent load is obtained from the following equation:

$$F_m = \sqrt[p]{\frac{1}{N}\int_0^N F_n{}^p \, dN} \quad \cdots\cdots (19)$$

where, F_m : Mean equivalent load, N
N : Total number of revolutions, rev.
F_n : Fluctuating load, N
p : Exponent, Roller bearing = 10/3
Ball bearing = 3

Table 9 shows examples of the calculation of mean equivalent loads for various fluctuating loads.

Table 9 Mean equivalent load for the fluctuation load

Type of fluctuating load		Mean equivalent load F_m
Step load		$F_m = \sqrt[p]{\frac{1}{N}\left(F_1{}^p N_1 + F_2{}^p N_2 + \cdots + F_n^p N_n\right)}$ where, N_1 : Total number of revolutions under load F_1 rev. N_2 : Total number of revolutions under load F_2 rev. N_n : Total number of revolutions under load F_n rev.
Monotonously changing load		$F_m = \frac{1}{3}\left(2F_{max} + F_{min}\right)$ where, F_{max} : Maximum value of fluctuating load, N F_{min} : Minimum value of fluctuating load, N
Sinusoidally fluctuating load		$F_m \fallingdotseq 0.65 F_{max}$
		$F_m \fallingdotseq 0.75 F_{max}$
Stationary load plus rotating load		$F_m = F_S + F_R - \frac{F_S F_R}{F_S + F_R}$ where, F_S : Stationary load, N F_R : Rotating load, N

Equivalent load

The loads applied to the bearing are divided into radial loads that are applied perpendicular to the central axis and axial loads that are applied in parallel to the central axis. These loads act independently or in combination with other loads.

Dynamic equivalent load

When both radial load and axial load are applied to the bearing simultaneously, the virtual load, acting on the center of the bearing, that will give a life equal to that under the radial load and the axial load is defined as a dynamic equivalent load.
In the case of needle roller bearings, radial bearings receive only radial loads and thrust bearings receive only axial loads. Accordingly, radial loads are directly used in the life calculation of the radial bearings, while axial loads are directly used for the thrust bearings.

[For radial bearings]

$$P_r = F_r \quad \cdots\cdots (20)$$

[For thrust bearings]

$$P_a = F_a \quad \cdots\cdots (21)$$

where, P_r : Dynamic equivalent radial load, N
P_a : Dynamic equivalent axial load, N
F_r : Radial load, N
F_a : Axial load, N

Static equivalent load

When both radial load and axial load are applied to the bearing simultaneously, the virtual load, acting on the center of the bearing, that will produce a maximum contact stress on the contact surface between the rolling element and the raceway equal to that given by the radial load and the axial load is defined as a static equivalent load.
In the case of needle roller bearings, radial bearings receive only radial loads and thrust bearings receive only axial loads. Accordingly, radial loads are directly used for the radial bearings, while axial loads are directly used for the thrust bearings.

[For radial bearings]

$$P_{0r} = F_r \quad \cdots\cdots (22)$$

[For thrust bearings]

$$P_{0a} = F_a \quad \cdots\cdots (23)$$

where, P_{0r} : Static equivalent radial load, N
P_{0a} : Static equivalent axial load, N
F_r : Radial load, N
F_a : Axial load, N

Boundary Dimensions and Identification Number

Boundary dimensions

Examples of symbols for quantities indicating the boundary dimensions of IKO Needle Roller Bearings are shown below. For details, see the table of dimensions for each model.

Machined Type Needle Roller Bearing

d : Nominal bearing bore diameter
D : Nominal bearing outside diameter
B : Nominal inner ring width
C : Nominal outer ring width
F_w : Nominal roller set bore diameter
r : Chamfer dimensions of inner and outer rings
$r_{s\,min}$: Smallest permissible single chamfer dimensions of inner and outer rings

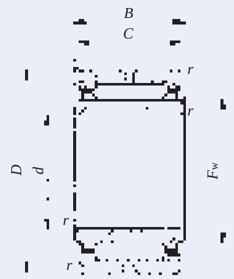


Fig. 7 Machined Type Needle Roller Bearing

Shell Type Needle Roller Bearing

D : Nominal bearing outside diameter
F_w : Nominal roller set bore diameter
C : Nominal outer ring width

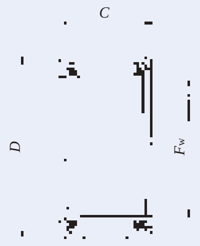


Fig. 8 Shell Type Needle Roller Bearing

Needle Roller Cage

E_w : Nominal roller set outside diameter
F_w : Nominal roller set bore diameter
B_c : Nominal cage width

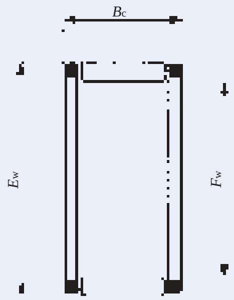


Fig. 9 Needle Roller Cage

Thrust Roller Bearing

D_c : Nominal cage outside diameter
d_c : Nominal cage bore diameter
D_w : Nominal roller diameter

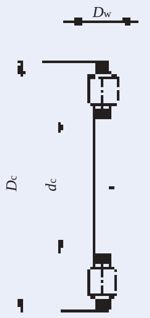


Fig. 10 Thrust Roller Bearing

Identification Number

The identification number of IKO Bearings consists of a model number and supplemental codes. The descriptions of typical codes and their arrangements are shown below. There are many codes other than those described. See the section of identification number of each bearing.

Table 10 Arrangement of identification number of bearing

Model number	Model code	❶
	Boundary dimensions	❷
Supplemental code	Material symbol	❸
	Cage symbol	❹
	Shield symbol Seal symbol,	❺
	Bearing ring shape symbol	❻
	Clearance symbol	❼
	Classification symbol	❽

❶Model code

The model code represents the bearing series. The features of each bearing series are shown on pages A5 to A15.

❷Boundary dimensions

One of the following four kinds of presentation methods is used for showing boundary dimensions in the identification number, which vary depending on the bearing series. Table 11 shows the presentation methods of boundary dimensions for each model code.

(a)Dimension series + Bore diameter number
(b)Bore diameter or roller set bore diameter + Outside diameter or roller set outside diameter + Width
(c)Bore diameter or roller set bore diameter + Width
(d)Basic diameter

❸Material symbol

Symbol	Type of material
F	Stainless steel for bearing rings and rolling elements

❹Cage symbol

Symbol	Descriptions
N	Made of synthetic resin
V	No cage or full complement

❺Seal or shield symbol

Symbol	Descriptions
Z	With dust cover
ZZ	With shields on both sides
U	With a seal on one side
UU	With seals on both sides
S(1)	With ThrustDisk Seals™
2RS	With seals on both sides

Note(1) ThrustDisk Seals™ are embedded on both sides.

❻Bearing ring shape symbol

Symbol	Descriptions
NR	With stop ring on outer surface of outer ring
OH(1)	With oil hole in bearing ring
J	No oil hole

Note(1) This differs depending on the type of bearing. See the section of each bearing.

❼Clearance symbol

Symbol	Descriptions
C2	C2 clearance
(None)	CN clearance
C3	C3 clearance
C4	C4 clearance
C5	C5 clearance
T1	Special radial clearance (Applicable to Crossed Roller Bearings)
C1	
C2	

❽Classification symbol

Symbol	Descriptions
(None)	JIS Class 0
P6	JIS Class 6
P5	JIS Class 5
P4	JIS Class 4

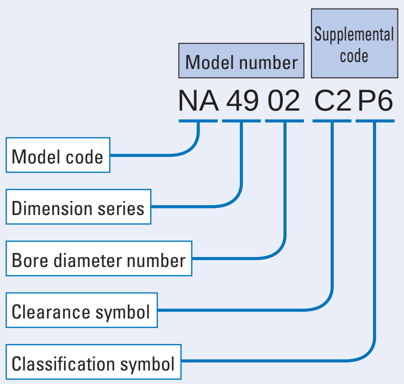
Table 11 Indication of boundary dimensions

Bearing type	Model number	
	Model code	Indication of boundary dimensions
Shell Type Needle Roller Bearings	TA, TLA, YT, YTL	Roller set bore diameter + Outer ring width
	BA, BHA, YB, YBH	Roller set bore diameter + Outer ring width (1)
Needle Roller Cages for General Usage	KT, KTW	Roller set bore diameter + Roller set outside diameter + Cage width
Needle Roller Cages for Engine Connecting Rods	KT···EG, KTV···EG	Roller set bore diameter + Roller set outside diameter + Cage width
Machined Type Needle Roller Bearings	NA, RNA	Dimension series + Bore diameter number
	TR, TAF, GTR	Roller set bore diameter + Bearing outside diameter + Bearing width
	TRI, TAFI, GTRI	Bearing bore diameter + Bearing outside diameter + Outer ring width
	BR	Roller set bore diameter + Bearing outside diameter + Bearing width (1)
	BRI	Bearing bore diameter + Bearing outside diameter + Outer ring width (1)
Needle Roller Bearings with Separable Cage	RNAF, RNAFW	Roller set bore diameter + Bearing outside diameter + Bearing width
	NAF, NAFW	Bearing bore diameter + Bearing outside diameter + Bearing width
Roller Bearings	NAU, NAG, NAS	Dimension series + Bore diameter number
	TRU	Bearing bore diameter + Bearing outside diameter + Bearing width
Thrust Bearings	NTB, AS, WS, GS	Bearing bore diameter + Bearing outside diameter
	AZ	Bearing bore diameter + Bearing outside diameter + Bearing height
	AZK	Bearing bore diameter + Bearing outside diameter + Roller diameter
Combined Type Needle Roller Bearings	NAX, NBX	Roller set bore diameter + Assembled bearing width
	NAXI, NBXI	Inner ring bore diameter + Assembled bearing width
	NATA, NATB	Dimensional series + Bore diameter number
Cam Followers	CF···B, CFS, NUCF···B	Stud diameter
	CFKR	Bearing outside diameter
	CR···B, CR, CRH···B	Bearing outside diameter (1)
Roller Followers	NAST, NART, NURT	Bearing bore diameter
	CRY	Bearing outside diameter (1)
Crossed Roller Bearings	CRBHV, CRBFV, CRBC, CRB, CRBT, CRBTF, CRBS	Bearing bore diameter + Bearing width
Spherical Bushings	SB···A, GE	Inner ring bore diameter
	SBB	Inner ring bore diameter (1)
PILLOBALLs	PB,PHS,POS,PHSB,POSB,PHSA	Inner ring bore diameter
L-Balls	LHSA, LHS	Screw size
Seals for Needle Roller Bearings	OS, DS	Shaft diameter + Seal outside diameter + Seal width
Cir-clips for Needle Roller Bearings	WR	Shaft diameter
	AR	Bore diameter

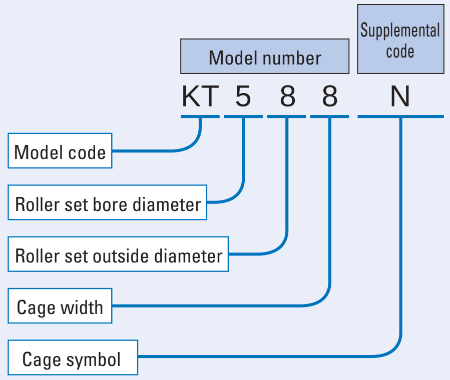
Note(1) The nominal dimensions of inch series bearings are indicated in units of 1/16 inch.

Example of identification number

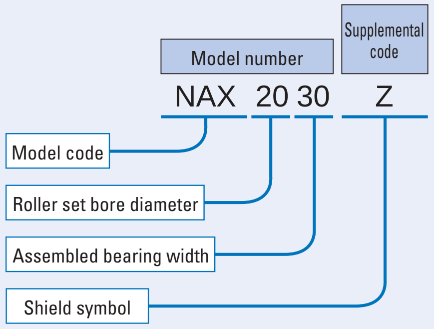
(a) Example of "Dimension series + Bore diameter number"



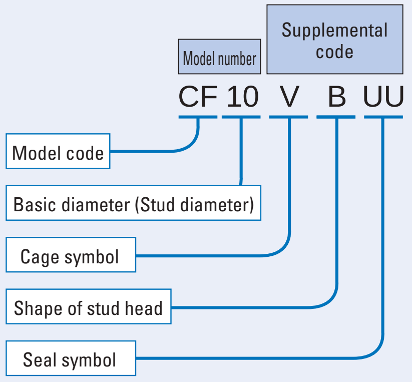
(b) Example of "Bore diameter or roller set bore diameter + Outside diameter or roller set outside diameter + width"



(c) Example of "Bore diameter or roller set bore diameter + width"



(d) Example of "Basic diameter"



Accuracy

The accuracy of IKO Needle Roller Bearings conforms to JIS B 1514-1~-3 (Rolling bearings - Tolerances of bearings), and the dimensional accuracy and rotational accuracy are specified. The specified items are shown in Fig. 11.

Needle Roller Bearings are classified into 4 classes of accuracy. These classes are represented by the numbers 0, 6, 5 and 4, written in order of increasing accuracy.

Table 12 shows the accuracy for the inner rings of radial bearings, Table 13 shows the accuracy for the outer rings of radial bearings, Table 14 shows the tolerances for the smallest single roller set bore diameter of radial bearings, and Table 15 shows the permissible limit values of chamfer dimensions of radial bearings. For thrust bearings, see the section on accuracy of Thrust Bearings. Note that the series of Shell Type Needle Roller Bearings, Roller Bearings, Cam Followers, Roller Followers, Combined Type Needle Roller Bearings, and Crossed Roller Bearings have special accuracy. For further details, see the section on accuracy of each bearing series.

Remarks

The meanings of the new symbols for quantities used for accuracy of radial bearings are as follows:

① Δ represents the deviation of a dimension from the specified value.

② V represents the variation of a dimension.

③ Suffixes $_s$, $_m$, and $_p$ represent a single (or actual) measurement, a mean measurement, and a measurement in a single radial plane, respectively.

[Example] V_{dp} means the difference between the largest and the smallest of the bore diameters in a single radial plane (circularity). V_{dmp} means the difference between the largest and the smallest of the single plane mean bore diameters (cylindricity).

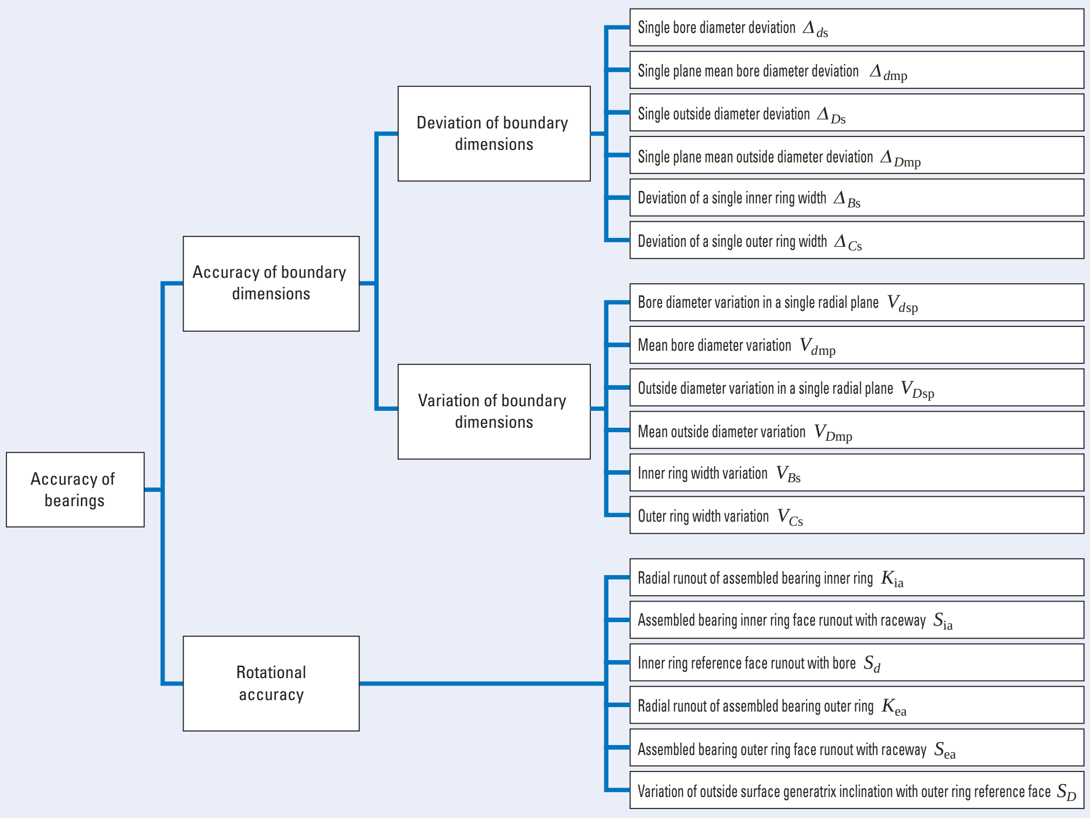


Fig. 11 Accuracy of bearings

Table 12 Tolerances for inner ring

unit: μ m

d Nominal bearing bore diameter mm		Δ_{dmp} Single plane mean bore diameter deviation								Δ_{ds} Single bore diameter deviation		V_{dsp} Bore diameter variation in a single radial plane								V_{dmp} Mean bore diameter variation			
												Diameter series 8, 9(1)				Diameter series 0(2)							
		Class 0		Class 6		Class 5		Class 4		Class 4		Class 0	Class 6	Class 5	Class 4	Class 0	Class 6	Class 5	Class 4	Class 0	Class 6	Class 5	Class 4
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	Max.				Max.				Max.			
2.5	10	0	- 8	0	- 7	0	- 5	0	- 4	0	- 4	10	9	5	4	8	7	4	3	6	5	3	2
10	18	0	- 8	0	- 7	0	- 5	0	- 4	0	- 4	10	9	5	4	8	7	4	3	6	5	3	2
18	30	0	- 10	0	- 8	0	- 6	0	- 5	0	- 5	13	10	6	5	10	8	5	4	8	6	3	2.5
30	50	0	- 12	0	- 10	0	- 8	0	- 6	0	- 6	15	13	8	6	12	10	6	5	9	8	4	3
50	80	0	- 15	0	- 12	0	- 9	0	- 7	0	- 7	19	15	9	7	19	15	7	5	11	9	5	3.5
80	120	0	- 20	0	- 15	0	- 10	0	- 8	0	- 8	25	19	10	8	25	19	8	6	15	11	5	4
120	180	0	- 25	0	- 18	0	- 13	0	- 10	0	- 10	31	23	13	10	31	23	10	8	19	14	7	5
180	250	0	- 30	0	- 22	0	- 15	0	- 12	0	- 12	38	28	15	12	38	28	12	9	23	17	8	6
250	315	0	- 35	0	- 25	0	- 18					44	31	18		44	31	14		26	19	9	
315	400	0	- 40	0	- 30	0	- 23					50	38	23		50	38	18		30	23	12	
400	500	0	- 45	0	- 35							56	44			56	44			34	26		
500	630	0	- 50	0	- 40							63	50			63	50			38	30		
630	800	0	- 75																				
800	1000	0	- 100																				
1000	1250	0	- 125																				
1250	1600	0	- 160																				
1600	2000	0	- 200																				

K_{ia} Radial runout of assembled bearing inner ring				S_d Inner ring reference face runout with bore		S_{ia}(3) Assembled bearing inner ring face runout with raceway		Δ_{Bs} Deviation of a single inner ring width								V_{Bs} Inner ring width variation				d Nominal bearing bore diameter mm	
Class 0	Class 6	Class 5	Class 4	Class 5	Class 4	Class 5	Class 4	Class 0		Class 6		Class 5		Class 4		Class 0	Class 6	Class 5	Class 4		
Max.				Max.		Max.		High	Low	High	Low	High	Low	High	Low	Max.				Over	Incl.
10	6	4	2.5	7	3	7	3	0	- 120	0	- 120	0	- 40	0	- 40	15	15	5	2.5	2.5	10
10	7	4	2.5	7	3	7	3	0	- 120	0	- 120	0	- 80	0	- 80	20	20	5	2.5	10	18
13	8	4	3	8	4	8	4	0	- 120	0	- 120	0	- 120	0	- 120	20	20	5	2.5	18	30
15	10	5	4	8	4	8	4	0	- 120	0	- 120	0	- 120	0	- 120	20	20	5	3	30	50
20	10	5	4	8	5	8	5	0	- 150	0	- 150	0	- 150	0	- 150	25	25	6	4	50	80
25	13	6	5	9	5	9	5	0	- 200	0	- 200	0	- 200	0	- 200	25	25	7	4	80	120
30	18	8	6	10	6	10	7	0	- 250	0	- 250	0	- 250	0	- 250	30	30	8	5	120	180
40	20	10	8	11	7	13	8	0	- 300	0	- 300	0	- 300	0	- 300	30	30	10	6	180	250
50	25	13		13		15		0	- 350	0	- 350	0	- 350			35	35	13		250	315
60	30	15		15		20		0	- 400	0	- 400	0	- 400			40	40	15		315	400
65	35							0	- 450	0	- 450					50	45			400	500
70	40							0	- 500	0	- 500					60	50			500	630
80								0	- 750							70				630	800
90								0	- 1000							80				800	1000
100								0	- 1250							100				1000	1250
120								0	- 1600							120				1250	1600
140								0	- 2000							140				1600	2000

Note(1) Applicable to all series except NAS series
(2) Applicable to NAS series
(3) Applicable to NATA and NATB series

Table 13 Tolerances for outer ring

unit: μ m

D Nominal bearing outside diameter mm		Δ_{Dmp} Single plane mean outside diameter deviation								Δ_{Ds} Single outside diameter deviation		V_{Dsp}(1) Outside diameter variation in a single radial plane								
												Open bearing								Bearing with seal or shield
												Diameter series 8, 9(2)				Diameter series 0(3)				Diameter series 0(3)
		Class 0		Class 6		Class 5		Class 4		Class 4		Class 0	Class 6	Class 5	Class 4	Class 0	Class 6	Class 5	Class 4	Class 6
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	Max.				Max.				Max.
2.5	6	0	- 8	0	- 7	0	- 5	0	- 4	0	- 4	10	9	5	4	8	7	4	3	9
6	18	0	- 8	0	- 7	0	- 5	0	- 4	0	- 4	10	9	5	4	8	7	4	3	9
18	30	0	- 9	0	- 8	0	- 6	0	- 5	0	- 5	12	10	6	5	9	8	5	4	10
30	50	0	- 11	0	- 9	0	- 7	0	- 6	0	- 6	14	11	7	6	11	9	5	5	13
50	80	0	- 13	0	- 11	0	- 9	0	- 7	0	- 7	16	14	9	7	13	11	7	5	16
80	120	0	- 15	0	- 13	0	- 10	0	- 8	0	- 8	19	16	10	8	19	16	8	6	20
120	150	0	- 18	0	- 15	0	- 11	0	- 9	0	- 9	23	19	11	9	23	19	8	7	25
150	180	0	- 25	0	- 18	0	- 13	0	- 10	0	- 10	31	23	13	10	31	23	10	8	30
180	250	0	- 30	0	- 20	0	- 15	0	- 11	0	- 11	38	25	15	11	38	25	11	8	
250	315	0	- 35	0	- 25	0	- 18	0	- 13	0	- 13	44	31	18	13	44	31	14	10	
315	400	0	- 40	0	- 28	0	- 20	0	- 15	0	- 15	50	35	20	15	50	35	15	11	
400	500	0	- 45	0	- 33	0	- 23					56	41	23		56	41	17		
500	630	0	- 50	0	- 38	0	- 28					63	48	28		63	48	21		
630	800	0	- 75	0	- 45	0	- 35					94	56	35		94	56	26		
800	1000	0	- 100	0	- 60							125	75			125	75			
1000	1250	0	- 125																	
1250	1600	0	- 160																	
1600	2000	0	- 200																	
2000	2500	0	- 250																	

V_{Dmp} Mean outside diameter variation				K_{ea} Radial runout of assembled bearing outer ring				S_D Variation of outside surface generatrix inclination with outer ring reference face		S_{ea}(4) Assembled bearing outer ring face runout with raceway		Δ_{Cs} Deviation of a single outer ring width		V_{Cs} Outer ring width variation				D Nominal bearing outside diameter mm	
Class 0	Class 6	Class 5	Class 4	Class 0	Class 6	Class 5	Class 4	Class 5	Class 4	Class 5	Class 4	Class 0, 6, 5, 4		Class 0	Class 6	Class 5	Class 4		
Max.				Max.				Max.		Max.		High	Low	Max.				Over	Incl.
6	5	3	2	15	8	5	3	8	4	8	5	Same as the tolerance values of Δ_{Bs} for d of the same bearing		Same as the tolerance values of V_{Bs} for d of the same bearing		5	2.5	2.5	6
6	5	3	2	15	8	5	3	8	4	8	5					5	2.5	6	18
7	6	3	2.5	15	9	6	4	8	4	8	5					5	2.5	18	30
8	7	4	3	20	10	7	5	8	4	8	5					5	2.5	30	50
10	8	5	3.5	25	13	8	5	8	4	10	5					6	3	50	80
11	10	5	4	35	18	10	6	9	5	11	6					8	4	80	120
14	11	6	5	40	20	11	7	10	5	13	7					8	5	120	150
19	14	7	5	45	23	13	8	10	5	14	8					8	5	150	180
23	15	8	6	50	25	15	10	11	7	15	10					10	7	180	250
26	19	9	7	60	30	18	11	13	8	18	10					11	7	250	315
30	21	10	8	70	35	20	13	13	10	20	13					13	8	315	400
34	25	12		80	40	23		15		23						15		400	500
38	29	14		100	50	25		18		25						18		500	630
55	34	18		120	60	30		20		30						20		630	800
75	45			140	75													800	1000
				160														1000	1250
				190														1250	1600
				220														1600	2000
				250														2000	2500

Note(1) Classes 0 and 6 are applicable to outer rings without stop rings.
(2) Applicable to all series except NAS series
(3) Applicable to NAS series
(4) Applicable to NATA and NATB series

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Table 14 Tolerances for smallest single roller set bore diameter $F_{\mathrm{ws\,min}}$(1)

unit: μm

F_{w} Nominal roller set bore diameter mm		$\Delta_{F\mathrm{ws\,min}}$ Deviation of smallest single roller set bore diameter	
Over	Incl.	High	Low
3	6	+ 18	+ 10
6	10	+ 22	+ 13
10	18	+ 27	+ 16
18	30	+ 33	+ 20
30	50	+ 41	+ 25
50	80	+ 49	+ 30
80	120	+ 58	+ 36
120	180	+ 68	+ 43
180	250	+ 79	+ 50
250	315	+ 88	+ 56
315	400	+ 98	+ 62
400	500	+ 108	+ 68

Note(1) This is the diameter of the cylinder used instead of the inner ring, where the radial clearance becomes 0 at least in one radial direction.

Table 15 Permissible limit values for chamfer dimensions of radial bearings

unit: mm

$r_{\mathrm{s\,min}}$ Smallest permissible single chamfer dimension	d Nominal bore diameter		$r_{\mathrm{s\,max}}$ Largest permissible single chamfer dimension	
	Over	Incl.	Radial direction	Axial direction
0.1	—	—	0.55 (2)	0.55 (2)
0.15	—	—	0.6 (2)	0.6
0.2	—	—	0.7 (2)	0.8
0.3	—	40	0.8 (2)	1
	40	—	0.8	1
0.4 (1)	—	—	0.8	1.2
0.6	—	40	1.1 (2)	2
	40	—	1.3	2
1	—	50	1.5	3
	50	—	1.9	3
1.1	—	120	2	3.5
	120	—	2.5	4
1.5	—	120	2.3	4
	120	—	3	5
2	—	80	3	4.5
	80	220	3.5	5
	220	—	3.8	6
2.1	—	280	4	6.5
	280	—	4.5	7
2.5 (1)	—	100	3.8	6
	100	280	4.5	6
	280	—	5	7
3	—	280	5	8
	280	—	5.5	8
4	—	—	6.5	9
5	—	—	8	10
6	—	—	10	13

Note(1) Not specified in JIS.
(2) The numeric value differs from JIS.
Remark Although the exact shape of the chamfer is not specified, its profile in the axial plane must not extend beyond the imaginary circular arc of radius $r_{\mathrm{s\,min}}$ which is tangential to the inner ring side surface and bearing bore surface or to the outer ring side surface and bearing outside surface. (See Fig. 12.)

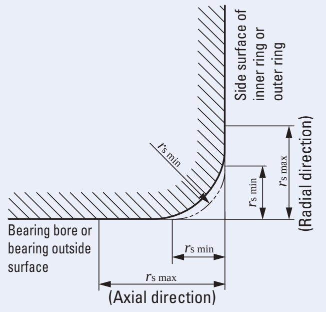
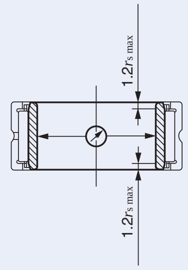
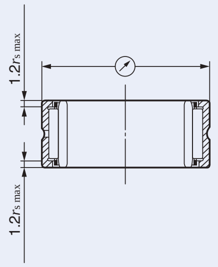


Fig. 12 Permissible values for chamfer dimensions

Methods of Measurement

Measurement of IKO Needle Roller Bearings is based on JIS B 1515-1, -2 (Rolling bearings-Tolerances). Tables 16 and 17 show some examples of the methods.
Special methods are used to measure Shell Type Needle Roller Bearings. Therefore, refer to the section on accuracy for these bearings on page B3.

Table 16 Measurement methods of accuracy of boundary dimensions

Measurement methods		Accuracy and definitions	
Single bore diameter	Zero the gauge indicator to the appropriate size using gauge blocks or a master ring. In several angular directions and in a single radial plane, measure and record the largest and the smallest single bore diameters, $d_{\mathrm{sp\,max}}$ and $d_{\mathrm{sp\,min}}$, within the measuring zone (excluding the zone 1.2 times the respective maximum allowable chamfer dimensions of the inner ring face). Repeat angular measurements and recordings in several radial planes to determine the largest and the smallest single bore diameter, $d_{\mathrm{s\,max}}$ and $d_{\mathrm{s\,min}}$. 	d_{mp} Mean bore diameter in a single plane	Calculated mean value of the maximum and minimum values of the single bore diameter within a radial plane. $d_{\mathrm{mp}}=\dfrac{d_{\mathrm{sp\,max}}+d_{\mathrm{sp\,min}}}{2}$ d_{sp} : Single bore diameter in a single plane
		$\Delta_{d\mathrm{mp}}$ Deviation of mean bore diameter in a single plane	Deviation of mean bore diameter in a single plane and nominal bore diameter. $\Delta_{d\mathrm{mp}}=d_{\mathrm{mp}}-d$ d : Nominal bearing bore diameter
		$V_{d\mathrm{sp}}$ Variation of bore diameter in a single plane	Deviation of the maximum and minimum values of the single bore diameter within a radial plane. $V_{d\mathrm{sp}}=d_{\mathrm{sp\,max}}-d_{\mathrm{sp\,min}}$
		$V_{d\mathrm{mp}}$ Variation of mean bore diameter	Deviation of the maximum and minimum values of mean bore diameter in a single plane, for individual raceway rings with essentially cylindrical bore diameter surfaces. $V_{d\mathrm{mp}}=d_{\mathrm{mp\,max}}-d_{\mathrm{mp\,min}}$
		$\Delta_{d\mathrm{s}}$ Deviation of a single bore diameter	Deviation of single bore diameter and nominal bore diameter. $\Delta_{d\mathrm{s}}=d_{\mathrm{s}}-d$ d_{s} : Single bore diameter (distance between two parallel straight lines touching the intersection of the single bore diameter surface and the radial plane)
Single outside diameter	Zero the gauge indicator to the appropriate size using gauge blocks or a master. In several angular directions and in a single radial plane, measure and record the largest and the smallest single outside diameters, $D_{\mathrm{sp\,max}}$ and $D_{\mathrm{sp\,min}}$, within the measuring zone (excluding the zone 1.2 times the respective maximum allowable chamfer dimensions of the outer ring face). Repeat and record measurements in several radial planes to determine the largest and the smallest single outside diameter, $D_{\mathrm{s\,max}}$ and $D_{\mathrm{s\,min}}$. 	D_{mp} Mean outside diameter in a single plane	Calculated mean value of the maximum and minimum values of the single outside diameter within a radial plane. $D_{\mathrm{mp}}=\dfrac{D_{\mathrm{sp\,max}}+D_{\mathrm{sp\,min}}}{2}$ D_{sp} : Single outside diameter in a single plane
		$\Delta_{D\mathrm{mp}}$ Deviation of mean outside diameter in a single plane	Deviation of mean outside diameter in a single plane and nominal outside diameter. $\Delta_{D\mathrm{mp}}=D_{\mathrm{mp}}-D$ D : Nominal bearing outside diameter
		$V_{D\mathrm{sp}}$ Variation of outside diameter in a single plane	Deviation of the maximum and minimum values of the single outside diameter within a radial plane. $V_{D\mathrm{sp}}=D_{\mathrm{sp\,max}}-D_{\mathrm{sp\,min}}$
		$V_{D\mathrm{mp}}$ Variation of mean outside diameter	Deviation of the maximum and minimum values of mean outside diameter in a single plane, for individual raceway rings with essentially cylindrical outside diameter surfaces. $V_{D\mathrm{mp}}=D_{\mathrm{mp\,max}}-D_{\mathrm{mp\,min}}$
		$\Delta_{D\mathrm{s}}$ Deviation of a single outside diameter	Deviation of single outside diameter and nominal outside diameter. $\Delta_{D\mathrm{s}}=D_{\mathrm{s}}-D$ D_{s} : Single outside diameter (distance between two parallel straight lines touching the intersection of the single outside diameter surface and the radial plane)

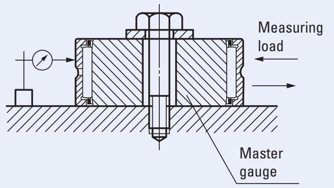
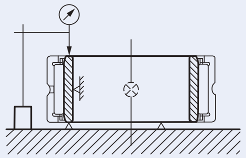
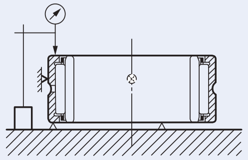
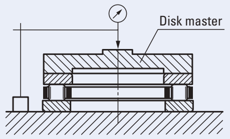
Measurement methods		Accuracy and definitions	
Single bore diameter of rolling element complement	Fasten the master gauge to a surface plate. Position the bearing on the master gauge and apply the indicator in the radial direction near the middle of the width on the ring outside surface. Measure the amount of movement of the outer ring in the radial direction by applying sufficient load on the outer ring in the same radial direction as that of the indicator and in the opposite radial direction. Record indicator readings at the extreme radial positions of the outer ring. Rotate the bearing and repeat the measurement in several different angular positions to determine the largest and the smallest readings, $F_{\mathrm{ws\,max}}$ and $F_{\mathrm{ws\,min}}$.  	F_{ws} Single bore diameter of roller complement	In radial bearings without inner rings, the distance between two parallel straight lines touching the intersection of the inscribed circle of roller complement and the radial plane.
		$F_{\mathrm{ws\,min}}$ Smallest single bore diameter of roller complement	In radial bearings without inner rings, the minimum value of the single bore diameter of roller complement. Remark Diameter of a cylinder where the smallest single bore diameter of roller complement has zero radial clearance in at least one radial direction.
Inner ring width	Zero the gauge indicator to the appropriate height from the reference surface using gauge blocks or a master. Support one face of the inner or outer ring on three equally spaced fixed supports of equal height and provide two suitable radial supports on the bore or outside surface set at 90° to each other to centre the inner or outer ring. Position the indicator against the other face of the ring opposite one fixed support. Rotate the inner or outer ring one revolution and measure and record the largest and the smallest single inner (outer) ring width, $B_{\mathrm{s\,max}}$ and $B_{\mathrm{s\,min}}$, ($C_{\mathrm{s\,max}}$ and $C_{\mathrm{s\,min}}$).  	Δ_{Bs} Deviation of a single inner ring width	Deviation of single inner ring width and nominal inner ring width. $\Delta_{Bs} = B_s - B$
		V_{Bs} Variation of inner ring width	Deviation of the maximum and minimum values of the single inner ring width for individual inner rings. $V_{Bs} = B_{\mathrm{s\,max}} - B_{\mathrm{s\,min}}$
Outer ring width		Δ_{Cs} Deviation of a single outer ring width	Deviation of single outer ring width and nominal outer ring width. $\Delta_{Cs} = C_s - C$
		V_{Cs} Variation of outer ring width	Deviation of the maximum and minimum values of the single outer ring width for individual outer rings. $V_{Cs} = C_{\mathrm{s\,max}} - C_{\mathrm{s\,min}}$
Bearing height	Support the bearing on a surface plate. Zero the gauge indicator to an appropriate height from the surface plate using gauge blocks or a master. Place a plate of known thickness on the bearing assembly, apply a dynamically stable coaxial load, and position the indicator over the centre of the plate. Rotate the housing washer several times, to be sure to reach the smallest height, and take indicator readings.  	Δ_{Ts} Deviation of the actual bearing height	Deviation of actual bearing height and nominal bearing height of the thrust bearing. $\Delta_{Ts} = T_s - T$ T_s : Actual bearing height T : Nominal bearing height

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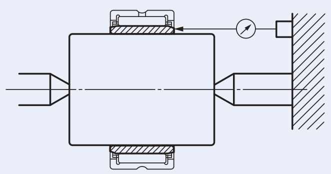
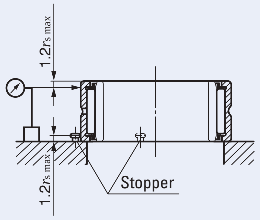
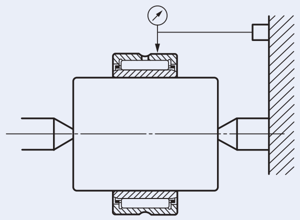
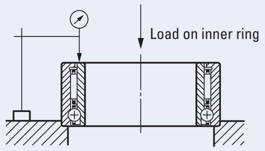
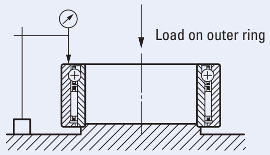
Table 17 Measurement methods for rotational accuracy

Accuracy	Measurement methods	
S_d **Perpendicularity of inner ring face with respect to the bore**	Use a precision arbor having a taper of approximately 1 : 5 000 on diameter. Mount the bearing assembly on the tapered arbor and place the arbor between two centres so that it can be accurately rotated. Position the indicator against the reference face of the inner ring at a radial distance from the arbor axis of half the mean diameter of the face. Take indicator readings while rotating the inner ring one revolution.	
S_D **Perpendicularity of outer ring outside surface with respect to the face**	Support the reference face of the outer ring on a surface plate leaving the inner ring, if an assembled bearing, free. Locate the outer ring cylindrical outside surface against two supports set at 90° to each other to centre the outer ring. Position the indicator directly above one support. The indicator and the two supports are axially located at the extremes of the measurement zone (positions 1.2 times the respective maximum allowable chamfer dimensions of the outer ring face). Take indicator readings while rotating the outer ring one revolution.	
K_{ia} **Radial runout of inner ring of assembled bearing**	Use a precision arbor having a taper of approximately 1 : 5 000 on diameter. Mount the bearing assembly on the tapered arbor and place the arbor between two centres so that it can be accurately rotated. Position the indicator against the outside surface of the outer ring as close as possible to the middle of the outer ring raceway. Hold the outer ring to prevent rotation but ensure its weight is supported by the rolling elements. Take indicator readings while rotating the arbor one revolution.	
K_{ea} **Radial runout of outer ring of assembled bearing**	Use a precision arbor having a taper of approximately 1 : 5 000 on diameter. Mount the bearing assembly on the tapered arbor and place the arbor between two centres so that it can be accurately rotated. Position the indicator against the outside surface of the outer ring as close as possible to the middle of the outer ring raceway. Hold the inner ring stationary. Take indicator readings while rotating the outer ring one revolution.	
S_{ia} **Axial runout of inner ring of assembled bearing**	Support the reference face of the outer ring on a surface plate with a pilot for centering the outside diameter of the ring. Apply a dynamically stable coaxial load to the reference face of the inner ring in order to ensure contact between rolling elements and raceways. Position the indicator against the reference face of the inner ring and take indicator readings while rotating the inner ring one revolution.	
S_{ea} **Axial runout of outer ring of assembled bearing**	Support the reference face of the inner ring on a surface plate with a pilot for centering in the bore of the inner ring. Apply a dynamically stable coaxial load to the reference face of the outer ring in order to ensure contact between rolling elements and raceways. Position the indicator against the reference face of the outer ring and take indicator readings while rotating the outer ring one revolution.	

Clearance

The clearances between the bearing rings and rolling elements are known as bearing clearances. When either the inner or outer ring is fixed and a specified measuring load is applied to the free bearing ring inward and outward alternately in the radial direction, the displacement of the free bearing is referred to as the radial internal clearance. The amount of measuring load in this case is extremely small, and its values are specified in JIS B 1515-2 (Rolling bearings-Tolerances-Part2:Measuring and gauging principles and methods).

❶Table 18 shows the radial internal clearances of Needle Roller Bearings with Inner Ring based on JIS B 1520 (Rolling bearings-Radial internal clearance). The radial internal clearances are classified into C2, CN, C3, C4, and C5, with clearances increasing in this order. CN is used under normal operating conditions. When a smaller range in radial internal clearance than the values shown in Table 18 is required, please consult IKO.

❷In the case of Shell Type Needle Roller Bearings, the correct dimensional accuracy is achieved only after the bearings are press-fitted into the specified housing bore. Therefore, the clearances shown in Table 18 are not applicable. See page B5.

❸For the radial internal clearances of Cam Followers, Roller Followers and Crossed Roller Bearings, see the relevant section for each bearing.

Table 18 Radial internal clearances of Needle Roller Bearings

unit: μm

d Nominal bore diameter mm		Classification of clearances									
		C2		CN		C3		C4		C5	
Over	Incl.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
—	10	0	25	20	45	35	60	50	75	—	—
10	24	0	25	20	45	35	60	50	75	65	90
24	30	0	25	20	45	35	60	50	75	70	95
30	40	5	30	25	50	45	70	60	85	80	105
40	50	5	35	30	60	50	80	70	100	95	125
50	65	10	40	40	70	60	90	80	110	110	140
65	80	10	45	40	75	65	100	90	125	130	165
80	100	15	50	50	85	75	110	105	140	155	190
100	120	15	55	50	90	85	125	125	165	180	220
120	140	15	60	60	105	100	145	145	190	200	245
140	160	20	70	70	120	115	165	165	215	225	275
160	180	25	75	75	125	120	170	170	220	250	300
180	200	35	90	90	145	140	195	195	250	275	330
200	225	45	105	105	165	160	220	220	280	305	365
225	250	45	110	110	175	170	235	235	300	330	395
250	280	55	125	125	195	190	260	260	330	370	440
280	315	55	130	130	205	200	275	275	350	410	485
315	355	65	145	145	225	225	305	305	385	455	535
355	400	100	190	190	280	280	370	370	460	510	600
400	450	110	210	210	310	310	410	410	510	565	665
450	500	110	220	220	330	330	440	440	550	625	735

Remark For bearings with CN clearance, no symbol is attached to the identification number. In the case of bearings with C2, C3, C4 and C5 clearances, these symbols are attached to the identification number.
Example NA 4905 C2

Selection of clearance

Radial clearances of needle roller bearings change according to bearing fit, temperature difference between bearing rings and rolling elements, loads, etc., and these factors greatly influence bearing life, accuracy, noise, generation of heat, etc. If radial clearances are too large, noise and vibration will increase, and if they are too small, abnormally great forces are exerted on the contact areas between raceways and rolling elements, resulting in abnormally high heat generation and a decrease in bearing life. Therefore, in the ideal case, the clearance provided before mounting should be such that it will become zero or slightly larger when the bearing has reached steady-state operation and the temperature has become constant (saturation temperature). However, it is difficult to achieve this ideal state for all bearings. Under general operating conditions, bearings with CN clearance are most widely used, and are manufactured to provide satisfactory performance when fitted according to Tables 21 and 22.

When radial internal clearances other than CN are used, refer to Table 19.

Table 19 Examples of selecting radial internal clearances other than CN clearance

Operating conditions	Selection of clearance
When heavy loads and shock loads are applied, and amount of interference is great.	C3 or larger clearance
When directionally indeterminate loads are applied, and a tight fit is required for both inner and outer rings.	
When temperature of inner ring is much higher than that of outer ring.	
When shaft deflection and/or mounting error to the housing are great.	
When less noise and vibration are required. When a loose fit is required for both inner and outer rings. When preload is required.	C2 or smaller clearance

Reduction of radial clearances by fit

When the inner or outer rings are interference fitted onto shafts and into housings, respectively, they expand or shrink due to elastic deformation. As the result, the radial clearances are reduced. These reduced radial clearances are called residual (internal) clearances.

The amount of reduction is obtained by the following equation, and it is generally 70 to 90% of the interference amount.

$$\Delta_C = \Delta_F + \Delta_E \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (24)$$

where, Δ_C : Amount of reduction of the radial clearance, mm
Δ_F : Amount of expansion of the outside diameter of inner ring, mm
Δ_E : Amount of shrinkage of the bore diameter of outer ring, mm

❶Amount of expansion of the outside diameter of inner ring

· With solid shaft

$$\Delta_F = \Delta_{de} \frac{d}{F} \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (25)$$

· With hollow shaft

$$\Delta_F = \Delta_{de} \frac{d}{F} \frac{1-(d_{\mathrm{i}}/d)^2}{1-(d/F)^2\ (d_{\mathrm{i}}/d)^2} \quad \cdots\cdots (26)$$

where, Δ_{de} : Effective interference of inner ring, mm
d : Bore diameter of inner ring, mm
F : Outside diameter of inner ring, mm
d_{i} : Bore diameter of hollow shaft, mm

❷Amount of shrinkage of the bore diameter of outer ring

· With steel housing $(D_0 = \infty)$

$$\Delta_E = \Delta_{De} \frac{E}{D} \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (27)$$

· With steel housing $(D_0 \neq \infty)$

$$\Delta_E = \Delta_{De} \frac{E}{D} \frac{1-(D/D_0)^2}{1-(E/D)^2\ (D/D_0)^2} \quad \cdots\cdots (28)$$

where, Δ_{De} : Effective interference of outer ring, mm
D : Outside diameter of outer ring, mm
E : Bore diameter of outer ring, mm
D_0 : Outside diameter of housing, mm

Reduction of radial clearances due to temperature differences between inner and outer rings

Frictional heat generated by rotation is dissipated through the shafts and housings as well as through oil and air. Under general operating conditions, heat dissipation is larger on the housing side compared with that on the shaft side, and the temperature of the outer ring is usually lower than that of the inner ring. During operation, the temperature of the rolling elements is the highest, followed by that of the inner ring and that of the outer ring. The amount of thermal expansion, therefore, varies, and the radial clearances are reduced. This reduced radial clearance is called the effective (internal) clearance, and the amount of reduction is obtained by the following equation:

$$\Delta\delta = \alpha \Delta_t E \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (29)$$

where, $\Delta\delta$: Reduction of radial clearance, mm
α : Coefficient of linear expansion for bearing steel
$\fallingdotseq 12.5 \times 10^{-6}$ 1/ °C
Δ_t : Temperature difference between the outer ring and the inner ring plus rolling elements considered as one unit, °C
E : Bore diameter of outer ring, mm

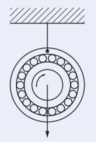
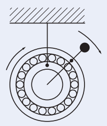
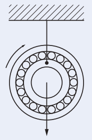
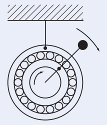
The temperature difference Δ_t is considered to be 5 ~ 10°C under normal operating conditions and 15 ~ 20°C at high rotational speeds. Therefore, when the temperature difference is great, a correspondingly larger radial internal clearance must be selected.

Fit

Purpose of fit

To achieve the best performance of needle roller bearings, it is important that the bearing rings are correctly fitted onto the shaft and into the housing.
The purpose of fit is to provide the appropriate amount of interference required between the inner ring and the shaft or between the outer ring and the housing, to prevent harmful mutual slippage.
If the interference is insufficient, it will cause a harmful relative displacement, known as creep, between the fitted surfaces in the circumferential direction. This may lead to abnormal wear of fitted surfaces, intrusion of wear particles into the bearing, generation of abnormal heat, vibration, etc. Therefore, a suitable fit must be selected.

Table 20 Nature of radial load and fit

Nature of the load			Fit	
		Rotating conditions	Inner ring	Outer ring
Rotating load on inner ring Stationary load on outer ring		Inner ring : Rotating Outer ring : Stationary Load direction : Fixed	Interference fit	Clearance fit
		Inner ring : Stationary Outer ring : Rotating Load direction : Rotating with outer ring		
Rotating load on outer ring Stationary load on inner ring		Inner ring : Stationary Outer ring : Rotating Load direction : Fixed	Clearance fit	Interference fit
		Inner ring : Rotating Outer ring : Stationary Load direction : Rotating with inner ring		
Directionally indeterminate load	The load direction is not fixed, including cases where the load direction is fluctuating or there is an unbalanced load.	Inner ring : Rotating or stationary Outer ring : Rotating or stationary Load direction : Not fixed	Interference fit	Interference fit

Conditions for determination of fit

When determining a suitable fit for a bearing, it is necessary to consider various conditions such as nature and magnitude of the load, temperature, required rotational accuracy, material/finish grade/thickness of the shaft and housing, ease of mounting and dismounting, etc.

❶ Nature of load and fit
Basically, the appropriate fit depends on whether the load direction is rotational or stationary in relation to the inner and outer rings.
The relationship between the nature of radial loads and the fit is, in general, based on Table 20.

❷ Load amount and interference
The greater the load, the larger the interference must be.
When selecting an interference between the inner ring and the shaft, it is necessary to estimate the reduction of interference due to the radial load. The amount of reduction of interference is obtained by the following equations.

· When $F_r \leqq 0.2C_0$

$$\Delta_{dF} = 0.08\sqrt{\frac{d}{B}F_r} \times 10^{-3} \cdots\cdots\cdots\cdots\cdots\cdots (30)$$

· When $F_r > 0.2C_0$

$$\Delta_{dF} = 0.02\frac{F_r}{B} \times 10^{-3} \cdots\cdots\cdots\cdots\cdots\cdots (31)$$

where, F_r : Radial load applied to bearing, N
C_0 : Basic static load rating, N
Δ_{dF} : Amount of reduction of inner ring interference, mm
d : Bore diameter of inner ring, mm
B : Width of inner ring, mm

❸ Temperature conditions and change of interference
The interference of fitted surfaces is also influenced by the temperature difference between the bearing and the shaft and housing. For example, when steam is flowing through a hollow shaft, or when the housing is made of light metal, it is necessary to take into consideration the differences in temperature, the coefficient of linear expansion and other such factors.
Usually, the interference of the inner ring decreases as the bearing temperature increases during operation. If the temperature difference between the inside of the bearing and the outside of the housing is taken as Δ_T, the temperature difference between the inner ring and the shaft can be estimated to be (0.1 ~ 0.15) Δ_T. Accordingly, the amount of reduction of the inner ring interference is obtained by the following equation.

$$\Delta_{dT} = (0.1 \sim 0.15)\Delta_T \alpha d \fallingdotseq 0.0015\Delta_T d \times 10^{-3} \cdots (32)$$

where, Δ_{dT} : Reduction amount of inner ring interference due to temperature difference, mm
Δ_T : Temperature difference between the inside of the bearing and the outside of the housing, °C
α : Coefficient of linear expansion for bearing steel
$\fallingdotseq 12.5 \times 10^{-6}$ 1/ °C
d : Bore diameter of inner ring, mm

❹ Shaft finish grade and interference
Since peaks of surface roughness of the fitted surface are crushed down when fitting the bearing, the effective interference becomes smaller than the apparent interference obtained by measurements, and it is generally obtained by the following equations.
· For ground shaft

$$\Delta_{de} = \frac{d}{d+2}\Delta_{df} \cdots\cdots\cdots\cdots\cdots\cdots (33)$$

· For machined shaft

$$\Delta_{de} = \frac{d}{d+3}\Delta_{df} \cdots\cdots\cdots\cdots\cdots\cdots (34)$$

where, Δ_{de} : Effective interference of inner ring, mm
d : Bore diameter of inner ring, mm
Δ_{df} : Apparent interference, mm

❺ Minimum interference and maximum interference
When the load direction is rotating in relation to the inner ring, the inner ring is fitted with interference to the shaft.
For solid ground steel shafts, the minimum interference (required apparent interference) Δ_{df} is expressed by the following equation which is deduced from equations (30) or (31), (32) and (33).

$$\Delta_{df} \geqq \frac{d+2}{d}(\Delta_{dF} + 0.0015\Delta_T d \times 10^{-3}) \cdots (35)$$

It is desired that the maximum interference should be less than 1/1000 of the shaft diameter. In the case of the outer ring, the effective interference varies according to the housing material, thickness, shape, etc., so it is determined empirically.

Selection of fit

When selecting a suitable fit, in addition to the various conditions mentioned above, it is necessary to draw on experience and practical results.

Tables 21 and 22 show the most general fit data.

When a thin housing or a hollow shaft is used, the interference is made larger than an ordinary fit.

The fit between needle roller bearings without inner ring and shafts is based on Table 23.

For the fit between Shell Type Needle Roller Bearings and housing bores, see page B5.

For the fit between inner rings for Shell Type Needle Roller Bearings and shafts, see Table 22.

Table 21 Fit between needle roller bearings and housing bores (Not applicable to Shell Type Needle Roller Bearings)

Operating conditions		Tolerance class of housing bore (1)	Application examples (Reference)
Rotating load on outer ring	Heavy load on thin housing, large shock load	P7 (2)	Flywheels
	Heavy load, normal load	N7 (2)	Wheel bosses, transmission gears
	Light load, fluctuating load	M7	Pulleys, tension pulleys
Directionally indeterminate load	Large shock load	M7	Eccentric wheels, pumps
	Heavy load, normal load	K7	Compressors
	Normal load, light load	J7	Crankshafts, compressors
Stationary load on outer ring	Shock load, heavy load	J7	General bearing applications, gear shafts
	Normal load, light load	H7	General bearing applications
	With heat conduction through shaft	G7	Paper dryers
Light load, normal load, requirements of high-precision rotation and high rigidity		K6	Main spindles of machine tools

Notes(1) This table applies to steel or cast iron housings. For lighter metal, a tighter fit should be selected. For split housings, do not use a fit tighter than J7.

(2) Care should be taken so that the radial internal clearance is not too small.

Remark Light load, normal load and heavy load represent $P \leqq 0.06C$, $0.06C < P \leqq 0.12C$, and $0.12C < P$, respectively, where P is the dynamic equivalent radial load and C is the basic dynamic load rating of the bearing to be used.

Table 22 Fit between needle roller bearings with inner ring and shafts

Operating conditions		Shaft dia. mm Over	Shaft dia. mm Incl.	Tolerance class of shaft (1)	Application examples (Reference)
Stationary load on inner ring	Light load, normal load, low or medium rotating speed	All shaft diameters		g6	Wheels on dead axles Control lever gears Rope sheaves Tension pulleys
	Heavy load, medium rotating speed			h6	
	Especially smooth operation and accuracy are required.			h5	
Rotating load on inner ring or Directionally indeterminate load	Light load	— 50 100 200	50 100 200 —	j5 k5 m6 (2) n6 (3)	Electric appliances, Precision machinery Machine tools, Pumps Blowers, Transportation vehicles
	Normal load	— 50 150 200	50 150 200 —	k5 (4) m5, m6 (2) n6 (3) p6 (3)	General bearing applications Pumps, Transmission gearboxes, Wood working machinery, Internal combustion engines
	Heavy load Shock load	— 150	150 —	n6 (3) p6 (3)	Industrial vehicles, Construction machinery Crushers

Notes(1) This table applies to solid steel shafts.

(2) It is necessary to examine the reduction of radial internal clearances caused by the expansion of inner rings after mounting.

(3) It is necessary to use bearings with radial internal clearances greater than CN clearance.

(4) For NATA and NATB, do not use a tighter fit than k5.

Table 23 Tolerance class of shafts assembled with needle roller bearings without inner ring

F_w Nominal roller set bore diameter mm		Radial internal clearance		
		Smaller than CN clearance	CN clearance	Larger than CN clearance
Over	Incl.	Tolerance class of shaft (1)		
—	65	k5	h5	g6
65	80	k5	h5	f6
80	160	k5	g5	f6
160	180	k5	g5	e6
180	200	j5	g5	e6
200	250	j5	f6	e6
250	315	h5	f6	e6
315	—	g5	f6	d6

Note(1) When the housing bore fit is tighter than K7, the shaft diameter is made smaller by considering shrinkage of roller set bore diameter after mounting.

Table 24 Fit values for radial bearings (JIS Class 0) (Fit with housing bore)

unit: μm

D Nominal outside diameter mm		Δ_{Dmp} Single plane mean outside diameter deviation		G7	H7	J7	K6	K7	M7	N7	P7
Over	Incl.	High	Low								
3	6	0	-8	-24～-4	-20～0	-14～6	-10～6	-11～9	-8～12	-4～16	0～20
6	10	0	-8	-28～-5	-23～0	-16～7	-10～7	-13～10	-8～15	-4～19	1～24
10	18	0	-8	-32～-6	-26～0	-18～8	-10～9	-14～12	-8～18	-3～23	3～29
18	30	0	-9	-37～-7	-30～0	-21～9	-11～11	-15～15	-9～21	-2～28	5～35
30	50	0	-11	-45～-9	-36～0	-25～11	-14～13	-18～18	-11～25	-3～33	6～42
50	80	0	-13	-53～-10	-43～0	-31～12	-17～15	-22～21	-13～30	-4～39	8～51
80	120	0	-15	-62～-12	-50～0	-37～13	-19～18	-25～25	-15～35	-5～45	9～59
120	150	0	-18	-72～-14	-58～0	-44～14	-22～21	-30～28	-18～40	-6～52	10～68
150	180	0	-25	-79～-14	-65～0	-51～14	-29～21	-37～28	-25～40	-13～52	3～68
180	250	0	-30	-91～-15	-76～0	-60～16	-35～24	-43～33	-30～46	-16～60	3～79
250	315	0	-35	-104～-17	-87～0	-71～16	-40～27	-51～36	-35～52	-21～66	1～88
315	400	0	-40	-115～-18	-97～0	-79～18	-47～29	-57～40	-40～57	-24～73	1～98
400	500	0	-45	-128～-20	-108～0	-88～20	-53～32	-63～45	-45～63	-28～80	0～108

Remark The negative value denotes a clearance and the positive value denotes an interference.

Table 25 Fit values for radial bearings (JIS Class 0) (Fit with shaft)

unit: μm

d Nominal bore diameter mm		Δ_{dmp} Single plane mean bore diameter deviation		g6	h5	h6	j5	k5	m5	m6	n6	p6
Over	Incl.	High	Low									
3	6	0	-8	-12～4	-5～8	-8～8	-2～11	1～14	4～17	4～20	8～24	12～28
6	10	0	-8	-14～3	-6～8	-9～8	-2～12	1～15	6～20	6～23	10～27	15～32
10	18	0	-8	-17～2	-8～8	-11～8	-3～13	1～17	7～23	7～26	12～31	18～37
18	30	0	-10	-20～3	-9～10	-13～10	-4～15	2～21	8～27	8～31	15～38	22～45
30	50	0	-12	-25～3	-11～12	-16～12	-5～18	2～25	9～32	9～37	17～45	26～54
50	80	0	-15	-29～5	-13～15	-19～15	-7～21	2～30	11～39	11～45	20～54	32～66
80	120	0	-20	-34～8	-15～20	-22～20	-9～26	3～38	13～48	13～55	23～65	37～79
120	140	0	-25	-39～11	-18～25	-25～25	-11～32	3～46	15～58	15～65	27～77	43～93
140	160											
160	180											
180	200	0	-30	-44～15	-20～30	-29～30	-13～37	4～54	17～67	17～76	31～90	50～109
200	225											
225	250											
250	280	0	-35	-49～18	-23～35	-32～35	-16～42	4～62	20～78	20～87	34～101	56～123
280	315											
315	355	0	-40	-54～22	-25～40	-36～40	-18～47	4～69	21～86	21～97	37～113	62～138
355	400											
400	450	0	-45	-60～25	-27～45	-40～45	-20～52	5～77	23～95	23～108	40～125	68～153
450	500											

Remark The negative value denotes a clearance and the positive value denotes an interference.

Design of Shaft and Housing

Accuracy and roughness of shaft and housing

Accuracy and roughness of fitting surface

Since the bearing rings of needle roller bearings are thin, their performance is easily affected by poor accuracy of shafts or housings. Under general operating conditions, the fitting surfaces of shafts and housings can be finished by lathe turning. However, when the load is great and high accuracy and low noise are required, a grinding finish is required.

Table 26 shows the accuracy and roughness of fitting surfaces for general use.

Accuracy and roughness of raceway surface

In case of needle roller bearings unlike other bearings, mating surfaces such as shaft and housing bore surfaces can be used directly as the raceway surfaces. For such use, accuracy and roughness of the raceway surfaces are important because they will influence bearing life, noise and accuracy.

In general, accuracy and roughness of raceway surfaces are based on Table 26.

Inclination of shaft

Shafts and outer rings may have some inclination between them due to deflection of the shaft, machining accuracy of shafts and housings, errors in mounting, etc.

In this case, the use of two or more bearings in tandem arrangement on a single shaft should be avoided. Instead, a bearing with large load ratings should be used.

It is recommended that inclination of shafts be less than 1/1000.

Table 27 Tolerance class IT values for basic dimensions

Basic dimension mm		Tolerance class(1) IT5	IT6	IT7
Over	Incl.	Tolerance μm		
—	3	4	6	10
3	6	5	8	12
6	10	6	9	15
10	18	8	11	18
18	30	9	13	21
30	50	11	16	25
50	80	13	19	30
80	120	15	22	35
120	180	18	25	40
180	250	20	29	46
250	315	23	32	52
315	400	25	36	57
400	500	27	40	63
500	630	30	44	70

Note(1) Based on JIS B 0401.

Table 26 Specifications of shafts and housings for radial needle roller bearings

Item	Shaft: Fitting surface	Shaft: Raceway surface	Housing bore: Fitting surface	Housing bore: Raceway surface
Circularity	0.3 × IT6 (1) or 0.3 × IT5 (1)	0.3 × IT6 (1) or 0.3 × IT5 (1)	0.3 × IT7 (1) or 0.3 × IT6 (1)	0.3 × IT7 (1) or 0.3 × IT6 (1)
Cylindricity	0.5 × IT6 (2) or 0.5 × IT5 (2)	0.3 × IT6 (1) or 0.3 × IT5 (1)	0.5 × IT7 (2) or 0.5 × IT6 (2)	0.3 × IT7 (1) or 0.3 × IT6 (1)
Surface roughness μmR_a (μmR_y)	0.8 (3.2)	0.2 (3) (0.8)	1.6 (6.3)	0.2 (3) (0.8)
Hardness	—	58～64HRC (4)	—	58～64HRC (4)

Notes(1) 30% or less of the dimensional tolerance for shafts or housing bores is recommended.
(2) 50% or less of the dimensional tolerance for shafts or housing bores is recommended.
(3) When required accuracy is not critical, a surface roughness within 0.8 μmR_a (3.2 μmR_y) is allowable.
(4) An appropriate thickness of the hardened layer is required.
Remark For tolerance class IT, see Table 27.

Raceway materials and heat treatment

When using shafts and housings as raceways, the following materials are generally used.

High-carbon chromium bearing steel		
	SUJ2	JIS G 4805
Carburizing steel	SCM415～421	JIS G 4053
Carburizing steel	SNCM 220	JIS G 4053
Carburizing steel	SCr 420	JIS G 4053
Carburizing steel	SNC 415, 815	JIS G 4053
Carburizing steel	S 15 CK	JIS G 4051

In addition, S50C and S55C (JIS G 4051) can be used after through hardening or induction hardening.

The hardened layer produced by tempering at +160～+180°C after hardening must have a fine uniform martensite microstructure.

When hardening the raceway surface by case hardening or induction hardening, a surface hardness of 58～64HRC and an appropriate thickness of the hardened layer must be ensured. The minimum effective thickness of the hardened layer after heat treatment and grinding is defined as the distance from the surface to the depth where the hardness is 550HV, and it is obtained by the following equation.

$$E_{ht} \geqq 0.8D_w(0.1+0.002D_w) \quad \cdots\cdots\cdots\cdots\cdots(36)$$

where, E_{ht} : Minimum effective thickness of the hardened layer, mm

D_w : Roller diameter, mm

Generally, the required effective thickness of the hardened layer is at least 0.3 mm.

Dimensions related to mounting of bearings

The dimensions of shaft and housing related to mounting of the needle roller bearings are shown in the table of dimensions for each bearing. (See Fig. 13.)

The minimum value of the shaft shoulder diameter d_a which receives the inner ring, and the maximum value of the housing shoulder diameter D_a which receives the outer ring, represent the effective shoulder diameters (excluding the chamfered part) which make proper contact with the side faces of the inner and outer rings respectively.

Also, the maximum value of the shaft shoulder (or inner ring retaining piece) diameter d_a is the dimension related to the ease of mounting/dismounting of the shaft and inner ring to/from the housing and outer ring.

The largest permissible single corner radius $r_{as\ max}$ of the shaft and housing must be smaller than the smallest permissible single chamfer dimension $r_{s\ min}$ of the bearing so that the side surface of the bearing can make proper contact with the shoulder. Table 28 shows the related dimensions.

For dimensions of the fillet relief when finishing the shaft or housing by grinding, the values shown in Table 29 are recommended.

For other dimensions related to mounting, see the related section for each bearing as required.

In addition, for ease in dismounting of bearings, it is convenient to make notches in the shoulder of the shaft or housing to allow the insertion of dismounting hooks.

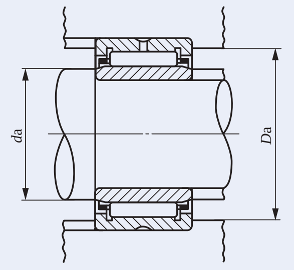


Fig. 13 Dimensions related to mounting

Table 28 Largest permissible single corner radius of shafts and housings $r_{as\ max}$

unit: mm

$r_{s\ min}$ Smallest permissible single chamfer dimension	$r_{as\ max}$ Largest permissible single corner radius of shafts and housings
0.1	0.1
0.15	0.15
0.2	0.2
0.3	0.3
0.4	0.4
0.6	0.6
1	1
1.1	1
1.5	1.5
2	2
2.1	2
2.5	2
3	2.5
4	3
5	4

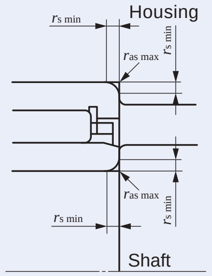
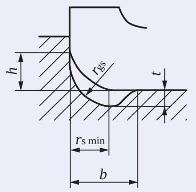


Table 29 Fillet relief dimensions for ground shafts and housings

unit: mm

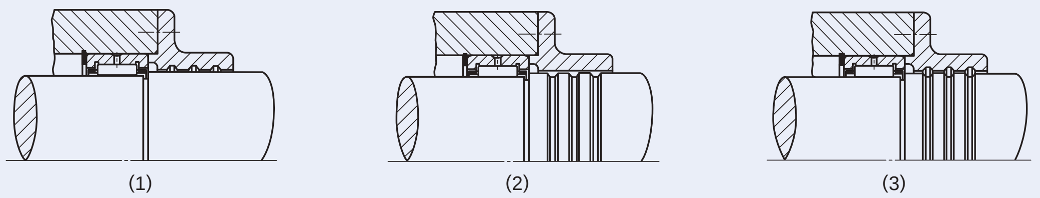
$r_{s\ min}$ Smallest permissible single chamfer dimension	Fillet relief dimensions		
	t	r_{gs}	b
1	0.2	1.3	2
1.1	0.3	1.5	2.4
1.5	0.4	2	3.2
2	0.5	2.5	4
2.1	0.5	2.5	4
3	0.5	3	4.7
4	0.5	4	5.9
5	0.6	5	7.4
6	0.6	6	8.6
7.5	0.6	7	10



Sealing

To obtain the best performance of rolling bearings, it is necessary to prevent leakage of lubricant and the entry of harmful foreign substances, such as dirt, dust and water. For this reason, sealing devices must always work effectively to seal and prevent against dust penetration under all operating conditions. Also, when selecting a suitable sealing method, it is necessary to consider such factors as the type of lubricant, peripheral speed of the seal, operating temperature, shaft eccentricity, seal friction, etc. as well as ease of assembly and disassembly.

Sealing methods are of the non-contact and contact types, and it is necessary to select the appropriate type depending on the application.



(1) (2) (3)

Fig. 14

Non-contact type sealing method

There are many methods of non-contact type sealing, including the use of oil grooves, flingers and labyrinths, which utilize the centrifugal force and narrow gaps.

Since they do not make direct contact with the shaft or housing, it is unnecessary to consider friction and wear, and the non-contact sealing method is suitable for high speed rotation and high operating temperatures. However, because of gaps, this method is not always sufficient in preventing oil leakage and dust entry when the machine is not in operation.

❶ Oil groove

Oil grooves are provided on either the shaft or housing bore, or on both for more effective sealing (See Fig. 14.). The clearance between the shaft and the housing bore should be as small as possible, and the values shown in Table 30 are generally used, taking into consideration errors in machining and assembly, shaft deformation, etc. Three or more grooves are made with a width of 3～5 mm and a depth of 4～5 mm. If the grooves are filled with grease, it will be more effective for dust prevention.

As shown in Fig. 15, helical grooves are suitable for horizontal shafts which have a fixed direction of rotation. Right or left handed grooves are used according to the direction of rotation, and they are used for oil lubrication normally in conjunction with a suitable anti-dust device.

Table 30 Clearance between grooved shaft and housing bore

unit: mm

Shaft dia.	Clearance
Incl. 50 mm	0.25～0.4
Over 50 mm	0.5　～1

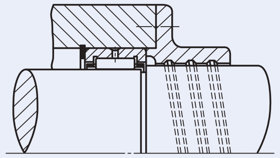
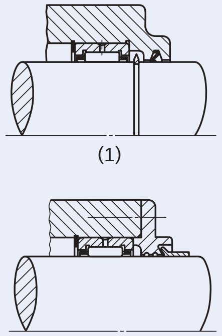


Fig. 15

❷ Flinger

The oil flinger is a disk attached to the shaft which throws off oil due to the centrifugal force of rotation and thus prevents oil leakage and the entry of foreign particles. Fig. 16 (1) shows an example in which the flinger is located inside the housing, mainly to prevent oil leakage. Since it sucks in dust and dirt, it should be used in a dust free environment. Fig. 16 (2) shows an example in which the flinger is located outside the housing, and is used in combination with another sealing device, to prevent entry of foreign particles.



(1)

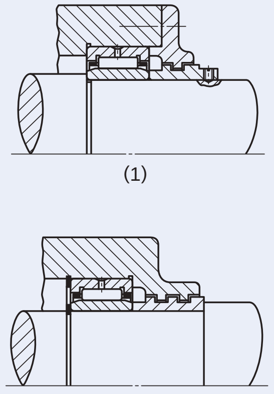
(2)

Fig. 16

❸ Labyrinth

Although it is a little difficult to make, the labyrinth is very effective in preventing oil leakage especially at high speeds. At low speeds, filling the labyrinth with grease is effective in preventing the entry of dust. In Fig. 17, it is necessary to split the housing or cover plate into two. In Fig. 18, it is easy to assemble, and if combined with an oil seal, it improves the sealing effect.

Table 31 shows the labyrinth clearances generally used.



(1)

(2)

Fig. 17

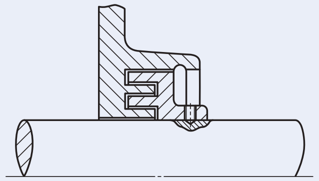


Fig. 18

Table 31 Labyrinth clearance

unit: mm

Shaft dia.	Clearance	
	Radial direction	Axial direction
Incl. 50 mm	0.25～0.4	1～2
Over 50 mm	0.5　～1	3～5

Contact type sealing method

In this type of sealing, the shaft is sealed by the application of pressure resulting from the elasticity of the seal material to the sealing surface of the shaft, which rotates, reciprocates or oscillates. Synthetic rubber, synthetic resin and felt are generally used as sealing materials.

❶ Oil seal

Synthetic rubber oil seals are the most general type of sealing used. The sealing effect is obtained when the elastic lip comes into contact with the shaft. Some lips are spring-loaded to maintain adequate pressing force.

The sliding surfaces of the lip and the shaft always show frictional behavior such that the boundary lubrication and fluid lubrication are mixed. If there is an insufficient amount of oil between the contact surfaces, it will cause heat generation, wear and seizure. Conversely, if the oil film is too thick, it may cause oil leakage.

General oil seals are specified in JIS B 2402-1~5. IKO Oil Seals for Needle Roller Bearings (See page L1.) have a low sectional height to match the Needle Roller Bearings.

Nitrile rubber is generally used as the material for oil seal lips. Table 32 shows the materials and their operating temperature ranges.

The finished surface of the shaft where the seal lip makes contact must have an appropriate surface roughness, as shown in Table 33, according to the peripheral speed. It must also have accurate circularity, and the shaft eccentricity should be less than 0.05 mm.

To increase wear resistance, the hardness of the sliding part of the shaft must be more than 40HRC. This can be achieved by hard-chrome plating or heat treatment.

Table 32 Seal materials and operating temperatures

Seal material		Operating temperature range ℃
Synthetic rubber	Nitrile rubber	－25～＋120
	Acrylic rubber	－15～＋130
	Silicon rubber	－50～＋180
	Fluoro rubber	－10～＋180
Tetrafluoethylene resin		－50～＋220

Table 33 Peripheral speed and surface roughness of shaft

Peripheral speed m／s		Surface roughness
Over	Incl.	μ mR_a(μ mR_y)
－	5	0.8(3.2)
5	10	0.4(1.6)
10	－	0.2(0.8)

❷ Felt seal

Because of their simple structure, felt seals have long been used to protect grease lubrication from dust. Since felt absorbs some grease during operation, it hardly causes heat generation and seizure, but it cannot be used when the peripheral speed of the shaft is high (more than 4 m/s). Where there is a high concentration of dirt and dust, they may become attached to the contact surface of felt, sometimes scratching the shaft surface. To prevent this, two felt seals are placed apart from each other, or a felt seal is used together with a synthetic rubber seal.

Lubrication

Purpose of lubrication

The main purpose of bearing lubrication is to reduce friction and wear and to prevent heat generation and seizure. The lubricant and the lubricating method have a big influence on the operating performance of the bearing, and it is therefore necessary to select them suitably for the operating conditions.
The effects of lubrication are as follows.

❶ Reduction of friction and wear
At the contact surfaces between the race rings, rolling elements and cage of the bearing, lubrication prevents metal-to-metal contact, and reduces friction and wear due to sliding and rolling, in the latter of which micro-slips occur by differential slip, skew, spin, or elastic deformation.

❷ Elimination of frictional heat
The lubricant removes the heat generated by friction or transferred from outside, and prevents overheating of the bearing. Circulating lubrication is generally used for this purpose.

❸ Influence on bearing life
The bearing life is extended if the rolling contact surfaces between the race rings and rolling elements are separated by an oil film of adequate thickness, and is shortened if the oil film is inadequate due to low oil viscosity, etc.

❹ Rust prevention
The lubricant prevents rust formation on the inside and outside surfaces of the bearing.

❺ Dust prevention
Grease lubrication is particularly effective for dust prevention. Oil circulating or jet lubrication is effective in washing foreign particles away from the area around the bearing.

Methods of lubrication

Grease lubrication and oil lubrication are generally used for rolling bearings. In special cases, solid lubricants are also used.
In general, grease lubrication requires the simplest sealing structure. It is therefore economical and widely used. Also, once filled with grease, the bearing can be used for a long period without replenishing the grease. However, compared with oil, its heat removal properties and cooling capacity are inferior, since grease has high flow resistance, which causes high churning heat.
Oil has greater fluidity and superior heat removal properties. It is therefore suitable for high-speed operations. In addition, it is simple to filter out dust and dirt from oil. Thus it can prevent the generation of noise and vibration and increase bearing life. Another advantage of oil lubrication is that it offers the possibility for selecting the appropriate method for particular operating conditions from among various available lubrication methods. However, measures to prevent oil leakage are required. As a guideline for selection, Table 34 compares grease and oil lubrication.
For the lubricants used for IKO Spherical Bushings, see page K8.

Table 34 Comparison between grease lubrication and oil lubrication

Item	Grease lubrication (1)	Oil lubrication
Sealing structure, Housing structure	Simple	Slightly complicated
Temperature	High temperature not allowed	High temperature allowed (Cooling effect by circulation)
Rotational speed	Low and medium speeds	High speed allowed
Load	Low and medium loads	High load allowed
Maintenance	Easy	Elaborate (Pay special attention to oil leaks.)
Lubricant replacement	Slightly complicated	Simple
Lubrication performance	Good	Very good
Dust filtration	Difficult	Simple
Entry of dust and dirt	Easy measures for protection	Dust and dirt can be removed by filtering in circulating lubrication.

Note(1) This represents bearing grease for general use.

Grease lubrication

❶ Amount of grease to be filled
The amount of grease to be filled depends on the housing structure, dimensions, type of grease used and atmosphere. Generally, filling about 1/3 to 1/2 of the free space inside of the bearing and the housing is considered to be appropriate. Too much will cause a rise in temperature, and care should be taken especially at high speed rotations.
In Fig. 19, several grease pockets are provided by the grease sectors on one side of the bearing. Even if the filled grease is dispersed by the centrifugal force at high rotational speeds, it is trapped by the grease pockets and diverted back into the bearing again. Old grease accumulates in the space on the opposite side of the bearing, and this can be removed periodically by taking off the cover.

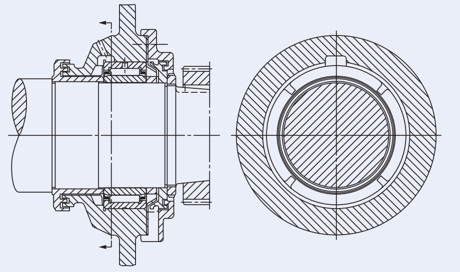
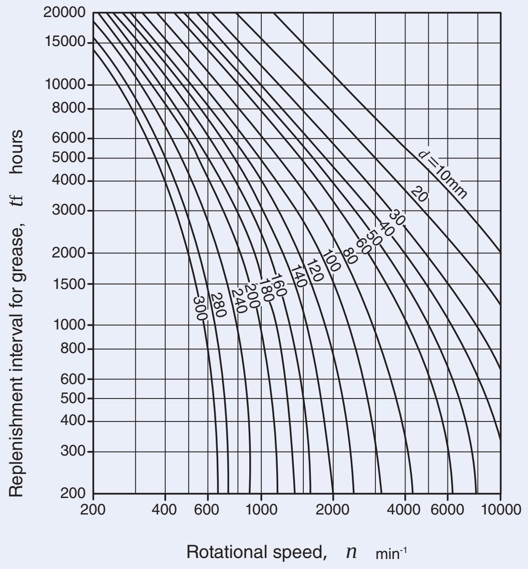


Fig. 19

❷ Replenishment of grease
The life of grease depends on its type and quality, the type and dimensions of the bearing, operating conditions, temperature, amount of wear, penetration of foreign particles and water, etc.
Fig. 20 shows the replenishment intervals for grease, and is used as a general guideline. The values obtained from this diagram apply to cases in which the load condition is normal, the machine body is stationary, and the operating temperature on the outer surface of bearing outer ring is less than +70°C. If the temperature exceeds +70°C, as a general rule, the replenishment interval is halved for every 15°C increase.



Remark
d is the bore diameter of the inner ring. For a bearing without an inner ring, the roller set bore diameter F_w is used for *d*.

Fig. 20 Interval for replenishment of grease

Oil lubrication

① Oil bath lubrication

This is the most commonly used oil lubrication method, and is used for medium and low speeds. If the amount of oil is too large, heat will be generated by churning, and if the amount is too small, seizure will occur. Therefore, the correct amount of oil must be maintained. When the machine is stationary, the correct oil level in the case of a bearing mounted on a horizontal shaft, is near the center of the lowest rolling element. In the case of a vertical shaft, about 50% of the surfaces of the rolling elements should be submerged in oil.

It is desirable to provide an oil gauge so that the oil level can be easily checked while the machine is stationary or running.

② Oil drip lubrication

Oil drips, which are fed down from a sight-feed oiler or along a fiber string, become an oil spray due to wind pressure generated by the rotating cage, shaft, nut, etc., or they strike the rotating parts and form an oil spray, which fills up the housing and every required part. Because oil spray removes frictional heat, this method has a more effective cooling effect than the oil bath method, and is widely used for high-speed rotation and medium load conditions.

In the case of the sight-feed oiler (Fig. 21), the number of drips can be adjusted. However, this is difficult using the string-feed method. The number of drips depends on the bearing type, rotational speed, etc., but 5 ～ 6 drips per minute is generally used.

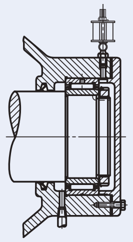


Fig. 21 Oil drip lubrication

③ Oil splash lubrication

In this method, oil is splashed in all directions by the rotation of the gear or disk. This can be used for considerably high-speed rotations without soaking the bearing directly in oil.

In the gear case where shafts and bearings are lubricated with the same oil, wear particles may be introduced into the bearing as they might get mixed with the oil. In this case, a permanent magnet is provided at the bottom of the gear case to collect metal particles, or a shield plate is installed next to the bearing.

Fig. 22 shows another method in which the splashed oil flows along the grooves in the case and accumulates in the oil pockets, keeping the oil level constant. So the oil is steadily supplied to the bearing.

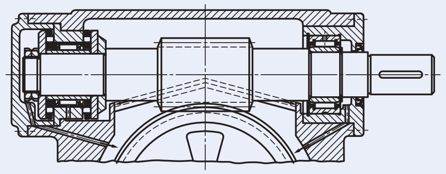


Fig. 22 Oil splash lubrication

④ Oil circulating lubrication

When automatic lubrication is more economical because lubrication is required at many points, or when cooling is required for high rotational speed, this method is used. The oil is supplied with a pump, which can control the oil pressure, and a filter or cooler, etc. can be set up in the circulation system, making this an ideal method of lubrication. As shown in Fig. 23, the oil supply and discharge ports are located opposite to each other, and the discharge port is made large to prevent the accumulation of oil.

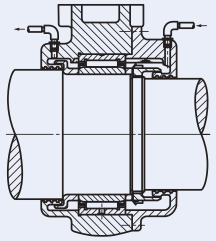


Fig. 23 Oil circulating lubrication

⑤ Oil mist lubrication

After dirt and dust are removed by a filter, the oil is turned into a spray by dry compressed air, and this lubricates the bearing. When the air and oil pass through the bearing, the air cools the bearing and the oil lubricates it. In addition, because the air inside the housing is at a higher pressure than the outside air, the entry of water and foreign particles is prevented. There are many other advantages of this method, and it is suitable for high rotational speed applications such as high speed internal grinding spindles.

⑥ Oil jet lubrication

This is a highly reliable lubrication method and is used under severe conditions such as ultra-high rotational speeds and high temperatures. The speed of the oil jet should be more than 20% of the peripheral speed of the inner ring raceway surface, since the air around the bearing rotates together with the bearing forming an air wall. As shown in Fig. 24, the jet from the nozzle blows directly into the space between the inner ring and the cage. Due to the large amount of oil being used, it is more effective to make the discharge port larger, and use the forced discharge.

When the $d_m n$ value (mean value of the bearing outside and bore diameters in millimeter x rotational speed in min^{-1}) is more than 1,000,000, the speed of the jet should be 10 ～ 20 m/s, the nozzle diameter should be about 1 mm, oil supply pressure should be 0.1 ～ 0.5 MPa, and the oil supply amount should be about 500 cc/min or greater. When the rotational speed is higher, the oil supply pressure and the oil amount should be higher.

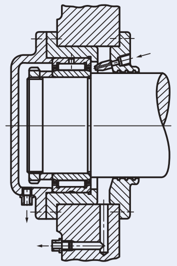


Fig. 24 Oil jet lubrication

Lubricants

For rolling bearings, lubricating grease or oil is generally used. For special applications, solid lubricants are used.

Lubricating grease

Grease is a semi-solid lubricant made by mixing base oil (liquid lubricant) and a thickener under heat and adding additives as required.

There are many types of grease according to various combinations of base oil, thickeners and additives. Grease is usually classified by thickeners and base oil. Table 35 shows the general properties of each type of grease.

Reference examples of the lubricant greece brand and performance are shown on page M46.

Table 35 Properties of various types of grease

Name (Common name) / Item	Calcium grease	Sodium grease	Aluminum grease	Mixed base grease	Barium grease	Lithium grease			Non-soap base grease (Non-soap grease)	
	(Cup grease)	(Fiber grease)	(Mobile grease)				(Diester grease)	(Silicon grease)	(Bentone grease)	
Base oil	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Diester oil	Silicon oil	Mineral oil	Synthetic oil
Thickener	Ca soap	Na soap	Al soap	Na + Ca soap, Li + Ca soap	Ba soap	Li soap	Li soap	Li soap	Bentone	Silica gel. Polyurea, etc.
Appearance	Buttery	Fibrous and buttery	Stringy and buttery	Fibrous and buttery	Fibrous and buttery	Buttery	Buttery	Buttery	Buttery	Buttery
Pour point ℃	80 ～ 90	150 ～ 180	70 ～ 90	160 ～ 190	150 ～ 180	170 ～ 190	170 ～ 190	200 ～ 250	200 ～	None
Operating temperature range ℃	− 10 ～+ 70	− 20 ～+ 120	− 10 ～+ 80	− 10 ～+ 100	− 10 ～+ 135	− 20 ～+ 120	− 50 ～+ 120	− 50 ～+ 180	− 10 ～+ 150	～+ 200
Pressure resistance	Strong to weak	Strong to medium	Strong	Strong	Strong to medium	Medium	Medium	Weak	Medium to weak	Medium
Water resistance	Good	Poor	Good	Good, poor for Na+ Ca soap grease	Good	Good	Good	Good	Good	Good
Mechanical stability	Fair	Good	Poor	Good	Poor	Excellent	Excellent	Excellent	Good	Good to poor
Features and application	Contains about 1% water. When the temperature rises to more than +80°C, the water evaporates and the grease separates into oil and soap. This is used for medium loads.	Long fibrous grease cannot withstand high speeds, but has good pressure resistance properties. Short fibrous grease is comparatively good for high speeds.	It has water and rust resistant properties, and adheres easily to metal surface.	Usable at fairly high speeds.	It has water and heat resistant properties. This is an all-purpose grease.	This is the best all-purpose grease among soap based greases.	Excellent under low temperature conditions and has superior frictional properties. Suitable for small bearings used in measuring instruments.	Mainly used for high temperatures. Not suited to high speeds and heavy loads.	Generally good heat resistance. Grease having a mineral base oil is for general use. Grease having a synthetic base oil is suitable for special use where superior heat and chemical resistance properties are required.	

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

❶ Base oil

Petroleum lubricating oil is usually used as the base oil.

As the lubricating performance of grease depends mainly on that of base oil, the viscosity of the base oil is an important property. In general, low viscosity is suitable for light-load and high-speed rotations, and high viscosity for heavy-load and low-speed rotations. Synthetic lubricants of the diester or silicon series are used instead of lubricants of the petroleum series in consideration of the pour point and high temperature stability.

❷ Thickener

As shown in Table 35, metal soap bases are mostly used as thickeners. In particular, Na-soap is water-soluble and emulsifies easily, and it cannot be used in damp or wet areas. The type of thickener and the pour point of grease have a close relationship. In general, the higher the pour point, the higher the maximum usable temperature of grease. However, even when the grease uses a thickener having a high pour point, its upper operating temperature limit is low if its base oil has low heat resistance.

❸ Consistency

This represents the hardness grade of grease. Grease becomes harder in proportion to the amount of thickener if the same thickener is used.

Immediately after grease has been stirred (usually 60 times), a depression is formed in the grease in a specified time using a specified cone. The consistency (combined consistency) is expressed by the value of depth of depression (mm) multiplied by 10.

This value gives an estimate of the fluidity during operation with a greater value for softer grease.

Table 36 shows the consistency number of grease and the relationship between the consistency and operating conditions.

Table 36 Consistency and operating conditions of grease

NLGI consistency number	Combined consistency	Application
0	385 ～ 355	For centralized lubrication,
1	340 ～ 310	For oscillating motion
2	295 ～ 265	For general use
3	250 ～ 220	For general use, For high temperature
4	205 ～ 175	For sealing with grease

❹ Additives

Additives include various types of substances, which are added to grease in small quantities to improve its characteristics. For example, when a bearing is kept running for long periods of time, its temperature rises. This results in oxidation of the lubricant and formation of oxides, which lead to corrosion of the bearing.

Thus, when a bearing is to be operated for long periods of time without regreasing, antioxidants are added. In addition, grease containing extreme pressure additives is suitable for use in places that are subjected to heavy loads.

❺ Miscibility of different greases

In principle, it is desirable to use grease of the same brand. However, when the mixing of different greases is unavoidable, greases with the same type of thickener and with a similar type of base oil should be used.

It should be noted that if different types of grease are mixed, they may interact with each other and the consistency will become softer than that for the individual greases.

Lubricating oil

For rolling bearings, refined mineral oil or synthetic oil is used. To improve its properties, antioxidant additives, extreme pressure additives and detergent additives are added as required.

When selecting lubricating oil, it is important to select oil which has adequate viscosity under operating temperatures. If the viscosity is too low, the formation of the oil film will be insufficient, causing abnormal wear and seizure. On the other hand, if the viscosity is too high, it will generate excessive heat or increase power loss due to viscous resistance. As a general standard, oil having higher viscosity should be used for heavier loads and oil having lower viscosity should be used for higher rotational speeds.

Under conditions of normal use for various bearings, the values of viscosity shown in Table 37 will be a guideline.

The relationship between viscosity and temperature can be obtained from Fig. 25. Also, Table 38 shows examples of selecting lubricating oil according to the conditions of bearing use.

Table 37 Bearing series and required viscosity of lubricating oil

Bearing series	Kinematic viscosity at operating temperatures
Needle roller bearings Roller bearings	13 mm²/s or more
Crossed roller bearings	20 mm²/s or more
Thrust needle roller bearings Thrust roller bearings	32 mm²/s or more

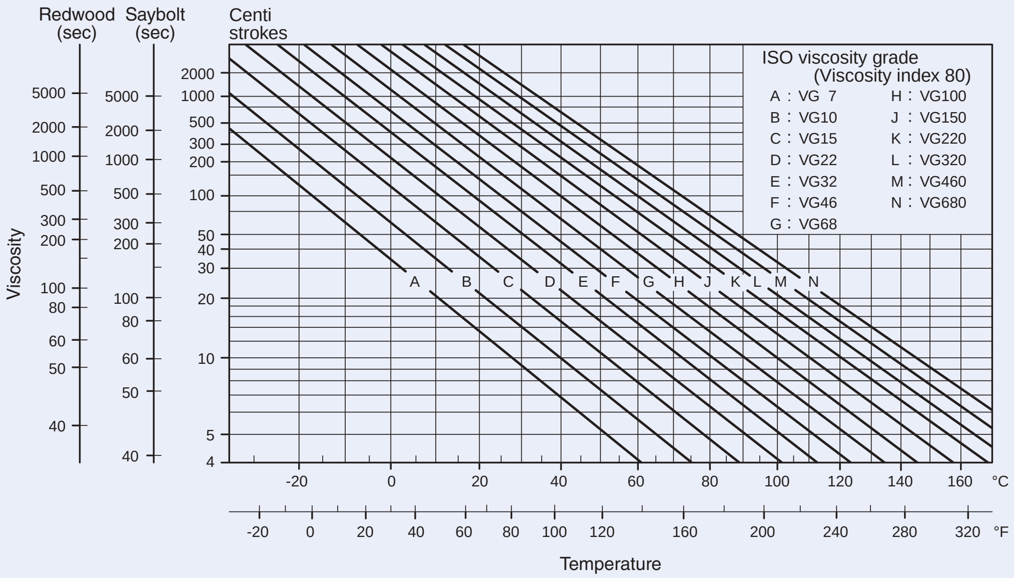


Fig. 25 Relationship between viscosity and temperature of lubricating oil

Table 38 Conditions of bearing use and examples of lubricating oil selection

Conditions		ISO viscosity grade(VG)											
		10	15	22	32	46	68	100	150	220	320	460	680
Operating temperature	− 30 ～ 0℃		◀	Refrigerator oil	▶								
	0 ～ 50℃	◀	—	—	Bearing oil	—	—	▶					
					◀	Turbine oil	▶						
	50 ～ 80℃				◀	—	—	Bearing oil	—	—	▶		
					◀	Turbine oil	▶						
	80 ～ 110℃						◀	—	Bearing oil	—	—	▶	
							◀ Turbine oil ▶					◀	Gear oil ▶
$d_m n$ value		Large ◀	—	—	—	—	—	—	—	—	—	—	▶ Small
Load		Small ◀	—	—	—	—	—	—	—	—	—	—	▶ Large

Remarks
- Lubricating oils are based on JIS K 2211 (Refrigerating machine oils), JIS K 2239 (Bearing Oil), JIS K 2213 (Turbine Oil), and JIS K 2219 (Gear Oil).
- The method of lubrication in these cases is mainly oil bath lubrication or circulating lubrication.
- When the temperature is on the high side within the operating temperature range, oils of high viscosity are used.
- $d_m n$ represents the mean value of the bore and outside diameters (mm) of the bearing multiplied by the rotational speed (min⁻¹).

C-Lube Bearing

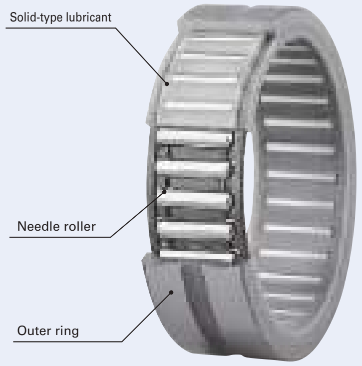
IKO C-Lube Bearing is a bearing that is lubricated with a newly developed thermosetting solid-type lubricant. A large amount of lubricating oil and fine particles of ultra high molecular weight polyolefin resin are solidified by heat treatment to fill the inner space of the bearing. As the bearing rotates, the lubricating oil oozes out onto the raceway in proper quantities, maintaining the lubrication performance for a long period of time.
The dimension tables for C-Lube Machined Type Needle Roller Bearings, C-Lube Cam Followers, and C-Lube Roller Followers are shown on pages D77, I55, and I99.
C-Lube Bearing is available in all Needle Roller Bearing series. Also C-Lube Bearings for food processing are available, using NSF H1-certified lubrication oil and resin compliant with FDA standards to mitigate any effect on human health. If needed, please contact IKO.

Features of C-Lube Bearing

- Most suitable for preventing grease dry-up in applications where lubrication is difficult.
- Great reduction of maintenance work by extending the lubrication interval.
- Elimination of oil contamination, making this bearing most suitable for applications that would be adversely affected by oil.

Cautions for using C-Lube Bearing

- Never wash C-Lube Bearing with organic solvent and/or white kerosene which have the ability to remove fat, or leave the bearing in contact with these agents.
- The operating temperature range is -15～+80°C. For continuous operation, the recommended operating temperature is +60°C or less.
- To ensure normal rotation of the bearing, apply a load of 1% or more of the basic dynamic load rating at use.
- The allowable rotational speed is different from that of the general needle roller bearings. For $d_m n$, $d_1 n$, and dn, use the values in Table 39 or less as guidelines.



Structure of C-Lube Bearing

Table 39 C-Lube Bearing $d_m n$, $d_1 n$, dn

Representative model		Allowable rotational speed
	Main model code	$d_m n$ (1), $d_1 n$ (2), dn (3)
C-Lube Machined Type Needle Roller Bearings	TAF···/SG	$d_m n$=20 000
C-Lube Cam Followers	CF···/SG	$d_1 n$ =10 000
C-Lube Roller Followers (4)	NART···/SG	dn = 8 000

Notes(1) $d_m n$ ＝（bore diameter of bearing ［mm］ ＋ outside diameter of bearing ［mm］）/2 × rotational speed ［min^{-1}］
(2) $d_1 n$ ＝ stud diameter ［mm］ ×rotational speed ［min^{-1}］
(3) dn ＝ inner ring bore diameter ［mm］ ×rotational speed ［min^{-1}］
(4) The allowable rotational speed of C-Lube Roller Followers is applicable to use with oscillating rotation. For use with one-way or continuous rotation, please consult IKO.

Friction and Allowable Rotational Speed

Friction

Compared with sliding bearings, the starting (static) friction for rolling bearings is small, and the difference between the starting (static) friction and the kinetic friction is also small. The loss of power and temperature rise in machines are thus reduced, improving the mechanical efficiency.
Frictional torque is influenced by the bearing type, bearing load, rotational speed, lubricant characteristics, etc. It varies according to the lubricant when operated under light-loads and high-speed conditions, and according to the load when operated under heavy-loads and low-speed conditions.
Frictional torque of rolling bearings is complicated because it is influenced by various factors, but for convenience, it can be expressed approximately by the following equations.

· Radial bearings $M = \mu P \dfrac{d}{2}$ ························(37)

· Thrust bearings $M = \mu P \dfrac{d_m}{2}$ ························(38)

where, M : Frictional torque, N-mm
μ : Coefficient of friction
P : Bearing load, N
d : Bearing bore diameter, mm
d_m : Mean value of bearing bore and outside diameters, mm

The approximate coefficients of friction of IKO Bearings under operating conditions, in which lubrication and mounting are correct and where loads are relatively large and stable, are shown in Table 40.

Table 40 Coefficient of friction

Bearing series	μ
Needle roller bearings with cage	0.0010 ～ 0.0030
Full complement needle roller bearings	0.0030 ～ 0.0050
Thrust needle roller bearings	0.0030 ～ 0.0040
Thrust roller bearings	0.0030 ～ 0.0040

Allowable rotational speed

As the rotational speed of rolling bearings is increased, the bearing temperature also increases due to the heat generated at the contact surfaces between the cage, raceways and rolling elements, until it finally leads to bearing seizure. It is therefore necessary to maintain the rotational speed of a bearing below a certain limit value to ensure safe operation for long periods. This limit value is called the allowable rotational speed.
Since the amount of heat generated is approximately proportional to the sliding speed at the contact area, this sliding speed is an approximate guide indicating the limit of the bearing rotational speed.
The allowable rotational speed of bearings thus varies according to the bearing type, size, bearing load, method of lubrication, radial clearance, and other such factors.
The allowable rotational speeds shown in the table of dimensions are empirical values. They are not absolute values and can be changed according to the bearing use conditions. Depending on the structure and accuracy around the bearing, the lubricant and the lubrication method, it is possible for some bearings to be operated at more than twice the allowable rotational speed given in the table without trouble.

Operating Temperature Range

The allowable operating temperature range for needle roller bearings is generally -20 ～ +120°C.

When operating at temperatures outside this range, the operation may be limited by the allowable temperature range of prepacked grease, seal, cage material, etc. Further, if the bearing is used at high temperature, i.e. 120°C or above, the amount of dimensional displacement gets larger. So special heat treatment is necessary.

The operating temperature range for some types of bearings is different from the above. See the section for each bearing.

Handling of Bearings

Precautions in handling

Since the bearing is a high-accuracy mechanical element, special attention must be paid to its handling. The following precautions should be noted when handling the bearings.

❶ Bearings and their surrounding parts should be kept clean.
Bearings and their surrounding parts must be kept clean paying special attention to dust and dirt. Tools and the working environment should also be cleaned.

❷ Bearings should be handled carefully.
A shock load during handling may cause scratches, indentations and even cracks or chips on the raceway surfaces and rolling elements.

❸ Bearings should be mounted or dismounted with proper tools.
When mounting and dismounting, tools suitable for the bearing type should be used.

❹ Bearings should be protected against corrosion.
Bearings are treated with anti-corrosive oil. However, when handling them with bare hands, sweat from the hands may result in future rust formation. Gloves should be worn, or hands should be dipped in mineral oil.

❺ Precautions regarding oil components.
Rust prevention oil or grease is used for bearings. Therefore, oil may drip or spatter depending on the operating conditions. Consider installing a shielding plate if necessary.

Storage

Store bearings laid flat indoors, placed in the packing/packaging provided by IKO. Avoid storing in high temperatures, low temperatures, and high humidity. In products pre-packed with lubricant, the lubricant will deteriorate with age if products are stored for a long time. Be sure to reapply lubricant before use.

Mounting

Preparation

Before mounting the bearing, the dimensions and fillets of the shaft and housing should be checked to ensure that they conform to specifications.

Bearings should be unwrapped just before mounting. In case of grease lubrication, bearings should be filled with grease without cleaning the bearings. Even in the case of oil lubrication, it is normally unnecessary to clean the bearings. However, when high accuracy is required or when using at high speeds, the bearings should be cleaned using cleaning oil to remove thoroughly oily contents. The cleaned bearings should not be left alone without anti-corrosive precautions, because bearings can easily be corroded after anti-corrosive agents are removed.

Lubricating grease is prepacked in some types of bearings. Therefore, refer to the relevant section for each bearing.

Methods of mounting

Mounting methods of bearings are different according to the type of bearing and the fit. In general, mounting of needle roller bearings is comparatively easy. However, non-separable bearings with large interferences should be handled with great care.

❶ Mounting by press fit
Small and medium bearings with small interferences require a small pressing-in force for mounting, and they are mounted using a press at room temperature. The bearing should be pressed in carefully, applying a force evenly to the bearing with a fitting tool as shown in Fig. 26. For separable bearings, the inner and outer rings can be mounted separately, and the mounting work is simple. However, when installing the shaft and inner ring assembly into the outer ring, care should be taken not to damage the raceway surfaces and rolling elements.

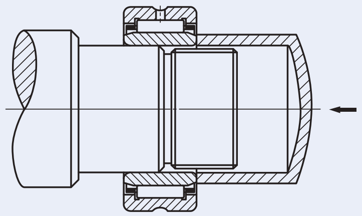


Fig. 26

When mounting non-separable bearings, the inner and outer rings are pressed in simultaneously by applying a cover plate as shown in Fig. 27. It must never happen that the inner ring is press-fitted to the shaft by striking the outer ring, or the outer ring by striking the inner ring, because the raceway surfaces and rolling elements will be scratched or indented.

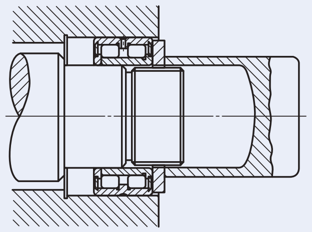


Fig. 27

When press fitting, the friction of the fitting surfaces can be reduced by applying high viscosity oil over the fitting surfaces.

The pressing-in or pulling-out force to be applied to the bearing is given on page A59.

❷ Mounting by shrink fitting
This method is used when the interference is great or when a large bearing is to be fitted. The housing is heated and thermally expanded when fitting the outer ring to the housing and the inner ring is heated and expanded when fitting it to the shaft allowing the bearing to be set easily within a short time. The maximum allowable temperature for the shrink fit is +120°C, and heating should be performed appropriately. Pure non-corrosive mineral oil is recommended as the heating oil for shrink fit, and insulation oil for transformers is considered to be the best. During cooling, the bearing also shrinks in the axial direction. Therefore, to ensure that there is no clearance between the bearing and the shoulder, an axial force must be applied continuously to the bearing until it has cooled.

When the interference between the outer ring and the housing is great, an expansion fit method in which the bearing is cooled using dry ice or other cooling agent before fitting can be used. Immediately after fitting, however, moisture from the air easily condenses on the bearing. Therefore, it is necessary to take preventive measures against corrosion.

Pressing force and pulling force

Guidelines for the pressing force when pressing in the inner ring to the shaft and the pulling force when pulling it out are obtained from the following equation.

$$K = f_{\mathrm{k}} \frac{d}{d+2} \Delta_{d\mathrm{f}} B \left\{ 1 - \left(\frac{d}{F} \right)^2 \right\} \cdots\cdots\cdots (39)$$

where, K : Pressing or pulling force, N

f_{k} : Resistance factor determined by the coefficient of friction

When pressing in inner ring to shaft, $f_{\mathrm{k}}=4\times10^4$

When pulling out inner ring from shaft, $f_{\mathrm{k}}=6\times10^4$

d : Bore diameter of inner ring, mm

$\Delta_{d\mathrm{f}}$: Apparent interference, mm

B : Width of inner ring, mm

F : Outside diameter of inner ring, mm

The actual pressing force or pulling force may be greater than the calculated value due to mounting errors. When designing a puller, it is necessary that the puller has the strength (rigidity) to withstand more than 5 times the calculated value.

Running test

After mounting the bearing, a running test is carried out to check whether the mounting is normal. Usually, it is first checked by manual turning. Then, it is operated by power gradually from no-load and low-speed up to normal operating conditions to check for abnormalities.

Noise can be checked by using a soundscope or similar instrument. In this test, checks are carried out for the following abnormalities.

❶ Manual turning

(a) Uneven torque ·················· Improper mounting

(b) Sticking and rattling ··· Scratches or indentations on the raceway surface

(c) Irregular noise ··· Penetration of dust or foreign particles

❷ Power running

(a) Abnormal noise or vibration ··· Indentations on the raceway surface, too great clearance

(b) Abnormal temperature ··· Unsuitable lubricant, improper mounting, too small clearance

Dismounting

Dismounting of the bearings is carried out for the periodic inspection or repairs of machines. By inspecting the bearing, related parts or mechanisms, lubrication, etc., important data is obtained. In the same manner as in mounting, care should be taken to prevent damage to the bearing or other parts.

A suitable dismounting method should be selected according to the type of the bearing, fit, etc. Bearings mounted by interference fit are especially difficult to dismount, and it is necessary to give due consideration to the structure around the bearing during the design stage.

Dismounting of outer ring

Outer rings mounted by interference fit are dismounted as shown in Fig. 28, by screwing in the push-out bolts evenly through several screw holes provided at places corresponding to the side face of the outer ring.

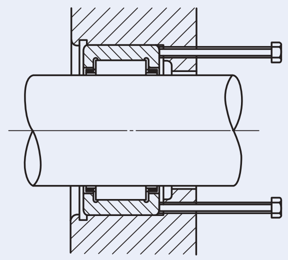


Fig. 28

Dismounting of inner ring

In the case of bearings such as needle roller bearings in which the inner and outer rings are separable, the simplest way to press out the inner ring is by using a press as shown in Fig. 29.

The puller shown in Fig. 30 is also generally used. This is designed according to the bearing size. In addition, there are a 3-hook puller (Fig. 31) and a 2-hook puller for wide-range use.

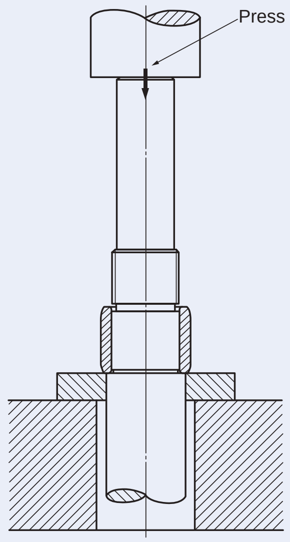


Fig. 29

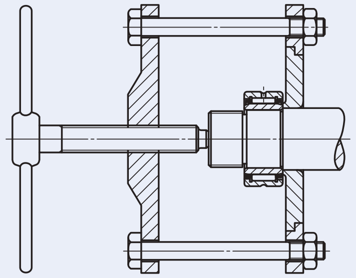


Fig. 30

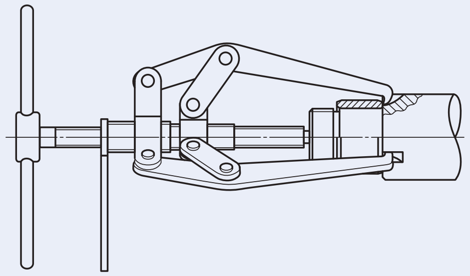


Fig. 31

In addition to these, when it is difficult to remove the inner ring due to high shoulders, several holes for removal pins are made through the shoulder, or several hook grooves are cut in the shoulder as shown in Fig. 32 and Fig. 33.

When a bearing is not to be used again after removal, it may be removed by heating with a torch lamp.

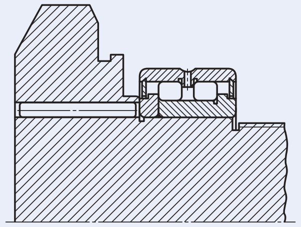


Fig. 32

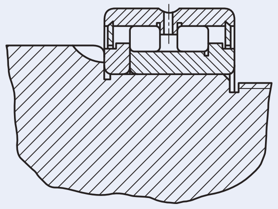


Fig. 33

Inspection of bearing

Cleaning of bearing

When inspecting a bearing after removal, the appearance of the bearing should be recorded first. Then, after the residual amount of lubricant is checked and a sample of lubricant is collected, the bearing should be cleaned.
For cleaning, light oil or kerosene is commonly used. Cleaning is divided into rough cleaning and final cleaning, and wire gauze is set as a raised bottom in a container to prevent the bearing from touching the bottom of the container.
Lubricating grease and adhering substances such as foreign particles are removed with a brush, etc., using oil for rough cleaning. Care should be taken during this process, because if the bearing is turned with foreign particles attached, the raceway surfaces may be scratched.
Final cleaning is carried out by turning the bearing in cleaning oil. It is desirable that the cleaning oil is kept clean by filtering. Immediately after cleaning, the bearing must be protected against corrosion.

Inspection and evaluation of bearing

The judgement as to whether the removed bearing is reusable depends on the inspection after cleaning. Conditions of the raceway surfaces, rolling elements and fitting surfaces, wear condition of the cage, increase of bearing clearance, dimensions, rotational accuracy, etc. should be checked for damage and abnormalities.
The evaluation is performed based on the experience taking into consideration the degree of damage, machine performance, importance of the machine, operating conditions, period until the next inspection, and other such factors.

Maintenance and inspection

Maintenance and inspection

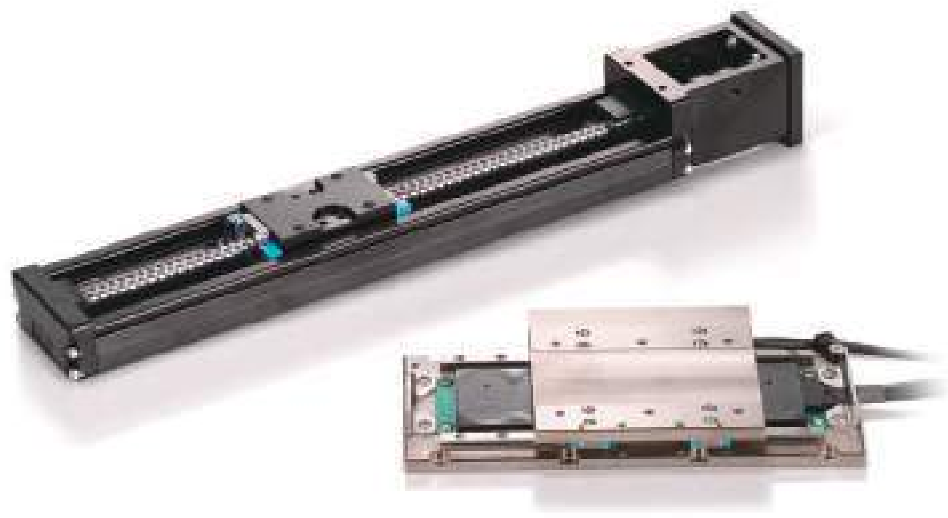
Maintenance and inspection are carried out to maintain good performance of bearings installed in the machine.
Maintenance is performed by checking the machine operating conditions, checking and replenishing or replacing the lubricant, checking the bearing and related parts by periodic disassembly and other such procedures.
Items for inspection of a running bearing in a machine include the bearing temperature, noise, vibration and condition of lubricant.
When any abnormality is found during operation, the cause should be investigated and measures taken by referring to the section on running test on page A59.
When removing a bearing, refer to the section on dismounting on page A59.

Damage, causes and corrective action

Rolling bearings can generally be used fully up to their rolling fatigue life if they are properly selected, mounted, operated and maintained. However, they may actually be damaged earlier than their expected lifetimes creating problems or accidents. Common causes of damage include improper mounting or handling, insufficient lubrication and penetration of foreign particles.
It may be difficult to determine the exact cause of a problem by checking only the damaged bearing. The conditions of the machine before and after the occurrence of the damage, the location and the operating and ambient conditions of the bearing, the structure around the bearing, etc. should also be examined. It then becomes possible to assess the cause of the damage by linking the conditions of the damaged bearing to the probable causes arising from the machine operation, and to prevent the recurrence of similar problems.
Common types of damage, causes and corrective action are listed in Table 41.

Table 41 Damage, causes and corrective action

Condition of bearing damage		Cause	Corrective action
Flaking	Flakings at opposite circumferential positions on raceway surfaces	Improper roundness of housing bore	Correction of housing bore accuracy
	Flakings in the vicinity of raceway surface edges and roller ends	Improper mounting, Shaft deflection, Poor centering, Poor accuracy of shaft or housing	Careful mounting, Careful centering, Correction of shoulders of shaft and housing for right angles
	Flakings on raceway surfaces with an interval corresponding to roller pitch	Great shock load when mounting, Rusting during machine stoppage	Careful mounting, Protection against rust for long periods of machine stoppage
	Early flaking on raceway surfaces and rolling elements	Too small clearance, Too great load, Poor lubrication, Rusting, etc.	Correct selection of fit and clearance Correct selection of lubricant
Galling	Galling on raceway surfaces and rolling surfaces of rollers	Poor lubrication in early stage Grease consistency too hard High acceleration at start	Selection of softer grease, Avoiding quick acceleration
	Galling between roller end faces and collar guide surfaces	Poor lubrication, Poor mounting, Large axial load	Correct selection of lubricant Correct mounting
Breakage	Cracks in outer or inner ring	Excessive shock load, Too much interference. Poor cylindricity of shaft. Too large fillet radius, Development of thermal cracks, Development of flaking	Reevaluation of load conditions, Correction of fit, Correction of machining accuracy of shaft or sleeve, Making fillet radius smaller than the chamfer dimension of bearing
	Cracked rolling elements, broken collar	Development of flaking Shock to collar when mounting, Dropped by careless handling	Careful handling and mounting
	Broken cage	Abnormal load to cage by poor mounting, Poor lubrication	Minimizing mounting errors, Study of lubricating method and lubricant
Dent	Indentations on raceway surfaces at an interval corresponding to the pitch between rolling elements (brinelling)	Shock load applied when mounting, Excessive load while stopping	Careful handling
	Indentation on raceway surfaces and rolling surfaces of rollers	Biting of foreign substances such as metal chips and sands	Cleaning of housing, Improvement of sealing, Use of clean lubricant
Abnormal wear	False brinelling (Phenomenon like brinelling)	Vibration when the bearing is stationary such as during transportation, Oscillating motion with small amplitude	Fixing of shaft and housing, Use of lubricating oil, Application of preload to reduce vibration
	Fretting Localized wear of fitted surfaces accompanied by red-brown wear particles	Sliding between fitted surfaces	Increase of interference, Application of oil
	Wear on raceway surfaces, collar surfaces, rolling surfaces of rollers, cages, etc.	Penetration of foreign particles, Poor lubrication, Rust	Improvement of sealing, Cleaning of housing Use of clean lubricant
	Creep Wear on fitted surfaces	Sliding between fitted surfaces, Insufficient tightening of sleeve	Increase of interference, Correct tightening of sleeve
Seizure	Discoloration of rolling elements and/or raceway surfaces and/or flange surfaces, Adhesion and welding, Discoloration of cage	Poor lubrication, Too small clearance, Poor mounting	Supply of proper amount of proper lubricant, Rechecking of fit and bearing clearance Rechecking of mounting dimensions and related parts
Electric corrosion	Ripples on raceway surfaces	Melting by sparks due to electric current	Insulation of bearing, Grounding to avoid electric current
Rust, corrosion	Rust or corrosion on bearing inside surfaces or on fitted surfaces	Condensation of vapor in air, Penetration of corrosive substances	Careful storage if under high temperature and high humidity, Protection against rust, Improvement of sealing



Recognizing that conservation of the global environment is the top-priority challenge for the world's population, Nippon Thompson will conduct its activities with consideration of the environment as a corporate social responsibility, reduce its negative impact on the environment, and help foster a rich global environment.

ISO 9001 & 14001 Quality system registration certificate

ISO 9001 Certified ISO 14001 Certified

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IKO Mechatronics Series General Catalog

CAT-1593E

POSITIONING TABLES

Good Environment and Good Quality
























IKO Precision Positioning Table is a product brought out from an integration of the linear motion rolling guide technology, which we have developed for many years, and the state-of-the-art technology in microelectronics.

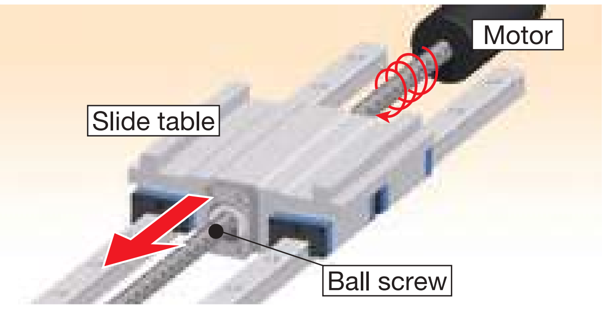
IKO Precision Positioning Table is composed of many leading-edge components carefully chosen to meet stringent needs. In the table guiding parts in particular, IKO linear motion rolling guide, which has been well proven in the fields of super precision machines and machine tools, is incorporated to make full use of their high potentials.

IKO Precision Positioning Table has proven its excellent performance through a wide range of applications as a positioning mechanism for the state-of-the-art LCD and semiconductor manufacturing facilities such as a variety of measuring equipments, processing machines, and assemblers.

Types of Mechatronics Series

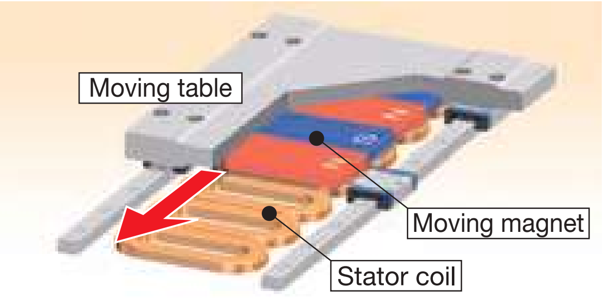
Drive model

Ball screw drive

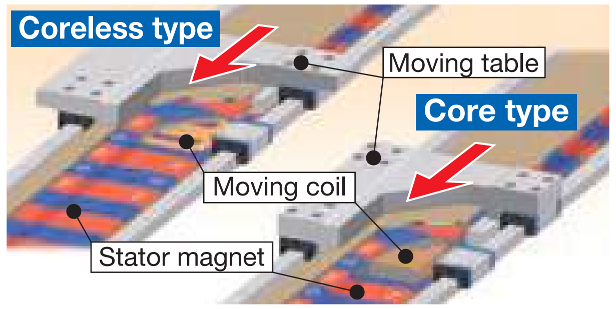


Linear motor drive

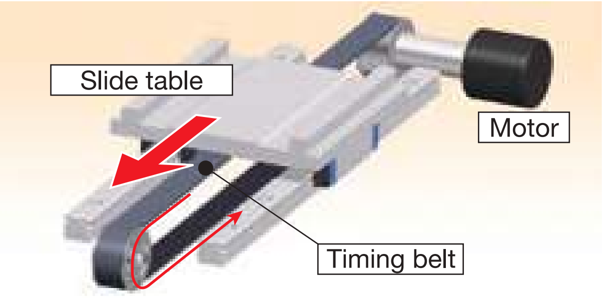
Moving magnet



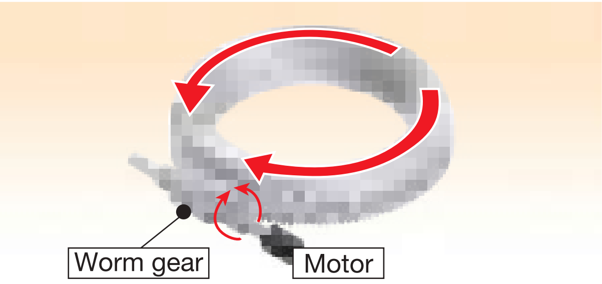
Moving coil

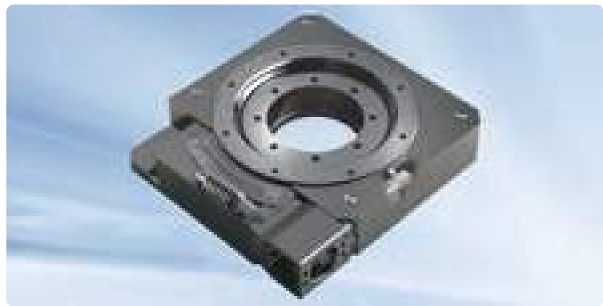


Timing belt drive



Worm gear drive





Characteristics of Mechatronics Series

		Motion direction	Stroke length	Thrust force	Speed	Acceleration	Positioning accuracy
Ball screw drive		Linear Vertical Alignment	○	◎	○	△	○
Linear motor drive	Moving magnet	Linear Alignment	△	△	◎	◎	◎
	Moving coil	Linear	◎	△	◎	◎	◎
Timing belt drive		Linear	◎	○	◎	◎	△
Worm gear drive		Rotation	◎	◎	△	△	○

Code description ◎Excellent ○Good △Fair

MECHATRONICS SERIES INDEX

Precision Positioning Table TE

- High-strength aluminum alloy is used for main components
- Light weight, low profile and compact positioning table

Ball screw drive
Linear

TE···B

Ⅱ-4

Precision Positioning Table TU

- High rigidity U-shaped track rail adopted
- Various table specifications are available according to your use.

Ball screw drive
Linear

TU

Ⅱ-34

Precision Positioning Table L

- Standard type highly-proven in various fields
- Parallel arrangement of Linear Ways with stable performance

Ball screw drive
Linear

TSL···M

Ⅱ-108

Precision Positioning Table LH

- Component parts from rigorous selection ensure high accuracy and reliability.
- High rigidity and large carrying mass

Ball screw drive
Linear

TSLH···M
CTLH···M

Ⅱ-130

Super Precision Positioning Table TX

- Achieved ultimate positioning performance with rolling guide type
- High accuracy attained by fully-closed loop control

Ball screw drive
Linear

TX···M
CTX···M

Ⅱ-158

Cleanroom Precision Positioning Table TC

- Optional for use in high cleanliness environment for semiconductor and LCD manufacturing machines
- Light weight, low profile and compact positioning table

Ball screw drive
Linear

TC···EB

Ⅱ-180

Micro Precision Positioning Table TM

- Ground ball screw drive realizes ultra-small size with sectional height of 20mm and width of 17mm.
- High positioning accuracy and excellent durability

Ball screw drive
Linear

TM

Ⅱ-198

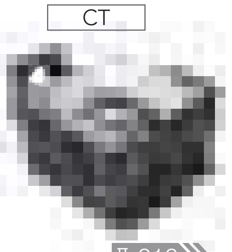
Precision Positioning Table TS/CT

- Compact structure with low profile
- Crossed Roller Way guaranteeing high reliability and high accuracy

Ball screw drive
Linear

TS

CT



Ⅱ-216

Precision Positioning Table LB

- High-speed type using a timing belt drive
- Parallel arrangement of Linear Way ensures stable and high operating performance.

Timing belt drive
Linear

TSLB

Ⅱ-242

Nano Linear NT

- Pursuing ultimate compactification
- Very low profile of NT38V: only 11mm
- A wide variety of selections support optimal choice according to your use.

Linear motor drive
Linear

NT···V
NT···XZ
NT···H
NT···XZH

Ⅱ-254

Alignment Stage SA

- Sectional height of 3 axes X, Y and θ is only 52mm (SA65DE).
- X- and Y-axis: 0.1 μm, θ-axis: excellent resolution as high as 0.36 sec (SA120DE)

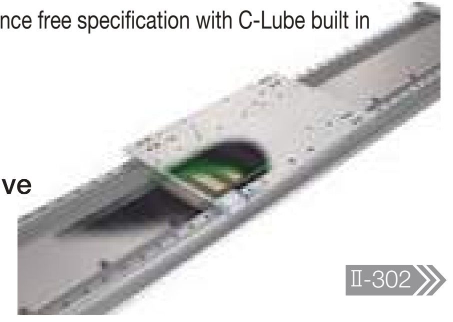
Linear motor drive
Alignment
Linear

SA···DE

Ⅱ-286

Linear Motor Table LT

- Both high speed and high resolution are achieved.
- High acceleration / deceleration, high response and smooth operations
- Long term maintenance free specification with C-Lube built in



Linear motor drive
Linear

LT···CE
LT···H
LT···LD

Ⅱ-302

Alignment Table AT

- High accuracy positioning ensuring precise angle correction
- Crossed Roller Bearing ensures high rigidity and compactness.

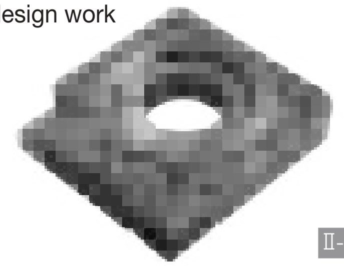
Ball screw drive
Alignment

AT

Ⅱ-330

Rotation Stage SK

- Crossed Roller Bearings ensure high rigidity and compactness
- Allows smooth, high-accuracy positioning
- Direct mounting of the table or test object reduces labor hours required for design work



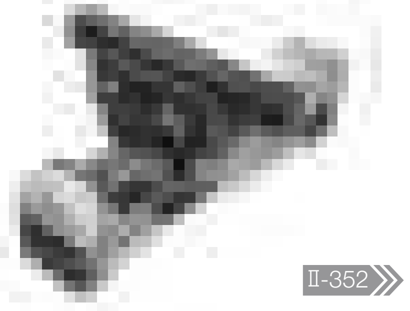
Worm gear drive
Rotation

SK···W

Ⅱ-344

Alignment Module AM

- Supports free designing of stage according to your use
- Control tolerance of height within ±10 μm



Ball screw drive
Alignment

AM

Ⅱ-352

Precision Elevating Table TZ

- Unique wedge mechanism ensures compact and high accuracy vertical positioning.
- TZ···X achieving high-accuracy and high rigidity through adoption of C-Lube Linear Roller Way Super X

Ball screw drive
Vertical

TZ···H
TZ···X

Ⅱ-366

A Variety of Models and Variations

Precision Positioning Table TE

Ball screw drive

TE…B

Linear

- High-strength aluminum alloy is used for main components
- Light weight, low profile and compact positioning table
- High accuracy positioning
- Long term maintenance free specification with C-Lube built in
- Excellent cost performance

Specification

Model and size	Maximum stroke (mm)	Maximum speed (mm/s)	Ball screw lead (mm)
TE50B	410	800	4, 8
TE60B	600	1 000	5, 10, 20
TE86B	800	1 860	10, 20

Accuracy

Positioning repeatability	○
Positioning accuracy	○
Lost motion	—
Parallelism in table motion A	—
Parallelism in table motion B	○
Attitude accuracy	—
Straightness	—
Backlash	○

See page Ⅱ–4

Precision Positioning Table TU

Ball screw drive

TU

Linear

- Original high rigidity U-shaped track rail adopted
- Various table specifications are available according to your use.
- Slide table with high accuracy and high rigidity in a single structure
- Easy ordering just by specifying the identification number for the required functions and performance

Specification

Model and size	Maximum stroke (mm)	Maximum speed (mm/s)	Ball screw lead (mm)
TU 25	100	400	4
TU 30	230	500	5
TU 40	285	800	4, 8
TU 50	560	1 000	5, 10
TU 60	1 010	1 860	5, 10, 20
TU 86	1 400	1 480	10, 20
TU100	1 140	1 110	20
TU130	1 260	1 110	25

Accuracy

Positioning repeatability	○
Positioning accuracy	○
Lost motion	—
Parallelism in table motion A	—
Parallelism in table motion B	○
Attitude accuracy	—
Straightness	—
Backlash	○

See page Ⅱ–34

Precision Positioning Table L

Ball screw drive

TSL…M

Linear

- Standard type highly-proven in various fields
- Parallel arrangement of Linear Ways with stable performance
- High running accuracy and positioning accuracy
- Many size variations support easy multi-axis system configurations.
- Long term maintenance free specification with C-Lube built in

Specification

Model and size	Maximum stroke (mm)	Maximum speed (mm/s)	Ball screw lead (mm)
TSL 90 M	300	500	5, 10
TSL 120 M	600	500	5, 10
TSL 170 M	500	500	5, 10
TSL 170S M	1 000	500	5, 10
TSL 220 M	1 000	500	5, 10

Accuracy

Positioning repeatability	○
Positioning accuracy	○
Lost motion	—
Parallelism in table motion A	—
Parallelism in table motion B	○
Attitude accuracy	—
Straightness	—
Backlash	○

See page Ⅱ–108

Precision Positioning Table LH

Ball screw drive

TSLH…M

(Single-axis specification)

CTLH…M

(Two-axis specification)

Linear

- Component parts from rigorous selection ensure high accuracy and reliability.
- High rigidity and large carrying mass
- High running accuracy and positioning accuracy
- The series including ultra large size with table width of 420mm
- Long term maintenance free specification with C-Lube built in

Specification

Model and size	Maximum stroke (mm)	Maximum speed (mm/s)	Ball screw lead (mm)
TSLH120M	300	500	5, 10
TSLH220M	400	500	5, 10
TSLH320M	500	448	5, 10
TSLH420M	800	448	5, 10
CTLH120M	300 × 300	500	5, 10
CTLH220M	400 × 400	500	5, 10
CTLH320M	500 × 500	448	5, 10

Accuracy

Positioning repeatability	○
Positioning accuracy	○
Lost motion	—
Parallelism in table motion A	○
Parallelism in table motion B	—
Attitude accuracy	—
Straightness	◎
Backlash	◎

See page Ⅱ–130

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

A Variety of Models and Variations

Super Precision Positioning Table TX

Ball screw drive

TX···M (Single-axis specification)

CTX···M (Two-axis specification)

Linear

- Achieved ultimate positioning performance with rolling guide type
- Fully-closed loop control equipped with super high accuracy linear encoder ensuring high accuracy
- Control method selectable according to needs
- Long term maintenance free specification with C-Lube built in

Specification

Model and size	Maximum stroke (mm)	Maximum speed (mm/s)	Ball screw lead (mm)
TX 120M	300	500	5, 10
TX 220M	400	500	5, 10
TX 320M	500	448	5, 10
TX 420M	800	448	5, 10
CTX120M	300 × 200	500	5, 10
CTX220M	400 × 300	500	5, 10

Accuracy

Positioning repeatability	◎
Positioning accuracy	◎
Lost motion	◎
Parallelism in table motion A	◎
Parallelism in table motion B	—
Attitude accuracy	◎
Straightness	◎
Backlash	◎

See page Ⅱ–158

Cleanroom Precision Positioning Table TC

Ball screw drive

TC···EB

Linear

- Optional for use in high cleanliness environment for semiconductor and LCD manufacturing machines
- Light weight, low profile and compact positioning table
- Compatible with cleanliness class 3
- Long term maintenance free specification with C-Lube built in

Specification

Model and size	Maximum stroke (mm)	Maximum speed (mm/s)	Ball screw lead (mm)
TC50EB	200	400	4, 8
TC60EB	500	500	5, 10
TC86EB	800	1 000	10, 20

Accuracy

Positioning repeatability	○
Positioning accuracy	○
Lost motion	—
Parallelism in table motion A	—
Parallelism in table motion B	○
Attitude accuracy	—
Straightness	—
Backlash	○

See page Ⅱ–180

Micro Precision Positioning Table TM

Ball screw drive

TM

Linear

- Ground ball screw drive realizes ultra-small size with sectional height of 20mm and width of 17mm.
- High positioning accuracy and excellent durability
- Two types of slide table shapes selectable according to needs
- Super-miniature sensor can be built in.

Specification

Model and size	Maximum stroke (mm)	Maximum speed (mm/s)	Ball screw lead (mm)
TM15	60	75	0.5, 1.0, 1.5
TM15G	50	75	0.5, 1.0, 1.5

Accuracy

Positioning repeatability	○
Positioning accuracy	○
Lost motion	—
Parallelism in table motion A	—
Parallelism in table motion B	—
Attitude accuracy	—
Straightness	—
Backlash	—

See page Ⅱ–198

Precision Positioning Table TS/CT

Ball screw drive

TS (Single-axis specification)

CT (Two-axis specification)

Linear

- Compact structure with low profile
- Crossed Roller Way guaranteeing high reliability and high accuracy positioning
- Compact design achieved by utilizing wide area of slide table

Specification

Model and size	Maximum stroke (mm)		Maximum speed (mm/s)	Ball screw lead (mm)
	X-axis	Y-axis		
TS 55/ 55	± 7.5		30	1
TS 75/ 75	± 12.5		30	1
TS125/125	± 25		250	1, 2, 5
TS125/220	± 60		250	2, 5
TS220/220	± 60		250	2, 5
TS220/310	± 90		250	2, 5
TS260/350	±125		250	2, 5
CT 55/ 55	± 7.5	± 7.5	30	1
CT 75/ 75	± 12.5	± 12.5	30	1
CT125/125	± 25	± 25	250	1, 2, 5
CT220/220	± 60	± 60	250	2, 5
CT260/350	± 75	±125	250	2, 5
CT350/350	±125	±125	250	2, 5

Accuracy

Positioning repeatability	○
Positioning accuracy	○
Lost motion	—
Parallelism in table motion A	◎
Parallelism in table motion B	○
Attitude accuracy	—
Straightness	—
Backlash	○

See page Ⅱ–216

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

A Variety of Models and Variations

Precision Positioning Table LB

Timing belt drive

TSLB

Linear

- Timing belt drive achieves high speed travel at 1,500mm/s.
- Parallel arrangement of Linear Way ensures stable and high operating performance.
- Long stroke up to 1,200mm

Specification

Model and size	Maximum stroke (mm)	Maximum speed (mm/s)	Resolution (mm)
TSLB 90	600	1 500	0.1
TSLB120	1 000	1 500	0.1
TSLB170	1 200	1 500	0.1

Accuracy

Positioning repeatability	△
Positioning accuracy	—
Lost motion	—
Parallelism in table motion A	—
Parallelism in table motion B	△
Attitude accuracy	—
Straightness	—
Backlash	—

See page
Ⅱ–242

Nano Linear NT

Standard Type

Linear motor drive

NT···V

Linear

- Pursuing ultimate compactification
- Very low profile of NT38V: only 11mm
- A wide variety of selections support optimal choice according to your use.
- High acceleration / deceleration ensuring highly responsive positioning
- Two-axis combination of X and Y

High Accuracy Type

Linear motor drive

NT···H

Linear

- Pursuing ultimate compactification
- High attitude accuracy
- High speed stability
- Simple system configuration

Pick and Place Unit

NT···XZ
NT···XZH

Linear motor drive

Linear

- Pursuing ultimate compactification
- High-tact positioning
- Ultrathin and space saving
- Operation monitoring function

Specification

Model and size	Maximum stroke (mm)	Maximum speed (mm/s)	Resolution (μm)
NT38V	18	500	0.1, 0.5
NT55V	65	1 300	0.1, 0.5
NT80V	120	1 300	0.1, 0.5
NT88H	65	400	0.01, 0.05
NT80XZ	45	1 300	0.1, 0.5
NT90XZH	25	1 300	0.1, 0.5

Accuracy

Item	NT···V	NT···H	NT···XZ
Positioning repeatability	◎	◎	◎
Positioning accuracy	—	◎	—
Lost motion	—	—	—
Parallelism in table motion A	—	◎	—
Parallelism in table motion B	—	—	—
Attitude accuracy	—	◎	—
Straightness	—	◎	—
Backlash	—	—	—

See page
Ⅱ–254

A Variety of Models and Variations

Alignment Stage SA

Linear motor drive

SA···DE Linear Alignment

- Slim and compact design with sectional height of 3 axes, X, Y and θ being only 52mm (SA65DE)
- X- and Y-axis: 0.1 μm, θ-axis: excellent resolution as high as 0.36 sec (SA120DE)
- Free and independent combination of X, Y and θ

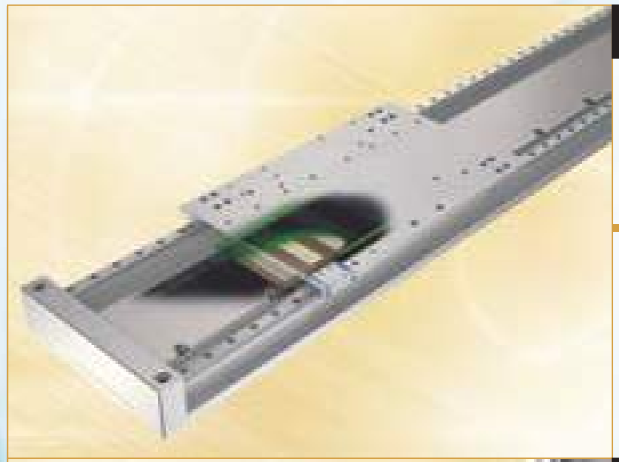
Specification

Model and size	Maximum stroke Maximum operating angle	Maximum speed	Resolution
SA 65 DE/X	10 (mm)	500 (mm/s)	0.1, 0.5 (μm)
SA120 DE/X	20 (mm)	800 (mm/s)	0.1, 0.5 (μm)
SA 65 DE/S	50 (degree)	720 (degree/s)	0.64 (s)
SA120 DE/S	60 (degree)	420 (degree/s)	0.36 (s)
SA200 DE/S	280 (degree)	270 (degree/s)	0.25 (s)

Accuracy

Positioning repeatability	◎
Positioning accuracy	—
Lost motion	—
Parallelism in table motion A	—
Parallelism in table motion B	—
Attitude accuracy	—
Straightness	—
Backlash	—

See page
Ⅱ–286



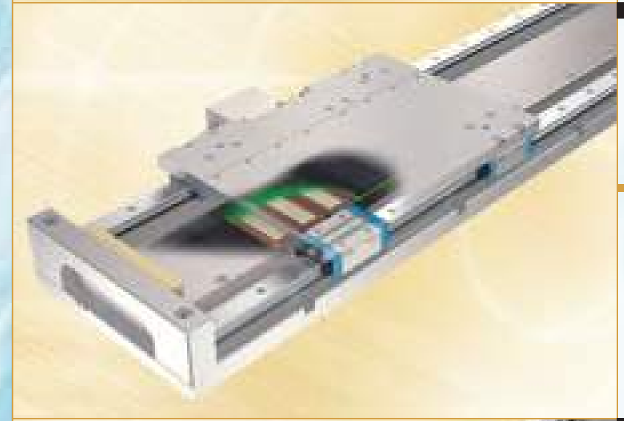
Linear Motor Table LT

Compact Type

Linear motor drive

LT···CE Linear

- Compact
- High static stability
- High speed stability
- High acceleration / deceleration and high response
- Long term maintenance free specification with C-Lube built in



Long Stroke Type

Linear motor drive

LT···LD Linear

- Super long stroke
- High static stability
- High speed stability
- Both high speed and high resolution are achieved.
- Long term maintenance free specification with C-Lube built in

High Thrust Type

Linear motor drive

LT···H Linear

- High thrust
- High acceleration / deceleration, high response and smooth operations
- High static stability
- Air-cooling capable
- Long term maintenance free specification with C-Lube built in

Specification

Model and size	Maximum stroke (mm)	Maximum speed (mm/s)	Resolution (μm)
LT100CE	1 000	2 000	0.1, 0.5, 1.0
LT150CE	1 200	2 000	0.1, 0.5, 1.0
LT130LD	2 760	3 000	0.1, 0.5, 1.0
LT170LD	2 720	3 000	0.1, 0.5, 1.0
LT170H	2 670	1 500	0.1, 0.5, 1.0

Accuracy

Item	LT···CE	LT···LD	LT···H
Positioning repeatability	◎	◎	◎
Positioning accuracy	—	—	—
Lost motion	—	—	—
Parallelism in table motion A	—	—	—
Parallelism in table motion B	—	—	—
Attitude accuracy	—	—	—
Straightness	—	—	—
Backlash	—	—	—

See page
Ⅱ–302

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

A Variety of Models and Variations

Alignment Table AT

Ball screw drive

AT

Alignment

- High accuracy positioning ensuring precise angle correction
- Crossed Roller Bearing ensures high rigidity and compactness.
- High positioning repeatability
- A series of 3 sizes

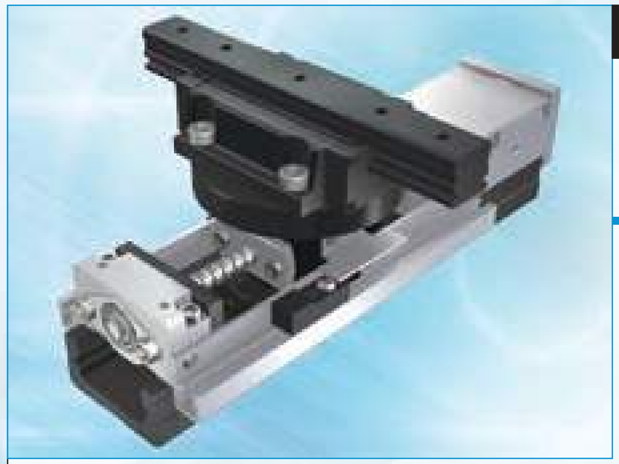
Specification

Model and size	Maximum operating angle (degree)	Ball screw lead (mm)	Rotator resolution (μm)
AT120	± 5	1	1
AT200	± 5	1	1
AT300	±10	2	2

Accuracy

Positioning repeatability	◎
Positioning accuracy	—
Lost motion	—
Parallelism in table motion A	—
Parallelism in table motion B	—
Attitude accuracy	—
Straightness	—
Backlash	—

See page Ⅱ-330



Alignment Module AM

Ball screw drive

AM

Alignment

- Supports free designing of stage according to your use
- Control tolerance of height within ±10μm
- Variety of positioning operations in combination of X, Y, and θ
- Ideal for large size equipment
- High accuracy, high rigidity, and high reliability

Specification

Model and size	Maximum stroke (mm)	Length of track rail (mm)	Ball screw lead (mm)
AM25	30	130	4
AM40	30	180	4
AM60	90	290	5
AM86	120	390	5

Accuracy

Positioning repeatability	○
Positioning accuracy	○
Lost motion	—
Parallelism in table motion A	—
Parallelism in table motion B	○
Attitude accuracy	—
Straightness	—
Backlash	○

See page Ⅱ-352

Rotation Stage SK

Worm gear drive

SK…W

Rotation

- Crossed Roller Bearings ensure high rigidity and compactness
- Allows smooth, high-accuracy positioning
- Direct mounting of the table or test object reduces labor hours required for design work

Specification

Model and size	Table diameter (mm)	Operating angle range (degree)	Maximum number of table revolutions (min^{-1})
SK120W	115	360	5
SK120W/SC	120	320	

Accuracy

Positioning repeatability	○
Positioning accuracy	◎
Lost motion	△
Parallelism in table motion A	—
Parallelism in table motion B	—
Attitude accuracy	—
Straightness	—
Backlash	△

See page Ⅱ-344

Precision Elevating Table TZ

Ball screw drive

TZ

Linear

- Unique wedge mechanism ensures compact and high accuracy vertical positioning.
- TZ…X achieving high accuracy and high rigidity through adoption of C-Lube Linear Roller Way Super MX
- Linear encoder mountable
- Long term maintenance free with C-Lube built in
- A series of two types of reduction ratios

Specification

Model and size	Maximum stroke (mm)	Maximum speed (mm/s)	Ball screw lead (mm)
TZ120X	10	100	4
TZ200H	24	125	5
TZ200X	24	125	5

Accuracy

Positioning repeatability	○
Positioning accuracy	○
Lost motion	○
Parallelism in table motion A	—
Parallelism in table motion B	—
Attitude accuracy	○
Straightness	—
Backlash	—

See page Ⅱ-366

For light weight and low profile innovative tables

Precision Positioning Table TE

TE…B

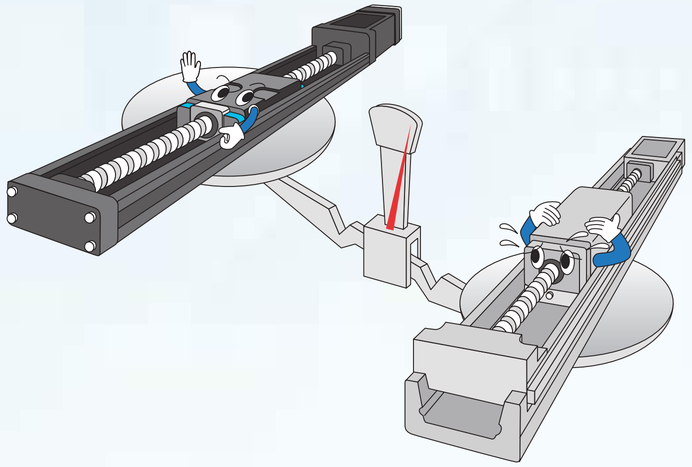
High-strength aluminum alloy is used for main components. Light weight and compact structure with slide table assembled inside the U-shaped bed!

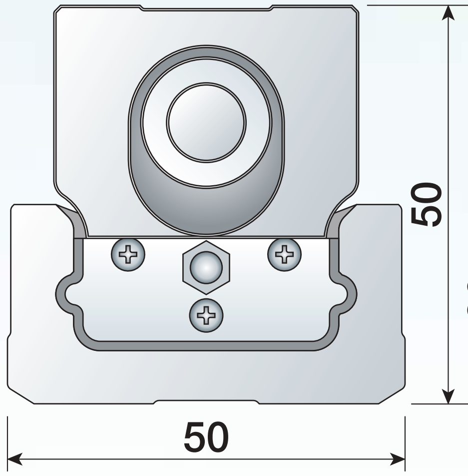
● Mass

unit: kg

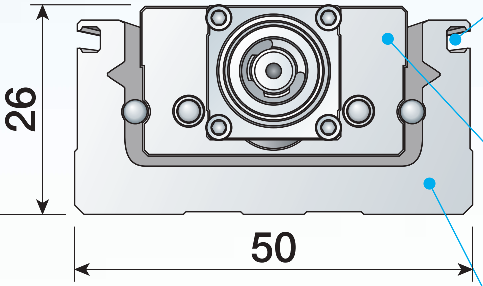
Bed width(mm)	TU	TE…B
50	1.8	0.52
60	3.3	1.0
86	10.9	3.7

The value shows the mass of the entire table with 1 standard table.





TU50



TE50B

Respective sensors to be attached directly into the mounting groove

Slide table and linear motion rolling guide integrated in a single structure to ensure low profile and compact design!

Ultra light weight achieved through the use of slide table and bed made of high-strength aluminum alloy!

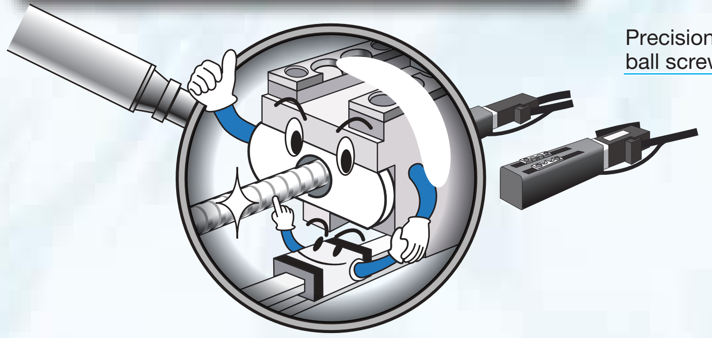
For ultimate compactification

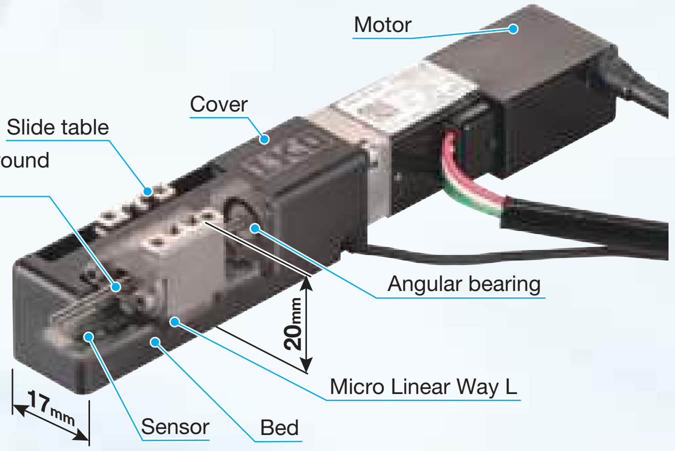
Micro Precision Positioning Table TM

TM

Ground ball screw specification realizes ultra-small size with sectional height of 20mm and width of 17mm.

Micro Linear Way L with track rail width of 2mm is adopted in the table guiding parts, and miniature ball screw with screw diameter of 2mm is used in the feeding mechanism. The unparalleled low cross sectional height in the ground ball screw drive is achieved.



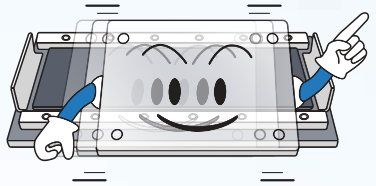


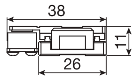
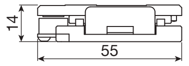
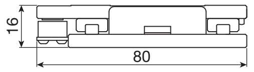
Nano Linear NT

NT…V

Pursuing ultimate compactification NT38V10, the smallest in the series, is only 11mm in sectional height, 38mm in table width and 62mm in entire length.

The occupied space is not increased even when tables are layered in X and Y, so further miniaturization of the positioning mechanism is promoted.



Model	NT…V						
	NT38V10	NT38V18	NT55V25	NT55V65	NT80V25	NT80V65	NT80V120
Model and size							
Sectional dimension	 38 26 11		 14 55		 16 80		

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

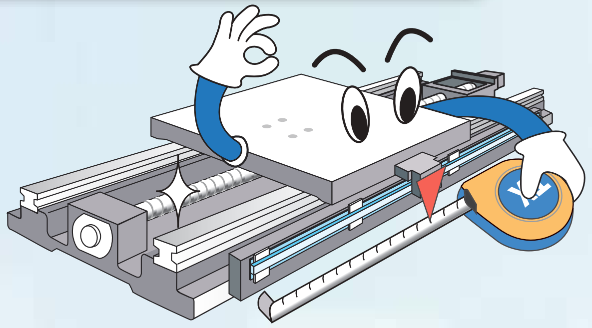
For higher accuracy

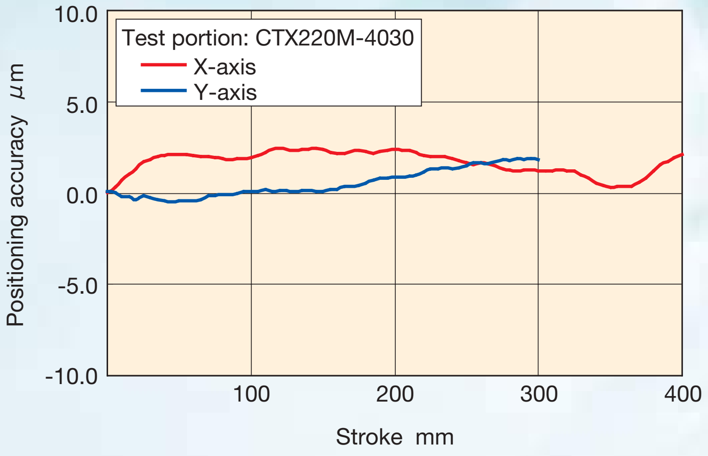
Super Precision Positioning Table TX

TX···M, CTX···M

Super high positioning accuracy and resolution guaranteed with an onboard super high accuracy linear encoder!

Adoption of C-Lube Linear Roller Way Super MX ensures ultimate running performance. Fully-closed loop control is established by super high resolution linear encoder to ensure high positioning accuracy over the whole stroke length.



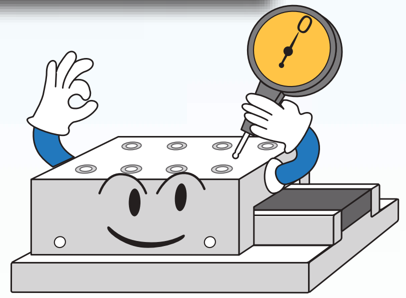


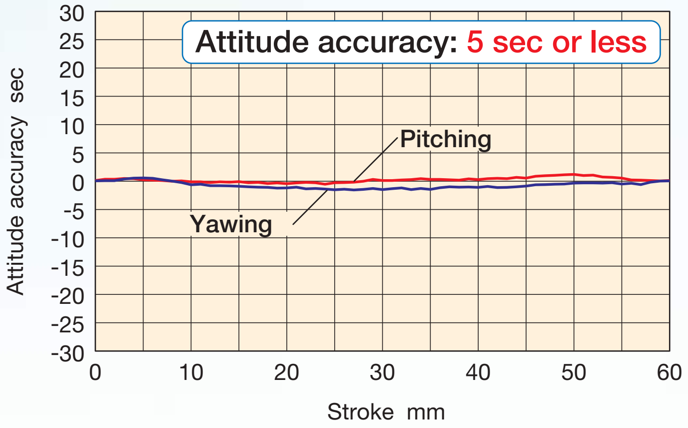
Nano Linear NT

NT···H

High attitude accuracy is realized!

Combination of parts processed with high accuracy and Anti-Creep Cage Crossed Roller Way realizes attitude accuracy of 5 sec or less. Variations in attitude due to movement is minimized, which ensures high positioning repeatability.





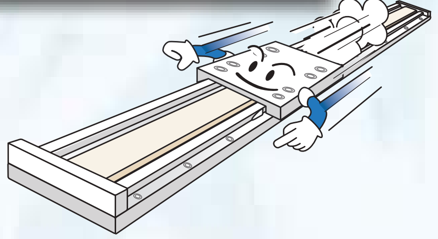
For attaining both high accuracy positioning and high speed

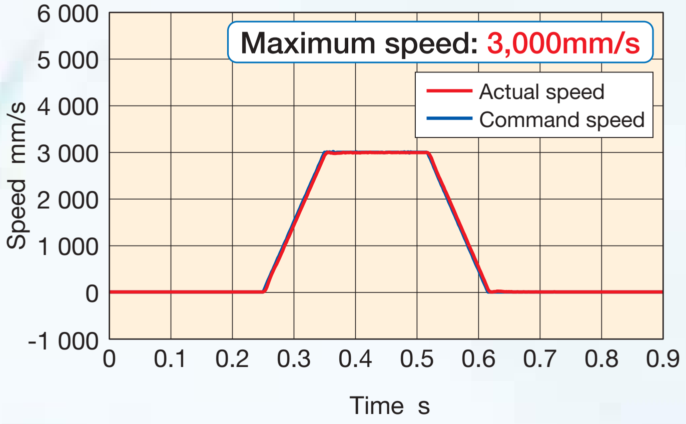
Linear Motor Table LT

LT···LD

Direct drive enables both high-precision positioning and high speed.

Supports high speed operation required for long stroke motion
It is possible to perform high-speed motion of up to 3,000mm/s.



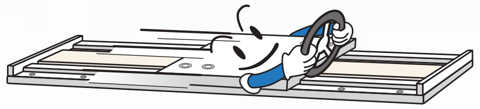


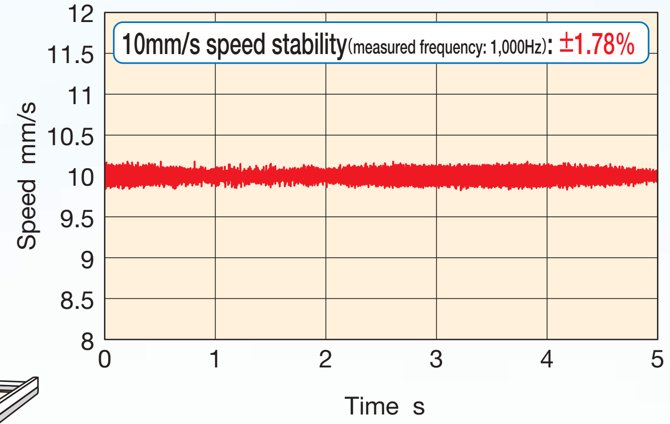
For high speed stability

Linear Motor Table LT

LT···CE, LT···LD, LT···H

Direct drive and advanced servo technology has achieved high speed stability.





1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

For choosing from a wide variety of options

Easy ordering is possible right now just by specifying the identification number for the required functions and performance!

Precision Positioning Table TU

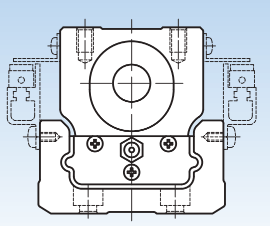
TU

Precision Positioning Table TE

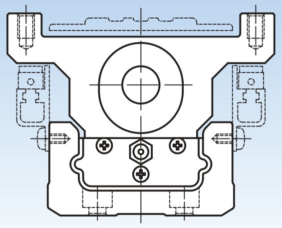
TE…B

Shape of slide table

Two types of shape are available according to needs.



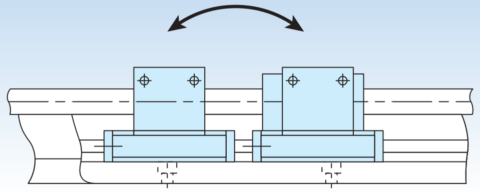
Standard
Short, standard, long



With flange
Short, standard, long

Number of slide tables

Two slide tables can be mounted on the track rail depending on the applied load and the moment.



Type and lead of ball screw

Rolled ball screw or ground ball screw can be selected according to the required accuracy. Ball screw lead is also selectable.

Motor folding back specification

Shortening the overall length of the table will contribute to space-saving.

With bridge cover

A specification with bridge cover is available for preventing foreign matter from falling onto the table.

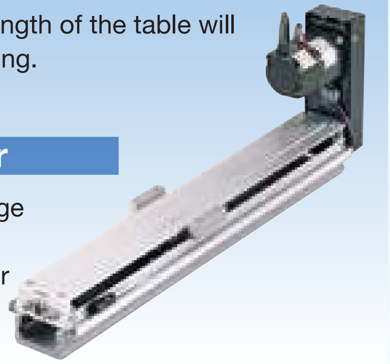
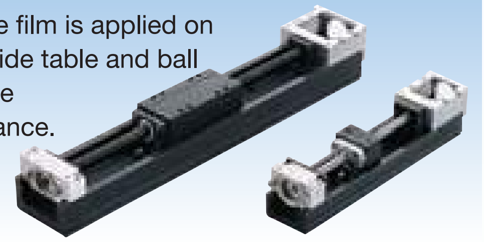


Table with bellows

A specification with bellows is available for preventing foreign matter from intruding into the inside of the table.

Black chrome surface treatment

Black permeable film is applied on the surface of slide table and ball screw to improve corrosion resistance.



For clean environment applications

Cleanroom Precision Positioning Table TC

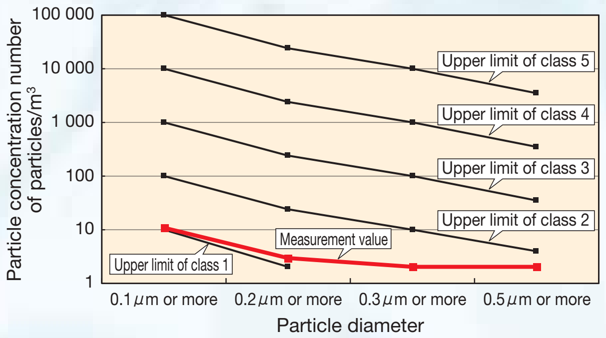
TC…EB

Cleanliness class 3 is achieved!

Stainless sheet with excellent corrosion resistance and side cover seal up drive parts and slide table guiding parts. Stainless sheet is pressed onto the side cover by resin roller within the slide table. The structure which ensures proper attraction by the strong magnet sheet prevents dust from generating to the surrounding of the table by air suction from the sealed internal space.

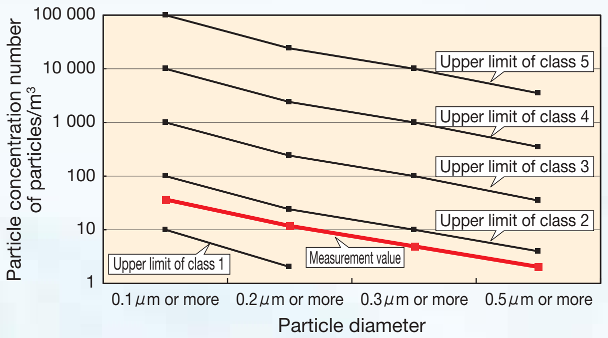
TC50EB150
(Ball screw lead: 4mm)

Stroke length : 50mm
Speed : 200mm/s
Suction amount : 5L/min



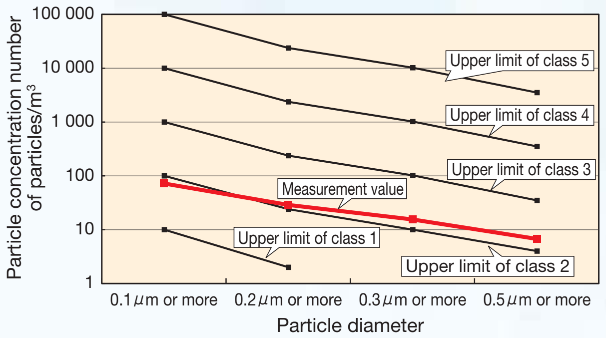
TC50EB300
(Ball screw lead: 8mm)

Stroke length : 200mm
Speed : 400mm/s
Suction amount : 10L/min



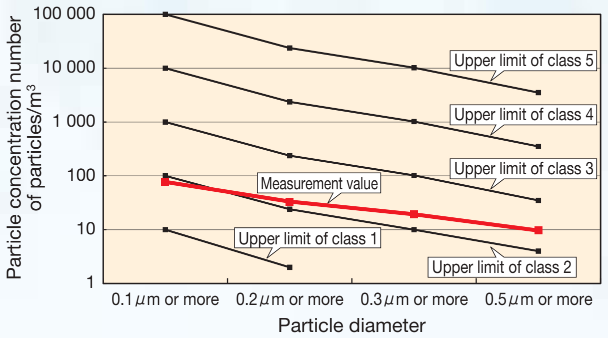
TC60EB300
(Ball screw lead: 10mm)

Stroke length : 200mm
Speed : 500mm/s
Suction amount : 30L/min



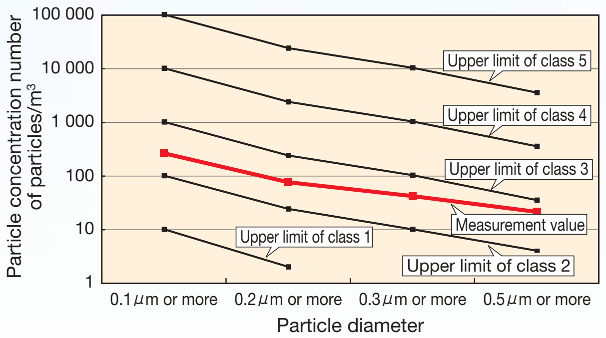
TC60EB600
(Ball screw lead: 10mm)

Stroke length : 500mm
Speed : 500mm/s
Suction amount : 30L/min



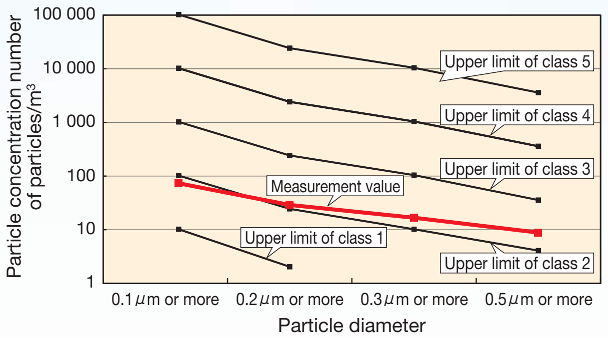
TC86EB640
(Ball screw lead: 20mm)

Stroke length : 200mm
Speed : 1 000mm/s
Suction amount : 70L/min



TC86EB940
(Ball screw lead: 20mm)

Stroke length : 800mm
Speed : 560mm/s
Suction amount : 40L/min



1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

For maintenance free

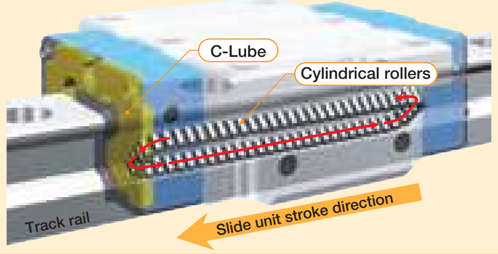
Oil Minimum
Gentle to The Earth IKO

Original and world's first structure with [C-Lube]

C-Lube integrated

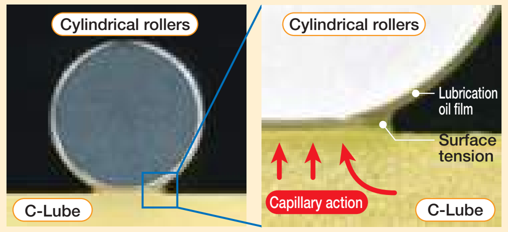
Lubrication oil is carried through circulation of rolling elements

The lubrication oil is supplied directly to the rolling elements, not to the track rail.
When rolling elements make contact with the capillary lubricating element integrated with the circulation path of slide unit rolling elements, the lubrication oil is supplied to surfaces of rolling elements and carried to the loading area through circulation of rolling elements.
This results in adequate lubrication oil being properly maintained in the loading area and lubrication performance will last for a long time.

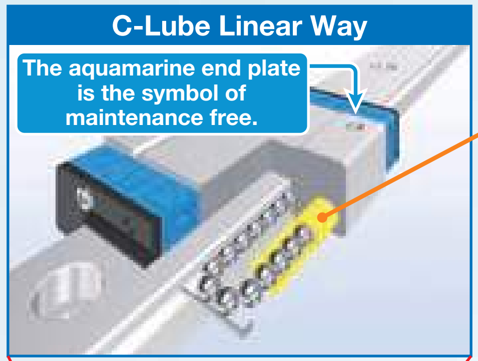


Lubrication oil is directly supplied to surfaces of the rolling elements

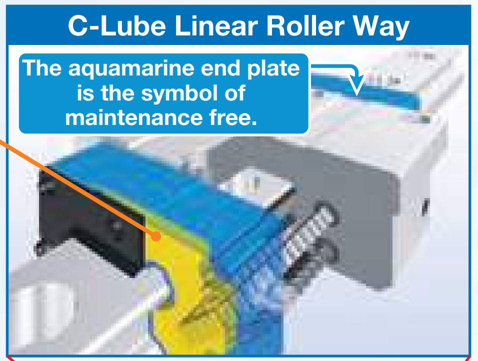
The surface of capillary lubricating element is always covered with the lubrication oil.
Lubrication oil is continuously supplied to the surface of rolling elements by surface tension in the contact of capillary lubricating element surface and rolling elements.
On the surface of capillary lubricating element with which the rolling elements make contact, new lubrication oil is always supplied from the other sections.

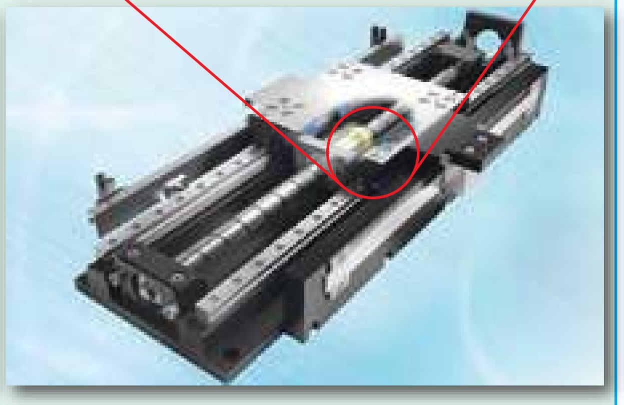


C-Lube Linear Way



C-Lube Linear Roller Way





- Precision Positioning Table TE
- Precision Positioning Table L
- Precision Positioning Table LH
- Cleanroom Precision Positioning Table TC
- Precision Elevating Table TZ

- Super Precision Positioning Table TX
- Nano Linear NT
- Alignment Stage SA
- Linear Motor Table LT

Series with [C-Lube] built in

For a wider variety of needs

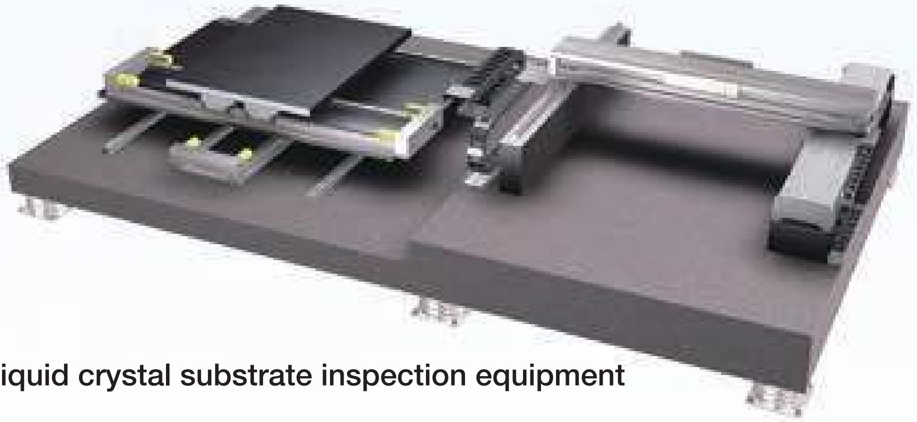
Extensive experience in special stages will help us precisely address your particular needs such as stages related to various axis configurations. If needed, please contact IKO.

▲ Liquid crystal substrate manufacturing equipment

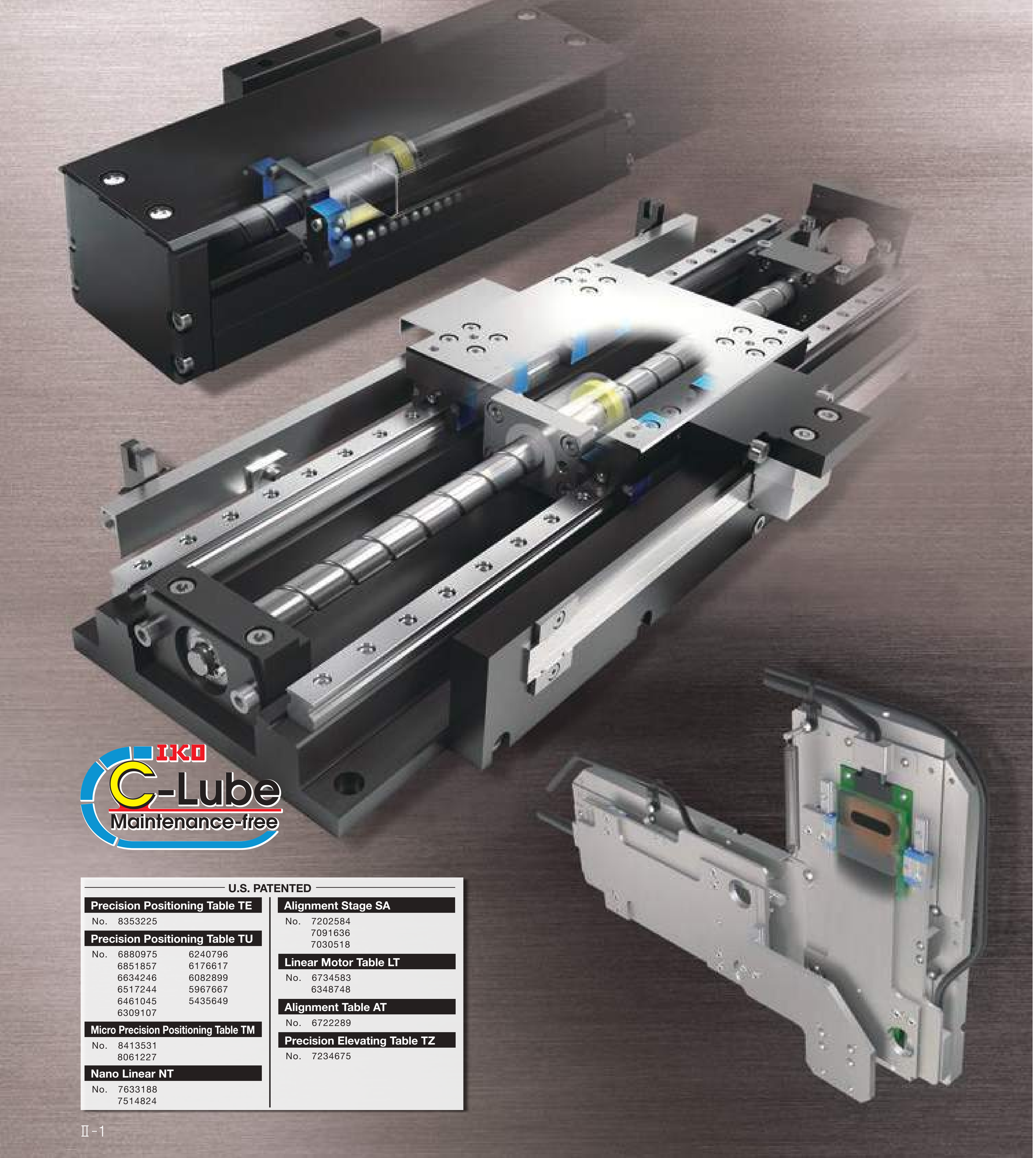
▲ Liquid crystal substrate manufacturing equipment

▲ Electronic parts inspection equipment

▲ Liquid crystal substrate inspection equipment



▲ Liquid crystal substrate inspection equipment



U.S. PATENTED

Precision Positioning Table TE

No. 8353225

Precision Positioning Table TU

No.	6880975	6240796
	6851857	6176617
	6634246	6082899
	6517244	5967667
	6461045	5435649
	6309107	

Micro Precision Positioning Table TM

No. 8413531
8061227

Nano Linear NT

No. 7633188
7514824

Alignment Stage SA

No. 7202584
7091636
7030518

Linear Motor Table LT

No. 6734583
6348748

Alignment Table AT

No. 6722289

Precision Elevating Table TZ

No. 7234675

Explanation and Dimension Table for Respective Product Series

General Explanation

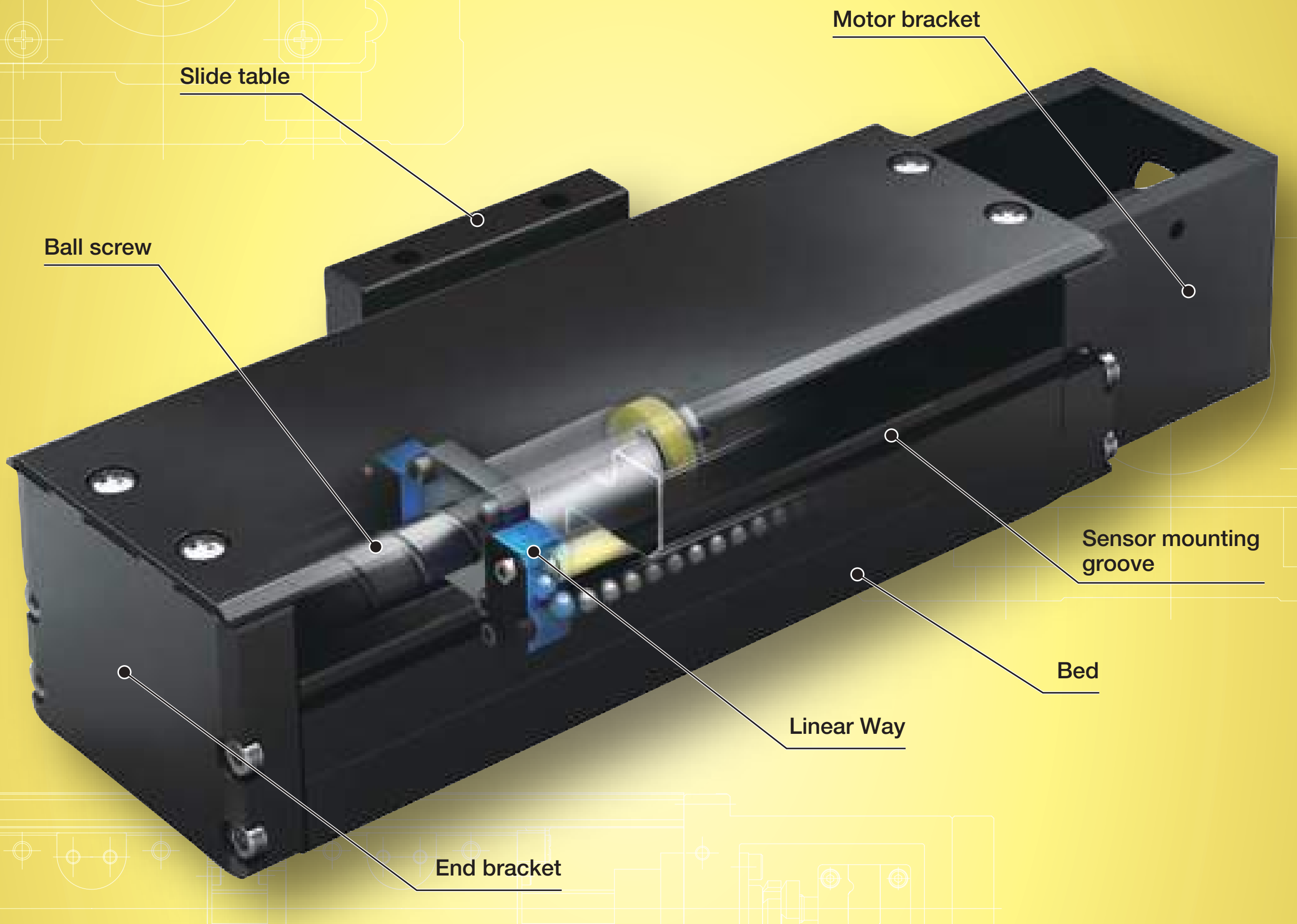
TE···B

TE···B

C-Lube Maintenance-free

Ball screw

Linear



Major product specifications

Driving method	Precision ball screw
Linear motion rolling guide	Linear Way (ball type)
Built-in lubrication part	Lubrication part "C-Lube" is built-in
Material of table and bed	High-strength aluminum alloy
Sensor	Select by identification number

Accuracy

unit: mm

Positioning repeatability	±0.002～0.020
Positioning accuracy	0.035～0.065
Lost motion	–
Parallelism in table motion A	–
Parallelism in table motion B	0.008～0.016
Attitude accuracy	–
Straightness	–
Backlash	0.005

Points

● Light weight, low profile and high-precision positioning table

1 Light weight, low profile and compact positioning table using high-strength aluminum alloy for its main components with a slide table assembled inside a U-shaped bed.
The mass of the entire table is reduced to about 40% of TU series. Low cross sectional height (26mm for TE50B, 33mm for TE60B, and 46mm for TE86B). Moreover, the structure of various sensors directly installable on sensor mounting groove of the bed contributes to the miniaturization.

● Table specification is selectable according to your use

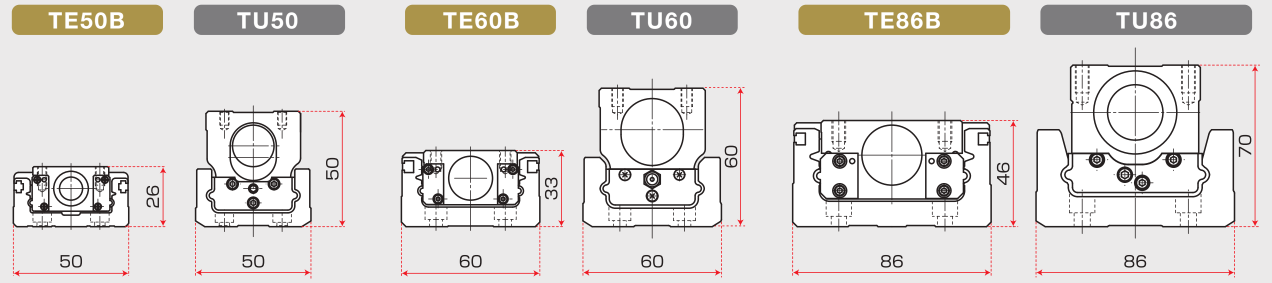
2 There are two types in the shape of slide table: standard and with flange. The number of slide tables, motor folding back specification, ball screw lead, with or without a dust protection cover, installation of various sensors can be selected, you can select an optimal product for the specifications of your machine and device.

● Excellent cost performance

3 The excellent cost performance is realized by reducing the number of parts, and optimizing the part shapes.

Comparison with Precision Positioning Table TU

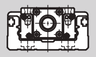
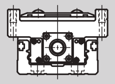
● Sectional height



● Mass

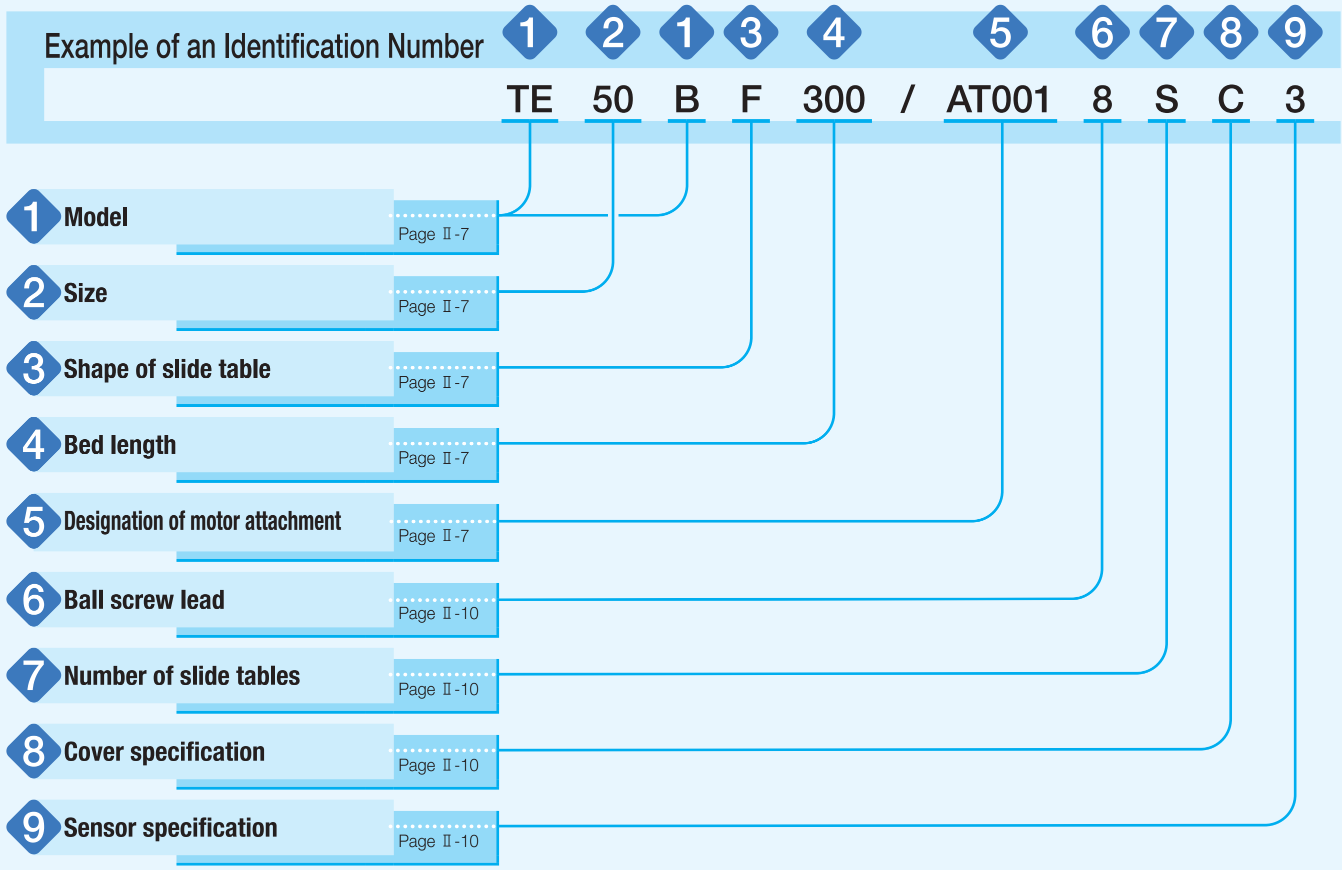
Model and size	Stroke length (mm)	Overall length (mm)	Mass (kg)	Mass / 100mm (kg)
TE50B	60	218	0.52	0.24
TU50	60	226	1.8	0.80
TE60B	100	269	1.0	0.37
TU60	100	298	3.3	1.11
TE86B	300	523	3.7	0.71
TU86	250	498	10.9	2.19

Variation

Shape	Model	Bed width (mm)		
		50	60	86
Standard 	TE···BS	☆	☆	☆
With flange 	TE···BF	☆	☆	☆

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Identification Number



① **Model** Page Ⅱ-7

② **Size** Page Ⅱ-7

③ **Shape of slide table** Page Ⅱ-7

④ **Bed length** Page Ⅱ-7

⑤ **Designation of motor attachment** Page Ⅱ-7

⑥ **Ball screw lead** Page Ⅱ-10

⑦ **Number of slide tables** Page Ⅱ-10

⑧ **Cover specification** Page Ⅱ-10

⑨ **Sensor specification** Page Ⅱ-10

Identification Number and Specification

① **Model**

TE…B: Precision Positioning Table TE

② **Size**

Size indicates bed width.
Select a size from the list of Table 1.

③ **Shape of slide table**

S: Standard table
F: Flange type standard table

④ **Bed length**

Select a bed length from the list of Table 1.

Table 1 Sizes and bed lengths unit: mm

Model and size	Bed width	Bed length
TE50B	50	150, 200, 250, 300, 400, 500
TE60B	60	150, 200, 300, 400, 500, 600, 700
TE86B	86	340, 440, 540, 640, 740, 840, 940

Remark: For stroke length, please see the dimension tables shown in pages of Ⅱ-19 or later.

⑤ **Designation of motor attachment**

AT000 : Motor inline specification Without motor attachment
AT001 to AT011 : Motor inline specification With motor attachment
AR000 : Motor folding back specification Without motor attachment
AR001 to AR008 : Motor folding back specification With motor attachment
To specify the motor attachment, select it from the list of Table 2.1 and Table 2.2.

- Please specify motor folding back specification and motor attachment applicable to motor for use.
- If motor inline specification with motor attachment is specified, the main body is shipped with a coupling indicated in the Table 3 mounted. However, the final position adjustment should be made by customer since it is only temporarily fixed. For a product without motor attachment (AT000), no coupling is attached.
- If motor folding back specification with motor attachment is specified, "housing applicable to the specified motor, pulley (on motor side and ball screw side), cover, motor bracket, belt and bolts necessary for assembly" are supplied. Motor mounting bolts should be prepared by customer.

Table 2.1 Application of motor attachment (motor inline specification)

Motor to be used					Flange size mm	Motor attachment		
Type	Manufacturer	Series	Model	Rated output W		TE50B	TE60B	TE86B
AC servo motor	YASKAWA ELECTRIC CORPORATION	Σ-7	SGM7J-A5A	50	□40	AT001	AT002	–
			SGM7A-A5A			AT001	AT002	–
			SGM7J-01A	100		–	AT002	–
			SGM7A-01A			–	AT002	–
			SGM7J-02A	200	□60	–	–	AT003
			SGM7A-02A			–	–	AT003
	Mitsubishi Electric Corporation	J4/J5	HG-MR053	50	□40	AT001	AT002	–
			HG-KR053/HK-KT053W			AT001	AT002	–
			HG-MR13	100		–	AT002	–
			HG-KR13/HK-KT13W			–	AT002	–
			HG-MR23	200	□60	–	–	AT003
			HG-KR23/HK-KT23W			–	–	AT003
	Panasonic Corporation	MINAS A6	MSMF5A	50	□38	AT004	AT005	–
			MSMF01	100		–	AT005	–
			MSMF02	200	□60	–	–	AT006
	Hitachi Industrial Equipment Systems Co., Ltd	AD	ADMA-R5L	50	□40	AT001	AT002	–
			ADMA-01L	100		–	AT002	–
			ADMA-02L	200	□60	–	–	AT003
Stepper motor	ORIENTAL MOTOR Co., Ltd.	α step	ARM46		□42	AT007	–	–
			ARM66		□60	–	–	AT008
			ARM69		□60	–	–	AT008
		CRK	CRK54		□42	AT009	–	–
			CRK56 (1)		□60	–	AT010	AT011

Note (1) Applicable to the outer diameter φ8 of motor output shaft.
Remark: For detailed motor specifications, please see respective motor manufacturer's catalog.

Table 2.2 Application of NEMA motor attachment (motor inline specification)

Motor to be used					Flange size inch	Motor attachment		
Type	Manufacturer	Series	Model	Rated output W		TE50B	TE60B	TE86B
AC servo motor	Allen-Bradley	TLY(metric)	TLY-A110(AA type)	41	□40	AT001	AT002	–
			TLY-A120(AA type)	86	□40	AT001	AT002	–
			TLY-A130(AA type)	140	□40	AT001	AT002	–
			TLY-A220(AA type)	350	□60	–	–	AT003 (3)
			TLY-A230(AA type)	440	□60	–	–	AT003 (3)
		TLY(NEMA)	TLY-A120(AN type)	86	□42	TAE9043-ATE137 (1)	–	–
			TLY-A130(AN type)	140	□42	TAE9043-ATE137 (1)	–	–
			TLY-A220(AN type)	350	□56.4	–	–	TAE9017-ATE135 (1)
			TLY-A230(AN type)	440	□56.4	–	–	TAE9017-ATE135 (1)
			TLY-A2530(AN type)	690	□86	–	–	TAE9056-ATE134 (1)
			TLY-A2540(AN type)	860	□86	–	–	TAE9056-ATE134 (1)
Servo or Stepper	NEMA17C					TAE9043-ATE110 (1) (2)	–	–
	NEMA23D					TAE9017-ATE096 (1) (2)	TAE9017-ATE096 (1) (2)	–
							TAE9017-ATE097 (1) (2)	–
	NEMA34D					–	–	TAE9056-ATE095 (1) (2)

Note (1) The TAE part numbers are the part number of motor attachment component sold separately. In the TE part number, please choose motor attachment code AT000. No Coupling is included. It is required to consider customer's operation patterns for these motor attachment.
(2) Please confirm the length and the diameter of the motor shaft etc., and check the usability of the motor attachment with your motor beforehand.
(3) It is required to change the delivered coupling to XGS-30C-8×12 which is for the 12mm motor shaft by customer.
Remark: For detailed motor specifications, please see respective motor manufacturer's catalog.

Table 2.3 Application of motor attachment (motor folding back specification)

Motor to be used					Flange size mm	Motor attachment		
Type	Manufacturer	Series	Model	Rated output W		TE50B	TE60B	TE86B
AC servo motor	YASKAWA ELECTRIC CORPORATION	Σ-7	SGM7J-A5A	50	□40	AR001	AR002	–
			SGM7A-A5A			AR001	AR002	–
			SGM7J-01A	100		–	AR002	–
			SGM7A-01A			–	AR002	–
			SGM7J-02A	200	□60	–	–	AR003
			SGM7A-02A			–	–	AR003
	Mitsubishi Electric Corporation	J4/J5	HG-MR053	50	□40	AR001	AR002	–
			HG-KR053/HK-KT053W			AR001	AR002	–
			HG-MR13	100		–	AR002	–
			HG-KR13/HK-KT13W			–	AR002	–
			HG-MR23	200	□60	–	–	AR003
			HG-KR23/HK-KT23W			–	–	AR003
	Panasonic Corporation	MINAS A6	MSMF5A	50	□38	AR004	AR005	–
			MSMF01	100		–	AR005	–
			MSMF02	200	□60	–	–	AR006
	Hitachi Industrial Equipment Systems Co., Ltd	AD	ADMA-R5L	50	□40	AR001	AR002	–
			ADMA-01L	100		–	AR002	–
			ADMA-02L	200	□60	–	–	AR003
Stepper motor	ORIENTAL MOTOR Co., Ltd.	α step	ARM46		□42	AR007	–	–
		CRK	CRK54		□42	AR008	–	–

Remark: For detailed motor specifications, please see respective motor manufacturer's catalog.

Table 3 Coupling models (motor inline specification)

Motor attachment	Coupling models	Manufacturer	Coupling inertia J_c $\times10^{-5}$kg · m^2
AT001	XGS-19C- 5× 8	Nabeya Bi-tech Kaisha	0.062
AT002	XGS-19C- 5× 8	Nabeya Bi-tech Kaisha	0.062
AT003	XGS-30C- 8×14	Nabeya Bi-tech Kaisha	0.55
AT004	XGS-19C- 5× 8	Nabeya Bi-tech Kaisha	0.062
AT005	XGS-19C- 5× 8	Nabeya Bi-tech Kaisha	0.062
AT006	XGS-30C- 8×11	Nabeya Bi-tech Kaisha	0.55
AT007	XGS-19C- 5× 6	Nabeya Bi-tech Kaisha	0.062
AT008	XGS-30C- 8×10	Nabeya Bi-tech Kaisha	0.55
AT009	XGS-19C- 5× 5	Nabeya Bi-tech Kaisha	0.062
AT010	XGS-19C- 5× 8	Nabeya Bi-tech Kaisha	0.062
AT011	XGS-30C- 8× 8	Nabeya Bi-tech Kaisha	0.55
TAE9043-ATE137	XGS-19C- 5× 6.35	Nabeya Bi-tech Kaisha	0.062
TAE9017-ATE135	XGS-30C- 8×12.7	Nabeya Bi-tech Kaisha	0.55
TAE9056-ATE134	XGS-34C- 8×15.875	Nabeya Bi-tech Kaisha	1.0

Remark: For detailed coupling specification, please see the manufacturer's catalog.

6 Ball screw lead

Select from among ball screw leads applicable to the sizes and bed lengths shown in the table below.

Model and size	Bed length mm	Ball screw lead mm				
		4	5	8	10	20
TE50B	300 or less	○	–	○	–	–
	400 or more	–	–	○	–	–
TE60B	600 or less	–	○	–	○	–
	700	–	–	–	–	○
TE86B	All	–	–	–	○	○

7 Number of slide table

S: One unit
C: Two units

8 Cover specification

0: Without cover
C: With bridge cover (applied to TE···BF)

9 Specification of sensor

0: Without sensor
2: Two units of sensor mounted (limit)
3: Three units of sensor mounted (limit, pre-origin)
4: Four units of sensor mounted (limit, pre-origin, origin)
5: Two sensors attached (limit)
6: Three sensors attached (limit, pre-origin)
7: Four sensors attached (limit, pre-origin and origin sensors)

If sensor mounting (symbol 2, 3, or 4) is specified, the sensor is mounted into the mounting groove on the side of bed, and two detecting plates are attached onto the slide table.
If sensor attachment (symbol 5, 6, or 7) is specified, specified number of sensors are attached including mounting screws for sensors, nuts, two detecting plates, and mounting screws for the detecting plates.

Specifications

Table 4 Accuracy

unit: mm

Model and size	Bed length	Positioning repeatability	Positioning accuracy (1)	Parallelism in table motion B	Backlash (1)
TE50B	150	±0.002 (±0.020)	0.035	0.008	0.005
	200				
	250		0.040		
	300				
	400		0.045	0.010	
	500			0.012	
TE60B	150	±0.002 (±0.020)	0.035	0.008	0.005
	200				
	300		0.040		
	400		0.045		
	500			0.010	
	600		0.050		
	700		0.060	0.012	
TE86B	340	±0.002 (±0.020)	0.040	0.008	0.005
	440		0.045	0.010	
	540		0.050		
	640			0.012	
	740		0.055		
	840		0.065	0.014	
	940			0.016	

Note (1) This does not apply to table of motor folding back specification.

Remark: The values in ( ) are reference values provided that the timing belt tension is properly adjusted in motor folding back specification table.

Table 5 Maximum carrying mass

Model and size	Ball screw lead mm	Carrying mass position mm	Maximum carrying mass kg							
			Horizontal direction				Vertical direction			
		Length L / Height H	0	100	200	300	0	100	200	300
TE50B	4	0	12	12	7	5	11	7	3.8	2.6
		100	12	12	7	4.9	6	4.4	2.9	2.1
		200	12	11	6	4.7	3.6	2.8	2.3	1.8
		300	12	10	6	4.6	2.5	2.1	1.8	1.6
	8	0	12	10	5	3.9	7	5	2.9	2.0
		100	12	8	5	3.6	5	3.4	2.3	1.7
		200	12	7	4.6	3.3	2.8	2.2	1.8	1.4
		300	11	6	4.1	3.1	1.9	1.6	1.4	1.2
TE60B	5	0	17	17	11	8	13	10	5	3.8
		100	17	17	11	7	9	6	4.4	3.2
		200	17	16	10	7	5	4.2	3.5	2.8
		300	17	14	9	7	3.7	3.1	2.7	2.4
	10	0	17	15	8	5	8	8	4.3	3.0
		100	17	11	7	5	7	5	3.4	2.5
		200	17	9	6	4.8	4.1	3.3	2.7	2.1
		300	13	8	5	4.4	2.8	2.4	2.1	1.8
	20	0	17	9	5	3.8	7	5	3.2	2.2
		100	13	6	4.3	3.2	5	3.7	2.5	1.8
		200	7	4.9	3.5	2.7	3.0	2.4	1.9	1.5
		300	5	3.9	3.0	2.4	2.1	1.7	1.5	1.3
TE86B	10	0	36	36	25	18	18	18	13	9
		100	36	35	22	16	18	15	10	7
		200	36	29	20	15	12	10	8	6
		300	36	24	17	13	9	7	6	5
	20	0	29	28	16	11	10	10	10	6
		100	29	19	13	10	10	10	7	5
		200	23	15	11	8	9	7	6	5
		300	17	12	9	7	6	5	4.8	4.3

Remarks 1. The value is for one flange type standard table.

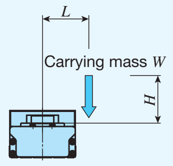
2. The maximum carrying mass is adjusted by the mass when the rating life of the linear motion rolling guide, ball screws, or bearings is 18,000 hours during continuous operation at a number of revolutions of the motor of 3000min^{-1} and an acceleration/deceleration time of 0.2s. The mass calculated is based upon the basic static load rating of the linear motion rolling guide.

Table 6 Maximum load mass

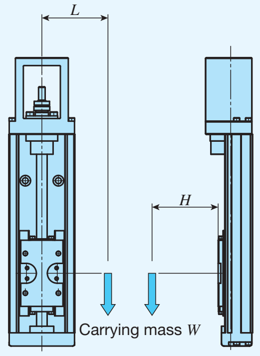
Model and size	Ball screw lead mm	Maximum load mass kg	
		Horizontal direction	Vertical direction
TE50B	4	105	26
	8	55	13
TE60B	5	172	44
	10	90	22
	20	46	11
TE86B	10	175	45
	20	91	23

Remarks 1. The maximum load mass shows the mass that ensures acceleration/deceleration of 0.3G.

2. The values shown in this table were calculated with the motor with the highest rated torque installed, selected from the AC servomotor models listed in Table 2.1.



Carrying mass position
(horizontal direction)



Carrying mass position
(vertical direction)

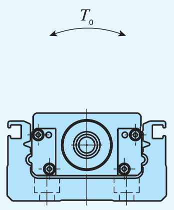
Table 7 Allowable moment

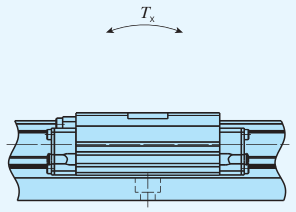
Model and size	Allowable moment (1) N・m		
	T_0	T_X	T_Y
TE50B	9.8 (19.6)	9.8 (48.4)	9.8 (48.4)
TE60B	16.7 (33.4)	16.7 (88.1)	16.7 (88.1)
TE86B	49.0 (98.0)	49.0 (247.0)	49.0 (247.0)

Note (1) The value in ( ) represents two slide tables in close contact.

■ Allowable moment

Allowable moment refers to the maximum static moment that can be used without affecting functions or performance. Therefore, do not exceed the allowable moment value during operation.





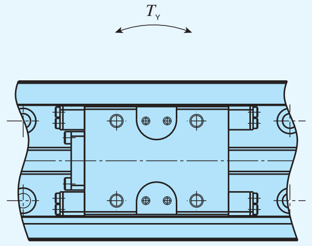


Table 8 Load rating of linear motion rolling guide

Model and size	Basic dynamic load rating C N	Basic static load rating C_0 N	Static moment rating (1) N · m		
			T_0	T_X	T_Y
TE50B	8 490	12 500	211 (422)	99.5 (508)	99.5 (508)
TE60B	12 400	17 100	354 (708)	151 (795)	151 (795)
TE86B	26 800	35 900	1 110 (2 220)	472 (2 400)	472 (2 400)

Note (1) In directions indicated in the above figures, the value in ( ) is for two slide tables in close contact.

Table 9 Maximum speed

Motor type	Model and size	Bed length mm	Maximum speed mm/s				
			Lead 4mm	Lead 5mm	Lead 8mm	Lead 10mm	Lead 20mm
AC servomotor	TE50B	300 or less	400	–	800	–	–
		400	–	–	800	–	–
		500	–	–	620	–	–
	TE60B	500 or less	–	500	–	1 000	–
		600	–	350	–	710	–
		700	–	–	–	–	960
	TE86B	540 or less	–	–	–	930	1 860
		640	–	–	–	830	1 630
		740	–	–	–	590	1 170
		840	–	–	–	440	880
		940	–	–	–	340	690
Stepper motor	TE50B	300 or less	120	–	240	–	–
		400	–	–	240	–	–
		500	–	–	240	–	–
	TE60B	600 or less	–	150	–	300	–
		700	–	–	–	–	600
	TE86B	940 or less	–	–	–	300	600

Remark: To measure the practical maximum speed, it is required to consider operation patterns based on the motor to be used and load conditions.

Table 10.1 Specifications of ball screw 1

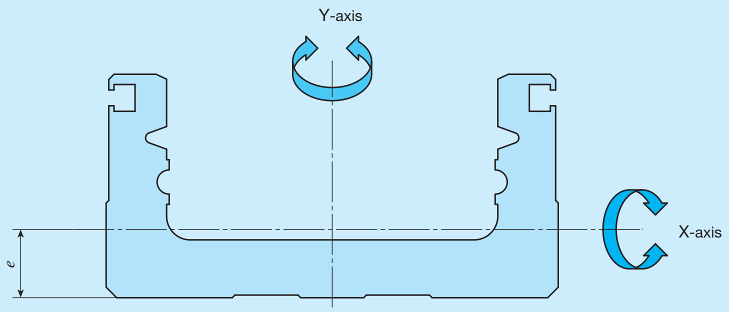
Model and size	Lead mm	Shaft dia. mm	Basic dynamic load rating C N	Basic static load rating C_0 N
TE50B	4	8	2 290	3 575
	8		1 450	2 155
TE60B	5	10	2 730	4 410
	10		1 720	2 745
	20		1 636	2 790
TE86B	10	12	3 820	6 480
	20		2 300	3 920

Table 10.2 Specifications of ball screw 2

unit: mm

Model and size	Bed length	Shaft dia.	Overall length
TE50B	150	8	192.5
	200		242.5
	250		292.5
	300		342.5
	400		442.5
	500		542.5
TE60B	150	10	194
	200		244
	300		344
	400		444
	500		544
	600		644
	700		744
TE86B	340	12	395
	440		495
	540		595
	640		695
	740		795
	840		895
	940		995

Table 11 Moment of inertia of sectional area of bed



Model and size	Moment of inertia of sectional area mm⁴		Center of gravity e mm
	I_X	I_Y	
TE50B	1.3×10^4	1.2×10^5	6.4
TE60B	4.7×10^4	3.2×10^5	8.8
TE86B	2.0×10^5	1.3×10^6	13.0

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Specifications

Table 12 Table inertia and starting torque

Model and size	Bed length mm	Table inertia J_T (2) ×10^{-5}kg · m²										Starting torque T_S(1) N · m
		Standard table					Flange type standard table					
		Lead					Lead					
		4mm	5mm	8mm	10mm	20mm	4mm	5mm	8mm	10mm	20mm	
TE50B	150	0.057	–	0.071	–	–	0.060	–	0.084	–	–	0.03
	200	0.069	–	0.083	–	–	0.072	–	0.096	–	–	
	250	0.085	–	0.099	–	–	0.088	–	0.112	–	–	
	300	0.097	–	0.111	–	–	0.100	–	0.124	–	–	
	400	–	–	0.139	–	–	–	–	0.152	–	–	
	500	–	–	0.167	–	–	–	–	0.180	–	–	
TE60B	150	–	0.13	–	0.17	–	–	0.14	–	0.20	–	0.03
	200	–	0.19	–	0.23	–	–	0.20	–	0.26	–	
	300	–	0.26	–	0.30	–	–	0.27	–	0.33	–	
	400	–	0.33	–	0.36	–	–	0.34	–	0.40	–	
	500	–	0.40	–	0.44	–	–	0.41	–	0.47	–	
	600	–	0.47	–	0.51	–	–	0.48	–	0.54	–	
	700	–	–	–	–	0.76	–	–	–	–	0.88	
TE86B	340	–	–	–	0.73	1.19	–	–	–	0.81	1.50	0.05
	440	–	–	–	0.88	1.35	–	–	–	0.95	1.64	
	540	–	–	–	1.03	1.50	–	–	–	1.11	1.80	
	640	–	–	–	1.18	1.64	–	–	–	1.25	1.95	
	740	–	–	–	1.33	1.79	–	–	–	1.41	2.10	
	840	–	–	–	1.48	1.94	–	–	–	1.56	2.25	
	940	–	–	–	1.63	2.10	–	–	–	1.71	2.40	

Notes (1) When two units of slide table are used, it is about 1.5 times as long as that of one unit, and when table of motor folding back specification is used, it is about twice.

(2) For motor folding back specification, please add the following value to the value in the table.
TE50B: 0.17×10^{-5}kg·m², TE60B: 0.39×10^{-5}kg·m², TE86B: 0.86×10^{-5}kg·m²

Mounting

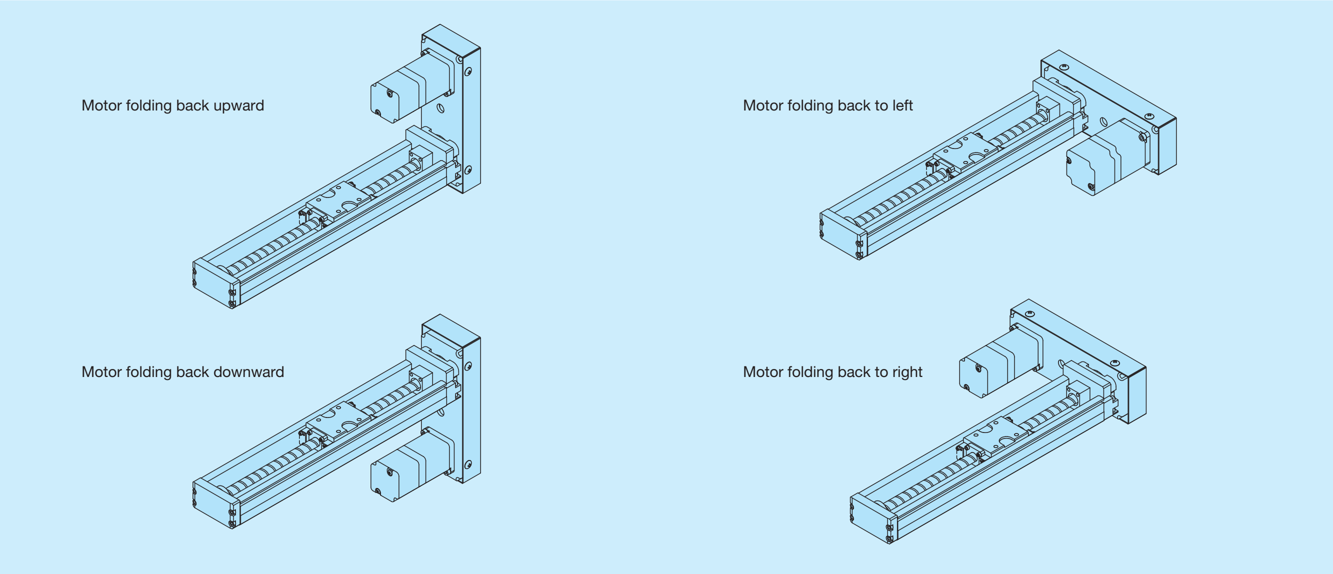
For the processing accuracy of the Precision Positioning Table mounting surface and the tightening torque of the fixing screws, see page Ⅲ-30.

Motor Folding Back Specification

Motor folding back specification is available for Precision Positioning Table TE, space can be saved by folding back the motor and reducing the overall length of the table. For dimensions of motor folding back specification, please refer to respective dimension table.

For motor folding back specification, assembly should be made by customer since "housing applicable to the specified motor, pulley (on motor side and ball screw side), cover, motor bracket, belt and bolts necessary for assembly" are supplied. However, motor mounting bolts should be prepared by customer. The motor attachment can be attached in 4 directions as indicated in the following figure.

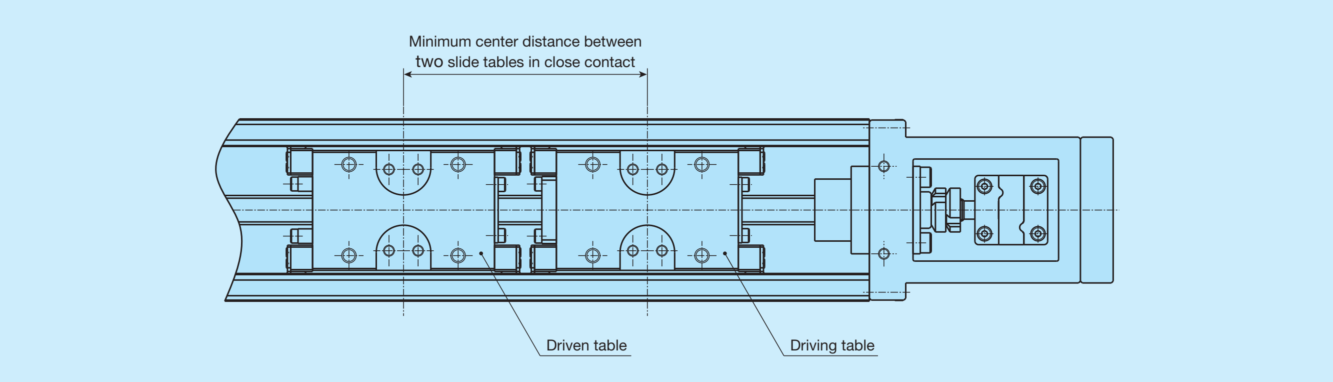
There is difference in dimension between where the motor attachment or the motor is lower than the bottom of the bed depending on the motor folding back direction. Do the design ensuring that the peripheral components do not interfere and that enough allowance is provided according to the approximate values in the dimension table shown in Page Ⅱ-25 to Ⅱ-30.



Two Slide Table Specification

Two slide table specification is available for Precision Positioning Table TE. Ball screw nuts are mounted on slide table at the motor side, and it can be driven by the motor (driving table). Ball screw nuts are not mounted on slide table at the opposite motor side, and it is free condition (driven table).

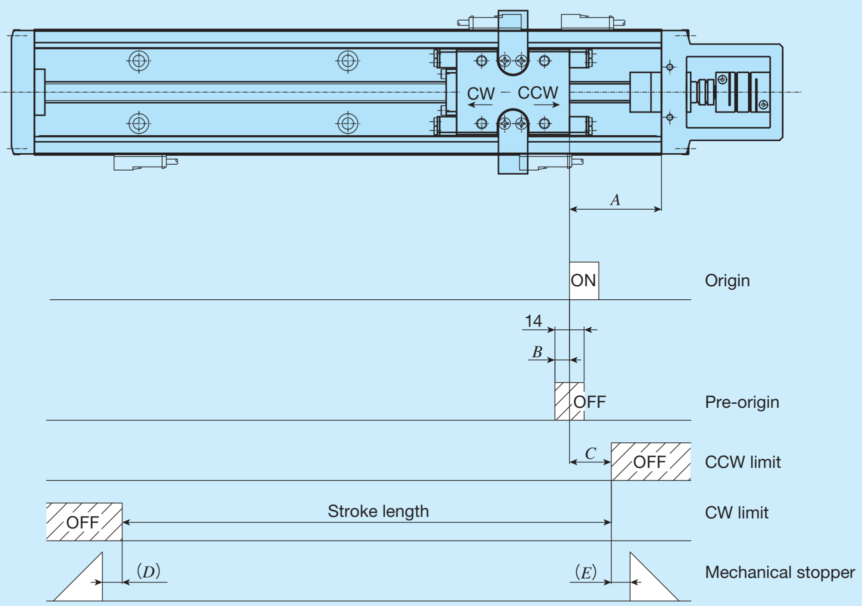
It is possible to make the structure resistant to moment load by using two slide tables in combination (Table 7). When combining slide tables, allow more clearance than "Minimum center distance between two slide tables in close contact" described in the dimension table shown in pages Ⅱ-19 to Ⅱ-30. (Enlarging the span will shorten the stroke.)



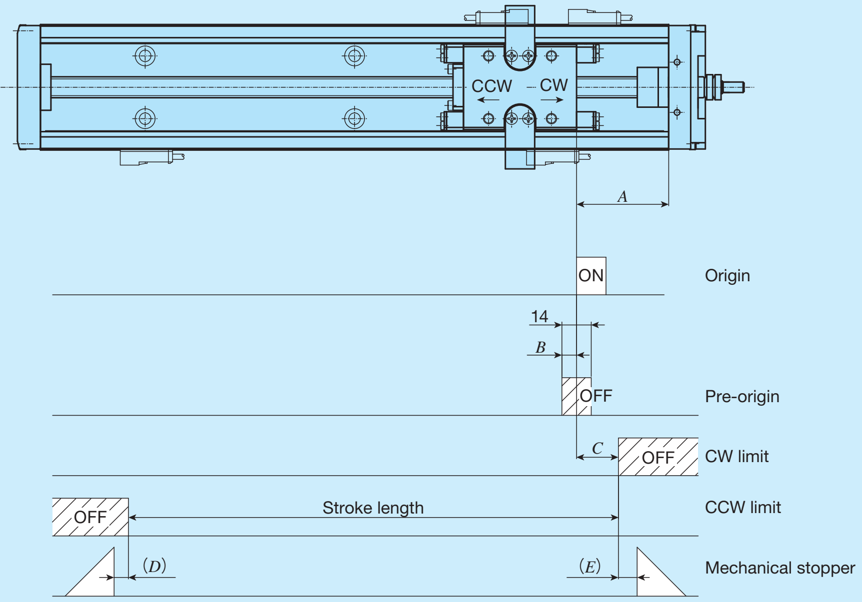
Sensor Specification

Table 13 Sensor timing chart

Motor inline specification



Motor folding back specification



unit: mm

Model and size	Ball screw lead	A	B	C	D(1)	E
TE50B	4	33	2	10	6 (9)	5
	8		6			
TE60B	5	44	3	20	9.5 (8.5)	9
	10		7			
	20		12			
TE86B	10	50	7	20	11 (11)	10
	20		12			

Note (1) The value in ( ) represents dimensions for two slide tables.

Remarks 1. Mounting a sensor is specified using the corresponding identification number.

2. For the specifications of respective sensors, please see the section of sensor specification in General Explanation.

3. For the motor folding back specification, CW and CCW will invert.

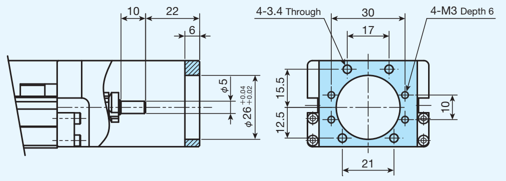
Dimensions of Motor Attachment

■ Motor inline specification

Remark: Motor attachment for NEMA, please see the pages Ⅲ-32 or later.

TE50B

AT000
(without attachment)



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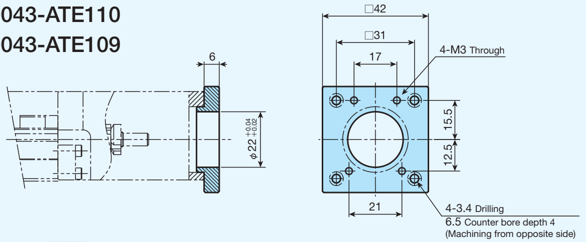
TAE9043-ATE109



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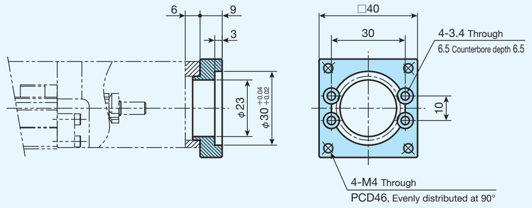

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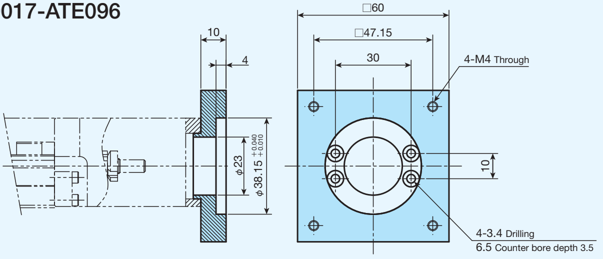

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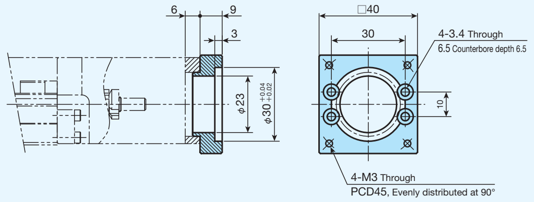

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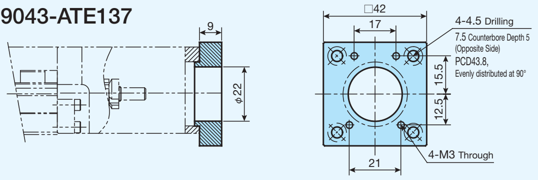

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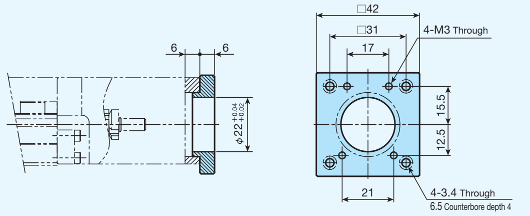
AT009



TE60B

AT000
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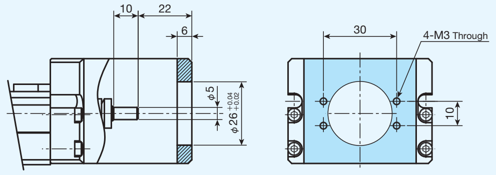

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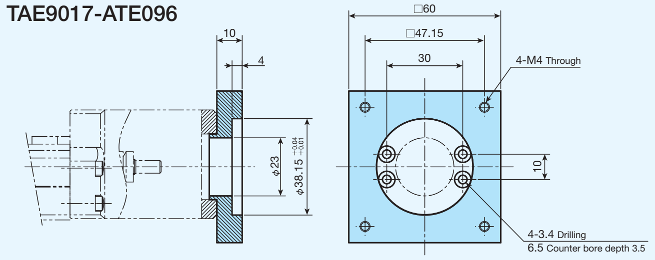

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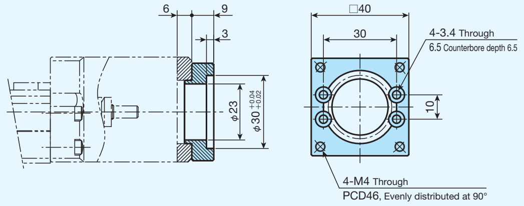

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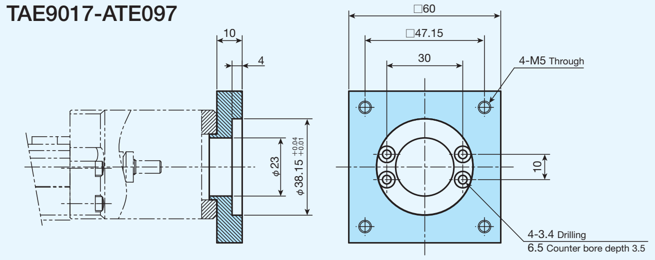

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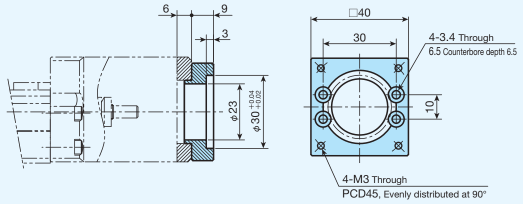

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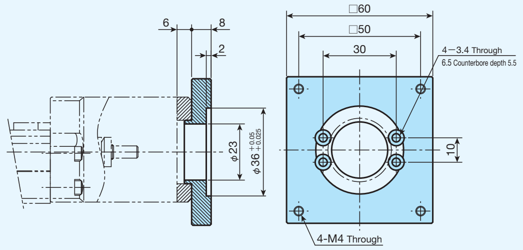

TE86B

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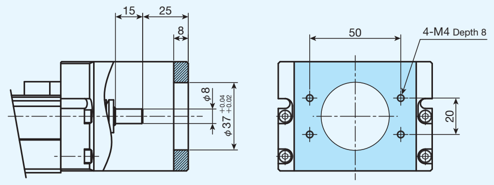

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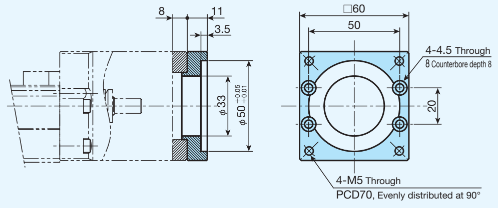

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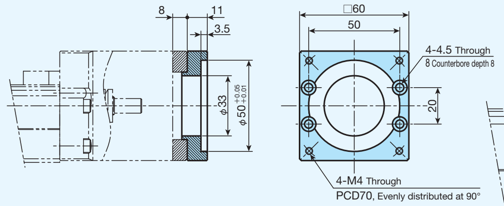

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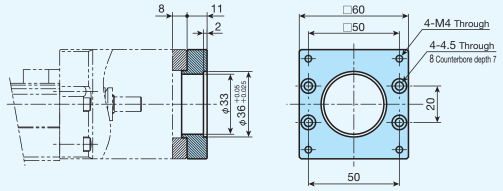
AT011



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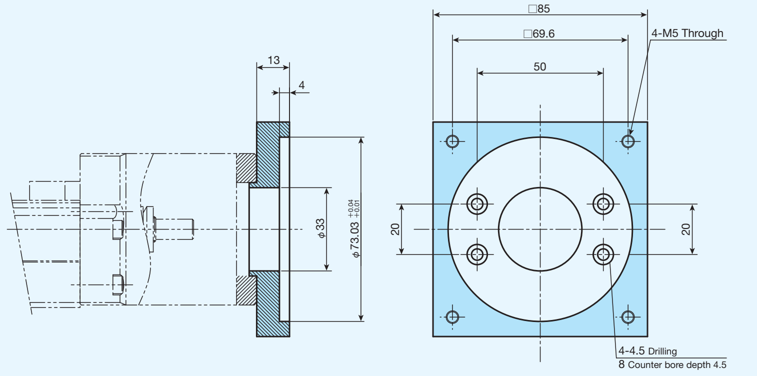

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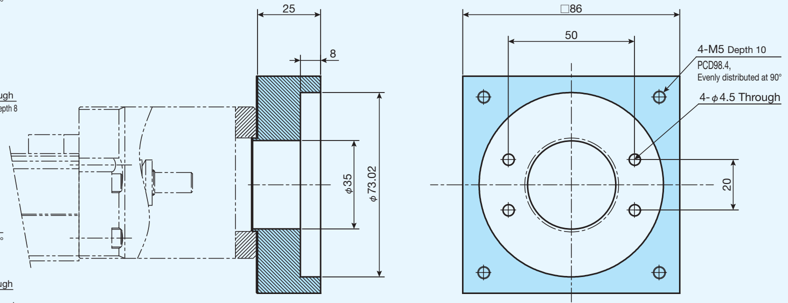

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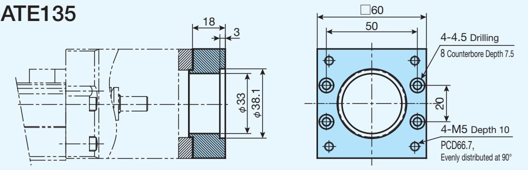

■ Motor folding back specification

TE50B

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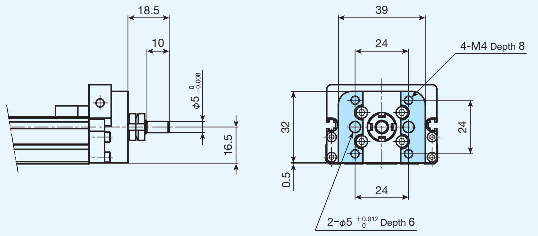

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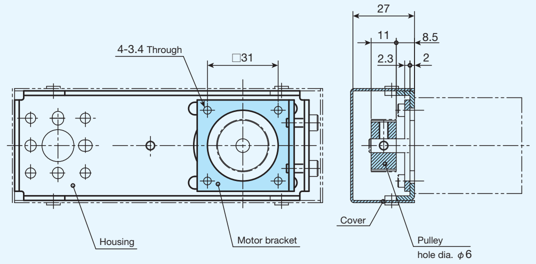

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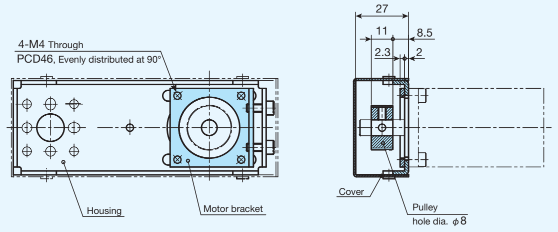

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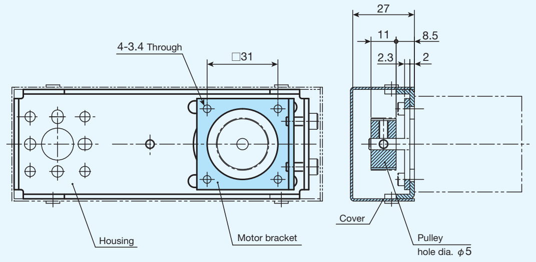

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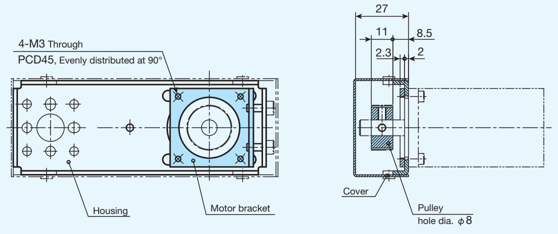

TE60B

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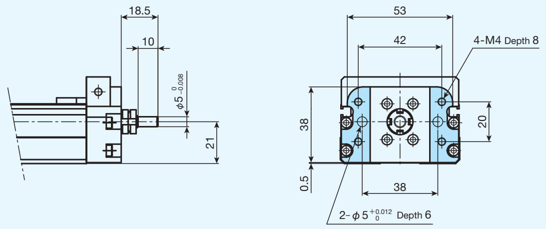

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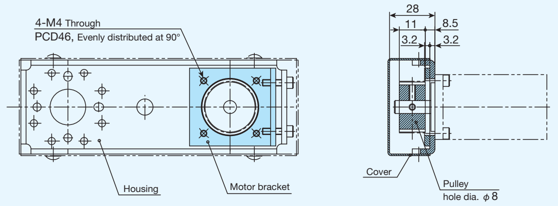

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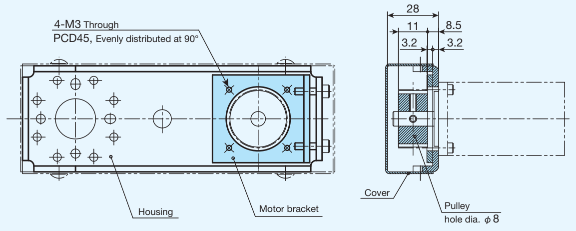

TE86B

AR000
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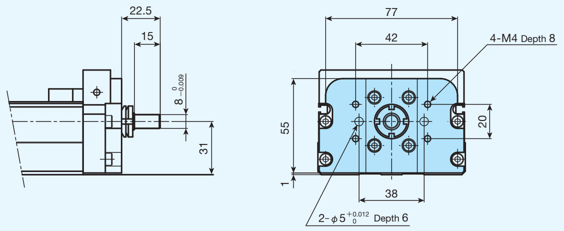

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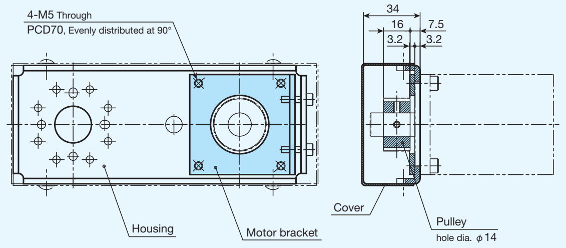
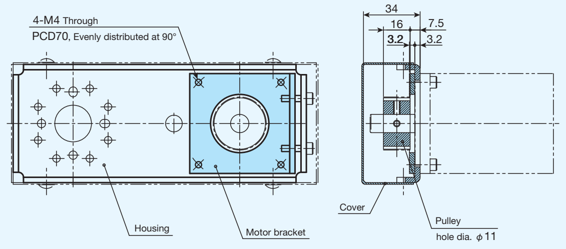
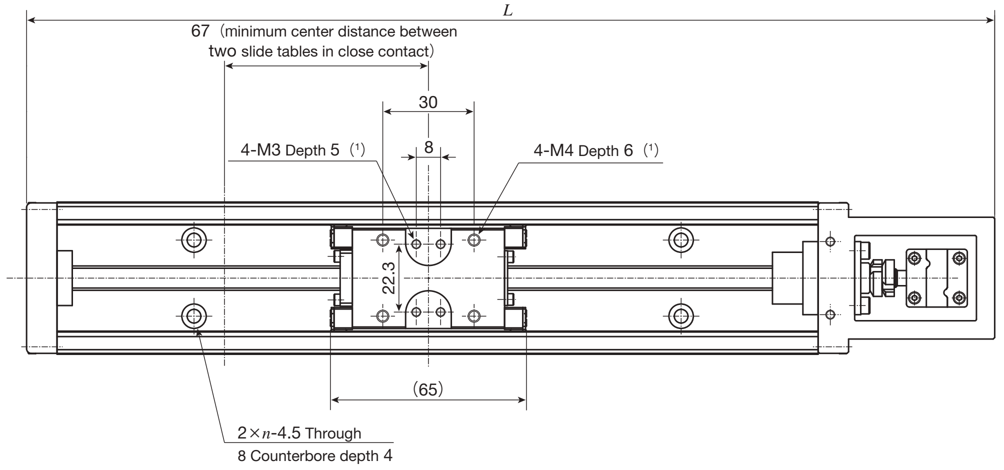


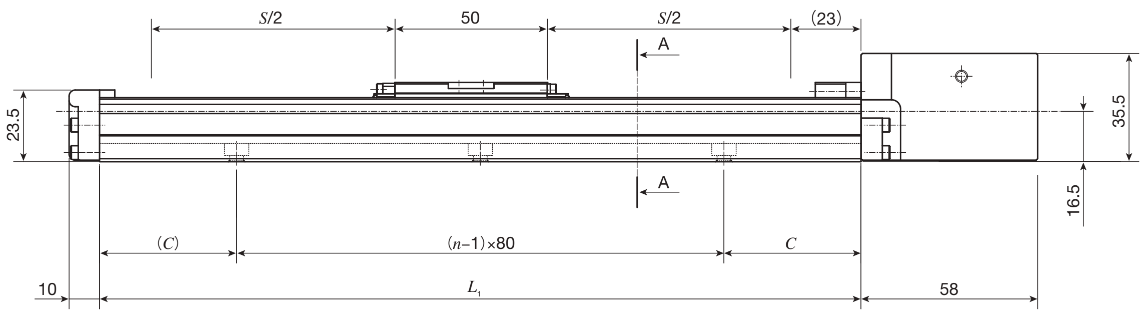
AR006

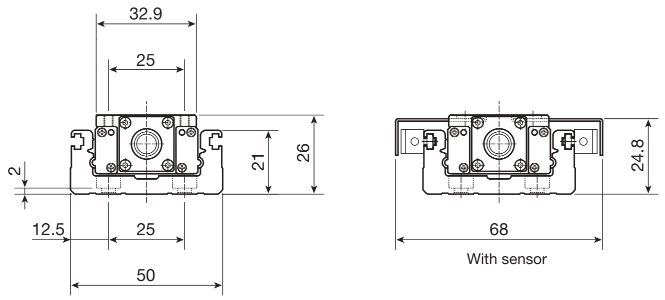


1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

TE50BS (Motor inline specification)







A—A Sectional dimension

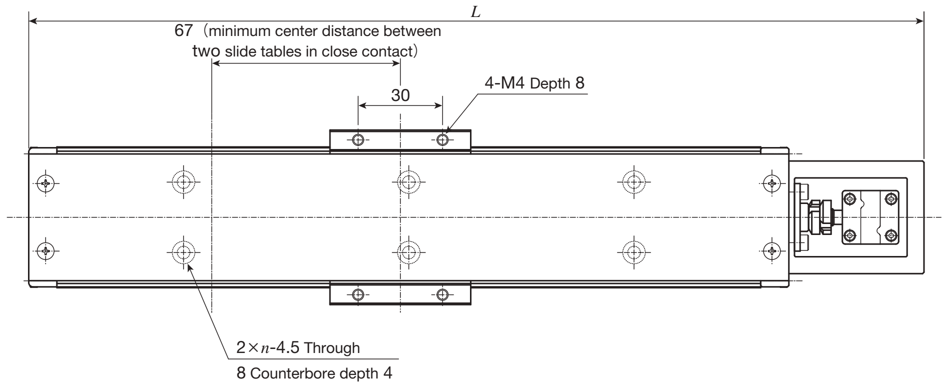
unit: mm

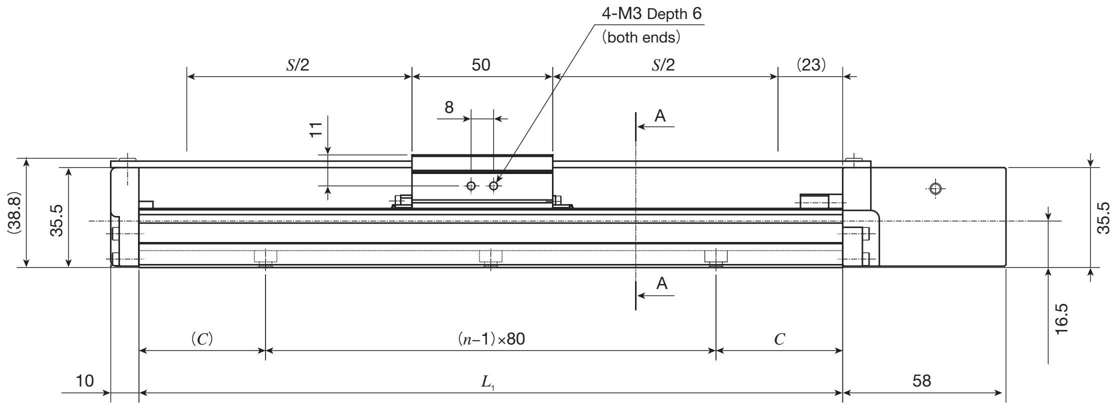
Bed length	Overall length	Stroke length	Mounting holes of bed		Mass (Ref.)
L_1	L	S(2)	C	n	kg(3)
150	218	60(−)	35	2	0.52
200	268	110(40)	20	3	0.62
250	318	160(90)	45	3	0.72
300	368	210(140)	30	4	0.82
400	468	310(240)	40	5	1.02
500	568	410(340)	10	7	1.22

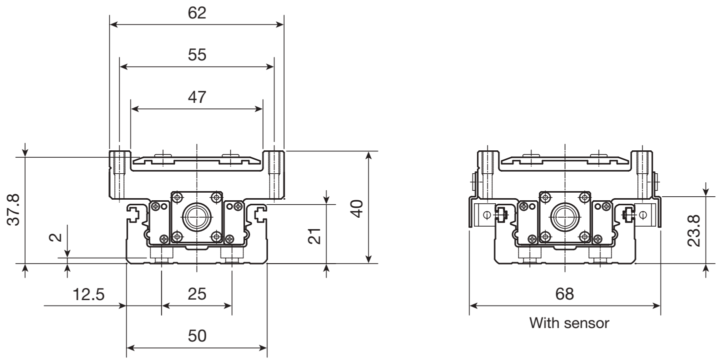
Notes (1) Too deep insertion depth of the mounting bolt may affect the running performance of the slide table, so never insert a bolt longer than the depth of the through hole.
(2) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(3) The value shows the mass of the entire table with one slide table, and it is 0.07kg heavier with two slide tables.

Remarks 1. Motor attachment for AC servomotor is 3.5mm lower than the bottom of the bed.
2. Motor attachment for stepper motor is 4.5mm lower than the bottom of the bed.

TE50BF (Motor inline specification)







A—A Sectional dimension

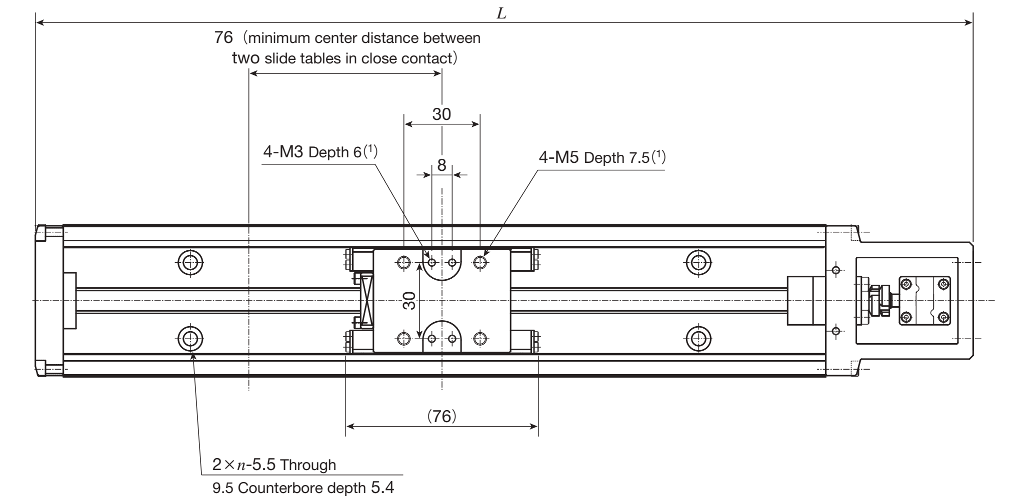
unit: mm

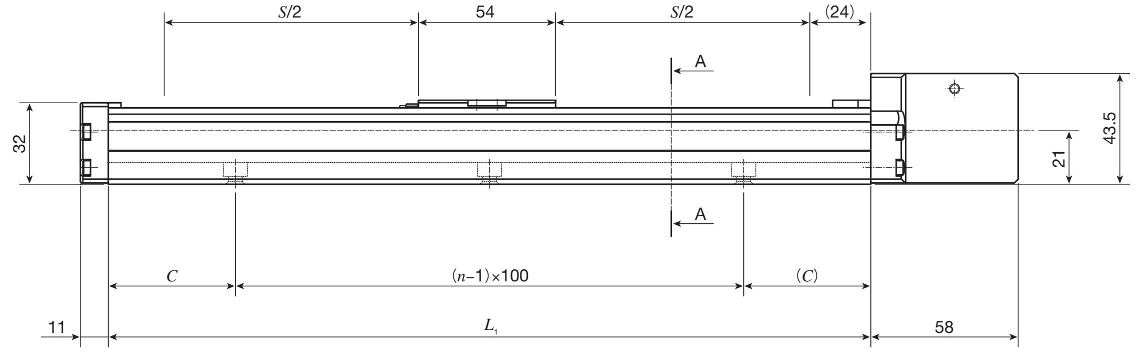
Bed length	Overall length	Stroke length	Mounting holes of bed		Mass (Ref.)
L_1	L	S(1)	C	n	kg(2)
150	218	60(−)	35	2	0.65
200	268	110(40)	20	3	0.75
250	318	160(90)	45	3	0.85
300	368	210(140)	30	4	0.94
400	468	310(240)	40	5	1.14
500	568	410(340)	10	7	1.33

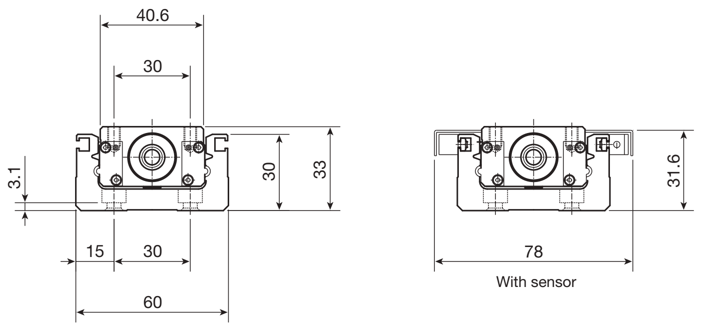
Notes (1) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(2) The value shows the mass of the entire table with one slide table, and it is 0.16kg heavier with two slide tables.

Remarks 1. Motor attachment for AC servomotor is 3.5mm lower than the bottom of the bed.
2. Motor attachment for stepper motor is 4.5mm lower than the bottom of the bed.

TE60BS (Motor inline specification)







A—A Sectional dimension

unit: mm

Bed length	Overall length	Stroke length	Mounting holes of bed		Mass（Ref.）
L_1	L	S(2)	C	n	kg(3)
150	219	50(−)	25	2	0.9
200	269	100(−)	50	2	1.0
300	369	200(125)	50	3	1.3
400	469	300(225)	50	4	1.6
500	569	400(325)	50	5	1.9
600	669	500(425)	50	6	2.2
700	769	600(525)	50	7	2.5

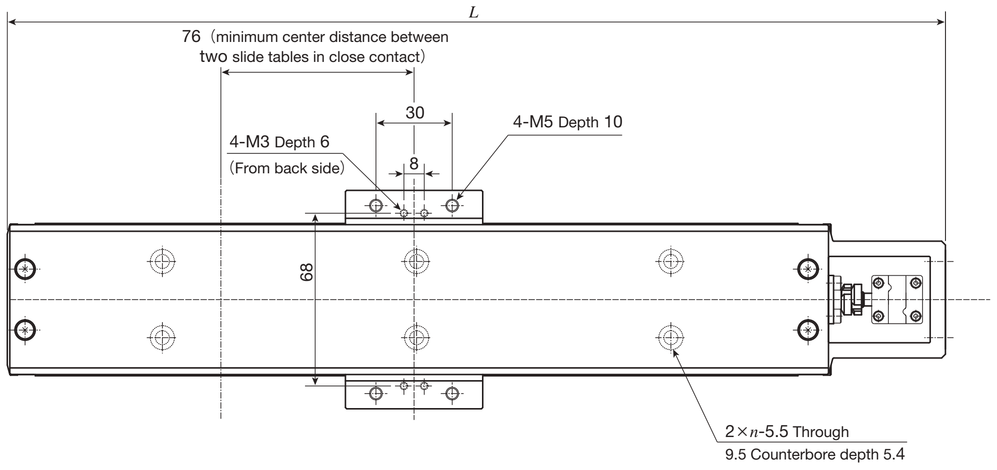
Notes (1) Too deep a fixing thread depth of the mounting bolt may affect the running performance of the slide table, so never insert a bolt longer than the depth of the tapped hole.

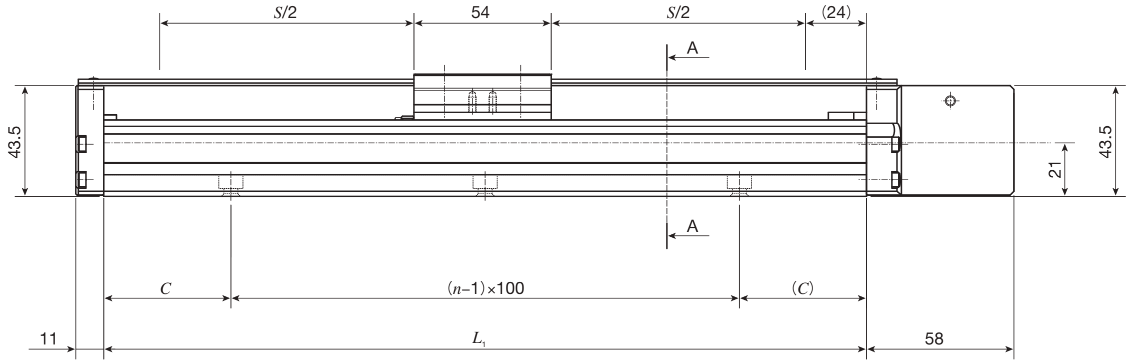
(2) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.

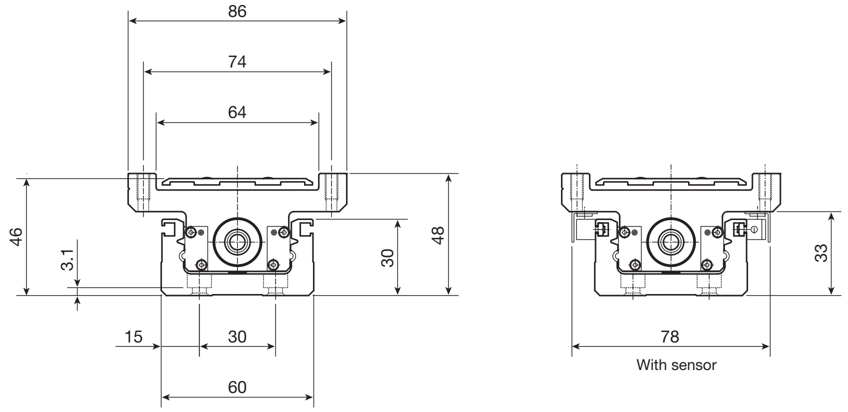
(3) The value shows the mass of the entire table with one slide table, and it is 0.1kg heavier with two slide tables.

Remark: Motor attachment for stepper motor is 9mm lower than the bottom of the bed.

TE60BF (Motor inline specification)







A—A Sectional dimension

unit: mm

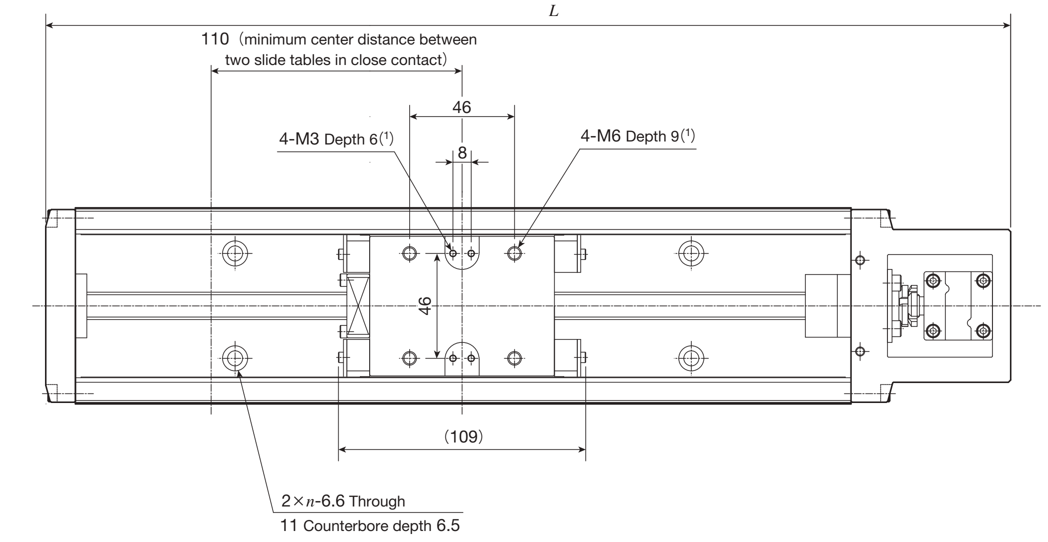
Bed length	Overall length	Stroke length	Mounting holes of bed		Mass（Ref.）
L_1	L	S(1)	C	n	kg(2)
150	219	50(−)	25	2	1.1
200	269	100(−)	50	2	1.2
300	369	200(125)	50	3	1.5
400	469	300(225)	50	4	1.9
500	569	400(325)	50	5	2.2
600	669	500(425)	50	6	2.5
700	769	600(525)	50	7	2.8

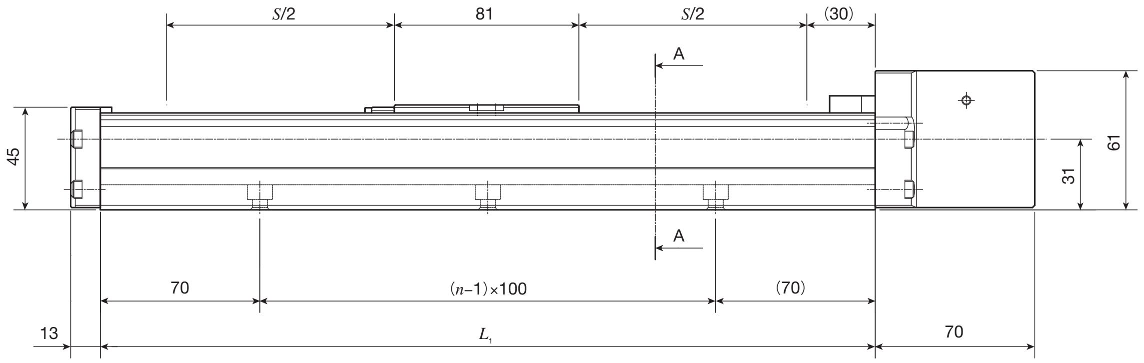
Notes (1) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.

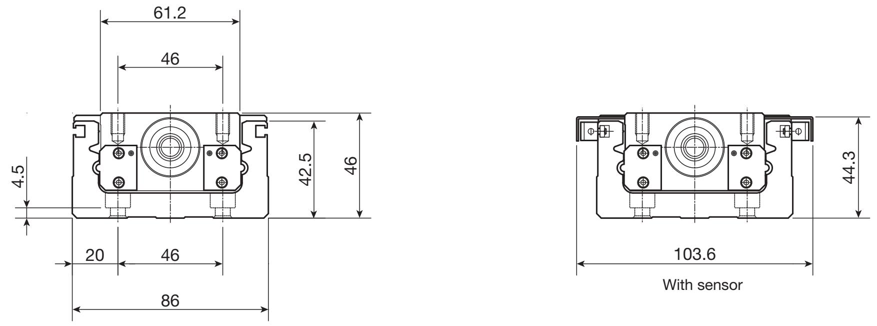
(2) The value shows the mass of the entire table with one slide table, and it is 0.2kg heavier with two slide tables.

Remark: Motor attachment for stepper motor is 9mm lower than the bottom of the bed.

TE86BS (Motor inline specification)







With sensor

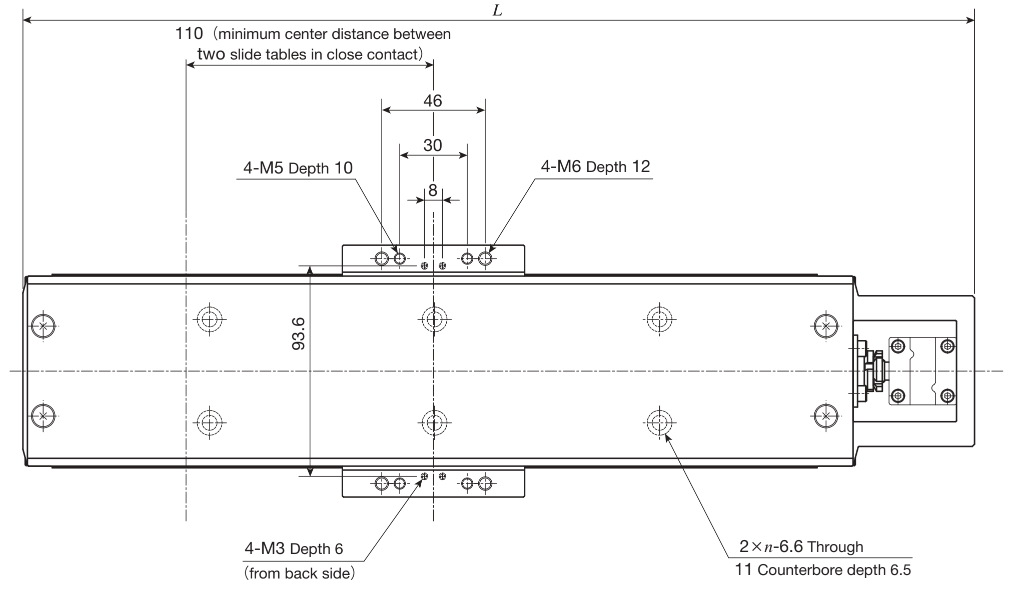
A−A Sectional dimension

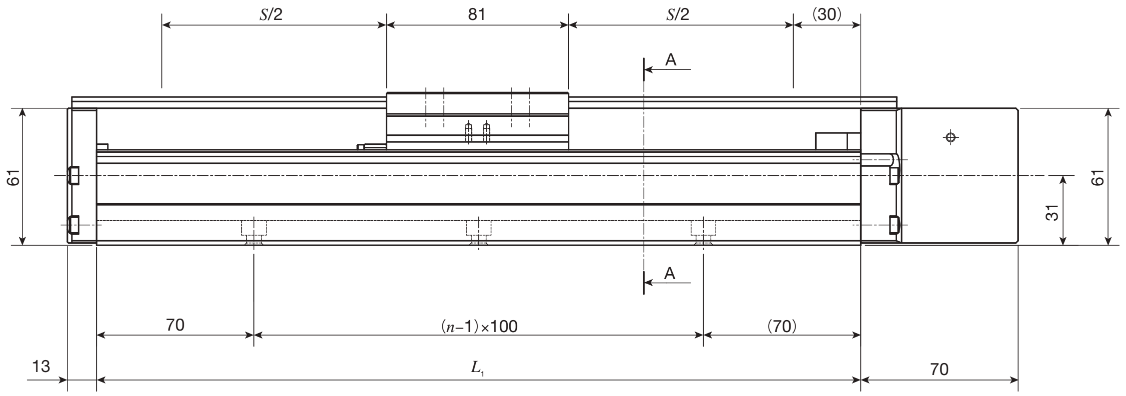
unit: mm

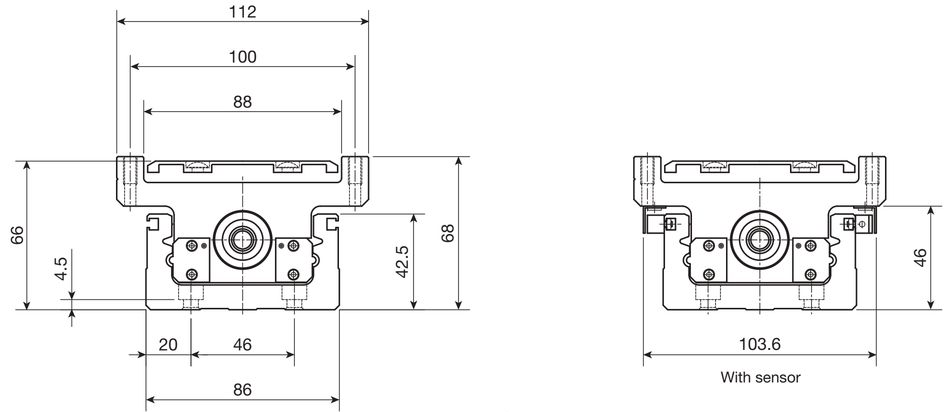
Bed length L_1	Overall length L	Stroke length S(2)	Mounting holes of bed n	Mass (Ref.) kg(3)
340	423	200(90)	3	3.1
440	523	300(190)	4	3.7
540	623	400(290)	5	4.2
640	723	500(390)	6	4.7
740	823	600(490)	7	5.2
840	923	700(590)	8	5.7
940	1 023	800(690)	9	6.3

Notes (1) Too deep a fixing thread depth of the mounting bolt may affect the running performance of the slide table, so never insert a bolt longer than the depth of the tapped hole.
(2) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(3) The value shows the mass of the entire table with one slide table, and it is 0.3kg heavier with two slide tables.

TE86BF (Motor inline specification)







With sensor

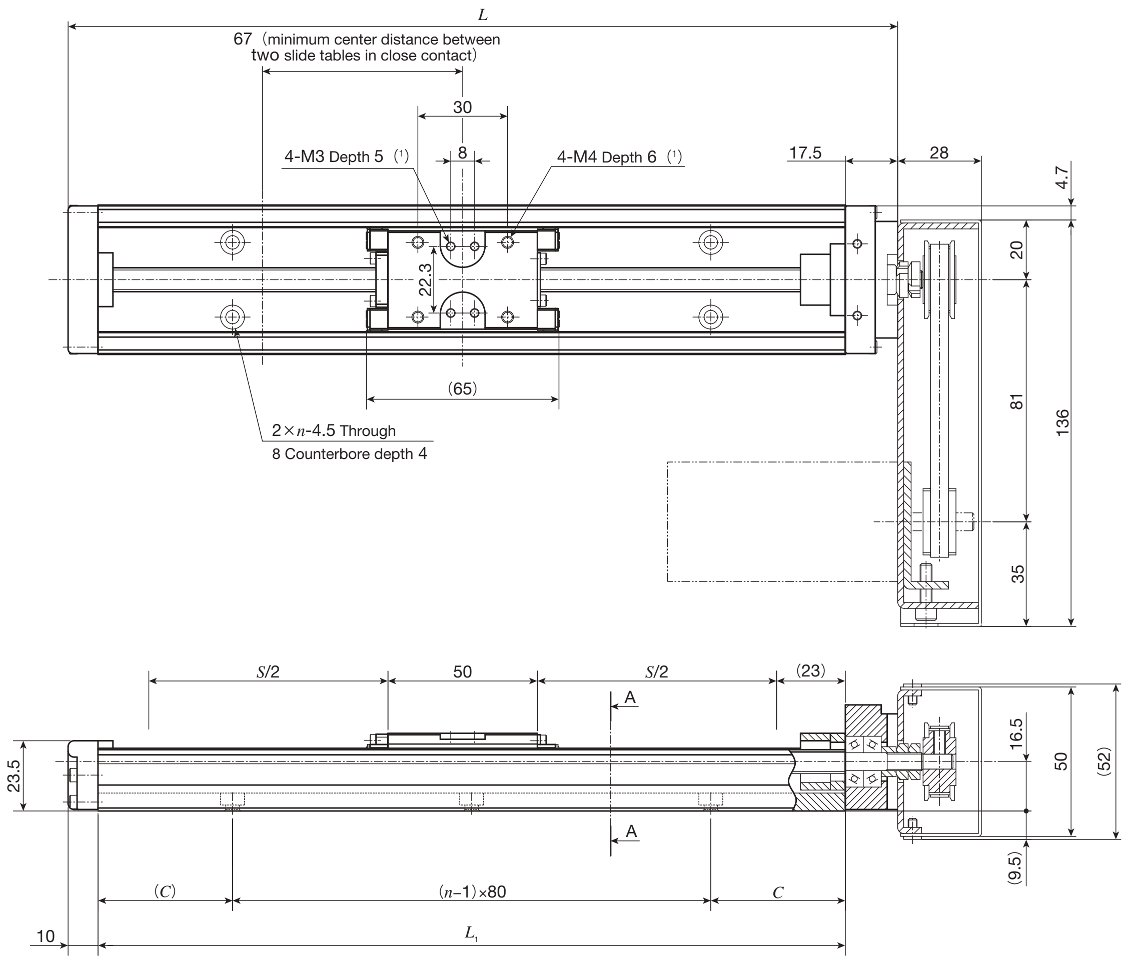
A−A Sectional dimension

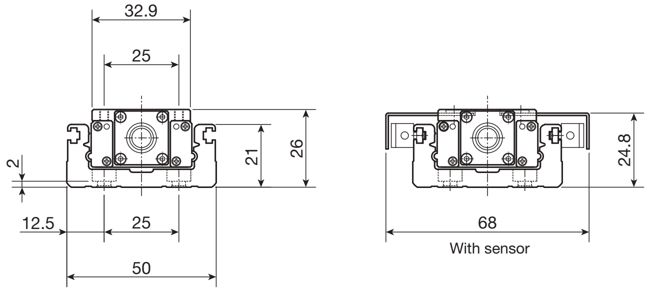
unit: mm

Bed length L_1	Overall length L	Stroke length S(1)	Mounting holes of bed n	Mass (Ref.) kg(2)
340	423	200(90)	3	3.7
440	523	300(190)	4	4.3
540	623	400(290)	5	4.9
640	723	500(390)	6	5.5
740	823	600(490)	7	6.1
840	923	700(590)	8	6.7
940	1 023	800(690)	9	7.2

Notes (1) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(2) The value shows the mass of the entire table with one slide table, and it is 0.6kg heavier with two slide tables.

TE50BS (Motor folding back specification)





A—A Sectional dimension

unit: mm

Bed length L_1	Overall length L	Stroke length S(2)	Mounting holes of bed C	 n	Mass (Ref.) kg(3)
150	177.5	60(−)	35	2	0.72
200	227.5	110(40)	20	3	0.82
250	277.5	160(90)	45	3	0.92
300	327.5	210(140)	30	4	1.02
400	427.5	310(240)	40	5	1.22
500	527.5	410(340)	10	7	1.42

Notes (1) Too deep insertion depth of the mounting bolt may affect the running performance of the slide table, so never insert a bolt longer than the depth of the through hole.

(2) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.

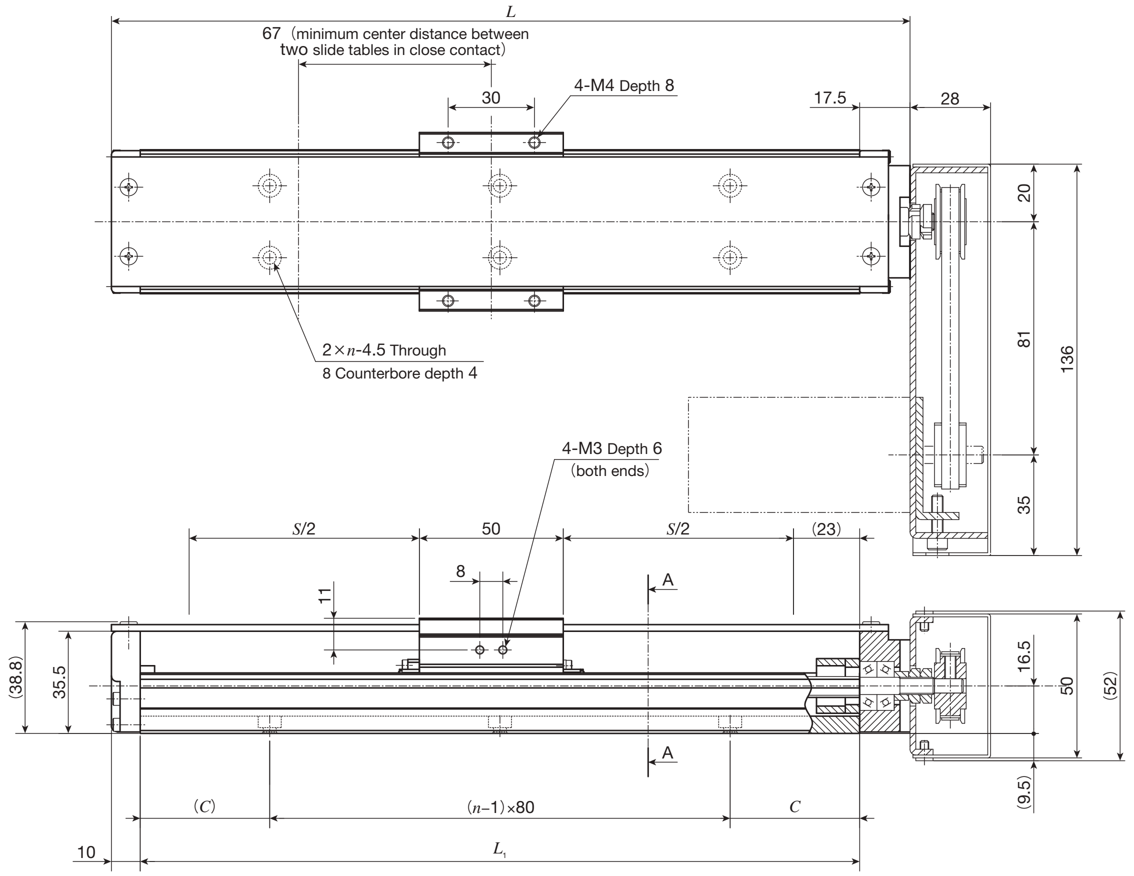
(3) The value shows the mass of the entire table with one slide table, and it is 0.07kg heavier with two slide tables.

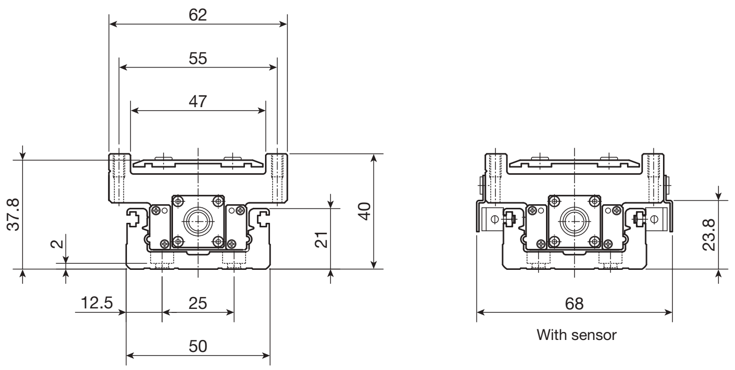
Remarks 1. Parts for motor attachment are appended, and this figure indicates a finished state after assembled by the customer.

2. If folded back to right and left, motor attachment is about 9.5mm lower than the bottom of the bed. In addition, it is about 2.5 to 3.5mm lower than the bottom of the bed if AC servomotor is mounted by customers, and about 4.5mm lower if stepper motor is mounted.

3. If folded back upward, motor attachment is about 3.5mm lower than the bottom of the bed.

TE50BF (Motor folding back specification)





A—A Sectional dimension

unit: mm

Bed length L_1	Overall length L	Stroke length S(1)	Mounting holes of bed C	 n	Mass (Ref.) kg(2)
150	177.5	60(−)	35	2	0.85
200	227.5	110(40)	20	3	0.95
250	277.5	160(90)	45	3	1.05
300	327.5	210(140)	30	4	1.15
400	427.5	310(240)	40	5	1.35
500	527.5	410(340)	10	7	1.55

Notes (1) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.

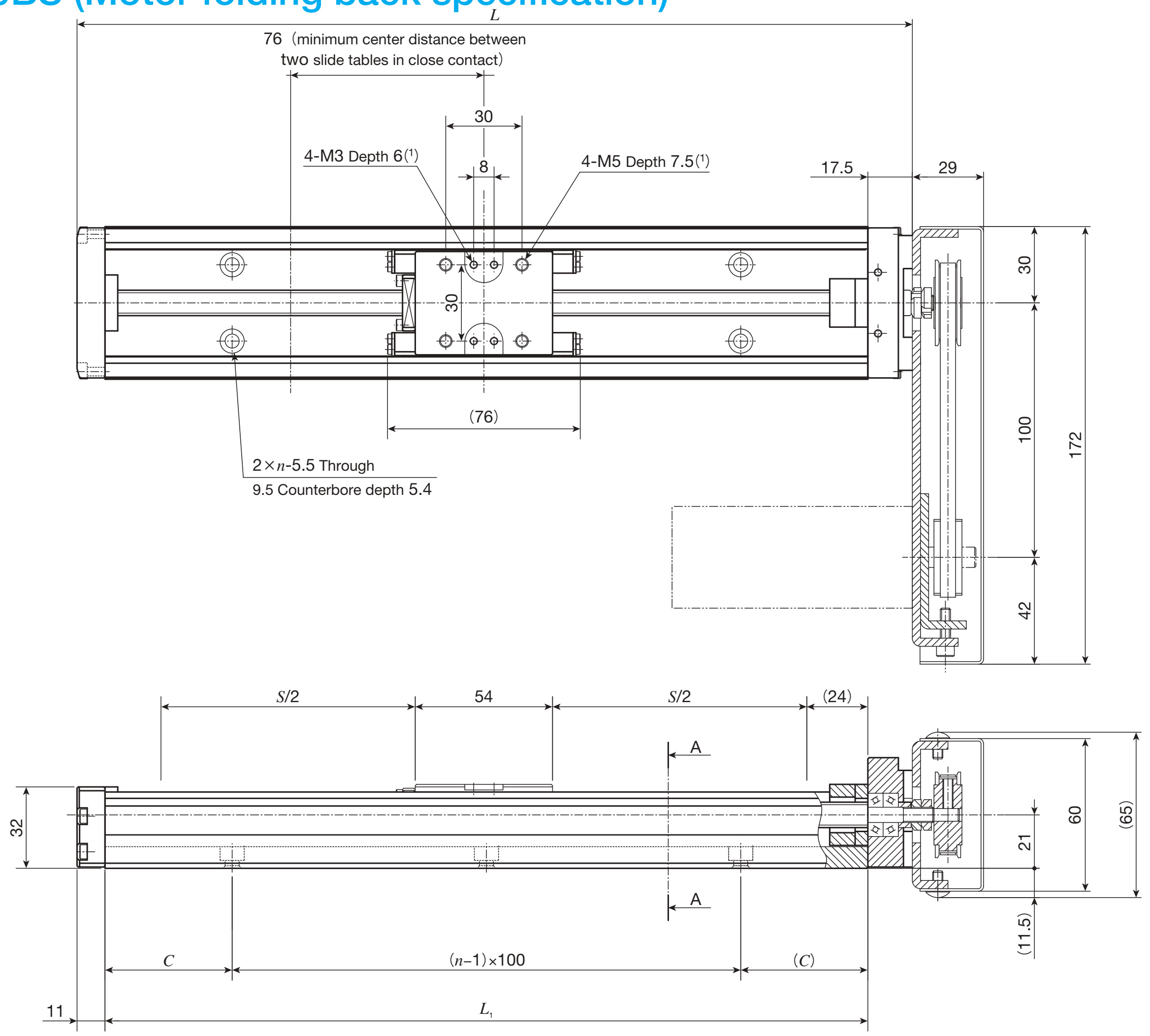
(2) The value shows the mass of the entire table with one slide table, and it is 0.16kg heavier with two slide tables.

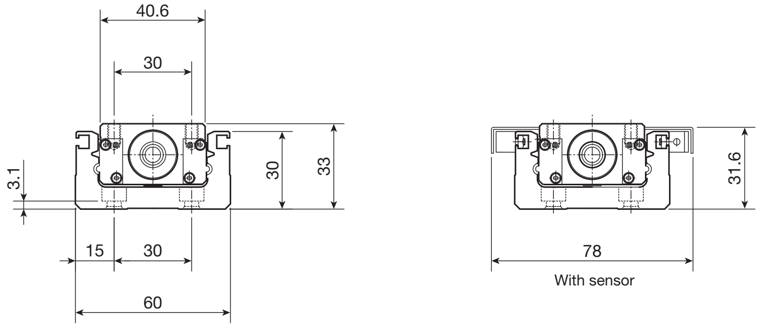
Remarks 1. Parts for motor attachment are appended, and this figure indicates a finished state after assembled by the customer.

2. If folded back to right and left, motor attachment is about 9.5mm lower than the bottom of the bed. In addition, it is about 2.5 to 3.5mm lower than the bottom of the bed if AC servomotor is mounted by customers, and about 4.5mm lower if stepper motor is mounted.

3. If folded back upward, motor attachment is about 3.5mm lower than the bottom of the bed.

TE60BS (Motor folding back specification)





A—A Sectional dimension

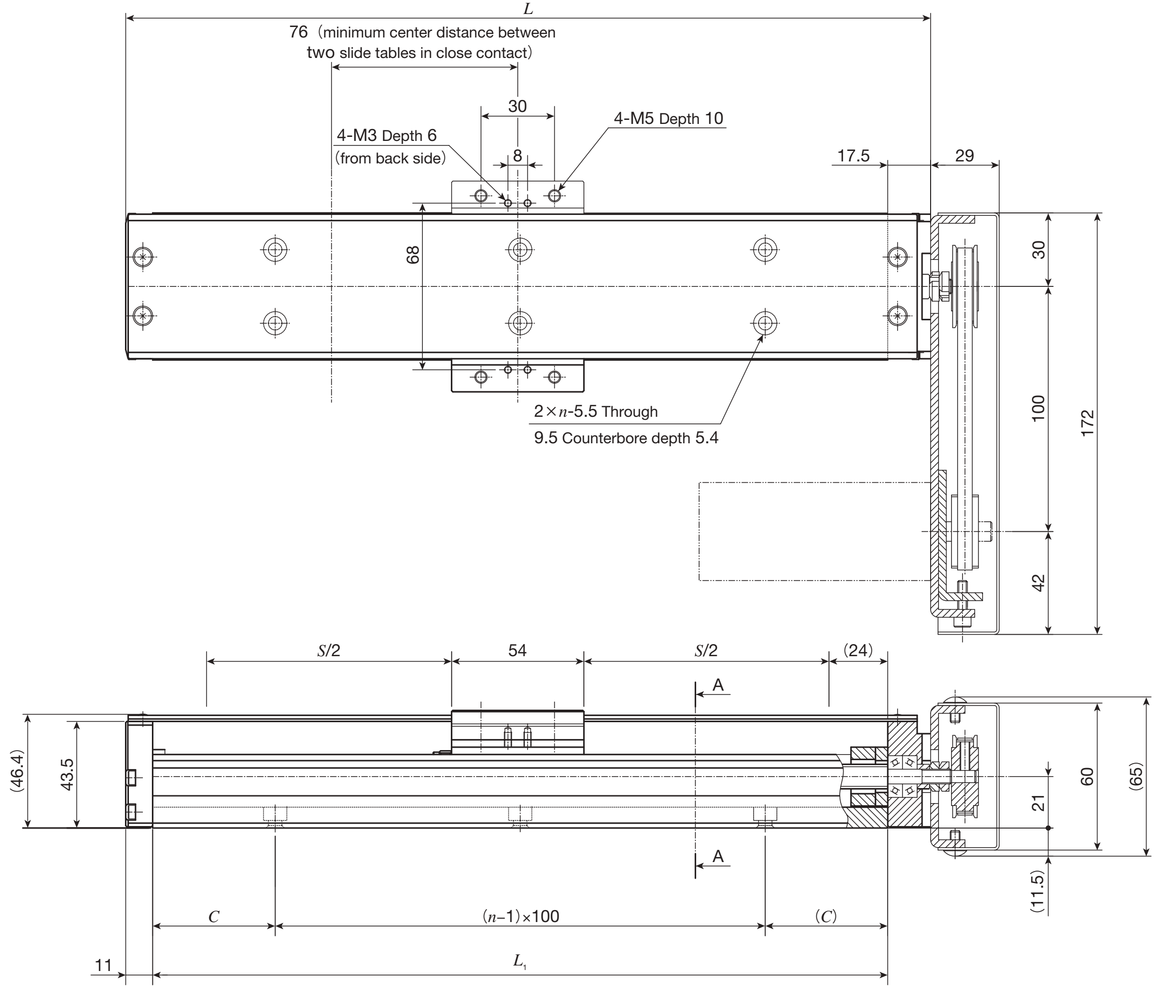
unit: mm

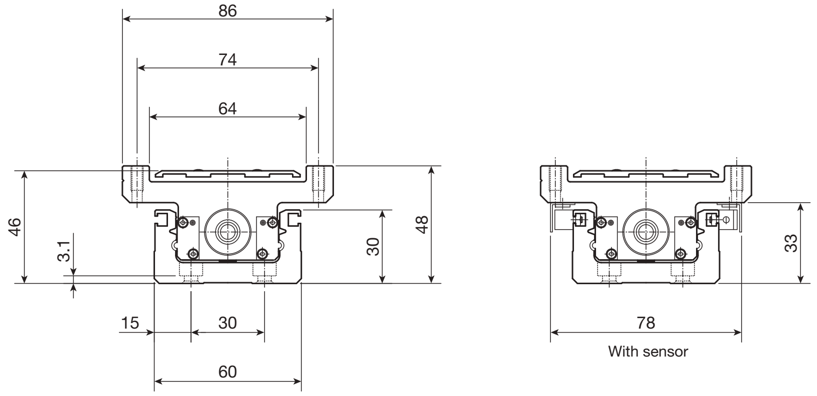
Bed length	Overall length	Stroke length	Mounting holes of bed		Mass (Ref.)
L_1	L	S(2)	C	n	kg(3)
150	178.5	50(−)	25	2	1.2
200	228.5	100(−)	50	2	1.3
300	328.5	200(125)	50	3	1.6
400	428.5	300(225)	50	4	1.9
500	528.5	400(325)	50	5	2.2
600	628.5	500(425)	50	6	2.5
700	728.5	600(525)	50	7	2.8

Notes (1) Too deep a fixing thread depth of the mounting bolt may affect the running performance of the slide table, so never insert a bolt longer than the depth of the tapped hole.
(2) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(3) The value shows the mass of the entire table with one slide table, and it is 0.1kg heavier with two slide tables.

Remarks 1. Parts for motor attachment are appended, and this figure indicates a finished state after assembled by the customer.
2. If folded back to right and left, motor attachment is about 11.5mm lower than the bottom of the bed.
3. If folded back upward, motor attachment is about 9mm lower than the bottom of the bed.

TE60BF (Motor folding back specification)





A—A Sectional dimension

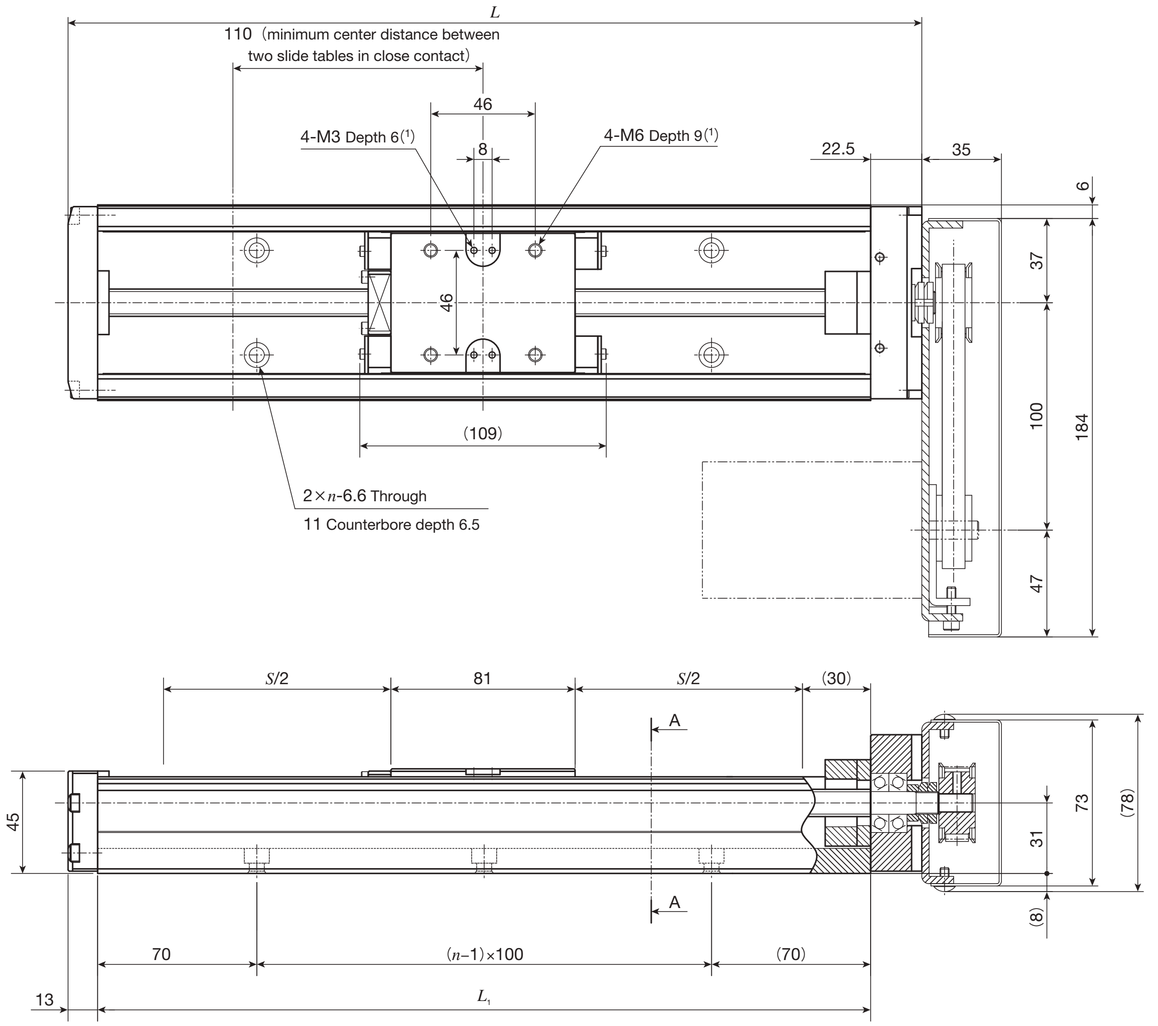
unit: mm

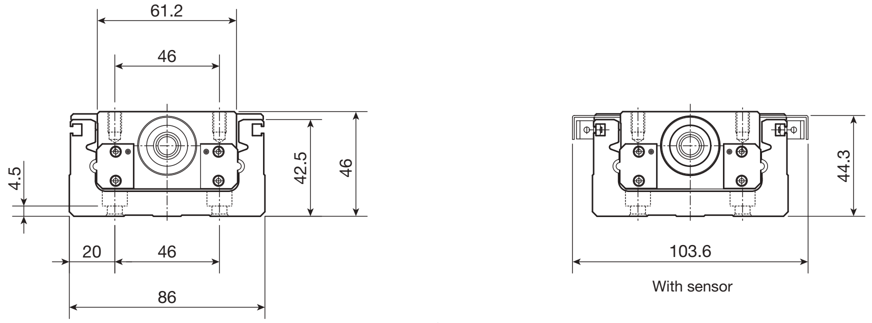
Bed length	Overall length	Stroke length	Mounting holes of bed		Mass (Ref.)
L_1	L	S(1)	C	n	kg(2)
150	178.5	50(−)	25	2	1.4
200	228.5	100(−)	50	2	1.5
300	328.5	200(125)	50	3	1.8
400	428.5	300(225)	50	4	2.2
500	528.5	400(325)	50	5	2.5
600	628.5	500(425)	50	6	2.8
700	728.5	600(525)	50	7	3.1

Notes (1) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(2) The value shows the mass of the entire table with one slide table, and it is 0.2kg heavier with two slide tables.

Remarks 1. Parts for motor attachment are appended, and this figure indicates a finished state after assembled by the customer.
2. If folded back to right and left, motor attachment is about 11.5mm lower than the bottom of the bed.
3. If folded back upward, motor attachment is about 9mm lower than the bottom of the bed.

TE86BS (Motor folding back specification)





A−A Sectional dimension

unit: mm

Bed length L_1	Overall length L	Stroke length S(2)	Mounting holes of bed n	Mass (Ref.) kg(3)
340	375.5	200(90)	3	4.0
440	475.5	300(190)	4	4.6
540	575.5	400(290)	5	5.1
640	675.5	500(390)	6	5.6
740	775.5	600(490)	7	6.1
840	875.5	700(590)	8	6.6
940	975.5	800(690)	9	7.2

Notes (1) Too deep a fixing thread depth of the mounting bolt may affect the running performance of the slide table, so never insert a bolt longer than the depth of the tapped hole.

(2) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.

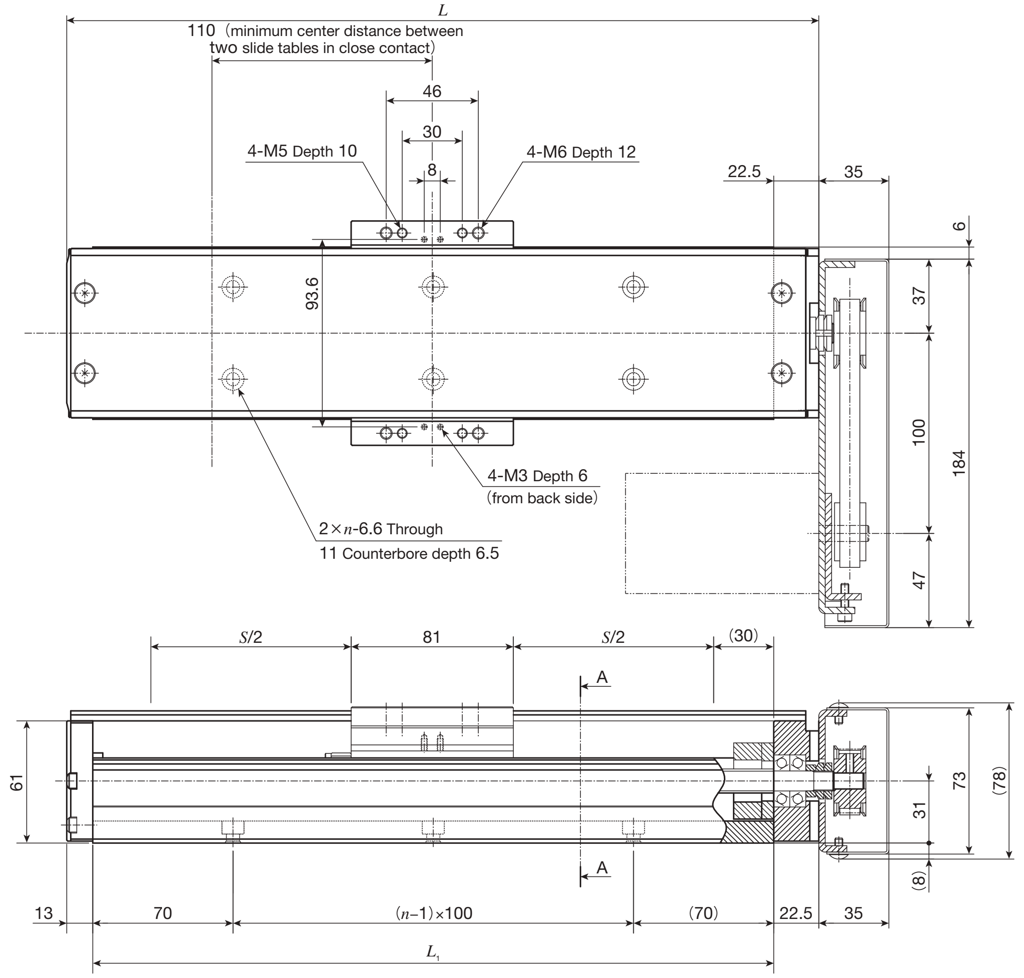
(3) The value shows the mass of the entire table with one slide table, and it is 0.3kg heavier with two slide tables.

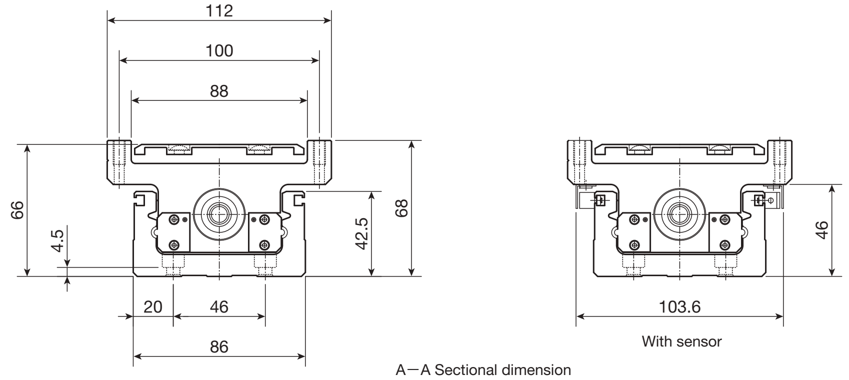
Remarks 1. Parts for motor attachment are appended, and this figure indicates a finished state after assembled by the customer.

2. If folded back to right and left, motor attachment is about 8mm lower than the bottom of the bed.

3. If folded back upward, motor attachment is about 6mm lower than the bottom of the bed.

TE86BF (Motor folding back specification)





A−A Sectional dimension

unit: mm

Bed length L_1	Overall length L	Stroke length S(1)	Mounting holes of bed n	Mass (Ref.) kg(2)
340	375.5	200(90)	3	4.6
440	475.5	300(190)	4	5.2
540	575.5	400(290)	5	5.8
640	675.5	500(390)	6	6.4
740	775.5	600(490)	7	7.0
840	875.5	700(590)	8	7.6
940	975.5	800(690)	9	8.1

Notes (1) The value indicates the allowable stroke when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.

(2) The value shows the mass of the entire table with one slide table, and it is 0.6kg heavier with two slide tables.

Remarks 1. Parts for motor attachment are appended, and this figure indicates a finished state after assembled by the customer.

2. If folded back to right and left, motor attachment is about 8mm lower than the bottom of the bed.

3. If folded back upward, motor attachment is about 6mm lower than the bottom of the bed.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

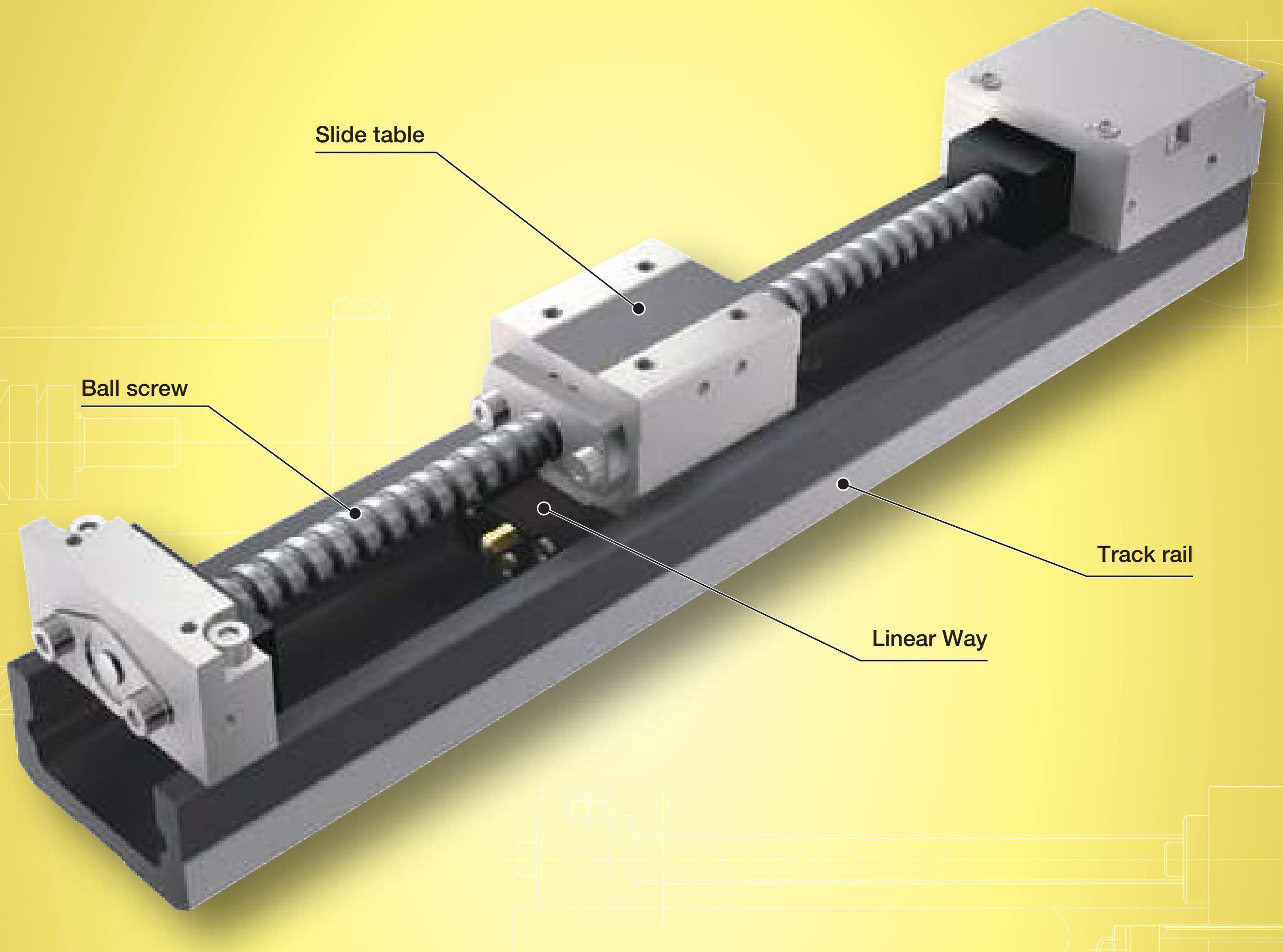
TU

TU

IKO C-Lube Maintenance-free

Ball screw

Linear



Major product specifications

Driving method	Precision ball screw and rolled ball screw
Linear motion rolling guide	Linear Way（ball type）
Built-in lubrication part	No built-in （The identification number is provided for your selection to attach lubrication part "C-Lube" or not）
Material of table and bed	High carbon steel
Sensor	Select by identification number

Accuracy

unit: mm

Positioning repeatability	±0.002～0.040
Positioning accuracy	0.020～0.050
Lost motion	–
Parallelism in table motion A	–
Parallelism in table motion B	0.008～0.030
Attitude accuracy	–
Straightness	–
Backlash	0.003～0.050

Points

Compact and slim type positioning table with an original U-shaped track rail

1 Precision Positioning Table TU is a compact and slim type positioning table with a slide table assembled inside a U-shaped track rail.
Also, by adopting a U-shaped track rail, the rigidity of the track rail under moment load and torsion is greatly increased. The track rail can be used as a structure beam of the machine and equipment. Therefore, freedom of design is expanded for user.

Slide table with high accuracy and high rigidity in a single structure

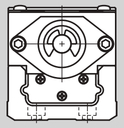
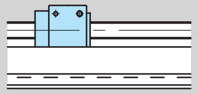
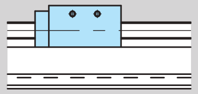
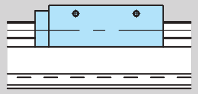
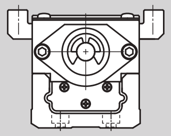
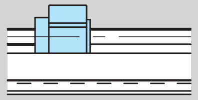
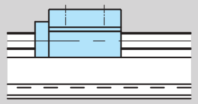
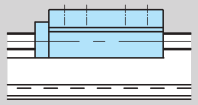
2 The slide table is an integral part of a linear motion rolling guide mechanism, in which large diameter steel balls are arranged in two rows and make four-point contact with the raceways. High accuracy and high rigidity positioning can thus be obtained even in applications where fluctuating load or complex load is applied.

The optimal table specification can be selected from a variety of options

Page Ⅱ-37

3 The optimal positioning table for each specific application can be configured easily by only indicating required functions and performance from our substantial size variations and a variety of options by the identification number.

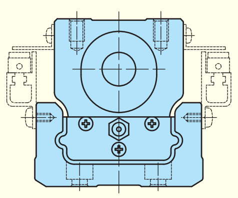
Variation

Shape		Model	Track rail width（mm）							
			25	30	40	50	60	86	100	130
Standard 	Short table 	TU…C	–	–	☆	☆	☆	☆	–	–
	Standard table 	TU…S	☆	☆	☆	☆	☆	☆	☆	☆
	Long table 	TU…G	–	–	☆	☆	☆	☆	–	–
With flange 	Short table 	TU…FC	–	–	–	–	☆	☆	–	–
	Standard table 	TU…F	☆	☆	☆	☆	☆	☆	☆	☆
	Long table 	TU…FG	–	–	–	–	☆	☆	–	–

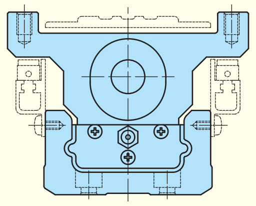
Special specifications that can be specified by the identification number

Shape and length of the slide table

The shape can be selected from two types, "standard" type and "with flange" type, and three types with different length with same section, i.e. short, standard, and long are listed on lineup. A bridge cover and XY bracket can be attached to the "with flange" type.



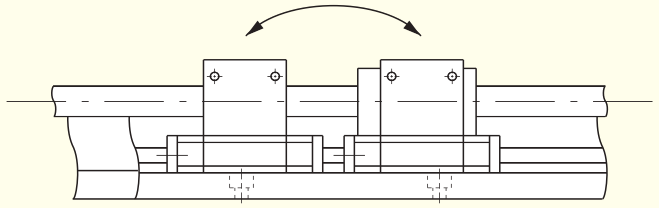
Standard
Short (C), standard (no symbol), long (G)



With flange
Short (FC), standard (F), long (FG)

Number of slide tables

Two slide tables can be mounted on the track rail depending on the applied load and the moment.



Type and lead of ball screw

Rolled ball screws and precision ball screws can be selected according to required accuracy. Ball screw lead is also selectable. The specification without ball screw can be used as a driven side linear motion rolling guide in biaxial parallel arrangement.

Designation of sensor

A variety of sensors can be specified for mounting, including limit sensors and origin sensors.

Table with C-Lube

Maintenance works such as relubricating with grease for ball screws and linear motion rolling guides can be reduced significantly by attaching lubrication part "C-Lube" impregnated with lubricant.

Motor folding back specification

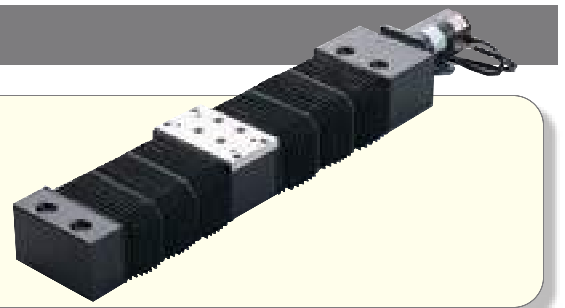
The motor folding back specification table can realize space saving by reducing the overall length of the table.

With bridge cover

A bridge cover can be attached to the "With flange" type.

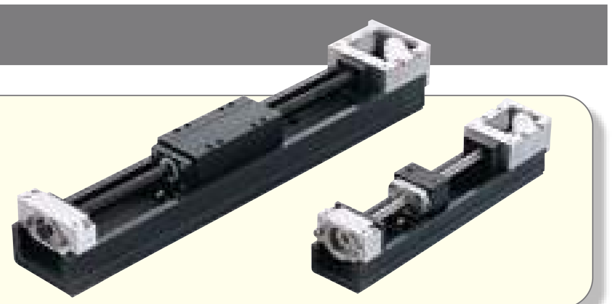
Table with bellows

A series of tables with bellows is available for preventing foreign matter from intruding into the table by covering the linear motion rolling guide and drive section with bellows.



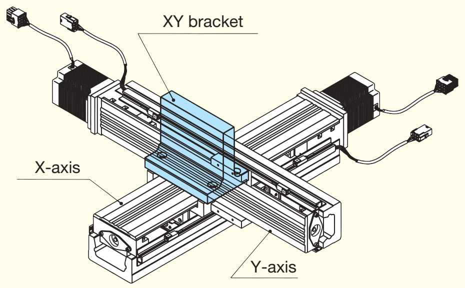
Black chrome surface treatment

Black permeable film is applied on the surface of slide table and ball screw to improve the corrosion resistance.



XY bracket

XY table can be configured easily since a series of XY bracket is available.



Identification Number

Example of an Identification Number

①	②	③	④		⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫
TU	86	FG	89	/	AT105	G	10	S	0	0	R	Q

①	**Model**	Page Ⅱ-40
②	**Size**	Page Ⅱ-40
③	**Shape of slide table**	Page Ⅱ-40
④	**Length of track rail**	Page Ⅱ-40
⑤	**Designation of motor attachment**	Page Ⅱ-41
⑥	**Ball screw type**	Page Ⅱ-41
⑦	**Ball screw lead**	Page Ⅱ-41
⑧	**Number of slide table**	Page Ⅱ-41
⑨	**Cover specification**	Page Ⅱ-42
⑩	**Specification of sensor**	Page Ⅱ-42
⑪	**Specification of surface treatment**	Page Ⅱ-42
⑫	**Specification of C-Lube**	Page Ⅱ-42

Identification Number and Specification

① Model

TU: Precision Positioning Table TU

② Size

Size indicates bed width.
Select a size from the list of Table 1.

③ Shape of slide table

C : Short table
S : Standard table
G : Long table
FC: Flange type short table
F : Flange type standard table
FG: Flange type long table

Table 1 Application of shape of slide table

Model and size	Model code					
	TU···C	TU···S	TU···G	TU···FC	TU···F	TU···FG
TU 25	–	○	–	–	○	–
TU 30	–	○	–	–	○	–
TU 40	○	○	○	–	○	–
TU 50	○	○	○	–	○	–
TU 60	○	○	○	○	○	○
TU 86	○	○	○	○	○	○
TU100	–	○	–	–	○	–
TU130	–	○	–	–	○	–

④ Length of track rail

From the [Identification] of track rail length shown in Table 2.1 and 2.2, select your desired one.

Table 2.1 Length of track rail (motor inline specification) unit: mm

Model and size	[Identification] of the length and dimensions of the track rail									
TU 25	[13] 130	[16] 165	[20] 200	–	–	–	–	–	–	–
TU 30	[14] 140	[18] 180	[22] 220	[26] 260	[30] 300	[34] 340	–	–	–	–
TU 40	[18] 180	[24] 240	[30] 300	[36] 360	[42] 420	–	–	–	–	–
TU 50	[22] 220	[30] 300	[38] 380	[46] 460	[54] 540	[62] 620	[70] 700	–	–	–
TU 60	[29] 290	[39] 390	[49] 490	[59] 590	[69] 690	[79] 790	[99] 990	[119] 1 190	–	–
TU 86	[49] 490	[59] 590	[69] 690	[79] 790	[89] 890	[99] 990	[109] 1 090	[119] 1 190	[139] 1 390	[159] 1 590
TU100	[101] 1 010	[116] 1 160	[131] 1 310	[146] 1 460	–	–	–	–	–	–
TU130	[101] 1 010	[116] 1 160	[131] 1 310	[146] 1 460	[161] 1 610	–	–	–	–	–

Remark: For stroke lengths, please see the dimension tables shown in pages of Ⅱ-69 or later.

Table 2.2 Length of track rail (motor folding back specification) unit: mm

Model and size	[Identification] of the length and dimensions of the track rail							
TU 40	[14] 140	[20] 200	[26] 260	[32] 320	[38] 380	–	–	–
TU 50	[18] 180	[26] 260	[34] 340	[42] 420	[50] 500	[58] 580	[66] 660	–
TU 60	[24] 244	[34] 344	[44] 444	[54] 544	[64] 644	[74] 744	–	–
TU 86	[44] 442	[54] 542	[64] 642	[74] 742	[84] 842	[94] 942	[104] 1 042	[114] 1 142

Remark: For stroke length, please see the dimension tables shown in pages of Ⅱ-81 or later.

5 Designation of motor attachment

AT100	: Motor inline specification	Without motor attachment
AT101 to AT125	: Motor inline specification	With motor attachment
AR100	: Motor folding back specification	Without motor attachment
AR101 to AR110	: Motor folding back specification	With motor attachment

Application of motor folding back specification is shown in Table 3. To specify the motor attachment, select it from the list of Table 6.1 and Table 6.2.

- Motor should be prepared by customer.
- Please specify motor folding back specification and motor attachment applicable to motor for use.
- If motor inline specification with motor attachment is specified, the main body is shipped with a coupling indicated in the Table 7 mounted. However, the final position adjustment should be made by customer since it is only temporarily fixed. For a product without motor attachment (AT100), no coupling is attached.
- If motor folding back specification with motor attachment is specified, "housing applicable to the specified motor, pulley (on motor side and ball screw side), cover, motor bracket, belt and bolts necessary for assembly" are supplied. Motor mounting bolts should be prepared by customer.

Table 3 Application of motor folding back specification

Model and size	With motor attachment		Without motor attachment
	AC servomotor	Stepper motor	
TU 25	–	–	–
TU 30	–	–	–
TU 40	○	○	○
TU 50	○	○	○
TU 60	○	–	○
TU 86	○	–	○
TU100	–	–	–
TU130	–	–	–

6 Ball screw type

No symbol: Rolled screw
G : Ground screw
N : Without ball screw

From among various types of ball screws shown in Table 4, select your desired one.

When specifying N

- For the entry of section ❺, specify AT100 or AR100, and for the entry of section ❼, specify "No symbol".
- For the entry of section ❿, select "Without sensor" (by specifying 0).
- In the entry of section ❾, you cannot specify "With bellows".

7 Ball screw lead

From among ball screw leads applicable to the sizes shown in Table 4, select your desired one.

Table 4 Application of ball screw lead

Model and size	Ball screw type	Ball screw lead mm					
		4	5	8	10	20	25
TU 25	Ground screw	○	–	–	–	–	–
TU 30	Ground screw	–	○	–	–	–	–
TU 40	Rolled screw	○	–	○	–	–	–
	Ground screw	○	–	○	–	–	–
TU 50	Rolled screw	–	○	–	○	–	–
	Ground screw	–	○	–	○	–	–
TU 60	Rolled screw	–	○	–	○	–	–
	Ground screw	–	○(1)	–	○(1)	○(1)	–
TU 86	Rolled screw	–	–	–	○(2)	○(2)	–
	Ground screw	–	–	–	○(2)	○	–
TU100	Ground screw	–	–	–	–	○	–
TU130	Ground screw	–	–	–	–	–	○

Notes (1) This is not applied to track rail lengths of 990mm and 1,190mm.
(2) This is not applied to track rail lengths of 1,390mm and 1,590mm.

8 Number of slide table

S: One unit
C: Two units

9 Cover specification

0 : Without cover
C: With bridge cover (applied to TU···FC, TU···F, and TU···FG)
J : With bellows (applied to TU60S and TU86S)

- When specifying "With bellows (J)", select 1 piece (by specifying S) for the entry of section ❽.
- "With bellows" type is not provided for TU60 with track rail lengths of 990 and 1,190mm and TU86 with track rail lengths of 1,390 and 1,590mm.
- "With bridge cover" type is not provided for TU60 with track rail lengths of 1,190mm and TU86 with track rail lengths of 1,590mm.

10 Specification of sensor

0: Without a sensor, without a sensor rail
2: Two sensors (limit), with a sensor rail
3: Three sensors (limit and pre-origin), with a sensor rail
4: Four sensors (limit, pre-origin, and origin), with a sensor rail
9: Without a sensor, with a sensor rail

11 Specification of surface treatment

No symbol: Not treated
R : Black chrome surface treatment 1
Black chrome surface treatment is applied on the surfaces of a slide table and track rail.
L : Black chrome surface treatment 2
In addition to the black chrome surface treatment 1, this treatment is applied on the ball screw shaft and nut.

12 Specification of C-Lube

No symbol: No C-Lube
Q : Table with C-Lube

A C-Lube is mounted on the slide table and the end face of a nut of ball screw. The C-Lube is a lubrication part with much lubricant oil impregnated in the consecutive porous resin. Sliding or moving along a smooth surface with contact on the track rail and the raceway surface of the ball screw causes the lubricant oil within the plate to continue to seep on the raceway surface, thus reducing the number of hours for maintenance caused by the extension of lubrication interval. This is an effective countermeasure for the attrition of grease at the location difficult to be lubricated.

- When specifying Q, for the entry of section ❻, select ground screw (by specifying G) or without ball screw (by specifying N).

Table 5 Application of C-Lube

Model and size	Rolled screw	Ground screw	Without ball screw
TU 25	–	–	–
TU 30	–	–	–
TU 40	–	○	○
TU 50	–	○	○
TU 60	–	○	○
TU 86(1)	–	○	○
TU100	–	○	○
TU130	–	○	○

Note (1) For the track rail lengths of 1,390mm and 1,590mm in TU86, please contact IKO.

Table 6.1 Application of motor attachment (motor inline specification)

Models of motor to be used					Flange size mm	Motor attachment							
Type	Manufacturer	Series	Model	Rated output W		TU25	TU30	TU40	TU50	TU60	TU86	TU100	TU130
AC servomotor	YASKAWA ELECTRIC CORPORATION	Σ-7	SGM7M-A2A	22	□25	AT101	AT101	–	–	–	–	–	–
			SGM7M-A3A	33		AT101	AT101	–	–	–	–	–	–
			SGM7J-A5A	50	□40	–	–	AT102	AT102	–	–	–	–
			SGM7A-A5A			–	–	AT102	AT102	–	–	–	–
			SGM7J-01A	100		–	–	AT102	AT102	AT103	–	–	–
			SGM7A-01A			–	–	AT102	AT102	AT103	–	–	–
			SGM7A-C2A	150		–	–	–	–	AT103	–	–	–
			SGM7J-02A	200	□60	–	–	–	–	AT104	AT105	–	–
			SGM7A-02A			–	–	–	–	AT104	AT105	–	–
			SGM7J-04A	400		–	–	–	–	–	AT106	AT107	–
			SGM7A-04A			–	–	–	–	–	AT106	AT107	–
			SGM7A-06A	600		–	–	–	–	–	AT106	AT107	–
			SGM7J-08A	750	□80	–	–	–	–	–	–	–	AT108
			SGM7A-08A			–	–	–	–	–	–	–	AT108
	Mitsubishi Electric Corporation	J4/J5	HG-AK0236	20	□25	AT101	AT101	–	–	–	–	–	–
			HG-AK0336	30		AT101	AT101	–	–	–	–	–	–
			HG-MR053	50	□40	–	–	AT102	AT102	–	–	–	–
			HG-KR053/HK-KT053W			–	–	AT102	AT102	–	–	–	–
			HG-MR13	100		–	–	AT102	AT102	AT103	–	–	–
			HG-KR13/HK-KT13W			–	–	AT102	AT102	AT103	–	–	–
			HG-MR23	200	□60	–	–	–	–	AT104	AT105	–	–
			HG-KR23/HK-KT23W			–	–	–	–	AT104	AT105	–	–
			HG-MR43	400		–	–	–	–	–	AT106	AT107	–
			HG-KR43/HK-KT43W			–	–	–	–	–	AT106	AT107	–
			HG-MR73	750	□80	–	–	–	–	–	–	–	AT108
			HG-KR43/HK-KT7M3W			–	–	–	–	–	–	–	AT108
	Panasonic Corporation	MINAS A6	MSMF5A	50	□38	–	–	AT110	AT110	–	–	–	–
			MSMF01	100		–	–	AT110	AT110	AT111	–	–	–
			MSMF02	200	□60	–	–	–	–	AT112	AT113	–	–
			MSMF04	400		–	–	–	–	–	AT114	AT115	–
			MSMF08	750	□80	–	–	–	–	–	–	–	AT116
	Hitachi Industrial Equipment Systems Co., Ltd	AD	ADMA-R5L	50	□40	–	–	AT102	AT102	–	–	–	–
			ADMA-01L	100		–	–	AT102	AT102	AT103	–	–	–
			ADMA-02L	200	□60	–	–	–	–	AT104	AT105	–	–
			ADMA-04L	400		–	–	–	–	–	AT106	AT107	–
			ADMA-08L	750	□75	–	–	–	–	–	–	–	AT108
Stepper motor	ORIENTAL MOTOR Co., Ltd.	α step	ARM46		□42	–	–	AT117	AT117	–	–	–	–
			ARM66		□60	–	–	–	–	AT118	AT119	–	–
			ARM69		□60	–	–	–	–	AT118	AT119	–	–
			ARM98		□85	–	–	–	–	–	–	AT120	AT121
			ARM911		□85	–	–	–	–	–	–	AT120	AT121
		RKS CRK	CRK52		□28	AT125	AT125	–	–	–	–	–	–
			CRK54		□42	–	–	AT122	AT122	–	–	–	–
			CRK56 (1)		□60	–	–	–	–	AT123	AT124	–	–
			RKS59		□85	–	–	–	–	–	–	AT120	AT121

Note (1) Applicable to the outer diameter φ8 of motor output shaft.
Remark: For detailed motor specifications, please see respective motor manufacturer's catalog.

Table 6.2 Application of NEMA motor attachment (motor inline specification)

Motor to be used					Flange size inch	Motor attachment							
Type	Manufacturer	Series	Model	Rated output W		TU25	TU30	TU40	TU50	TU60	TU86	TU100	TU130
AC servo motor	Allen-Bradley	TLY (metric)	TLY-A110(AA type)	41W	□40			AT102	AT102	AT103			
			TLY-A120(AA type)	86W	□40			AT102	AT102	AT103			
			TLY-A130(AA type)	140W	□40			AT102	AT102	AT103			
			TLY-A220(AA type)	350W	□60					AT104 (4-a)	AT105 (4-a)	AT107 (4-b)	AT107 (4-c)
			TLY-A230(AA type)	440W	□60					AT104 (4-a)	AT105 (4-a)	AT107 (4-b)	AT107 (4-c)
			TLY-A2530(AA type)	690W	□80							AT108 (4-b)	AT108 (4-e)
			TLY-A2540(AA type)	860W	□80							AT108 (4-b)	AT108 (4-e)
		TLY (NEMA)	TLY-A120(AN type)	86W	□42			TAE9043-ATE140 (1)					
			TLY-A130(AN type)	140W	□42			TAE9043-ATE140 (1)					
			TLY-A220(AN type)	350W	□56.4					TAE9017-ATE139 (1)	TAE9017-ATE129 (1)		
			TLY-A230(AN type)	440W	□56.4					TAE9017-ATE139 (1)	TAE9017-ATE129 (1)		
			TLY-A2530(AN type)	690W	□86						TAE9047-ATE130 (1)	TAE9047-ATE062 (1)	
			TLY-A2540(AN type)	860W	□86						TAE9047-ATE130 (1)	TAE9047-ATE062 (1)	
Servo or Stepper	(NEMA11C)					AT125 (2) (3)		–	–	–	–	–	–
	NEMA17C					TAE9065-ATE063 (1) (2)		AT122 (2) (3)		–	–	–	–
	NEMA23D					–	–	TAE9059-ATE054 (1) (2)		TAE9014-ATE094 (1) (2)	TAE9017-ATE093 (1) (2)	–	–
						–	–	–	–	TAE9014-ATE41 (1) (2)	TAE9017-ATE058 (1) (2)	–	–
	NEMA34D					–	–	–	–	–	TAE9056-ATE45 (1) (2)	TAE9047-ATE062 (1) (2)	
	NEMA42D					–	–	–	–	–	–	TAE9047-ATE060 (1) (2)	

Note (1) The TAE part numbers are the part number of motor attachment component sold separately. In the TU part number, please choose the motor attachment code AT100. No Coupling is included. It is required to consider customer's operation patterns for these motor attachment.

(2) Please confirm the length and the diameter of the motor shaft etc., and check the usability of the motor attachment with your motor beforehand.

(3) The appended coupling may not be used depending on the motor's specification, while these AT part number motor attachments will be delivered with the particular coupling as standard.

(4-a) (4-b) (4-c) (4-d) (4-e)
The appended coupling as standard will not be used. It is required to change the delivered coupling.
Please refer to Table 6.3.

Remark: For detailed motor specifications, please see respective motor manufacturer's catalog.

Table 6.3 Recommended coupling of IKO motor attachment for Allen Bradley

Note	Motor Attachment	Coupling	Motor Shaft Diameter	Recomennded Coupling
4-a	AT104/ AT105	Appended	φ12	UA-30C-8×12
4-b	AT107(TU100)	Appended	φ12	UA-40C-12×12
4-c	AT107(TU130)	Appended	φ15	UA-40C-12×15
4-d	AT108(TU100)	Appended	φ16	UA-40C-12×16
4-e	AT108(TU130)	Appended	φ16	UA-40C-15×16

Table 6.4 Application of motor attachment (motor folding back specification)

Models of motor to be used					Flange size mm	Motor attachment			
Type	Manufacturer	Series	Model	Rated output W		TU40	TU50	TU60	TU86
AC servo motor	YASKAWA ELECTRIC CORPORATION	Σ-7	SGM7J-A5A	50	□40	AR101	AR101	–	–
			SGM7A-A5A			AR101	AR101	–	–
			SGM7J-01A	100		AR101	AR101	AR102	–
			SGM7A-01A			AR101	AR101	AR102	–
			SGM7A-C2A	150		–	–	AR102	–
			SGM7J-02A	200	□60	–	–	AR103	AR104
			SGM7A-02A			–	–	AR103	AR104
	Mitsubishi Electric Corporation	J4/J5	HG-MR053	50	□40	AR101	AR101	–	–
			HG-KR053/HK-KT053W			AR101	AR101	–	–
			HG-MR13	100		AR101	AR101	AR102	–
			HG-KR13/HK-KT13W			AR101	AR101	AR102	–
			HG-MR23	200	□60	–	–	AR103	AR104
			HG-KR23/HK-KT23W			–	–	AR103	AR104
	Panasonic Corporation	MINAS A6	MSMF5A	50	□38	AR105	AR105	–	–
			MSMF01	100		AR105	AR105	AR106	–
			MSMF02	200	□60	–	–	AR107	AR108
	Hitachi Industrial Equipment Systems Co., Ltd	AD	ADMA-R5L	50	□40	AR101	AR101	–	–
			ADMA-01L	100		AR101	AR101	AR102	–
			ADMA-02L	200	□60	–	–	AR103	AR104
Stepper motor	ORIENTAL MOTOR Co., Ltd.	α step	ARM46		□42	AR109	AR109	–	–
		CRK	CRK54		□42	AR110	AR110	–	–

Remark: For detailed motor specifications, please see respective motor manufacturers' catalog.

Table 7 Coupling models (motor inline specification)

Motor attachment	Coupling models	Manufacturer	Coupling inertia J_c $\times 10^{-5}$kg · m^2
AT101	UA-15C- 5× 5	Sakai Manufacturing Co., Ltd	0.024
AT102	UA-20C- 5× 8	Sakai Manufacturing Co., Ltd	0.086
AT103	UA-25C- 8× 8	Sakai Manufacturing Co., Ltd	0.29
AT104	UA-30C- 8×14	Sakai Manufacturing Co., Ltd	0.603
AT105	UA-30C- 8×14	Sakai Manufacturing Co., Ltd	0.603
AT106	UA-35C- 8×14	Sakai Manufacturing Co., Ltd	1.34
AT107	UA-40C-12×14	Sakai Manufacturing Co., Ltd	2.61
AT108	UA-40C-15×19	Sakai Manufacturing Co., Ltd	2.61
AT109	UA-15C- 5× 6	Sakai Manufacturing Co., Ltd	0.024
AT110	UA-20C- 5× 8	Sakai Manufacturing Co., Ltd	0.086
AT111	UA-25C- 8× 8	Sakai Manufacturing Co., Ltd	0.29
AT112	UA-30C- 8×11	Sakai Manufacturing Co., Ltd	0.603
AT113	UA-30C- 8×11	Sakai Manufacturing Co., Ltd	0.603
AT114	UA-35C- 8×14	Sakai Manufacturing Co., Ltd	1.34
AT115	UA-40C-12×14	Sakai Manufacturing Co., Ltd	2.61
AT116	UA-40C-15×19	Sakai Manufacturing Co., Ltd	2.61
AT117	MSTS-16C- 5× 6	Nabeya Bi-tech Kaisha	0.090
AT118	MSTS-25C- 8×10	Nabeya Bi-tech Kaisha	0.710
AT119	MSTS-25C- 8×10	Nabeya Bi-tech Kaisha	0.710
AT120	MSTS-40C-12×14	Nabeya Bi-tech Kaisha	9.0
AT121	MSTS-40C-14×15	Nabeya Bi-tech Kaisha	9.0
AT122	MSTS-16C- 5× 5	Nabeya Bi-tech Kaisha	0.090
AT123	MSTS-25C- 8× 8	Nabeya Bi-tech Kaisha	0.710
AT124	MSTS-25C- 8× 8	Nabeya Bi-tech Kaisha	0.710
AT125	MSTS-12C- 5× 5	Nabeya Bi-tech Kaisha	0.022
TAE9017-ATE139	XGT-25CS- 8×12.7 (Customized)	Nabeya Bi-tech Kaisha	0.250
TAE9017-ATE129	XGS-30C- 8×12.7 (Customized)	Nabeya Bi-tech Kaisha	0.550
TAE9047-ATE130	XGS-34C- 8×15.875(Customized)	Nabeya Bi-tech Kaisha	1.000
TAE9043-ATE140	MSTS-16C- 5×6.35	Nabeya Bi-tech Kaisha	0.090
TAE9047-ATE062 (TU100)	XGT-34CS-15.875×12 (Customized)	Nabeya Bi-tech Kaisha	1.000
TAE9047-ATE062 (TU130)	XGT-34CS-15.875×15 (Customized)	Nabeya Bi-tech Kaisha	1.000

Remark: For detailed coupling specification, please see respective manufacturer's catalog.

Specifications

Table 8.1 TU accuracy (rolled screw) unit: mm

Length of track rail		Positioning repeatability	Parallelism in table motion B	Backlash (1)
Above	Below			
–	500	±0.025 (±0.040)	0.015	0.050
500	800		0.020	
800	1 200		0.025	

Note (1) This does not apply to table of motor folding back specification.

Remark: The positioning repeatability values in ( ) are reference values provided that the timing belt tension is properly adjusted in motor folding back specification table.

Table 8.2 TU accuracy (ground screw) unit: mm

Length of track rail		Positioning repeatability		Positioning accuracy (1)		Parallelism in table motion B		Backlash (1)
Above	Below	Short table	Standard table Long table	Short table	Standard table Long table	Short table	Standard table Long table	
–	400(350)	±0.004 (±0.020)	±0.002 (±0.020)	0.030	0.020	0.015	0.008	0.003
400(350)	500(500)						0.010	
500(500)	600(550)			0.035	0.025	0.020		
600(550)	700(700)						0.012	
700(700)	800(800)			0.040	0.030			
800(800)	900(900)					0.025	0.014	
900(900)	1 000(1 000)			0.045	0.035			
1 000(1 000)	1 100(1 100)						0.016	
1 100(1 100)	1 200			0.050	0.040			
1 200	1 400			–		–	0.030	
1 400	1 500			–	0.045	–		
1 500	1 610			–	0.050	–		

Note (1) This does not apply to table of motor folding back specification.

Remark: The positioning repeatability values in ( ) are reference values provided that the timing belt tension is properly adjusted in motor folding back specification table.

Table 9.1 Maximum speed (AC servomotor)

Motor type	Model and size	Length of track rail mm	Maximum speed mm/s					
			Lead 4mm	Lead 5mm	Lead 8mm	Lead 10mm	Lead 20mm	Lead 25mm
AC servo motor	TU 25	200 or less	400	–	–	–	–	–
	TU 30	340 or less	–	500	–	–	–	–
	TU 40	–	400 (390)	–	800 (790)	–	–	–
	TU 50	540 or less	–	500 (390)	–	1 000 (780)	–	–
		620	–	370 (350)	–	750 (710)	–	–
		700	–	280 (270)	–	560 (540)	–	–
	TU 60	590 or less	–	470 (330)	–	930 (660)	1 860	–
		690	–	380 (330)	–	780 (660)	1 620	–
		790	–	270 (270)	–	560 (560)	1 170	–
		990	–	(160)	–	(330)	–	–
		1 190	–	(110)	–	(210)	–	–
	TU 86	690 or less	–	–	–	750 (530)	1 480 (1 050)	–
		790	–	–	–	700 (530)	1 410 (1 050)	–
		890	–	–	–	530 (530)	1 060 (1 050)	–
		990	–	–	–	410 (410)	830 (830)	–
		1 090	–	–	–	330 (330)	670 (670)	–
		1 190	–	–	–	270 (270)	550 (550)	–
		1 390	–	–	–	–	530	–
		1 590	–	–	–	–	390	–
	TU100	1 010	–	–	–	–	1 110	–
		1 160	–	–	–	–	990	–
		1 310	–	–	–	–	730	–
		1 460	–	–	–	–	560	–
	TU130	1 010	–	–	–	–	–	1 110
		1 160	–	–	–	–	–	1 110
		1 310	–	–	–	–	–	1 110
		1 460	–	–	–	–	–	930
		1 610	–	–	–	–	–	730

Remark 1. The value in ( ) is applicable to rolled screws.
2. To measure the practical maximum speed, it is required to consider operation patterns based on the motor to be used and load conditions.

Table 9.2 Maximum speed (stepper motor)

Motor type	Model and size	Length of track rail mm	Number of revolutions of motor min^{-1}	Maximum speed mm/s					
				Lead 4mm	Lead 5mm	Lead 8mm	Lead 10mm	Lead 20mm	Lead 25mm
Stepper motor	TU 25	200 or less	1 800	120	–	–	–	–	–
	TU 30	340 or less	1 800	–	150	–	–	–	–
	TU 40	–	1 800	120	–	240	–	–	–
	TU 50	–	1 800	–	150	–	300	–	–
	TU 60	790 or less	1 800	–	–	–	–	600	–
		990 or less	1 800	–	150	–	300	–	–
		1 190	1 290	–	108	–	215	–	–
	TU 86	990 or less	1 800	–	–	–	300	600	–
		1 090	1 770	–	–	–	295	590	–
		1 190	1 460	–	–	–	243	487	–
		1 390	1 610	–	–	–	–	537	–
		1 590	1 200	–	–	–	–	400	–
	TU100	1 160 or less	1 800	–	–	–	–	600	–
		1 310	1 780	–	–	–	–	593	–
		1 460	1 400	–	–	–	–	467	–
	TU130	1 310 or less	1 800	–	–	–	–	–	750
		1 460	1 720	–	–	–	–	–	717
		1 610	1 390	–	–	–	–	–	579

Remark: To measure the practical maximum speed, it is required to consider operation patterns based on the motor to be used and load conditions.

Table 10.1 Maximum carrying mass

Model and size	Ball screw type	Ball screw lead mm	Length of slide table	Carrying mass position mm	Maximum carrying mass kg							
					Horizontal direction				Vertical direction			
				Length L / Height H	0	100	200	300	0	100	200	300
TU25	Ground screw	4	Standard	0	11	1.3	0.6	0.4	4.8	0.5	0.2	0.1
				100	6	1.1	0.6	0.4	0.6	0.3	0.2	0.1
				200	3.7	1.0	0.6	0.4	0.3	0.2	0.1	0.1
				300	2.7	0.9	0.5	0.4	0.2	0.1	0.1	0.1
TU30	Ground screw	5	Standard	0	15	1.9	0.9	0.6	5	0.7	0.3	0.2
				100	7	1.6	0.9	0.6	0.9	0.5	0.3	0.2
				200	4.5	1.4	0.8	0.6	0.5	0.3	0.2	0.2
				300	3.2	1.3	0.8	0.5	0.3	0.2	0.2	0.1
TU40	Ground screw	4	Short	0	24	7	4.1	2.8	11	2.4	1.2	0.8
				100	22	6	3.8	2.6	2.3	1.5	1.0	0.7
				200	13	5	3.4	2.5	1.2	0.9	0.8	0.6
				300	9	4.8	3.1	2.3	0.8	0.7	0.6	0.5
			Standard	0	39	11	6	4.1	11	5	2.6	1.7
				100	39	10	5	3.9	4.7	3.1	2.0	1.4
				200	25	8	5	3.7	2.5	1.9	1.6	1.2
				300	18	7	4.9	3.6	1.7	1.4	1.2	1.1
			Long	0	59	15	8	5	11	9	4.9	3.3
				100	59	14	7	5	8	5	3.8	2.8
				200	44	13	7	5	4.8	3.7	3.0	2.4
				300	32	12	7	5	3.2	2.7	2.3	2.0
	Ground screw	8	Short	0	24	5	2.9	1.9	7	1.9	1.0	0.6
				100	9	3.9	2.4	1.7	1.8	1.2	0.7	0.5
				200	5	3.0	2.1	1.5	0.9	0.7	0.6	0.4
				300	4.0	2.5	1.8	1.4	0.6	0.5	0.4	0.4
			Standard	0	39	8	4.3	2.9	7	3.9	2.0	1.3
				100	18	6	3.8	2.7	3.6	2.4	1.5	1.1
				200	11	5	3.4	2.5	1.9	1.5	1.2	1.0
				300	7	4.4	3.0	2.3	1.3	1.1	0.9	0.8
			Long	0	46	11	6	4.1	7	7	3.8	2.6
				100	33	9	5	3.9	6	4.5	3.0	2.2
				200	20	8	5	3.7	3.7	2.9	2.4	1.8
				300	14	7	4.7	3.4	2.5	2.1	1.8	1.6
	Rolled screw	4	Short	0	24	7	4.1	2.8	8	2.4	1.2	0.8
				100	22	6	3.8	2.6	2.3	1.5	1.0	0.7
				200	13	5	3.4	2.5	1.2	0.9	0.8	0.6
				300	9	4.8	3.1	2.3	0.8	0.7	0.6	0.5
			Standard	0	39	11	6	4.1	8	5	2.6	1.7
				100	39	10	5	3.9	4.7	3.1	2.0	1.4
				200	25	8	5	3.7	2.5	1.9	1.6	1.2
				300	18	7	4.9	3.6	1.7	1.4	1.2	1.1
			Long	0	59	15	8	5	8	8	4.9	3.3
				100	59	14	7	5	8	5	3.8	2.8
				200	44	13	7	5	4.8	3.7	3.0	2.4
				300	32	12	7	5	3.2	2.7	2.3	2.0
	Rolled screw	8	Short	0	24	5	2.9	1.9	5	1.9	1.0	0.6
				100	9	3.9	2.4	1.7	1.8	1.2	0.7	0.5
				200	5	3.0	2.0	1.5	0.9	0.7	0.6	0.4
				300	4.0	2.5	1.8	1.4	0.6	0.5	0.4	0.4
			Standard	0	32	8	4.3	2.9	4.9	3.9	2.0	1.3
				100	18	6	3.8	2.7	3.6	2.4	1.5	1.1
				200	11	5	3.4	2.5	1.9	1.5	1.2	0.9
				300	7	4.4	3.0	2.3	1.3	1.1	0.9	0.8
			Long	0	32	11	6	4.1	4.8	4.8	3.8	2.6
				100	32	9	5	3.9	4.8	4.5	3.0	2.2
				200	20	8	5	3.7	3.7	2.9	2.4	1.8
				300	14	7	4.7	3.4	2.5	2.1	1.8	1.6

Remarks 1. The value is for one slide table.
2. The maximum carrying mass is adjusted by the mass when the rating life of the linear motion rolling guide, ball screws, or bearings is 18,000 hours during continuous operation at a number of revolutions of the motor of 3000min^{-1} and an acceleration/deceleration time of 0.2s. The mass calculated is based upon the basic static load rating of the linear motion rolling guide.

Table 10.2 Maximum carrying mass

Model and size	Ball screw type	Ball screw lead mm	Length of slide table	Carrying mass position mm	Maximum carrying mass kg							
					Horizontal direction				Vertical direction			
				Length L / Height H	0	100	200	300	0	100	200	300
TU50	Ground screw	5	Short	0	35	12	6	4.7	13	3.9	2.1	1.4
				100	28	10	6	4.3	3.7	2.4	1.6	1.2
				200	17	8	5	4.0	2.0	1.5	1.3	1.0
				300	12	7	4.9	3.7	1.3	1.1	1.0	0.8
			Standard	0	64	20	11	7	13	9	5	3.4
				100	60	17	10	7	9	6	4.0	2.9
				200	39	15	9	6	4.9	3.8	3.1	2.5
				300	28	13	8	6	3.3	2.8	2.4	2.1
			Long	0	100	29	15	10	13	13	10	6
				100	100	26	14	10	13	12	8	5
				200	71	23	14	10	9	7	6	5
				300	53	21	13	9	6	5	4.9	4.3
	Ground screw	10	Short	0	35	8	4.6	3.2	8	3.0	1.6	1.1
				100	12	5	3.7	2.7	2.8	1.9	1.2	0.9
				200	7	4.4	3.1	2.4	1.5	1.2	1.0	0.8
				300	5	3.5	2.6	2.1	1.0	0.9	0.7	0.6
			Standard	0	44	14	7	5	8	7	3.9	2.7
				100	28	11	6	4.9	7	4.6	3.1	2.2
				200	17	9	6	4.4	3.8	3.0	2.4	1.9
				300	12	7	5	4.1	2.6	2.2	1.9	1.6
			Long	0	43	21	11	7	8	8	7	5
				100	43	17	10	7	8	8	6	4.5
				200	32	14	9	6	7	6	4.9	3.9
				300	23	12	8	6	5	4.4	3.8	3.3
	Rolled screw	5	Short	0	35	12	6	4.7	11	3.9	2.1	1.4
				100	28	10	6	4.3	3.7	2.4	1.6	1.2
				200	17	8	5	4.0	2.0	1.5	1.3	1.0
				300	12	7	4.9	3.7	1.3	1.1	1.0	0.8
			Standard	0	64	20	11	7	11	9	5	3.4
				100	60	17	10	7	9	6	4.0	2.9
				200	39	15	9	6	4.9	3.8	3.1	2.5
				300	28	13	8	6	3.3	2.8	2.4	2.1
			Long	0	100	29	15	10	11	11	10	6
				100	100	26	14	10	11	11	8	5
				200	71	23	14	10	9	7	6	5
				300	53	21	13	9	6	5	4.9	4.3
	Rolled screw	10	Short	0	35	8	4.6	3.2	9	3.0	1.6	1.1
				100	12	5	3.7	2.7	2.8	1.9	1.2	0.9
				200	7	4.4	3.1	2.4	1.5	1.2	1.0	0.8
				300	5	3.5	2.6	2.1	1.0	0.9	0.7	0.6
			Standard	0	47	14	7	5	8	7	3.9	2.7
				100	28	11	6	4.9	6	4.6	3.1	2.2
				200	17	9	6	4.4	3.8	2.9	2.4	1.9
				300	12	7	5	4.1	2.6	2.2	1.9	1.6
			Long	0	47	21	11	7	8	8	7	5
				100	47	17	10	7	8	8	6	4.5
				200	32	14	9	6	7	6	4.9	3.9
				300	23	12	8	6	5	4.4	3.8	3.3

Remarks 1. The value is for one slide table.
2. The maximum carrying mass is adjusted by the mass when the rating life of the linear motion rolling guide, ball screws, or bearings is 18,000 hours during continuous operation at a number of revolutions of the motor of 3000min^{-1} and an acceleration/deceleration time of 0.2s. The mass calculated is based upon the basic static load rating of the linear motion rolling guide.

Table 10.3 Maximum carrying mass

Model and size	Ball screw type	Ball screw lead mm	Length of slide table	Carrying mass position mm	Maximum carrying mass kg							
					Horizontal direction				Vertical direction			
				Length L / Height H	0	100	200	300	0	100	200	300
TU60	Ground screw	5	Short	0	48	19	10	7	16	6	3.3	2.3
				100	43	15	9	6	5	3.9	2.6	1.9
				200	27	13	8	6	3.2	2.5	2.0	1.6
				300	19	11	7	5	2.2	1.8	1.6	1.4
			Standard	0	88	31	17	11	16	15	8	5
				100	88	27	15	11	14	9	6	4.7
				200	60	24	14	10	7	6	5	4.0
				300	45	21	13	10	5	4.5	3.9	3.4
			Long	0	146	46	25	17	15	15	15	12
				100	146	42	24	16	15	15	14	10
				200	119	39	23	16	15	13	11	9
				300	91	36	22	15	12	10	8	7
	Ground screw	10	Short	0	48	12	7	4.9	11	4.9	2.6	1.7
				100	19	9	5	4.2	4.5	3.0	2.0	1.4
				200	11	6	4.8	3.7	2.4	1.9	1.6	1.2
				300	8	5	4.2	3.3	1.7	1.4	1.2	1.1
			Standard	0	58	22	12	8	10	10	6	4.3
				100	44	17	10	7	10	7	4.9	3.6
				200	27	14	9	7	6	4.7	3.9	3.1
				300	19	11	8	6	4.1	3.5	3.0	2.6
			Long	0	58	34	18	13	10	10	10	9
				100	58	29	17	12	10	10	10	8
				200	56	24	15	11	10	10	8	7
				300	41	21	14	10	9	7	6	6
	Ground screw	20	Short	0	29	7	3.9	2.6	10	3.5	1.9	1.2
				100	8	4.5	3.1	2.3	3.2	2.2	1.4	1.0
				200	4.8	3.2	2.4	1.9	1.8	1.4	1.1	0.9
				300	3.3	2.5	2.0	1.6	1.2	1.0	0.9	0.8
			Standard	0	29	14	7	5	10	8	4.6	3.1
				100	19	9	6	4.6	8	5	3.6	2.6
				200	11	7	5	4.0	4.4	3.4	2.8	2.2
				300	8	5	4.3	3.5	3.0	2.5	2.2	1.9
			Long	0	28	23	13	9	9	9	9	7
				100	28	17	11	8	9	9	8	5
				200	24	13	9	7	9	7	6	5
				300	17	11	8	6	6	5	5	4.4
	Rolled screw	5	Short	0	48	19	10	7	14	6	3.3	2.3
				100	43	15	9	6	5	3.9	2.6	1.9
				200	27	13	8	6	3.2	2.5	2.0	1.6
				300	19	11	7	5	2.2	1.8	1.6	1.4
			Standard	0	88	31	17	11	13	13	8	5
				100	88	27	15	11	13	9	6	4.7
				200	60	24	14	10	7	6	5	4.0
				300	45	21	13	10	5	4.5	3.9	3.4
			Long	0	143	46	25	17	13	13	13	12
				100	143	42	24	16	13	13	13	10
				200	119	39	23	16	13	13	11	9
				300	91	36	22	15	12	10	8	7
	Rolled screw	10	Short	0	46	12	7	4.9	8	4.9	2.6	1.7
				100	19	9	5	4.2	4.5	3.0	2.0	1.4
				200	11	6	4.8	3.7	2.4	1.9	1.6	1.2
				300	8	5	4.2	3.3	1.7	1.4	1.2	1.1
			Standard	0	45	22	12	8	8	8	6	4.3
				100	44	17	10	7	8	7	4.9	3.6
				200	27	14	9	7	6	4.7	3.9	3.1
				300	19	11	8	6	4.1	3.5	3.0	2.6
			Long	0	45	34	18	13	8	8	8	8
				100	45	29	17	12	8	8	8	8
				200	45	24	15	11	8	8	8	7
				300	41	21	14	10	8	7	6	6

Remarks 1. The value is for one slide table.
2. The maximum carrying mass is adjusted by the mass when the rating life of the linear motion rolling guide, ball screws, or bearings is 18,000 hours during continuous operation at a number of revolutions of the motor of 3000min^{-1} and an acceleration/deceleration time of 0.2s. The mass calculated is based upon the basic static load rating of the linear motion rolling guide.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Table 10.4 Maximum carrying mass

Model and size	Ball screw type	Ball screw lead mm	Length of slide table	Carrying mass position mm	Maximum carrying mass kg							
					Horizontal direction				Vertical direction			
				Length L / Height H	0	100	200	300	0	100	200	300
TU 86	Ground screw	10	Short	0	97	33	19	13	29	13	7	5
				100	50	24	15	11	12	8	5	4.2
				200	31	18	13	10	6	5	4.5	3.6
				300	22	15	11	9	4.7	4.0	3.5	3.1
			Standard	0	154	68	39	27	28	28	24	16
				100	142	56	34	25	28	27	19	14
				200	93	47	31	23	22	18	15	12
				300	69	40	28	21	16	13	11	10
			Long	0	154	85	48	34	28	28	28	25
				100	154	73	44	31	28	28	28	21
				200	135	63	40	30	28	27	23	18
				300	102	55	37	28	24	20	18	15
	Ground screw	20	Short	0	57	19	10	7	20	9	5	3.6
				100	22	12	8	6	8	6	4.1	3.0
				200	13	8	6	5	4.9	3.9	3.2	2.6
				300	9	7	5	4.6	3.4	2.9	2.5	2.2
			Standard	0	56	45	26	18	19	19	17	12
				100	56	32	21	15	19	19	13	10
				200	41	25	17	13	16	13	11	8
				300	29	20	15	12	11	9	8	7
			Long	0	56	56	33	23	18	18	18	18
				100	56	44	28	21	18	18	18	15
				200	56	35	24	18	18	18	16	13
				300	44	29	21	17	17	15	13	11
	Rolled screw	10	Short	0	97	33	19	13	23	13	7	5
				100	50	24	15	11	12	8	5	4.2
				200	31	18	13	10	6	5	4.5	3.6
				300	22	15	11	9	4.7	4.0	3.5	3.1
			Standard	0	125	68	39	27	22	22	22	16
				100	125	56	34	25	22	22	19	14
				200	93	47	31	23	22	18	15	12
				300	69	40	28	21	16	13	11	10
			Long	0	124	85	48	34	22	22	22	22
				100	124	73	44	31	22	22	22	21
				200	124	63	40	30	22	22	22	18
				300	102	55	37	28	22	20	18	15
	Rolled screw	20	Short	0	49	19	10	7	17	9	5	3.6
				100	22	12	8	6	8	6	4.1	3.0
				200	13	8	6	5	4.9	3.9	3.2	2.6
				300	9	7	5	4.6	3.4	2.9	2.5	2.2
			Standard	0	48	45	26	18	16	16	16	12
				100	48	32	21	15	16	16	13	10
				200	41	25	17	13	16	13	11	8
				300	29	20	15	12	11	9	8	7
			Long	0	48	48	33	23	15	15	15	15
				100	48	44	28	21	15	15	15	15
				200	48	35	24	18	15	15	15	13
				300	44	29	21	17	15	15	13	11
TU100	Ground screw	20	Standard	0	83	67	39	27	28	28	27	19
				100	83	49	32	24	28	28	21	16
				200	63	38	27	21	26	20	17	13
				300	45	31	23	18	18	15	13	11
TU130	Ground screw	25	Standard	0	94	87	52	37	37	37	36	24
				100	94	60	41	31	37	37	28	21
				200	68	45	34	27	33	26	22	18
				300	50	36	28	23	23	20	17	15

Remarks 1. The value is for one slide table.

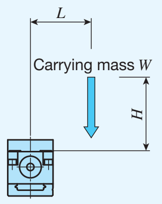
2. The maximum carrying mass is adjusted by the mass when the rating life of the linear motion rolling guide, ball screws, or bearings is 18,000 hours during continuous operation at a number of revolutions of the motor of 3000min^{-1} and an acceleration/deceleration time of 0.2s. The mass calculated is based upon the basic static load rating of the linear motion rolling guide.

Table 11 Maximum load mass

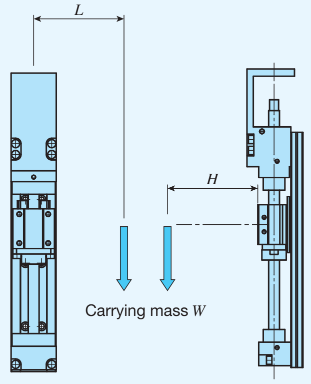
Model and size	Ball screw lead mm	Length of slide table	Maximum load mass kg	
			Horizontal direction	Vertical direction
TU 25	4	Standard	75	18
TU 30	5	Standard	59	14
TU 40	4	Short	218	56
		Standard	218	56
		Long	217	56
	8	Short	114	28
		Standard	114	28
		Long	114	28
TU 50	5	Short	171	44
		Standard	171	44
		Long	170	44
	10	Short	90	21
		Standard	90	21
		Long	89	21
TU 60	5	Short	299	81
		Standard	299	81
		Long	299	81
	10	Short	169	42
		Standard	169	42
		Long	168	42
	20	Short	90	21
		Standard	89	21
		Long	89	21
TU 86	10	Short	538	141
		Standard	537	140
		Long	537	140
	20	Short	261	64
		Standard	260	64
		Long	259	64
TU100	20	Standard	261	67
TU130	25	Standard	240	62

Remarks 1. The maximum load mass shows the mass that ensures acceleration/deceleration of 0.3G.

2. The values shown in this table were calculated with the motor with the highest rated torque installed, selected from the AC servomotor models listed in Table 6.1.



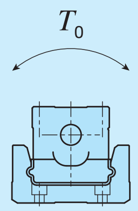
Carrying mass position (horizontal direction)

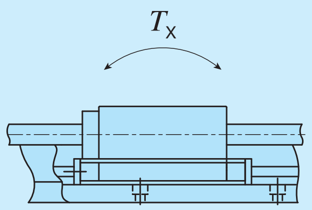


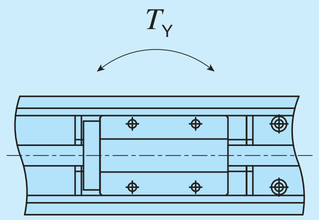
Carrying mass position (vertical direction)

Table 12 Load rating of linear motion rolling guide

Model and size	Length of slide table	Basic dynamic load rating C N	Basic static load rating C_0 N	Static moment rating (1) N・m		
				T_0	T_X	T_Y
TU 25	Standard	1 770	2 840	20.3 (40.6)	10.1 (53.7)	8.4 (45.0)
TU 30	Standard	2 280	3 810	34.9 (69.8)	16.9 (87.5)	14.2 (73.4)
TU 40	Short	6 050	6 110	83.8 (167.6)	22.8 (185)	22.8 (185)
	Standard	8 410	9 780	134 (268)	53.0 (351)	53.0 (351)
	Long	11 200	14 700	201 (402)	113 (649)	113 (649)
TU 50	Short	8 930	8 800	156 (312)	39.5 (315)	39.5 (315)
	Standard	13 500	15 800	280 (560)	114 (711)	114 (711)
	Long	18 400	24 600	436 (872)	260 (1 420)	260 (1 420)
TU 60	Short	12 400	12 000	236 (472)	62.7 (486)	62.7 (486)
	Standard	18 800	21 600	425 (850)	181 (1 150)	181 (1 150)
	Long	26 800	35 900	708 (1 416)	472 (2 470)	472 (2 470)
TU 86	Short	24 100	23 800	677 (1 354)	183 (1 280)	183 (1 280)
	Standard	41 400	51 500	1 470 (2 940)	764 (4 120)	764 (4 120)
	Long	49 900	67 300	1 920 (3 840)	1 270 (6 290)	1 270 (6 290)
TU100	Standard	54 600	68 500	2 230 (4 460)	1 210 (6 460)	1 210 (6 460)
TU130	Standard	70 300	88 800	3 920 (7 840)	1 830 (9 630)	1 830 (9 630)







Note (1) In directions indicated in the above figures, the value in ( ) is for two slide tables in close contact.

Table 13.1 Specifications of ball screw 1

Model and size	Ball screw type	Lead mm	Shaft dia. mm	Axial clearance mm	Basic dynamic load rating C N	Basic static load rating C_0 N
TU 25	Ground screw	4	6	0.005 or less	950	1 630
TU 30	Ground screw	5	8	0.005 or less	1 080	2 160
TU 40	Rolled screw	4	8	0.05 or less	1 600	2 800
		8			1 000	1 600
	Ground screw	4	8	0.005 or less	2 290	3 575
		8			1 450	2 155
TU 50	Rolled screw	5	10	0.05 or less	2 300	4 800
		10			1 850	3 200
	Ground screw	5	10	0.005 or less	2 730	4 410
		10			1 720	2 745
TU 60	Rolled screw	5	12	0.05 or less	2 800	5 000
		10			1 800	3 200
	Ground screw (1)	5	12	0.005 or less	3 230	6 320
		10			2 300	3 920
		20			2 300	3 920
TU 86	Rolled screw (2)	10	15	0.05 or less	4 900	9 100
		20			3 900	5 050
	Ground screw (2)	10	15	0.005 or less	6 080	12 500
		20			4 510	7 840
	Ground screw (3)	20	20	0.005 or less	6 620	12 600
TU100	Ground screw	20	20	0.005 or less	6 620	12 600
TU130	Ground screw	25	25	0.005 or less	9 700	19 600

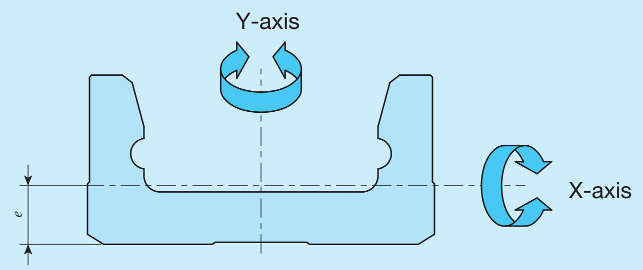
Notes (1) This is not applied to track rail lengths of 990mm and 1,190mm.
(2) This is not applied to track rail lengths of 1,390mm and 1,590mm.
(3) This applies to track rail lengths of 1,390mm and 1,590mm.

Table 13.2 Specifications of ball screw 2

unit: mm

Model and size	Length of track rail	Ball screw type		Shaft dia.	Overall length
TU 25	130	Ground	–	6	146
	165	Ground	–		181
	200	Ground	–		216
TU 30	140	Ground	–	8	156
	180	Ground	–		196
	220	Ground	–		236
	260	Ground	–		276
	300	Ground	–		316
	340	Ground	–		356
TU 40	180	Ground	Rolled	8	158
	240	Ground	Rolled		218
	300	Ground	Rolled		278
	360	Ground	Rolled		338
	420	Ground	Rolled		398
	140	Ground	Rolled		158
	200	Ground	Rolled		218
	260	Ground	Rolled		278
	320	Ground	Rolled		338
	380	Ground	Rolled		398
TU 50	220	Ground	Rolled	10	198
	300	Ground	Rolled		278
	380	Ground	Rolled		358
	460	Ground	Rolled		438
	540	Ground	Rolled		518
	620	Ground	Rolled		598
	700	Ground	Rolled		678
	180	Ground	Rolled		198
	260	Ground	Rolled		278
	340	Ground	Rolled		358
	420	Ground	Rolled		438
	500	Ground	Rolled		518
	580	Ground	Rolled		598
	660	Ground	Rolled		678
TU 60	290	Ground	Rolled	12	263
	390	Ground	Rolled		363
	490	Ground	Rolled		463
	590	Ground	Rolled		563
	690	Ground	Rolled		663
	790	Ground	Rolled		763
	990	–	Rolled		963
	1 190	–	Rolled		1 163
	244	Ground	Rolled		263
	344	Ground	Rolled		363
	444	Ground	Rolled		463
	544	Ground	Rolled		563
	644	Ground	Rolled		663
	744	Ground	Rolled		763
TU 86	490	Ground	Rolled	15	461
	590	Ground	Rolled		561
	690	Ground	Rolled		661
	790	Ground	Rolled		761
	890	Ground	Rolled		861
	990	Ground	Rolled		961
	1 090	Ground	Rolled		1 061
	1 190	Ground	Rolled		1 161
	1 390	Ground	–	20	1 361
	1 590	Ground	–		1 561
	442	Ground	Rolled	15	461
	542	Ground	Rolled		561
	642	Ground	Rolled		661
	742	Ground	Rolled		761
	842	Ground	Rolled		861
	942	Ground	Rolled		961
	1 042	Ground	Rolled		1 061
	1 142	Ground	Rolled		1 161
TU100	1 010	Ground	–	20	972
	1 160	Ground	–		1 122
	1 310	Ground	–		1 272
	1 460	Ground	–		1 422
TU130	1 010	Ground	–	25	972
	1 160	Ground	–		1 122
	1 310	Ground	–		1 272
	1 460	Ground	–		1 422
	1 610	Ground	–		1 572

Table 14 Moment of inertia of sectional area of track rails



Model and size	Moment of inertia of sectional area mm⁴		Center of gravity e mm
	I_X	I_Y	
TU 25	3.7×10^2	7.5×10^3	2.6
TU 30	9.3×10^2	1.7×10^4	3.3
TU 40	1.0×10^4	6.8×10^4	6.6
TU 50	2.8×10^4	1.7×10^5	8.7
TU 60	6.4×10^4	3.8×10^5	10.9
TU 86	2.4×10^5	1.6×10^6	14.6
TU100	5.9×10^5	3.3×10^6	18.8
TU130	1.4×10^6	8.8×10^6	23.0

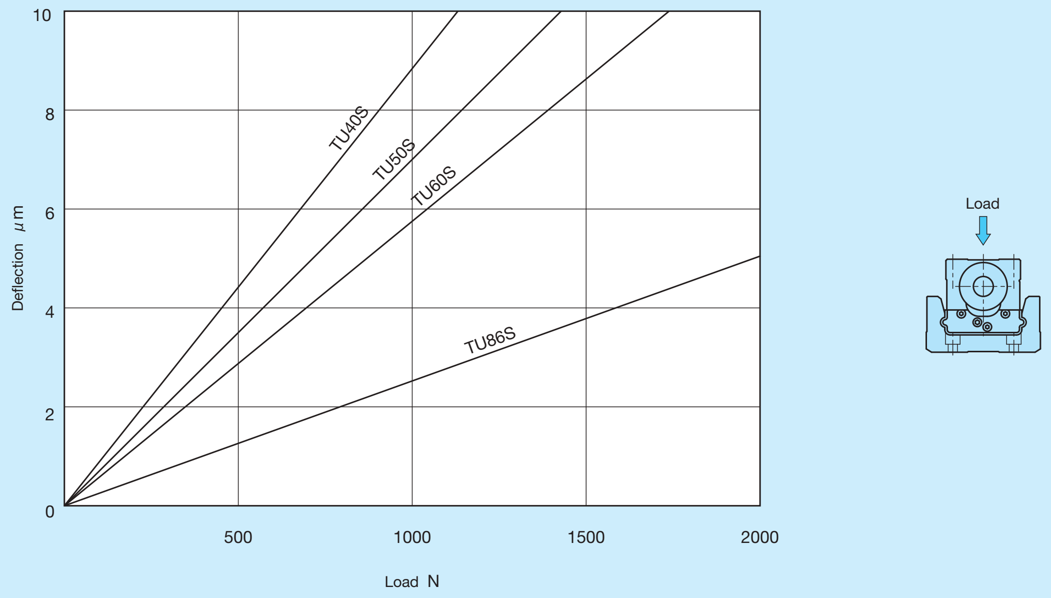


Fig. 1 Deflection vs. Downward load

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Table 15.1 Table inertia and starting torque

Model and size	Length of track rail mm	Table inertia J_T ×10^{-5}kg·m^2	Starting torque T_S(2) N·m
		Standard table	
		Lead 4mm	Ground screw
TU25	130	0.018	0.01
	165	0.021	
	200	0.024	

Model and size	Length of track rail mm	Table inertia J_T (3) ×10^{-5}kg·m^2	Starting torque T_S(2) N·m
		Standard table	
		Lead 5mm	Ground screw
TU30	140	0.057	0.015
	180	0.069	
	220	0.082	
	260	0.095	
	300	0.107	
	340	0.120	

Model and size	Length of track rail(1) mm	Table inertia J_T (3) ×10^{-5}kg·m^2						Starting torque T_S(2) N·m			
		Short table		Standard table		Long table		Rolled screw		Ground screw	
		Lead 4mm	Lead 8mm	Lead 4mm	Lead 8mm	Lead 4mm	Lead 8mm	Lead 4mm	Lead 8mm	Lead 4mm	Lead 8mm
TU40	180(140)	0.05	0.07	0.06	0.09	–	–	0.03	0.04	0.03 (0.04)	0.04 (0.05)
	240(200)	0.07	0.09	0.08	0.11	0.08	0.12				
	300(260)	0.09	0.11	0.10	0.12	0.10	0.14				
	360(320)	0.11	0.13	0.12	0.14	0.12	0.16				
	420(380)	0.13	0.15	0.13	0.16	0.14	0.18				

Model and size	Length of track rail(1) mm	Table inertia J_T (3) ×10^{-5}kg·m^2						Starting torque T_S(2) N·m			
		Short table		Standard table		Long table		Rolled screw		Ground screw	
		Lead 5mm	Lead 10mm	Lead 5mm	Lead 10mm	Lead 5mm	Lead 10mm	Lead 5mm	Lead 10mm	Lead 5mm	Lead 10mm
TU50	220(180)	0.17	0.21	0.18	0.27	–	–	0.04	0.05	0.04 (0.05)	0.05 (0.06)
	300(260)	0.23	0.28	0.24	0.33	0.26	0.40				
	380(340)	0.29	0.34	0.30	0.39	0.32	0.46				
	460(420)	0.35	0.40	0.36	0.45	0.38	0.53				
	540(500)	0.41	0.46	0.43	0.51	0.44	0.59				
	620(580)	0.47	0.52	0.49	0.57	0.51	0.65				
	700(660)	0.54	0.58	0.55	0.63	0.57	0.71				

Model and size	Length of track rail(1) mm	Table inertia J_T (3) ×10^{-5}kg·m^2									Starting torque T_S(2) N·m			
		Short table			Standard table			Long table			Rolled screw		Ground screw	
		Lead 5mm	Lead 10mm	Lead 20mm	Lead 5mm	Lead 10mm	Lead 20mm	Lead 5mm	Lead 10mm	Lead 20mm	Lead 5mm	Lead 10mm	Lead 5mm 10mm	Lead 20mm
TU60	290(244)	0.45	0.53	1.03	0.47	0.61	1.43	0.49	0.71	1.94	0.08		0.08 (0.09)	0.10 (0.12)
	390(344)	0.60	0.69	1.19	0.62	0.77	1.59	0.65	0.87	2.10				
	490(444)	0.76	0.85	1.34	0.78	0.93	1.75	0.81	1.0	2.26				
	590(544)	0.92	1.0	1.50	0.94	1.1	1.90	0.97	1.2	2.41				
	690(644)	1.1	1.2	1.66	1.1	1.2	2.06	1.1	1.3	2.57				
	790(744)	1.2	1.3	1.82	1.3	1.4	2.22	1.3	1.5	2.73				
	990	1.6	1.7	–	1.6	1.7	–	1.6	1.8	–	0.10		–	
	1 190	1.9	2.0	–	1.9	2.1	–	1.9	2.2	–				

Notes (1) The value in ( ) represents track rail length of motor folding back specification.

(2) When two units of slide table are used, it is about 1.5 times as long as that of one unit, and when table of motor folding back specification is used, it is about twice. The value in ( ) represents starting torque of C-Lube specification.

(3) For motor folding back specification, please add the following value to the value in the table.
TU40 and TU50: 0.17×10^{-5}kg·m^2, TU60: 0.86×10^{-5}kg·m^2

Table 15.2 Table inertia and starting torque

Model and size	Length of track rail (1) mm	Table inertia J_T (3) ×10^{-5}kg·m^2						Starting torque T_S(2) N·m			
		Short table		Standard table		Long table		Rolled screw		Ground screw	
		Lead 10mm	Lead 20mm	Lead 10mm	Lead 20mm	Lead 10mm	Lead 20mm	Lead 10mm	Lead 20mm	Lead 10mm	Lead 20mm
TU 86	490(442)	2.1	2.9	2.3	3.9	2.4	4.4	0.10	0.16	0.10 (0.12)	0.16 (0.18)
	590(542)	2.4	3.2	2.7	4.3	2.8	4.8				
	690(642)	2.8	3.6	3.1	4.6	3.2	5.1				
	790(742)	3.2	4.0	3.5	5.0	3.6	5.5				
	890(842)	3.6	4.4	3.9	5.4	4.0	5.9				
	990(942)	4.0	4.8	4.2	5.8	4.4	6.3				
	1 090(1 042)	4.4	5.2	4.6	6.2	4.8	6.7				
	1 190(1 142)	4.8	5.6	5.0	6.6	5.1	7.1				
	1 390	–	18	–	19	–	19	–		–	0.30
	1 590	–	20	–	21	–	22				

Model and size	Length of track rail mm	Table inertia J_T ×10^{-5}kg·m^2	Starting torque T_S(2) N·m
		Standard table	
		Lead 20mm	Ground screw
TU100	1 010	15	0.20 (0.26)
	1 160	17	
	1 310	19	
	1 460	20	

Model and size	Length of track rail mm	Table inertia J_T ×10^{-5}kg·m^2	Starting torque T_S(2) N·m
		Standard table	
		Lead 25mm	Ground screw
TU130	1 010	39	0.40 (0.50)
	1 160	43	
	1 310	48	
	1 460	52	
	1 610	57	

Notes (1) The value in ( ) represents track rail length of motor folding back specification.

(2) When two units of slide table are used, it is about 1.5 times as long as that of one unit, and when table of motor folding back specification is used, it is about twice. The value in ( ) represents starting torque of C-Lube specification.

(3) For motor folding back specification, please add the following value to the value in the table.
TU86: 0.86×10^{-5}kg·m^2

Mounting

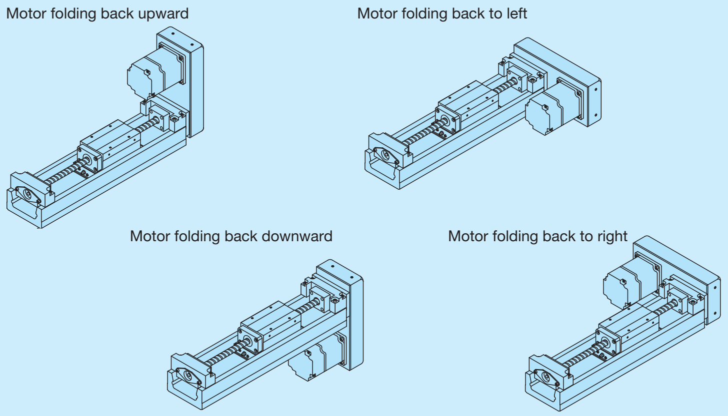
For the processing accuracy of the Precision Positioning Table mounting surface and the tightening torque of the fixing screws, see page Ⅲ-30.

Motor Folding Back Specification

Motor folding back specification is available for Precision Positioning Table TU, space can be saved by folding back the motor and reducing the overall length of the table. For dimensions of motor folding back specification, please refer to respective dimension table.

For motor folding back specification, assembly should be made by customer since "housing applicable to the specified motor, pulley (on motor side and ball screw side), cover, motor bracket, belt and bolts necessary for assembly" are supplied. However, motor mounting bolts should be prepared by customer.

Motor folding back unit can be mounted in 4 directions as indicated in the following figure.



Cover Specification

A bridge cover and bellows are available for Precision Positioning Table TU as a measure for protection against dust.
For the dimensions of table with bellows, please see dimension tables shown in pages of Ⅱ-89 to Ⅱ-90.

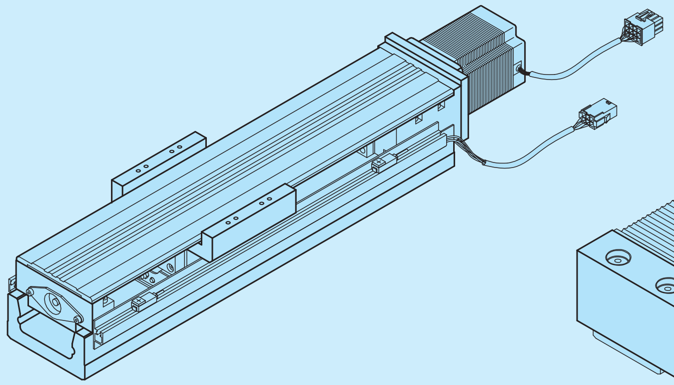


Table with bridge cover

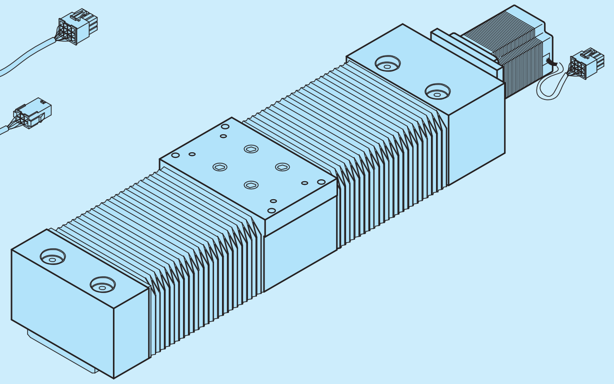
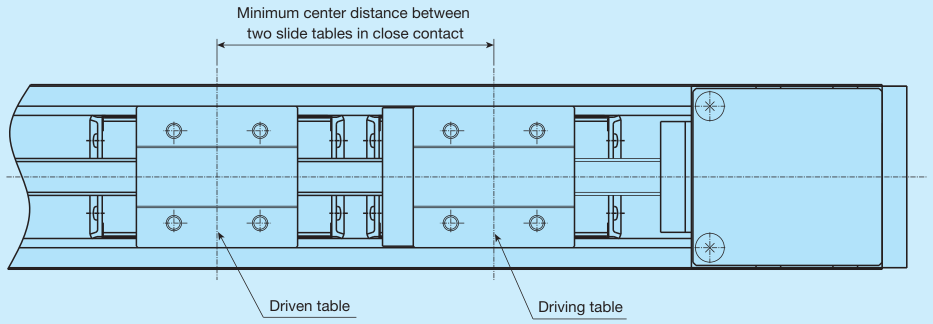


Table with bellows

Two Slide Table Specification

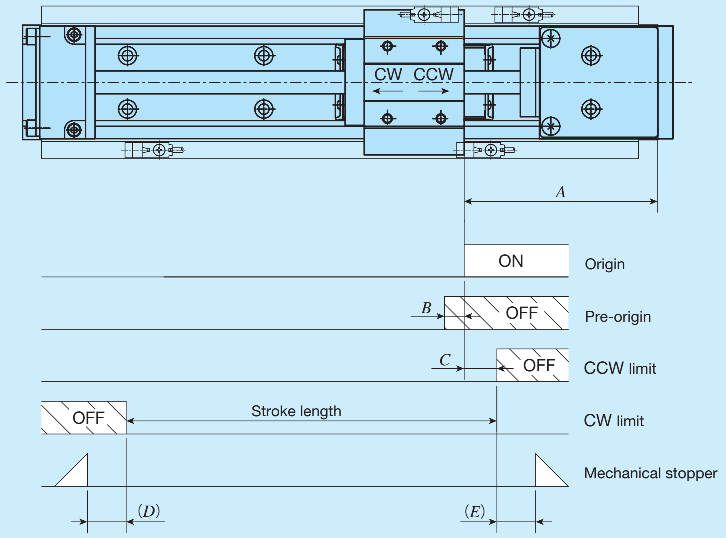
Two slide table specification is available for Precision Positioning Table TU. Ball screw nuts are mounted on slide table at the motor side, and it can be driven by the motor (driving table). Ball screw nuts are not mounted on slide table at the opposite motor side, and it is free condition (driven table).

It is possible to make the structure resistant to moment load by using two slide tables in combination (Table 12). When combining slide tables, allow more clearance than "minimum center distance between two slide tables in close contact" described in the dimension table shown in pages Ⅱ-69 to Ⅱ-100 (Enlarging the span will shorten the stroke.).



Sensor Specification

Table 16.1 *Sensor timing chart (motor inline specification)*



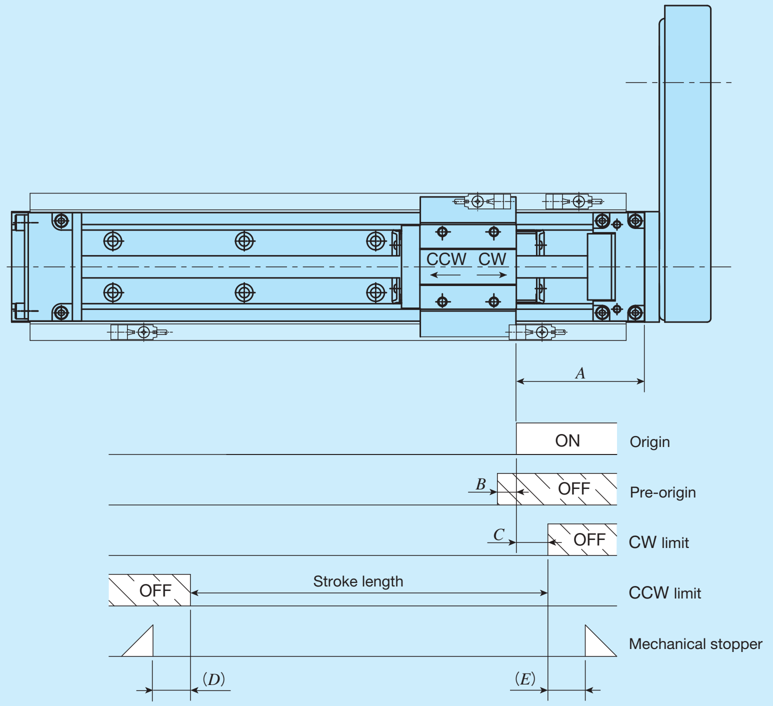
unit: mm

Model and size	Length of slide table	Ball screw lead	*A*	*B*	*C*	*D*(1)	*E*
TU 25	Standard	4	50	2	10	8.4(6)	8
TU 30	Standard	5	50	3	10	10.9(6.4)	8
TU 40	Short	4	85	2	10	7.5(5.5)	4.5
		8		6			
	Standard	4	85	2		10.5(8.5)	8
		8		6			
	Long	4	85	2		4.5(7.5)	8
		8		6			
TU 50	Short	5	85	3	10	7.2(6.2)	3.8
		10		7			
	Standard	5	85	3		8.2(7.2)	8
		10		7			
	Long	5	85	3		4.2(3.2)	8
		10		7			
TU 60	Short	5	110	3	20	14.6(19.6)	10.4
		10		7			
		20(2)	130	14		9.6(14.6)	
	Standard	5	100	3		9.6(9.6)	8
		10		7			
		20	105	14			
	Long	5	100	3		9 (8.5)	8
		10		7			
		20	105	14			
TU 86	Short	10	105(3)	7	20	13 (14)	11
		20		14		12 (14)(4)	4
	Standard	10	105	7		13 (14)	11
		20		14		12 (14)	
	Long	10	105	7		13 (14)	11
		20		14		12 (14)	
TU100	Standard	20	150	14	20	22 (19)	20
TU130	Standard	25	160	18	20	18 (23)	20

Notes (1) The value in ( ) indicates the dimension for two slide tables.
(2) After pre-origin signal is turned off, CCW limit is turned on before turned off.
(3) In case of track rail lengths of 1,390mm and 1,590mm, this length is 110mm.
(4) In case of track rail lengths of 1,390mm and 1,590mm, this length is 7 (9)mm.

Remarks 1. Mounting a sensor is specified using the corresponding identification number.
2. For the specifications of respective sensors, please see the section of sensor specification in General Explanation.
3. For tables with bellows, the values in the table are not applied.
4. For tables with C-Lube plate, please see Table 16.3.

Table 16.2 *Sensor timing chart (motor folding back specification)*



* In a table of motor folding back specification, the movements of CW direction and CCW direction in a slide table become reversed.

unit: mm

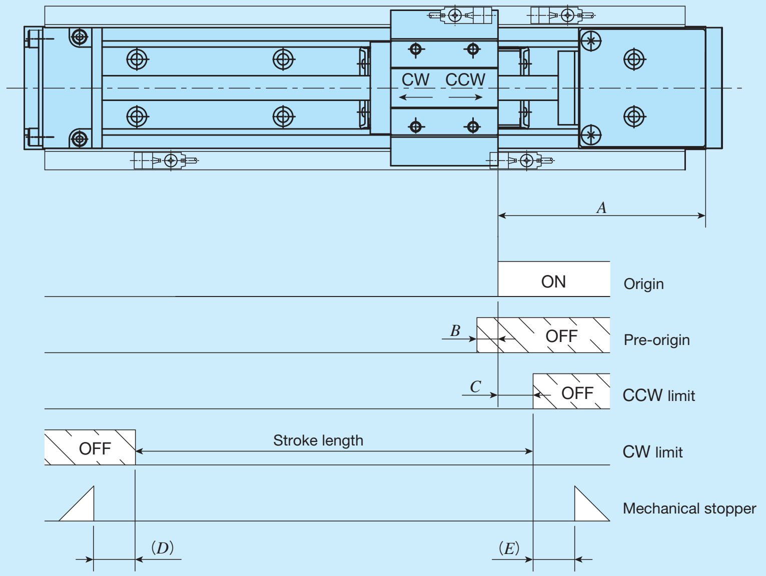
Size	Length of slide table	Ball screw lead	*A*	*B*	*C*	*D*(1)	*E*
TU 40	Short	4	45	2	10	7.5(5.5)	4.5
		8		6			
	Standard	4	45	2		10.5(8.5)	8
		8		6			
	Long	4	45	2		4.5(7.5)	8
		8		6			
TU 50	Short	5	45	3	10	7.2(6.2)	3.8
		10		7			
	Standard	5	45	3		8.2(7.2)	8
		10		7			
	Long	5	45	3		4.2(3.2)	8
		10		7			
TU 60	Short	5	64	3	20	14.6(19.6)	10.4
		10		7			
		20(2)	84	14		9.6(14.6)	
	Standard	5	59	3		9.6(9.6)	8
		10		7			
		20		14			
	Long	5	59	3		9 (8.5)	8
		10		7			
		20		14			
TU 86	Short	10	62	7	20	13 (14)	11
		20		14		12 (14)	4
	Standard	10	62	7		13 (14)	11
		20		14		12 (14)	
	Long	10	62	7		13 (14)	11
		20		14		12 (14)	

Notes (1) The value in ( ) indicates the dimension for two slide tables.
(2) After pre-origin signal is turned off, CCW limit is turned on before turned off.

Remarks 1. Mounting a sensor is specified using the corresponding identification number.
2. For the specifications of respective sensors, please see the section of sensor specification in General Explanation.
3. For tables with bellows, the values in the table are not applied.
4. For tables with C-Lube plate, please see Table 16.4.

Sensor Specification

Table 16.3 Sensor timing chart (motor inline specification, with C-Lube)



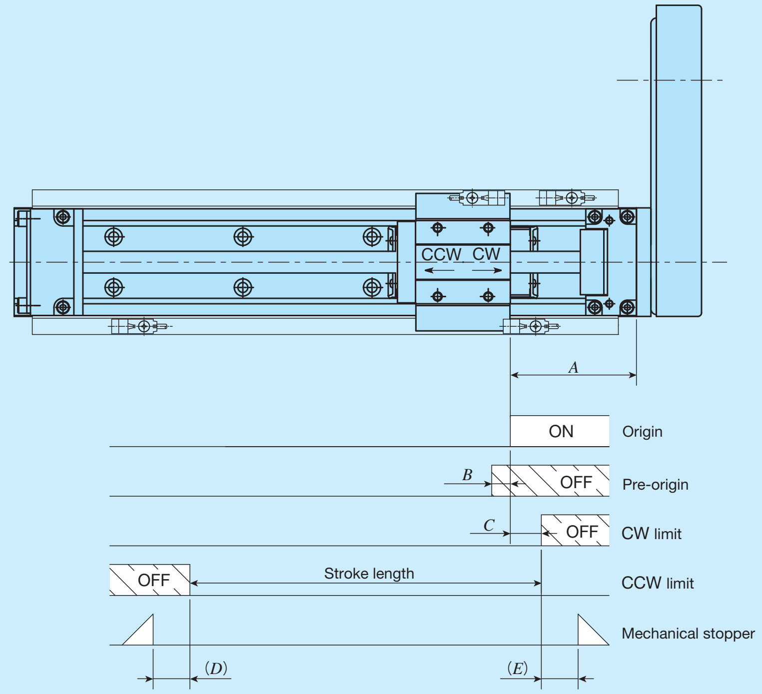
unit: mm

Model and size	Length of slide table	Ball screw lead	*A*	*B*	*C*	*D*(1)	*E*
TU 40	Short	**4**	100	2	10	7.5(5.5)	9
		8		6			
	Standard	**4**	100	2		5.5(8.5)	9
		8		6			
	Long	**4**	100	2		9.5(7.5)	9
		8		6			
TU 50	Short	**5**	100	3	10	7.2(6.2)	8
		10		7			
	Standard	**5**	100	3		8.2(7.2)	8
		10		7			
	Long	**5**	100	3		9.2(8.2)	8
		10		7			
TU 60	Short	**5**	120	3	20	9.6(9.6)	5.4
		10		7			
		20(2)	140	14			
	Standard	**5**	100	3		4.6(9.6)	8
		10		7			
		20	115	14		9.6(4.6)	5.4
	Long	**5**	100	3		4 (9)	8
		10		7			
		20	105	14		4 (4)	
TU 86	Short	**10**	130	7	20	8 (14)	19
		20		14		7 (14)	9
	Standard	**10**	105	7		13 (9)	11
		20		14		12 (9)	
	Long	**10**	105	7		8 (9)	11
		20		14		7 (9)	
TU100	Standard	**20**	150	14	20	17 (14)	20
TU130	Standard	**25**	160	18	20	18 (18)	20

Notes (1) The value in ( ) indicates the dimension for two slide tables.
(2) After pre-origin signal is turned off, CCW limit is turned on before turned off.

Remarks 1. Mounting a sensor is specified using the corresponding identification number.
2. For the specifications of respective sensors, please see the section of sensor specification in General Explanation.
3. For tables with bellows, the values in the table are not applied.

Table 16.4 Sensor timing chart (motor folding back specification, with C-Lube)



* In a table of motor folding back specification, the movements of CW direction and CCW direction in a slide table becomes reversed.

unit: mm

Model and size	Length of slide table	Ball screw lead	*A*	*B*	*C*	*D*(1)	*E*
TU 40	Short	**4**	60	2	10	7.5(5.5)	9
		8		6			
	Standard	**4**	60	2		5.5(8.5)	9
		8		6			
	Long	**4**	60	2		9.5(7.5)	9
		8		6			
TU 50	Short	**5**	60	3	10	7.2(6.2)	8
		10		7			
	Standard	**5**	60	3		8.2(7.2)	8
		10		7			
	Long	**5**	60	3		9.2(8.2)	8
		10		7			
TU 60	Short	**5**	75	3	20	8.6(8.6)	6.4
		10		7			
		20(2)	94	14		9.6(9.6)	5.4
	Standard	**5**	60	3		8.6(3.6)	9
		10		7			
		20	69	14		9.6(4.6)	5.4
	Long	**5**	60	3		8 (3)	9
		10		7			
		20	59	14		4 (4)	8
TU 86	Short	**10**	90	7	20	10 (6)	22
		20		14		9 (6)	12
	Standard	**10**	60	7		10 (6)	9
		20		14		9 (6)	
	Long	**10**	60	7		5 (6)	9
		20		14		4 (6)	

Notes (1) The dimension in ( ) represents dimensions for two slide tables.
(2) After pre-origin signal is turned off, CCW limit is turned on before turned off.

Remarks 1. Mounting a sensor is specified using the corresponding identification number.
2. For the specifications of respective sensors, please see the section of sensor specification in General Explanation.
3. For tables with bellows, the values in the table are not applied.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

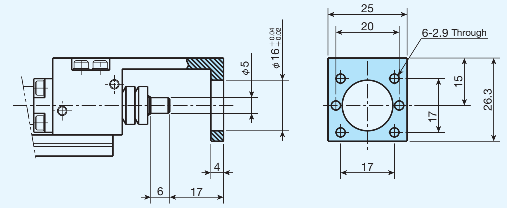
Dimensions of Motor Attachment

■ Motor inline specification

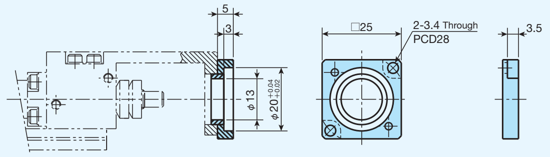
Remark: Motor attachment for NEMA, please see the pages Ⅲ-32 or later.

TU25

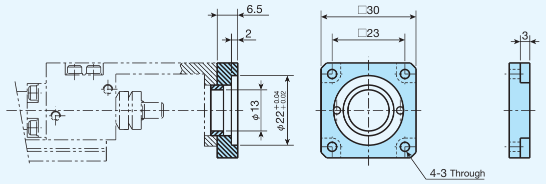
AT100
(without attachment)



AT101



AT125



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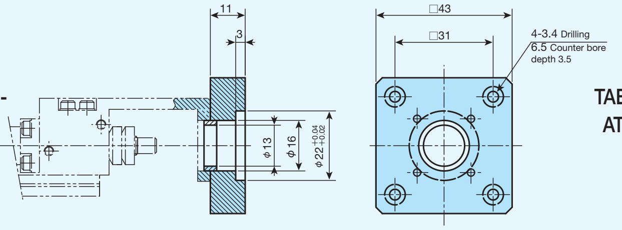

TU30

AT100
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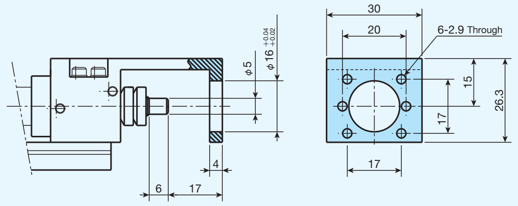

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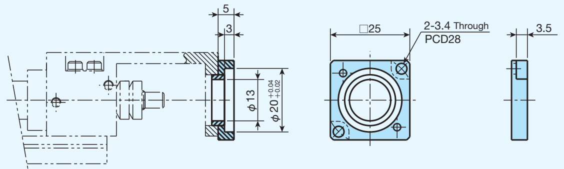

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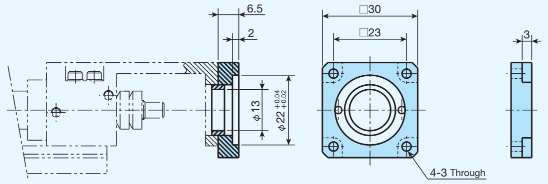

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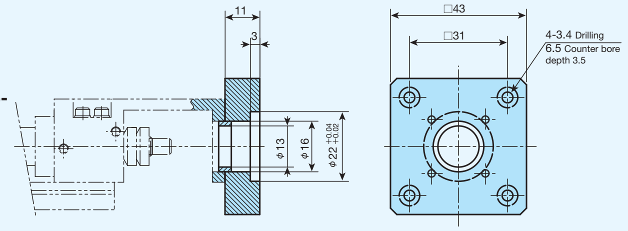
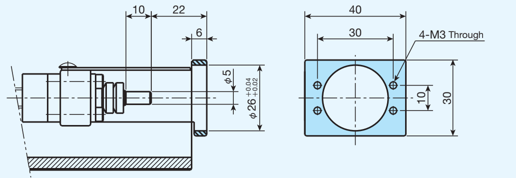


TU40

AT100
(without attachment)



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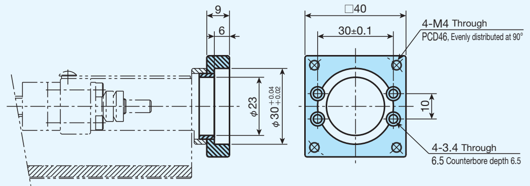

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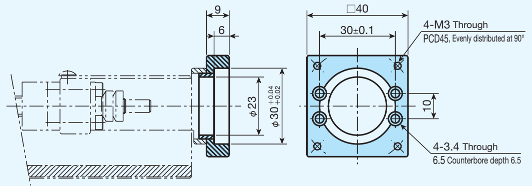
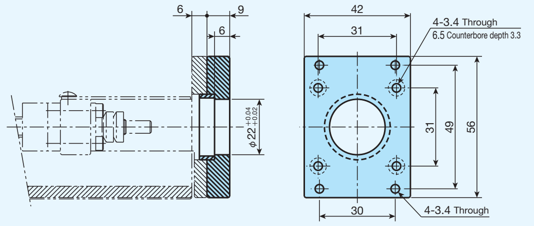


AT117
AT122



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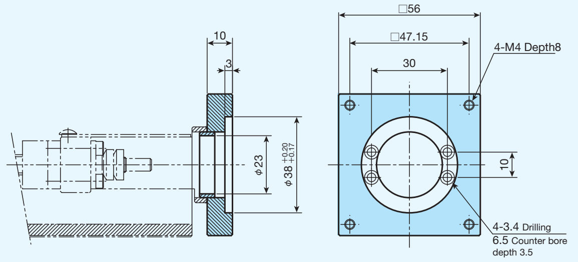
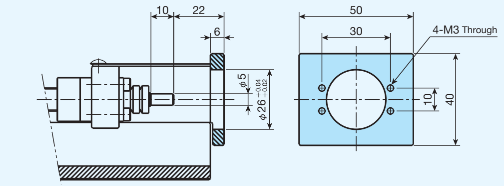


TU50

AT100
(without attachment)



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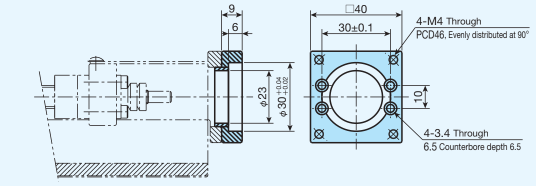

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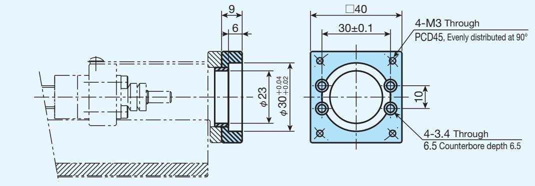
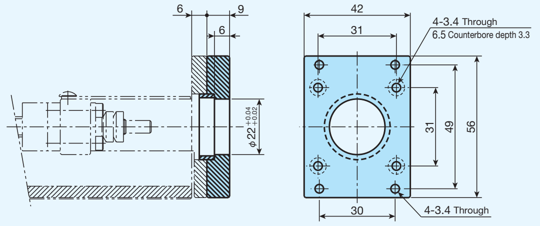


AT117
AT122



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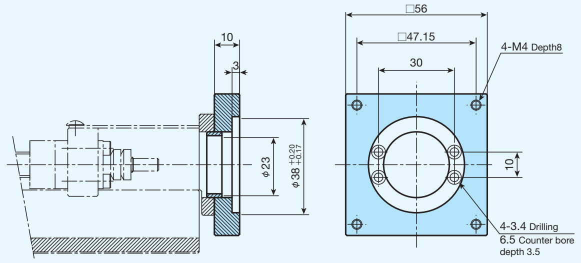
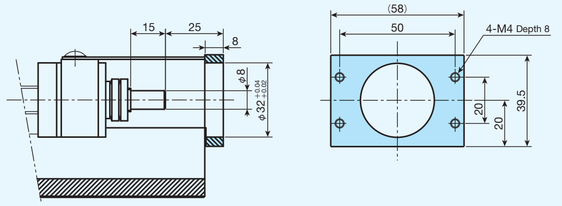


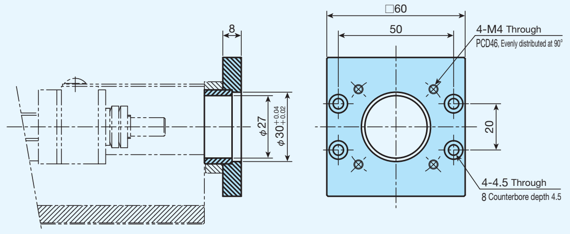
Dimensions of Motor Attachment

TU60

AT100
(without
attachment)



AT103



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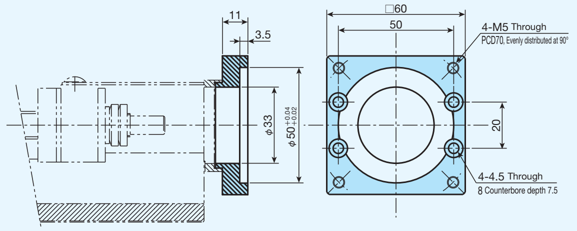
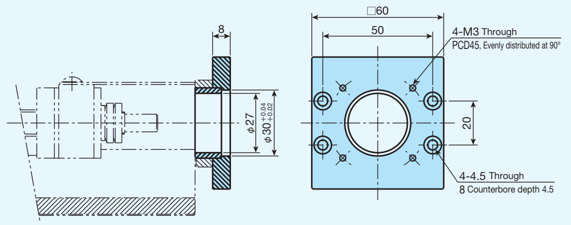


AT111



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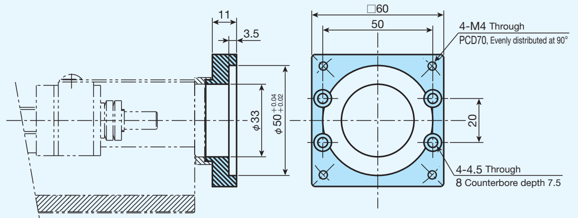

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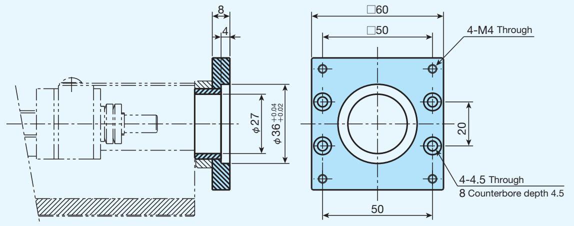
AT123



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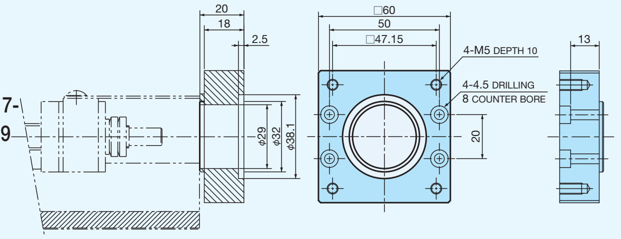

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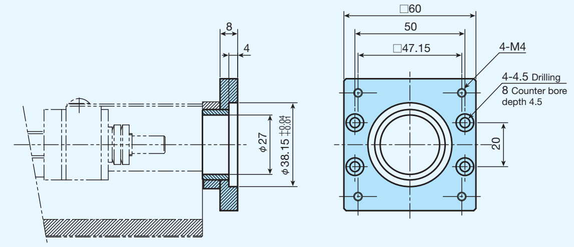

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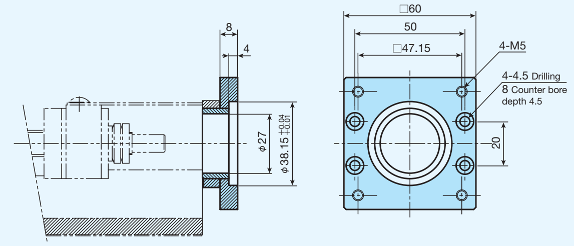
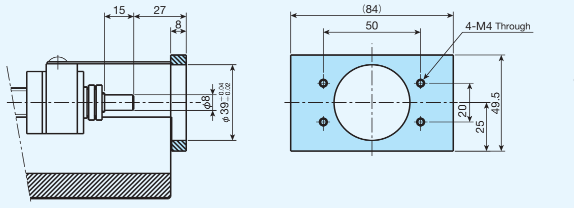


TU86

AT100
(without
attachment)



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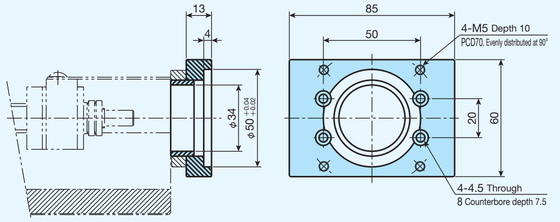

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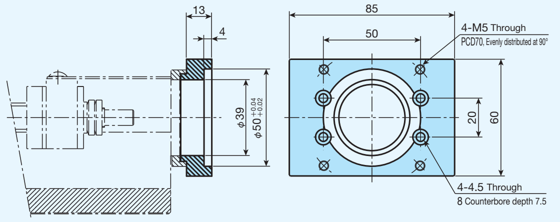

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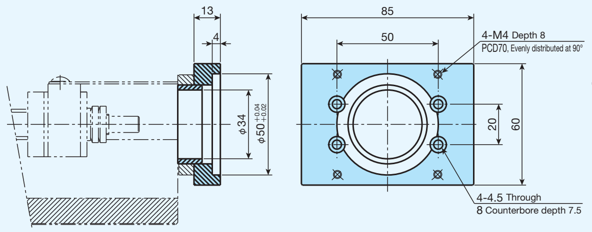
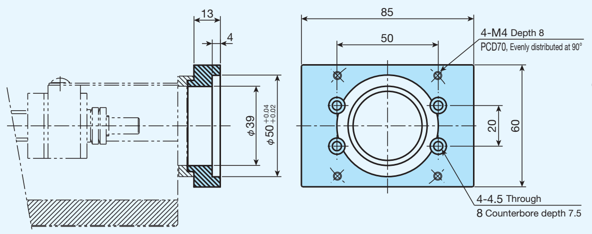
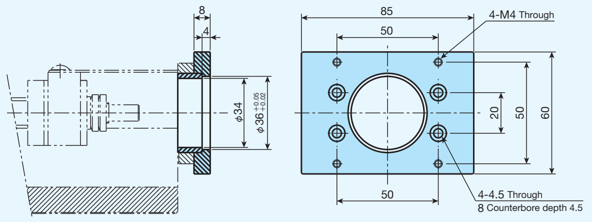


AT114



AT119
AT124



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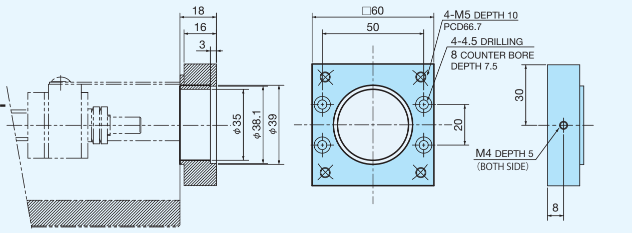

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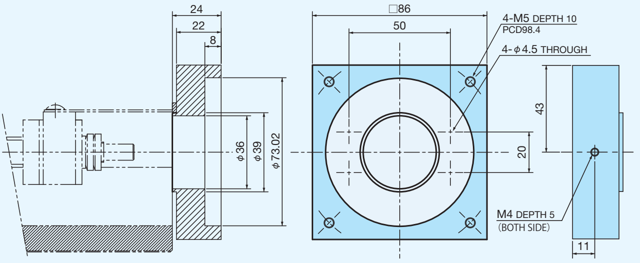

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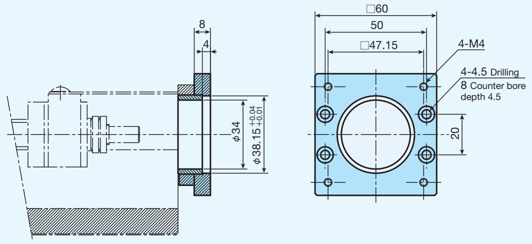

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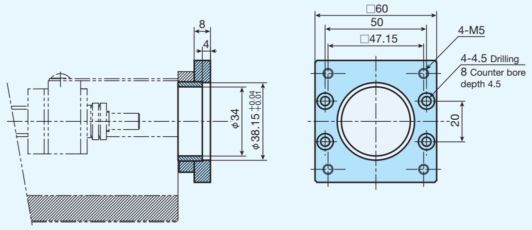
ATE058



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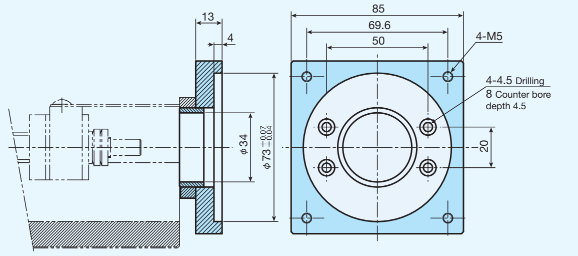
ATE45

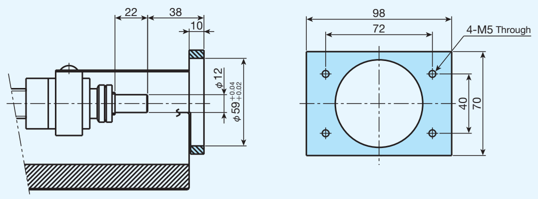


1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

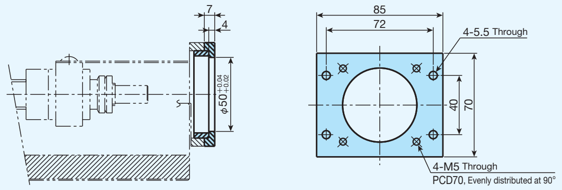
Dimensions of Motor Attachment

TU100

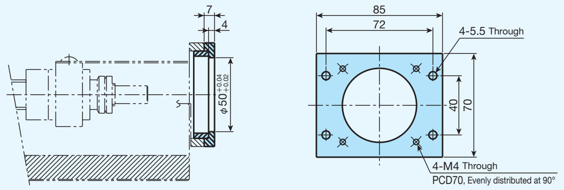
AT100
(without
attachment)



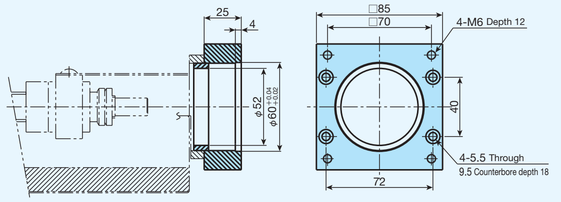
AT107



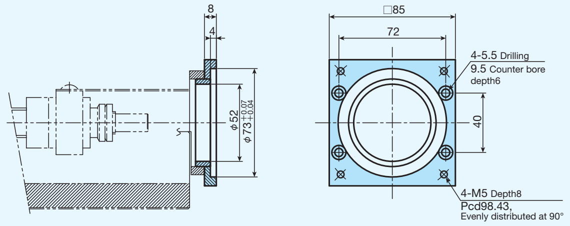
AT115



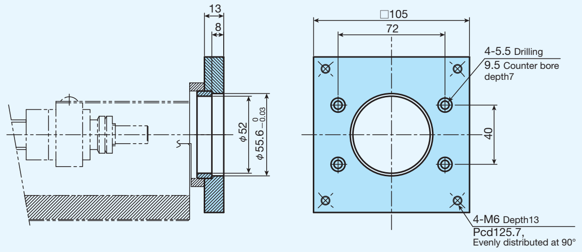
AT120



TAE9047-
ATE062

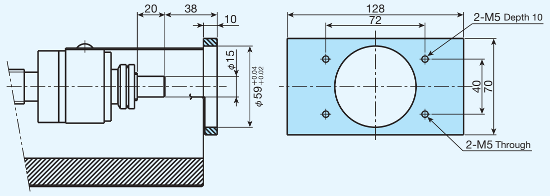


TAE9047-
ATE060

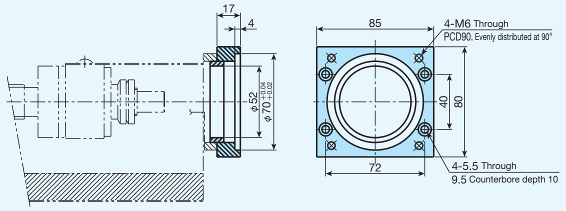


TU130

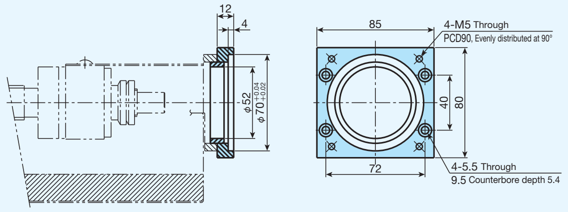
AT100
(without
attachment)



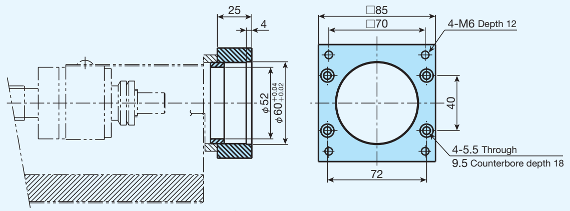
AT108



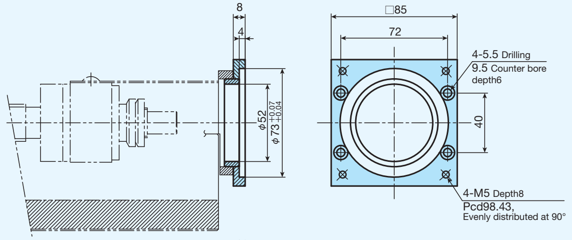
AT116



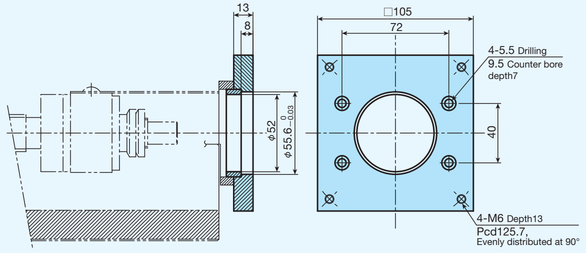
AT121



TAE9047-
ATE062



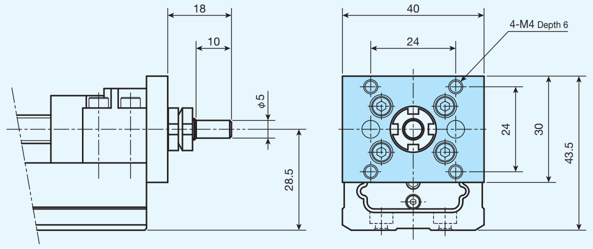
TAE9047-
ATE060



Motor folding back specification

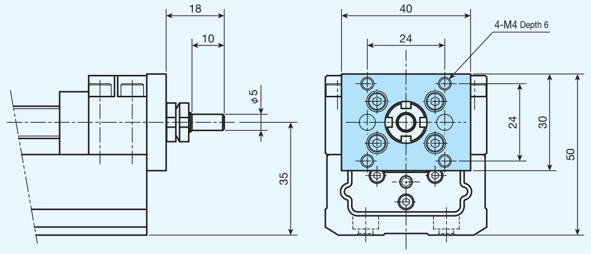
TU40

AR100
(without attachment)



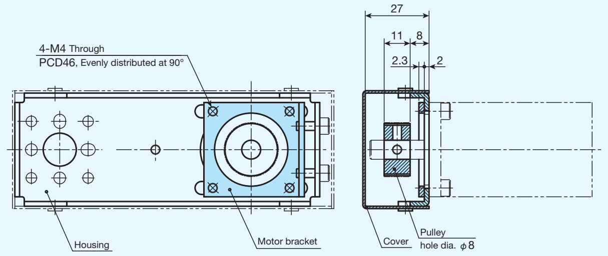
TU50

AR100
(without attachment)

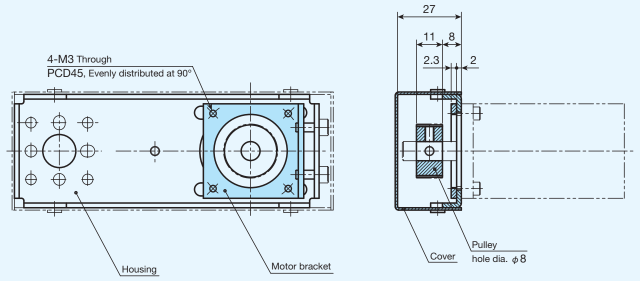


TU40, TU50

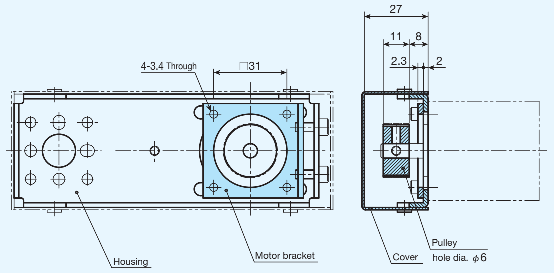
AR101



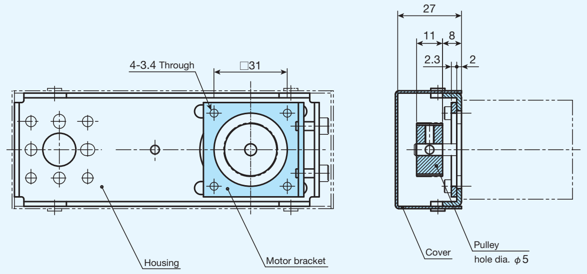
AR105



AR109



AR110



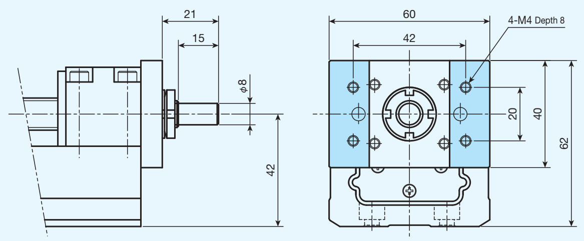
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Dimensions of Motor Attachment

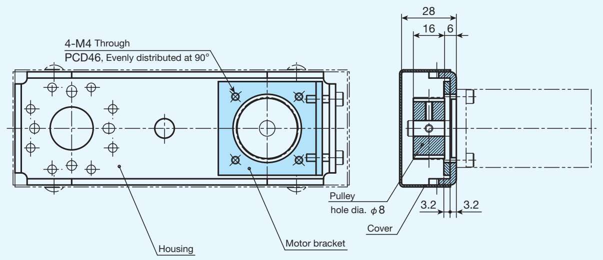
TU60

AR100

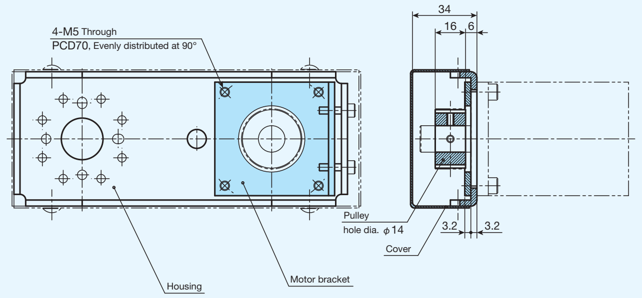
(without attachment)



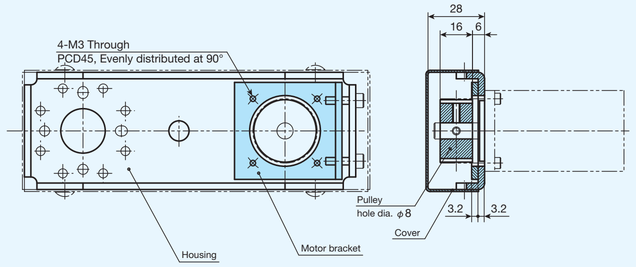
AR102



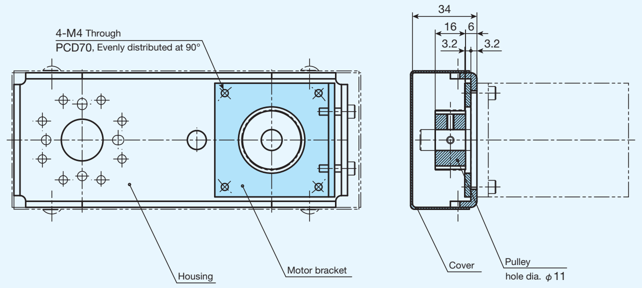
AR103



AR106



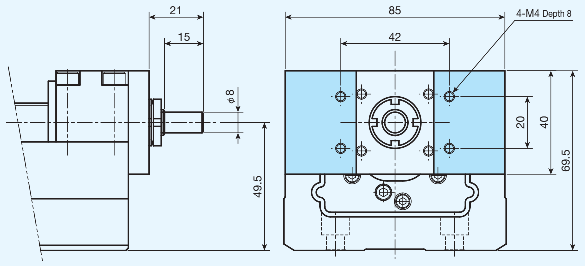
AR107



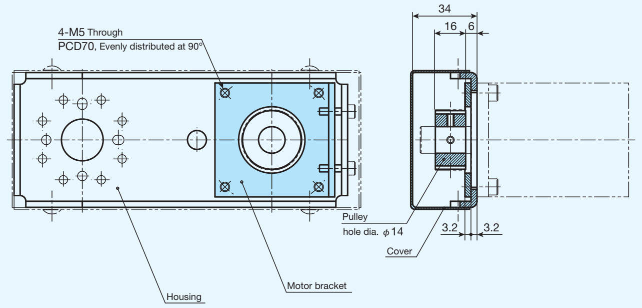
TU86

AR100

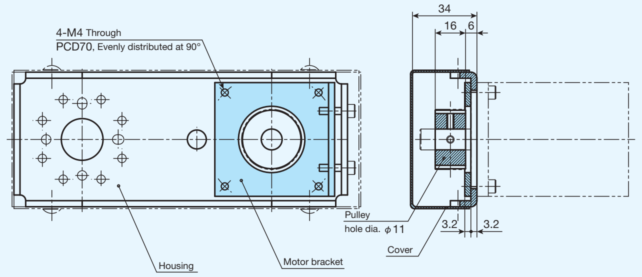
(without attachment)



AR104



AR108



Example of Combination

In Precision Positioning Table TU, using XY bracket enables you to configure various two-axis combination. Light aluminum alloy-made XY bracket can be mounted to a flange type standard table. Table 17 shows various XY bracket models. If you are interested, please specify the model number of your desired model from the table.

Table 17 Configuration of two-axis combination and XY bracket models

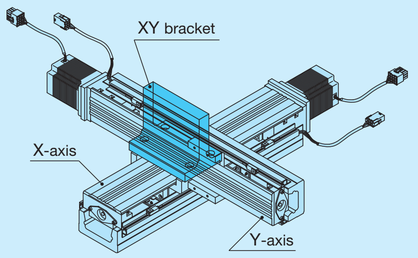
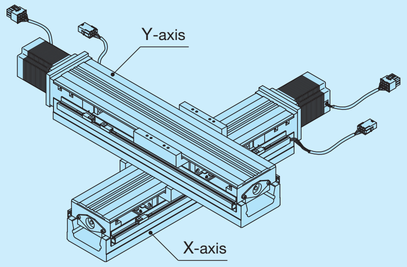
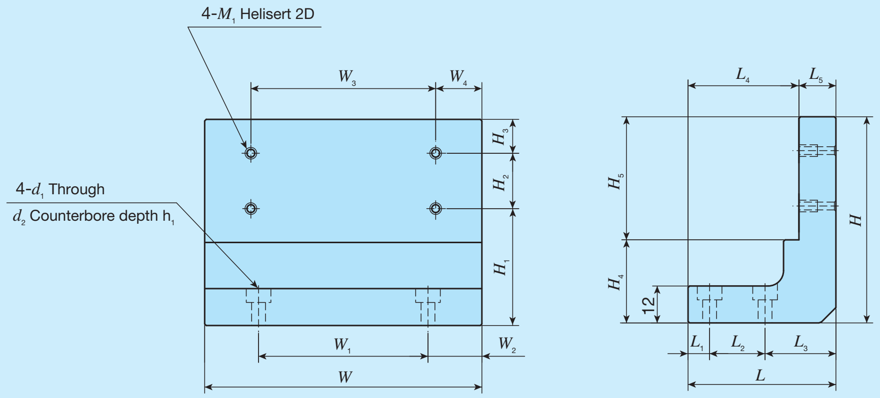
Combination by use of XY bracket			Combination possible without the bracket		
					
X-axis	Y-axis	Model number of XY bracket	X-axis	Y-axis	Model number of XY bracket
–	–	–	TU 25F	TU 25	Not required
–	–	–	TU 30F	TU 30	Not required
TU 40F	TU 40	TAE0412-BR	–	–	–
TU 50F	TU 40	TAE0413-BR	–	–	–
TU 50F	TU 50	TAE0414-BR	–	–	–
TU 60F	TU 50	TAE0415-BR	–	–	–
TU 60F	TU 60	TAE0409-BR	–	–	–
TU 86F	TU 60	TAE0410-BR	TU 86F	TU 60	Not required
TU 86F	TU 86	TAE0411-BR	TU 86F	TU 86	Not required
–	–	–	TU130F	TU100	Not required

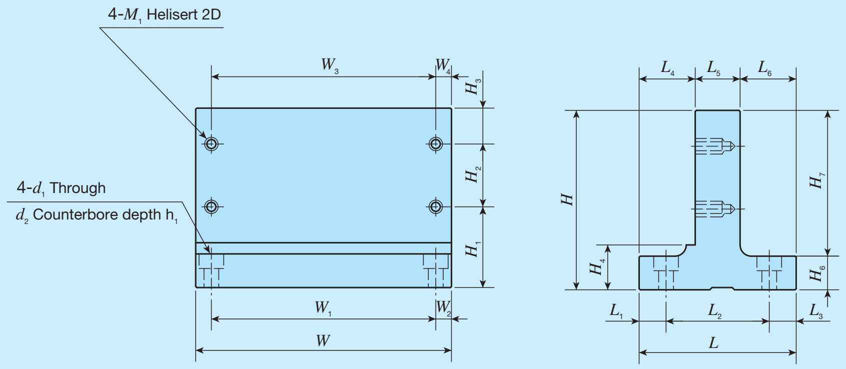
Table 18.1 Dimensions of XY bracket



unit: mm

Model number	W	W_1	W_2	W_3	W_4	H	H_1	H_2	H_3	H_4	H_5	L	L_1	L_2	L_3	L_4	L_5	M_1	d_1	d_2	h_1
TAE0412-BR	90	55	17.5	60	15	67	38	18	11	27	40	48	7	18	23	36	12	M3	4.5	8	4.5
TAE0413-BR	90	65	12.5	60	15	67	38	18	11	27	40	51	9	25	17	39	12	M3	4.5	8	4.5
TAE0414-BR	90	65	12.5	80	5	77	39.5	25	12.5	27	50	57	9	25	23	45	12	M4	4.5	8	4.5

Table 18.2 Dimensions of XY bracket

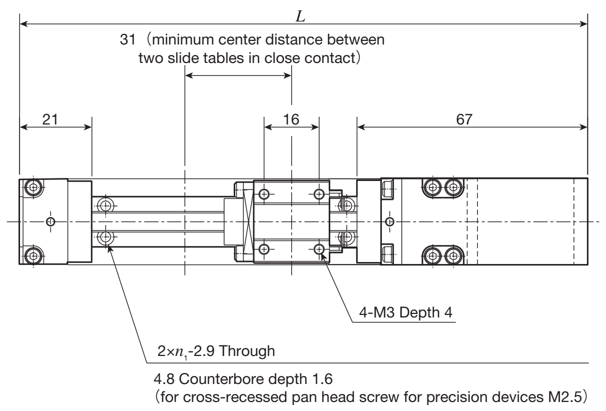


unit: mm

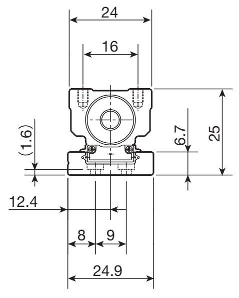
Model number	W	W_1	W_2	W_3	W_4	H	H_1	H_2	H_3	H_4	H_6	H_7	L	L_1	L_2	L_3	L_4	L_5	L_6	M_1	d_1	d_2	h_1
TAE0415-BR	114	74	20	80	17	70	32.5	25	12.5	20	15	55	52.4	12.2	28	12.2	19.2	15	18.2	M4	5.5	9.5	5.5
TAE0409-BR	114	74	20	100	7	80	36	28	16	20	15	65	52.4	12.2	28	12.2	19.2	15	18.2	M5	5.5	9.5	5.5
TAE0410-BR	114	100	7	100	7	80	36	28	16	20	15	65	70	12	46	12	25	20	25	M5	6.6	11	6.5
TAE0411-BR	114	100	7	100	7	106	40	46	20	20	15	91	73	13.5	46	13.5	26.5	20	26.5	M6	6.6	11	6.5

IKO Precision Positioning Table TU

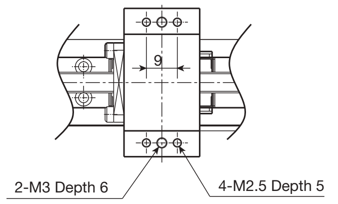
TU25

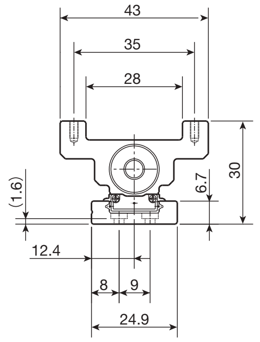


A-A Sectional dimension

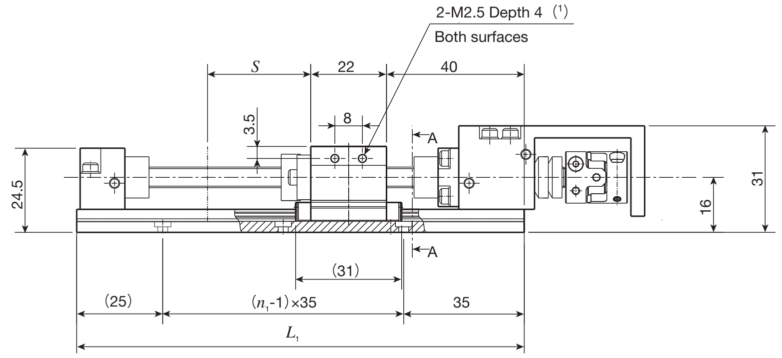


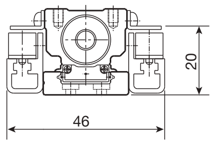
TU25S





TU25F





With sensor

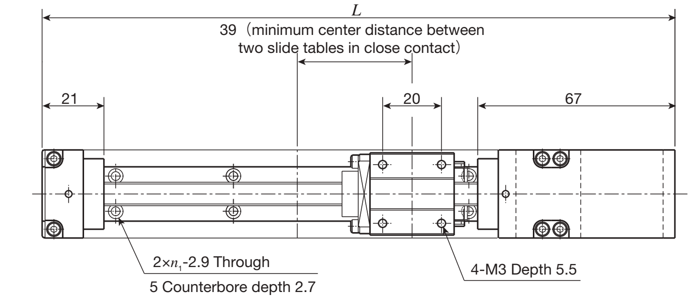
Note (1) No thread hole is prepared for TU25F.

Dimensions unit: mm

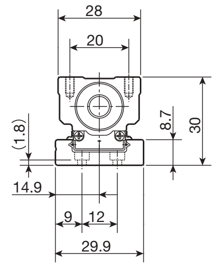
Model and size	Length of track rail L_1	Overall length L	Stroke length S (1)	n_1	Mass of slide table kg	Mass(2) kg
TU25S	130	165	30(−)	3	0.05	0.31
	165	200	65(45)	4		0.34
	200	235	100(80)	5		0.38
TU25F	130	165	30(−)	3	0.07	0.33
	165	200	65(45)	4		0.36
	200	235	100(80)	5		0.40

Notes (1) The value indicates the allowable stroke length when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(2) The value shows the mass of the entire table with one slide table.
Remark: The material of track rail and casing is stainless steel.

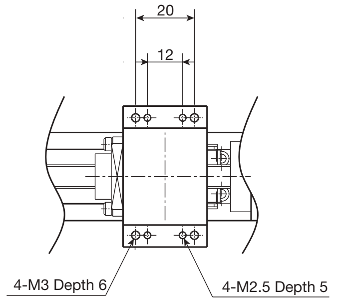
TU30

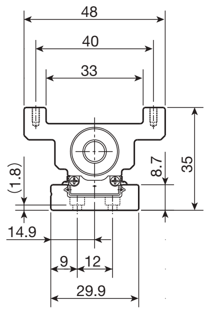


A-A Sectional dimension

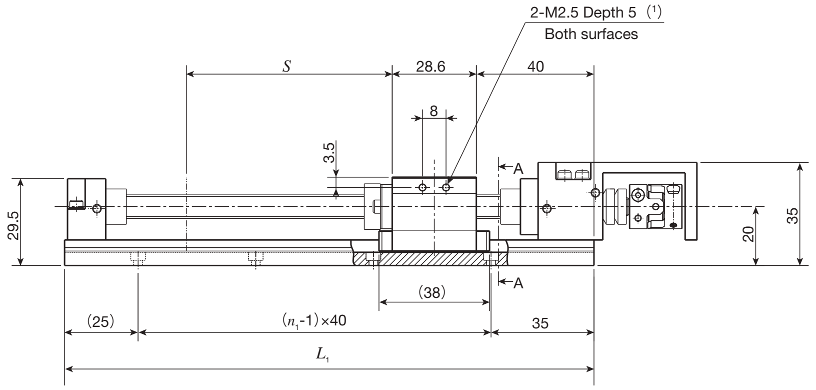


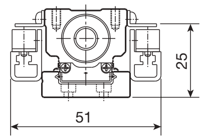
TU30S





TU30F





With sensor

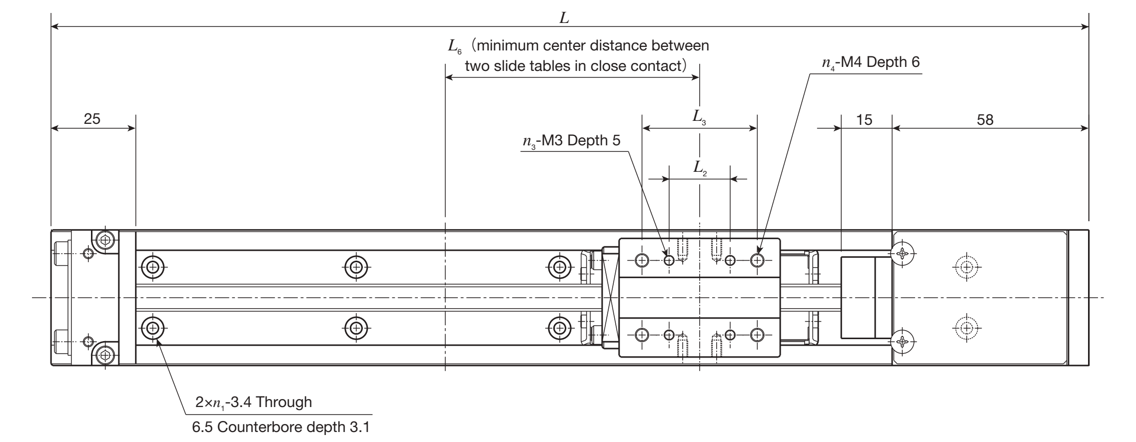
Note (1) No thread hole is prepared for TU30F.

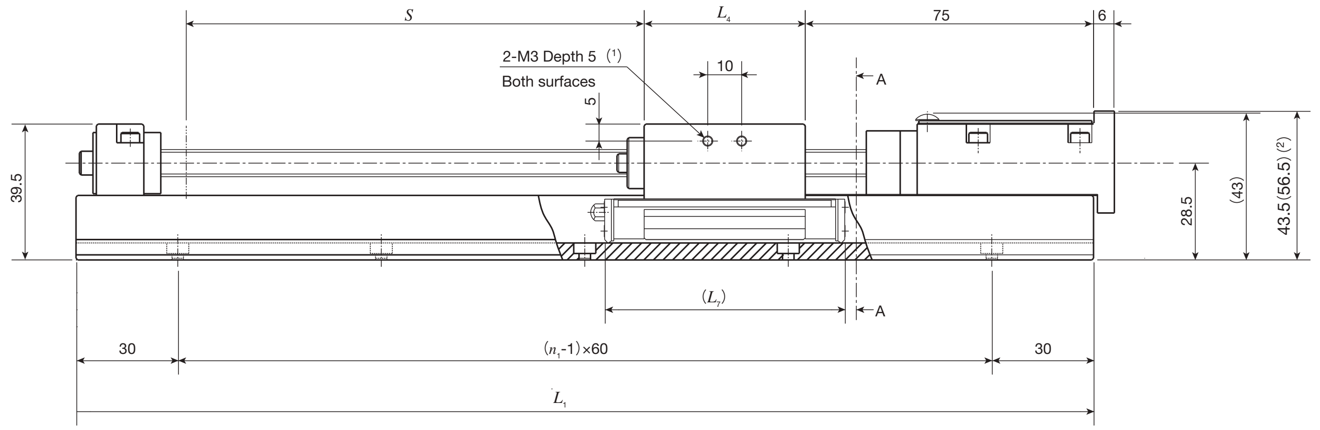
Dimensions unit: mm

Model and size	Length of track rail L_1	Overall length L	Stroke length S (1)	n_1	Mass of slide table kg	Mass(2) kg
TU30S	140	175	30(−)	3	0.09	0.49
	180	215	70(45)	4		0.56
	220	255	110(85)	5		0.63
	260	295	150(125)	6		0.70
	300	335	190(165)	7		0.77
	340	375	230(205)	8		0.84
TU30F	140	175	30(−)	3	0.12	0.52
	180	215	70(45)	4		0.59
	220	255	110(85)	5		0.66
	260	295	150(125)	6		0.73
	300	335	190(165)	7		0.80
	340	375	230(205)	8		0.87

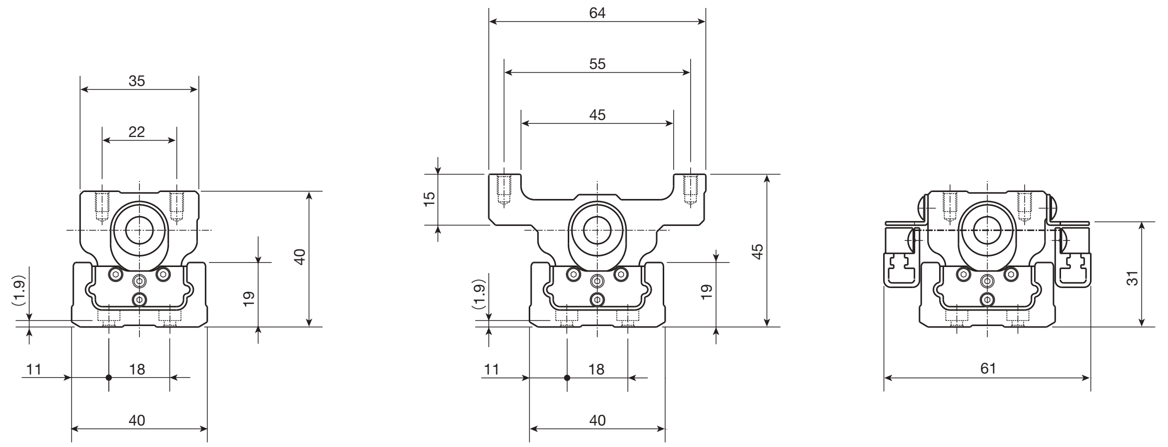
Notes (1) The value indicates the allowable stroke length when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(2) The value shows the mass of the entire table with one slide table.
Remark: The material of track rail and casing is stainless steel.

TU40





A-A Sectional dimension



TU40C, TU40S, TU40G

TU40F

With sensor

Note (1) No thread hole is prepared for TU40F.

(2) The dimension in ( ) is applied to motor attachment codes AT117 and AT122.

Dimensions of slide table

unit: mm

Model and size	L_2	L_3	L_4	L_6	L_7	n_3	n_4	Mass kg
TU40C	−	−	19.5	45	43	−	2	0.1
TU40S	−	18	31.5	60	55	−	4	0.2
TU40G	18	34	47.5	75	71	4	4	0.3
TU40F	−	18	31.5	60	55	−	4	0.3

Dimensions of track rail

unit: mm

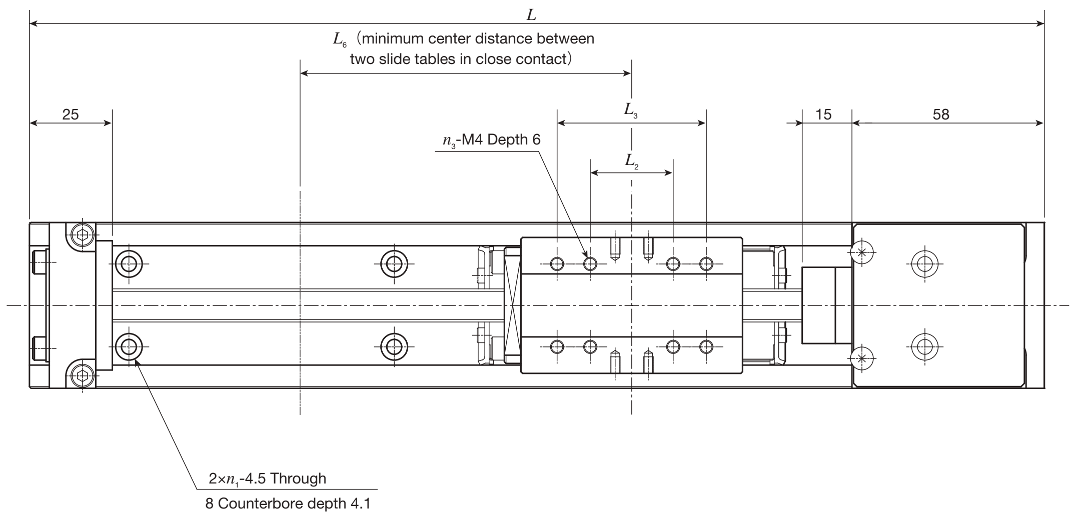
Length of track rail L_1	Overall length L	n_1	Stroke length S(1)			Mass (2) kg			
			TU40C	TU40S TU40F	TU40G	TU40C	TU40S	TU40G	TU40F
180	186	3	45(−)	30(−)	− (−)	0.9	1.0	−	1.1
240	246	4	105(70)	90(40)	80(−)	1.1	1.2	1.3	1.3
300	306	5	165(130)	150(100)	140(70)	1.2	1.3	1.4	1.4
360	366	6	225(190)	210(160)	200(130)	1.4	1.5	1.6	1.6
420	426	7	285(250)	270(220)	260(190)	1.6	1.7	1.8	1.8

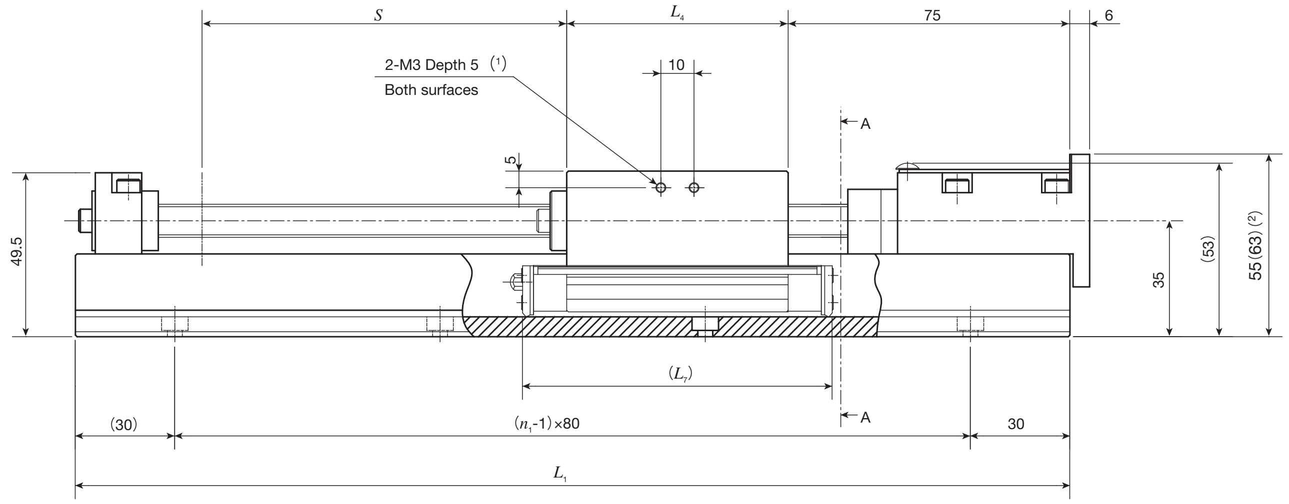
Notes (1) The value indicates the allowable stroke length when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.

(2) The value shows the mass of the entire table with one slide table.

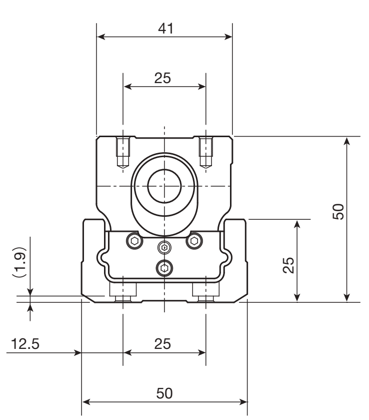
IKO Precision Positioning Table TU

TU50

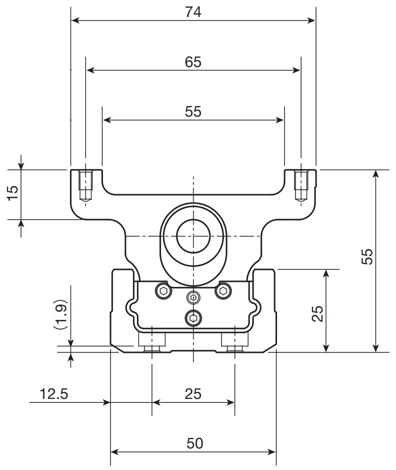




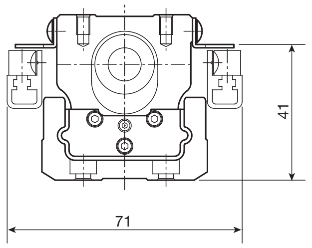
A-A Sectional dimension



TU50C, TU50S, TU50G



TU50F



With sensor

Note (1) No thread hole is prepared for TU50F.

(2) The dimension in ( ) is applied to motor attachment codes AT117 and AT122.

Dimensions of slide table

unit: mm

Model and size	L_2	L_3	L_4	L_6	L_7	n_3	Mass kg
TU50C	–	–	23.8	55	51	2	0.2
TU50S	25	–	42.8	75	70	4	0.4
TU50G	25	45	66.8	100	94	8	0.7
TU50F	25	–	42.8	75	70	4	0.5

Dimensions of track rail

unit: mm

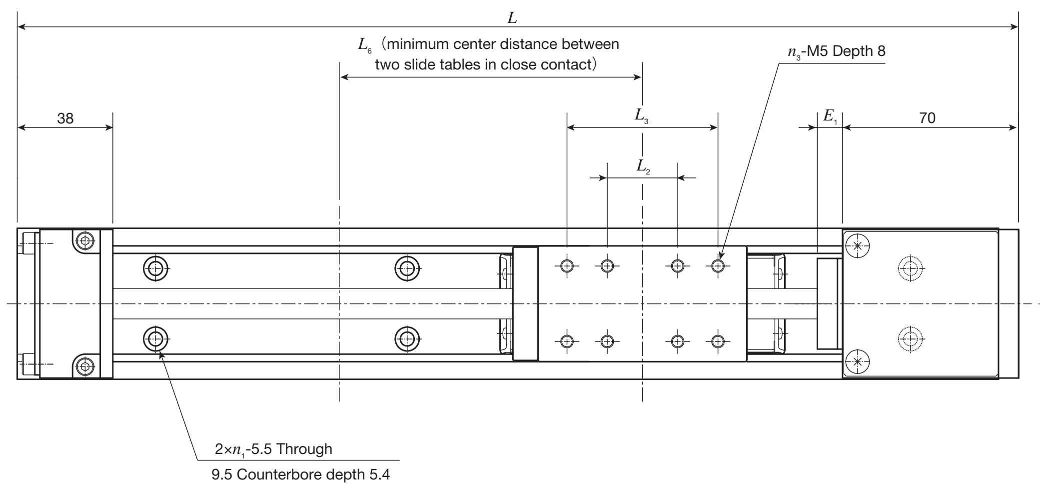
Length of track rail L_1	Overall length L	n_1	Stroke length S(1)			Mass(2) kg			
			TU50C	TU50S TU50F	TU50G	TU50C	TU50S	TU50G	TU50F
220	226	3	80(–)	60(–)	– (–)	1.6	1.8	–	1.9
300	306	4	160(115)	140(75)	120(–)	1.9	2.1	2.4	2.2
380	386	5	240(195)	220(155)	200(110)	2.3	2.5	2.8	2.6
460	466	6	320(275)	300(235)	280(190)	2.7	2.9	3.2	3.0
540	546	7	400(355)	380(315)	360(270)	3.1	3.3	3.6	3.4
620	626	8	480(435)	460(395)	440(350)	3.5	3.7	3.9	3.8
700	706	9	560(515)	540(475)	520(430)	3.8	4.0	4.3	4.1

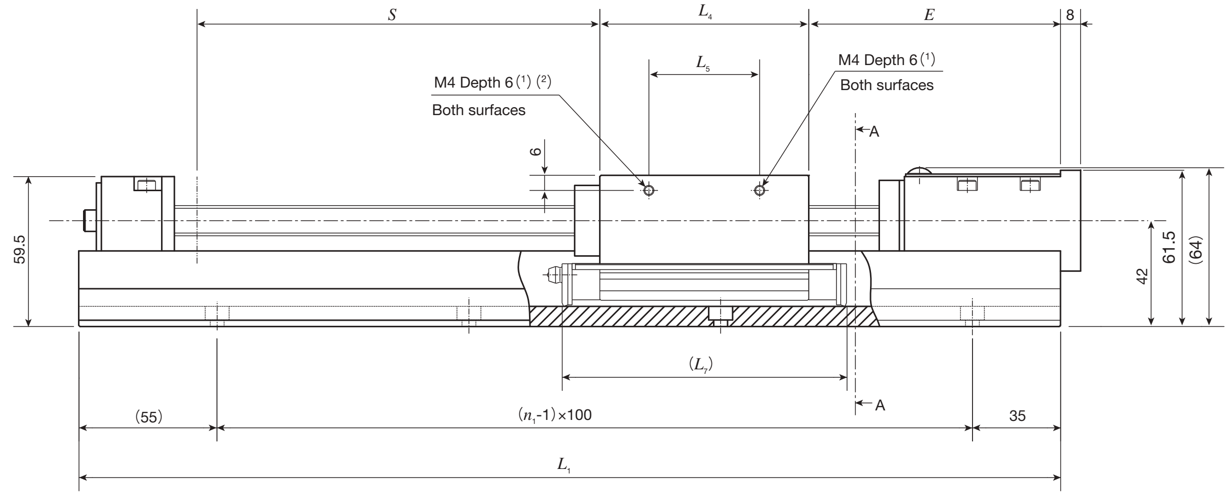
Notes (1) The value indicates the allowable stroke length when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.

(2) The value shows the mass of the entire table with one slide table.

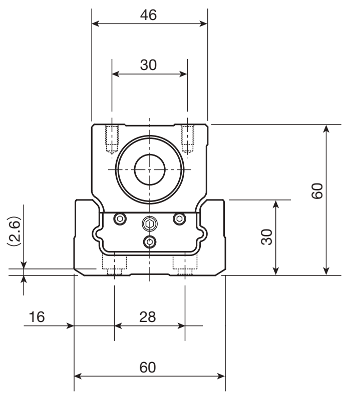
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

TU60

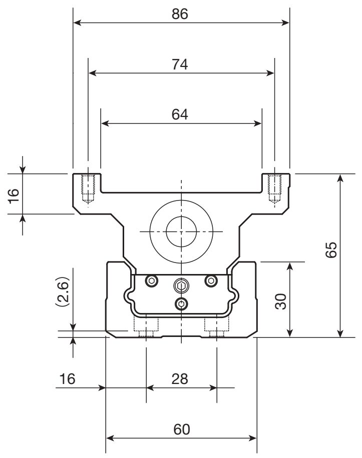




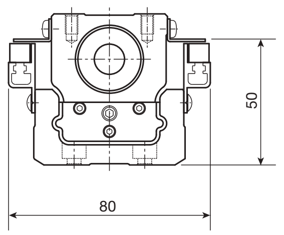
A-A Sectional dimension



TU60C, TU60S, TU60G



TU60FC, TU60F, TU60FG



With sensor

Notes (1) No thread hole is prepared for TU60FC, TU60F, TU60FG.
(2) TU60C is ϕ3 depth 2.

<Ball screw lead 5mm, 10mm>

Dimensions of slide table

unit: mm

Model and size	L_2	L_3	L_4	L_5	L_6	L_7	n_3	E	E_1	Mass kg
TU60C	–	–	27.4	17.4	65	58	2	90	15	0.3
TU60S	28	–	52.4	18	90	83	4	80	10	0.6
TU60G	28	60	83	44	120.5	113	8	80	10	1.0
TU60FC	–	–	27.4	–	65	58	2	90	15	0.4
TU60F	28	–	52.4	–	90	83	4	80	10	0.8
TU60FG	28	60	83	–	120.5	113	8	80	10	1.3

Dimensions of track rail

unit: mm

Length of track rail L_1	Overall length L	n_1	Stroke length S(1)			Mass (2) kg					
			TU60C TU60FC	TU60S TU60F	TU60G TU60FG	TU60C	TU60S	TU60G	TU60FC	TU60F	TU60FG
290	298	3	110(50)	100(–)	70(–)	3.0	3.3	3.6	3.1	3.5	3.9
390	398	4	210(150)	200(120)	170(60)	3.7	4.0	4.4	3.8	4.2	4.7
490	498	5	310(250)	300(220)	270(160)	4.5	4.8	5.1	4.6	4.9	5.4
590	598	6	410(350)	400(320)	370(260)	5.2	5.5	5.8	5.3	5.7	6.1
690	698	7	510(450)	500(420)	470(360)	6.0	6.2	6.6	6.1	6.4	6.9
790	798	8	610(550)	600(520)	570(460)	6.7	7.0	7.3	6.8	7.2	7.6
990	998	10	810(750)	800(720)	770(660)	8.3	8.6	9.0	8.4	8.7	9.1
1190	1198	12	1 010(950)	1 000(920)	970(860)	9.8	10.1	10.5	9.9	10.2	10.6

Notes (1) The value indicates the allowable stroke length when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(2) The value shows the mass of the entire table with one slide table.

<Ball screw lead 20mm>

Dimensions of slide table

unit: mm

Model and size	L_2	L_3	L_4	L_5	L_6	L_7	n_3	E	E_1	Mass kg
TU60C	–	–	27.4	17.4	65	58	2	110	15	0.3
TU60S	28	–	52.4	18	90	83	4	85	15	0.6
TU60G	28	60	83	44	120.5	113	8	85	15	1.0
TU60FC	–	–	27.4	–	65	58	2	110	15	0.4
TU60F	28	–	52.4	–	90	83	4	85	15	0.8
TU60FG	28	60	83	–	120.5	113	8	85	15	1.3

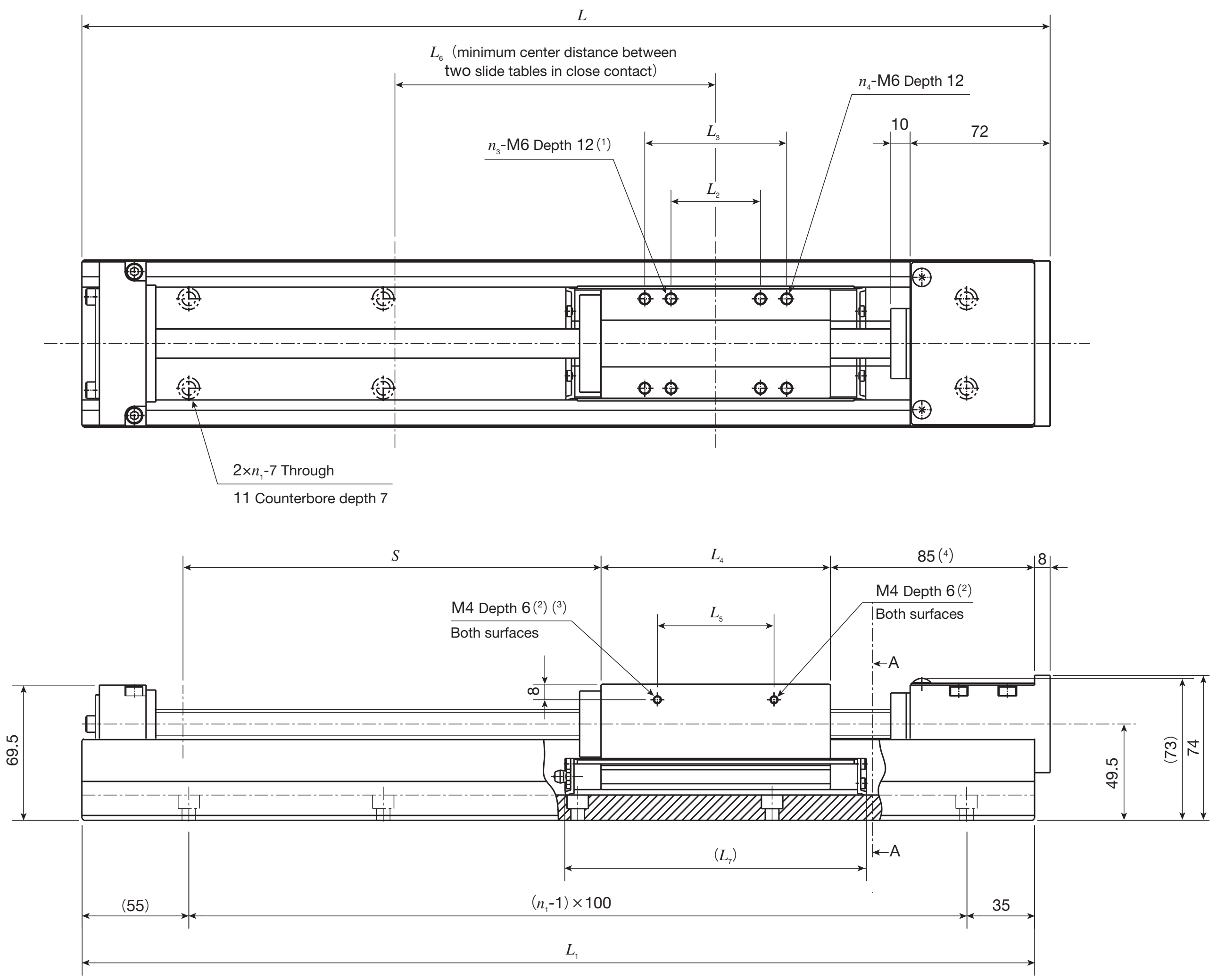
Dimensions of track rail

unit: mm

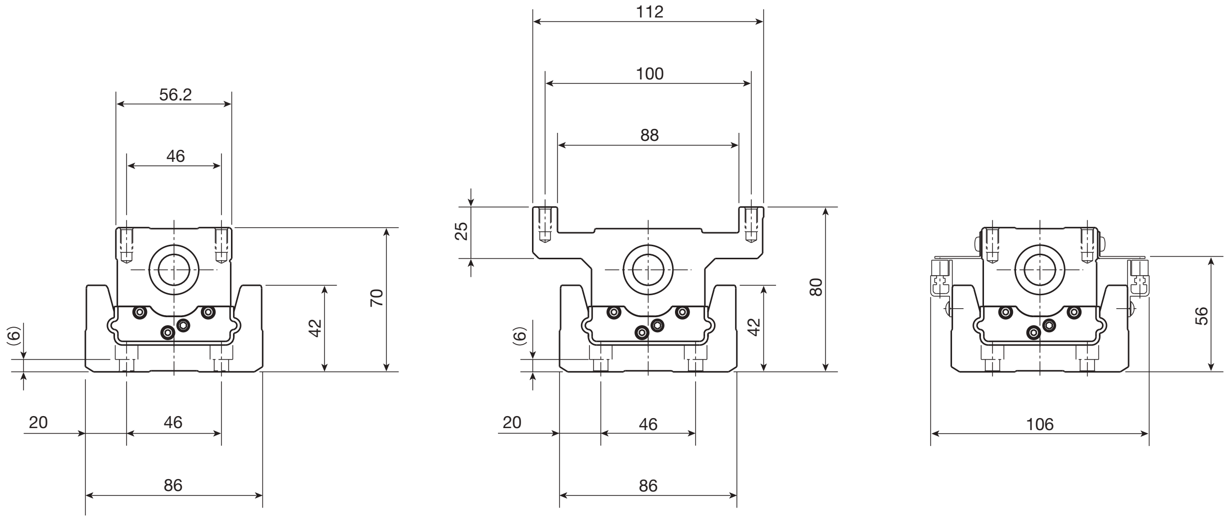
Length of track rail L_1	Overall length L	n_1	Stroke length S(1)			Mass (2) kg					
			TU60C TU60FC	TU60S TU60F	TU60G TU60FG	TU60C	TU60S	TU60G	TU60FC	TU60F	TU60FG
290	298	3	95(–)	95(–)	65(–)	3.1	3.4	3.7	3.2	3.6	4.0
390	398	4	195(135)	195(115)	165(–)	3.8	4.1	4.5	3.9	4.3	4.8
490	498	5	295(235)	295(215)	265(155)	4.6	4.9	5.2	4.7	5.0	5.5
590	598	6	395(335)	395(315)	365(255)	5.3	5.6	5.9	5.4	5.8	6.2
690	698	7	495(435)	495(415)	465(355)	6.1	6.3	6.7	6.2	6.5	7.0
790	798	8	595(535)	595(515)	565(455)	6.8	7.1	7.4	6.9	7.3	7.7

Notes (1) The value indicates the allowable stroke length when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(2) The value shows the mass of the entire table with one slide table.

TU86



A-A Sectional dimension



TU86C, TU86S, TU86G

TU86FC, TU86F, TU86FG

With sensor

Notes (1) TU86F is M5 depth 12.
(2) No thread hole is prepared for TU86FC, TU86F, TU86FG.
(3) TU86C is ϕ3 depth 2.
(4) If the track rail length for TU86C and TU86FC is 1,390 or 1,590, the height is 90.

Dimensions of slide table

unit: mm

Model and size	L_2	L_3	L_4	L_5	L_6	L_7	n_3	n_4	Mass kg
TU86C	–	–	43	30	90	80	2	–	0.7
TU86S	46	–	93	63	140	130	4	–	1.7
TU86G	46	73	118	60	165	155	4	4	2.2
TU86FC	–	–	43	–	90	80	2	–	1.1
TU86F	28	46	93	–	140	130	4	4	2.3
TU86FG	46	73	118	–	165	155	4	4	3.0

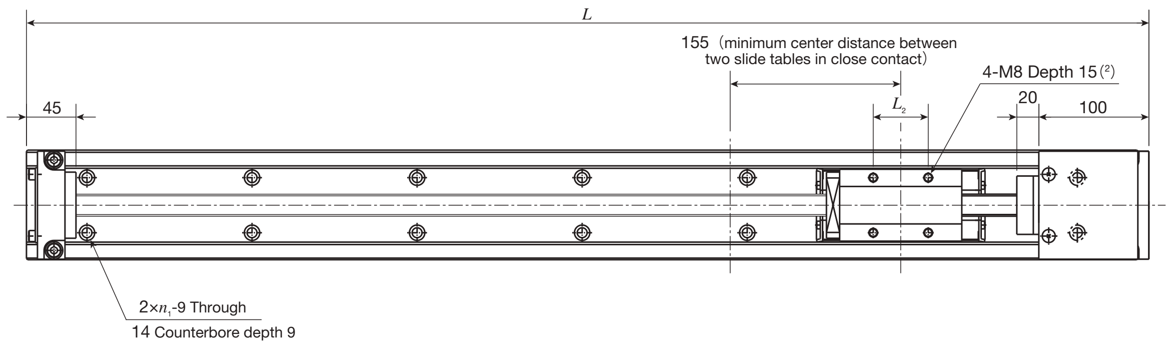
Dimensions of track rail

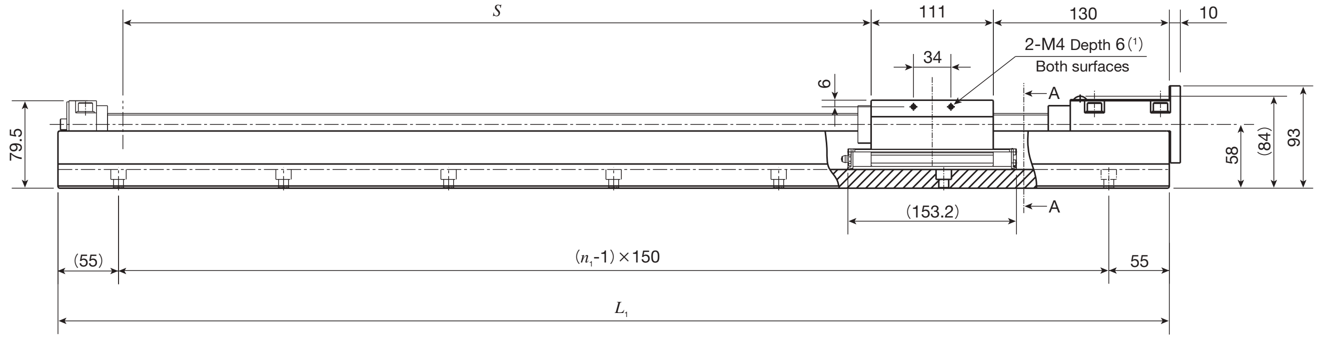
unit: mm

Length of track rail L_1	Overall length L	n_1	Stroke length S(1)			Mass(2) kg					
			TU86C TU86FC	TU86S TU86F	TU86G TU86FG	TU86C	TU86S	TU86G	TU86FC	TU86F	TU86FG
490	498	5	300(　220)	250(　120)	225(　–　)	9.9	10.9	11.4	10.3	11.5	12.2
590	598	6	400(　320)	350(　220)	325(　170)	10.8	11.7	12.2	11.2	12.4	13.0
690	698	7	500(　420)	450(　320)	425(　270)	12.3	13.2	13.8	12.7	13.9	14.6
790	798	8	600(　520)	550(　420)	525(　370)	13.8	14.7	15.3	14.2	15.4	16.1
890	898	9	700(　620)	650(　520)	625(　470)	15.0	15.9	16.4	15.4	16.6	17.2
990	998	10	800(　720)	750(　620)	725(　570)	16.5	17.4	17.9	16.9	18.1	18.7
1090	1 098	11	900(　820)	850(　720)	825(　670)	18.0	18.9	19.4	18.4	19.6	20.2
1190	1 198	12	1 000(　920)	950(　820)	925(　770)	19.5	20.4	21.0	19.9	21.1	21.8
1390	1 398	14	1 200(1 120)	1 150(1 020)	1 125(　970)	24.5	25.4	25.9	24.9	26.0	26.7
1590	1 598	16	1 400(1 320)	1 350(1 220)	1 325(1 170)	27.8	28.7	29.2	28.2	29.3	30.0

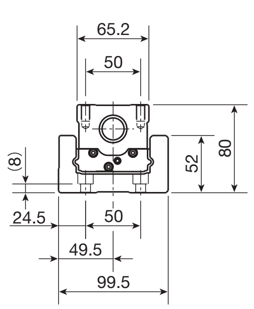
Notes (1) The value indicates the allowable stroke length when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(2) The value shows the mass of the entire table with one slide table.

TU100

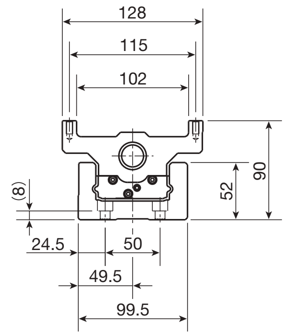




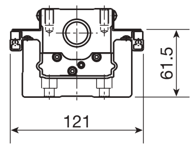
A-A Sectional dimension



TU100S



TU100F



With sensor

Notes (1) No thread hole is prepared for TU100F.
(2) TU100F is M6 depth 12.
Remark: M12 female threads for hanging bolt are provided on the track rail.

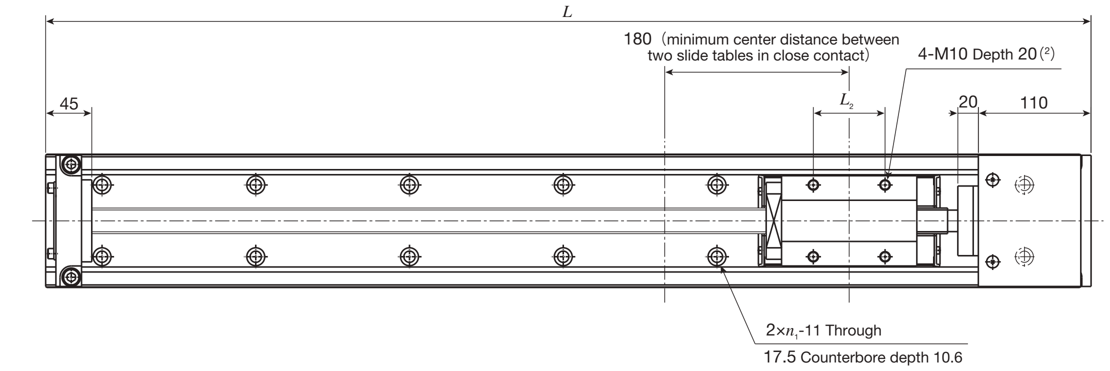
Dimensions

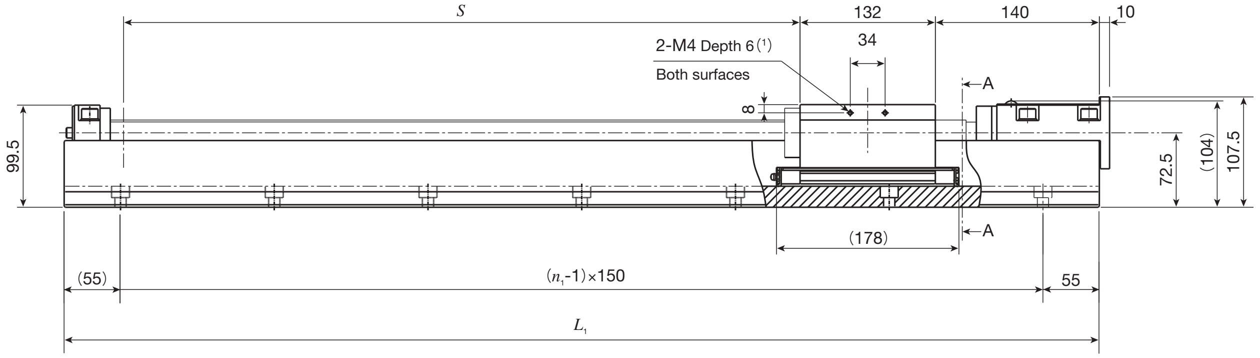
unit: mm

Model and size	Length of track rail L_1	Overall length L	Stroke length S (1)	n_1	L_2	Mass of slide table kg	Mass(2) kg
TU100S	1 010	1 020	690(550)	7	50	2.6	28.0
	1 160	1 170	840(700)	8			31.6
	1 310	1 320	990(850)	9			35.1
	1 460	1 470	1 140(1 000)	10			38.8
TU100F	1 010	1 020	690(550)	7	46	3.7	29.1
	1 160	1 170	840(700)	8			32.7
	1 310	1 320	990(850)	9			36.2
	1 460	1 470	1 140(1 000)	10			39.9

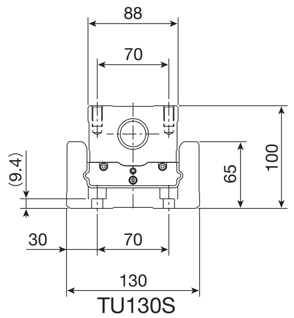
Notes (1) The value indicates the allowable stroke length when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(2) The value shows the mass of the entire table with one slide table.

TU130

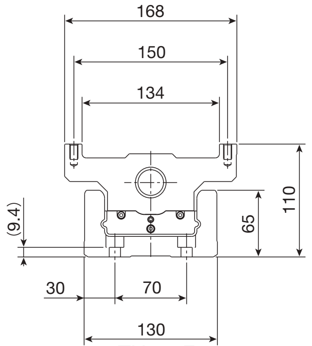




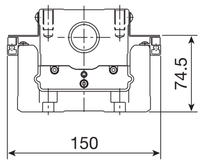
A-A Sectional dimension



TU130S



TU130F



With sensor

Notes (1) No thread hole is prepared for TU130F.
(2) TU130F is M8 depth 15.
Remark: M12 female threads for hanging bolt are provided on the track rail.

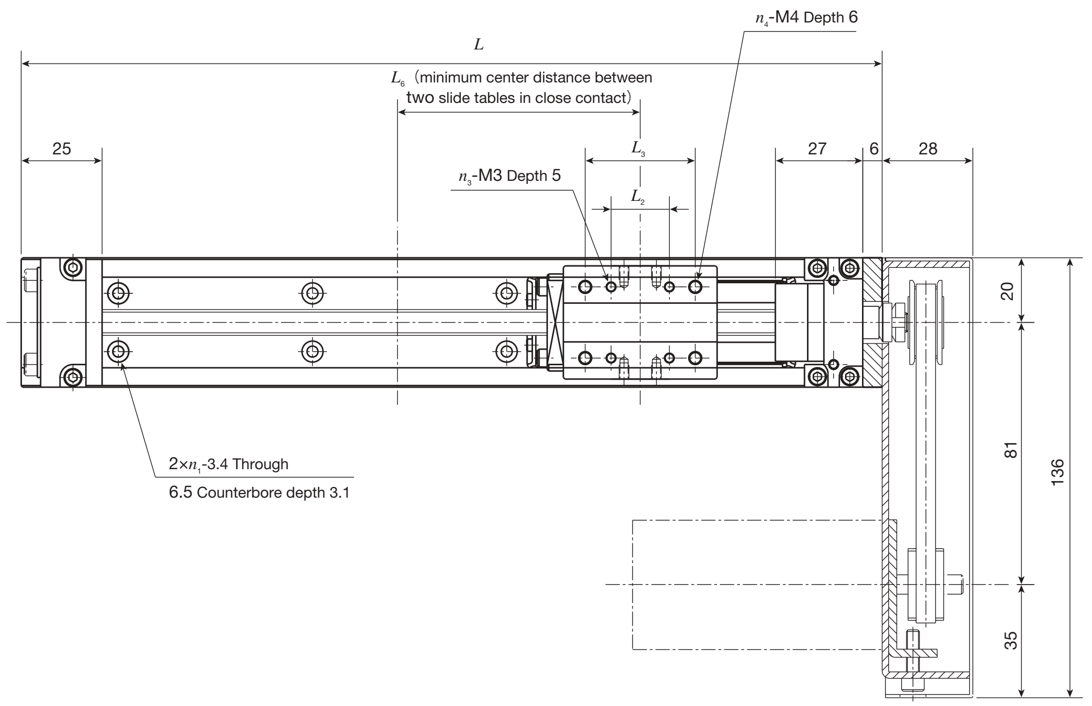
Dimensions

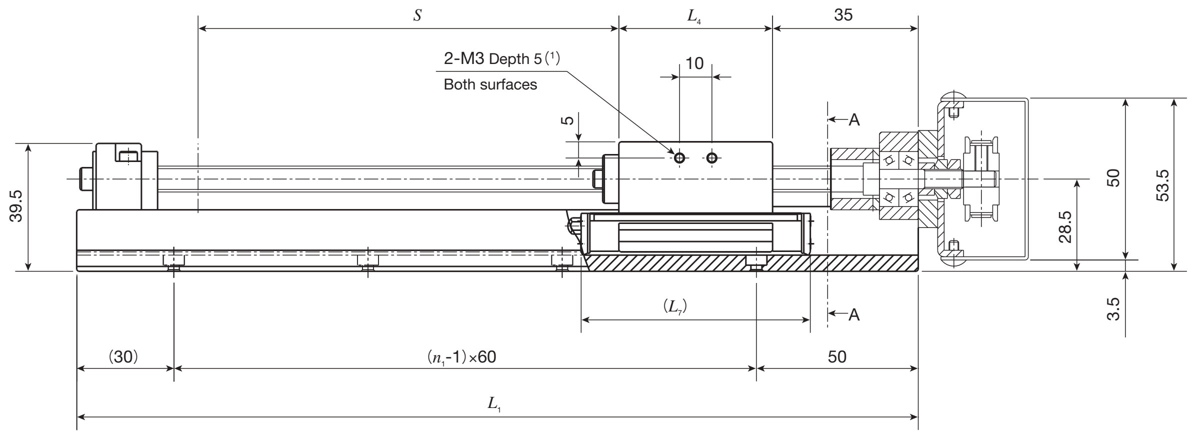
unit: mm

Model and size	Length of track rail L_1	Overall length L	Stroke length S (1)	n_1	L_2	Mass of slide table kg	Mass(2) kg
TU130S	1 010	1 020	660(490)	7	70	5.4	45.2
	1 160	1 170	810(640)	8			50.6
	1 310	1 320	960(790)	9			56.2
	1 460	1 470	1 110(940)	10			61.8
	1 610	1 620	1 260(1 090)	11			67.3
TU130F	1 010	1 020	660(490)	7	50	7.8	47.6
	1 160	1 170	810(640)	8			53.0
	1 310	1 320	960(790)	9			58.6
	1 460	1 470	1 110(940)	10			64.2
	1 610	1 620	1 260(1 090)	11			69.7

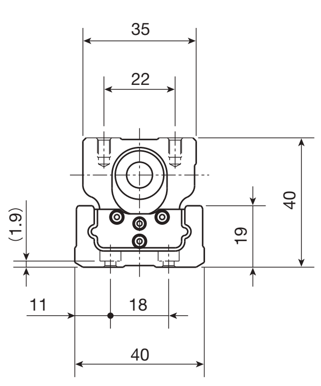
Notes (1) The value indicates the allowable stroke length when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(2) The value shows the mass of the entire table with one slide table.

TU40 Motor folding back specification

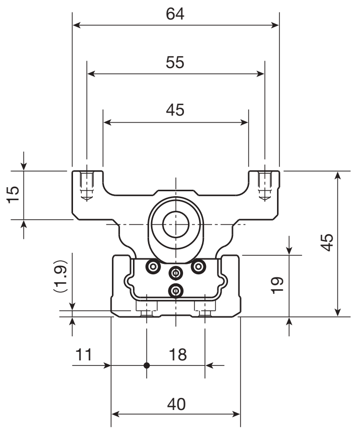




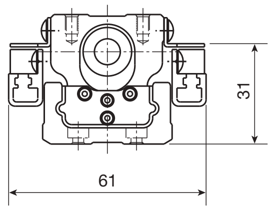
A-A Sectional dimension



TU40C, TU40S, TU40G



TU40F



With sensor

Note (1) No thread hole is prepared for TU40F.

Remark: Parts for motor attachment are appended. This figure indicates a finished state after the motor attachment is assembled by the customer.

Dimensions of slide table unit: mm

Model and size	L_2	L_3	L_4	L_6	L_7	n_3	n_4	Mass kg
TU40C	–	–	19.5	45	43	–	2	0.1
TU40S	–	18	31.5	60	55	–	4	0.2
TU40G	18	34	47.5	75	71	4	4	0.3
TU40F	–	18	31.5	60	55	–	4	0.3

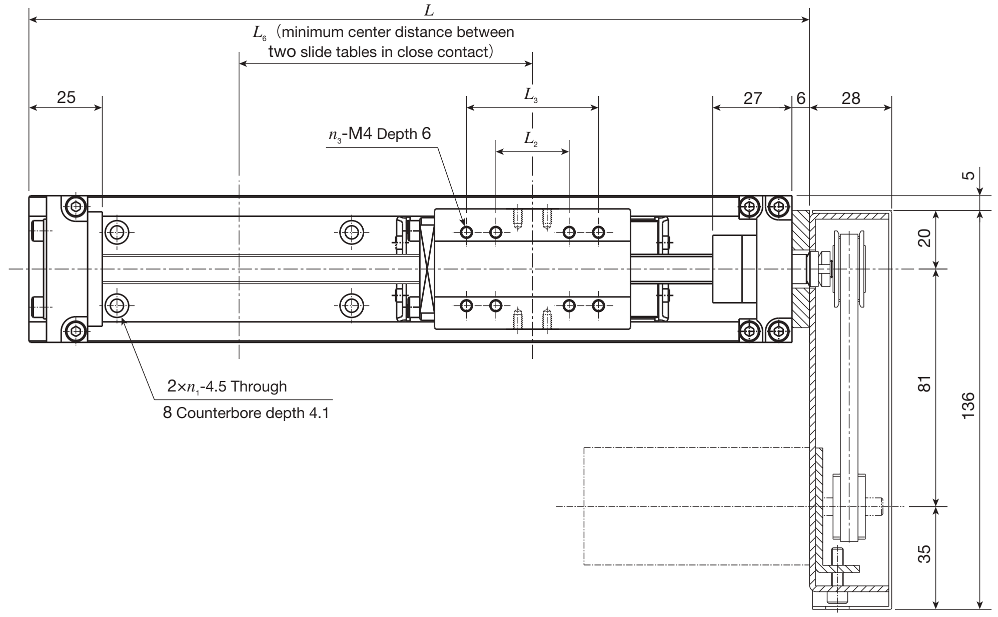
Dimensions of track rail unit: mm

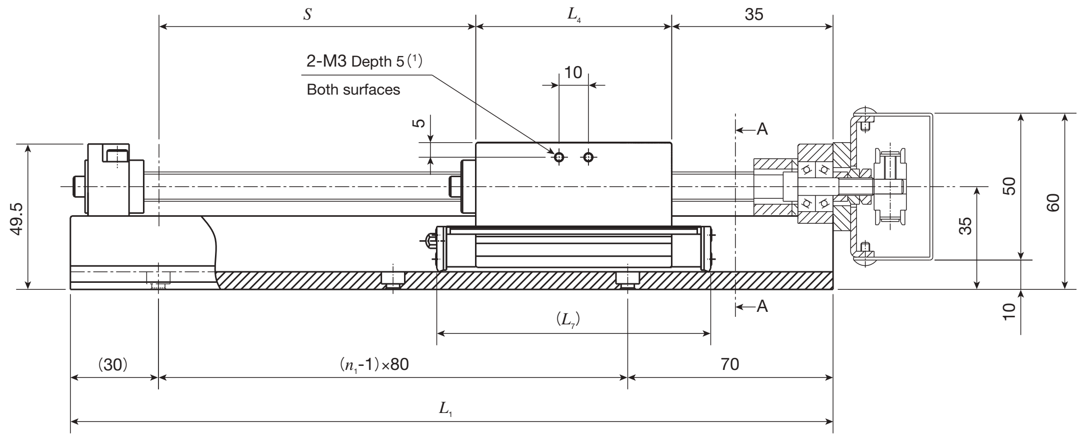
Length of track rail L_1	Overall length L	n_1	Stroke length S(1)			Mass(2) kg			
			TU40C	TU40S TU40F	TU40G	TU40C	TU40S	TU40G	TU40F
140	146	2	45(–)	30(–)	– (–)	1.0	1.1	–	1.2
200	206	3	105(70)	90(40)	80(–)	1.2	1.3	1.4	1.4
260	266	4	165(130)	150(100)	140(70)	1.4	1.5	1.6	1.6
320	326	5	225(190)	210(160)	200(130)	1.6	1.7	1.8	1.8
380	386	6	285(250)	270(220)	260(190)	1.8	1.9	2.0	2.0

Notes (1) The value indicates the allowable stroke length when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.

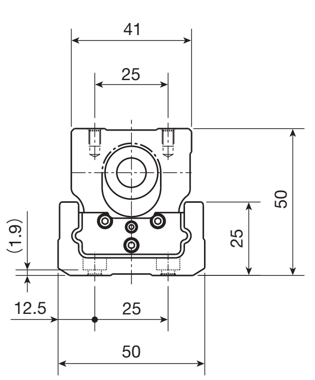
(2) The value shows the mass of the entire table with one slide table.

TU50 Motor folding back specification

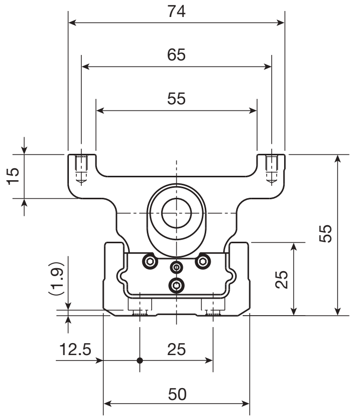




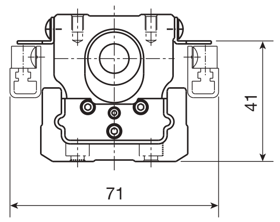
A-A Sectional dimension



TU50C, TU50S, TU50G



TU50F



With sensor

Note (1) No thread hole is prepared for TU50F.
Remark: Parts for motor attachment are appended. This figure indicates a finished state after the motor attachment is assembled by the customer.

Dimensions of slide table

unit: mm

Model and size	L_2	L_3	L_4	L_6	L_7	n_3	Mass kg
TU50C	–	–	23.8	55	51	2	0.2
TU50S	25	–	42.8	75	70	4	0.4
TU50G	25	45	66.8	100	94	8	0.7
TU50F	25	–	42.8	75	70	4	0.5

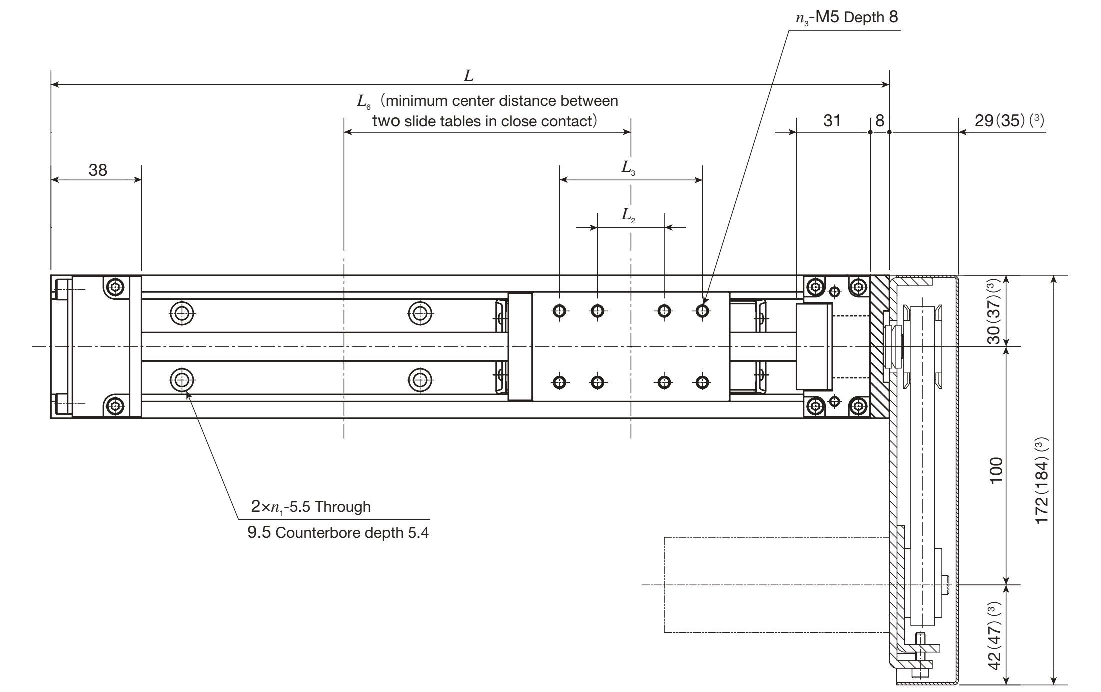
Dimensions of track rail

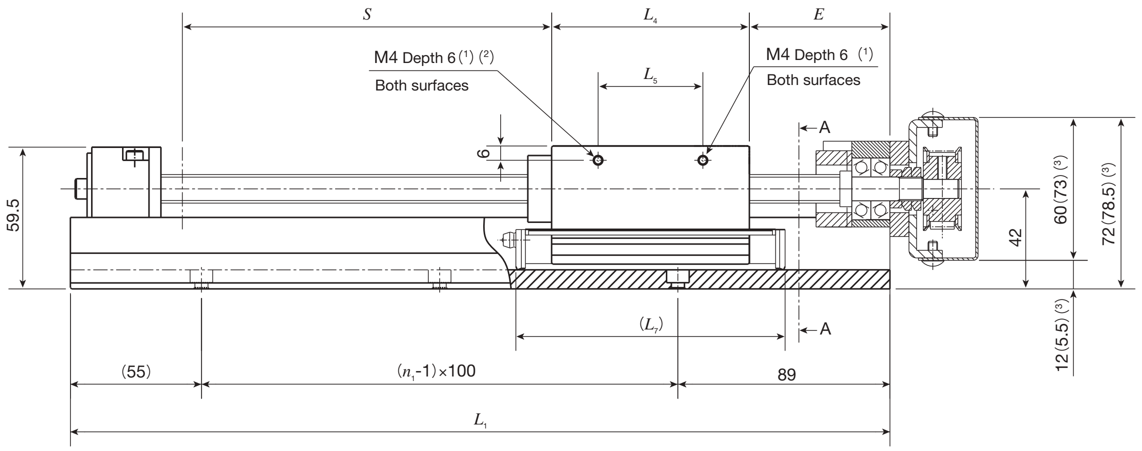
unit: mm

Length of track rail L_1	Overall length L	n_1	Stroke length S(1)			Mass(2) kg			
			TU50C	TU50S TU50F	TU50G	TU50C	TU50S	TU50G	TU50F
180	186	2	80(–)	60(–)	– (–)	1.6	1.8	–	1.9
260	266	3	160(115)	140(75)	120(–)	1.9	2.1	2.4	2.2
340	346	4	240(195)	220(155)	200(110)	2.3	2.5	2.8	2.6
420	426	5	320(275)	300(235)	280(190)	2.7	2.9	3.2	3.0
500	506	6	400(355)	380(315)	360(270)	3.1	3.3	3.6	3.4
580	586	7	480(435)	460(395)	440(350)	3.5	3.7	3.9	3.8
660	666	8	560(515)	540(475)	520(430)	3.8	4.0	4.3	4.1

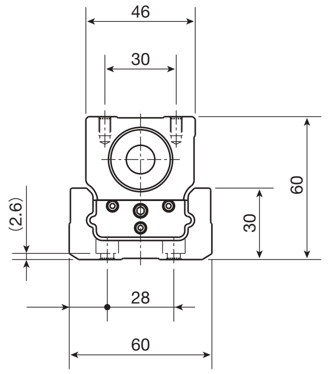
Notes (1) The value indicates the allowable stroke length when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(2) The value shows the mass of the entire table with one slide table.

TU60 Motor folding back specification

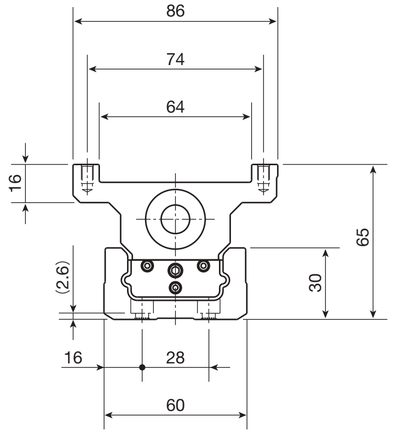




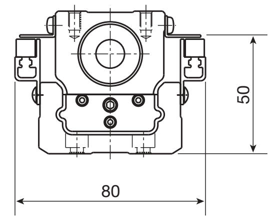
A-A Sectional dimension



TU60C, TU60S, TU60G



TU60FC, TU60F, TU60FG



With sensor

Notes (1) No thread hole is prepared for TU60FC, TU60F, TU60FG.
(2) TU60C is φ3 depth 2.
(3) The dimension in ( ) is applied to motor attachment codes AT117 and AT122.
Remark: Parts for motor attachment are appended. This figure indicates a finished state after the motor attachment is assembled by the customer.

<Ball screw lead 5mm, 10mm>

Dimensions of slide table

unit: mm

Model and size	L_2	L_3	L_4	L_5	L_6	L_7	n_3	E	Mass kg
TU60C	–	–	27.4	17.4	65	58	2	44	0.3
TU60S	28	–	52.4	18	90	83	4	39	0.6
TU60G	28	60	83	44	120.5	113	8	39	1.0
TU60FC	–	–	27.4	–	65	58	2	44	0.4
TU60F	28	–	52.4	–	90	83	4	39	0.8
TU60FG	28	60	83	–	120.5	113	8	39	1.3

Dimensions of track rail

unit: mm

Length of track rail L_1	Overall length L	n_1	Stroke length S(1)			Mass(2) kg					
			TU60C TU60FC	TU60S TU60F	TU60G TU60FG	TU60C	TU60S	TU60G	TU60FC	TU60F	TU60FG
244	252	2	110(50)	95(–)	– (–)	3.6	3.9	–	3.7	4.1	–
344	352	3	210(150)	195(115)	165(–)	4.3	4.6	5.0	4.4	4.8	5.3
444	452	4	310(250)	295(215)	265(155)	5.1	5.4	5.7	5.2	5.5	6.0
544	552	5	410(350)	395(315)	365(255)	5.8	6.1	6.4	5.9	6.3	6.7
644	652	6	510(450)	495(415)	465(355)	6.6	6.8	7.2	6.7	7.0	7.5
744	752	7	610(550)	595(515)	565(455)	7.5	7.6	7.9	7.6	7.8	8.2

Notes (1) The value indicates the allowable stroke length when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(2) The value shows the mass of the entire table with one slide table.

<Ball screw lead 20mm>

Dimensions of slide table

unit: mm

Model and size	L_2	L_3	L_4	L_5	L_6	L_7	n_3	E	Mass kg
TU60C	–	–	27.4	17.4	65	58	2	64	0.3
TU60S	28	–	52.4	18	90	83	4	39	0.6
TU60G	28	60	83	44	120.5	113	8	39	1.0
TU60FC	–	–	27.4	–	65	58	2	64	0.4
TU60F	28	–	52.4	–	90	83	4	39	0.8
TU60FG	28	60	83	–	120.5	113	8	39	1.3

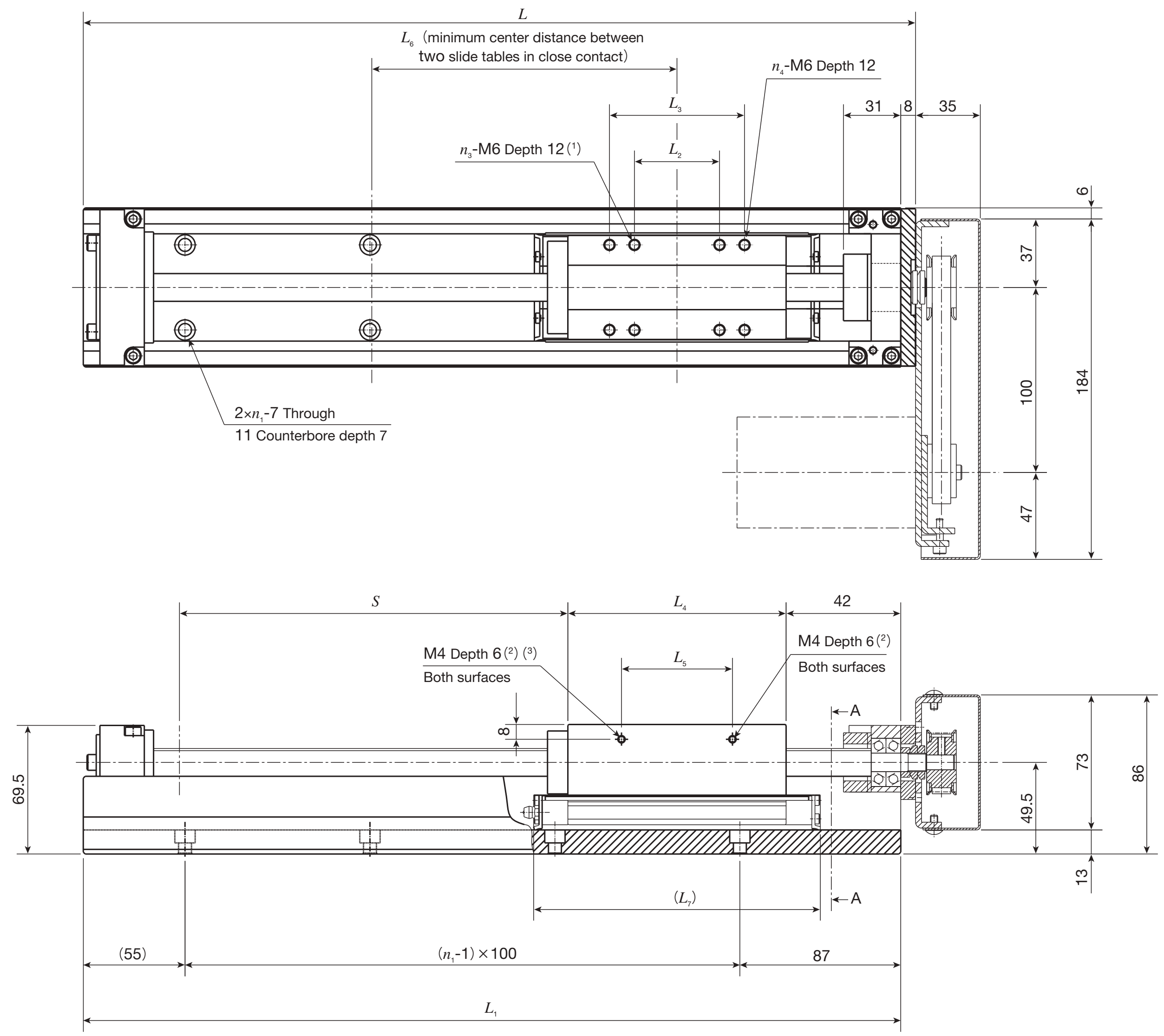
Dimensions of track rail

unit: mm

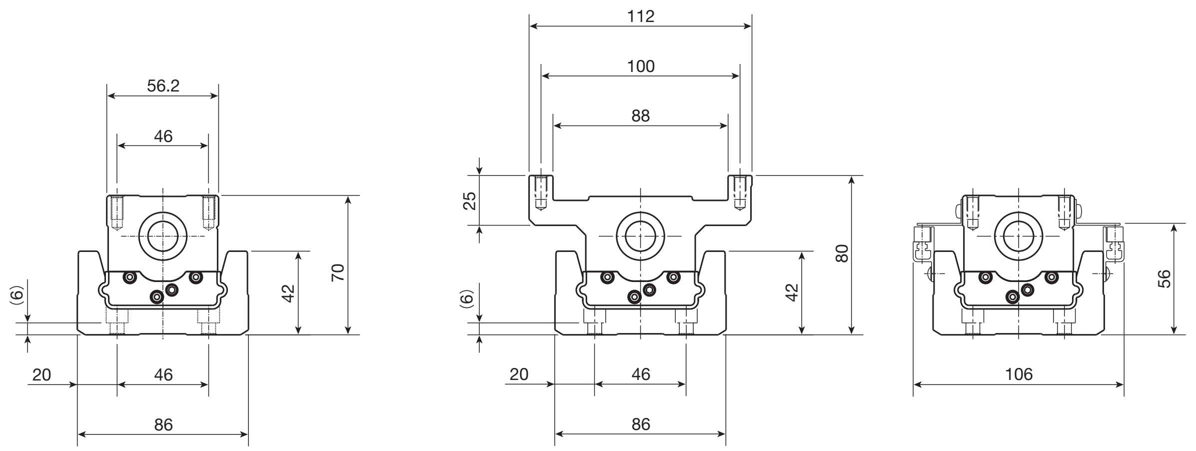
Length of track rail L_1	Overall length L	n_1	Stroke length S(1)			Mass(2) kg					
			TU60C TU60FC	TU60S TU60F	TU60G TU60FG	TU60C	TU60S	TU60G	TU60FC	TU60F	TU60FG
244	252	2	95(–)	95(–)	– (–)	3.7	4.0	–	3.8	4.2	–
344	352	3	195(135)	195(115)	165(–)	4.4	4.7	5.1	4.5	4.9	5.4
444	452	4	295(235)	295(215)	265(155)	5.2	5.5	5.8	5.3	5.6	6.1
544	552	5	395(335)	395(315)	365(255)	5.9	6.2	6.5	6.0	6.4	6.8
644	652	6	495(435)	495(415)	465(355)	6.7	6.9	7.3	6.8	7.1	7.6
744	752	7	595(535)	595(515)	565(455)	7.6	7.7	8.0	7.7	7.9	8.3

Notes (1) The value indicates the allowable stroke length when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(2) The value shows the mass of the entire table with one slide table.

TU86 Motor folding back specification



A-A Sectional dimension



TU86C, TU86S, TU86G

TU86FC, TU86F, TU86FG

With sensor

Notes (1) TU86F is M5 depth 12.
(2) No thread hole is prepared for TU86FC, TU86F, TU86FG.
(3) TU86C is $\phi 3$ depth 2.

Remark: Parts for motor attachment are appended. This figure indicates a finished state after the motor attachment is assembled by the customer.

Dimensions of slide table

unit: mm

Model and size	L_2	L_3	L_4	L_5	L_6	L_7	n_3	n_4	Mass kg
TU86C	–	–	43	30	90	80	2	–	0.7
TU86S	46	–	93	63	140	130	4	–	1.7
TU86G	46	73	118	60	165	155	4	4	2.2
TU86FC	–	–	43	–	90	80	2	–	1.1
TU86F	28	46	93	–	140	130	4	4	2.3
TU86FG	46	73	118	–	165	155	4	4	3.0

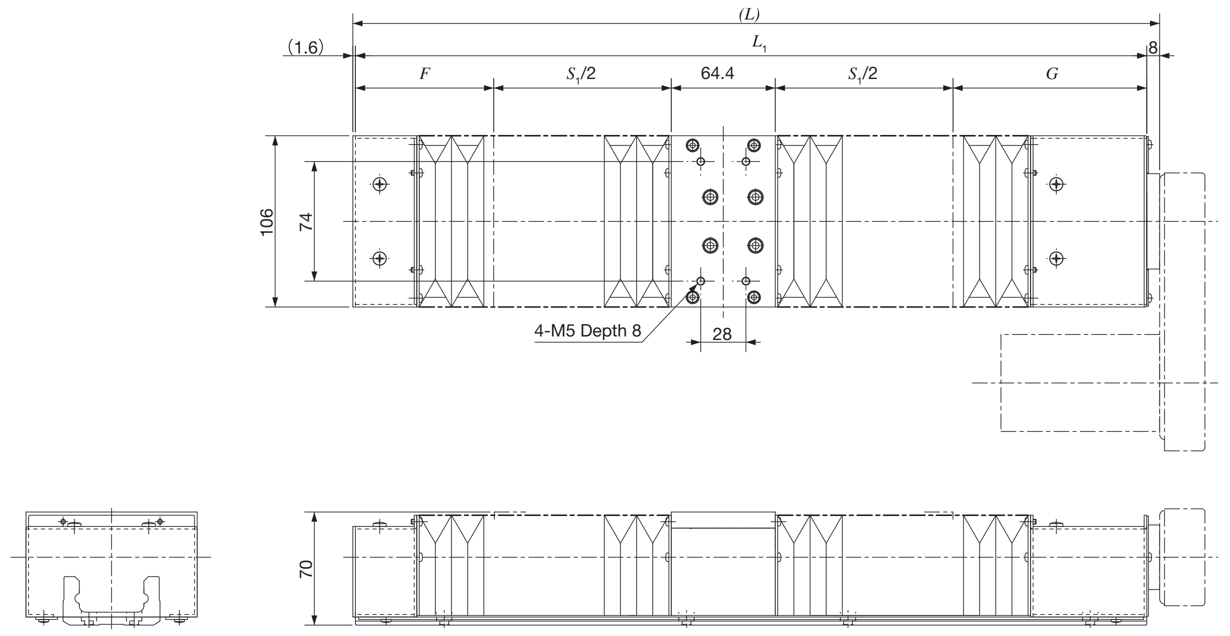
Dimensions of track rail

unit: mm

Length of track rail L_1	Overall length L	n_1	Stroke length S(1)			Mass(2) kg					
			TU86C TU86FC	TU86S TU86F	TU86G TU86FG	TU86C	TU86S	TU86G	TU86FC	TU86F	TU86FG
442	450	4	295(215)	245(115)	220(–)	10.3	11.3	11.8	10.7	11.9	12.6
542	550	5	395(315)	345(215)	320(165)	11.2	12.1	12.6	11.6	12.8	13.4
642	650	6	495(415)	445(315)	420(265)	12.7	13.6	14.2	13.1	14.3	15.0
742	750	7	595(515)	545(415)	520(365)	14.2	15.1	15.7	14.6	15.8	16.5
842	850	8	695(615)	645(515)	620(465)	15.4	16.3	16.8	15.8	17.0	17.6
942	950	9	795(715)	745(615)	720(565)	16.9	17.8	18.3	17.3	18.5	19.1
1042	1 050	10	895(815)	845(715)	820(665)	18.4	19.3	19.8	18.8	20.0	20.6
1142	1 150	11	995(915)	945(815)	920(765)	19.9	20.8	21.4	20.3	21.5	22.2

Notes (1) The value indicates the allowable stroke length when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.
(2) The value shows the mass of the entire table with one slide table.

TU60S Table with bellows



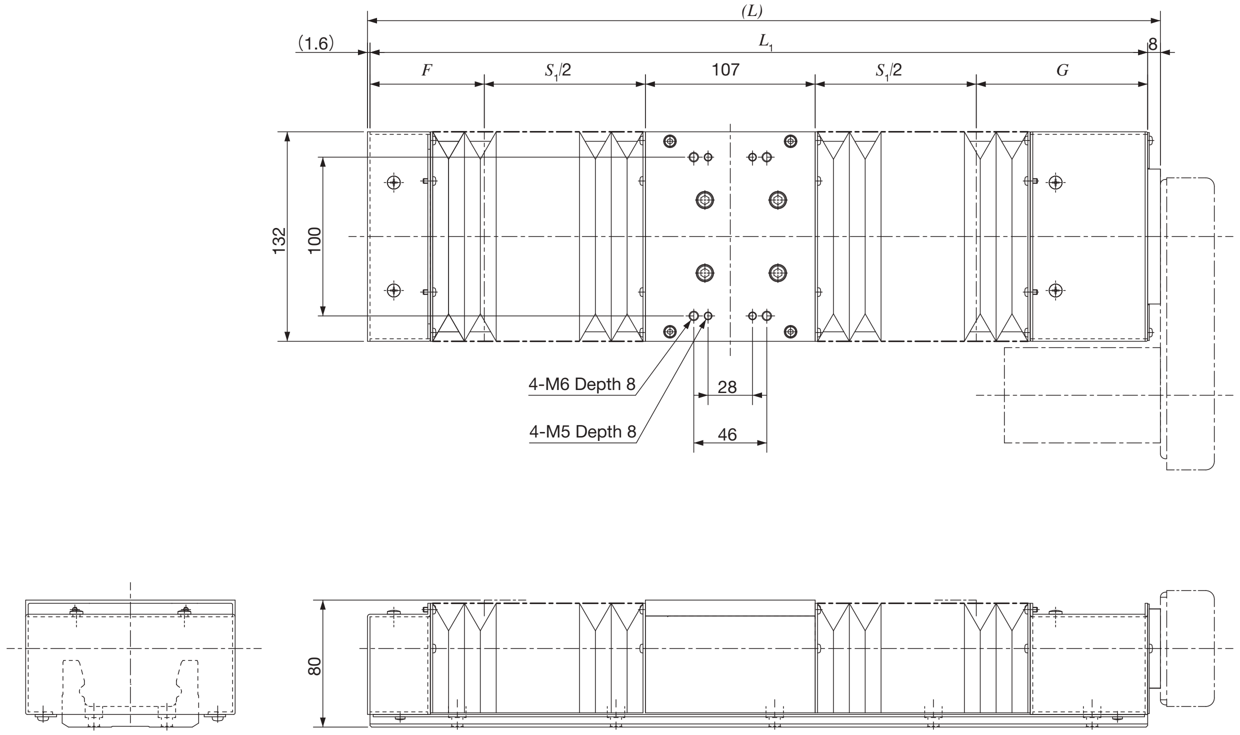
unit: mm

Length of track rail L_1	Overall length (L)	Limit stroke length (1) S_1	Stroke length (2) S	F	G
290 (244)	299.6(253.6)	73.6(68.6)	65(60)	59(59)	93(52)
390 (344)	399.6(353.6)	147.6(142.6)	140(135)	72(72)	106(65)
490 (444)	499.6(453.6)	219.6(214.6)	210(205)	86(86)	120(79)
590 (544)	599.6(553.6)	293.6(288.6)	285(280)	99(99)	133(92)
690 (644)	699.6(653.6)	393.6(388.6)	380(375)	99(99)	133(92)
790 (744)	799.6(753.6)	465.6(460.6)	455(450)	113(113)	147(106)

Notes (1) The value indicates the limit value of stroke with which the slide table can move.
(2) The value indicates the allowable stroke length when limit sensors are mounted.

Remarks 1. The values in ( ) are applied to table with bellows of motor folding back specification.
2. For the track rail mounting dimensions, please see the dimension table for TU60.
3. Applicable to tables with C-Lube.

TU86S Table with bellows



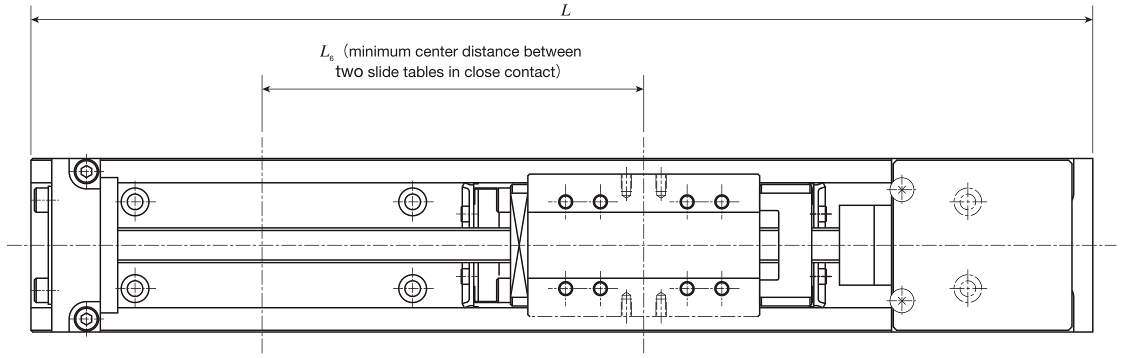
unit: mm

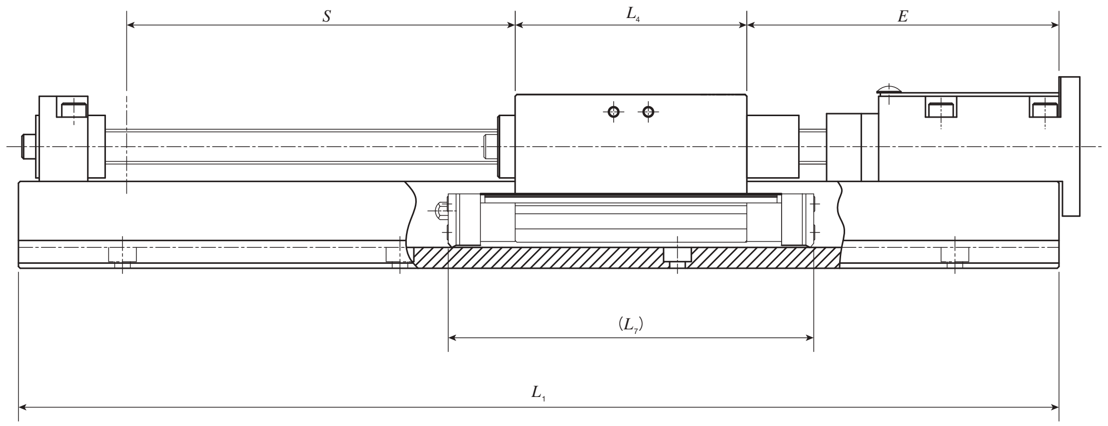
Length of track rail L_1	Overall length (L)	Limit stroke length (1) S_1	Stroke length (2) S	F	G
490(442)	499.6(451.6)	203(198)	195(190)	72(72)	108(65)
590(542)	599.6(551.6)	275(270)	265(260)	86(86)	122(79)
690(642)	699.6(651.6)	349(344)	340(335)	99(99)	135(92)
790(742)	799.6(751.6)	421(416)	410(405)	113(113)	149(106)
890(842)	899.6(851.6)	521(516)	510(505)	113(113)	149(106)
990(942)	999.6(951.6)	593(588)	580(575)	127(127)	163(120)
1 090(1 042)	1 099.6(1 051.6)	667(662)	655(650)	140(140)	176(133)
1 190(1 142)	1 199.6(1 151.6)	739(734)	730(725)	154(154)	190(147)

Notes (1) The value indicates the limit value of stroke with which the slide table can move.
(2) The value indicates the allowable stroke length when limit sensors are mounted.

Remarks 1. The values in ( ) are applied to table with bellows of motor folding back specification.
2. For the track rail mounting dimensions, please see the dimension table for TU86.
3. Applicable to tables with C-Lube.

TU40, TU50 Table with C-Lube





unit: mm

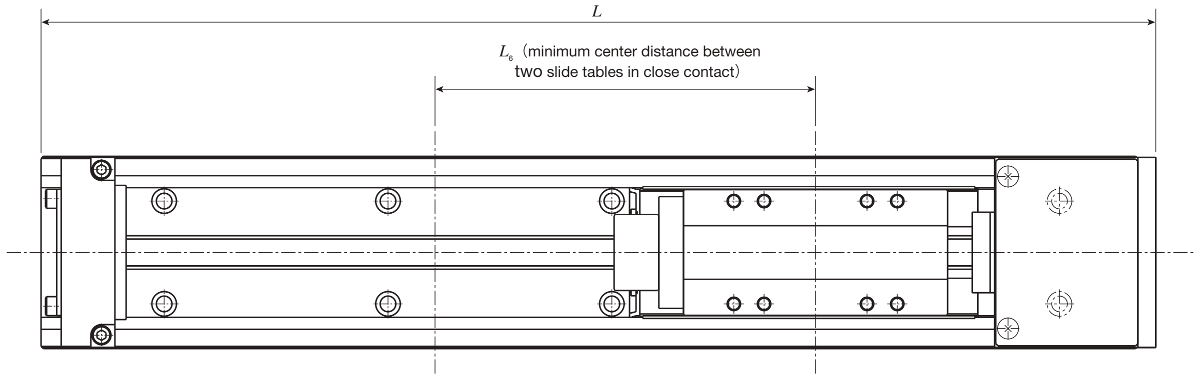
Model and size	Length of track rail L_1	Overall length L	Stroke length (1) S	E	L_4	L_6	L_7
TU40C	180	186	30(−)	90	19.5	60	55
	240	246	90(40)				
	300	306	150(100)				
	360	366	210(160)				
	420	426	270(220)				
TU40S TU40F	240	246	80(−)	90	31.5	70	67
	300	306	140(75)				
	360	366	200(135)				
	420	426	260(195)				
TU40G	240	246	60(−)	90	47.5	85	83
	300	306	120(−)				
	360	366	180(105)				
	420	426	240(165)				

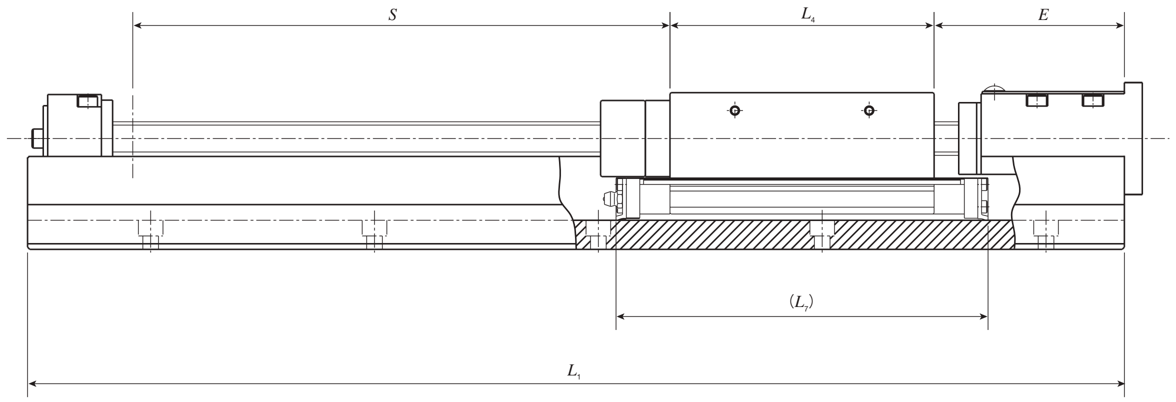
Model and size	Length of track rail L_1	Overall length L	Stroke length (1) S	E	L_4	L_6	L_7
TU50C	220	226	65(−)	90	23.8	65	63
	300	306	145(90)				
	380	386	225(170)				
	460	466	305(250)				
	540	546	385(330)				
	620	626	465(410)				
	700	706	545(490)				
TU50S TU50F	220	226	45(−)	90	42.8	85	82
	300	306	125(50)				
	380	386	205(130)				
	460	466	285(210)				
	540	546	365(290)				
	620	626	445(370)				
	700	706	525(450)				
TU50G	300	306	100(−)	90	66.8	110	106
	380	386	180(−)				
	460	466	260(160)				
	540	546	340(240)				
	620	626	420(320)				
	700	706	500(400)				

Note (1) The value indicates the allowable stroke length when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.

Remark: For dimensions of the slide table and track rail, please see the dimension table for each size.

TU60, TU86, TU100, TU130 Table with C-Lube





unit: mm

Model and size	Length of track rail L_1	Overall length L	Stroke length (1) S		E		L_4	L_6	L_7
			Lead 5mm Lead 10mm	Lead 20mm	Lead 5mm Lead 10mm	Lead 20mm			
TU60C TU60FC	290	298	90(–)	70(–)	100	120	27.4	75	70
	390	398	190(140)	170(120)					
	490	498	290(240)	270(220)					
	590	598	390(340)	370(320)					
	690	698	490(440)	470(420)					
	790	798	590(540)	570(520)					
TU60S TU60F	290	298	90(–)	70(–)	80	95	52.4	100	95
	390	398	190(110)	170(100)					
	490	498	290(210)	270(200)					
	590	598	390(310)	370(300)					
	690	698	490(410)	470(400)					
	790	798	590(510)	570(500)					
TU60G TU60FG	290	298	–(–)	–(–)	80	85	83	130	125
	390	398	160(–)	155(–)					
	490	498	260(150)	255(150)					
	590	598	360(250)	355(250)					
	690	698	460(350)	455(350)					
	790	798	560(450)	555(450)					

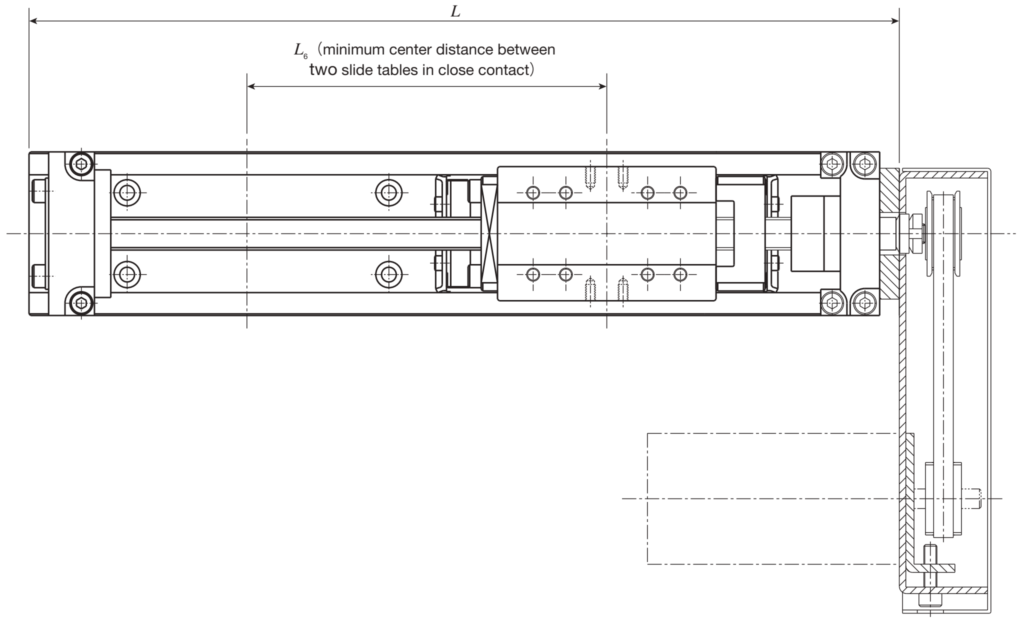
Model and size	Length of track rail L_1	Overall length L	Stroke length (1) S	E	L_4	L_6	L_7
TU86C TU86FC	490	498	260(190)	110	43	95	92
	590	598	360(290)				
	690	698	460(390)				
	790	798	560(490)				
	890	898	660(590)				
	990	998	760(690)				
	1 090	1 098	860(790)				
	1 190	1 198	960(890)				
TU86S TU86F	490	498	230(120)	85	93	145	142
	590	598	330(220)				
	690	698	430(320)				
	790	798	530(420)				
	890	898	630(520)				
	990	998	730(620)				
	1 090	1 098	830(720)				
	1 190	1 198	930(820)				
TU86G TU86FG	490	498	210(–)	85	118	170	167
	590	598	310(170)				
	690	698	410(270)				
	790	798	510(370)				
	890	898	610(470)				
	990	998	710(570)				
	1 090	1 098	810(670)				
	1 190	1 198	910(770)				
TU100S TU100F	1 010	1 020	670(540)	130	111	170	166
	1 160	1 170	820(690)				
	1 310	1 320	970(840)				
	1 460	1 470	1 120(990)				
TU130S TU130F	1 010	1 020	630(480)	140	132	195	190
	1 160	1 170	780(630)				
	1 310	1 320	930(780)				
	1 460	1 470	1 080(930)				
	1 610	1 620	1 230(1 080)				

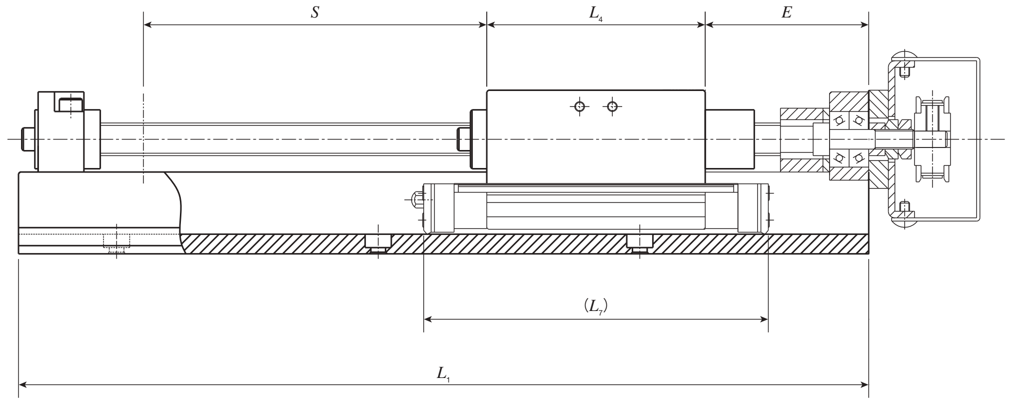
Note (1) The value indicates the allowable stroke length when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.

Remark: For dimensions of the slide table and track rail, please see the dimension table for each size.

IKO Precision Positioning Table TU

TU40, TU50 Table with C-Lube (Motor folding back specification)





unit: mm

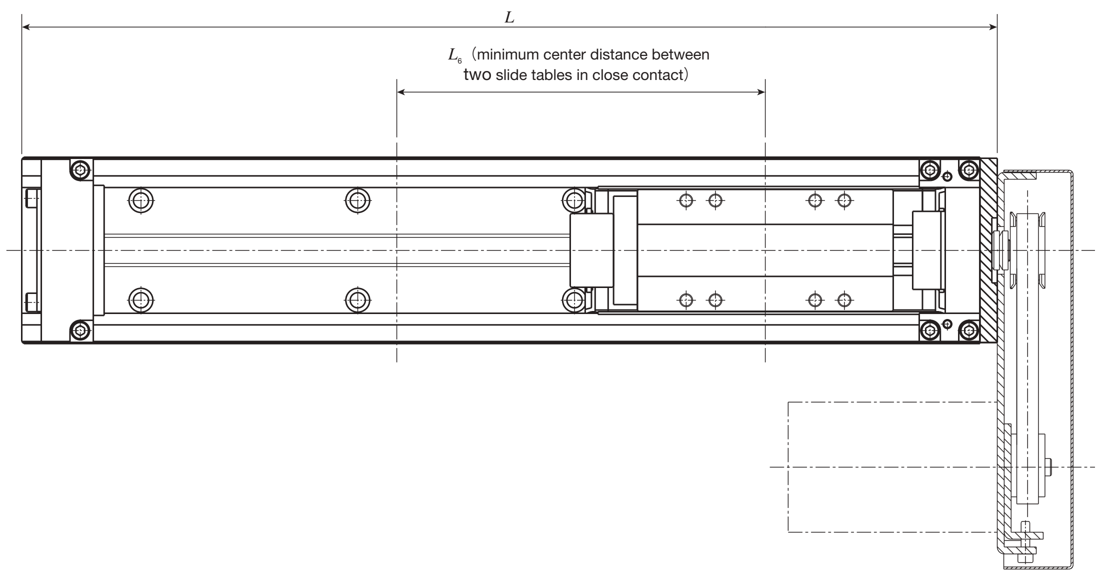
Model and size	Length of track rail L_1	Overall length L	Stroke length [1] S	E	L_4	L_6	L_7
TU40C	140	146	30(−)	50	19.5	60	55
	200	206	90(40)				
	260	266	150(100)				
	320	326	210(160)				
	380	386	270(220)				
TU40S TU40F	200	206	80(−)	50	31.5	70	67
	260	266	140(75)				
	320	326	200(135)				
	380	386	260(195)				
TU40G	200	206	60(−)	50	47.5	85	83
	260	266	120(−)				
	320	326	180(105)				
	380	386	240(165)				

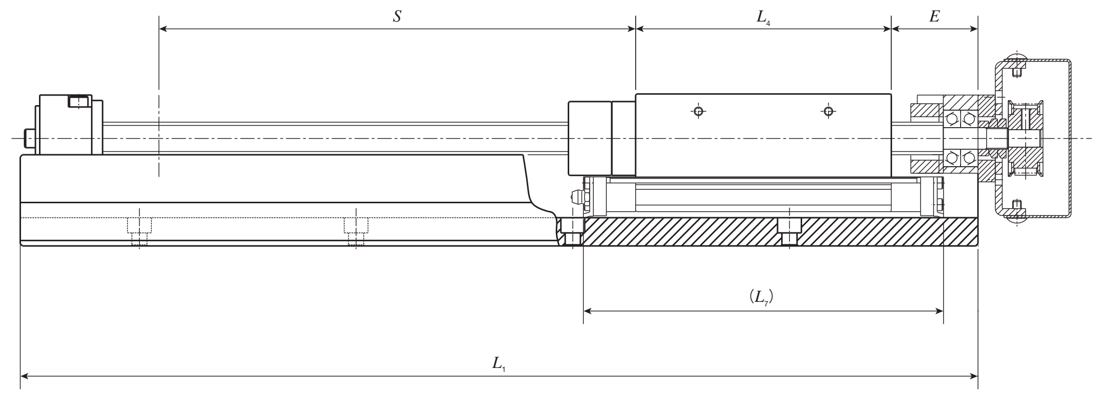
Model and size	Length of track rail L_1	Overall length L	Stroke length [1] S	E	L_4	L_6	L_7
TU50C	180	186	65(−)	50	23.8	65	63
	260	266	145(90)				
	340	346	225(170)				
	420	426	305(250)				
	500	506	385(330)				
	580	586	465(410)				
	660	666	545(490)				
TU50S TU50F	180	186	45(−)	50	42.8	85	82
	260	266	125(50)				
	340	346	205(130)				
	420	426	285(210)				
	500	506	365(290)				
	580	586	445(370)				
	660	666	525(450)				
TU50G	260	266	100(−)	50	66.8	110	106
	340	346	180(80)				
	420	426	260(160)				
	500	506	340(240)				
	580	586	420(320)				
	660	666	500(400)				

Note (1) The value indicates the allowable stroke length when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.

Remarks 1. Parts for motor attachment are appended. This figure indicates a finished state after the motor attachment is assembled by the customer.
2. For dimensions of the slide table and track rail, please see the dimension table for each size.

TU60, TU86 Table with C-Lube (Motor folding back specification)





unit: mm

Model and size	Length of track rail L_1	Overall length L	Stroke length (1) S		E		L_4	L_6	L_7
			Lead 5mm Lead 10mm	Lead 20mm	Lead 5mm Lead 10mm	Lead 20mm			
TU60C TU60FC	244	252	90(–)	70(–)	55	74	27.4	75	70
	344	352	190(140)	170(120)					
	444	452	290(240)	270(220)					
	544	552	390(340)	370(320)					
	644	652	490(440)	470(420)					
	744	752	590(540)	570(520)					
TU60S TU60F	244	252	80(–)	70(–)	40	49	52.4	100	95
	344	352	180(110)	170(100)					
	444	452	280(210)	270(200)					
	544	552	380(310)	370(300)					
	644	652	480(410)	470(400)					
	744	752	580(510)	570(500)					
TU60G TU60FG	244	252	–(–)	–(–)	40	39	83	130	125
	344	352	150(–)	155(–)					
	444	452	250(150)	255(150)					
	544	552	350(250)	355(250)					
	644	652	450(350)	455(350)					
	744	752	550(450)	555(450)					

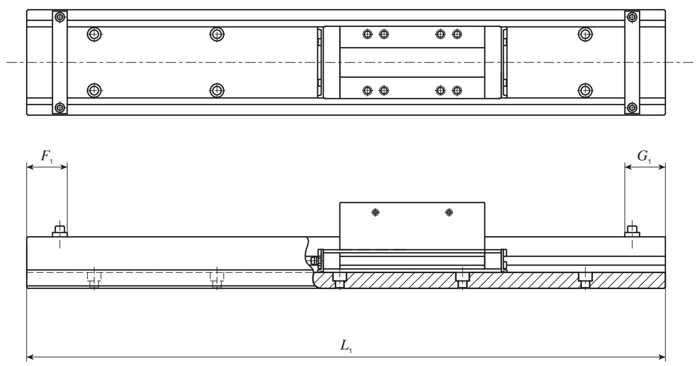
Model and size	Length of track rail L_1	Overall length L	Stroke length (1) S	E	L_4	L_6	L_7
TU86C TU86FC	442	450	250(190)	70	43	95	92
	542	550	350(290)				
	642	650	450(390)				
	742	750	550(490)				
	842	850	650(590)				
	942	950	750(690)				
	1 042	1 050	850(790)				
	1 142	1 150	950(890)				
TU86S TU86F	442	450	230(120)	40	93	145	142
	542	550	330(220)				
	642	650	430(320)				
	742	750	530(420)				
	842	850	630(520)				
	942	950	730(620)				
	1 042	1 050	830(720)				
	1 142	1 150	930(820)				
TU86G TU86FG	442	450	210(–)	40	118	170	167
	542	550	310(170)				
	642	650	410(270)				
	742	750	510(370)				
	842	850	610(470)				
	942	950	710(570)				
	1 042	1 050	810(670)				
	1 142	1 150	910(770)				

Note (1) The value indicates the allowable stroke length when limit sensors are mounted. The value in ( ) represents dimension for two slide tables in close contact.

Remarks 1. Parts for motor attachment are appended. This figure indicates a finished state after the motor attachment is assembled by the customer.
2. For dimensions of the slide table and track rail, please see the dimension table for each size.

Precision Positioning Table TU

Without ball screw specification



unit: mm

Model and size	Specification of track rail	Length of track rail L_1	Without bridge cover		With bridge cover	
			F_1	G_1	F_1	G_1
TU 25	Without motor folding back	130	14	14	14	14
		165				
		200				
TU 30	Without motor folding back	140	14	14	14	14
		180				
		220				
		260				
		300				
		340				
TU 40	Without motor folding back	180	20	18	20	18
		240				
		300				
		360				
		420				
	Motor folding back specification	140	20	18	20	18
		200				
		260				
		320				
		380				
TU 50	Without motor folding back	220	20	18	20	18
		300				
		380				
		460				
		540				
		620				
		700				
	Motor folding back specification	180	20	18	20	18
		260				
		340				
		420				
		500				
		580				
		660				
TU 60	Without motor folding back	290	32	17	35	29
		390				
		490				
		590				
		690				
		790				
		990				
		1190	32	17	–	–
	Motor folding back specification	244	32	28	35	29
		344				
		444				
		544				
		644				
		744				
TU 86	Without motor folding back	490	32	19	35	29
		590				
		690				
		790				
		890				
		990				
		1 090				
		1 190				
		1 390				
		1 590	32	19	–	–
	Motor folding back specification	442	32	28	35	29
		542				
		642				
		742				
		842				
		942				
		1 042				
		1 142				
TU 100	Without motor folding back	1 010	35	34	35	34
		1 160				
		1 310				
		1 460				
TU 130	Without motor folding back	1 010	35	38	35	38
		1 160				
		1 310				
		1 460				
		1 610				

Remark: For dimensions of the slide table and track rail, please see the dimension table for each size.

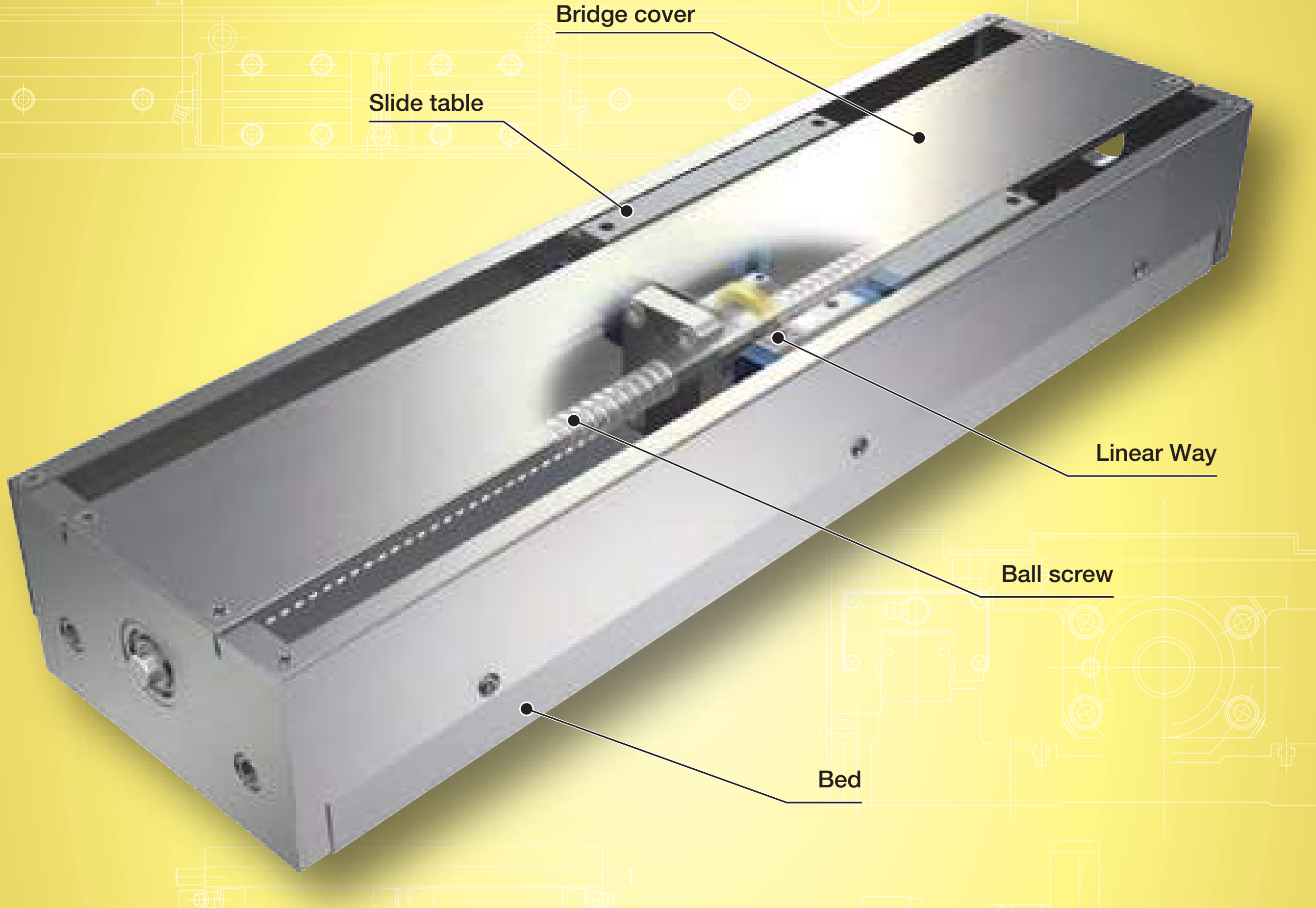
TSL…M

TSL···M

IKO C-Lube Maintenance-free

Ball screw

Linear



Major product specifications

Driving method	Precision ball screw
Linear motion rolling guide	Linear Way（ball type）
Built-in lubrication part	Lubrication part "C-Lube" is built-in
Material of table and bed	High-strength aluminum alloy
Sensor	Provided as standard

Accuracy

unit: mm

Positioning repeatability	±0.002
Positioning accuracy	0.015～0.060
Lost motion	–
Parallelism in table motion A	–
Parallelism in table motion B	0.020～0.070
Attitude accuracy	–
Straightness	–
Backlash	0.003

Points

1 Light weight and long stroke positioning table

Light weight and long stroke positioning table configured with the slide table and bed made from high-strength aluminum alloy.

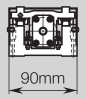
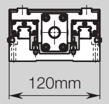
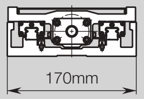
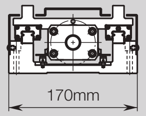
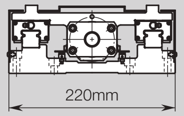
2 Stable high running accuracy and positioning accuracy

High running accuracy and high accuracy positioning are realized by incorporating 2 sets of Linear Way in parallel, and combining with precision ball screws.

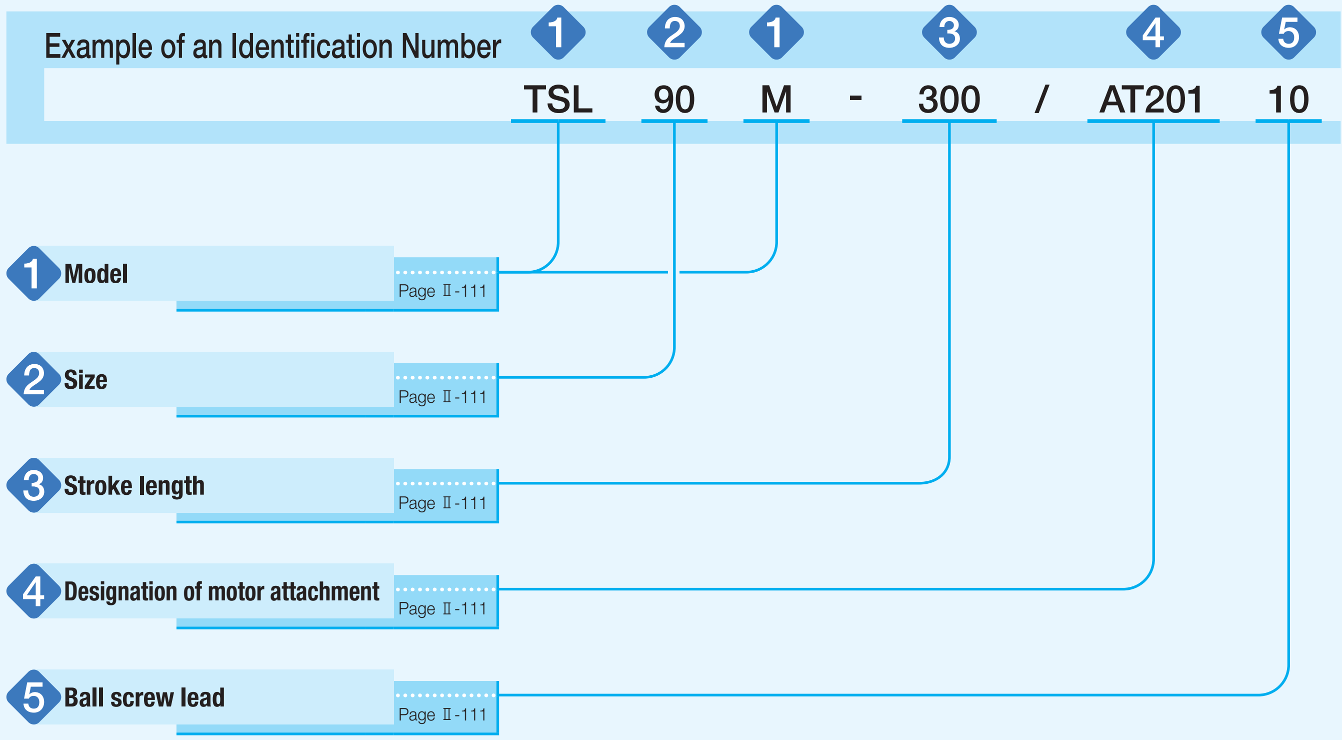
3 Configuration of multiaxis system available with XY bracket

A series of four sizes from 90mm to 220mm (table width) is available. Multiaxis configuration can be easily realized with XY bracket.

Variation

Shape	Model and size	Table width (mm)	Stroke length（mm）										
			50	100	150	200	250	300	400	500	600	800	1 000
 90mm	TSL 90 M	90	☆	☆	☆	☆	☆	☆	–	–	–	–	–
 120mm	TSL120 M	120	–	☆	☆	☆	☆	☆	☆	☆	☆	–	–
 170mm	TSL170 M	170	–	–	☆	☆	☆	☆	☆	☆	–	–	–
 170mm	TSL170SM	170	–	–	–	–	–	☆	☆	☆	☆	☆	☆
 220mm	TSL220 M	220	–	–	–	–	–	☆	☆	☆	☆	☆	☆

Identification Number



Example of an Identification Number

①	②	①		③		④	⑤
TSL	90	M	-	300	/	AT201	10

① Model — Page Ⅱ-111

② Size — Page Ⅱ-111

③ Stroke length — Page Ⅱ-111

④ Designation of motor attachment — Page Ⅱ-111

⑤ Ball screw lead — Page Ⅱ-111

Identification Number and Specification

① **Model**	TSL···M: Precision Positioning Table L
② **Size**	Size indicates table width. Select a size from the list of Table 1.
③ **Stroke length**	Select a stroke length from the list of Table 1.

Table 1 Sizes, table width dimensions, and stroke lengths unit: mm

Model and size	Table width	Stroke length
TSL 90 M	90	50, 100, 150, 200, 250, 300
TSL120 M	120	100, 150, 200, 250, 300, 400, 500, 600
TSL170 M	170	150, 200, 250, 300, 400, 500
TSL170S M	170	300, 400, 500, 600, 800, 1 000
TSL220 M	220	300, 400, 500, 600, 800, 1 000

④ **Designation of motor attachment**	As for a motor attachment, select it from the list of Table 2. · Motor should be prepared by customer. · Please specify motor attachment applicable to motor for use. · A coupling shown in Table 3 is mounted on the main body before shipment. However, the final position adjustment should be performed by customer since it is only temporarily fixed. · When specifying an AC servomotor attachment, an origin sensor is not provided.
⑤ **Ball screw lead**	5: Lead 5mm 10: Lead 10mm

Identification Number and Specification

Table 2 Application of motor attachment

Models of motor to be used					Flange size mm	Motor attachment			
Type	Manufacturer	Series	Model	Rated output W		TSL 90M TSL170M	TSL120M	TSL170SM	TSL220M
AC servo motor	YASKAWA ELECTRIC CORPORATION	Σ-7	**SGM7J-01A**	**100**	**□40**	AT201	AT201	–	–
			SGM7A-01A			AT201	AT201	–	–
			SGM7J-02A	**200**	**□60**	–	–	AT202	AT202
			SGM7A-02A			–	–	AT202	AT202
	Mitsubishi Electric Corporation	J4/J5	**HG-MR13**	**100**	**□40**	AT201	AT201	–	–
			HG-KR13/HK-KT13W			AT201	AT201	–	–
			HG-MR23	**200**	**□60**	–	–	AT202	AT202
			HG-KR23/HK-KT23W			–	–	AT202	AT202
	Panasonic Corporation	MINAS A6	**MSMF01**	**100**	**□38**	AT203	AT203	–	–
			MSMF02	**200**	**□60**	–	–	AT204	AT204
	Hitachi Industrial Equipment Systems Co., Ltd	AD	**ADMA-01L**	**100**	**□40**	AT201	AT201	–	–
			ADMA-02L	**200**	**□60**	–	–	AT202	AT202
Stepper motor	ORIENTAL MOTOR Co., Ltd.	α step	**ARM66**		**□60**	AT205	AT206	–	–
			ARM69		**□60**	AT205	AT206	–	–
			ARM98		**□85**	–	–	AT207	AT210
			ARM911		**□85**	–	–	AT207	AT210
		RKS CRK	**CRK56**⁽¹⁾		**□60**	AT208	AT209	–	–
			RKS59		**□85**	–	–	AT207	AT210

Note ⁽¹⁾ Applicable to the outer diameter φ8 of motor output shaft.

Remark: For detailed motor specifications, please see respective motor manufacturer's catalog.

Table 3 Coupling models

Motor attachment	Coupling models	Manufacturer	Coupling inertia J_c $\times 10^{-5}$kg · m²
AT201	UA-25C- 8× 8	Sakai Manufacturing Co., Ltd	0.29
AT202	UA-35C-12×14	Sakai Manufacturing Co., Ltd	1.34
AT203	UA-25C- 8× 8	Sakai Manufacturing Co., Ltd	0.29
AT204	UA-35C-11×12	Sakai Manufacturing Co., Ltd	1.34
AT205	MSTS-25C- 8×10	Nabeya Bi-tech Kaisha	0.71
AT206	MSTS-25C- 8×10	Nabeya Bi-tech Kaisha	0.71
AT207	MSTS-32C-12×14	Nabeya Bi-tech Kaisha	2.70
AT208	MSTS-20C- 8× 8	Nabeya Bi-tech Kaisha	0.25
AT209	MSTS-25C- 8× 8	Nabeya Bi-tech Kaisha	0.71
AT210	MSTS-32C-12×14	Nabeya Bi-tech Kaisha	2.70

Remark: For detailed coupling specifications, please see respective manufacturer's catalog.

Specifications

Table 4 Accuracy

unit: mm

Model and size	Stroke length	Positioning repeatability	Positioning accuracy	Parallelism in table motion B	Backlash
TSL 90 M	50	±0.002	0.015	0.020	0.003
	100		0.020	0.030	
	150				
	200		0.025		
	250				
	300		0.030	0.040	
TSL120 M	100	±0.002	0.020	0.030	0.003
	150				
	200		0.025		
	250				
	300		0.030	0.040	
	400		0.040	0.050	
	500		0.045		
	600		0.050	0.070	
TSL170 M	150	±0.002	0.020	0.030	0.003
	200		0.025		
	250				
	300		0.030	0.050	
	400		0.040		
	500		0.045		
TSL170SM TSL220 M	300	±0.002	0.030	0.040	0.003
	400		0.040	0.050	
	500		0.045		
	600		0.050	0.070	
	800				
	1 000		0.060		

Table 5 Maximum speed

Motor type	Model and size	Stroke length mm	Maximum speed mm/s	
			Lead 5mm	Lead 10mm
AC Servomotor	TSL 90 M	–	500	1000
	TSL120 M	500 or less	370	750
		600	370	720
	TSL170 M	–	370	750
	TSL170 SM	800 or less	280	560
	TSL220 M	1000	190	390
Stepper motor	TSL 90 M TSL120 M TSL170 M TSL170 SM TSL220 M	–	150	300

Remark: To measure the practical maximum speed, it is required to consider operation patterns based on the motor to be used and load conditions.

Table 6 Maximum carrying mass

Model and size	Ball screw lead mm	Carrying mass position mm	Maximum carrying mass kg							
			Horizontal direction				Vertical direction			
		Height H \ Length L	0	100	200	300	0	100	200	300
TSL 90 M	5	0	46	20	11	8	7	7	7	7
		100	46	20	11	8	7	7	7	7
		200	46	20	11	8	7	7	7	7
		300	46	20	11	8	7	7	6	5
	10	0	26	16	9	6	4.7	4.7	4.7	4.7
		100	26	15	9	6	4.7	4.7	4.7	4.7
		200	26	14	8	6	4.7	4.7	4.7	4.7
		300	26	13	8	6	4.7	4.7	4.7	4.4
TSL120 M	5	0	195	144	84	59	18	18	18	18
		100	195	143	83	59	18	18	18	18
		200	195	140	83	58	18	18	18	18
		300	195	136	82	58	18	18	18	18
	10	0	97	97	63	44	18	18	18	18
		100	97	97	63	44	18	18	18	18
		200	97	97	61	44	18	18	18	18
		300	97	92	59	43	18	18	18	18
TSL170 M	5	0	195	174	104	74	18	18	18	18
		100	195	171	103	74	18	18	18	18
		200	195	166	102	73	18	18	18	18
		300	195	160	101	73	18	18	18	18
	10	0	97	97	78	55	17	17	17	17
		100	97	97	77	55	17	17	17	17
		200	97	97	74	54	17	17	17	17
		300	97	97	70	52	17	17	17	17
TSL170SM	5	0	218	191	117	84	21	21	21	21
		100	218	190	117	84	21	21	21	21
		200	218	188	116	84	21	21	21	21
		300	218	186	116	84	21	21	21	21
	10	0	113	113	90	65	20	20	20	20
		100	113	113	89	64	20	20	20	20
		200	113	113	88	64	20	20	20	20
		300	113	113	86	63	20	20	20	20
TSL220 M	5	0	226	226	226	226	19	19	19	19
		100	226	226	226	226	19	19	19	19
		200	226	226	226	226	19	19	19	19
		300	226	226	226	225	19	19	19	19
	10	0	111	111	111	111	18	18	18	18
		100	111	111	111	111	18	18	18	18
		200	111	111	111	111	18	18	18	18
		300	111	111	111	111	18	18	18	18

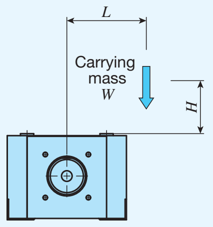
Remark: The maximum carrying mass is adjusted by the mass when the rating life of the linear motion rolling guide, ball screws, or bearings is 18,000 hours during continuous operation at a number of revolutions of the motor of 3000min^{-1} and an acceleration/deceleration time of 0.2s. The mass calculated is based upon the basic static load rating of the linear motion rolling guide.

Specifications

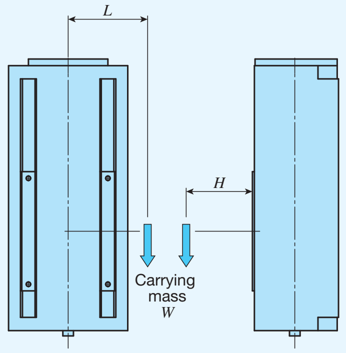
Table 7 Maximum load mass

Model and size	Ball screw lead mm	Maximum load mass kg	
		Horizontal direction	Vertical direction
TSL 90 M	5	169	42
	10	89	21
TSL120 M	5	124	36
	10	76	20
TSL170 M	5	132	37
	10	78	20
TSL170 SM	5	92	41
	10	114	36
TSL220 M	5	77	36
	10	110	35

Remarks 1. The maximum load mass shows the mass that ensures acceleration/deceleration of 0.3G.
2. The values shown in this table were calculated with the motor with the highest rated torque installed, selected from the AC servomotor models listed in Table 2.

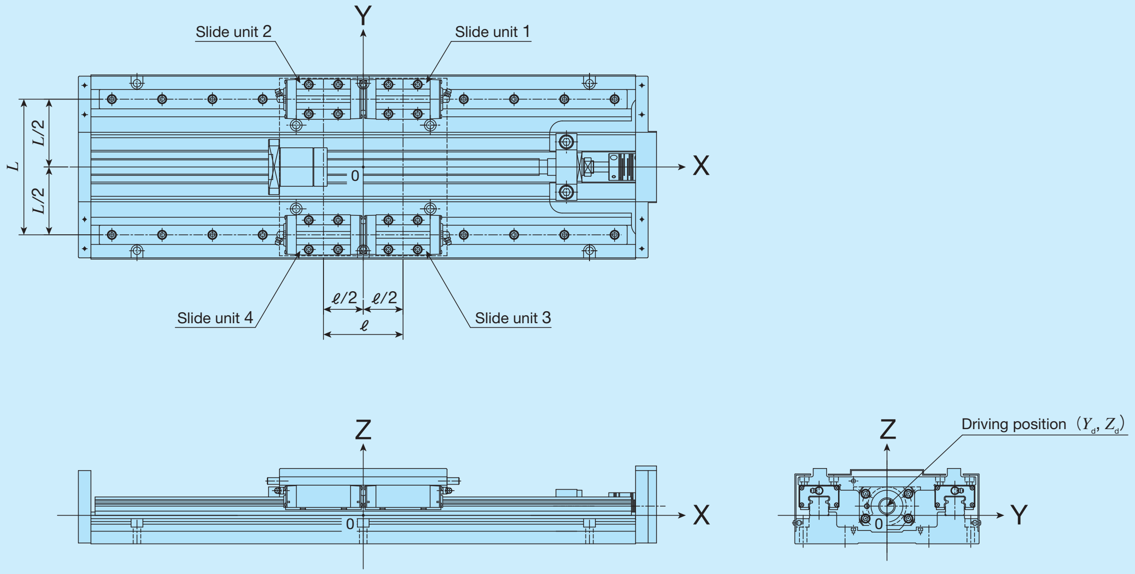


Carrying mass position
(horizontal direction)



Carrying mass position
(vertical direction)

Table 8 Specification of linear motion rolling guide



Model and size	Basic dynamic load rating(1) C N	Basic static load rating(1) C_0 N	Arrangement			
			L mm	ℓ mm	Y_d mm	Z_d mm
TSL 90 M	1 810	2 760	60	60	0	−7
TSL120 M	11 600	13 400	80	66	0	8
TSL170 M			106	66	0	11
TSL170SM			120	130	0	1
TSL220 M	25 200	28 800	162	95	0	11

Note (1) Represent the value per slide unit.

Specifications

Table 9.1 Specifications of ball screw 1

Model and size	Lead mm	Shaft dia. mm	Axial clearance mm	Basic dynamic load rating C N	Basic static load rating C_0 N
TSL 90 M	5	10	0.005	1 470	2 210
	10			1 030	1 370
TSL120 M TSL170 M	5	15	0.005	3 820	6 370
	10			3 820	6 370
TSL170SM TSL220 M	5	20	0.005	4 460	8 580
	10			4 460	8 580

Table 9.2 Specifications of ball screw 2

unit: mm

Model and size	Stroke length	Shaft dia.	Overall length
TSL 90 M	50	10	179
	100		229
	150		279
	200		329
	250		379
	300		429
TSL120 M	100	15	273
	150		323
	200		373
	250		423
	300		473
	400		573
	500		673
	600		773
TSL170 M	150	15	289
	200		339
	250		389
	300		439
	400		539
	500		639
TSL170SM	300	20	545
	400		645
	500		745
	600		845
	800		1 045
	1 000		1 245
TSL220 M	300	20	545
	400		645
	500		745
	600		845
	800		1 045
	1 000		1 245

Table 10 Table inertia and starting torque

Model and size	Stroke length mm	Table inertia J_T $\times 10^{-5}$kg・m^2		Starting torque T_S N・m
		Lead 5mm	Lead 10mm	
TSL 90 M	50	0.20	0.33	0.05
	100	0.25	0.38	
	150	0.28	0.40	
	200	0.33	0.45	
	250	0.35	0.48	
	300	0.40	0.53	
TSL120 M	100	1.3	1.7	0.06
	150	1.5	1.9	
	200	1.7	2.1	
	250	1.9	2.3	
	300	2.1	2.5	
	400	2.4	2.9	
	500	2.8	3.3	
	600	3.2	3.7	
TSL170 M	150	1.4	1.8	0.06
	200	1.6	2.0	
	250	1.8	2.2	
	300	2.0	2.4	
	400	2.3	2.8	
	500	2.7	3.2	
TSL170S M	300	6.9	7.4	0.10
	400	8.1	8.6	
	500	9.3	9.8	
	600	11	11	
	800	13	14	
	1 000	15	16	
TSL220 M	300	7.5	8.5	0.10
	400	8.7	9.7	
	500	9.9	11	
	600	11	12	
	800	14	15	
	1 000	16	17	

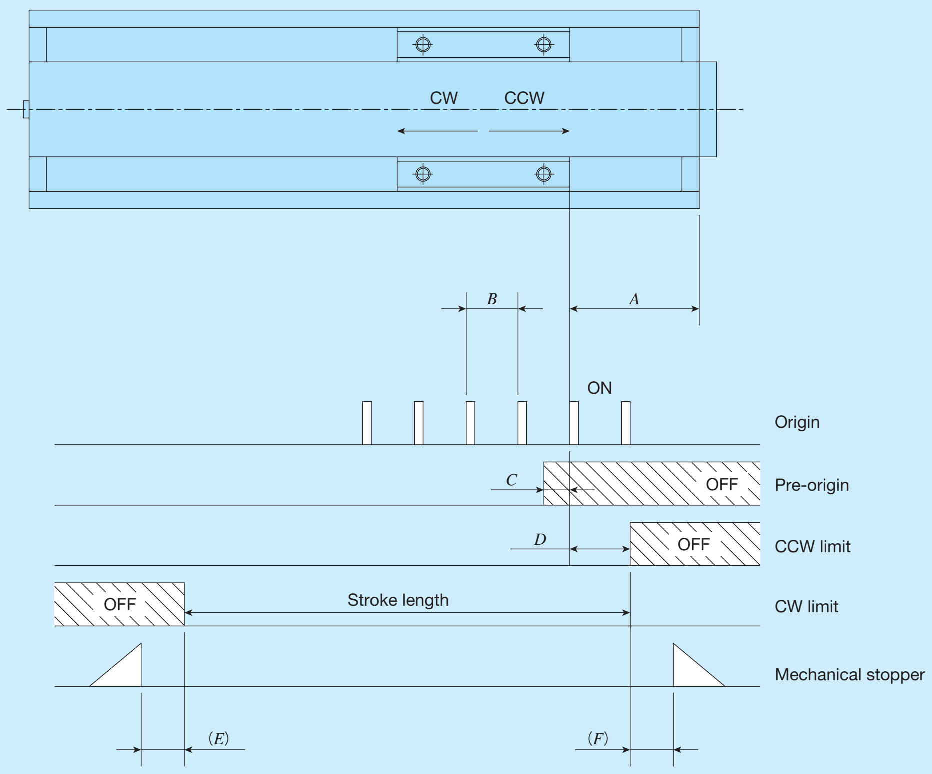
Mounting

For the processing accuracy of the Precision Positioning Table mounting surface and the tightening torque of the fixing screws, see page Ⅲ-30.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Sensor Specification

Table 11 Sensor timing chart



unit: mm

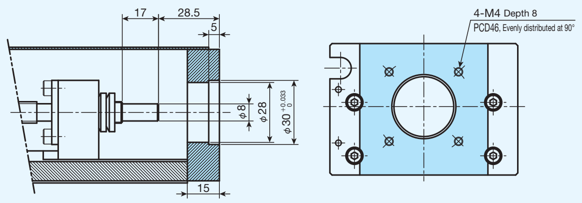
Model and size	Ball screw lead	*A*	*B*	*C*	*D*	*E*	*F*
TSL 90 M	5	50	5	3	20	5	5
	10		10	7			
TSL120 M	5	60	5	3	20	15	15
	10		10	7			
TSL170 M	5	45	5	3	20	3	3
	10		10	7			
TSL170SM	5	60	5	3	20	5	5
	10		10	7			
TSL220 M	5	60	5	3	20	5	5
	10		10	7			

Remark: For detailed specifications of respective sensors, please see the section of sensor specification in General Explanation.

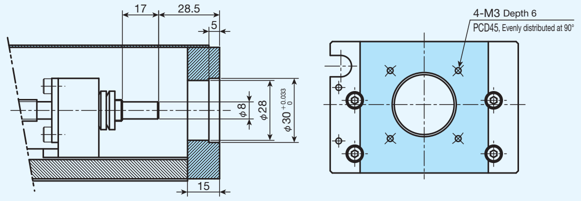
Dimensions of Motor Attachment

TSL90M

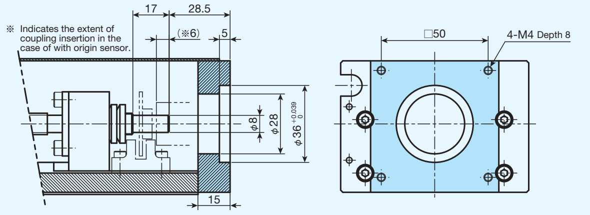
AT201



AT203

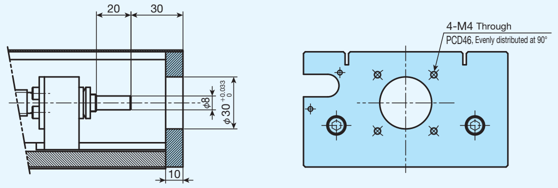


AT205
AT208



TSL120M

AT201



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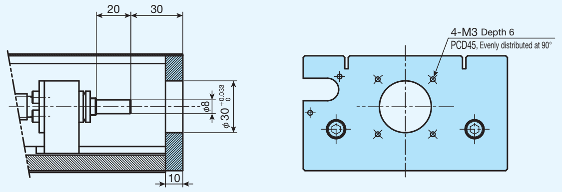
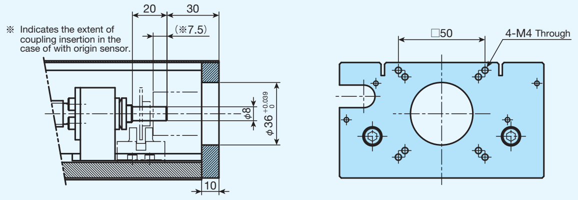
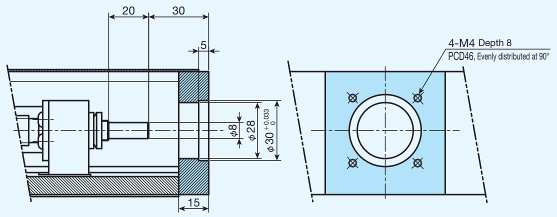


AT206
AT209

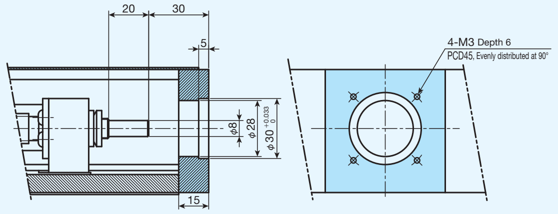


TSL170M

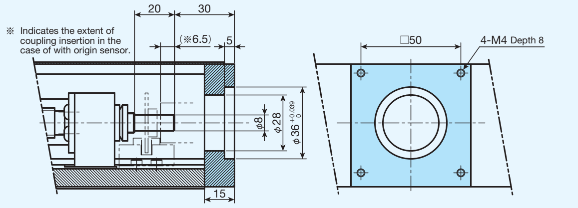
AT201



AT203

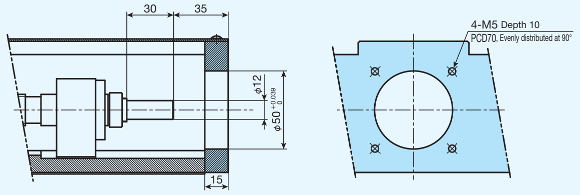


AT205
AT208

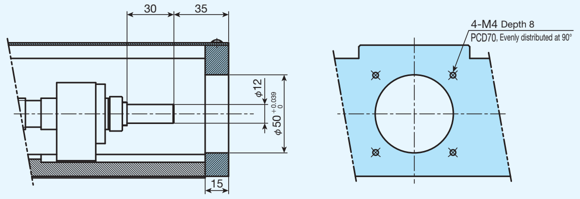


TSL170SM

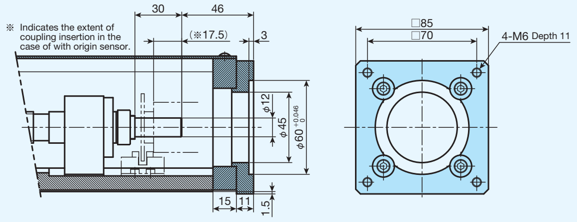
AT202



AT204



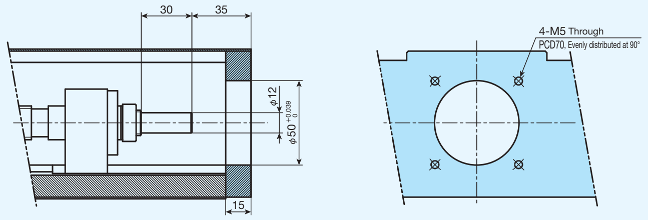
AT207



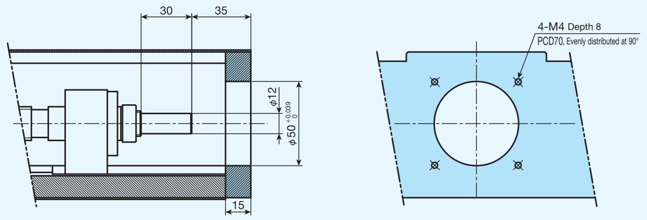
Dimensions of Motor Attachment

TSL220M

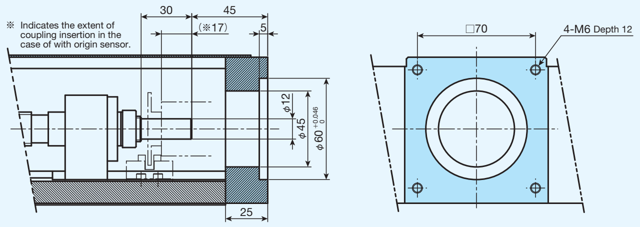
AT202



AT204



AT210



XY Bracket

Precision Positioning Table L can configure various combinations of two-axis using XY bracket (aluminum alloy) shown in Fig. 2. If you are interested, please specify the identification number of your desired model from the figure.

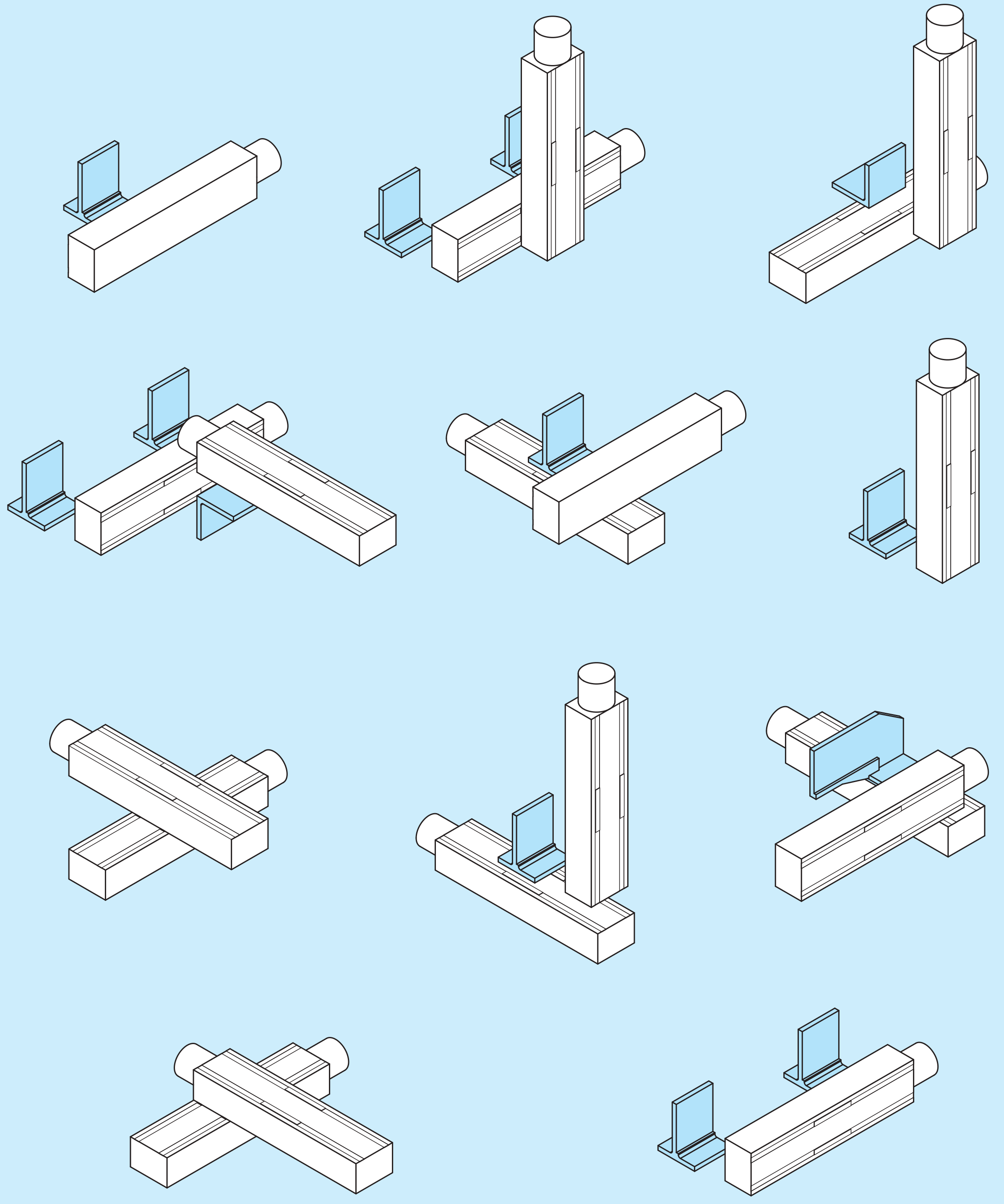
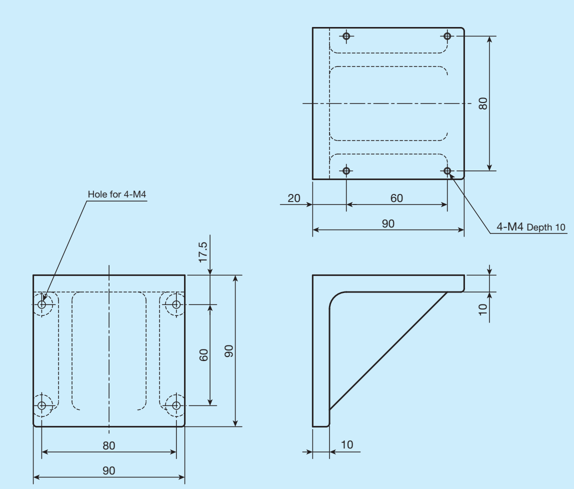
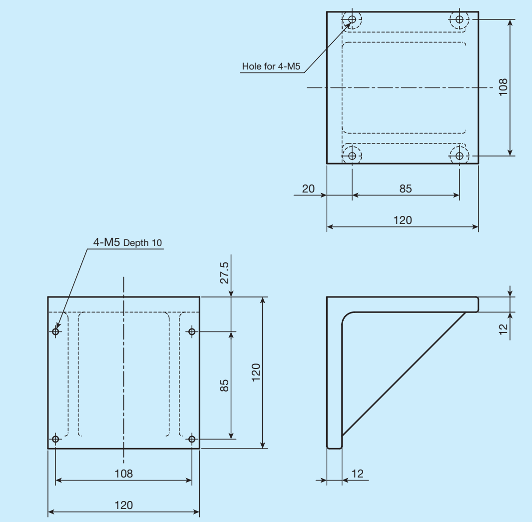


Fig. 1 Examples of two-axis combinations

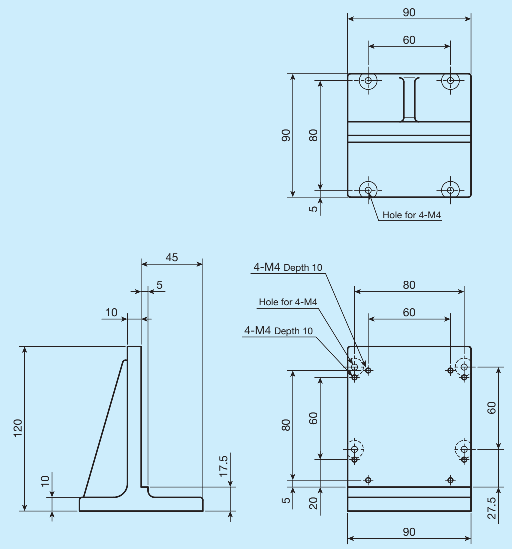
●TSL90-AGL



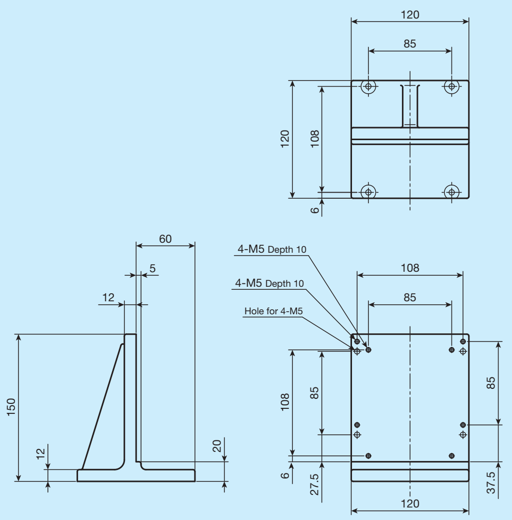
●TSL120-AGL



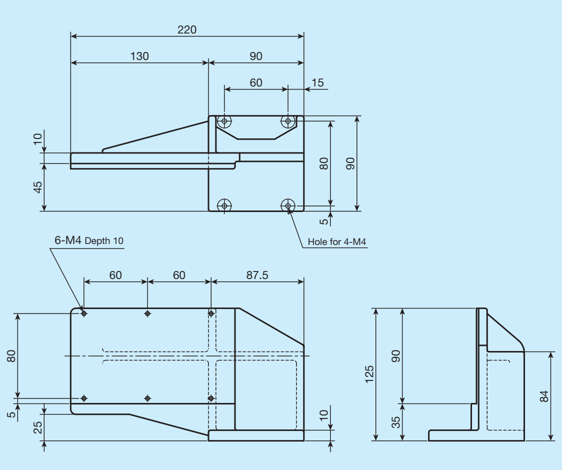
●TSL90-AGI



●TSL120-AGI



●TSL90-AGT



●TSL120-AGT

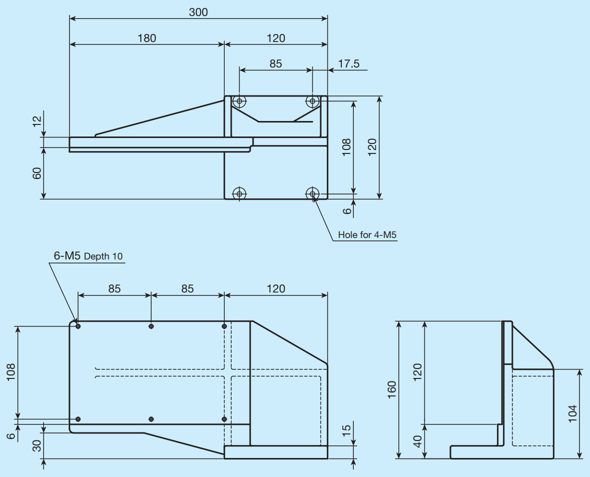
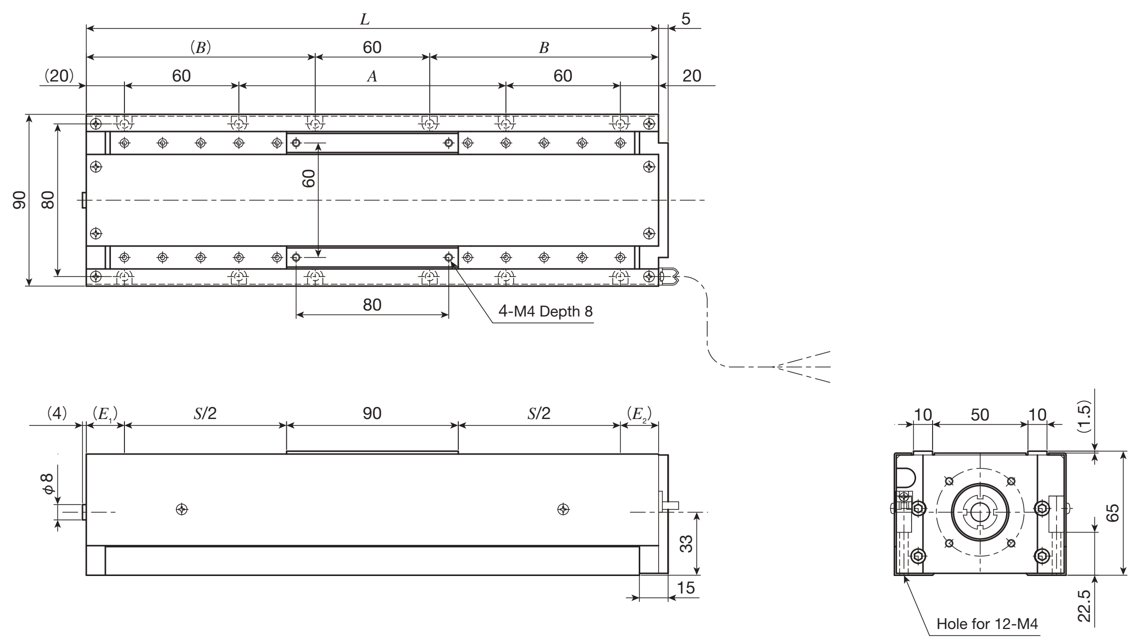


Fig. 2 XY bracket

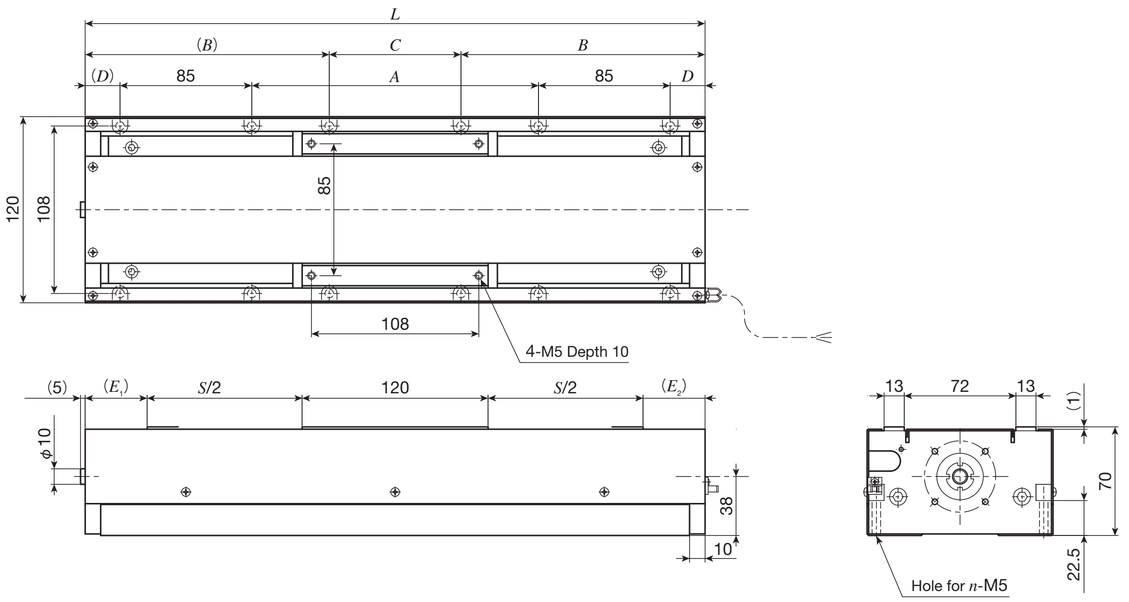
TSL90M



unit: mm

Identification number	Stroke length			Dimensions of table			Mass (Ref.) kg
	S	E_1	E_2	Overall length *L*	Mounting holes of bed *A*	*B*	
TSL90M- 50	50	30	30	200	40	70	2.8
TSL90M-100	100			250	90	95	3.2
TSL90M-150	150			300	140	120	3.5
TSL90M-200	200			350	190	145	3.9
TSL90M-250	250			400	240	170	4.2
TSL90M-300	300			450	290	195	4.6

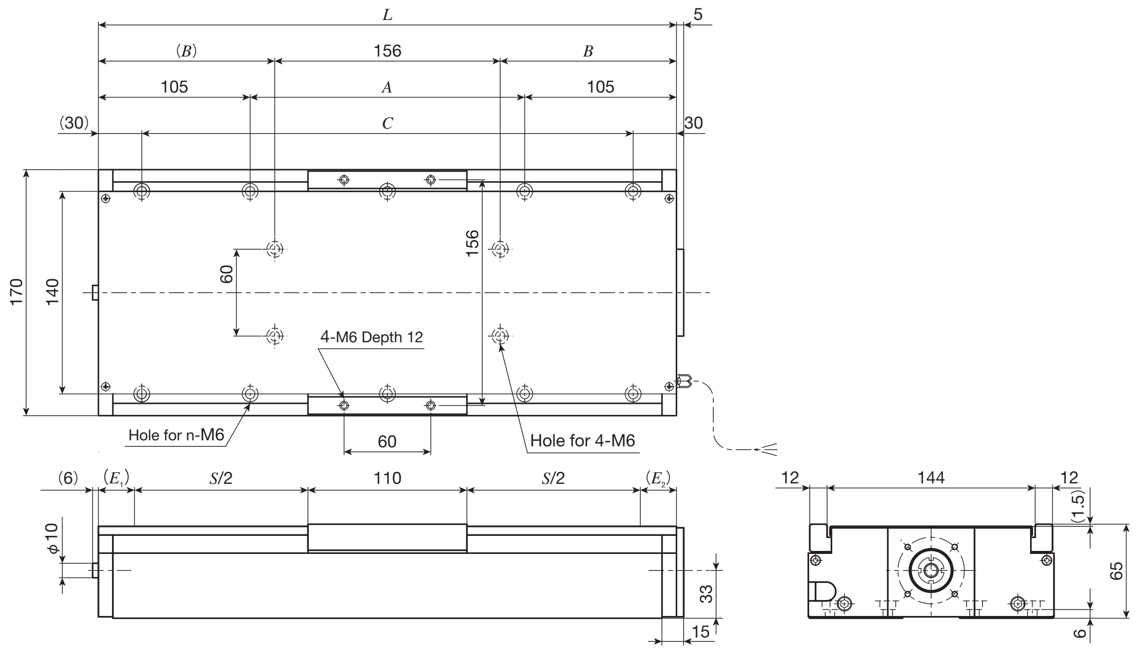
TSL120M



unit: mm

Identification number	Stroke length			Dimensions of table						Mass (Ref.) kg
				Overall length	Mounting holes of bed					
	S	E_1	E_2	L	A	B	C	D	n	
TSL120M-100	100	40	40	300	85	107.5	85	22.5	8	6.1
TSL120M-150	150			350	135	132.5	85	22.5	12	6.6
TSL120M-200	200			400	185	157.5	85	22.5	12	7.1
TSL120M-250	250			450	235	182.5	85	22.5	12	7.6
TSL120M-300	300			500	255	207.5	85	37.5	12	8.1
TSL120M-400	400			600	355	207.5	185	37.5	12	9.1
TSL120M-500	500			700	455	207.5	285	37.5	12	10.1
TSL120M-600	600			800	555	207.5	385	37.5	12	11.1

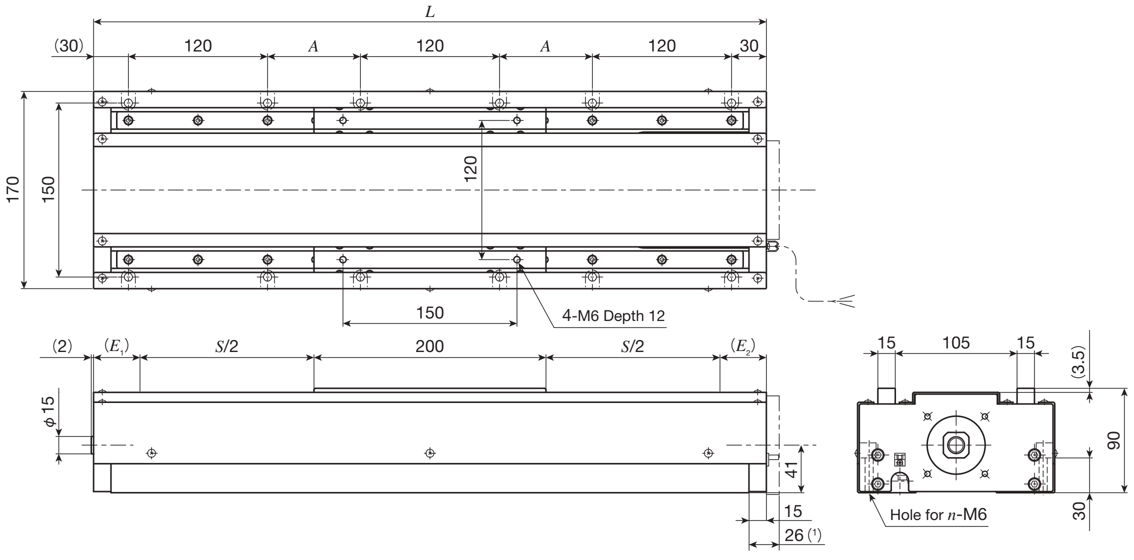
TSL170M



unit: mm

Identification number	Stroke length			Dimensions of table					Mass (Ref.) kg
				Overall length	Mounting holes of bed				
	S	E_1	E_2	L	A	B	C (the number of holes×pitch)	n	
TSL170M-150	150	25	25	310	100	77	250	8	7.2
TSL170M-200	200			360	150	102	300	8	7.8
TSL170M-250	250			410	200	127	350（2×175）	10	8.4
TSL170M-300	300			460	250	152	400（2×200）	10	9.1
TSL170M-400	400			560	350	202	500（2×250）	10	10.4
TSL170M-500	500			660	450	252	600（2×300）	10	11.6

TSL170SM

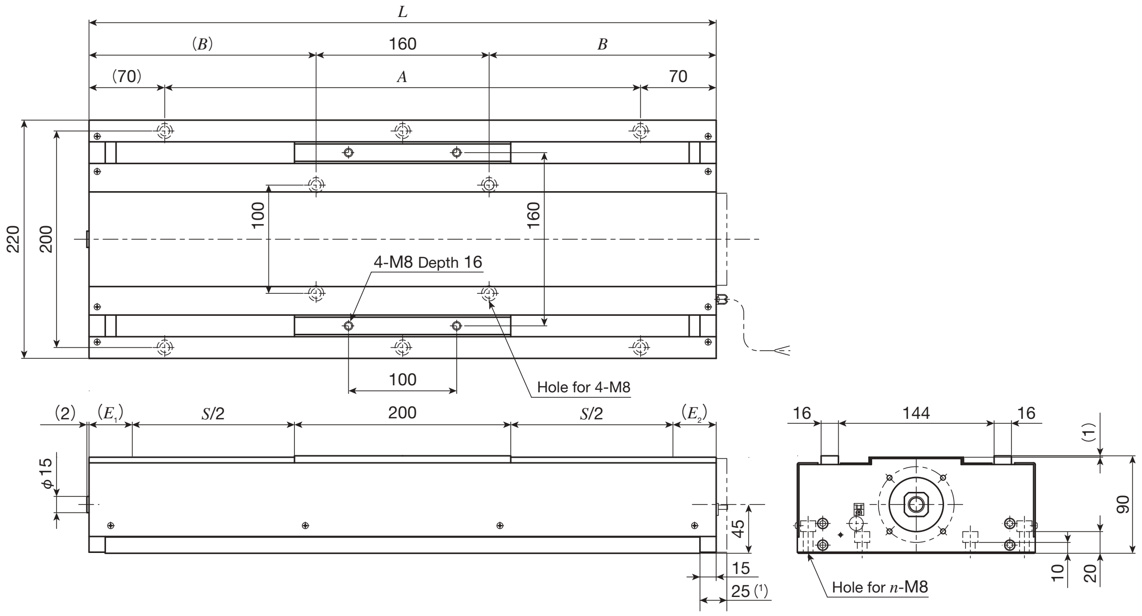


unit: mm

Identification number	Stroke length			Dimensions of table			Mass (Ref.) kg
	S	E_1	E_2	Overall length L	Mounting holes of bed A (the number of holes×pitch)	n	
TSL170SM- 300	300	40	40	580	80	12	14.8
TSL170SM- 400	400			680	130	12	16.6
TSL170SM- 500	500			780	180	12	18.5
TSL170SM- 600	600			880	230	12	20.3
TSL170SM- 800	800			1 080	330 (2×165)	16	24.0
TSL170SM-1000	1 000			1 280	430 (2×215)	16	27.7

Note (1) Applicable to AT207.

TSL220M



unit: mm

Identification number	Stroke length			Dimensions of table				Mass (Ref.) kg
	S	E_1	E_2	Overall length L	Mounting holes of bed A (the number of holes×pitch)	B	n	
TSL220M- 300	300	40	40	580	440 (2×220)	210	6	20.1
TSL220M- 400	400			680	540 (2×270)	260	6	22.5
TSL220M- 500	500			780	640 (2×320)	310	6	24.7
TSL220M- 600	600			880	740 (4×185)	360	10	27.0
TSL220M- 800	800			1 080	940 (4×235)	460	10	31.5
TSL220M-1000	1 000			1 280	1 140 (4×285)	560	10	36.2

Note (1) Applicable to AT210.

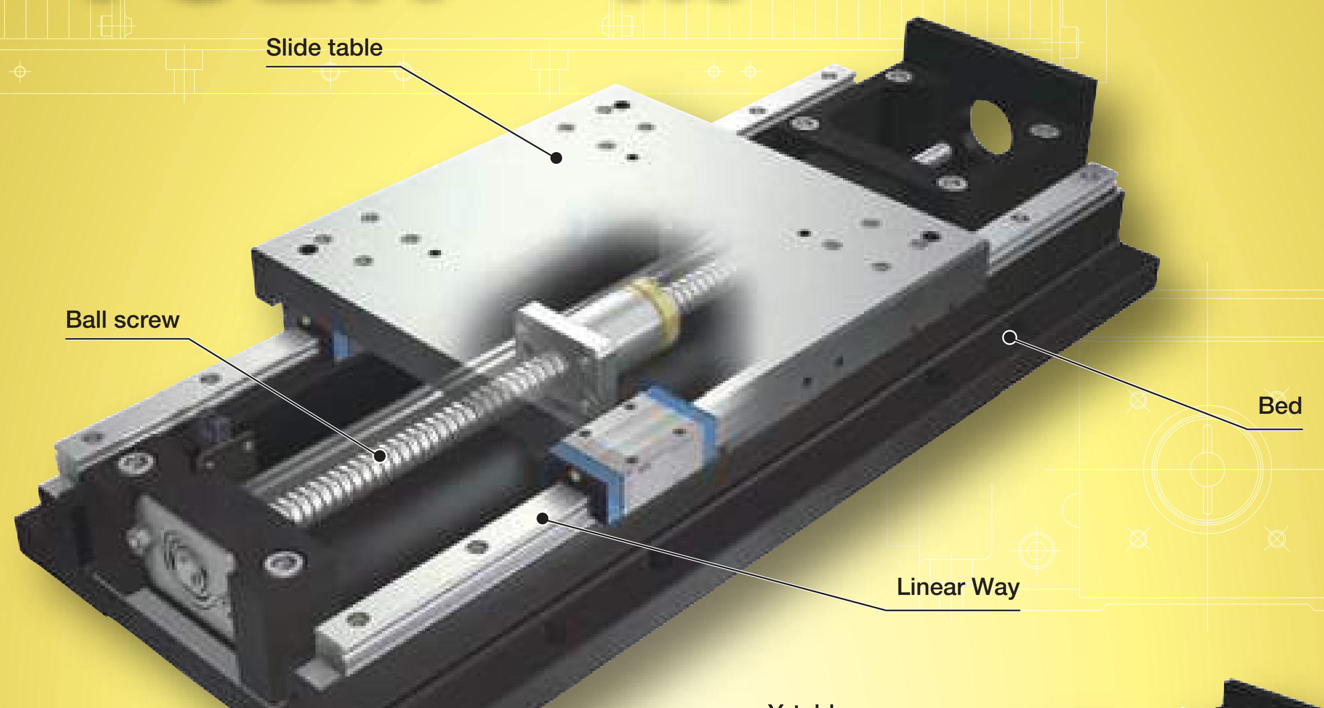
TSLH…M
CTLH…M

TSLH···M

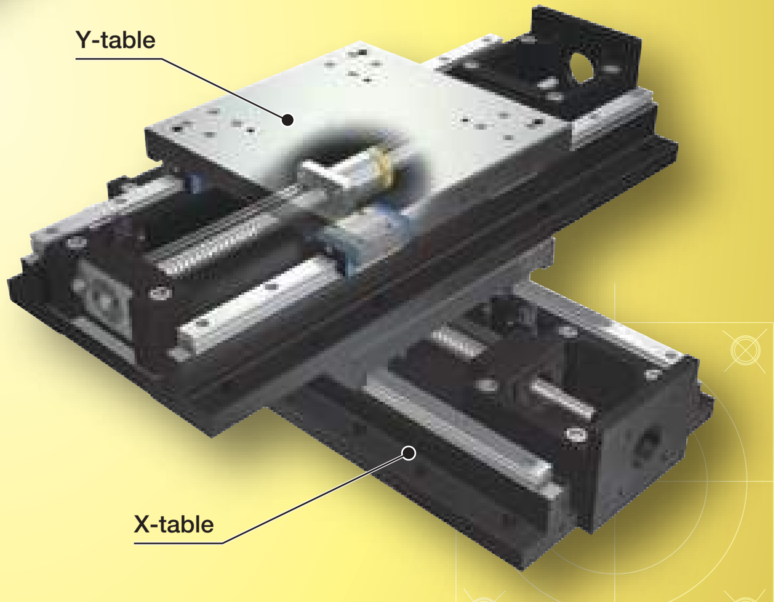
C-Lube Maintenance-free

Ball screw

Linear



CTLH···M



Major product specifications

Driving method	Precision ball screw
Linear motion rolling guide	Linear Way（ball type）
Built-in lubrication part	Lubrication part "C-Lube" is built-in
Material of table and bed	Cast iron
Sensor	Provided as standard

Accuracy

unit: mm

Positioning repeatability	±0.002
Positioning accuracy	0.010～0.035
Lost motion	–
Parallelism in table motion A	0.010～0.035
Parallelism in table motion B	–
Attitude accuracy	–
Straightness	0.005～0.025
Backlash	0.001

Points

1 ● High precision, high rigidity positioning table

High precision, high rigidity positioning table configured with high rigidity and vibration damping performance cast iron slide tables and beds.

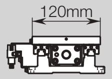
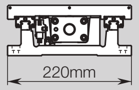
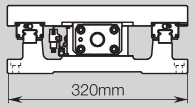
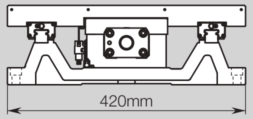
2 ● High running accuracy and positioning accuracy

High running accuracy and high accuracy positioning are realized by incorporating 2 sets of Linear Way in parallel on cast iron slide tables and beds finished by accurate ground and combining with precision ball screws.

3 ● High rigidity and large carrying mass

The structure with large carrying mass, and resistant to moment and complex load since 2 sets of Linear Way are optimally positioned on the high rigidity bed.

Variation

Shape	Model and size	Table width (mm)	Stroke length（mm）									
			100	150	200	250	300	400	500	600	800	1000
 120mm	TSLH120M	120	☆	☆	☆	☆	☆	–	–	–	–	–
 220mm	TSLH220M	220	–	☆	☆	☆	☆	☆	(☆)	(☆)	–	–
 320mm	TSLH320M	320	–	–	–	–	☆	☆	☆	(☆)	(☆)	(☆)
 420mm	TSLH420M	420	–	–	–	–	–	–	☆	☆	☆	(☆)

Identification Number

Example of an Identification Number
(Single-axis specification)

1	2	1		3		4	5	6	7
TSLH	120	M	-	300	/	AT301	10	J	R

1 **Model** Page Ⅱ-134

2 **Size** Page Ⅱ-134

3 **Stroke length** Page Ⅱ-134

4 **Designation of motor attachment** Page Ⅱ-134

5 **Ball screw lead** Page Ⅱ-134

6 **Designation of bellow** Page Ⅱ-134

7 **Surface treatment** Page Ⅱ-134

Identification Number and Specification

1 Model

TSLH···M: Precision Positioning Table LH (single-axis specification)

2 Size

Size indicates table width.
Select a size from the list of Table 1.

3 Stroke length

Select a stroke length from the list of Table 1.

As for a table with bellows, available stroke length is somewhat shorter, so please see the dimension table.

Table 1 Sizes, table width dimensions, and stroke lengths unit: mm

Model and size	Table width	Stroke length
TSLH120M	120	100, 150, 200, 250, 300
TSLH220M	220	150, 200, 250, 300, 400 (500, 600)
TSLH320M	320	300, 400, 500 (600, 800, 1 000)
TSLH420M	420	500, 600, 800 (1 000)

Remark: If the stroke length shown in ( ) is needed, please contact IKO.

4 Designation of motor attachment

As for a motor attachment, select it from the list of Table 3.

- Motor should be prepared by customer.
- Please specify motor attachment applicable to motor for use.
- A coupling shown in Table 4 is mounted on the main body before shipment. However, the final position adjustment should be made by customer since it is only temporarily fixed.
- When specifying an AC servomotor attachment, an origin sensor is not provided.

5 Ball screw lead

5: Lead 5mm
10: Lead 10mm

6 Designation of bellow

No symbol: Without bellows
J : With bellows

As for a table with bellows, available stroke length is somewhat shorter, so please see the dimension table.

7 Surface treatment

No symbol: Black chrome surface treatment
R : Black chrome surface treatment 1
L : Black chrome surface treatment 2

Black chrome surface treatment: This treatment is performed on main parts excluding Linear Way, ball screw, and ball bearing.
Black chrome surface treatment 1: In addition to the above black chrome surface treatment, this treatment is performed even on the surface of Linear Way.
Black chrome surface treatment 2: In addition to the above black chrome surface treatment 1, this treatment is performed even on the surface of ball screw.
The black chrome surface treatment improves the corrosion resistance by forming black permeable film on the surface.
For the upper and lower surfaces of the main body and the reference surfaces of respective parts, surface treatment is excluded.

Identification Number

Example of an Identification Number
(Two-axis specification)

①	②	①		③	④		⑤	⑥	⑦	⑧	⑨
CTLH	120	M	-	30	20	/	AT301	10	J	R	C

- ① **Model** Page Ⅱ-136
- ② **Size** Page Ⅱ-136
- ③ **X-axis stroke length** Page Ⅱ-136
- ④ **Y-axis stroke length** Page Ⅱ-136
- ⑤ **Designation of motor attachment** Page Ⅱ-136
- ⑥ **Ball screw lead** Page Ⅱ-136
- ⑦ **Designation of bellow** Page Ⅱ-136
- ⑧ **Surface treatment** Page Ⅱ-136
- ⑨ **Designation of combination direction** Page Ⅱ-136

Identification Number and Specification

① Model

CTLH…M: Precision Positioning Table LH (two-axis specification)

② Size

Size indicates table width.
Select a size from the list of Table 2.

Tables of different sizes can also be combined.

③ X-axis stroke length

④ Y-axis stroke length

Select a stroke length from the list of Table 2.

Stroke lengths of respective axes are displayed in cm. Please note that allowable lengths for X- and Y-axes vary.
As for a table with bellows, available stroke length is somewhat shorter, so please see the dimension table.

Table 2 Sizes, table width dimensions, and stroke lengths

unit: mm

Model and size	Table width	Stroke length	
		X-axis	Y-axis
CTLH120M	120	100	100
		200	100
		200	200
		300	200
		300	300
CTLH220M	220	200	200
		300	200
		300	300
		400	300
		400	400
CTLH320M	320	300	300
		400	300
		400	400
		500	400
		500	500

⑤ Designation of motor attachment

As for a motor attachment, select it from the list of Table 3.

- Motor should be prepared by customer.
- Please specify motor attachment applicable to motor for use.
- A coupling shown in Table 4 is mounted on the main body before shipment. However, the final position adjustment should be made by customer since it is only temporarily fixed.
- When specifying an AC servomotor attachment, an origin sensor is not provided.

⑥ Ball screw lead

5: Lead 5mm
10: Lead 10mm

⑦ Designation of bellow

No symbol: Without bellows
J : With bellows

As for a table with bellows, available stroke length is somewhat shorter, so please see the dimension table.

⑧ Surface treatment

No symbol: Black chrome surface treatment
R : Black chrome surface treatment 1
L : Black chrome surface treatment 2

Black chrome surface treatment: This treatment is performed on main parts excluding Linear Way, ball screw, and ball bearing.
Black chrome surface treatment 1: In addition to the above black chrome surface treatment, this treatment is performed even on the surface of Linear Way.
Black chrome surface treatment 2: In addition to the above black chrome surface treatment 1, this treatment is performed even on the surface of ball screw.
The black chrome surface treatment improves the corrosion resistance by forming black permeable film on the surface.
For the upper and lower surfaces of the main body and the reference surfaces of respective parts, surface treatment is excluded.

⑨ Designation of combination direction

No symbol: Standard configuration
C : Reverse configuration

Standard configuration: A direction under the condition where X-axis motor side is placed at the front and Y-axis motor side is placed on the right side respectively.
Reverse configuration: A direction under the condition where X-axis motor side is placed at the front and Y-axis motor side is placed on the left side respectively.

Table 3 Application of motor attachment

Models of motor to be used					Flange size mm	Motor attachment			
Type	Manufacturer	Series	Model	Rated output W		TSLH120M CTLH120M	TSLH220M CTLH220M	TSLH320M CTLH320M	TSLH420M
AC servo motor	YASKAWA ELECTRIC CORPORATION	Σ-7	SGM7J-01A	100	□40	AT301	–	–	–
			SGM7A-01A			AT301	–	–	–
			SGM7J-02A	200	□60	AT302	AT303	–	–
			SGM7A-02A			AT302	AT303	–	–
			SGM7J-04A	400		–	AT303	AT304	–
			SGM7A-04A			–	AT303	AT304	–
			SGM7J-08A	750	□80	–	–	AT305	AT306
			SGM7A-08A			–	–	AT305	AT306
	Mitsubishi Electric Corporation	J4/J5	HG-MR13	100	□40	AT301	–	–	–
			HG-KR13/HK-KT13W			AT301	–	–	–
			HG-MR23	200	□60	AT302	AT303	–	–
			HG-KR23/HK-KT23W			AT302	AT303	–	–
			HG-MR43	400		–	AT303	AT304	–
			HG-KR43/HK-KT43W			–	AT303	AT304	–
			HG-MR73	750	□80	–	–	AT305	AT306
			HG-KR73/HK-KT7M3W			–	–	AT305	AT306
	Panasonic Corporation	MINAS A6	MSMF01	100	□38	AT307	–	–	–
			MSMF02	200	□60	AT308	AT309	AT311	–
			MSMF04	400		–	AT310	AT312	–
			MSMF08	750	□80	–	–	AT313	AT314
	Hitachi Industrial Equipment Systems Co., Ltd	AD	ADMA-01L	100	□40	AT301	–	–	–
			ADMA-02L	200	□60	AT302	AT303	–	–
			ADMA-04L	400		–	AT303	AT304	–
			ADMA-08L	750	□75	–	–	AT305	AT306
Stepper motor	ORIENTAL MOTOR Co., Ltd.	α step	ARM66		□60	AT315	–	–	–
			ARM69			AT315	–	–	–
			ARM98		□85	–	AT317	AT318	–
			ARM911			–	AT317	AT318	–
		RKS CRK	CRK56 (1)		□60	AT316	–	–	–
			RKS59		□85	–	AT317	AT318	–

Note (1) Applicable to the outer diameter ϕ8 of motor output shaft.

Remark: For detailed motor specifications, please see respective motor manufacturer's catalog.

Table 4 Coupling models

Motor attachment	Coupling models	Manufacturer	Coupling inertia J_c $\times 10^{-5}$kg・m^2
AT301	UA-25C- 8× 8	Sakai Manufacturing Co., Ltd	0.290
AT302	UA-30C- 8×14	Sakai Manufacturing Co., Ltd	0.603
AT303	UA-35C-12×14	Sakai Manufacturing Co., Ltd	1.34
AT304	UA-35C-14×15	Sakai Manufacturing Co., Ltd	1.34
AT305	UA-40C-15×19	Sakai Manufacturing Co., Ltd	2.61
AT306	UA-40C-15×19	Sakai Manufacturing Co., Ltd	2.61
AT307	UA-25C- 8× 8	Sakai Manufacturing Co., Ltd	0.290
AT308	UA-30C- 8×11	Sakai Manufacturing Co., Ltd	0.603
AT309	UA-35C-11×12	Sakai Manufacturing Co., Ltd	1.34
AT310	UA-35C-12×14	Sakai Manufacturing Co., Ltd	1.34
AT311	UA-35C-11×15	Sakai Manufacturing Co., Ltd	1.34
AT312	UA-35C-14×15	Sakai Manufacturing Co., Ltd	1.34
AT313	UA-40C-15×19	Sakai Manufacturing Co., Ltd	2.61
AT314	UA-40C-15×19	Sakai Manufacturing Co., Ltd	2.61
AT315	MSTS-25C- 8×10	Nabeya Bi-tech Kaisha	0.71
AT316	MSTS-25C- 8× 8	Nabeya Bi-tech Kaisha	0.71
AT317	MSTS-32C-12×14	Nabeya Bi-tech Kaisha	2.7
AT318	MSTS-40C-14×15	Nabeya Bi-tech Kaisha	9.0

Remark: For detailed coupling specifications, please see respective manufacturer's catalog.

Specifications

Table 5 Accuracy

unit: mm

Model and size		Stroke length		Positioning repeatability	Positioning accuracy	Parallelism in table motion A	Straightness	Squareness of XY motion	Backlash
		X-axis	Y-axis						
Single-axis specification	TSLH120M	100		±0.002	0.010	0.010	0.005	–	0.001
		150							
		200			0.015	0.015			
		250					0.010		
		300			0.020	0.020			
	TSLH220M	150		±0.002	0.010	0.010	0.005	–	0.001
		200			0.015	0.015			
		250							
		300							
		400			0.020	0.020	0.010		
	TSLH320M	300		±0.002	0.015	0.015	0.005	–	0.001
		400			0.020				
		500							
	TSLH420M	500		±0.002	0.025	0.025	0.015	–	0.001
		600			0.030	0.030			
		800			0.035	0.035	0.020		
Two-axis specification	CTLH120M	100	100	±0.002	0.015	0.015	0.005	0.005	0.001
		200	100		0.020	0.020	0.010	0.010	
		200	200			0.025			
		300	200		0.030	0.030	0.025		
		300	300						
	CTLH220M	200	200	±0.002	0.020	0.025	0.010	0.010	0.001
		300	200						
		300	300						
		400	300		0.030	0.035	0.020	0.015	
		400	400						
	CTLH320M	300	300	±0.002	0.020	0.020	0.005	0.010	0.001
		400	300		0.025	0.025	0.010	0.015	
		400	400						
		500	400		0.030				
		500	500						

Table 6 Maximum speed

Motor type	Model and size		Maximum speed mm/s	
	Single-axis specification	Two-axis specification	Lead 5mm	Lead 10mm
AC servo motor	TSLH120M TSLH220M	CTLH120M CTLH220M	250	500
	TSLH320M TSLH420M	CTLH320M	224	448
Stepper motor	TSLH120M TSLH220M TSLH320M	CTLH120M CTLH220M CTLH320M	150	300

Remark: To measure the practical maximum speed, it is required to consider operation patterns based on the motor to be used and load conditions.

Specifications

Table 7 Maximum carrying mass

Model and size	Ball screw lead mm	Carrying mass position mm	Maximum carrying mass kg							
			Horizontal direction				Vertical direction			
		Height H \ Length L	0	100	200	300	0	100	200	300
TSLH120M	5	0	135	82	48	34	28	28	28	28
		100	135	82	48	34	28	28	28	26
		200	135	81	48	34	28	28	28	23
		300	135	79	47	34	28	28	24	20
	10	0	135	63	36	26	28	28	28	23
		100	135	61	36	25	28	28	28	20
		200	135	58	35	25	28	28	23	17
		300	111	54	34	25	26	21	18	15
TSLH220M	5	0	218	218	141	103	30	30	30	30
		100	218	218	140	103	30	30	30	30
		200	218	218	140	103	30	30	30	30
		300	218	214	139	102	30	30	30	30
	10	0	187	170	108	79	29	29	29	29
		100	187	167	107	78	29	29	29	29
		200	187	161	105	77	29	29	29	29
		300	187	153	102	76	29	29	29	29
TSLH320M	5	0	536	536	498	378	27	27	27	27
		100	536	536	496	377	27	27	27	27
		200	536	536	494	376	27	27	27	27
		300	536	536	491	375	27	27	27	27
	10	0	254	254	254	254	25	25	25	25
		100	254	254	254	254	25	25	25	25
		200	254	254	254	254	25	25	25	25
		300	254	254	254	254	25	25	25	25
TSLH420M	5	0	519	519	519	437	10	10	10	10
		100	519	519	519	437	10	10	10	10
		200	519	519	519	436	10	10	10	10
		300	519	519	519	435	10	10	10	10
	10	0	237	237	237	237	8	8	8	8
		100	237	237	237	237	8	8	8	8
		200	237	237	237	237	8	8	8	8
		300	237	237	237	237	8	8	8	8

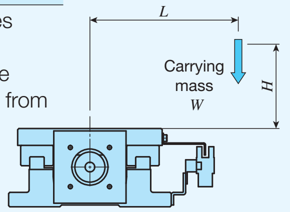
Remark: The maximum carrying mass is adjusted by the mass when the rating life of the linear motion rolling guide, ball screws, or bearings is 18,000 hours during continuous operation at a number of revolutions of the motor of 3000min^{-1} and an acceleration/deceleration time of 0.2s. The mass calculated is based upon the basic static load rating of the linear motion rolling guide.

Table 8 Maximum load mass

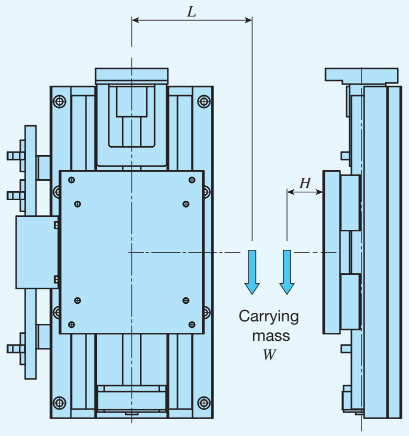
Model and size	Ball screw lead mm	Maximum load mass kg	
		Horizontal direction	Vertical direction
TSLH120M	5	301	84
	10	168	44
TSLH220M	5	566	169
	10	329	90
TSLH320M	5	777	272
	10	531	158
TSLH420M	5	571	227
	10	468	148

Remarks 1. The maximum load mass shows the mass that ensures acceleration/deceleration of 0.3G.

2. The values shown in this table were calculated with the motor with the highest rated torque installed, selected from the AC servomotor models listed in Table 3.

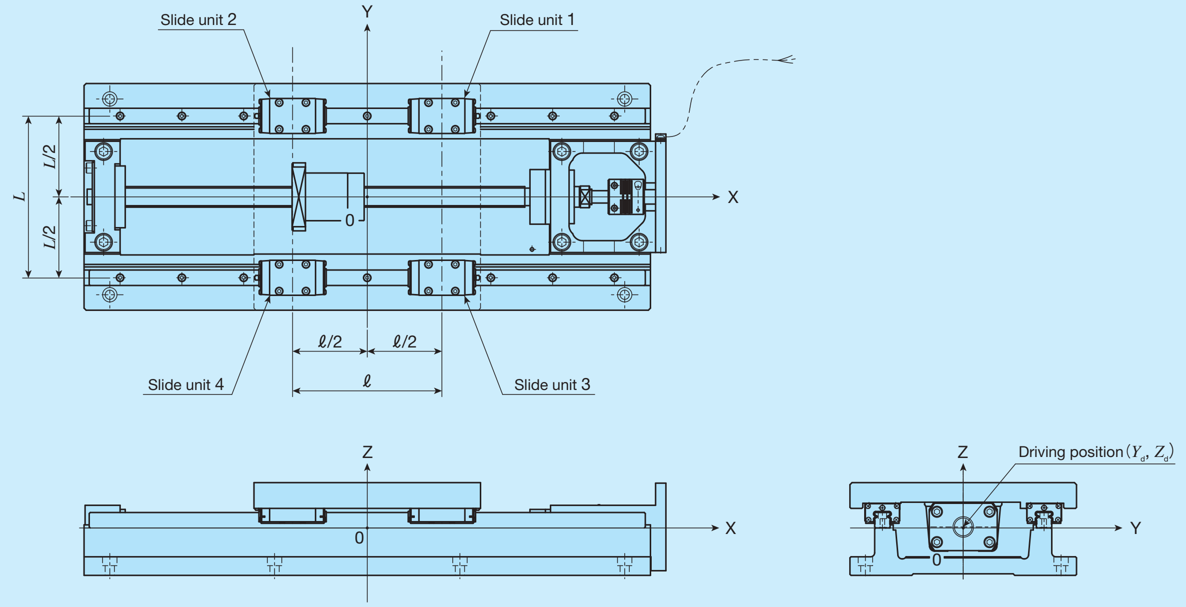


Carrying mass position
(horizontal direction)



Carrying mass position
(vertical direction)

Table 9 Specifications of linear motion rolling guide



Model and size	Basic dynamic load rating(¹) C N	Basic static load rating(¹) C_0 N	Arrangement			
			L mm	ℓ mm	Y_d mm	Z_d mm
TSLH120M	6 260	8 330	88	82	0	2
TSLH220M	11 600	13 400	157	145	0	1
TSLH320M	25 200	28 800	240	210	0	6
TSLH420M	30 800	38 300	300	290	0	0

Note (¹) Represent the value per slide unit.

Table 10.1 Specifications of ball screw 1

Model and size	Lead mm	Shaft dia. mm	Axial clearance mm	Basic dynamic load rating C N	Basic static load rating C_0 N
TSLH120M	5	15	0	7 070	12 800
	10			7 070	12 800
TSLH220M	5	20	0	8 230	17 510
	10			10 900	21 700
TSLH320M TSLH420M	5	25	0	16 700	43 500
	10			15 800	32 700

Table 10.2 Specifications of ball screw 2

unit: mm

Model and size	Stroke length	Shaft dia.	Overall length
TSLH120M	100	15	256
	150		306
	200		356
	250		406
	300		456
TSLH220M	150	20	370
	200		420
	250		470
	300		520
	400		620
TSLH320M	300	25	616
	400		716
	500		816
TSLH420M	500	25	916
	600		1 016
	800		1 216

Table 11 Table inertia and starting torque

Model and size		Stroke length mm		Table inertia J_T $\times 10^{-5}$kg・m^2		Starting torque T_S N・m	
		X-axis	Y-axis	Lead 5mm	Lead 10mm	Lead 5mm	Lead 10mm
Single-axis specification	TSLH120M	100		1.2	1.7	0.07	
		150		1.4	1.9		
		200		1.5	2.1		
		250		1.7	2.3		
		300		1.9	2.5		
	TSLH220M	150		5.1	6.9	0.12	
		200		5.7	7.5		
		250		6.3	8.1		
		300		7.0	8.7		
		400		8.2	10		
	TSLH320M	300		20	26	0.20	
		400		23	29		
		500		26	32		
	TSLH420M	500		30	39	0.22	
		600		33	42		
		800		39	48		
Two-axis specification	CTLH120M	100	100	1.8	4.2	0.08	
		200	100	2.2	4.5		
		200	200	2.3	5.1		
		300	200	2.7	5.5		
		300	300	2.8	6.0		
	CTLH220M	200	200	7.8	16	0.12	
		300	200	9.1	17		
		300	300	9.3	18		
		400	300	11	19		
		400	400	11	21		
	CTLH320M	300	300	27	51	0.22	0.25
		400	300	30	54		
		400	400	30	57		
		500	400	33	60		
		500	500	34	62		

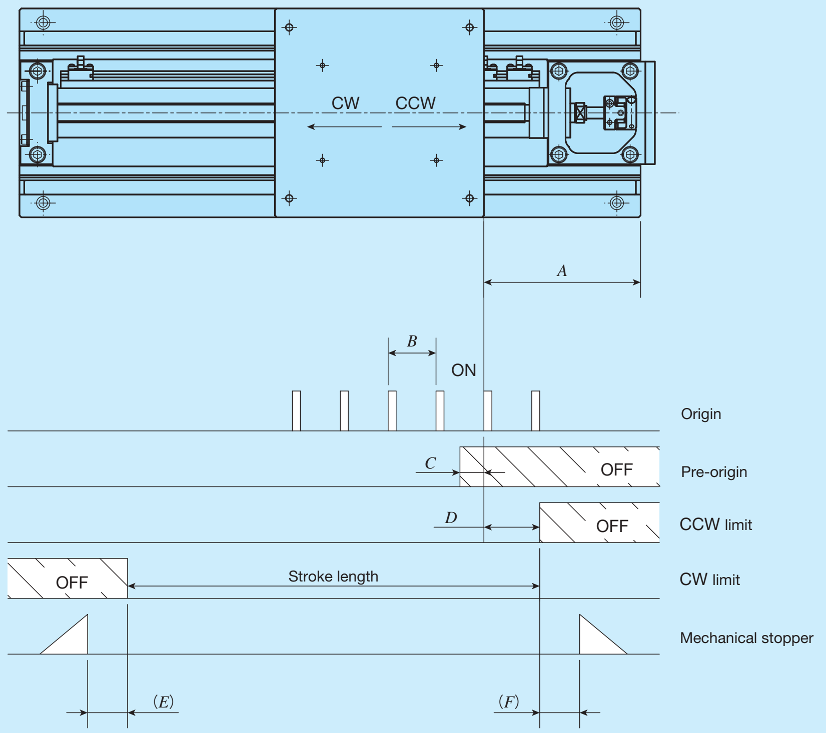
Remark: As for tables of two-axis specification, the figures represent values in X-axis. For values in Y-axis, see the figures for single-axis specification.

Mounting

For the processing accuracy of the Precision Positioning Table mounting surface and the tightening torque of the fixing screws, see page Ⅲ-30.

Sensor Specification

Table 12.1 Sensor timing chart (without bellows)



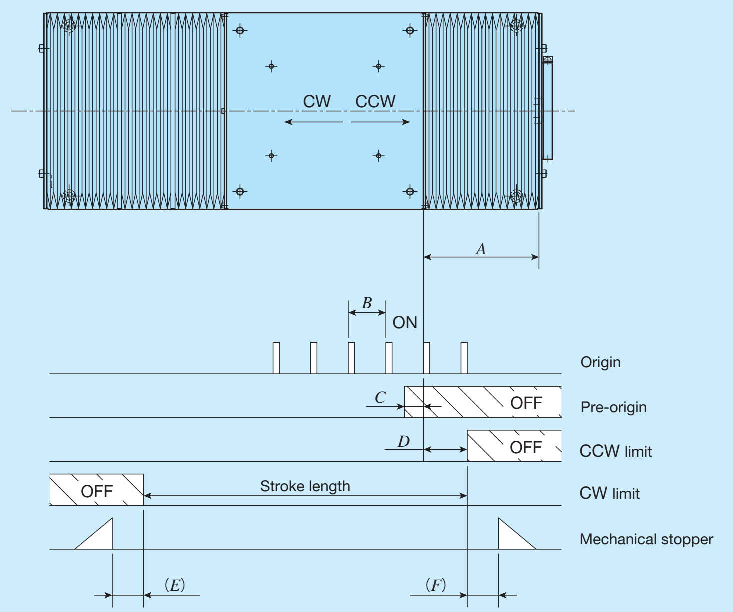
unit: mm

Model and size	Ball screw lead	*A*	*B*	*C*	*D*	*E*	*F*
TSLH120M	5	50	5	3	30	5.5	4.5
	10		10	7			
TSLH220M	5	45	5	3	30	14	10
	10		10	7		12	10
TSLH320M	5	45	5	3	30	20	15
	10		10	7		20	15
TSLH420M	5	45	5	3	30	18	15
	10		10	7			

Remarks 1. For detailed specifications of respective sensors, please see the section of sensor specification in General Explanation.
2. The values of respective axes in tables of two-axis specification are the same as those of tables of single-axis specification.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Table 12.2 *Sensor timing chart (with bellows)*



unit: mm

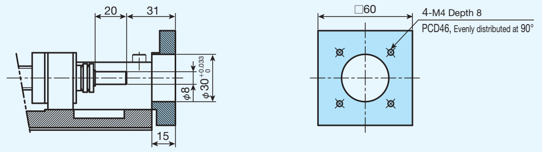
Model and size	Ball screw lead	*A*	*B*	*C*	*D*	*E*	*F*
TSLH120M-100/J	5	57.5	5	3	30	5	5
	10		10	7			
TSLH120M-150/J	5	62.5	5	3	30	5	5
	10		10	7			
TSLH120M-200/J	5	67.5	5	3	30	5	5
	10		10	7			
TSLH120M-250/J	5	72.5	5	3	30	5	5
	10		10	7			
TSLH120M-300/J	5	80	5	3	30	5	5
	10		10	7			
TSLH220M-150/J	5	65	5	3	30	7	5
	10		10	7		5	
TSLH220M-200/J	5	70	5	3	30	7	5
	10		10	7		5	
TSLH220M-250/J	5	80	5	3	30	7	5
	10		10	7		5	
TSLH220M-300/J	5	85	5	3	30	7	5
	10		10	7		5	
TSLH220M-400/J	5	95	5	3	30	7	5
	10		10	7		5	
TSLH320M-300/J	5	80	5	3	30	5	5
	10		10	7			
TSLH320M-400/J	5	90	5	3	30	5	5
	10		10	7			
TSLH320M-500/J	5	95	5	3	30	5	5
	10		10	7			
TSLH420M-500/J	5	90	5	3	30	5	5
	10		10	7			
TSLH420M-600/J	5	95	5	3	30	5	5
	10		10	7			
TSLH420M-800/J	5	115	5	3	30	5	5
	10		10	7			

Remarks 1. For detailed specifications of respective sensors, please see the section of sensor specification in General Explanation.
2. The values of respective axes in tables of two-axis specification are the same as those of tables of single-axis specification.

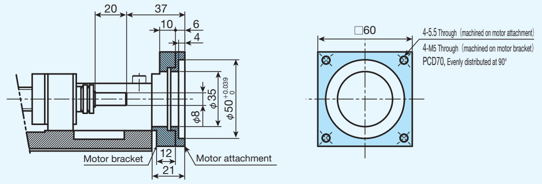
Dimensions of Motor Attachment

TSLH120M, CTLH120M

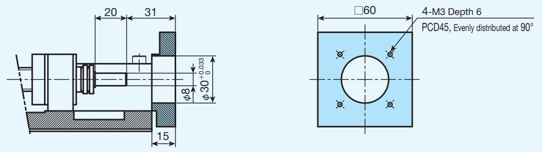
AT301



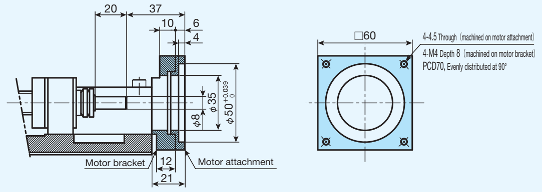
AT302



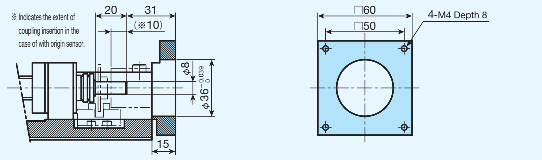
AT307



AT308

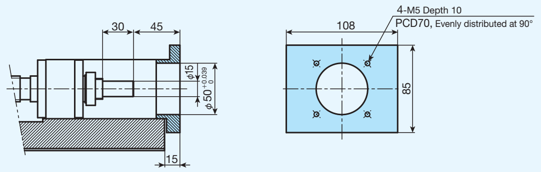


AT315
AT316

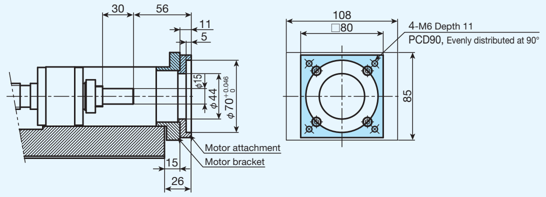


TSLH320M, CTLH320M

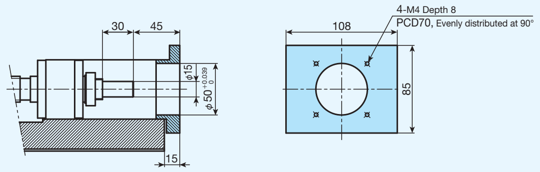
AT304



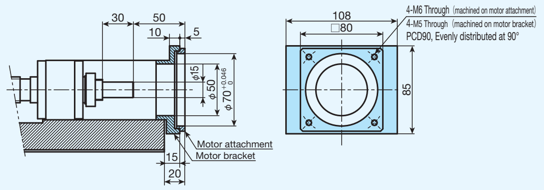
AT305



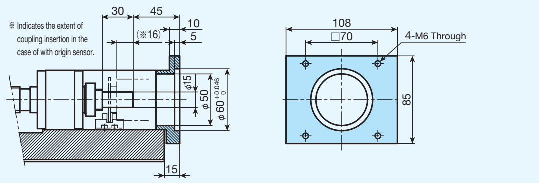
AT311
AT312



AT313

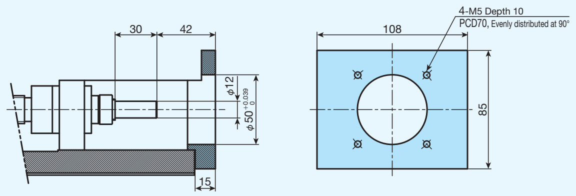


AT318

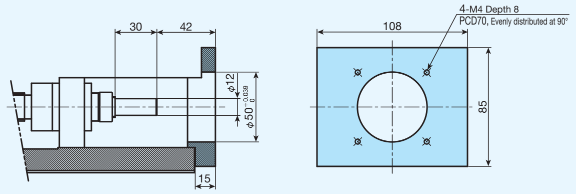


TSLH220M, CTLH220M

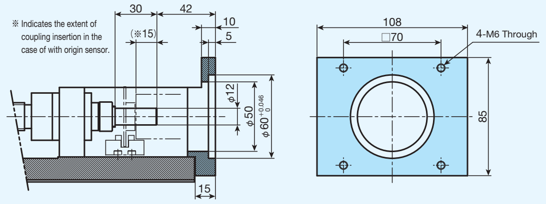
AT303



AT309
AT310

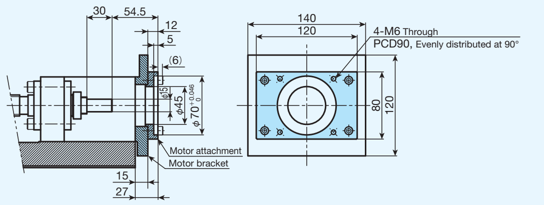


AT317

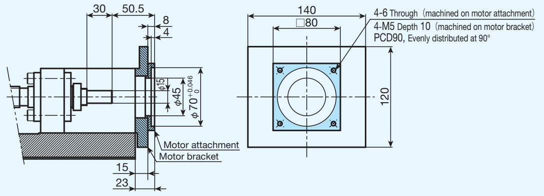


TSLH420M

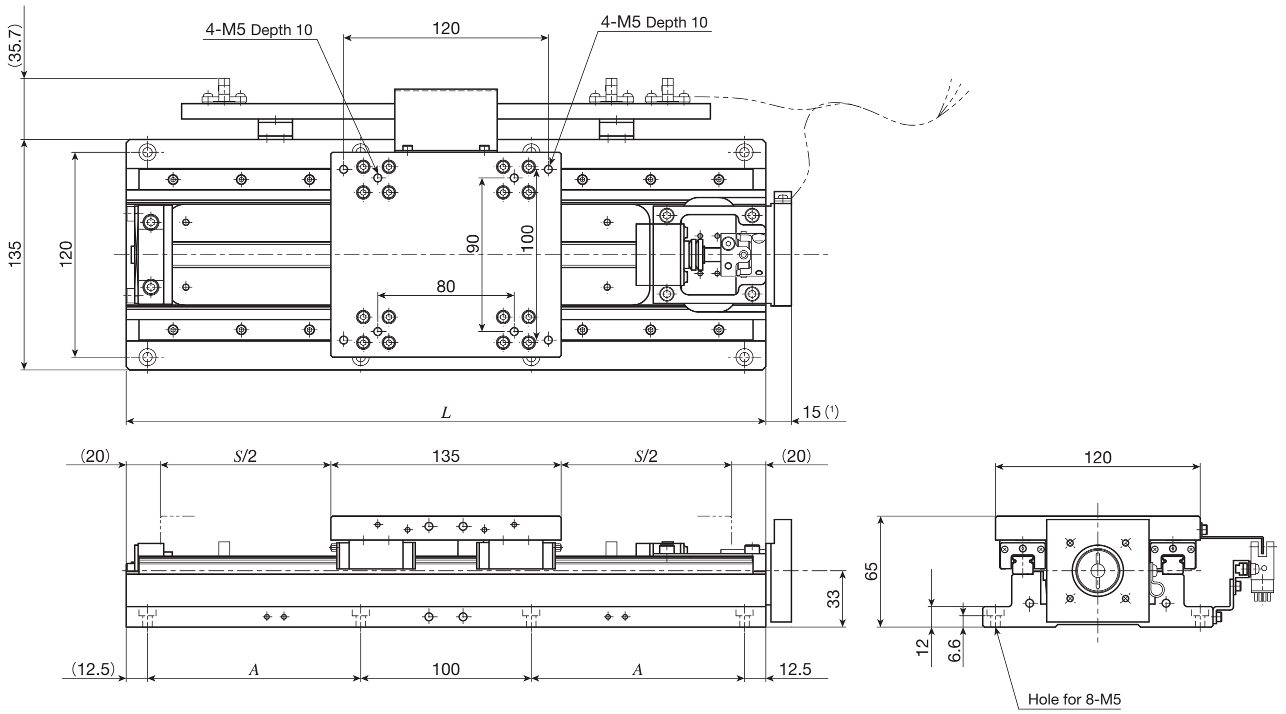
AT306



AT314



TSLH120M

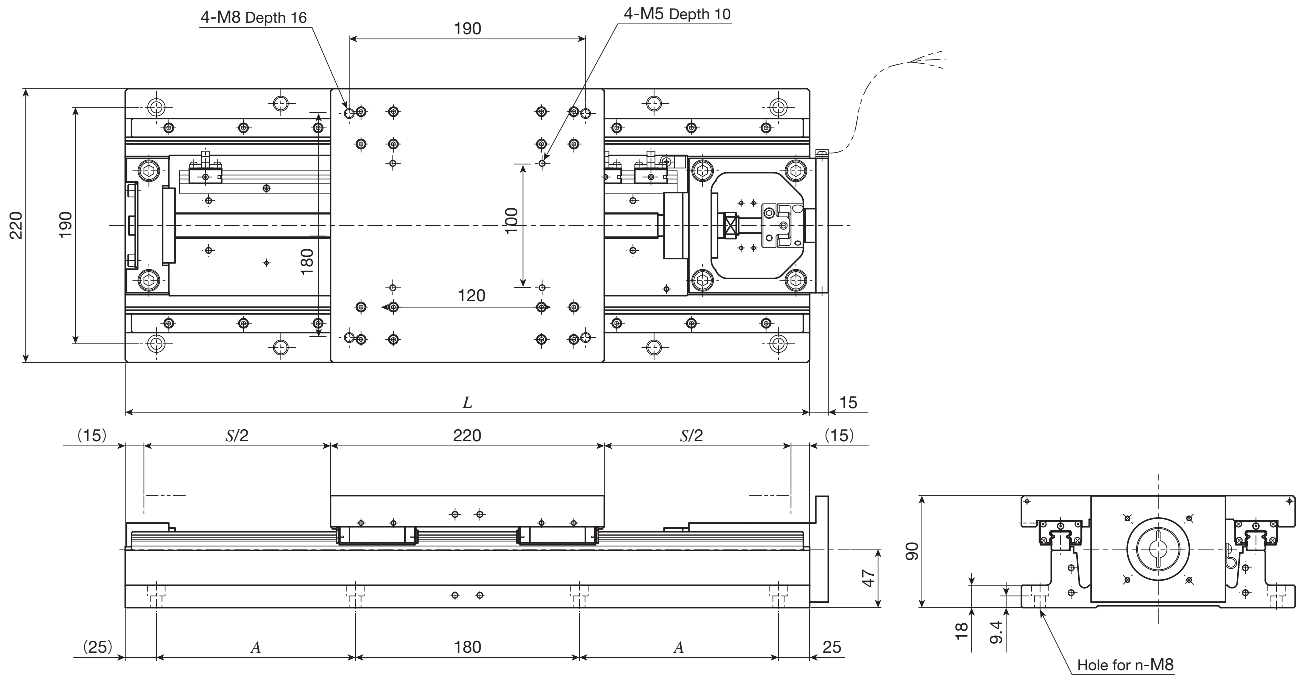


unit: mm

Identification number	Stroke length *S*	Overall length *L*	Mounting holes of bed *A*	Mass (Ref.) kg
TSLH120M-100	100	275	75	10
TSLH120M-150	150	325	100	11
TSLH120M-200	200	375	125	12
TSLH120M-250	250	425	150	13
TSLH120M-300	300	475	175	14

Note (1) When selecting AT302 or AT308, 21mm is applied.

TSLH220M

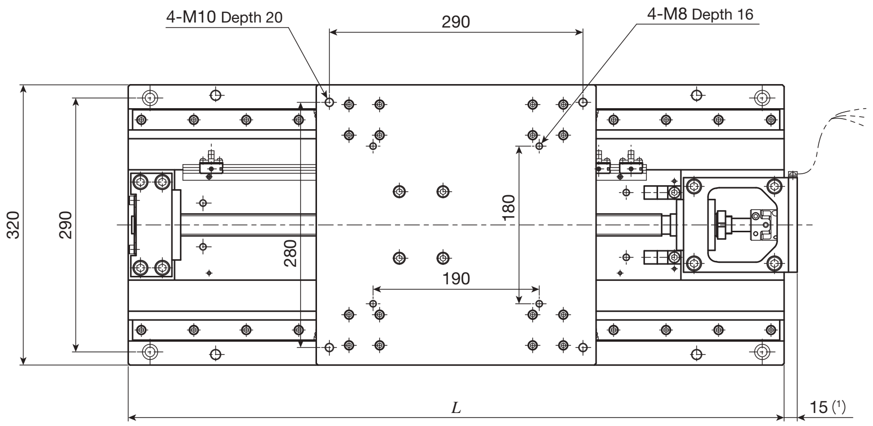


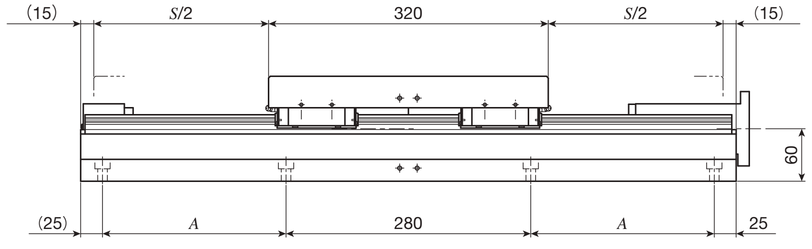
unit: mm

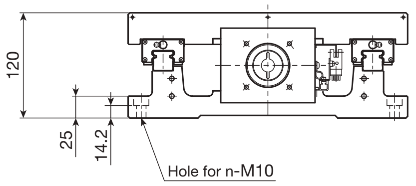
Identification number	Stroke length *S*	Overall length *L*	Mounting holes of bed		Mass (Ref.) kg
			A (the number of holes×pitch)	*n*	
TSLH220M-150	150	400	85	8	32
TSLH220M-200	200	450	110	8	34
TSLH220M-250	250	500	135	8	36
TSLH220M-300	300	550	160	8	38
TSLH220M-400	400	650	210 (2×105)	12	42
(TSLH220M-500)	500	750	260 (2×130)	12	47
(TSLH220M-600)	600	850	310 (2×155)	12	51

Remark: If you are interested in a product of identification number shown in ( ), please contact IKO.

TSLH320M





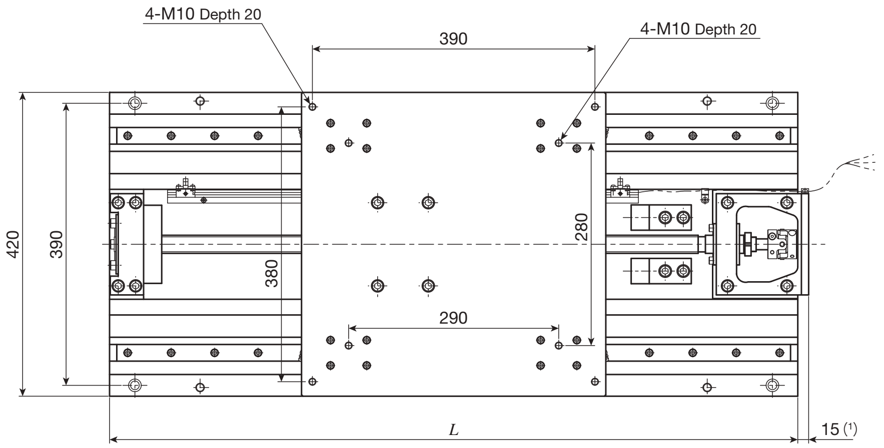


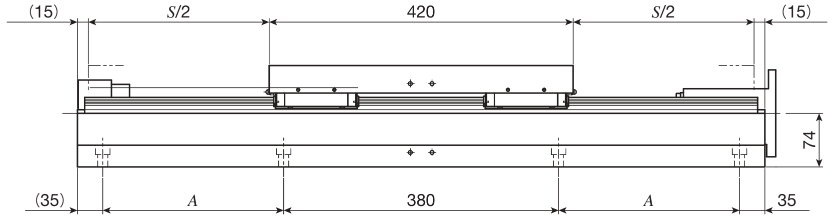
unit: mm

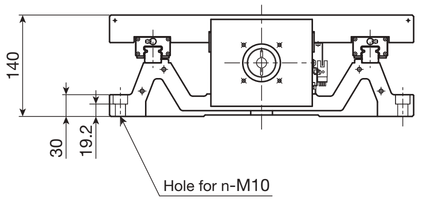
Identification number	Stroke length S	Overall length L	Mounting holes of bed A (the number of holes×pitch)	 n	Mass (Ref.) kg
TSLH320M- 300	300	650	160	8	100
TSLH320M- 400	400	750	210	8	109
TSLH320M- 500	500	850	260	8	118
(TSLH320M- 600)	600	950	310	8	127
(TSLH320M- 800)	800	1 150	410 (2×205)	12	146
(TSLH320M-1000)	1 000	1 350	510 (2×255)	12	164

Note (1) When selecting AT305, 26mm is applied. When selecting AT313, 20mm is applied.
Remark: If you are interested in a product of identification number shown in ( ), please contact IKO.

TSLH420M





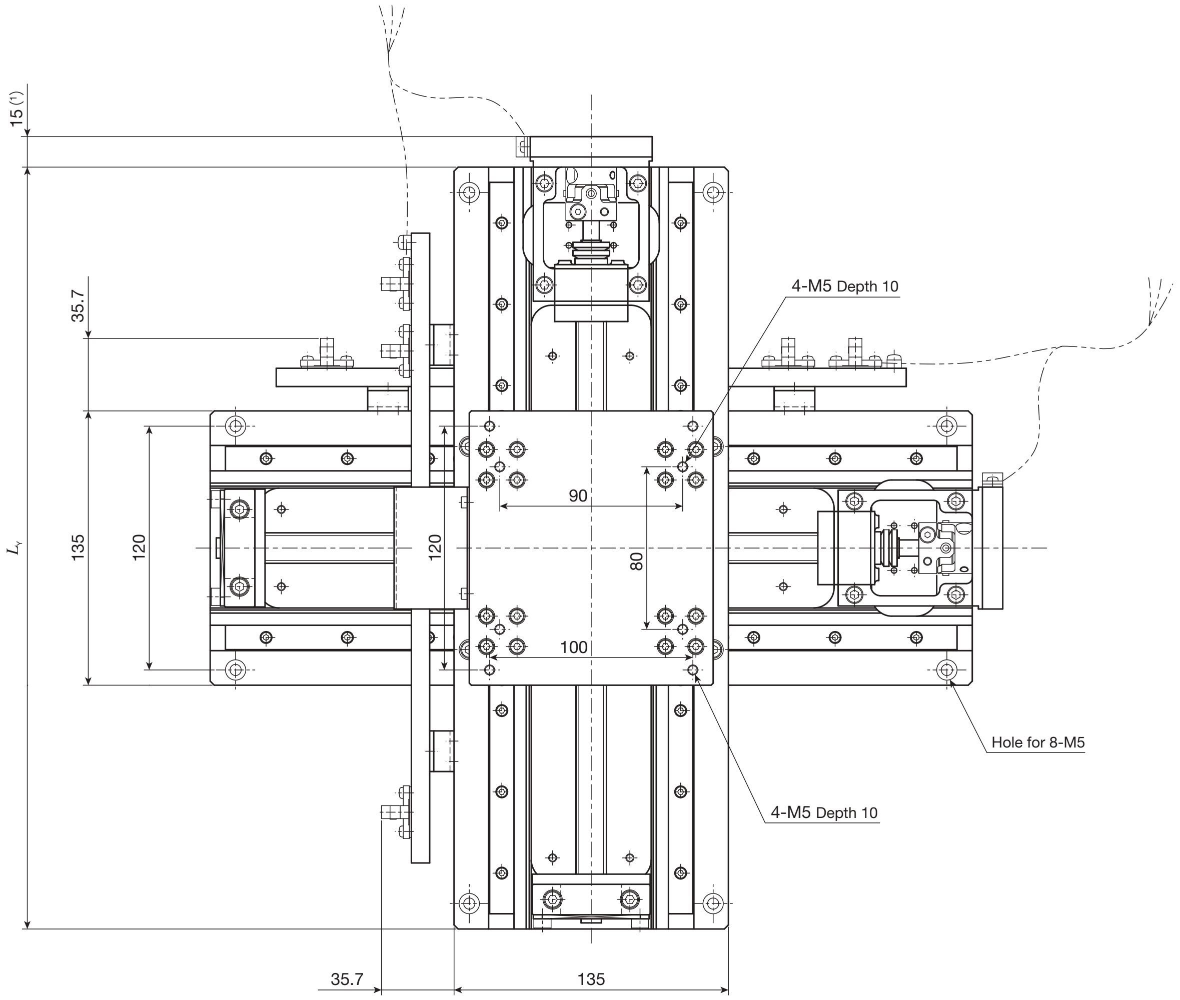


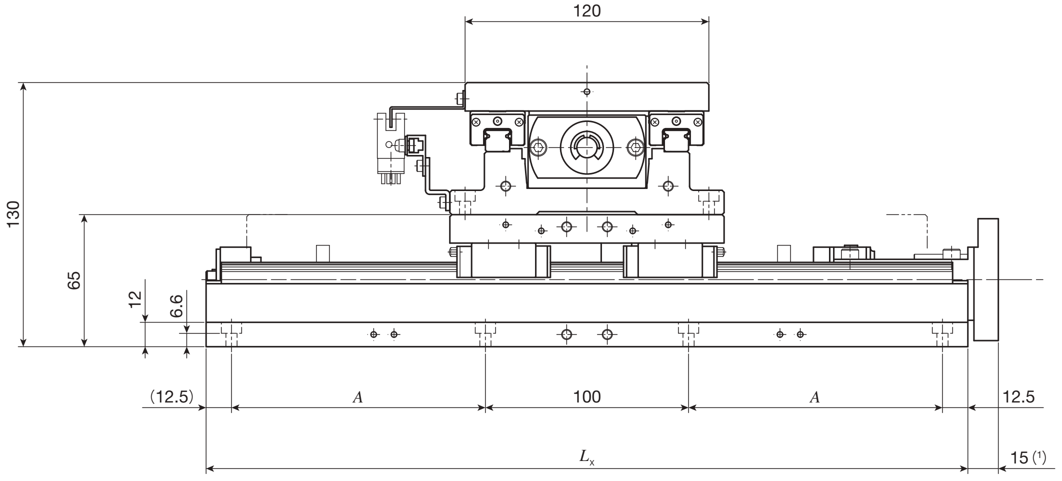
unit: mm

Identification number	Stroke length S	Overall length L	Mounting holes of bed A (the number of holes×pitch)	 n	Mass (Ref.) kg
TSLH420M- 500	500	950	250	8	176
TSLH420M- 600	600	1 050	300	8	188
TSLH420M- 800	800	1 250	400 (2×200)	12	212
(TSLH420M-1000)	1 000	1 450	500 (2×250)	12	237

Note (1) They represent the dimensions of motor bracket only. When selecting AT306, 27mm is applied. When selecting AT314, 23mm is applied.
Remark: If you are interested in a product of identification number shown in ( ), please contact IKO.

CTLH120M



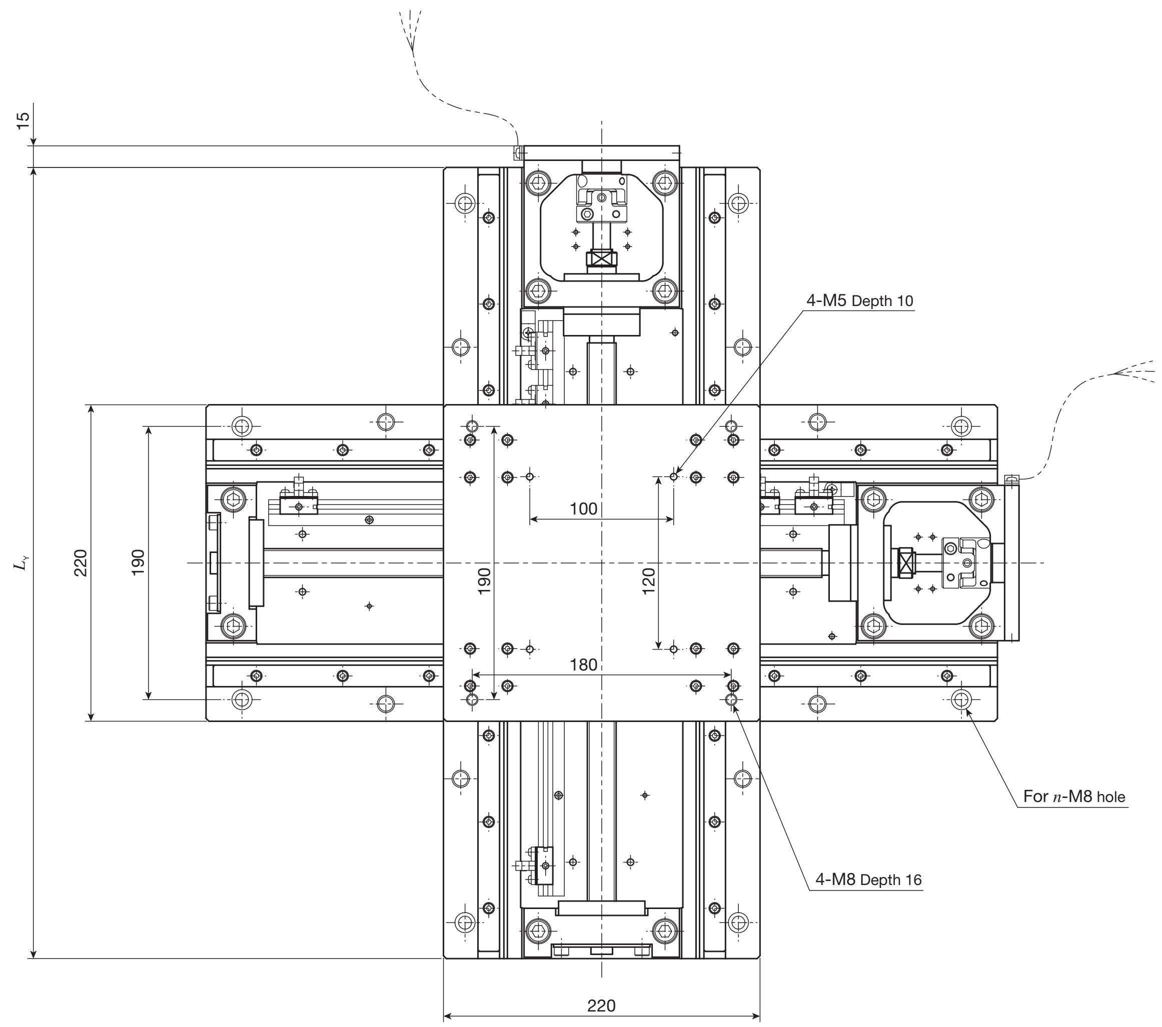


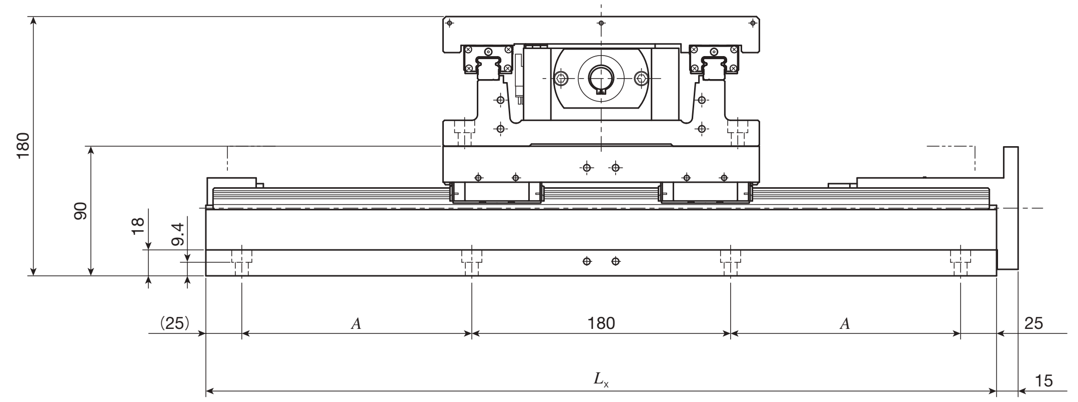
unit: mm

Identification number	Stroke length S		Overall length		Mounting holes of bed	Mass (Ref.)
	X-axis	Y-axis	L_X	L_Y	A	kg
CTLH120M-1010	100	100	275	275	75	20
CTLH120M-2010	200	100	375	275	125	22
CTLH120M-2020	200	200	375	375	125	24
CTLH120M-3020	300	200	475	375	175	26
CTLH120M-3030	300	300	475	475	175	28

Note (1) When selecting AT302 or AT308, 21mm is applied.
Remark: As a combination of stroke length other than listed above and a table of different size is possible, please contact IKO.

CTLH220M



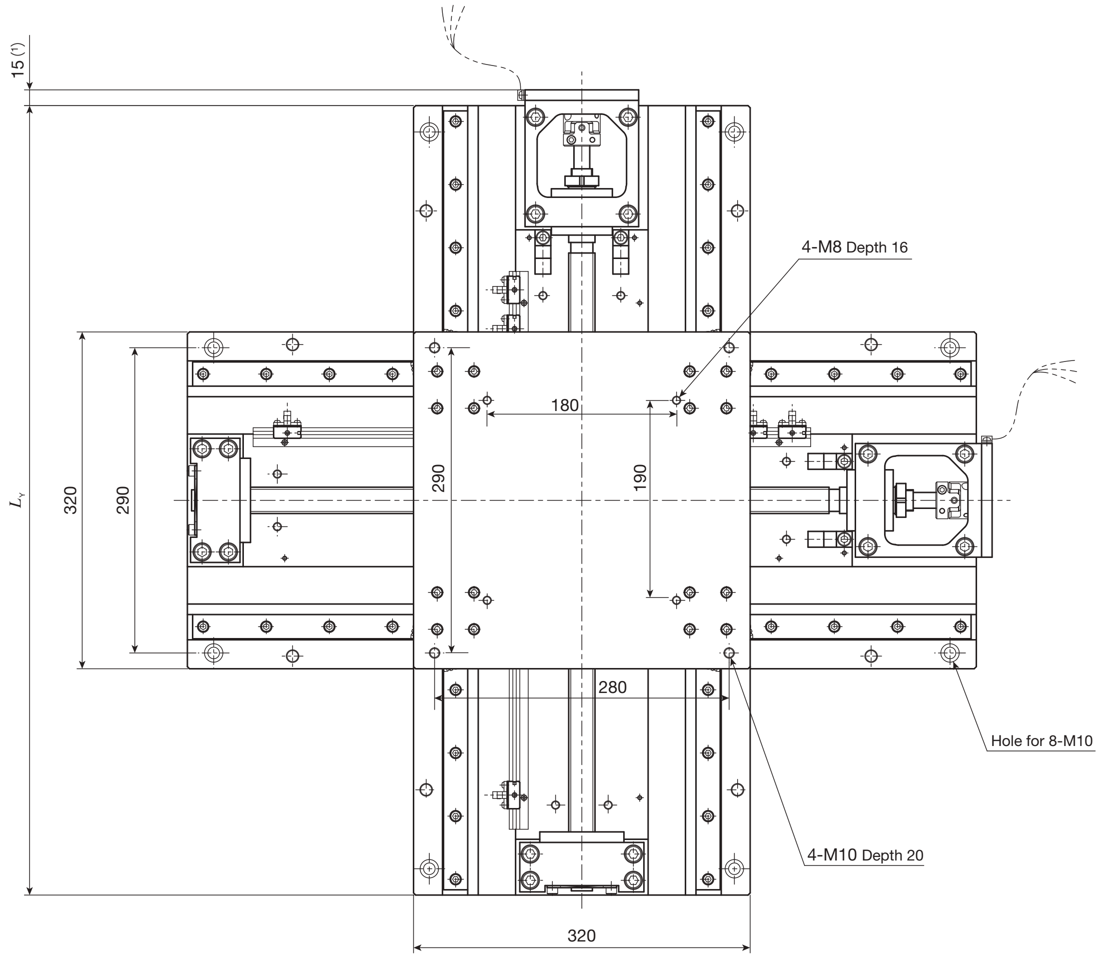


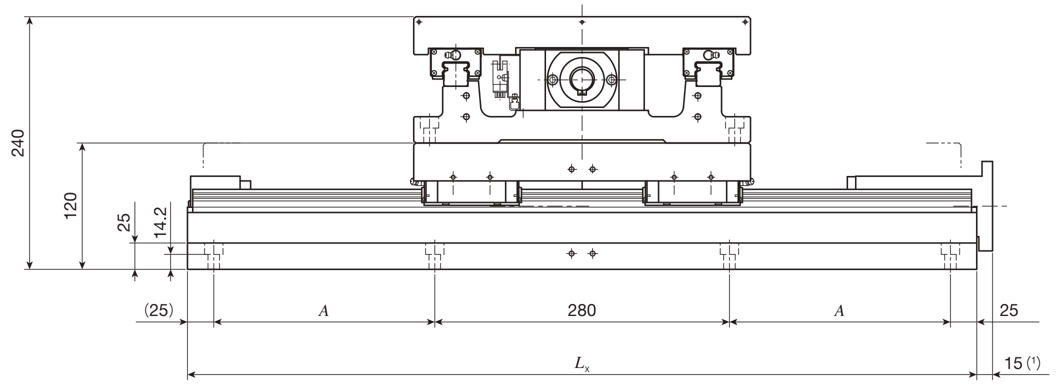
unit: mm

Identification number	Stroke length S		Overall length		Mounting holes of bed		Mass (Ref.)
	X-axis	Y-axis	L_X	L_Y	A (the number of holes×pitch)	n	kg
CTLH220M-2020	200	200	450	450	110	8	67
CTLH220M-3020	300	200	550	450	160	8	71
CTLH220M-3030	300	300	550	550	160	8	76
CTLH220M-4030	400	300	650	550	210 (2×105)	12	80
CTLH220M-4040	400	400	650	650	210 (2×105)	12	84

Remark: As a combination of stroke length other than listed above and a table of different size is possible, please contact IKO.

CTLH320M



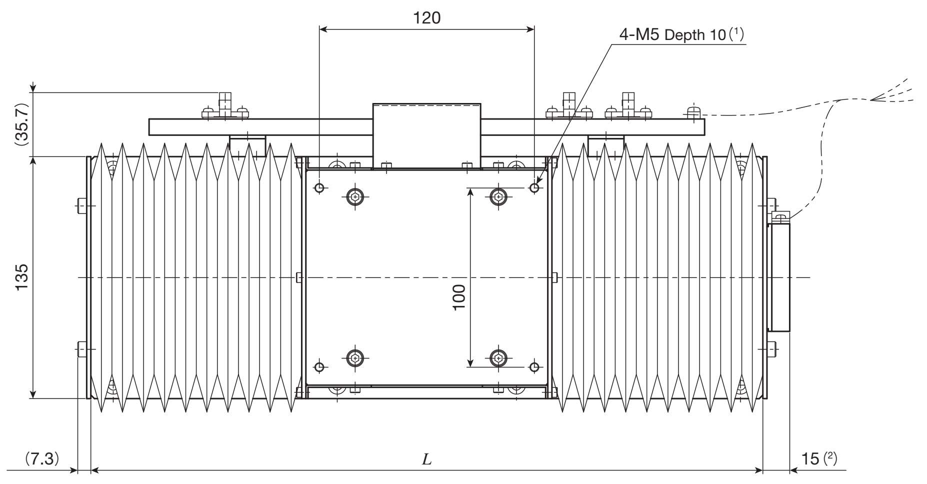


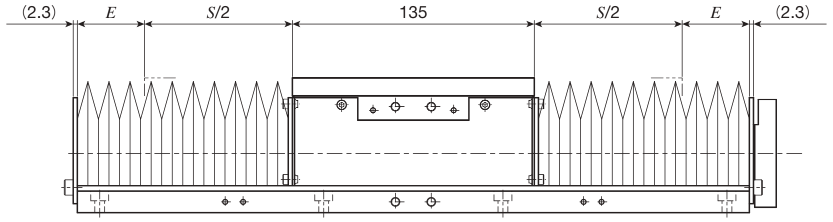
unit: mm

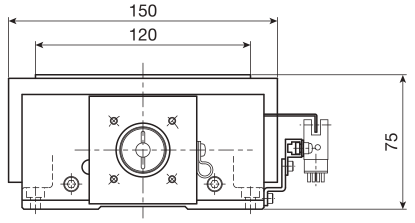
Identification number	Stroke length *S*		Overall length		Mounting holes of bed	Mass (Ref.)
	X-axis	Y-axis	L_X	L_Y	*A*	kg
CTLH320M-3030	300	300	650	650	160	199
CTLH320M-4030	400	300	750	650	210	209
CTLH320M-4040	400	400	750	750	210	218
CTLH320M-5040	500	400	850	750	260	227
CTLH320M-5050	500	500	850	850	260	236

Note (¹) When selecting AT305, 26mm is applied. When selecting AT313, 20mm is applied.
Remark: As a combination of stroke length other than listed above and a table of different size is possible, please consult IKO.

TSLH120M…/J Table with bellows





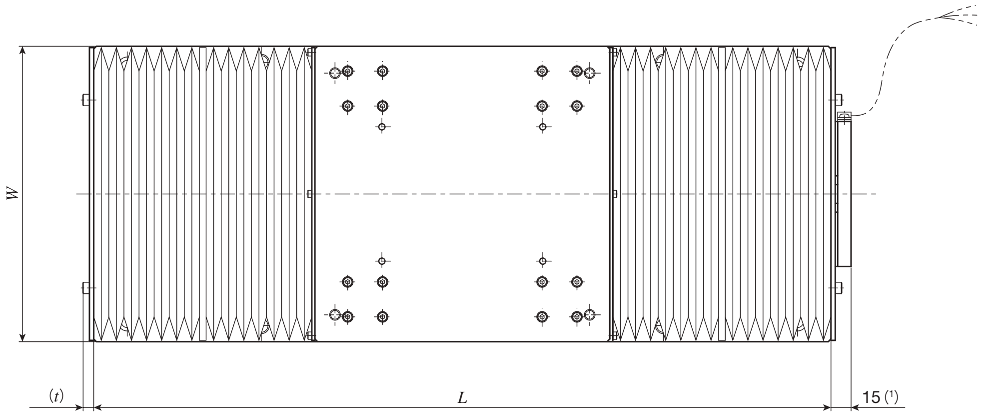


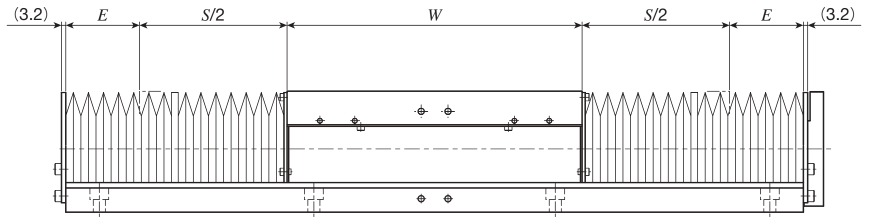
unit: mm

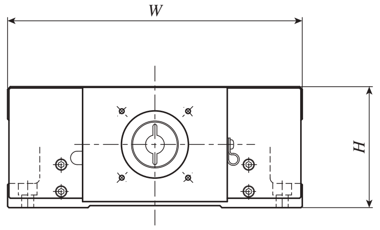
Identification number	Stroke length *S*	Overall length *L*	*E*	Mass (Ref.) kg
TSLH120M-100/J	85	275	27.5	13
TSLH120M-150/J	125	325	32.5	14
TSLH120M-200/J	165	375	37.5	15
TSLH120M-250/J	205	425	42.5	16
TSLH120M-300/J	240	475	50.0	17

Notes (¹) Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the through hole.
(²) When selecting AT302 or AT308, 21mm is applied.
Remarks 1. For the usage in vertical axis, the dimension of the bellows is different, so please contact IKO.
2. For bed mounting dimensions, see the dimension table for TSLH120M.

TSLH220M…/J, TSLH320M…/J, TSLH420M…/J Table with bellows







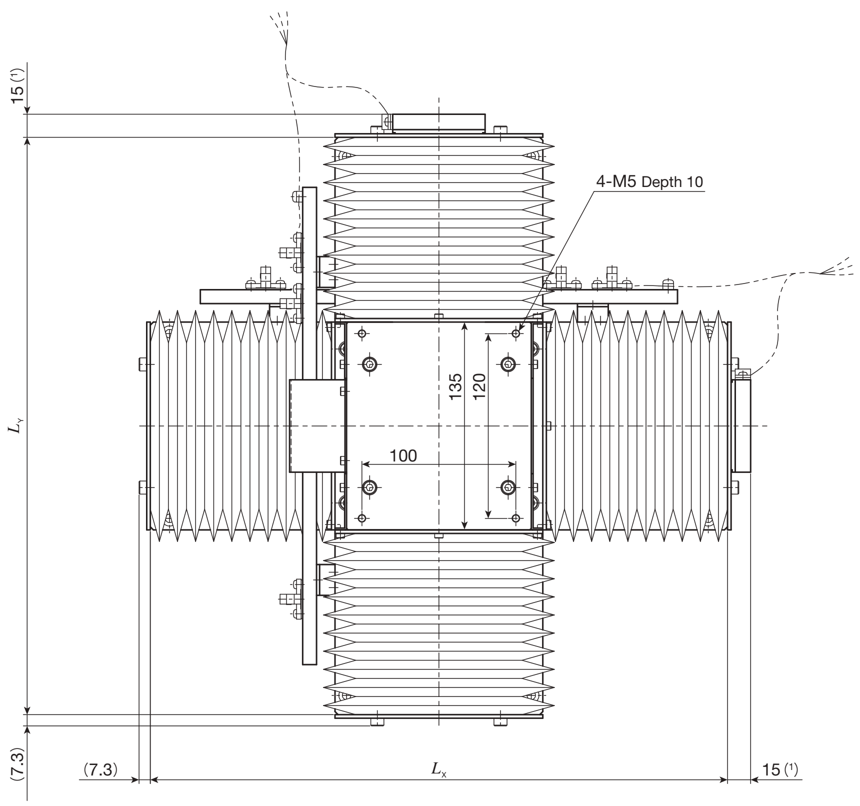
unit: mm

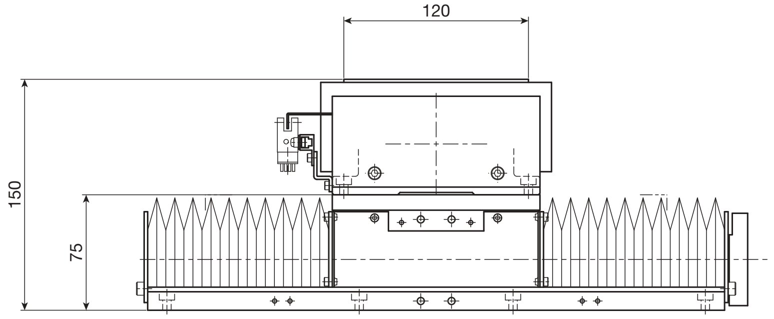
Identification number	Stroke length *S*	Overall length *L*	*W*	*H*	*E*	*t*	Mass（Ref.） kg
TSLH220M- 150/J	110	400	220	90	35	8.2	33
TSLH220M- 200/J	150	450			40		36
TSLH220M- 250/J	180	500			50		38
TSLH220M- 300/J	220	550			55		40
TSLH220M- 400/J	300	650			65		44
(TSLH220M- 500/J)	370	750			80		49
(TSLH220M- 600/J)	440	850			95		53
TSLH320M- 300/J	230	650	320	120	50	9.2	104
TSLH320M- 400/J	310	750			60		113
TSLH320M- 500/J	400	850			65		129
(TSLH320M- 600/J)	480	950			75		131
(TSLH320M- 800/J)	640	1 150			95		151
(TSLH320M-1000/J)	800	1 350			115		169
TSLH420M- 500/J	410	950	420	140	60	10.5	183
TSLH420M- 600/J	500	1 050			65		195
TSLH420M- 800/J	660	1 250			85		219
(TSLH420M-1000/J)	830	1 450			100		244

Note (1) When selecting AT305, 26mm is applied. When selecting AT306, 27mm is applied.
When selecting AT313, 20mm is applied. When selecting AT314, 23mm is applied.

Remarks 1. For the usage in vertical axis, the dimension of the bellows is different, so please contact IKO.
2. If you are interested in a product of identification number shown in (　), please contact IKO.
3. For mounting dimensions, see the dimension tables for TSLH220M, TSLH320M, and TSLH420M.

CTLH120M…/J Table with bellows





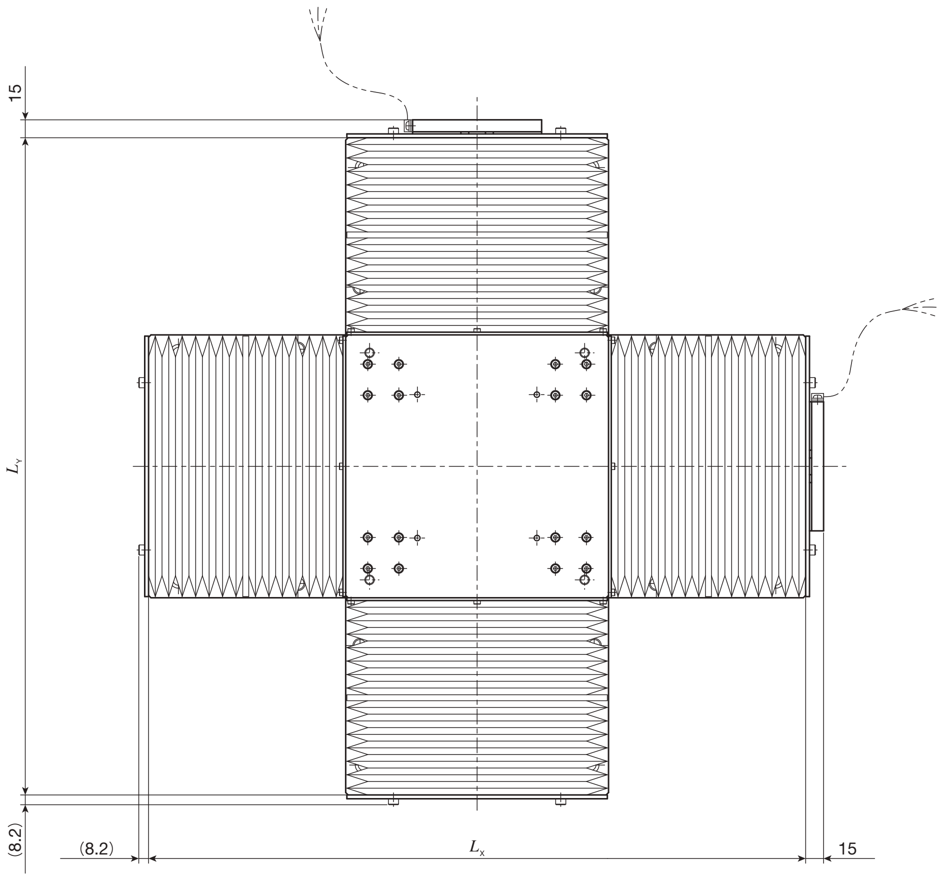
unit: mm

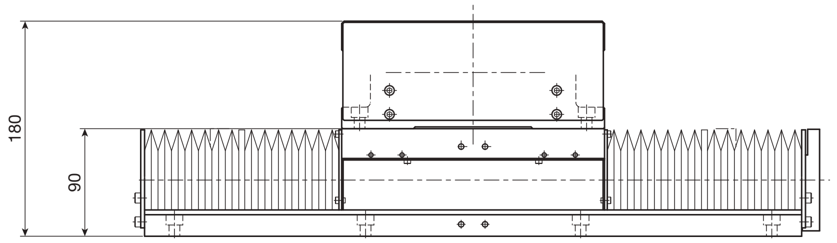
Identification number	Stroke length *S*		Overall length of bed		Mass（Ref.） kg
	X-axis	Y-axis	L_x	L_Y	
CTLH120M-1010/J	85	85	275	275	25
CTLH120M-2010/J	165	85	375	275	27
CTLH120M-2020/J	165	165	375	375	29
CTLH120M-3020/J	240	165	475	375	31
CTLH120M-3030/J	240	240	475	475	33

Note (1) When selecting AT302 or AT308, 21mm is applied.

Remarks 1. For the usage in vertical axis, the dimension of the bellows is different, so please contact IKO.
2. For mounting dimensions, see the dimension table for TSLH120M.

CTLH220M···/J Table with bellows



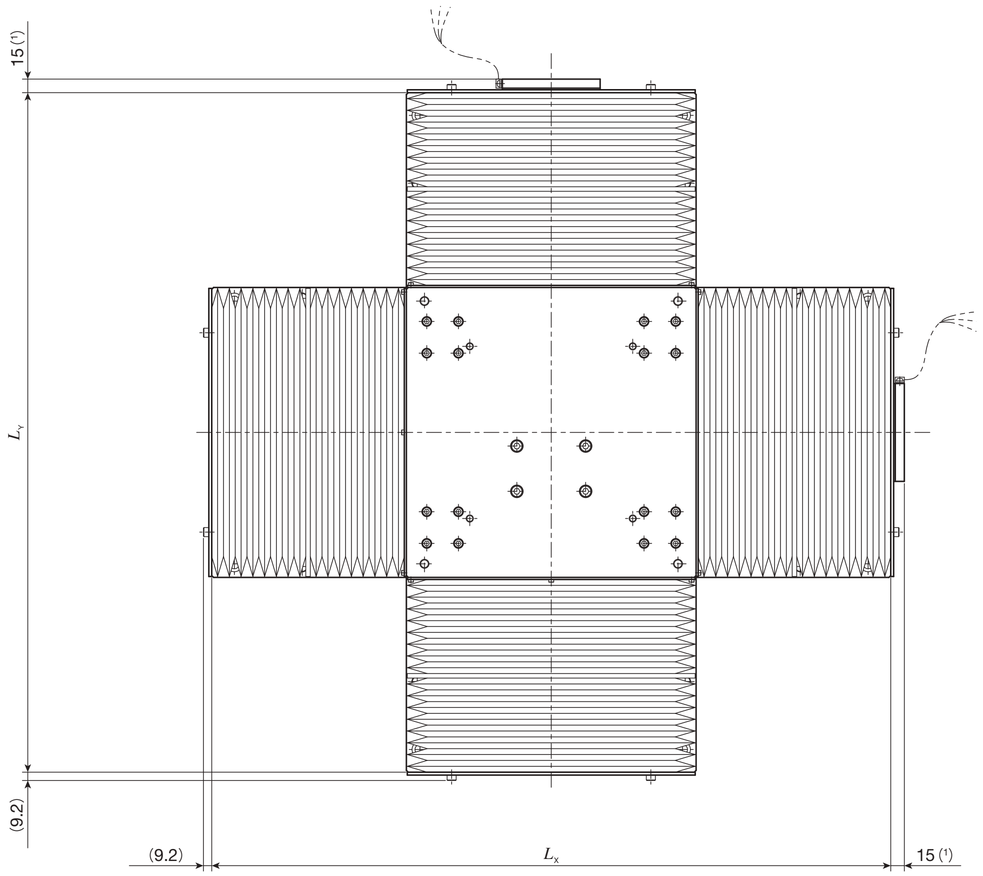


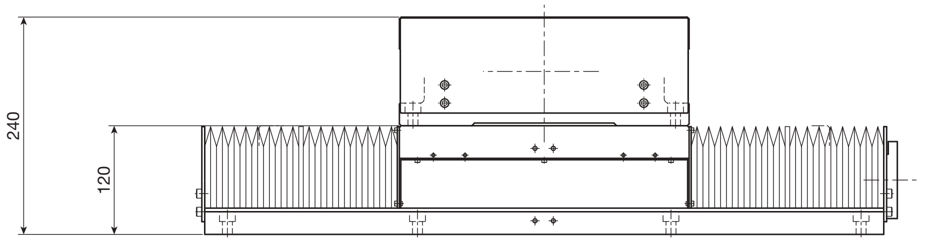
unit: mm

Identification number	Stroke length S		Overall length of bed		Mass (Ref.) kg
	X-axis	Y-axis	L_X	L_Y	
CTLH220M-2020/J	150	150	450	450	71
CTLH220M-3020/J	220	150	550	450	75
CTLH220M-3030/J	220	220	550	550	80
CTLH220M-4030/J	300	220	650	550	84
CTLH220M-4040/J	300	300	650	650	88

Remarks 1. For the usage in vertical axis, the dimension of the bellows is different, so please contact IKO.
2. For mounting dimensions, see the dimension table for TSLH220M.

CTLH320M···/J Table with bellows





unit: mm

Identification number	Stroke length S		Overall length of bed		Mass (Ref.) kg
	X-axis	Y-axis	L_X	L_Y	
CTLH320M-3030/J	230	230	650	650	207
CTLH320M-4030/J	310	230	750	650	216
CTLH320M-4040/J	310	310	750	750	226
CTLH320M-5040/J	400	310	850	750	235
CTLH320M-5050/J	400	400	850	850	244

Note (1) When selecting AT305, 26mm is applied. When selecting AT313, 20mm is applied.

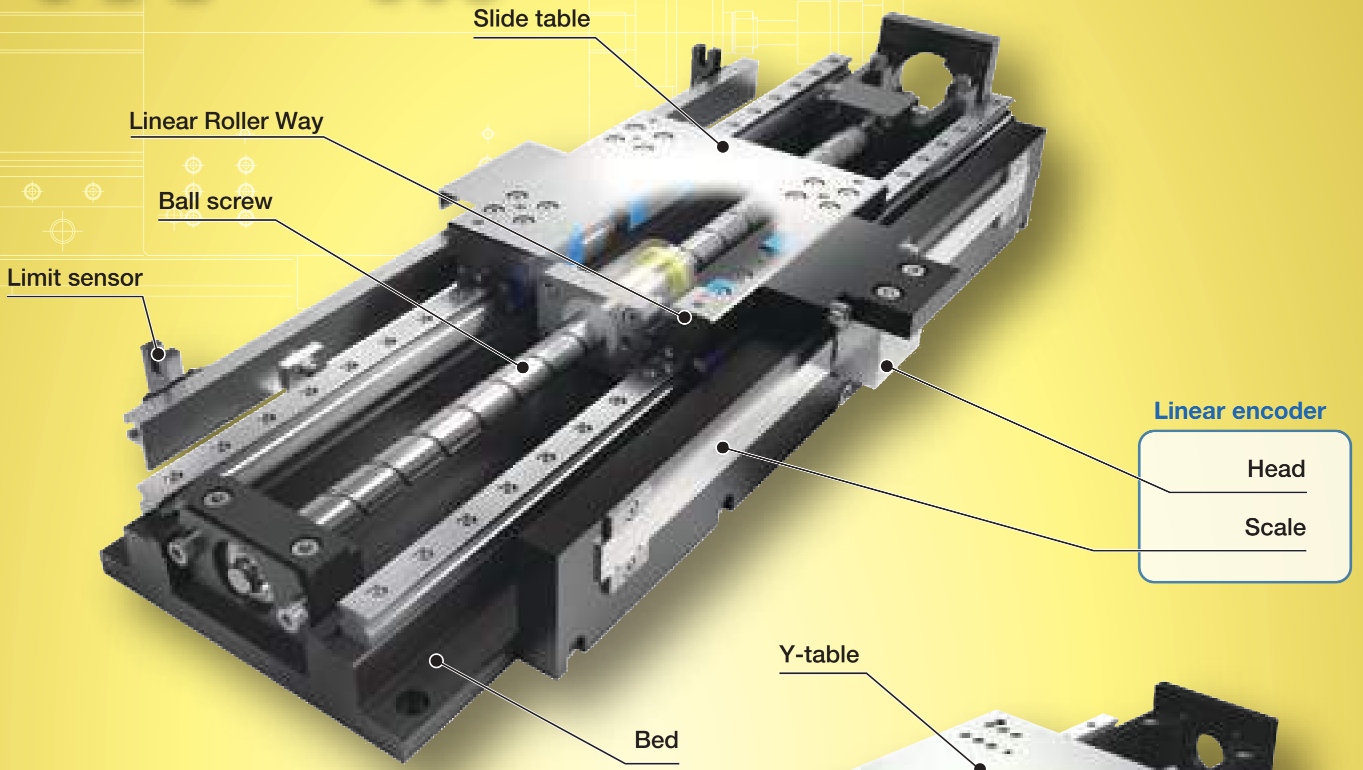
Remarks 1. For the usage in vertical axis, the dimension of the bellows is different, so please contact IKO.
2. For mounting dimensions, see the dimension table for TSLH320M.

TX···M
CTX···M

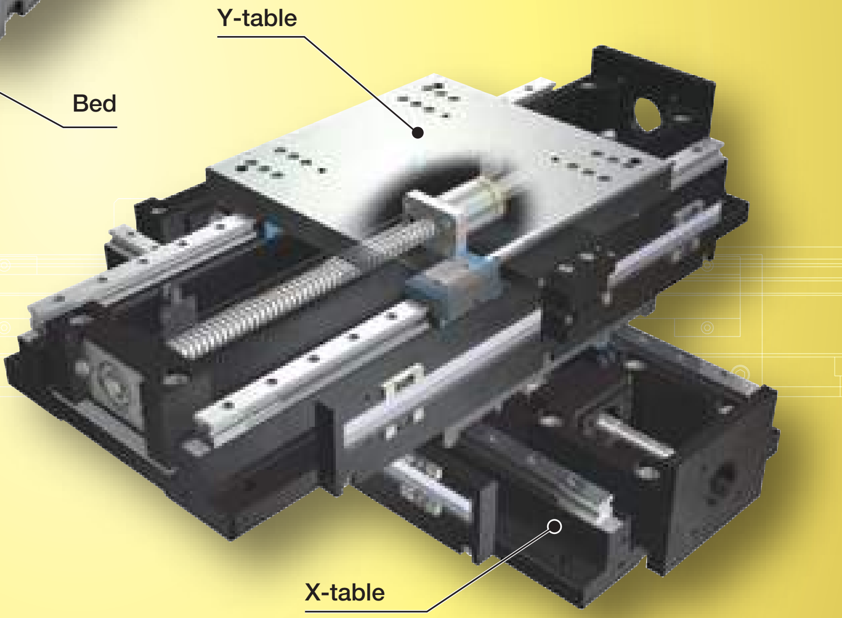
TX···M

Ball screw

Linear



CTX···M



Major product specifications

Driving method	Precision ball screw
Linear motion rolling guide	Linear Roller Way（roller type）
Built-in lubrication part	Lubrication part "C-Lube" is built-in
Material of table and bed	Cast iron
Sensor	Provided as standard

Accuracy

unit: mm

Positioning repeatability	±0.0005～0.0010
Positioning accuracy	0.003～0.020
Lost motion	0.001
Parallelism in table motion A	0.005～0.011
Parallelism in table motion B	–
Attitude accuracy	5～11sec
Straightness	0.003～0.008
Backlash	–

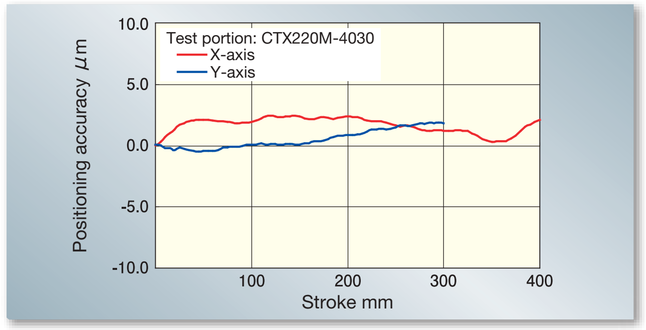
Points

● Ultimate high accuracy table of rolling guide type

1 High precision, high rigidity Precision Positioning Table LH based positioning table with positioning accuracy almost the same as Air Stage with ultimate rolling guide C-Lube Linear Roller Way Super MX incorporated and by a thorough investigation of the accuracy of each part.

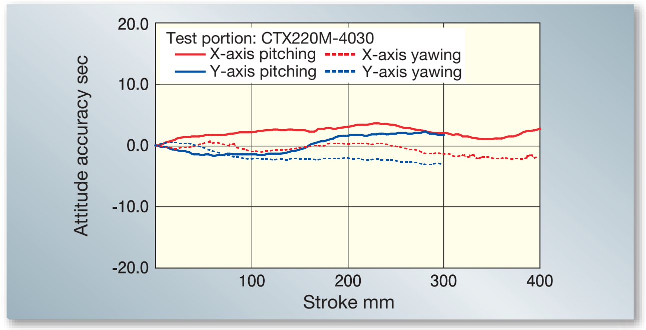
● High positioning accuracy and resolution performance realized with an onboard super high accuracy linear encoder

2 Fully closed loop control is configure and the positioning accuracy of the entire stroke is guaranteed with a direct feed back of positional information from a super high accuracy linear encoder.



● Ultimate high running performance produced by adopting roller type linear motion rolling guide

3 Ultimate running accuracy is achieved since components processed and assembled with high accuracy are combined with C-Lube Linear Roller Way Super MX that exhibits the highest level of running performance with a rolling guide.



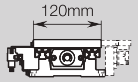
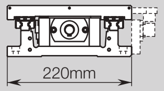
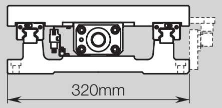
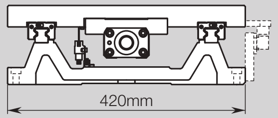
● Absolute linear encoder can be selected

4 For the linear encoder, select either absolute type or incremental type. Absolute types do not require returning to origin and can handle both high resolution and high-speed travel.

● Simple system configuration

5 The simple system configuration provides space saving and cost reduction since an air supply device for driving, like an Air Stage, is not required.

Variation

Shape	Model and size	Table width (mm)	Stroke length（mm）								
			100	150	200	250	300	400	500	600	800
 120mm	TX120M	120	☆	☆	☆	☆	☆	–	–	–	–
 220mm	TX220M	220	–	☆	☆	☆	☆	☆	–	–	–
 320mm	TX320M	320	–	–	–	–	☆	☆	☆	–	–
 420mm	TX420M	420	–	–	–	–	–	–	☆	☆	☆

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Identification Number

Example of an Identification Number (Single-axis specification)

①	②	①		③		④	⑤	⑥
TX	220	M	-	150	/	AT402	10	SB010

①	Model	Page Ⅱ-161
②	Size	Page Ⅱ-161
③	Stroke length	Page Ⅱ-161
④	Designation of motor attachment	Page Ⅱ-161
⑤	Ball screw lead	Page Ⅱ-161
⑥	Designation of linear encoder	Page Ⅱ-161

Identification Number and Specification

①	**Model**	TX…M: Super Precision Positioning Table TX (single-axis specification)
②	**Size**	Size indicates table width. Select a size from the list of Table 1.
③	**Stroke length**	Select a stroke length from the list of Table 1.
④	**Designation of motor attachment**	As for a motor attachment, select it from the list of Table 3. ・Motor should be prepared by customer. ・Please specify motor attachment applicable to motor for use. ・A coupling shown in Table 4 is mounted on the main body before shipment. However, the final position adjustment should be made by customer since it is only temporarily fixed.
⑤	**Ball screw lead**	5: Lead 5mm 10: Lead 10mm
⑥	**Designation of linear encoder**	Select the linear encoder from Table 5. Without a linear encoder, select the S0000 code. ・When specifying the attachment for a stepper motor, set S0000. ・If using a motor not shown in Table 3, please contact IKO.

Identification Number

Example of an Identification Number (Two-axis specification)

①	②	①		③	④		⑤	⑥	⑦	⑧
CTX	120	M	-	30	20	/	AT401	5	C	SA000

①	Model	Page Ⅱ-162
②	Size	Page Ⅱ-162
③	X-axis stroke length	Page Ⅱ-162
④	Y-axis stroke length	Page Ⅱ-162
⑤	Designation of motor attachment	Page Ⅱ-162
⑥	Ball screw lead	Page Ⅱ-162
⑦	Designation of combination direction	Page Ⅱ-162
⑧	Designation of linear encoder	Page Ⅱ-162

Identification Number and Specification

①	**Model**	CTX…M: Super Precision Positioning Table TX (two-axis specification)
②	**Size**	Size indicates table width. Select a size from the list of Table 2. Tables of different sizes can also be combined.
③	**X-axis stroke length**	Select a stroke length from the list of Table 2. Stroke lengths of respective axes are displayed in cm. Different stroke lengths can be specified for X- and Y-axes.
④	**Y-axis stroke length**	
⑤	**Designation of motor attachment**	As for a motor attachment, select it from the list of Table 3. ・Motor should be prepared by customer. ・Please specify motor attachment applicable to motor for use. ・A coupling shown in Table 4 is mounted on the main body before shipment. However, the final position adjustment should be made by customer since it is only temporarily fixed.
⑥	**Ball screw lead**	5: Lead 5mm 10: Lead 10mm
⑦	**Designation of combination direction**	No symbol : Standard configuration C : Reverse configuration Standard configuration: A direction under the condition where X-axis motor side is placed at the front and Y-axis motor side is placed on the right side respectively. Reverse configuration: A direction under the condition where X-axis motor side is placed at the front and Y-axis motor side is placed on the left side respectively. Specify "No symbol" if 200mm is selected for Y-axis stroke length for CTX220M.
⑧	**Designation of linear encoder**	Select the linear encoder from Table 5. Without a linear encoder, select the S0000 code. ・When specifying the attachment for a stepper motor, set S0000. ・If using a motor not shown in Table 3, please contact IKO.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Identification Number and Specification

Table 1 Sizes and stroke lengths of TX

Model and size	Table width mm	Stroke length mm
TX120M	**120**	100, 150, 200, 250, 300
TX220M	**220**	150, 200, 250, 300, 400
TX320M	**320**	300, 400, 500
TX420M	**420**	500, 600, 800

Table 2 Sizes and stroke lengths of CTX

Model and size	Table width mm	Stroke length mm	
		X-axis	Y-axis
CTX120M	120	100	100
		200	100
		200	200
		300	200
CTX220M	220	200	200
		300	200
		300	300
		400	300

Table 3 Application of motor attachment

Models of motor to be used					Flange size mm	Motor attachment			
Type	Manufacturer	Series	Model	Rated output W		TX120M CTX120M	TX220M CTX220M	TX320M	TX420M
AC servo motor	YASKAWA ELECTRIC CORPORATION	Σ-7	**SGM7A-02A**	**200**	□60	AT401	–	–	–
			SGM7A-04A	**400**		–	AT402	–	–
			SGM7A-06A	**600**		–	–	AT403	–
			SGM7A-08A	**750**	□80	–	–	–	AT404
	Mitsubishi Electric Corporation	J4 J5	**HG-KR23/HK-KT23W**	**200**	□60	AT401	–	–	–
			HG-KR43/HK-KT43W	**400**		–	AT402	AT403	–
			HG-KR43/HK-KT7M3W	**750**	□80	–	–	–	AT404
	Panasonic Corporation	MINAS A6	**MSMF02**	**200**	□60	AT405	–	–	–
			MSMF04	**400**		–	AT406	AT407	–
			MSMF08	**750**	□80	–	–	–	AT408
Stepper motor	ORIENTAL MOTOR Co., Ltd.	α step	**ARM66**		□60	AT409	–	–	–
			ARM69			AT409	–	–	–
			ARM98		□85	–	AT411	AT412	–
			ARM911			–	AT411	AT412	–
		RKS	**RKS56**		□60	AT409	–	–	–
			RKS59		□85	–	AT411	AT412	–

Remark: For detailed motor specifications, please see respective motor manufacturer's catalog.

Table 4 Coupling models

Motor attachment	Coupling models	Manufacturer	Coupling inertia J_c $\times10^{-5}$kg · m^2
AT401	RA-30C- 8×14	Sakai Manufacturing Co., Ltd	0.281
AT402	RA-35C-12×14	Sakai Manufacturing Co., Ltd	0.847
AT403	RA-35C-14×15	Sakai Manufacturing Co., Ltd	0.847
AT404	RA-40C-15×19	Sakai Manufacturing Co., Ltd	1.365
AT405	RA-30C- 8×11	Sakai Manufacturing Co., Ltd	0.281
AT406	RA-35C-12×14	Sakai Manufacturing Co., Ltd	0.847
AT407	RA-35C-14×15	Sakai Manufacturing Co., Ltd	0.847
AT408	RA-40C-15×19	Sakai Manufacturing Co., Ltd	1.365
AT409	RA-30C- 8×10	Sakai Manufacturing Co., Ltd	0.281
AT411	RA-35C-12×14	Sakai Manufacturing Co., Ltd	0.847
AT412	RA-35C-14×15	Sakai Manufacturing Co., Ltd	0.847

Remark: For detailed coupling specifications, please see respective manufacturer's catalog.

Table 5 Linear encoder code

Linear encoder type	Symbol	Supported AC servomotors	Resolution [μm]	Linear encoder model
Without linear encoder	S0000	–	–	–
Incremental linear encoder	SA000	Yaskawa Electric Corporation Σ-7	Variable	HEIDENHAIN K.K. LIF181R
	SC000		Variable	Renishaw plc. TONiC
	SB010	Mitsubishi Electric Corporation J4 and Panasonic Corporation MINAS A6	0.01	HEIDENHAIN K.K. LIF181R
	SB020		0.02	
	SB040		0.04	
	SB050		0.05	
	SB100		0.1	
	SB200		0.2	
	SD010		0.01	Renishaw plc. VIONiC
	SD020		0.02	
	SD040		0.04	
	SD050		0.05	
	SD100		0.1	
	SD200		0.2	
Absolute linear encoder	SE050	Yaskawa Electric Corporation Σ-7	0.05	Renishaw plc. RESOLUTE
	SF050	Mitsubishi Electric Corporation J4	0.05	
	SG050	Panasonic Corporation MINAS A6	0.05	

Remarks 1. For details of SA000 and SC000 variable resolution, see Table 7.
2. For linear encoder specification, see Table 11.

Specifications

Table 6 Accuracy

unit: mm

Model and size		Stroke length		Positioning Repeatability	Positioning accuracy	Lost motion(1)	Parallelism in table motion A	Attitude accuracy (2) sec	Straightness in vertical Straightness in horizontal	Squareness of XY motion
		X-axis	Y-axis							
Single-axis specification	TX120M	**100**		±0.0005 (±0.001)	0.003 (0.006)	0.001	0.005	5	0.003	–
		150								
		200			0.004 (0.008)		0.006	6	0.004	
		250								
		300								
	TX220M	**150**		±0.0005 (±0.001)	0.003 (0.006)	0.001	0.005	5	0.003	–
		200			0.004 (0.008)		0.006	6	0.004	
		250								
		300								
		400			0.005 (0.013)		0.007	7	0.005	
	TX320M	**300**		±0.0005 (±0.001)	0.004 (0.008)	0.001	0.006	6	0.004	–
		400			0.005 (0.013)		0.007	7	0.005	
		500								
	TX420M	**500**		±0.0005 (±0.001)	0.005 (0.013)	0.001	0.007	7	0.005	–
		600			0.006 (0.016)		0.008	8	0.006	
		800			0.008 (0.020)		0.009	9	0.008	
Two-axis specification	CTX120M	**100**	**100**	±0.0005 (±0.001)	0.005 (0.007)	0.001	0.008	8	0.005	0.005
		200	**100**		0.005 (0.010)					0.010
		200	**200**							
		300	**200**							
	CTX220M	**200**	**200**	±0.0005 (±0.001)	0.006 (0.010)	0.001	0.009	9	0.006	0.005
		300	**200**							0.010
		300	**300**							
		400	**300**		0.008 (0.010)		0.011	11	0.008	

Notes (1) When no linear encoder is used, this represents the value for backlash.
(2) This represents accuracy in pitching and yawing.

Remark: The values in ( ) indicate values without a linear encoder.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Table 7 Maximum speed attained when a motor manufactured by YASKAWA ELECTRIC CORPORATION is used (with incremental linear encoder)

Designation of linear encoder	Resolution μm/pulse	Maximum speed mm/s		Linear encoder	Serial conversion unit (1)
		Lead 5mm	Lead 10mm		
SA000	0.0156	62.5	62.5	HEIDENHAIN K.K. LIF181R	Yaskawa Electric Corporation JZDP-H003-000
	0.0312	125	125		
	0.0625	250 (224)	250 (224)		
	0.125		500 (448)		
	0.250				
	0.500				
SC000	0.0781	250 (224)	312.5	Renishaw plc. TONiC	Yaskawa Electric Corporation JZDP-H005-000
	0.156		500 (448)		
	0.312				
	0.625				
	1.25				
	2.5				

Note (1) Serial conversion unit is attached.

Remarks 1. The values in ( ) are applicable to TX320M and TX420M.
2. Practical maximum speed varies depending on load condition.
3. To change the maximum speed, the resolution needs to be changed by setting the electronic gear for driver.

Table 8 Maximum speed attained when a motor manufactured by Mitsubishi Electric Corporation or Panasonic Corporation is used (with incremental linear encoder)

Designation of linear encoder	Resolution μm/pulse	Maximum speed mm/s		Linear encoder	Linear encoder signal conversion unit (1)
		Lead 5mm	Lead 10mm		
SB010	0.01	40 (2)	40 (2)	HEIDENHAIN K.K. LIF181R	HEIDENHAIN K.K. IBV3271 100F (1)
SB020	0.02	80 (2)	80 (2)		HEIDENHAIN K.K. IBV3271 50F (1)
SB040	0.04	160 (2)	160 (2)		HEIDENHAIN K.K. IBV3271 25F (1)
SB050	0.05	200 (2)	200 (2)		HEIDENHAIN K.K. IBV3271 20F (1)
SB100	0.1	250 (224)	400 (2)		HEIDENHAIN K.K. IBV3171 10F (1)
SB200	0.2	250 (224)	500 (448)		HEIDENHAIN K.K. IBV3171 5F (1)
SD010	0.01	40	40	Renishaw plc. VIONiC	–
SD020	0.02	80	80		
SD040	0.04	160	160		
SD050	0.05	200	200		
SD100	0.1	250 (224)	400		
SD200	0.2	250 (224)	500 (448)		

Notes (1) A linear encoder signal conversion unit corresponding to resolution is attached (Made by HEIDENHAIN K.K).
(2) Because the allowable value of the linear encoder signal conversion unit maximum response frequency is ±5%, the maximum speed may decrease by 5%.

Remarks 1. The values in ( ) are applicable to TX320M and TX420M.
2. Practical maximum speed varies depending on load condition.
3. The included linear encoder signal conversion unit has model numbers set by resolution, so the resolution cannot be changed.

Table 9 Maximum speed attained when a motor manufactured by Yaskawa Electric Corporation, Mitsubishi Electric Corporation, or Panasonic Corporation is used (with absolute linear encoder)

Designation of linear encoder	Resolution μm/pulse	Maximum speed mm/s		Linear encoder	Linear encoder signal conversion unit
		Lead 5mm	Lead 10mm		
SE050	0.05	250 (224)	500 (448)	Renishaw plc. RESOLUTE	–
SF050	0.05	250 (224)	500 (448)		
SG050	0.05	250 (224)	500 (448)		

Remarks 1. The values in ( ) are applicable to TX320M and TX420M.
2. Practical maximum speed varies depending on load condition.
3. The included linear encoder signal conversion unit has model numbers set by resolution, so the resolution cannot be changed.

Table 10 Maximum speed attained when no linear encoder is used

Motor type	Model and size	Maximum speed mm/s	
		Lead 5mm	Lead 10mm
AC servo motor	TX120M	250	500
	TX220M		
	TX320M	224	448
	TX420M		
Stepper motor	TX120M	150	300
	TX220M		
	TX320M		

Remark: The values of respective axes in tables of two-axis specification are the same as those of tables of single-axis specification.

Table 11 Linear encoder specification

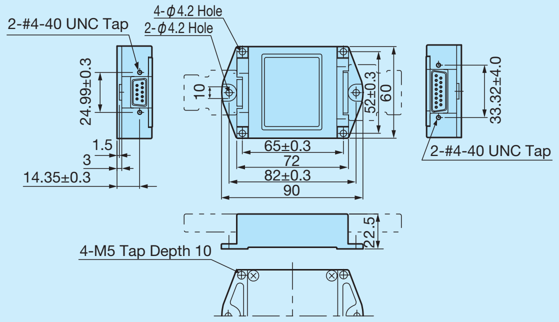
Item		Content			
Model		LIF181R	TONiC	VIONiC	RESOLUTE
Manufacturer		HEIDENHAIN K.K.	Renishaw plc		
Material of scale main body		Glass	Low expansion nickel alloy		
Coefficient of linear expansion	/℃	8×10-6	0.75±0.35×10-6		
Accuracy class	μm/m	±1	±1	±1	±1
Output type		Sine wave (1Vpp)	Sine wave (1Vpp)	Square wave	Serial communication
Signal cycle	μm	4	20	20	30
Maximum operation speed	m/sec	4	10	12	100
Cord length	m	3	3	3	3
Cord diameter	mm	φ4.5	φ4.25±0.25	φ4.25±0.25	φ4.7±0.2
Cord bending radius	mm	When movable: 50 or more	When movable: 20 or more	When movable: 30 or more	When movable: 20 or more
		When fixed: 10 or more	When fixed: 10 or more	When fixed: 10 or more	When fixed: 10 or more

Table 12 Serial conversion unit specification for YASKAWA ELECTRIC CORPORATION

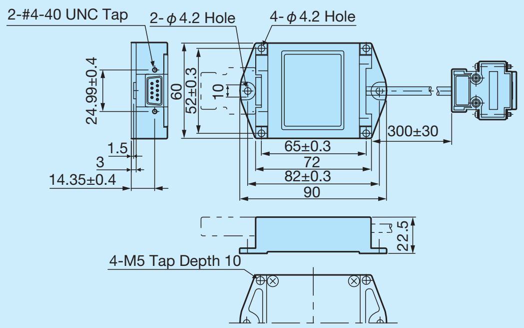
Item		Content	
Linear encoder		HEIDENHAIN K.K. LIF181R	Renishaw plc. TONiC
Serial conversion unit model		JZDP-H003-000	JZDP-H005-000
Signal resolution		1/256 of input two phase sine wave pitch	
Maximum responding frequency	kHz	250	
Size	mm	90×60×23	
Mass	kg	0.15	

Remark The connection cable for the serial conversion unit and driver must be prepared by the customer.

Model: JZDP-H003-000



Model: JZDP-H005-000



Remark Excerpted from YASKAWA ELECTRIC CORPORATION materials

Table 13 Linear encoder signal conversion unit specification for Panasonic Corporation and Mitsubishi Electric Corporation

Item		Content					
Linear encoder model		HEIDENHAIN K.K. IBV 3171 [5F, 10F] 0.22μs		HEIDENHAIN K.K. IBV 3271 [20F,25F,50F,100F] 0.22μs			
Signal resolution		Input two phase sine wave pitch ÷ 4-time multiplication ÷ electronic division ratio					
Maximum responding frequency (1)	kHz	5F : 200	10F : 200	20F : 100	25F : 80	50F : 40	100F : 20
Size	mm	Converter part: 50×41×16					
		Connector part: 48×42×17					
		Cord length: 1000					
Mass	kg	0.13					

Remark The connection cable for the signal conversion unit and driver must be prepared by the customer.

Table 14 Maximum carrying mass

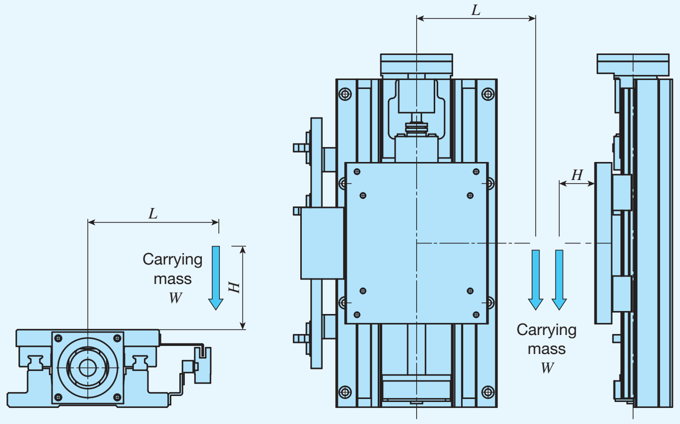
Model and size	Ball screw lead mm	Carrying mass position mm	Maximum carrying mass kg							
			Horizontal direction				Vertical direction			
		Length L / Height H	0	100	200	300	0	100	200	300
TX120M	5	0	254	97	57	40	28	28	28	28
		100	254	96	57	40	28	28	28	28
		200	254	95	56	40	28	28	28	28
		300	233	92	56	40	28	28	28	26
	10	0	154	76	44	31	28	28	28	28
		100	154	74	44	31	28	28	28	27
		200	154	70	43	31	28	28	28	24
		300	129	65	41	30	28	26	23	20
TX220M	5	0	382	263	167	123	30	30	30	30
		100	382	261	167	122	30	30	30	30
		200	382	258	166	122	30	30	30	30
		300	382	254	165	122	30	30	30	30
	10	0	187	187	131	96	29	29	29	29
		100	187	187	130	95	29	29	29	29
		200	187	187	127	94	29	29	29	29
		300	187	183	124	93	29	29	29	29
TX320M	5	0	536	536	536	473	27	27	27	27
		100	536	536	536	472	27	27	27	27
		200	536	536	536	471	27	27	27	27
		300	536	536	536	469	27	27	27	27
	10	0	254	254	254	254	25	25	25	25
		100	254	254	254	254	25	25	25	25
		200	254	254	254	254	25	25	25	25
		300	254	254	254	254	25	25	25	25
TX420M	5	0	519	519	519	519	10	10	10	10
		100	519	519	519	519	10	10	10	10
		200	519	519	519	519	10	10	10	10
		300	519	519	519	519	10	10	10	10
	10	0	237	237	237	237	8	8	8	8
		100	237	237	237	237	8	8	8	8
		200	237	237	237	237	8	8	8	8
		300	237	237	237	237	8	8	8	8

Remark: The maximum carrying mass is adjusted by the mass when the rating life of the linear motion rolling guide, ball screws, or bearings is 18,000 hours during continuous operation at a number of revolutions of the motor of 3000min^{-1} and an acceleration/deceleration time of 0.2s. The mass calculated is based upon the basic static load rating of the linear motion rolling guide.

Table 15 Maximum load mass

Model and size	Ball screw lead mm	Maximum load mass kg	
		Horizontal direction	Vertical direction
TX120M	5	315	86
	10	172	44
TX220M	5	572	170
	10	331	90
TX320M	5	672	217
	10	430	122
TX420M	5	588	224
	10	471	145

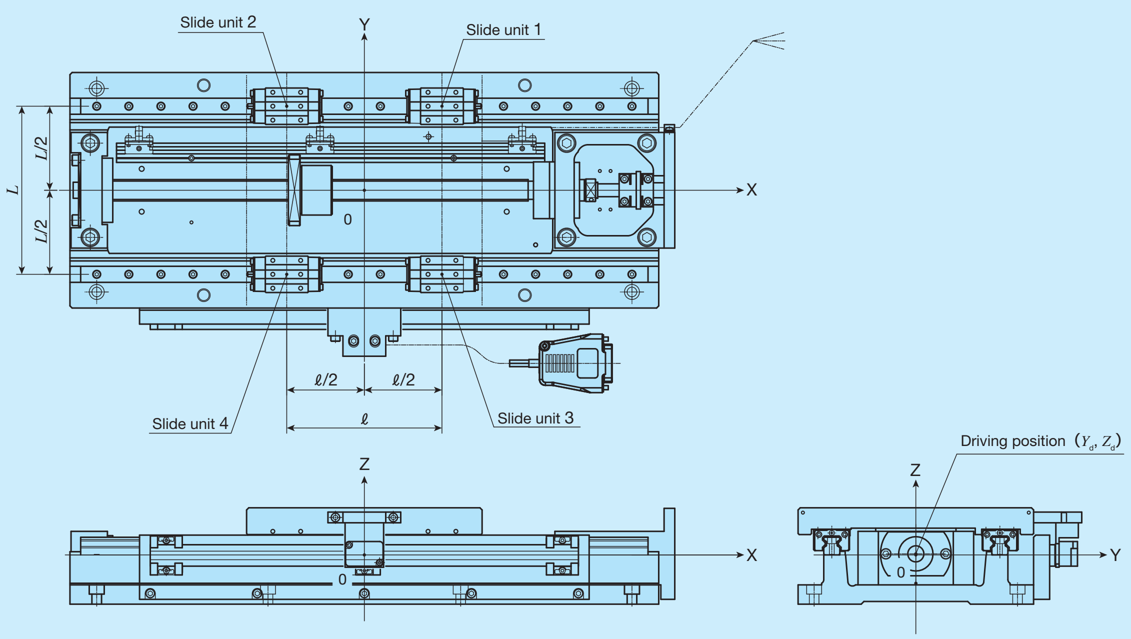
Remarks 1. The maximum load mass shows the mass that ensures acceleration/deceleration of 0.3G.
2. The values shown in this table were calculated with the motor with the highest rated torque installed, selected from the AC servomotor models listed in Table 3.



Carrying mass position (horizontal direction)

Carrying mass position (vertical direction)

Table 16 Specifications of linear motion rolling guide



Model and size	Basic dynamic load rating(1) C N	Basic static load rating(1) C_0 N	Arrangement L mm	ℓ mm	Y_d mm	Z_d mm
TX120M	6 120	10 400	88	82	0	2
TX220M	11 500	20 000	157	145	0	1
TX320M	32 100	56 300	240	210	0	6
TX420M	38 200	70 300	300	290	0	0

Note (1) Represent the value per slide unit.
Remark: The values of respective axes in tables of two-axis specification are the same as those of tables of single-axis specification.

Table 17.1 Specifications of ball screw 1

Model and size	Ball screw type	Lead mm	Shaft dia. mm	Axial clearance mm	Basic dynamic load rating C N	Basic static load rating C_0 N
TX120M	Ground screw	5	15	0	7 070	12 800
		10			7 070	12 800
TX220M	Ground screw	5	20	0	8 230	17 150
		10			10 900	21 700
TX320M	Ground screw	5	25	0	16 700	43 500
		10			15 800	32 700
TX420M	Ground screw	5	25	0	16 700	43 500
		10			15 800	32 700

Remark: The values of respective axes in tables of two-axis specification are the same as those of tables of single-axis specification.

Table 17.2 Specifications of ball screw 2

unit: mm

Model and size	Stroke length	Shaft dia.	Overall length
TX120M	100	15	256
	150		306
	200		356
	250		406
	300		456
TX220M	150	20	370
	200		420
	250		470
	300		520
	400		620
TX320M	300	25	616
	400		716
	500		816
TX420M	500	25	916
	600		1 016
	800		1 216

Table 18 Table inertia and starting torque

	Model and size	Stroke length mm X-axis	Y-axis	Table inertia J_T $\times10^{-5}$kg·m^2 Lead 5mm	Lead 10mm	Coupling inertia J_C $\times10^{-5}$kg·m^2	Starting torque T_S N·m
Single-axis specification	TX120M	100		1.3	1.8	0.29	0.07
		150		1.5	2.0		
		200		1.6	2.2		
		250		1.8	2.4		
		300		2.0	2.6		
	TX220M	150		5.2	7.0	0.85	0.12
		200		5.8	7.6		
		250		6.4	8.2		
		300		7.1	8.8		
		400		8.3	10		
	TX320M	300		20	26	0.85	0.26
		400		23	29		
		500		26	32		
	TX420M	500		30	39	0.85	0.30
		600		33	42		
		800		39	48		
Two-axis specification	CTX120M	100	100	2.1	4.7	0.29	0.07
		200	100	2.4	5.1		
		200	200	2.5	5.8		
		300	200	2.9	6.2		
	CTX220M	200	200	8.2	16.9	0.85	0.13
		300	200	9.5	18.1		
		300	300	9.8	19.3		
		400	300	11.0	20.5		

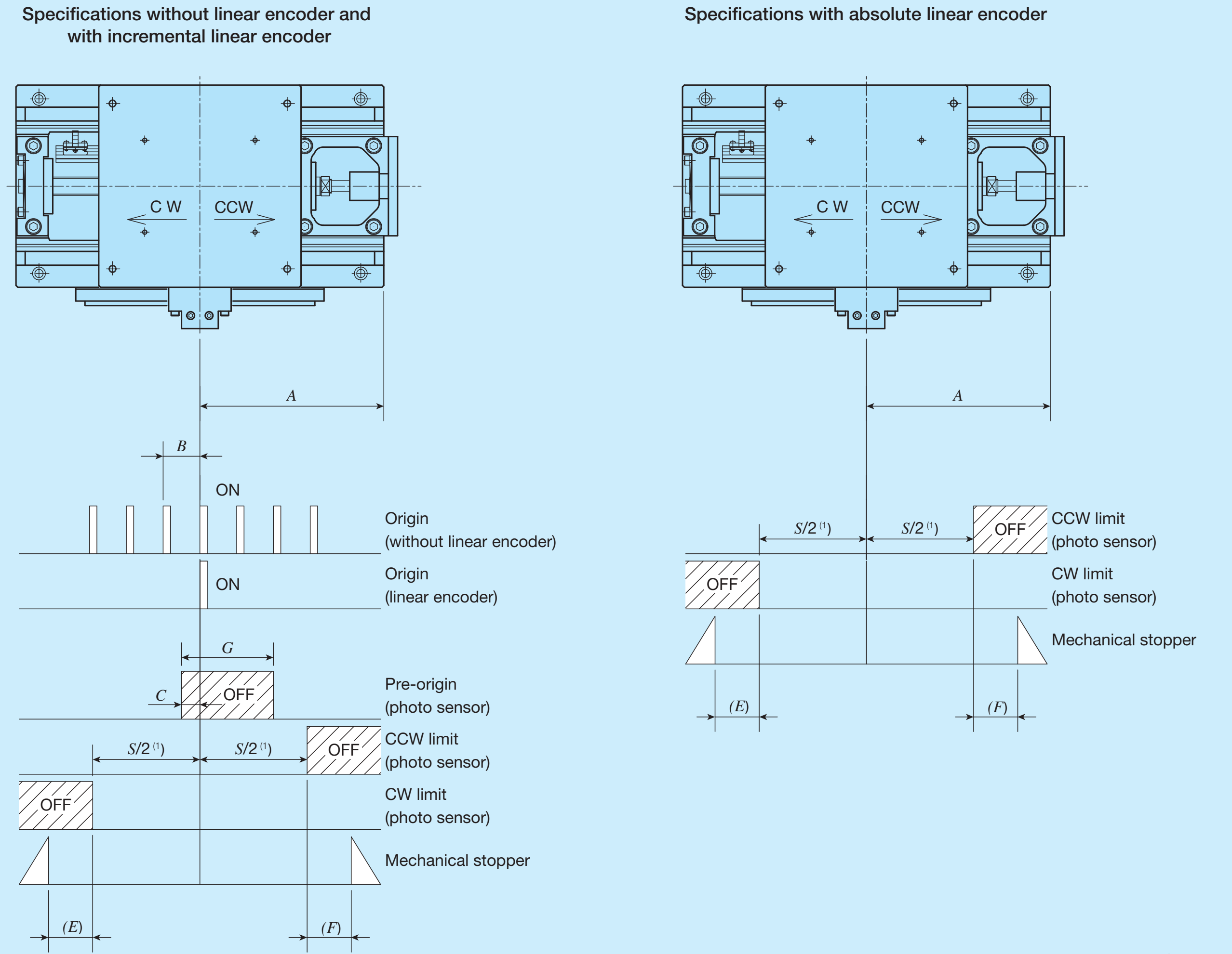
Remark: As for tables of two-axis specification, the figures represent values in X-axis. For values in Y-axis, see the table for single-axis specification.

Mounting

For the processing accuracy of the Precision Positioning Table mounting surface and the tightening torque of the fixing screws, see page Ⅲ-30.

Sensor Specification

Table 19 Sensor timing chart



unit: mm

Model and size	Ball screw lead	*A*	*B*	*C*	*E*	*F*	*G*
TX120M	5	*L*/2 (1)	5	3	5.5	4.5	60
	10		10	7			
TX220M	5	*L*/2 (1)	5	3	14	10	58
	10		10	7	12	10	
TX320M	5	*L*/2 (1)	5	3	20	15	80
	10		10	7			
TX420M	5	*L*/2 (1)	5	3	18	15	100
	10		10	7			

Note (1) See the dimension tables on page Ⅱ-173 to Ⅱ-178.

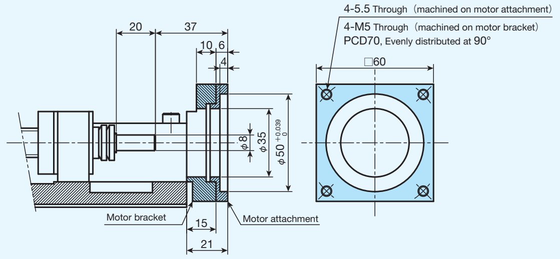
Remarks 1. For detailed specifications of respective sensors, please see the section of sensor specification in General Explanation.

2. The values of respective axes in tables of two-axis specification are the same as those of tables of single-axis specification.

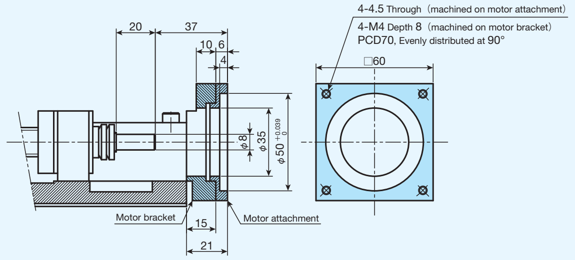
Dimensions of Motor Attachment

TX120M, CTX120M

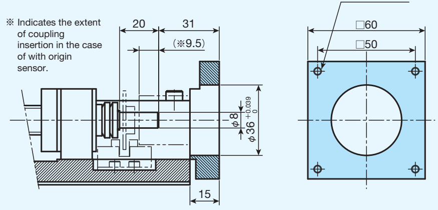
AT401



AT405

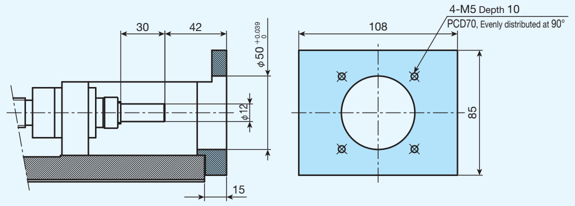


AT409

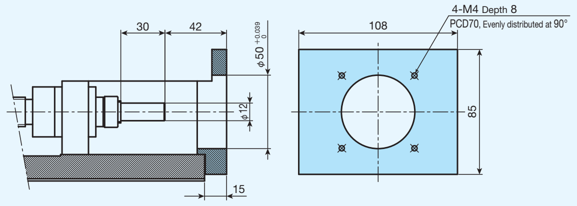


TX220M, CTX220M

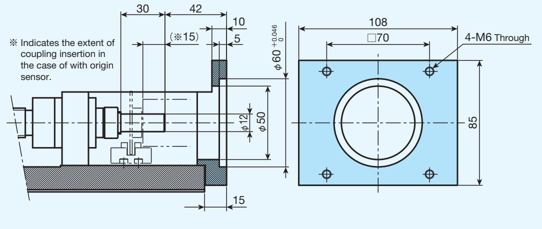
AT402



AT406

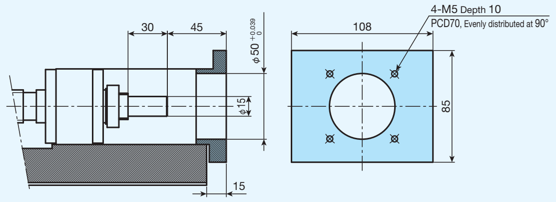


AT411

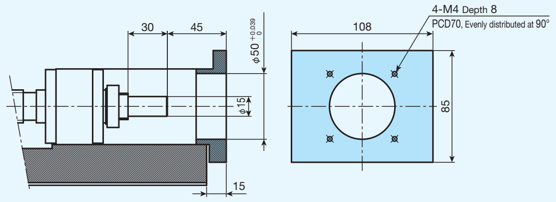


TX320M

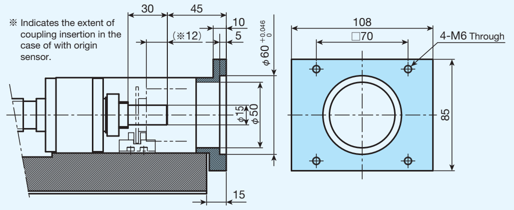
AT403



AT407

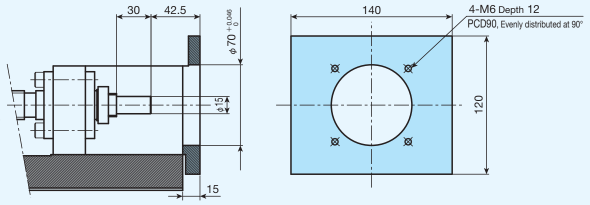


AT412

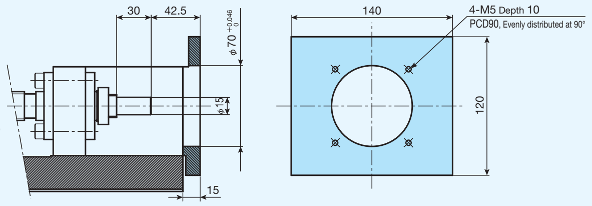


TX420M

AT404

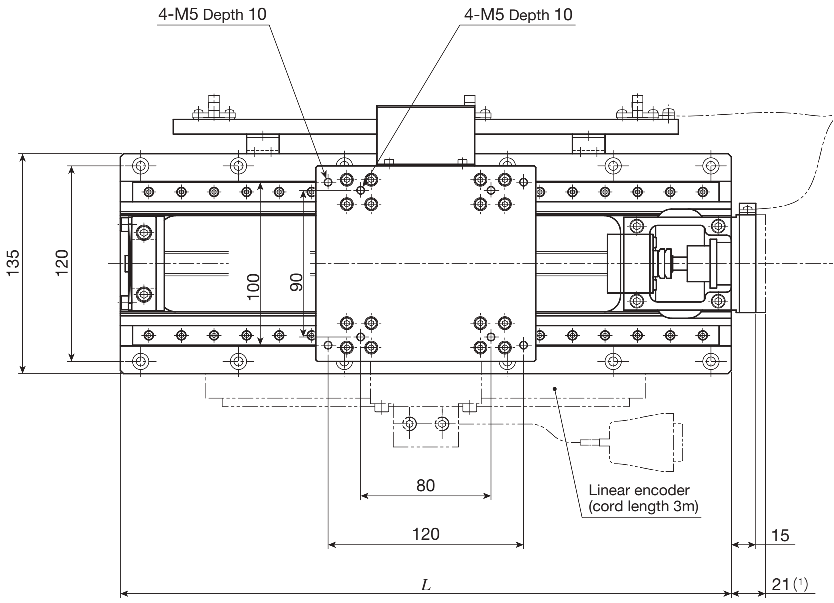


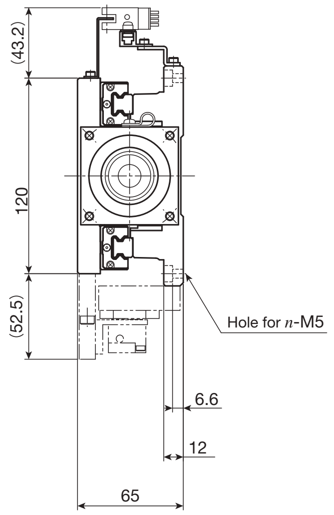
AT408

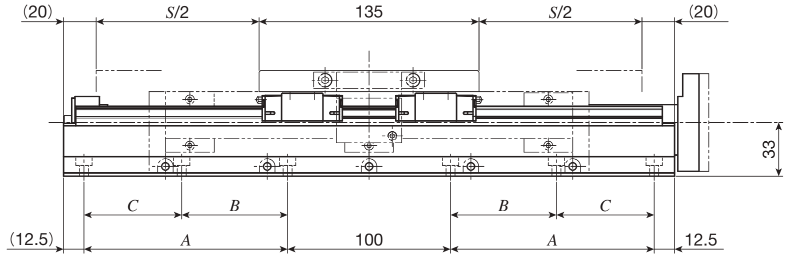


1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

TX120M





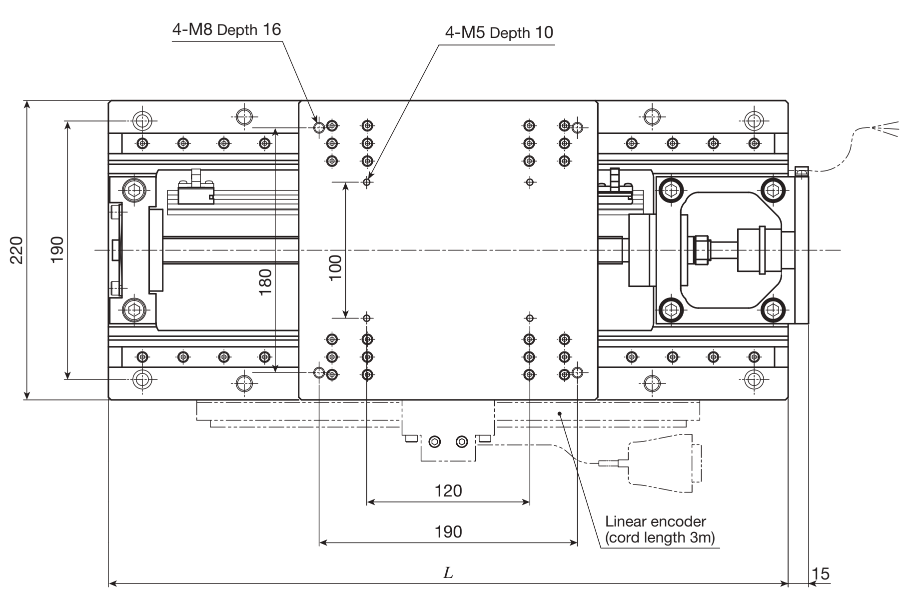


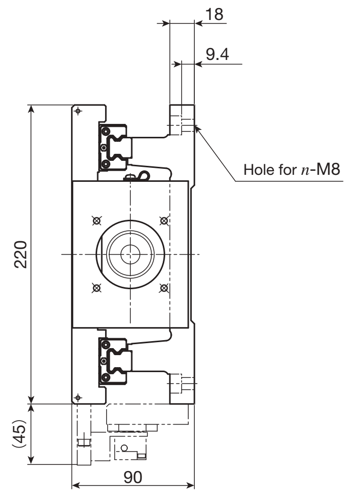
unit: mm

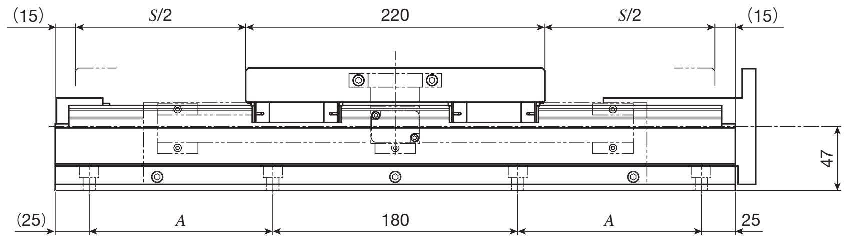
Identification number	Stroke length S	Overall length L	Mounting holes of bed				Mass (Ref.) kg
			A	B	C	n	
TX120M-100	100	275	75	–	–	8	12
TX120M-150	150	325	100	–	–	8	13
TX120M-200	200	375	125	–	–	8	14
TX120M-250	250	425	150	75	75	12	16
TX120M-300	300	475	175	100	75	12	17

Note (1) This applies to AT401 and AT405.

TX220M





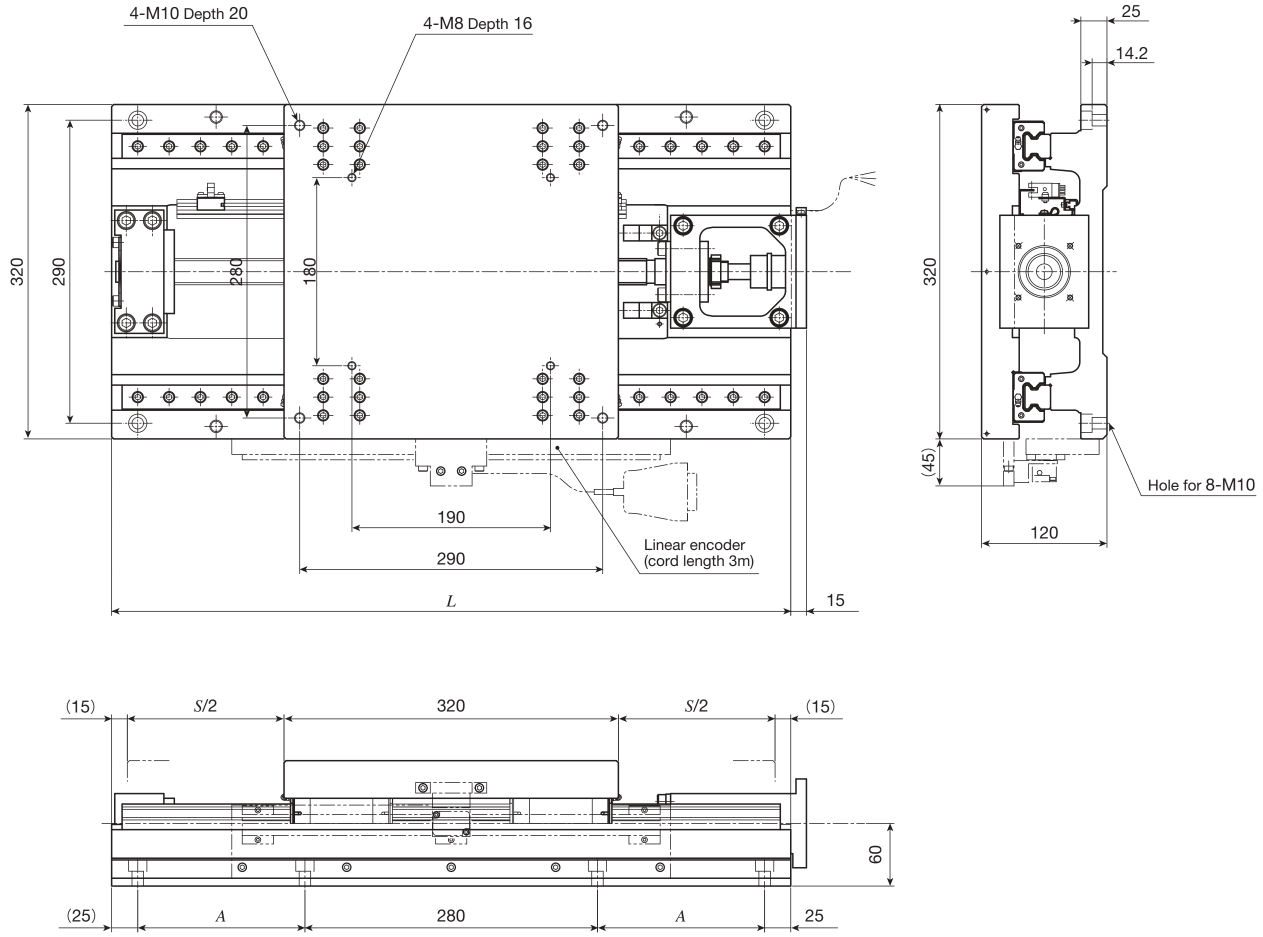


unit: mm

Identification number	Stroke length S	Overall length L	Mounting holes of bed		Mass (Ref.) kg
			A (the number of holes×pitch)	n	
TX220M-150	150	400	85	8	34
TX220M-200	200	450	110	8	37
TX220M-250	250	500	135	8	39
TX220M-300	300	550	160	8	42
TX220M-400	400	650	210 (2×105)	12	47

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

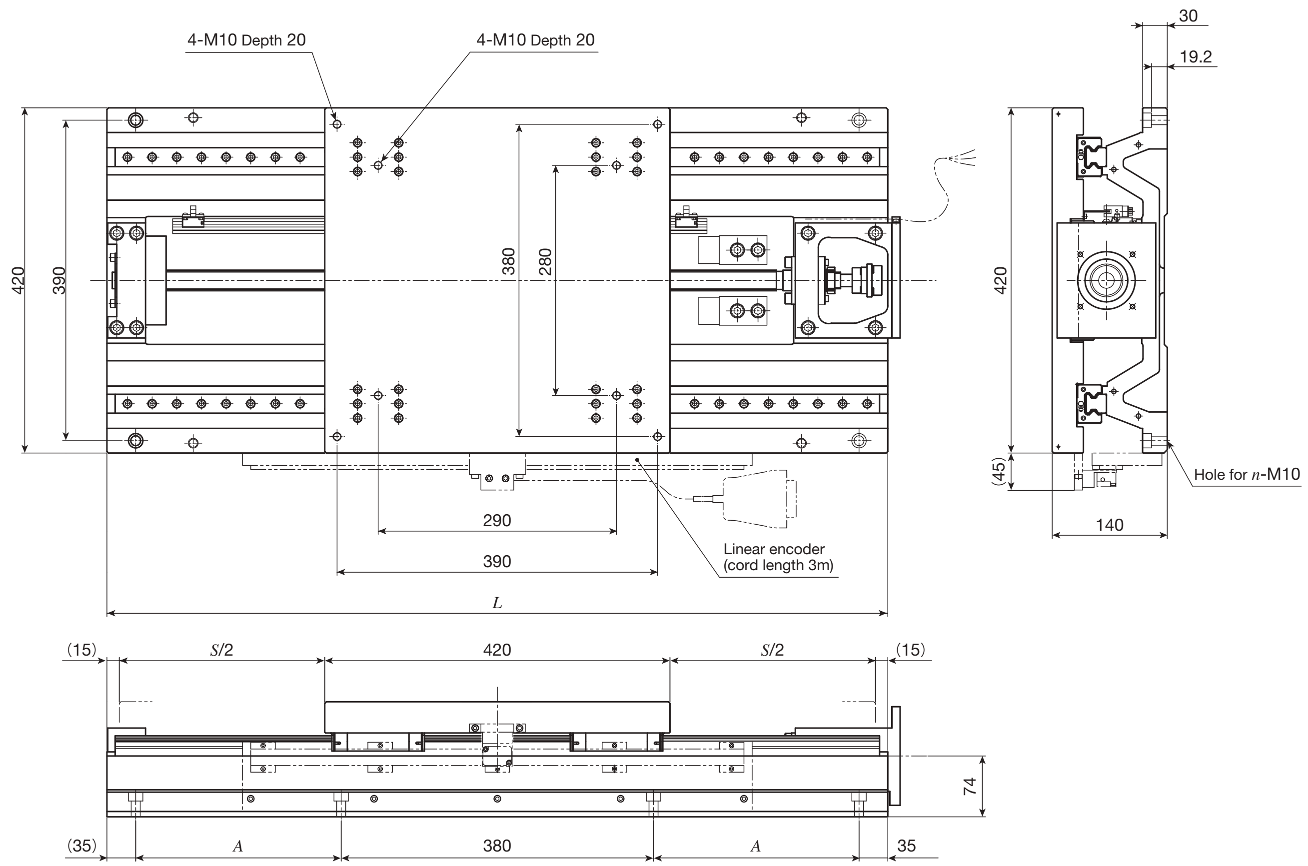
TX320M



unit: mm

Identification number	Stroke length *S*	Overall length *L*	Mounting holes of bed *A*	Mass（Ref.） kg
TX320M-300	300	650	160	104
TX320M-400	400	750	210	115
TX320M-500	500	850	260	124

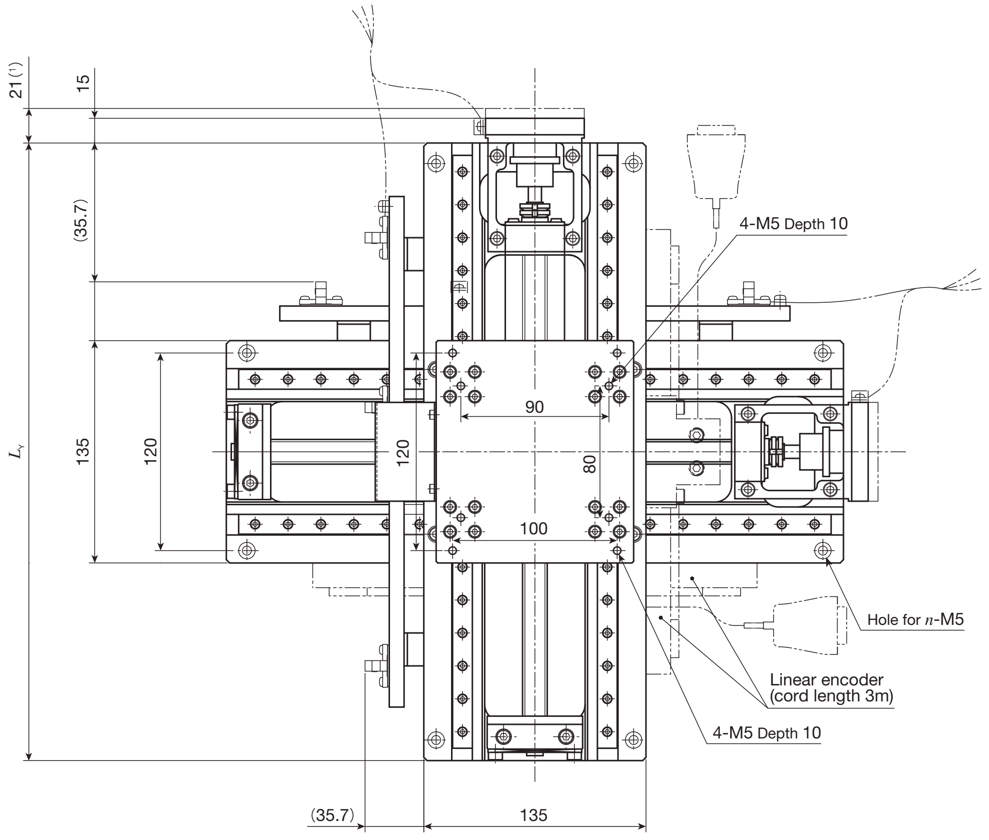
TX420M

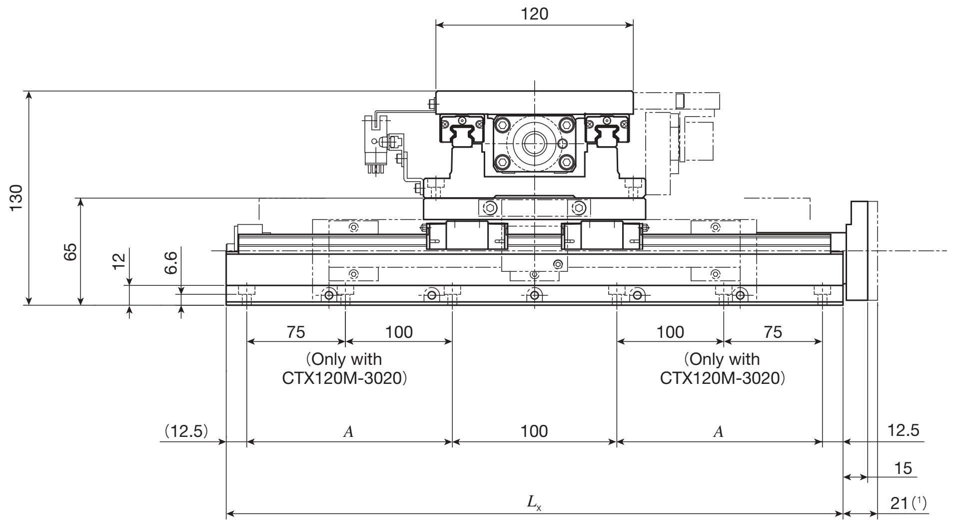


unit: mm

Identification number	Stroke length *S*	Overall length *L*	Mounting holes of bed		Mass（Ref.） kg
			A (the number of holes×pitch)	*n*	
TX420M-500	500	950	250	8	183
TX420M-600	600	1 050	300	8	197
TX420M-800	800	1 250	400（2×200）	12	223

CTX120M





unit: mm

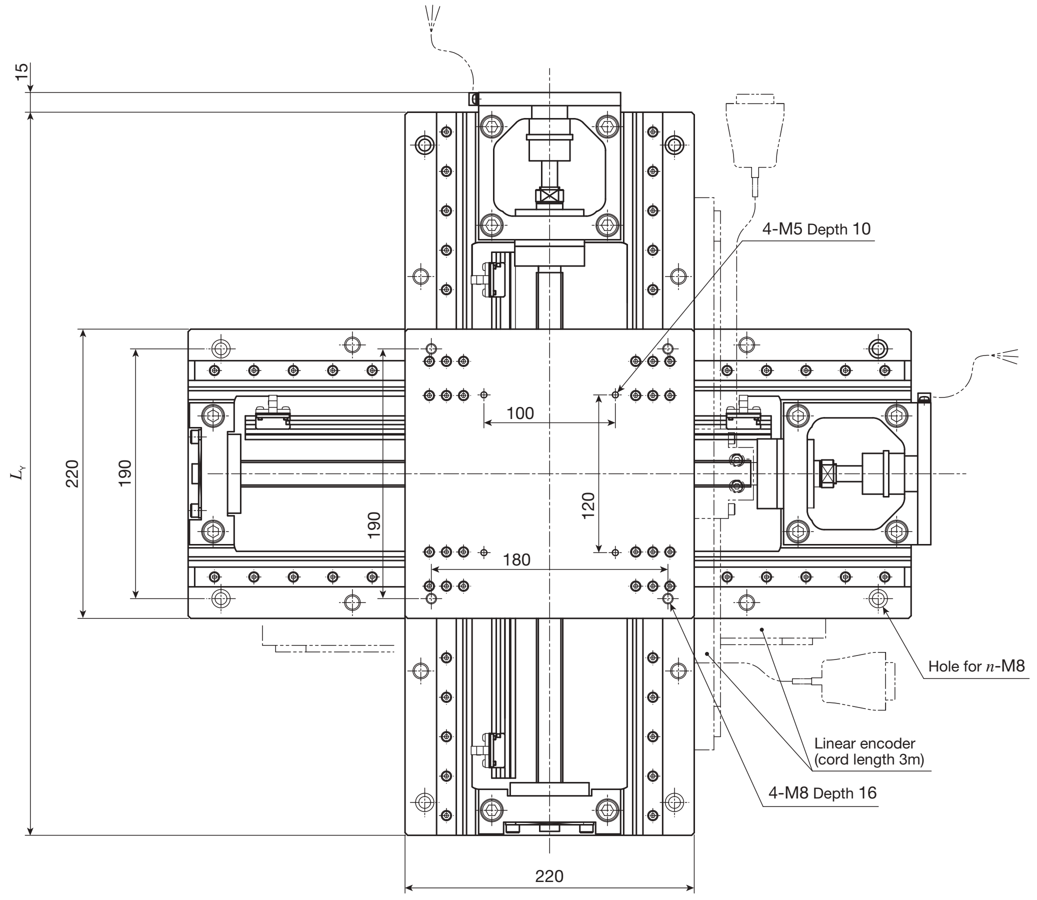
Identification number	Stroke length S		Overall length		Mounting holes of bed		Mass (Ref.)
	X-axis	Y-axis	L_X	L_Y	A	n	kg
CTX120M-1010	100	100	275	275	75	8	23
CTX120M-2010	200	100	375	275	125	8	26
CTX120M-2020	200	200	375	375	125	8	28
CTX120M-3020	300	200	475	375	175	12	31

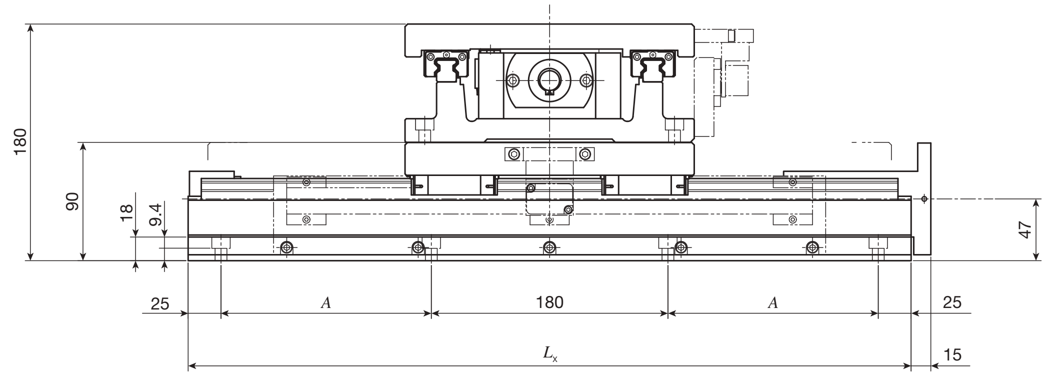
Note (1) This applies to AT401 and AT405.

Remarks 1. The combination for CTX in the above figure is the standard configuration.

2. Since other combinations of stroke lengths other than those listed above, different table sizes, as well as production of cableveyor specification are possible, please contact IKO.

CTX220M





unit: mm

Identification number	Stroke length S		Overall length		Mounting holes of bed		Mass (Ref.)
	X-axis	Y-axis	L_X	L_Y	A (the number of holes×pitch)	n	kg
CTX220M-2020	200	200	450	450	110	8	73
CTX220M-3020	300	200	550	450	160	8	78
CTX220M-3030	300	300	550	550	160	8	83
CTX220M-4030	400	300	650	550	210 (2×105)	12	88

Remarks 1. The combination for CTX in the above figure is the standard configuration.

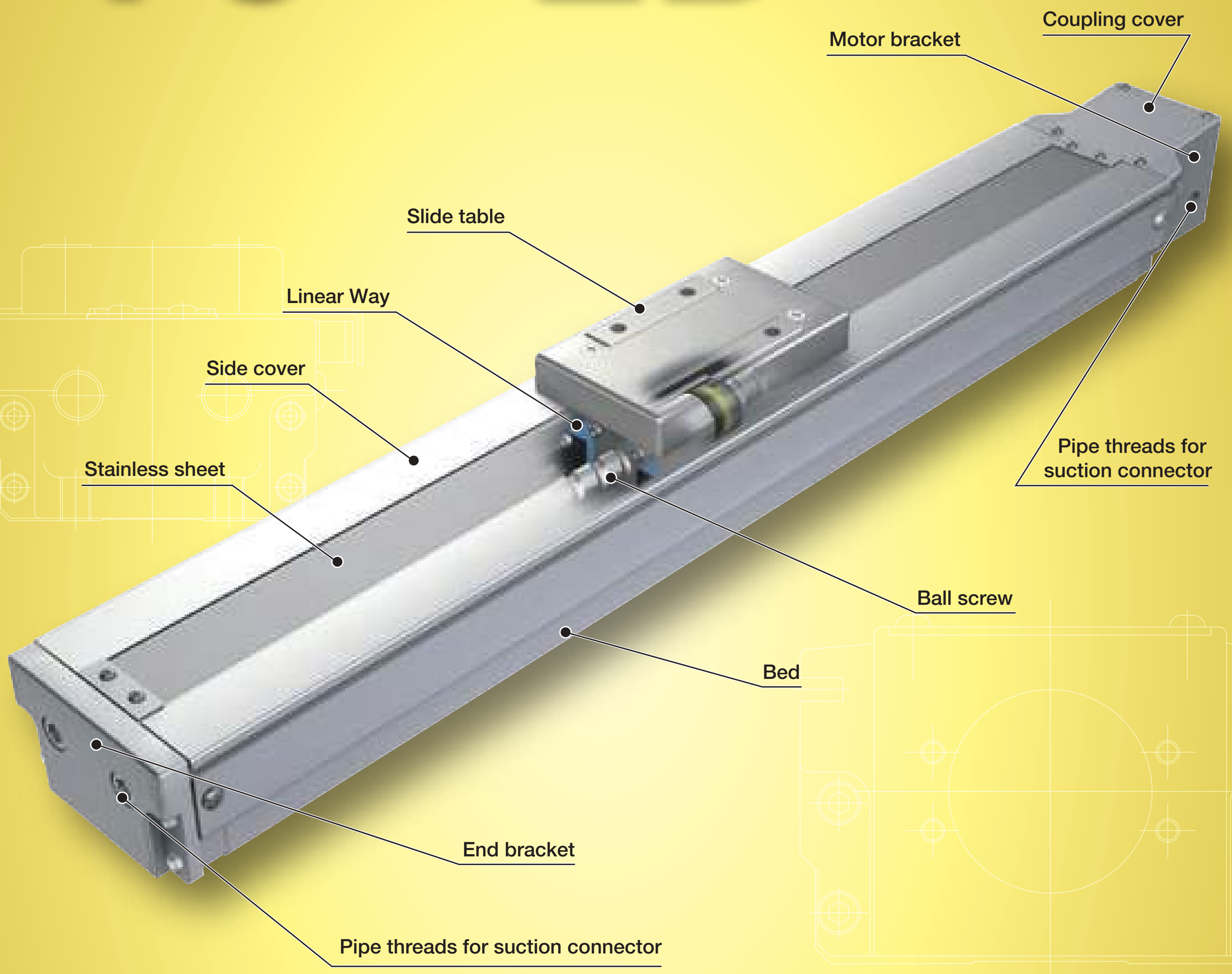
2. Since other combinations of stroke lengths other than those listed above, different table sizes, as well as production of cableveyor specification are possible, please contact IKO.

TC···EB

TC···EB

C-Lube Maintenance-free

Ball screw
Linear



Major product specifications

Driving method	Precision ball screw
Linear motion rolling guide	Linear Way（ball type）
Built-in lubrication part	Lubrication part "C-Lube" is built-in
Material of table and bed	High-strength aluminum alloy
Sensor	Select by identification number

Accuracy

unit: mm

Positioning repeatability	±0.002
Positioning accuracy	0.035～0.065
Lost motion	–
Parallelism in table motion A	–
Parallelism in table motion B	0.008～0.016
Attitude accuracy	–
Straightness	–
Backlash	0.005

Points

● Light weight, low profile and compact clean table

1 Positioning table of a structure with enhanced sealing property inside the table, based on light weight, low profile and compact Precision Positioning Table TE. Thanks to optimal design of linear motion rolling guide and ball screws, low cross sectional height as low as 50mm for TC50EB, 54mm for TC60EB and 67mm for TC86EB is realized. Since the sensor is designed to be directly mounted into the mounting groove, it contributes to space saving.

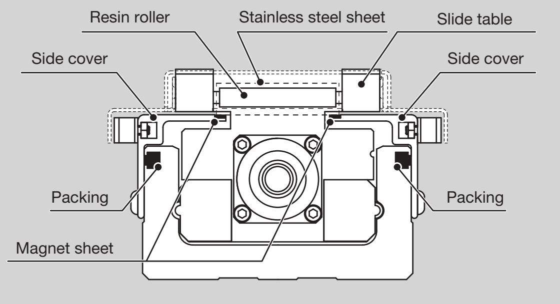
● High corrosion resistance

3 Anodized high-tension aluminum alloy and stainless steel (stainless sheet) are used in main components to ensure excellent corrosion resistance.

● Compatible with cleanliness class 3

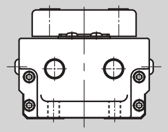
➔Page Ⅱ-183

2 Press the stainless sheet against the side cover using the resin roller within the slide table, securely absorb it with a strong magnet sheet and seal the drive parts and slide table guiding parts. Dust-generation in proximity is prevented by sucking air from an enclosed space and class 3 cleanliness rating based on IKO measurement method is realized. Low dust-generation grease CGL for clean environment is contained in slide table guiding parts and ball screws to suppress dust-generation.



Sealed structure

Variation

Shape	Model	Bed width（mm）		
		50	60	86
	TC···EB	☆	☆	☆

About measurement of cleanliness

Cleanliness refers to classified air cleanliness levels based on size (particle diameter) and quantity of suspended particulates per unit volume.
IKO measures cleanliness by following the procedures.

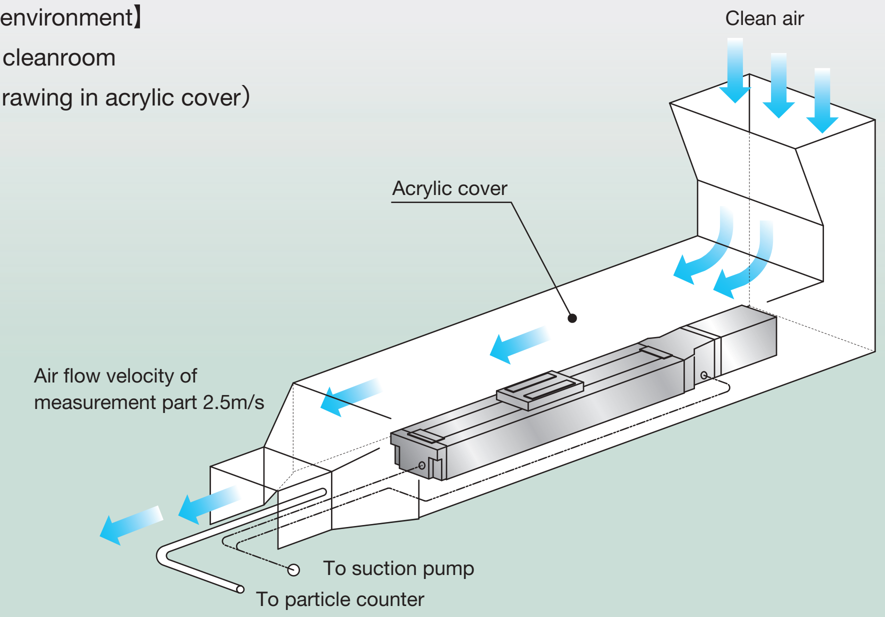
● Measuring condition

Item	Content
Measuring equipment	Particle counter
Air flow velocity of measurement part	2.5m/s
Measured air quantity	28.3L （1cf）
Measurement time	48h（10min/measurement, 1measurement/h）

● Appearance of test device

● Outline of test device

【Measurement environment】
Clean bench in cleanroom
（clean air withdrawing in acrylic cover）



● Upper concentration limit of each cleanliness class (JIS B 9920 : 2002, ISO 14644-1: 1999)

unit: number of particles/m³

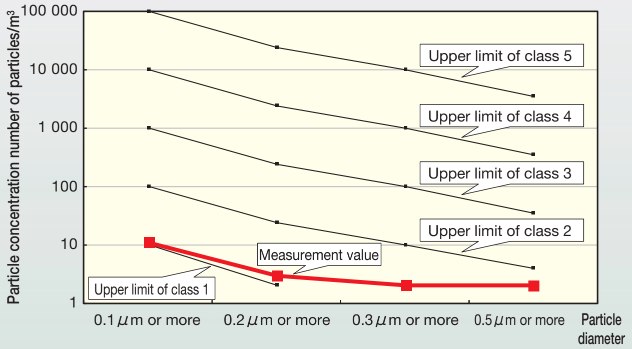
Cleanliness	Particle diameter			
	0.1μm or larger	0.2μm or larger	0.3μm or larger	0.4μm or larger
Class 1	10	2	—	—
Class 2	100	24	10	4
Class 3 (Federal Standard 209D Class 1)	1 000	237	102	35
Class 4 (Federal Standard 209D Class 10)	10 000	2 370	1 020	352
Class 5 (Federal Standard 209D Class 100)	100 000	23 700	10 200	3 520
Class 6 (Federal Standard 209D Class 1000)	1 000 000	237 000	102 000	35 200

Actual measurement data of cleanliness

● Example of measurement data [Upper concentration limit chart for each cleanliness class]

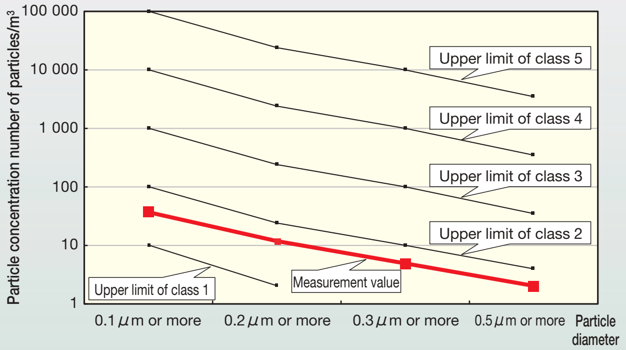
TC50EB150
（Ball screw lead: 4mm）

Stroke: 50mm
Speed: 200mm/s Suction amount: 5L/min



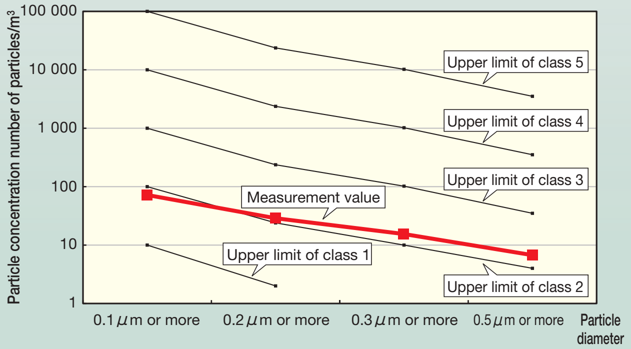
TC50EB300
（Ball screw lead: 8mm）

Stroke: 200mm
Speed: 400mm/s Suction amount: 10L/min



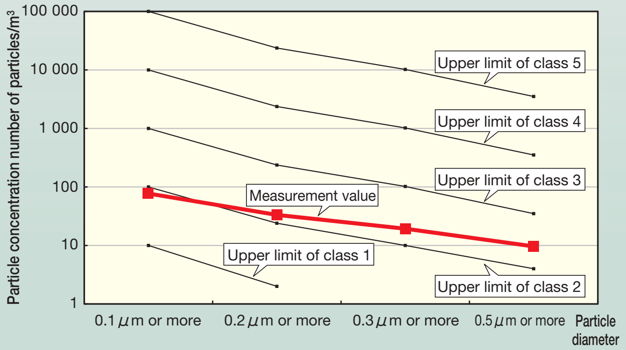
TC60EB300
（Ball screw lead: 10mm）

Stroke: 200mm
Speed: 500mm/s Suction amount: 30L/min



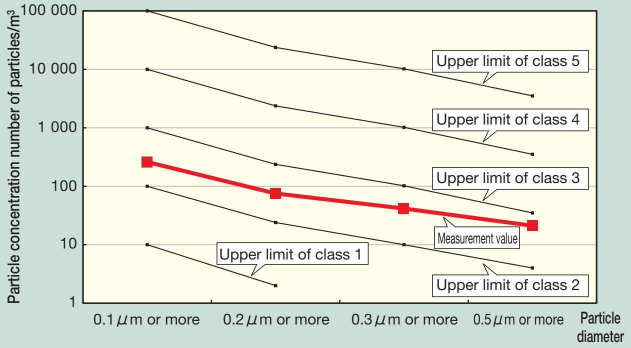
TC60EB600
（Ball screw lead: 10mm）

Stroke: 500mm
Speed: 500mm/s Suction amount: 30L/min



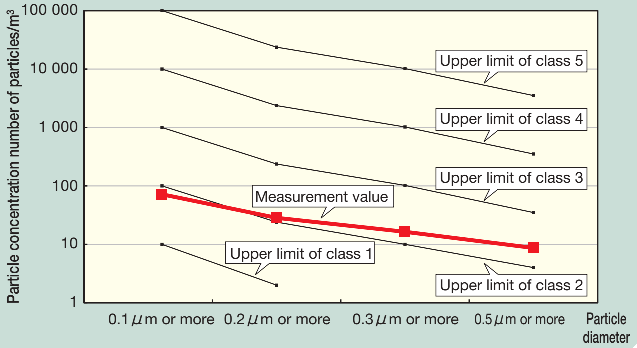
TC86EB640
（Ball screw lead: 20mm）

Stroke: 500mm
Speed: 1 000mm/s Suction amount: 70L/min



TC86EB940
（Ball screw lead: 20mm）

Stroke: 800mm
Speed: 560mm/s Suction amount: 40L/min



● Measurement result of cleanliness

Model and size	Bed length	Ball screw lead mm	Stroke length mm	Speed mm/s	Suction amount L/min	Cleanliness class (JIS B 9920:2002, ISO 14644-1: 1999)
TC50EB	150	4	50	200	5	Class 2
	200	4	100	200	10	Class 2
	300	8	200	400	10	Class 2
TC60EB	150	5	50	250	30	Class 3
	300	10	200	500	30	Class 3
	600	10	500	500	30	Class 3
TC86EB	340	10	200	500	30	Class 3
	640	10	500	500	40	Class 3
	640	20	500	1 000	70	Class 3
	940	20	800	560	40	Class 3

Remark: Cleanliness varies depending on operating environment and operating conditions.

Identification Number

Example of an Identification Number

1	2	1	3		4	5	6
TC	50	EB	200	/	AT501	8	3

- 1 **Model** Page Ⅱ-186
- 2 **Size** Page Ⅱ-186
- 3 **Bed length** Page Ⅱ-186
- 4 **Designation of motor attachment** Page Ⅱ-186
- 5 **Ball screw lead** Page Ⅱ-186
- 6 **Specification of sensor** Page Ⅱ-186

Identification Number and Specification

1 Model

TC···EB: Cleanroom Precision Positioning Table TC

2 Size

Size indicates bed width.
Select a size from the list of Table 1.

3 Bed length

Select a bed length from the list of Table 1.

Table 1 Sizes, bed widths, and bed lengths

unit: mm

Model and size	Bed width	Bed length (stroke length)						
TC50EB	50	150(50)	200(100)	250(150)	300(200)	–	–	–
TC60EB	60	150(50)	200(100)	300(200)	400(300)	500(400)	600(500)	–
TC86EB	86	340(200)	440(300)	540(400)	640(500)	740(600)	840(700)	940(800)

4 Designation of motor attachment

AT500: Without motor attachment
To specify the motor attachment, select it from the list of Table 2.

- Motor should be prepared by customer.
- Please specify motor attachment applicable to motor for use.
- If motor attachment is specified, a coupling shown in Table 3 is mounted on the main body before shipment. However, the final position adjustment should be made by customer since it is only temporarily fixed.
- For a product without motor attachment (AT500), no coupling is attached.

5 Ball screw lead

4: Lead 4mm (applied to TC50EB)
5: Lead 5mm (applied to TC60EB)
8: Lead 8mm (applied to TC50EB)
10: Lead 10mm (applied to TC60EB and TC86EB)
20: Lead 20mm (applied to TC86EB)

6 Specification of sensor

0: Without sensor
2: Two units of sensor mounted (limit)
3: Three units of sensor mounted (limit, pre-origin)
4: Four units of sensor mounted (limit, pre-origin, origin)
5: Two sensors attached (limit)
6: Three sensors attached (limit and pre-origin)
7: Four sensors attached (limit, pre-origin, origin)

If sensor mounting (symbol 2, 3, or 4) is specified, the sensor is mounted into the mounting groove on the side cover, and two detecting plates are attached onto the slide table.
If sensor attachment (symbol 5, 6, or 7) is specified, mounting screws and nuts for sensor are provided in addition to the specified number of sensors, and two detecting plates are attached onto the slide table.

Table 2 Application of motor attachment

Models of motor to be used					Flange size	Motor attachment		
Type	Manufacturer	Series	Model	Rated output W		TC50EB	TC60EB	TC86EB
AC servo motor	YASKAWA ELECTRIC CORPORATION	Σ-7	**SGM7J-A5A**	**50**	□40	AT501	AT502	–
			SGM7A-A5A			AT501	AT502	–
			SGM7J-01A	**100**		–	AT502	–
			SGM7A-01A			–	AT502	–
			SGM7J-02A	**200**	□60	–	–	AT503
			SGM7A-02A			–	–	AT503
	Mitsubishi Electric Corporation	J4/J5	**HG-MR053**	**50**	□40	AT501	AT502	–
			HG-KR053/HK-KT053W			AT501	AT502	–
			HG-MR13	**100**		–	AT502	–
			HG-KR13/HK-KT13W			–	AT502	–
			HG-MR23	**200**	□60	–	–	AT503
			HG-KR23/HK-KT23W			–	–	AT503
	Panasonic Corporation	MINAS A6	**MSMF5A**	**50**	□38	AT504	AT505	–
			MSMF01	**100**		–	AT505	–
			MSMF02	**200**	□60	–	–	AT506
	Hitachi Industrial Equipment Systems Co., Ltd	AD	**ADMA-R5L**	**50**	□40	AT501	AT502	–
			ADMA-01L	**100**		–	AT502	–
			ADMA-02L	**200**	□60	–	–	AT503
Stepper motor	ORIENTAL MOTOR Co., Ltd.	α step	**ARM46**		□42	AT507	–	–
			ARM66		□60	–	–	AT508
			ARM69		□60	–	–	AT508
		CRK	**CRK54**		□42	AT509	–	–
			CRK56 (1)		□60	–	AT510	AT511

Note (1) Applicable to the outer diameter φ8 of motor output shaft.
Remark: For detailed motor specifications, please see respective motor manufacturer's catalog.

Table 3 Coupling models

Motor attachment	Coupling models	Manufacturer	Coupling inertia J_c $\times 10^{-5}$kg · m^2
AT501	XGS-19C-5× 8	Nabeya Bi-tech Kaisha	0.062
AT502	XGS-19C-5× 8	Nabeya Bi-tech Kaisha	0.062
AT503	XGS-30C-8×14	Nabeya Bi-tech Kaisha	0.55
AT504	XGS-19C-5× 8	Nabeya Bi-tech Kaisha	0.062
AT505	XGS-19C-5× 8	Nabeya Bi-tech Kaisha	0.062
AT506	XGS-30C-8×11	Nabeya Bi-tech Kaisha	0.55
AT507	XGS-19C-5× 6	Nabeya Bi-tech Kaisha	0.062
AT508	XGS-30C-8×10	Nabeya Bi-tech Kaisha	0.55
AT509	XGS-19C-5× 5	Nabeya Bi-tech Kaisha	0.062
AT510	XGS-19C-5× 8	Nabeya Bi-tech Kaisha	0.062
AT511	XGS-30C-8× 8	Nabeya Bi-tech Kaisha	0.55

Remark: For detailed coupling specifications, please see respective manufacturer's catalog.

Specifications

Table 4 Accuracy

unit: mm

Model and size	Bed length	Positioning repeatability	Positioning accuracy	Parallelism in table motion B	Backlash
TC50EB	**150**	±0.002	0.035	0.008	0.005
	200				
	250		0.040		
	300				
TC60EB	**150**	±0.002	0.035	0.008	0.005
	200				
	300		0.040		
	400		0.045		
	500			0.010	
	600		0.050		
TC86EB	**340**	±0.002	0.040	0.008	0.005
	440		0.045	0.010	
	540		0.050		
	640			0.012	
	740		0.055		
	840		0.065	0.014	
	940			0.016	

Table 5 Maximum carrying mass

Model and size	Ball screw lead mm	Carrying mass position mm	Maximum carrying mass kg							
			Horizontal direction				Vertical direction			
		Length L / Height H	0	100	200	300	0	100	200	300
TC50EB	4	0	12	12	7	5	11	6	3.7	2.5
		100	12	12	7	4.9	6	4.3	2.9	2.1
		200	12	11	6	4.7	3.5	2.8	2.3	1.8
		300	12	10	6	4.5	2.4	2.0	1.8	1.6
	8	0	12	10	5	3.9	7	5	2.9	2.0
		100	12	8	5	3.6	4.9	3.3	2.3	1.6
		200	12	7	4.5	3.3	2.7	2.2	1.8	1.4
		300	10	6	4.1	3.1	1.9	1.6	1.4	1.2
TC60EB	5	0	17	17	11	8	13	10	5	3.8
		100	17	17	10	7	9	6	4.3	3.2
		200	17	16	10	7	5	4.1	3.4	2.7
		300	17	14	9	7	3.6	3.1	2.7	2.3
	10	0	17	15	8	5	8	7	4.3	2.9
		100	17	11	7	5	7	4.9	3.3	2.5
		200	17	9	6	4.8	4.0	3.2	2.6	2.1
		300	13	8	5	4.4	2.8	2.4	2.0	1.8
TC86EB	10	0	36	36	26	18	18	18	13	9
		100	36	36	22	16	18	15	10	8
		200	36	29	20	15	12	10	8	6
		300	36	25	18	14	9	7	6	5
	20	0	29	28	16	11	10	10	10	6
		100	29	20	13	10	10	10	7	5
		200	23	15	11	8	9	7	6	5
		300	17	12	9	7	6	5	4.9	4.3

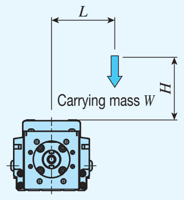
Remark: The maximum carrying mass is adjusted by the mass when the rating life of the linear motion rolling guide, ball screws, or bearings is 18,000 hours during continuous operation at a number of revolutions of the motor of 3000min^{-1} and an acceleration/deceleration time of 0.2s. The mass calculated is based upon the basic static load rating of the linear motion rolling guide.

Specifications

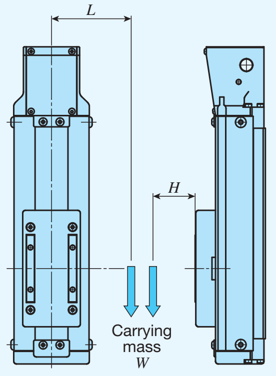
Table 6 Maximum load mass

Model and size	Ball screw lead mm	Maximum load mass kg	
		Horizontal direction	Vertical direction
TC50EB	4	105	26
	8	55	13
TC60EB	5	172	45
	10	90	22
TC86EB	10	175	45
	20	90	21

Remarks 1. The maximum load mass shows the mass that ensures acceleration/deceleration of 0.3G.
2. The values shown in this table were calculated with the motor with the highest rated torque installed, selected from the AC servomotor models listed in Table 2.



Carrying mass position
(horizontal direction)



Carrying mass position
(vertical direction)

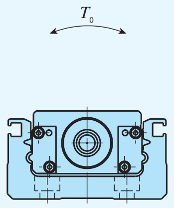
Table 7 Allowable moment

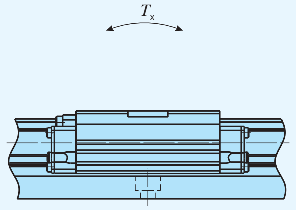
Model and size	Allowable moment N・m
TC50EB	5.0
TC60EB	6.0
TC86EB	10.0

Remark: Applied in all directions.

■ Allowable moment

Allowable moment refers to the maximum static moment that can be used without affecting functions or performance. Therefore, do not exceed the allowable moment value during operation.





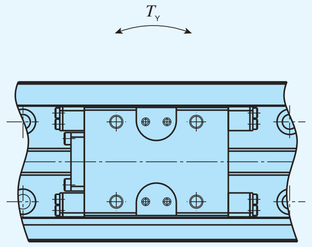


Table 8 Load rating of linear motion rolling guide

Model and size	Basic dynamic load rating C N	Basic static load rating C_0 N	Static moment rating N·m		
			T_0	T_X	T_Y
TC50EB	8 490	12 500	211	99.5	99.5
TC60EB	12 400	17 100	354	151	151
TC86EB	26 800	35 900	1 110	472	472

Table 9 Maximum speed

Motor type	Model and size	Bed length mm	Maximum speed mm/s				
			Lead 4mm	Lead 5mm	Lead 8mm	Lead 10mm	Lead 20mm
AC servo motor	TC50EB	–	200	–	400	–	–
	TC60EB	–	–	250	–	500	–
	TC86EB	640 or less	–	–	–	500	1 000
		740	–	–	–	500	1 000
		840	–	–	–	400	800
		940	–	–	–	330	660
Stepper motor	TC50EB	–	120	–	240	–	–
	TC60EB	–	–	150	–	300	–
	TC86EB	840 or less	–	–	–	300	600
		940	–	–	–	300	600

Remark: To measure the practical maximum speed, it is required to consider operation patterns based on the motor to be used and load conditions.

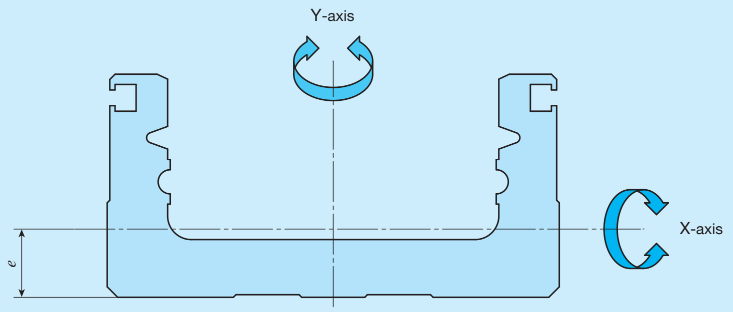
Table 10.1 Specifications of ball screw 1

Model and size	Lead mm	Shaft dia. mm	Basic dynamic load rating C N	Basic static load rating C_0 N
TC50EB	4	8	2 290	3 575
	8		1 450	2 155
TC60EB	5	10	2 730	4 410
	10		1 720	2 745
TC86EB	10	12	3 820	6 480
	20		2 300	3 920

Table 10.2 Specifications of ball screw 2 unit: mm

Model and size	Bed length	Shaft dia.	Overall length
TC50EB	150	8	192.5
	200		242.5
	250		292.5
	300		342.5
TC60EB	150	10	194
	200		244
	300		344
	400		444
	500		544
	600		644
TC86EB	340	12	395
	440		495
	540		595
	640		695
	740		795
	840		895
	940		995

Table 11 Moment of inertia of sectional area of bed



Model and size	Moment of inertia of sectional area mm^4		Center of gravity e mm
	I_X	I_Y	
TC50EB	1.3×10^4	1.2×10^5	6.4
TC60EB	4.7×10^4	3.2×10^5	8.8
TC86EB	2.0×10^5	1.3×10^6	13.0

Table 12 Table inertia and starting torque

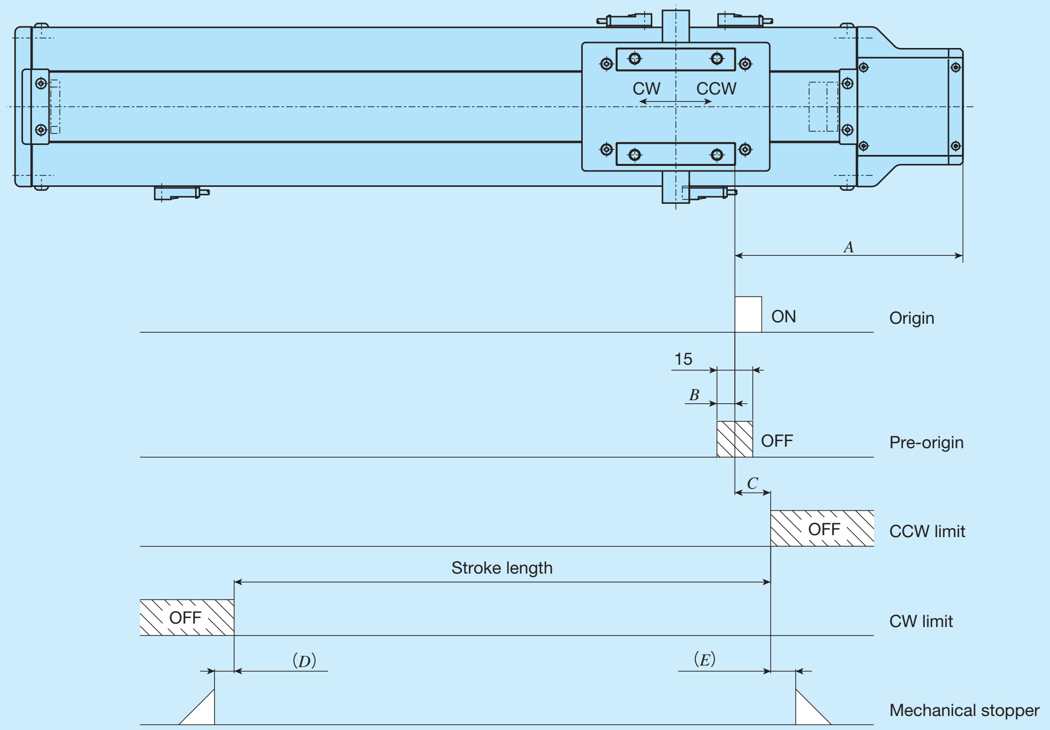
Model and size	Bed length mm	Table inertia J_T $\times10^{-5}\text{kg}\cdot\text{m}^2$					Starting torque T_S N·m				
		Lead 4mm	Lead 5mm	Lead 8mm	Lead 10mm	Lead 20mm	Lead 4mm	Lead 5mm	Lead 8mm	Lead 10mm	Lead 20mm
TC50EB	150	0.062	–	0.092	–	–	0.03	–	0.03	–	–
	200	0.074	–	0.104	–	–					
	250	0.090	–	0.120	–	–					
	300	0.102	–	0.132	–	–					
TC60EB	150	–	0.14	–	0.21	–	–	0.03	–	0.04	–
	200	–	0.20	–	0.27	–					
	300	–	0.27	–	0.34	–					
	400	–	0.34	–	0.41	–					
	500	–	0.41	–	0.48	–					
	600	–	0.49	–	0.55	–					
TC86EB	340	–	–	–	0.78	1.36	–	–	–	0.06	0.10
	440	–	–	–	0.93	1.51					
	540	–	–	–	1.08	1.66					
	640	–	–	–	1.23	1.81					
	740	–	–	–	1.38	1.96					
	840	–	–	–	1.53	2.11					
	940	–	–	–	1.68	2.26					

Mounting

For the processing accuracy of the Precision Positioning Table mounting surface and the tightening torque of the fixing screws, see page Ⅲ-30.

Sensor Specification

Table 13 Sensor timing chart



unit: mm

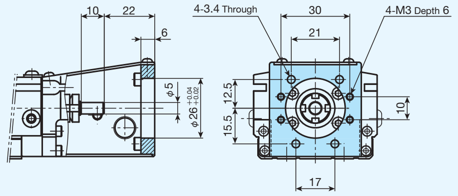
Model and size	Ball screw lead	A	B	C	D	E
TC50EB	4	104	3	20	7	7
	8		5			
TC60EB	5	104	3	20	7.5	8
	10		5			
TC86EB	10	127.5	5	20	11	14
	20		10			

Remarks 1. Mounting a sensor is specified using the corresponding identification number.
2. For the specifications of respective sensors, please see the section of sensor specification in General Explanation.

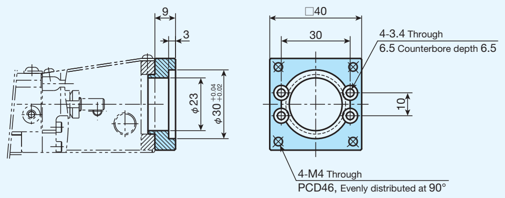
Dimensions of Motor Attachment

TC50EB

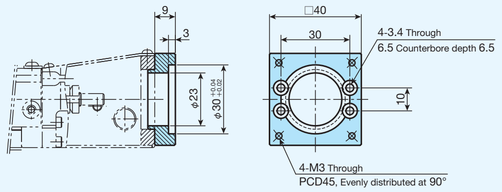
AT500
(without
attachment)



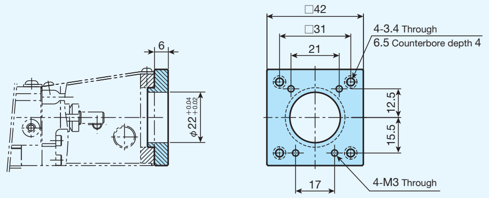
AT501



AT504

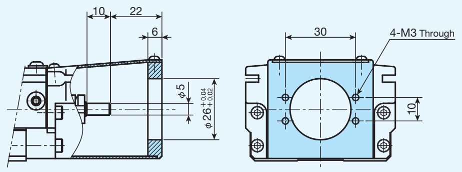


AT507
AT509



TC60EB

AT500
(without
attachment)



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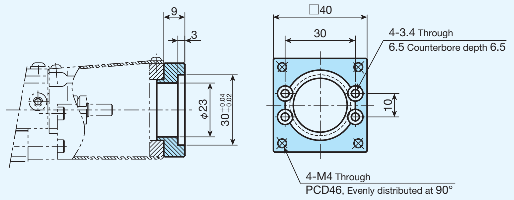

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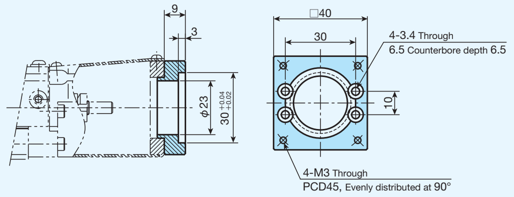

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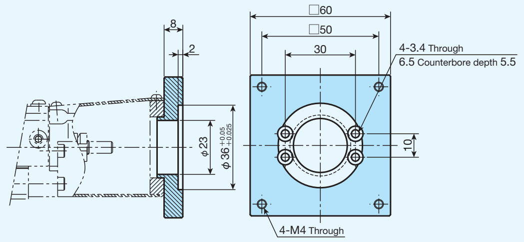

TC86EB

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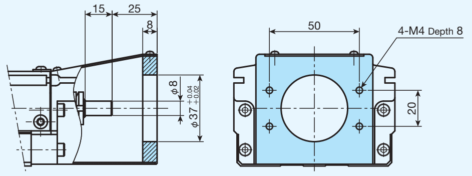
(without
attachment)



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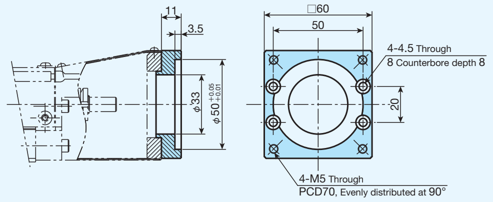

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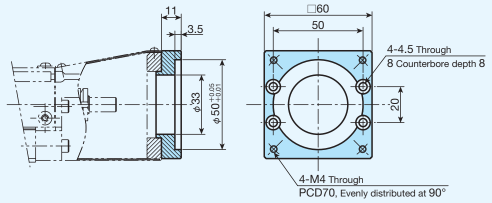
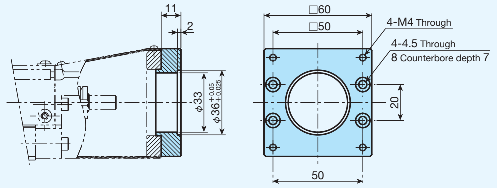


AT508
AT511



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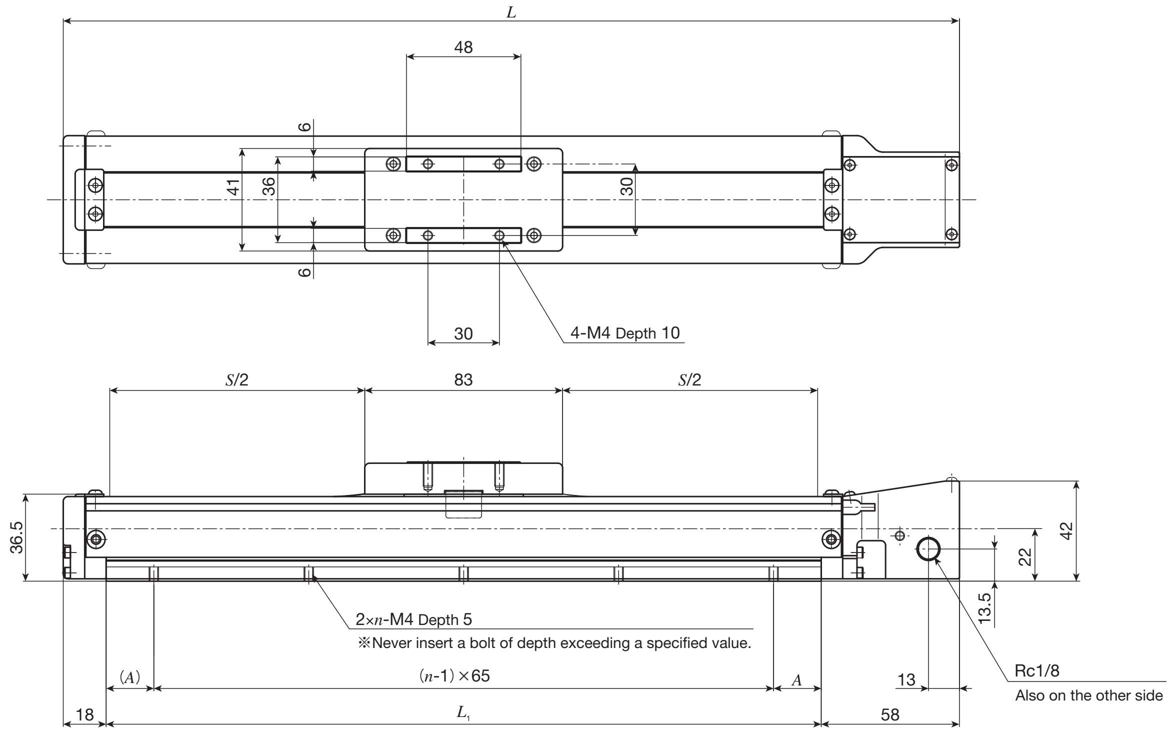
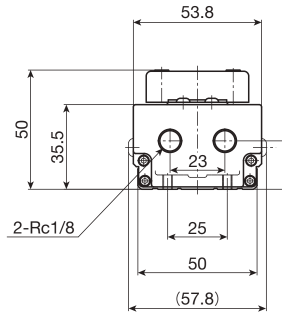
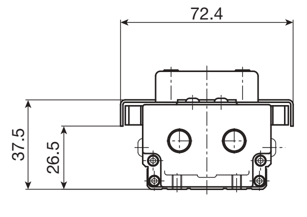






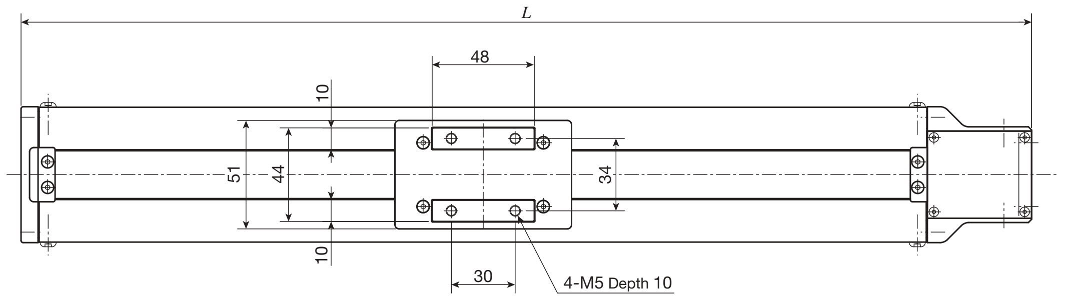
With sensor

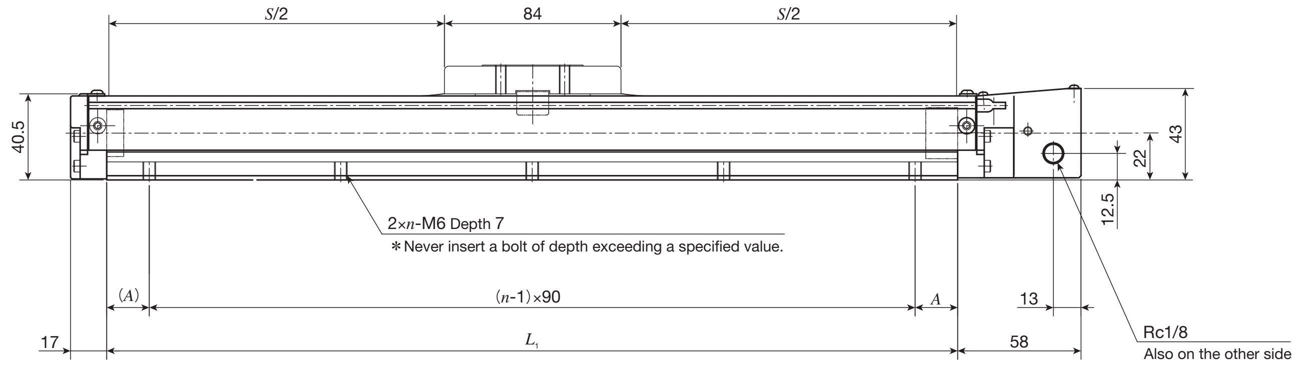
unit: mm

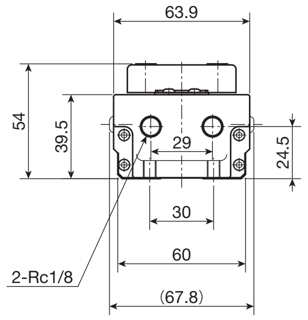
Bed length L_1	Overall length L	Stroke length S	Mounting holes of bed		Mass (Ref.) kg
			A	n	
150	226	50	10	3	0.9
200	276	100	35	3	1.0
250	326	150	27.5	4	1.1
300	376	200	20	5	1.2

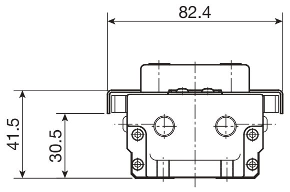
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

TC60EB









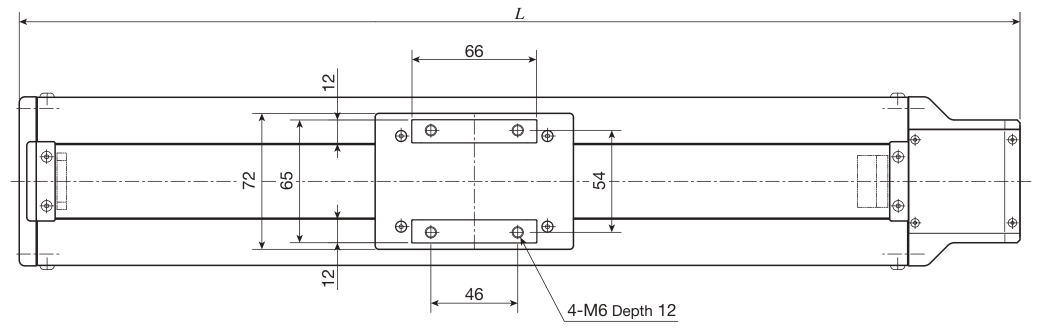
With sensor

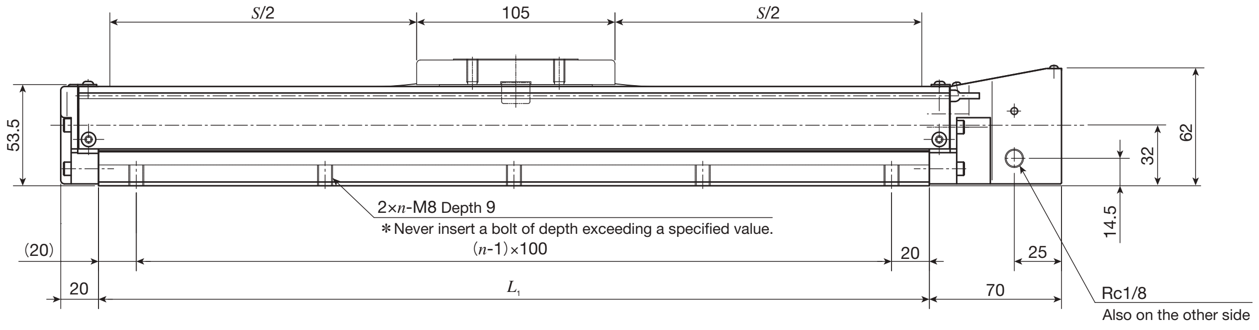
unit: mm

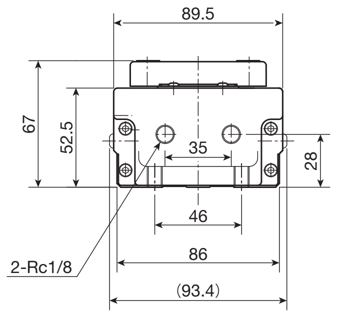
Bed length L_1	Overall length L	Stroke length S	Mounting holes of bed		Mass（Ref.）kg
			A	n	
150	225	50	30	2	1.1
200	275	100	10	3	1.3
300	375	200	15	4	1.7
400	475	300	20	5	2.0
500	575	400	25	6	2.4
600	675	500	30	7	2.7

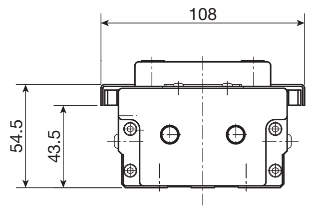
Remark: Motor attachment for stepper motor is 8mm lower than the bottom of the bed.

TC86EB









With sensor

unit: mm

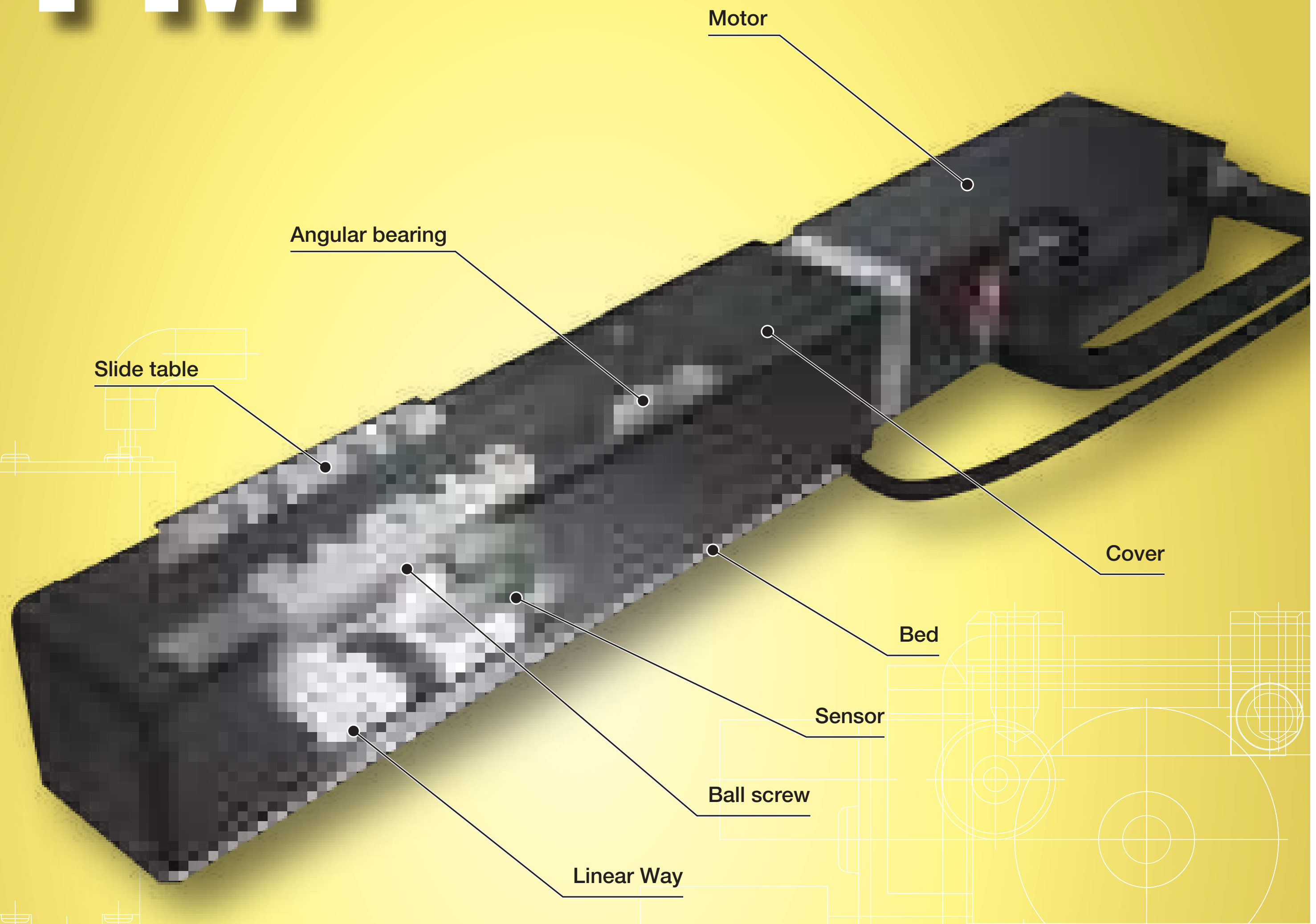
Bed length L_1	Overall length L	Stroke length S	Mounting holes of bed n	Mass（Ref.）kg
340	430	200	4	3.6
440	530	300	5	4.2
540	630	400	6	4.8
640	730	500	7	5.4
740	830	600	8	6.0
840	930	700	9	6.6
940	1 030	800	10	7.3

TM

TM

Ball screw

Linear



Major product specifications

Driving method	Precision ball screw
Linear motion rolling guide	Linear Way（ball type）
Built-in lubrication part	No built-in
Material of table and bed	Stainless steel
Sensor	Select by identification number

Accuracy

unit: mm

Positioning repeatability	±0.001～0.002
Positioning accuracy	0.015
Lost motion	–
Parallelism in table motion A	–
Parallelism in table motion B	–
Attitude accuracy	–
Straightness	–
Backlash	–

Points

Ground ball screw drive realizes ultra-small positioning table with sectional height of 20mm and width of 17mm.

1 Incorporating a Micro Linear Way L of 2mm in rail width in the table guiding parts and a miniature ball screw of 2mm in diameter in the feeding mechanism, this is an unparalleled ultra-small size positioning table with ground ball screw drive type.

Maximum table speed of 75mm/s is exerted.

2 Combination of high-lead ball screws and high-torque AC servomotors enables the table to move at high speed without reducing the accuracy.

Table specification is selectable according to your use.

3 There are two types in the shape of slide table: standard table and long table. As two Micro Linear Way L with two slide units are incorporated in parallel into the long table, the table is structurally resistant to moment and complex load. The motor can be selected from two types of AC servomotor (standard type or high torque type) and stepper motor according to your use.

Super small sensor can also be optionally built in.

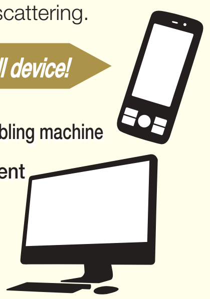
4 Built-in origin, pre-origin, CW limit and CCW limit sensors can be indicated without modifying the outside dimensions.

☑ Widely applicable in such fields as below!

Featuring the ultra-small size yet super precision positioning capability, this table is best suited to enhancing the accuracy of the positioning mechanism of super small device. And, use of stainless steel in steel parts allows the table to be used even in a location where use of oil and grease should be preferably avoided and under the environment that tends to suffer from water scattering.

Best suited for positioning mechanism of super small device!

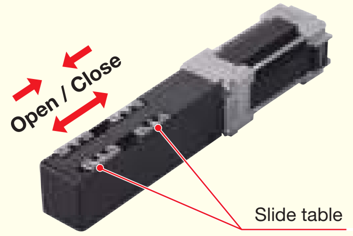
- Measuring equipment
- Watch assembling machine
- Medical equipment
- Winder etc.…
- Electronic parts assembling machine
- Bio-related equipment
- Robot



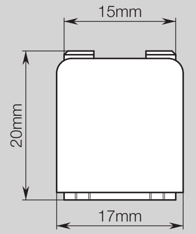
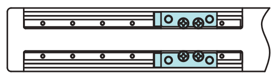
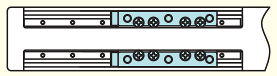
☑ This table can respond to various requests!

We can prepare tables of various specifications such as switching table specification, lead screw specification, and stainless steel cover specification, in order to meet customer needs. For more information, please contact IKO.

Example of special specification: Switching table specification



Variation

Shape		Model and size	Stroke length（mm）10	20	30	40	50	60
	Standard table 	TM15	–	☆	–	☆	–	☆
	Long table 	TM15G	☆	–	☆	–	☆	–

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Identification Number

Example of an Identification Number

①	②	③		④	⑤		⑥	⑦	⑧
TM	15	G	-	50	A	/	Y061	05	1

①	**Model**	Page Ⅱ-202
②	**Size**	Page Ⅱ-202
③	**Shape of slide table**	Page Ⅱ-202
④	**Effective stroke length**	Page Ⅱ-202
⑤	**With motor type**	Page Ⅱ-202
⑥	**Motor type**	Page Ⅱ-202
⑦	**Ball screw lead**	Page Ⅱ-202
⑧	**Specification of sensor**	Page Ⅱ-202

Identification Number and Specification

① Model

TM: Micro Precision Positioning Table TM

② Size

15: Table width 15mm

③ Shape of slide table

No symbol: Standard table G: Long table

④ Effective stroke length

Select a effective stroke length from the list of Table 1.

Table 1 Shape of slide table and effective stroke length

Shape of slide table	Effective stroke length mm
Standard table	20、40、60
Long table	10、30、50

⑤ With motor type

A: With motor

⑥ Motor type

Y061: AC servomotor（standard type）
Y062: AC servomotor（high torque type）
V001: Stepper motor（five phases）

When Y062 is specified, ⑦ Ball screw lead of 0.5mm cannot be specified.
For details of motor specification, see pages Ⅱ-195 and Ⅱ-197.
If you use a non-standard motor, please contact IKO.

⑦ Ball screw lead

05: Lead 0.5mm
10: Lead 1.0mm
15: Lead 1.5mm

When the ball screw lead of 0.5mm is specified, Y062: AC servomotor（high torque type） cannot be specified in ⑥.

⑧ Specification of sensor

0: Without sensor
1: With sensor（on the right as viewed from the side opposite the motor）
2: With sensor（on the left as viewed from the side opposite the motor）

Once you select "Without sensor", adding a sensor afterward is not allowed.
Once you select "Without sensor", the motor wiring will be on the right as viewed from the side opposite the motor.
If "With sensor" is selected, the directions of wirings for the motor and the sensor are the same direction.

Remark: A resin table cover is used but a stainless table cover can also be manufactured. If needed, please contact IKO.

Specifications

Table 2 Accuracy

unit: mm

Model	Ball screw lead	Positioning repeatability	Positioning accuracy
TM15 -20	0.5	±0.001	0.015
	1	±0.002	
	1.5		
TM15 -40	0.5	±0.001	0.015
	1	±0.002	
	1.5		
TM15 -60	0.5	±0.001	0.015
	1	±0.002	
	1.5		
TM15G-10	0.5	±0.001	0.015
	1	±0.002	
	1.5		
TM15G-30	0.5	±0.001	0.015
	1	±0.002	
	1.5		
TM15G-50	0.5	±0.001	0.015
	1	±0.002	
	1.5		

Table 3 Maximum speed

Motor type	Number of revolutions of motor min^{-1}	Maximum speed mm/s		
		Lead 0.5mm	Lead 1mm	Lead 1.5mm
AC servo motor	3 000	25	50	75
Stepper motor	1 800	15	30	45

Remark: To measure the practical maximum speed, it is required to consider operation patterns based on the motor to be used and load conditions.

Table 4 Maximum carrying mass

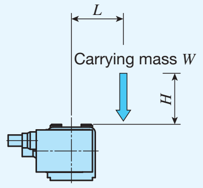
Model and size	Ball screw lead mm	Length of slide table	Carrying mass position mm	Maximum carrying mass kg							
				Horizontal direction				Vertical direction			
			Length L / Height H	0	100	200	300	0	100	200	300
TM15	0.5	Standard	0	0.7	0.4	0.2	0.1	0.7	0.1	–	–
			100	0.7	0.4	0.2	0.1	0.1	–	–	–
			200	0.7	0.4	0.2	0.1	–	–	–	–
			300	0.7	0.4	0.2	0.1	–	–	–	–
	1	Standard	0	0.7	0.3	0.1	0.1	0.7	0.1	–	–
			100	0.7	0.3	0.1	0.1	0.1	–	–	–
			200	0.7	0.3	0.1	0.1	–	–	–	–
			300	0.7	0.2	0.1	0.1	–	–	–	–
	1.5	Standard	0	0.7	0.2	0.1	–	0.7	0.1	–	–
			100	0.7	0.2	0.1	–	–	–	–	–
			200	0.7	0.2	0.1	–	–	–	–	–
			300	0.7	0.2	0.1	–	–	–	–	–
TM15G	0.5	Long	0	1.5	0.8	0.4	0.2	0.7	0.7	0.7	0.4
			100	1.5	0.8	0.4	0.2	0.7	0.7	0.5	0.4
			200	1.5	0.8	0.4	0.2	0.6	0.4	0.4	0.3
			300	1.5	0.8	0.4	0.2	0.4	0.3	0.3	0.2
	1	Long	0	1.5	0.6	0.3	0.2	0.7	0.7	0.5	0.3
			100	1.5	0.6	0.3	0.2	0.7	0.6	0.4	0.3
			200	1.5	0.6	0.3	0.2	0.4	0.3	0.3	0.2
			300	1.5	0.6	0.3	0.2	0.3	0.2	0.2	0.2
	1.5	Long	0	1.5	0.5	0.3	0.2	0.7	0.7	0.5	0.3
			100	1.5	0.5	0.3	0.2	0.7	0.5	0.3	0.2
			200	1.5	0.5	0.3	0.2	0.4	0.3	0.2	0.2
			300	1.5	0.5	0.3	0.2	0.2	0.2	0.2	0.1

Remark: The maximum carrying mass is adjusted by the mass when the rating life of the linear motion rolling guide, ball screws, or bearings is 18,000 hours during continuous operation at a number of revolutions of the motor of 3000min^{-1} and an acceleration/deceleration time of 0.2s. The mass calculated is based upon the basic static load rating of the linear motion rolling guide.

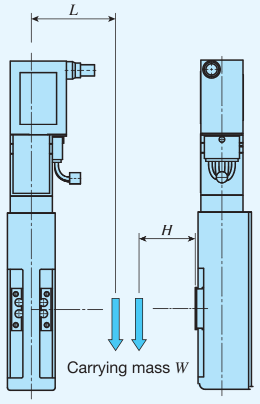
Table 5 Maximum load mass

Model and size	Ball screw lead mm	Maximum load mass kg	
		Horizontal direction	Vertical direction
TM15	0.5	85	20
	1	47	10
	1.5	32	7
TM15G	0.5	85	20
	1	47	10
	1.5	32	7

Remarks 1. The maximum load mass shows the mass that ensures acceleration/deceleration of 0.3G.
2. The values shown in this table were calculated with the motor with the highest rated torque installed, selected from the AC servomotor models listed in Table 11.



Carrying mass position (horizontal direction)



Carrying mass position (vertical direction)

Table 6 Specifications of ball screw

unit: mm

Model and size	Shape of slide table	Stroke	Shaft dia.	Overall length
TM15	Standard	20	2	54
		40		74
		60		94
	Long	10		54
		30		74
		50		94

Table 7 Table inertia, coupling inertia, and starting torque

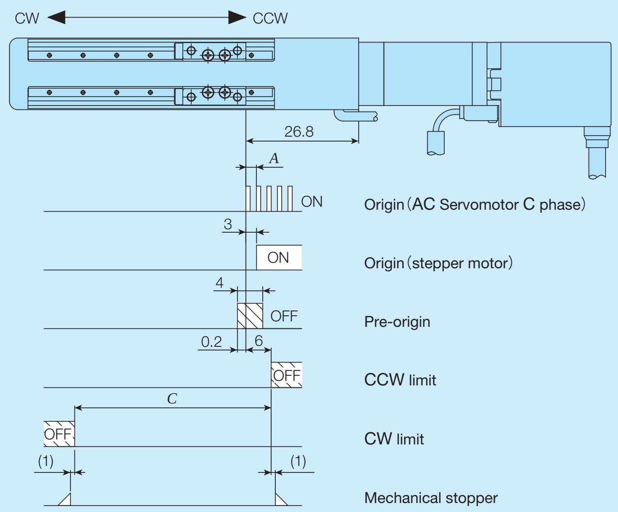
Model and size	Table inertia J_T $\times10^{-5}$kg · m^2			Coupling inertia J_C $\times10^{-5}$kg · m^2	Starting torque T_S N·m
	Lead 0.5mm	Lead 1mm	Lead 1.5mm		
TM15 -20	0.00013	0.00016	0.00022	0.0028	0.005
TM15 -40	0.00016	0.00019	0.00024		
TM15 -60	0.00018	0.00021	0.00026		
TM15G-10	0.00014	0.00019	0.00028		
TM15G-30	0.00016	0.00021	0.00030		
TM15G-50	0.00018	0.00023	0.00032		

Mounting

For the processing accuracy of the Precision Positioning Table mounting surface and the tightening torque of the fixing screws, see page Ⅲ-30.

Sensor Specification

Table 8 Sensor timing chart



unit: mm

Model and size	Ball screw lead	*A*	Effective stroke length (1)	*C* (Ref.)
TM15 -20	0.5	0.5	20	Effective stroke length+2
	1	1		
	1.5	1.5		
TM15 -40	0.5	0.5	40	Effective stroke length+2
	1	1		
	1.5	1.5		
TM15 -60	0.5	0.5	60	Effective stroke length+2
	1	1		
	1.5	1.5		
TM15G-10	0.5	0.5	10	Effective stroke length+0.5
	1	1		
	1.5	1.5		
TM15G-30	0.5	0.5	30	Effective stroke length+0.5
	1	1		
	1.5	1.5		
TM15G-50	0.5	0.5	50	Effective stroke length+0.5
	1	1		
	1.5	1.5		

Note (1) The sensor position cannot be adjusted. The effective stroke length indicates the stroke length that can be surely secured between the limit sensors.

Remarks 1. "With sensor" or "Without sensor", and wiring directions are specified using the corresponding identification number.
2. For the specifications of respective sensors, please see the section of sensor specification in General Explanation.
3. The origin sensor is for stepper motor.

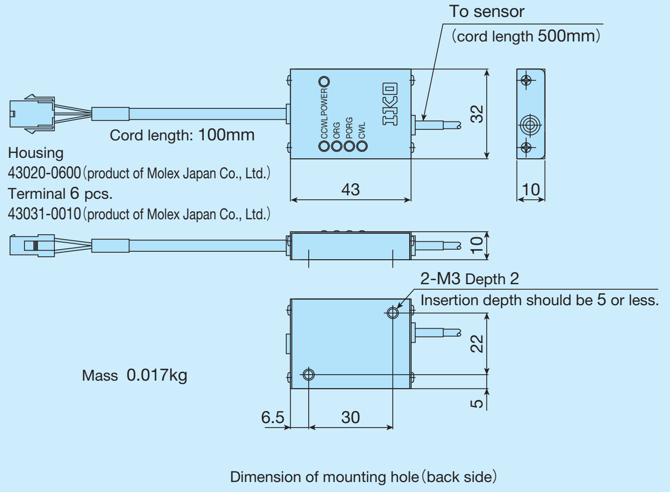
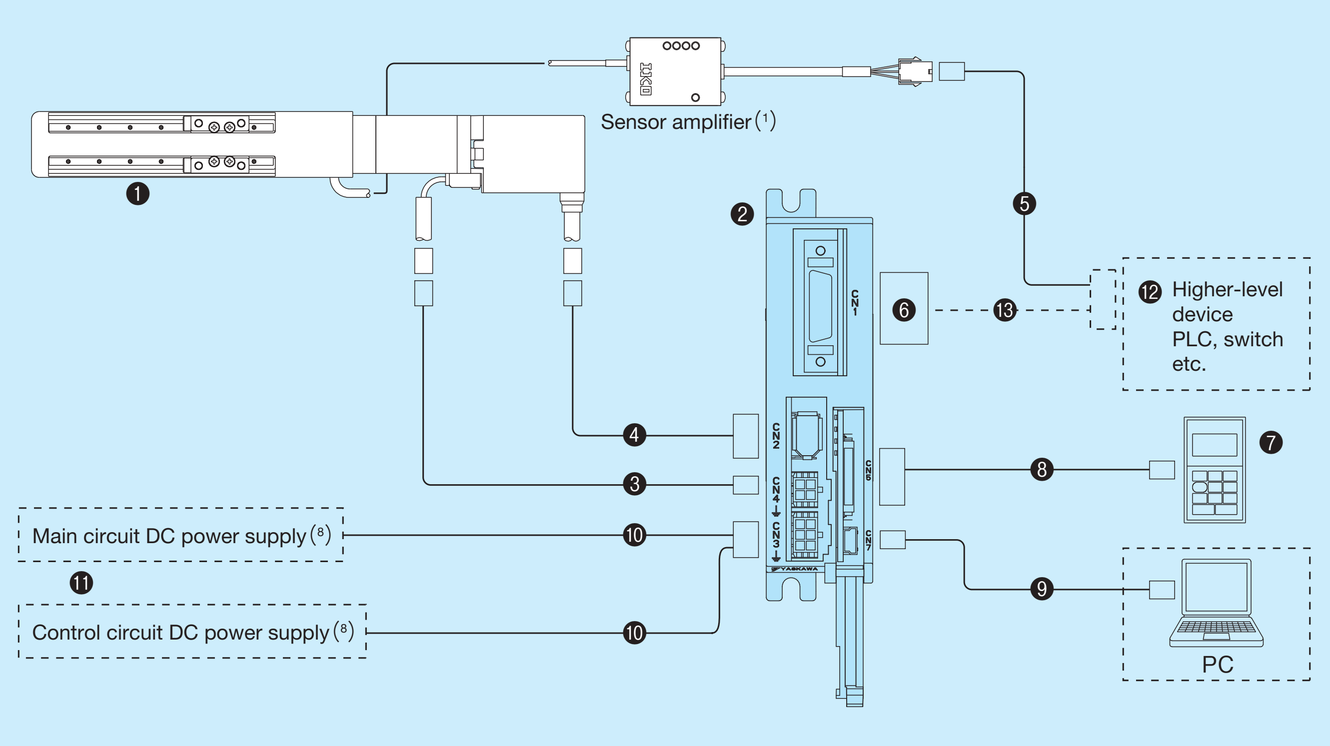


Fig.1 Outside dimension of sensor amplifier

System Configuration

A dedicated driver for Micro Precision Positioning Table TM is provided. Pages Ⅱ-207 and Ⅱ-208 show its typical system configuration. For the specifications of the driver, please see the section of specifications of motor and driver on pages Ⅱ-209 to Ⅱ-212. When you place an order, please specify desired identification numbers from the list of Tables 9 and 10.

Table 9 System Configuration for AC Servomotor (Y061, Y062)

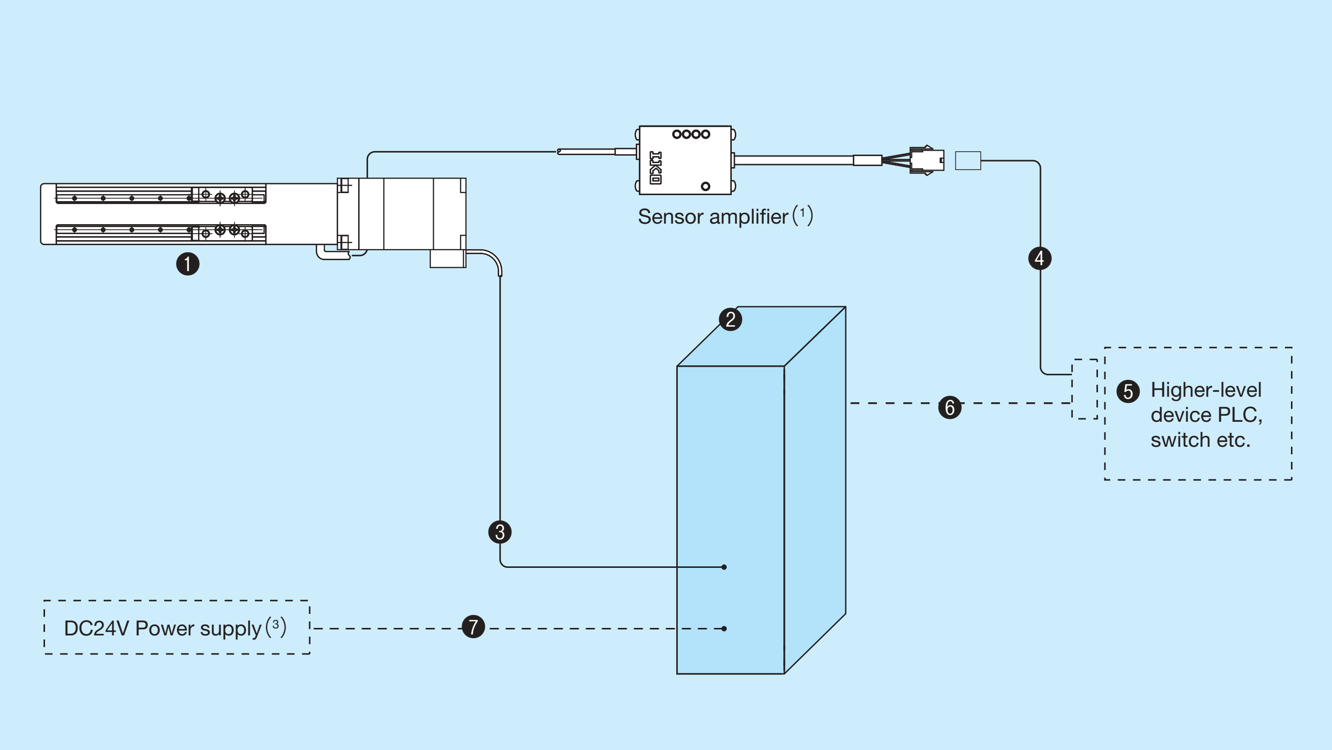


No.	Name	Identification number	
❶	Table body (motor code)	Y061 AC Servomotor (standard type)	Y062 AC Servomotor (high torque type)
❷	Driver(2)	SGDV-1R7EP1A	
❸	Motor cord (3m)(2)(3)	JZSP-CF1M20-03-E	
❹	Encoder cord (3m)(2)(3)	JZSP-CMP10-03-E	
❺	Sensor extension cord (3m)(2)(4)(5)	TAE10W0-LC03	
❻	I/O connector	TAE20W1-CN(6)	
❼	Digital operator(2)(7)	JUSP-OP05A-1-E	
❽	Digital operator extension cable(2)(7)	JZSP-CF1S00-A3-E	
❾	PC connection cable (2)(7)	JZSP-CVS06-02-E	
❿	Power supply cable (2)(4)(8)	JZSP-CF1G00-□□-E	
⓫	Power supply(9)	This must be prepared by customer.	
⓬	Higher-level device		
⓭	I/O connector connection cable		

Notes (1) Once you select "Without sensor", a sensor amplifier will not be attached.
(2) Manufactured by Yaskawa Electric Corporation.
(3) For specific cord length, please contact IKO.
(4) The higher-level device side of the cord will be loose.
(5) If an origin signal is not required, do not use the origin sensor signal (ORG).
(6) I/O connector TAE20W1-CN is a combined product of 10126-3000PE (connector) and 10326-52F0-008 (cover) from 3M Japan Limited.
(7) A digital operator or ordinary PC is required for parameter setting.
(8) Specify the length 1 - 3m in 1m increments in □□ of the identification number. (Example for 3m: JZSP-CF1G00-03-E)
(9) The main circuit power supply supports DC48V as well as DC24V. The control circuit power supply is DC24V. Each power supply must be prepared separately by the customer.

Remarks 1: The motor cord, encoder cord and sensor extension cord have excellent bending resistance.
2: Initial setting of parameters is required for the driver for AC Servomotor.
When setting parameters with an ordinary PC, download the setting software from the Yaskawa Electric Corporation website.
(URL: http://www.e-mechatronics.com/download/tool/servo/sgmwinpls/download.html)

Table 10 System Configuration for stepper motor (V001)



No.	Name	Identification number
❶	Table body (motor code)	Stepper motor (five phases)
❷	Driver(2)	CVD503-K
❸	Motor cord	TAE20R6-SM0□ (Fixed cable specification)
		TAE20R7-SN0□ (Bending-resistant cable specification)
❹	Sensor extension cord (4)(5)	TAE10W0-LC03
❺	Higher-level device	This must be prepared by customer.
❻	I/O connector connection cord	This must be prepared by customer.(6)(7)
❼	Power cord	This must be prepared by customer.(6)(7)

Notes (1) Once you select "Without sensor", a sensor amplifier will not be attached.
(2) Manufactured by Oriental Motor Co., Ltd.
(3) DC24V power supply must be prepared separately by the customer.
(4) For specific cord length, please contact IKO.
(5) The higher-level device side of the cord will be loose.
(6) Connectors are provided for the driver. Please see the section of specifications of motor and driver on page Ⅱ-212.
(7) Connect the cord directly.

Remark The motor cord length can be specified using the box (□) at the end of the identification number, up to 5m in increments of 1m.
(For 5m: TAE20R6-SM05)

Specifications of Motor and Driver

AC Servomotor manufactured by Yaskawa Electric Corporation (Y061, Y062)

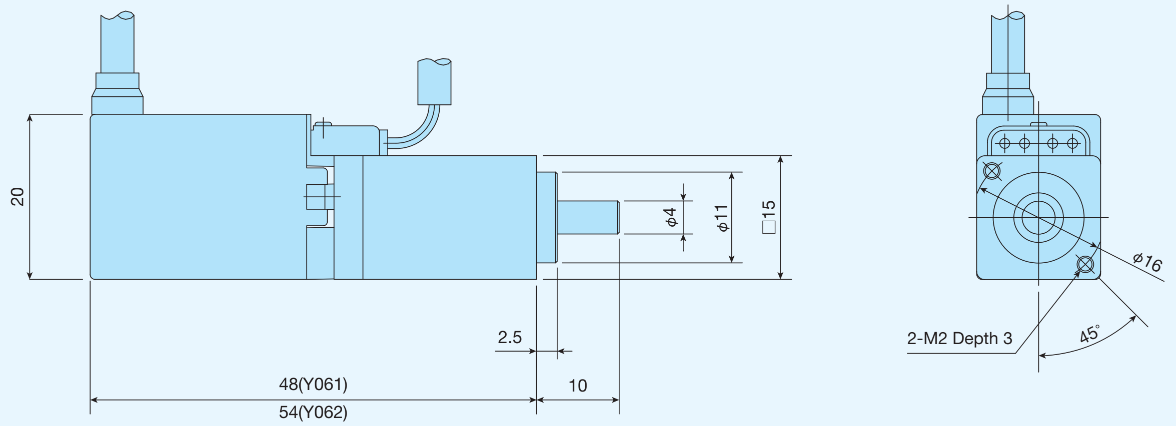


Table 11 Motor specifications

Motor type	Motor code	Motor identification number	Voltage specification	Rated output W	Rated torque N·m	Max. momentary torque N·m	Rated number of revolutions r /min	Motor inertia J_M $\times10^{-4}$ kg·m^2	Encoder resolution pulse/rev	Mass kg
Standard	Y061	SGMMV-B3E2A21	DC24V DC48V	3.3	0.0105	0.0263	3 000	0.000441	131072 (17bit)	0.055
High torque	Y062	SGMMV-B5E2A21	DC24V DC48V	5.5	0.0175	0.0438	3 000	0.000796	131072 (17bit)	0.06

Remarks 1. The main circuit power supply supports DC48V as well as DC24V.
2. Motor torque starts to decrease when the number of revolutions of the motor exceeds 3,000 min^{-1}.

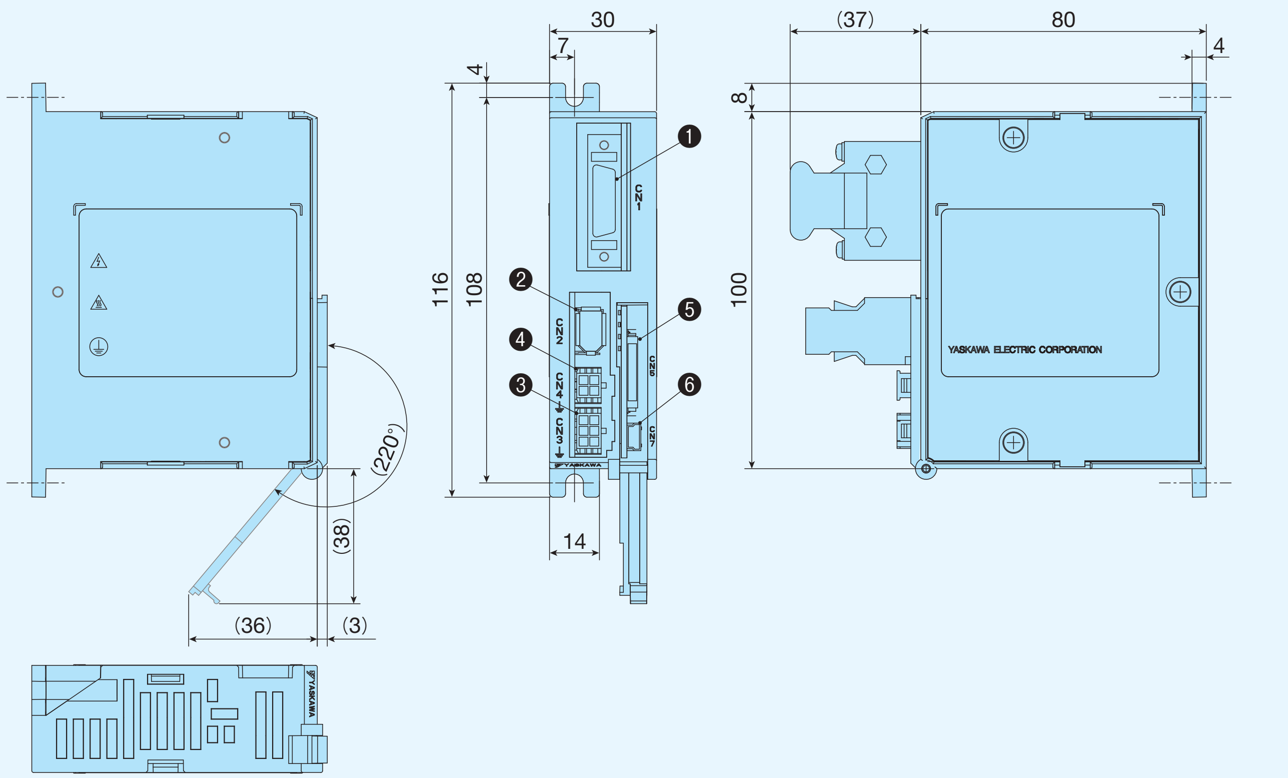
Table 12 Specifications of wirings for the motor and connector

Motor code Y061,Y062			Motor side	Mating side
Pin No.	Content	Wire color		
1	U phase	Red	Connector 43020-0401 Contact 43031-0001 Molex Japan Co., Ltd.	Connector 43025-0400 Contact 43030-0001 Molex Japan Co., Ltd.
2	V phase	White		
3	W phase	Blue		
4	FG	Green		

Table 13 Specifications of wirings for the encoder and connector

Motor code Y061,Y062			Motor side	Mating side
Pin No.	Content	Wire color		
1	PG 5V	Orange	Socket connector solder type 54280-0609 Molex Japan Co., Ltd.	Connector crimp type 55100-0670 Molex Japan Co., Ltd.
2	PG 0V	Light green		
3	BAT(+)	Red/pink		
4	BAT(-)	Black/pink		
5	PS	Red/sky blue		
6	/PS	Black/ sky blue		
Shell	FG	FG		

Table 14 Driver for AC Servomotor Y061/Y062, manufactured by Yaskawa Electric Corporation



No.	Name		Function
❶	CN1	I/O connector	Connect a pulse cord to this connector.
❷	CN2	Encoder connector	Connect the encoder cord.
❸	CN3	Driving power supply connector	Connect to the driving power supply.
❹	CN4	Motor connector	Connect a motor cord to this connector.
❺	CN5	Connector for digital operator	Connect the digital operator extension cable.
❻	CN7	Connector for PC	Connect the PC connection cable.

Table 15 Driver specification

Identification number of driver	SGDV-1R7EP1A(1)	
Applicable motor code	Y061	Y062
Rated output of applicable motor	3.3W	5.5W
Feedback	Serial encoder 17bit	
Specified system of pulse input(1)	CW/CCW signal, pulse signal/rotational direction signal	
Specified method of pulse input(1)	Line driver, open collector	
Main circuit power supply voltage(2)	DC24V±15%, DC48V±15%	
Control circuit power supply	DC24V±15%	
Continuous output current Arms	1.7	
Maximum output current Arms	4.1	
Operating temperature range	0~55℃	
Storage temperature range	-20~85℃	
Operating humidity	90% RH or lower (keep freeze/condensation free)	
Mass kg	0.3	

Note (1) This driver is a pulse train command type. If the network communication command type or analog voltage command type is required, please contact IKO.
(2) The main circuit power supply supports DC48V and DC24V.

Stepper motor (V001) manufactured by Oriental Motor Co., Ltd.

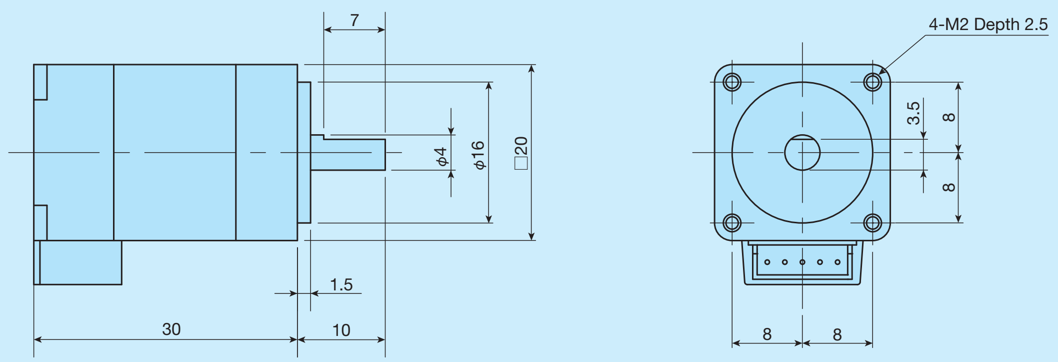


Table 16 Motor specifications

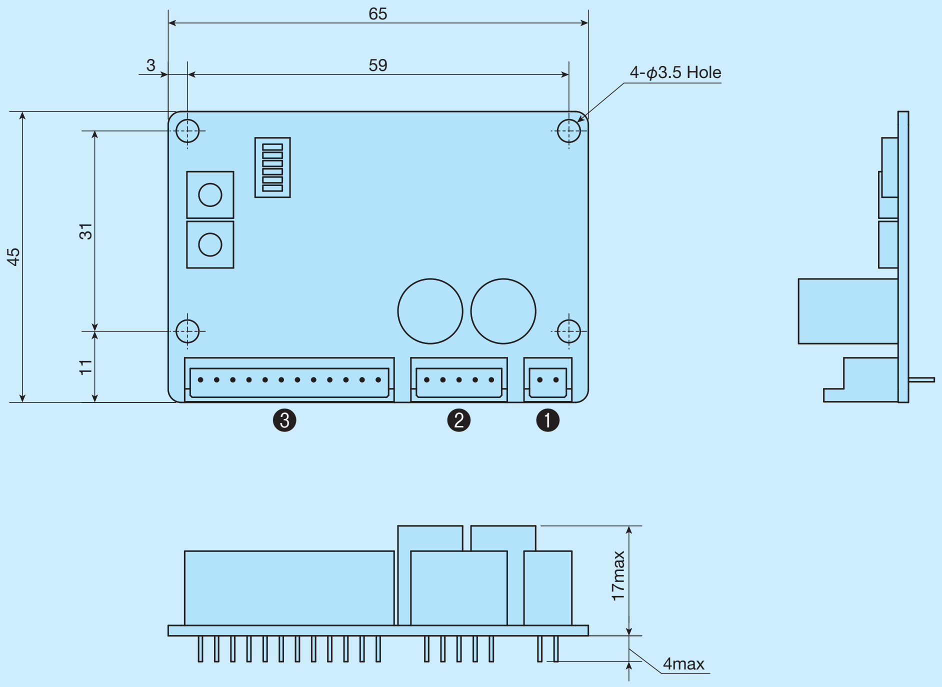
Motor code	Model number of motor	Step angle	Maximum holding torque N・m	Current A/phase	Rotor inertia J_M $\times10^{-4}$kg・m^2	Mass（Ref.）kg
V001	PK513PA	0.72	0.023	0.35	0.0016	0.05

Table 17 Specifications of wirings for the motor and connector

Pin No.	Color of lead wire	Motor side	Mating side（1）
1	Blue	Housing 51065-0500 Terminal 50212-8100	Housing 51103-0500 Terminal 50351-8100
2	Red		
3	Orange		
4	Green		
5	Black		

Note（1） Mating-side connector must be prepared by customer.
Remark: Connectors are manufactured by Molex Japan Co., Ltd.

Table 18 Stepper motor driver manufactured by Oriental Motor Co., Ltd. (RoHS Compliant)



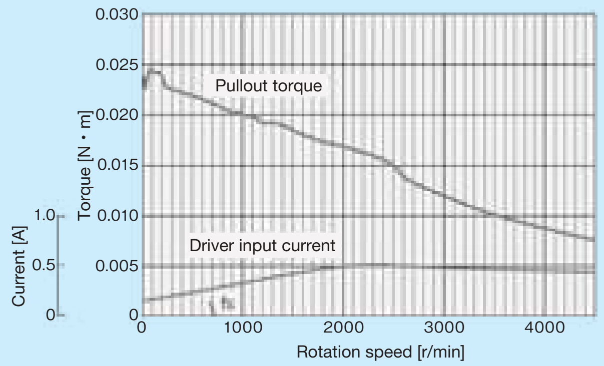
No.	Name		Function
❶	CN1	Power supply connector	Connect a power supply to this connector.
❷	CN2	Motor connector	Connect a motor cord to this connector.
❸	CN3	Input/output signal connector	Connect a pulse cord to this connector.

Table 19 Stepper motor driver specifications

Identification number of driver	CVD503-K
Applicable motor code	V001
Driving method	Micro step drive bi-polar constant current method
Driver current (default settings)	0.35A/phase
Power supply voltage	DC24V ±10%
Input current	0.6A
Maximum input pulse frequency	Higher-level controller line driver output: 1MHz (when duty is 50%) / Higher-level controller open collector output: 250kHz (when duty is 50%) negative logic pulse input
Ambient temperature (during operation)	0 to +50° C (keep freeze free)
Ambient humidity (during operation)	85% or lower (keep condensation free)
Atmosphere	Keep corrosive gas and dust free. Avoid direct contact with water, oil, etc.

Remark: DC24V is recommended for power supply voltage. The power supply must be prepared by customer.

Torque chart for stepper motor



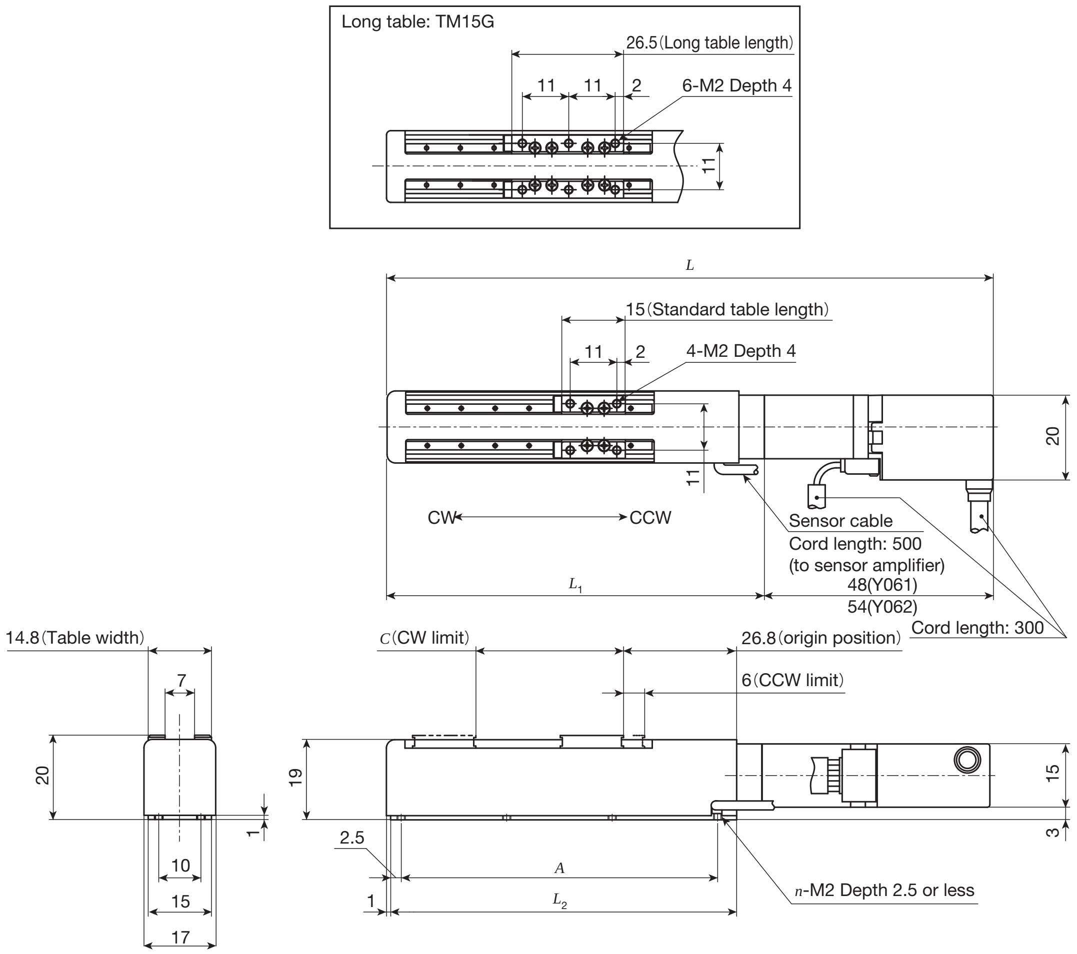
Motor code	Model number of motor	Model number of driver
V001	PK513PA	CVD503-K

Table 20 Stepper motor driver accessories

Name		Model number		Remark
		Housing	Contact	
CN1	Power supply connector	51103-0200	50351-8100	Molex Japan Co., Ltd.
CN2	Motor connector	51103-0500		
CN3	Input/output signal connector	51103-1200		

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

TM15 Specifications of AC servomotor



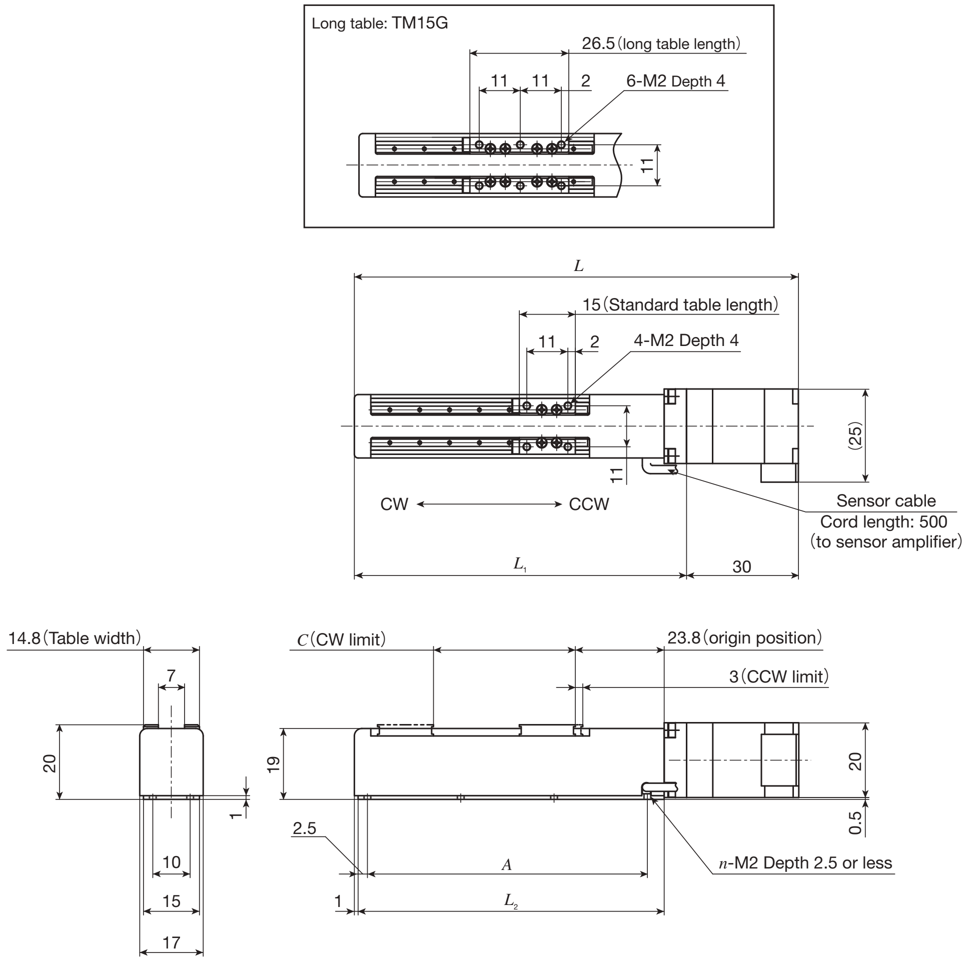
Unit: mm

Model and size	Stroke length		Dimensions of table						Mass(1) (Ref.) kg
	Effective stroke length(2)	CW limit position *C*	Overall length *L*		*L*₁	*L*₂	Mounting holes of bed		
			Y061	Y062			*A* (Number of units x pitch)	*n*	
TM15 -20	20	16	117	123	69	62	50 (2×25)	6	0.15
TM15 -40	40	36	137	143	89	82	75 (3×25)	8	0.16
TM15 -60	60	56	157	163	109	102	96 (4×24)	10	0.17
TM15G-10	10	4.5	117	123	69	62	50 (2×25)	6	0.16
TM15G-30	30	24.5	137	143	89	82	75 (3×25)	8	0.17
TM15G-50	50	44.5	157	163	109	102	96 (4×24)	10	0.18

Note (1) Represents value when Y061 is specified. It will be 0.01 kg heavier when Y062 is specified.
(2) The sensor position cannot be adjusted. The effective stroke length indicates the stroke length that can be surely secured between the limit sensors.

Remark: A resin table cover is used but a stainless steel table cover can also be manufactured. If needed, please contact IKO.

TM15 Specifications of stepper motor



unit: mm

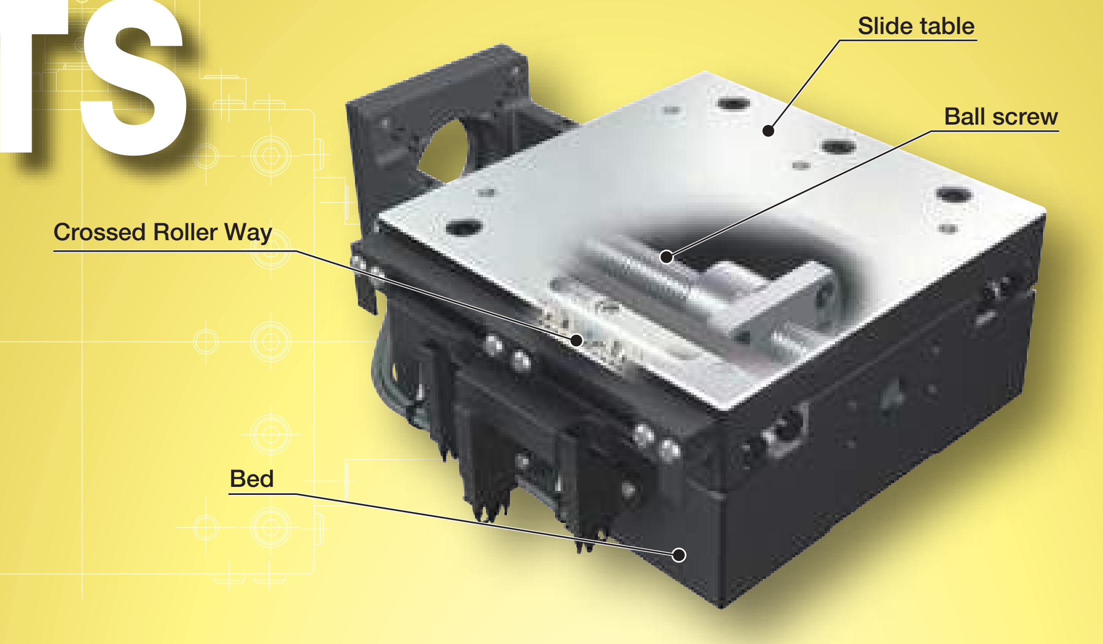
Model and size	Stroke length		Dimensions of table					Mass (Ref.) kg
	Effective stroke length(1)	CW limit position *C*	Overall length *L*	*L*₁	*L*₂	Mounting holes of bed *A* (the number of holes×pitch)	*n*	
TM15 -20	20	19	99	69	62	50 (2×25)	6	0.15
TM15 -40	40	39	119	89	82	75 (3×25)	8	0.16
TM15 -60	60	59	139	109	102	96 (4×24)	10	0.17
TM15G-10	10	7.5	99	69	62	50 (2×25)	6	0.16
TM15G-30	30	27.5	119	89	82	75 (3×25)	8	0.17
TM15G-50	50	47.5	139	109	102	96 (4×24)	10	0.18

Note (1) The sensor position cannot be adjusted. The effective stroke length indicates the stroke length that can be surely secured between the limit sensors.

Remark: A resin table cover is used but a stainless table cover can also be manufactured. If needed, please contact IKO.

TS / CT

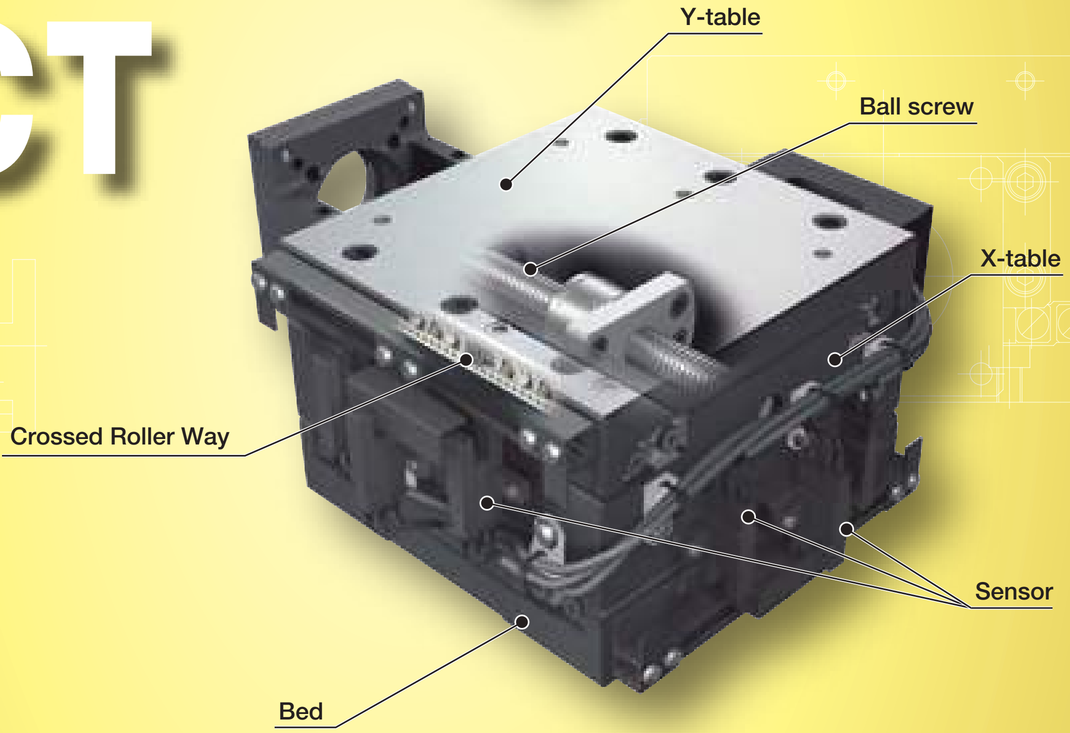
TS



Ball screw

Linear

CT



Major product specifications

Driving method	Precision ball screw
Linear motion rolling guide	Crossed Roller Way
Built-in lubrication part	No built-in
Material of table and bed	Cast iron
Sensor	Select by identification number

Accuracy

unit: mm

Positioning repeatability	±0.002
Positioning accuracy	0.005～0.015
Lost motion	–
Parallelism in table motion A	0.005～0.008
Parallelism in table motion B	0.015～0.020
Attitude accuracy	–
Straightness	–
Backlash	–

TS/CT

Points

● High precision and compact positioning table

1

High precision and compact positioning table incorporating Crossed Roller Way into high rigidity and vibration damping performance cast iron slide tables and beds.

● Safety design with retainer creep proof function

2

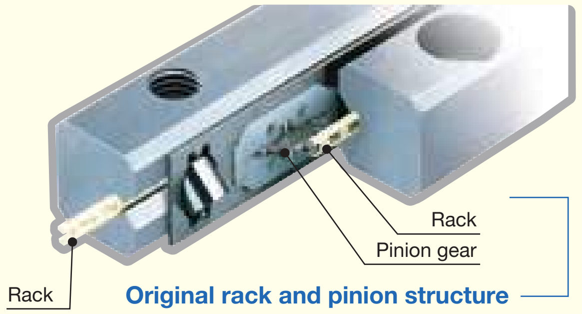
Adoption of Anti-Creep Cage Crossed Roller Way that does not cause retainer creep in the linear motion rolling guide allows you to safely use the table even in vertical axis use and high acceleration / deceleration operation. (TS55/55 and CT55/55 are not included.)

● Optimal for works directly conducted on the table upper surface

3

Adoption of large precisely polished table allows you to use the entire table upper surface as work space.

Structure and features of Anti-Creep Cage Crossed Roller Way

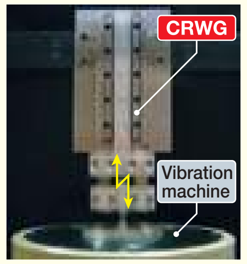


Original rack and pinion structure

No retainer creep even under high-tact operation in vertical axis ！

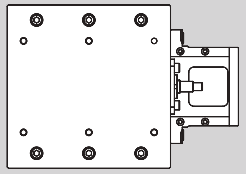
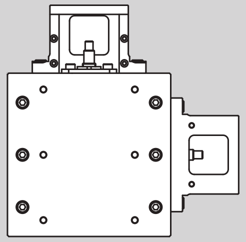
《**Durability test**》Test conditions

Model number	CRWG 3	
Test method	Vibration test machine	
Operating conditions	Posture	Vertical
	Maximum speed	827 mm/s
	Acceleration	15 G
	Cycle	31 Hz
	Stroke	8 mm
	Mass of moving table	330 g
Number of strokes	100 million strokes	



《**Result**》No retainer creep nor material damage in any component is found.

Variation

Shape	Model	Table width (mm)	Table length (mm)					
			55	75	125	220	310	350
Single-axis specification 	TS	55	☆	–	–	–	–	–
		75	–	▨ ☆	–	–	–	–
		125	–	–	▨ ☆	▨ ☆	–	–
		220	–	–	–	▨ ☆	▨ ☆	–
		260	–	–	–	–	–	▨ ☆
Two-axis specification 	CT	55	☆	–	–	–	–	–
		75	–	▨ ☆	–	–	–	–
		125	–	–	▨ ☆	–	–	–
		220	–	–	–	▨ ☆	–	–
		260	–	–	–	–	–	▨ ☆
		350	–	–	–	–	–	▨ ☆

▨ uses Anti-Creep Cage Crossed Roller Way.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Identification Number

Example of an Identification Number

① CT ② 125 / 125 / ③ AT602 ④ 5 ⑤ SC

① Model Page Ⅱ-219

② Dimension of slide table Page Ⅱ-219

③ Designation of motor attachment Page Ⅱ-219

④ Ball screw lead Page Ⅱ-220

⑤ Special specification Page Ⅱ-220

Identification Number and Specification

① Model

TS : Precision Positioning Table TS (single-axis specification)
CT : Precision Positioning Table CT (two-axis specification)

② Dimension of slide table

Select a dimension for slide table from the list of Table 1.

Width and length of slide table are indicated in mm. For CT (two-axis specification), width and length of Y-table are indicated.

Table 1 Models of linear motion rolling guide/slide table dimension and stroke length

unit: mm

Model	Linear motion rolling guide	Width/length	Stroke length
TS	Crossed Roller Way	55/ 55	15
	Anti-Creep Cage Crossed Roller Way	75/ 75	25
		125/125	50
		125/220	120
		220/220	120
		220/310	180
		260/350	250
CT	Crossed Roller Way	55/ 55	X-axis: 15, Y-axis: 15
	Anti-Creep Cage Crossed Roller Way	75/ 75	X-axis: 25, Y-axis: 25
		125/125	X-axis: 50, Y-axis: 50
		220/220	X-axis: 120, Y-axis: 120
		260/350	X-axis: 150, Y-axis: 250
		350/350	X-axis: 250, Y-axis: 250

③ Designation of motor attachment

As for a motor attachment, select it from the list of Table 2.

- Motor should be prepared by customer.
- Please specify motor attachment applicable to motor for use.
- A coupling shown in Table 3 is mounted on the main body before shipment. However, the final position adjustment should be made by customer since it is only temporarily fixed.

Table 2 Application of motor attachment

Motor to be used					Flange size mm	Motor attachment			
Type	Manufacturer	Series	Model	Rated output W		TS55/55 TS75/75 CT55/55 CT75/75	TS125/125 TS125/220 TS220/220 CT125/125 CT220/220	TS220/310	TS260/350 CT260/350 CT350/350
AC servomotor	YASKAWA ELECTRIC CORPORATION	Σ-7	SGM7J-01A	100	□40	–	AT602	AT604	–
			SGM7A-01A			–	AT602	AT604	–
			SGM7J-02A	200	□60	–	–	–	AT606
			SGM7A-02A			–	–	–	AT606
	Mitsubishi Electric Corporation	J4/J5	HG-MR13	100	□40	–	AT602	AT604	–
			HG-KR13/HK-KT13W			–	AT602	AT604	–
			HG-MR23	200	□60	–	–	–	AT606
			HG-KR23/HK-KT23W			–	–	–	AT606
	Panasonic Corporation	MINAS A6	MSMF01	100	□38	–	AT603	AT605	–
			MSMF02	200	□60	–	–	–	AT607
	Hitachi Industrial Equipment Systems Co., Ltd	AD	ADMA-01L	100	□40	–	AT602	AT604	–
			ADMA-02L	200	□60	–	–	–	AT606
Stepper Motor	ORIENTAL MOTOR Co., Ltd.	PK	PK544-A		□38	AT601	–	–	–
		RKS · CRK	CRK56 (1)		□60	–	AT608	AT609	–
			RKS59		□85	–	–	–	AT610

Note (1) Applicable to the outer diameter φ8 of motor output shaft.
Remark: For detailed motor specifications, please see respective motor manufacturer's catalog.

Table 3 Coupling models

Motor attachment	Coupling models	Manufacturer	Coupling inertia J_c $\times 10^{-5}$kg · m²
AT601	MWSS-12- 5× 5	Nabeya Bi-tech Kaisha	0.018
AT602	MSTS-25C- 8× 8	Nabeya Bi-tech Kaisha	0.71
AT603	MSTS-25C- 8× 8	Nabeya Bi-tech Kaisha	0.71
AT604	MSTS-25C- 6× 8	Nabeya Bi-tech Kaisha	0.71
AT605	MSTS-25C- 6× 8	Nabeya Bi-tech Kaisha	0.71
AT606	MSTS-32C-12×14	Nabeya Bi-tech Kaisha	2.7
AT607	MSTS-32C-11×12	Nabeya Bi-tech Kaisha	2.7
AT608	MSTS-19C- 6× 8	Nabeya Bi-tech Kaisha	0.277
AT609	MSTS-25C- 6× 8	Nabeya Bi-tech Kaisha	0.71
AT610	MSTS-32C-12×14	Nabeya Bi-tech Kaisha	2.7

Remark: For detailed coupling specifications, please see respective manufacturer's catalogs.

④ Ball screw lead

1: Lead 1mm (applicable to 55/55, 75/75, and 125/125)
2: Lead 2mm (not applicable to 55/55 or 75/75)
5: Lead 5mm (not applicable to 55/55 or 75/75)

⑤ Special specification

No symbol : Standard specification
BE : Option base (applicable to 55/55)
LR : Black chrome surface treatment
SC : Table with sensor

Option base : Base plate is available for attaching the main body downward. For detailed information, please see the dimension table.
Black chrome surface treatment : A black permeable film is formed on the surface to improve corrosion resistance. This treatment is performed on the surfaces of slide table, bed, and motor bracket. For the reference surfaces of respective parts, surface treatment is excluded.
Table with sensors : A set of limit sensor, pre-origin sensor, and origin sensor is attached. However, when selecting an AC servomotor attachment, an origin sensor is not provided. Please use the C-phase or Z-phase of the encoder.

Remark: When using multiple special specifications for combination, please indicate by arranging supplemental codes in alphabetical order.

Specifications

Table 4 Accuracy

unit: mm

Identification number		Positioning repeatability	Positioning accuracy	Parallelism in table motion A	Parallelism in table motion B	Squareness of XY motion (1)
Single-axis specification	Two-axis specification					
TS 55/ 55	–	±0.002	0.005	0.005	0.015	0.005
–	CT 55/ 55		0.010			
TS 75/ 75	CT 75/ 75		0.005			
TS125/125	CT125/125					
TS125/220	–		0.008			
TS220/220	CT220/220					
TS220/310	–		0.015	0.008	0.020	0.008
TS260/350	CT260/350					
–	CT350/350					

Note (1) Applied to tables with two-axis specification.

Table 5 Maximum speed

Motor type	Maximum speed mm/s		
	Lead 1mm	Lead 2mm	Lead 5mm
AC servomotor	50	100	250
Stepper motor	30	60	150

Remark: To measure the practical maximum speed, it is required to consider operation patterns based on the motor to be used and load conditions.

Table 6.1 Maximum carrying mass of TS

Model and size	Ball screw lead mm	Carrying mass position mm	Maximum carrying mass kg Horizontal direction				Vertical direction			
		Length L Height H	0	100	200	300	0	100	200	300
TS 55/ 55	1	0	4.3	4.2	2.3	1.6	2.2	0.9	0.5	0.3
		100	4.3	4.2	2.3	1.5	1.1	0.6	0.4	0.3
		200	4.3	4.1	2.2	1.5	0.6	0.4	0.3	0.2
		300	4.3	4.0	2.2	1.5	0.4	0.3	0.2	0.2
TS 75/ 75	1	0	21	21	12	8	1.5	1.5	1.5	1.3
		100	21	21	12	8	1.5	1.5	1.5	1.1
		200	21	20	11	8	1.5	1.5	1.3	1.0
		300	21	20	11	8	1.5	1.2	1.0	0.8
TS125/125	1	0	72	72	59	42	2.3	2.3	2.3	2.3
		100	72	72	57	41	2.3	2.3	2.3	2.3
		200	72	72	55	40	2.3	2.3	2.3	2.3
		300	72	72	54	39	2.3	2.3	2.3	2.3
	2	0	72	72	45	32	11	11	7	5
		100	72	69	42	30	11	10	6	4.7
		200	72	62	40	29	9	6	5	4.1
		300	72	56	37	28	6	5	4.4	3.7
	5	0	72	49	28	20	29	11	5	4.0
		100	72	38	24	18	12	7	4.8	3.5
		200	54	31	21	16	6	5	4.1	3.1
		300	40	26	19	15	4.8	3.9	3.3	2.8
TS125/220	2	0	115	114	67	47	9	9	9	9
		100	115	104	64	46	9	9	9	9
		200	115	96	60	44	9	9	9	8
		300	115	88	57	42	9	9	8	7
	5	0	115	75	44	31	28	21	11	8
		100	115	61	39	29	22	14	9	6
		200	94	51	35	26	12	9	7	6
		300	71	44	31	24	8	7	6	5
TS220/220	2	0	169	169	169	130	3.9	3.9	3.9	3.9
		100	169	169	164	123	3.9	3.9	3.9	3.9
		200	169	169	152	116	3.9	3.9	3.9	3.9
		300	169	169	142	110	3.9	3.9	3.9	3.9
	5	0	169	169	109	80	24	24	20	14
		100	169	134	92	70	24	24	17	12
		200	169	108	79	63	23	17	14	10
		300	129	90	69	56	16	13	11	9
TS220/310	2	0	256	256	256	197	–	–	–	–
		100	256	256	249	187	–	–	–	–
		200	256	256	233	178	–	–	–	–
		300	256	256	218	169	–	–	–	–
	5	0	282	267	169	124	19	19	19	19
		100	282	209	144	110	19	19	19	19
		200	266	170	125	98	19	19	19	18
		300	204	143	110	89	19	19	18	16
TS260/350	2	0	310	310	310	242	–	–	–	–
		100	310	310	305	232	–	–	–	–
		200	310	310	288	222	–	–	–	–
		300	310	310	272	212	–	–	–	–
	5	0	310	310	208	154	18	18	18	18
		100	310	258	181	139	18	18	18	18
		200	310	216	159	126	18	18	18	18
		300	263	185	142	115	18	18	18	18

Remarks 1. Not operable when the maximum carrying mass is "-".

2. The maximum carrying mass is adjusted by the mass when the rating life of the linear motion rolling guide, ball screws, or bearings is 18,000 hours during continuous operation at a number of revolutions of the motor of 3000min^{-1} and an acceleration/deceleration time of 0.2s. The mass calculated is based upon the basic static load rating of the linear motion rolling guide.

Table 6.2 Maximum carrying mass of CT

Model and size	Ball screw lead mm	Carrying mass position mm	Maximum carrying mass kg							
			Horizontal direction				Vertical direction(1)			
		Length L / Height H	0	100	200	300	0	100	200	300
CT 55/ 55	1	0	4.3	4.1	2.2	1.5	2.2	0.9	0.5	0.3
		100	4.3	4.1	2.2	1.5	1.1	0.6	0.4	0.2
		200	4.3	4.0	2.2	1.5	0.6	0.4	0.3	0.2
		300	4.3	3.9	2.2	1.5	0.4	0.3	0.2	0.2
CT 75/ 75	1	0	21	21	12	8	1.5	1.5	1.5	1.2
		100	21	21	11	8	1.5	1.5	1.5	1.1
		200	21	20	11	8	1.5	1.5	1.3	0.9
		300	21	20	11	8	1.4	1.2	1.0	0.8
CT125/125	1	0	72	72	58	41	2.3	2.3	2.3	2.3
		100	72	72	57	40	2.3	2.3	2.3	2.3
		200	72	72	55	39	2.3	2.3	2.3	2.3
		300	72	72	53	39	2.3	2.3	2.3	2.3
	2	0	72	72	44	31	11	11	7	5
		100	72	68	42	30	11	9	6	4.5
		200	72	61	39	29	8	6	5	4.0
		300	72	55	37	27	6	4.9	4.2	3.6
	5	0	72	48	28	20	29	10	5	3.9
		100	72	37	24	18	11	7	4.7	3.4
		200	53	30	21	16	6	4.8	3.8	3.0
		300	39	25	18	14	4.4	3.6	3.0	2.6
CT220/220	2	0	169	169	169	128	3.9	3.9	3.9	3.9
		100	169	169	162	121	3.9	3.9	3.9	3.9
		200	169	169	151	115	3.9	3.9	3.9	3.9
		300	169	169	140	109	3.9	3.9	3.9	3.9
	5	0	169	169	108	78	24	24	20	13
		100	169	132	91	69	24	24	16	12
		200	167	107	78	61	22	16	13	10
		300	127	89	68	55	15	12	10	9
CT260/350	2	0	225	225	225	181	–	–	–	–
		100	225	225	225	173	–	–	–	–
		200	225	225	216	166	–	–	–	–
		300	225	225	204	159	–	–	–	–
	5	0	225	225	151	112	18	18	18	18
		100	225	188	132	101	18	18	18	18
		200	225	158	117	92	18	18	18	17
		300	194	136	104	84	18	18	16	14
CT350/350	2	0	286	286	286	286	–	–	–	–
		100	286	286	286	277	–	–	–	–
		200	286	286	286	262	–	–	–	–
		300	286	286	286	248	–	–	–	–
	5	0	310	310	229	174	14	14	14	14
		100	310	265	194	153	14	14	14	14
		200	309	218	168	137	14	14	14	14
		300	245	184	148	123	14	14	14	14

Note (1) When the Y-axis moves vertically.

Remarks 1. Not operable when the maximum carrying mass is "-".

2. The maximum carrying mass is adjusted by the mass when the rating life of the linear motion rolling guide, ball screws, or bearings is 18,000 hours during continuous operation at a number of revolutions of the motor of 3000min^{-1} and an acceleration/deceleration time of 0.2s. The mass calculated is based upon the basic static load rating of the linear motion rolling guide.

Table 7.1 Maximum load mass of TS

Model and size	Ball screw lead mm	Maximum load mass kg	
		Horizontal direction	Vertical direction
TS 55/ 55(1)	1	–	–
TS 75/ 75(1)	1	–	–
TS125/125	1	322	122
	2	314	90
	5	159	40
TS125/220	2	298	88
	5	152	39
TS220/220	2	261	78
	5	148	37
TS220/310	2	205	67
	5	133	35
TS260/350	2	109	56
	5	217	68

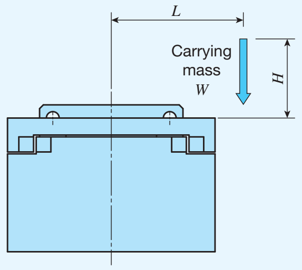
Table 7.2 Maximum load mass of CT

Model and size	Ball screw lead mm	Maximum load mass kg	
		Horizontal direction	Vertical direction
CT 55/ 55(1)	1	–	-
CT 75/ 75(1)	1	–	–
CT125/125	1	322	122
	2	310	89
	5	154	39
CT220/220	2	249	76
	5	136	35
CT260/350	2	31	18
	5	199	65
CT350/350	2	1.5	1.0
	5	180	61

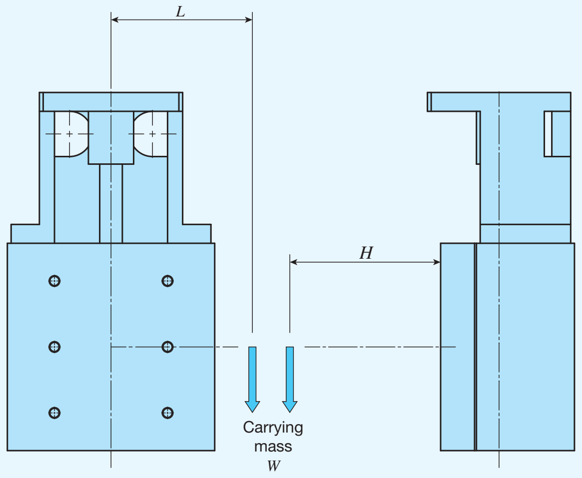
Note (1) For information on the maximum load mass for stepper motors, please contact IKO.

Remarks 1. The maximum load mass shows the mass that ensures acceleration/deceleration of 0.3G.

2. The values shown in this table were calculated with the motor with the highest rated torque installed, selected from the AC servomotor models listed in Table 2.



Carrying mass position
(horizontal direction)



Carrying mass position
(vertical direction)

Table 8 Specifications of ball screw

unit: mm

Model and size		Ball screw lead	Axis name	Shaft dia.	Overall length
Single-axis specification	TS 55/ 55	1	–	6	68
	TS 75/ 75	1	–	6	89
	TS125/125	1	–	12	148
		2	–	12	148
		5	–	14	148
	TS125/220	2	–	12	269
		5	–	14	269
	TS220/220	2	–	14	269
		5	–	14	269
	TS220/310	2	–	14	389
		5	–	14	389
	TS260/350	2	–	20	435
		5	–	20	435
Two-axis specification	CT 55/ 55	1	X-axis, Y-axis	6	68
	CT 75/ 75	1	X-axis, Y-axis	6	89
	CT125/125	1	X-axis, Y-axis	12	148
		2	X-axis, Y-axis	12	148
		5	X-axis, Y-axis	14	148
	CT220/220	2	X-axis, Y-axis	14	269
		5	X-axis, Y-axis	14	269
	CT260/350	2	X-axis	20	330
			Y-axis	20	435
		5	X-axis	20	330
			Y-axis	20	435
	CT350/350	2	X-axis, Y-axis	20	435
		5	X-axis, Y-axis	20	435

Table 9 Table inertia and starting torque

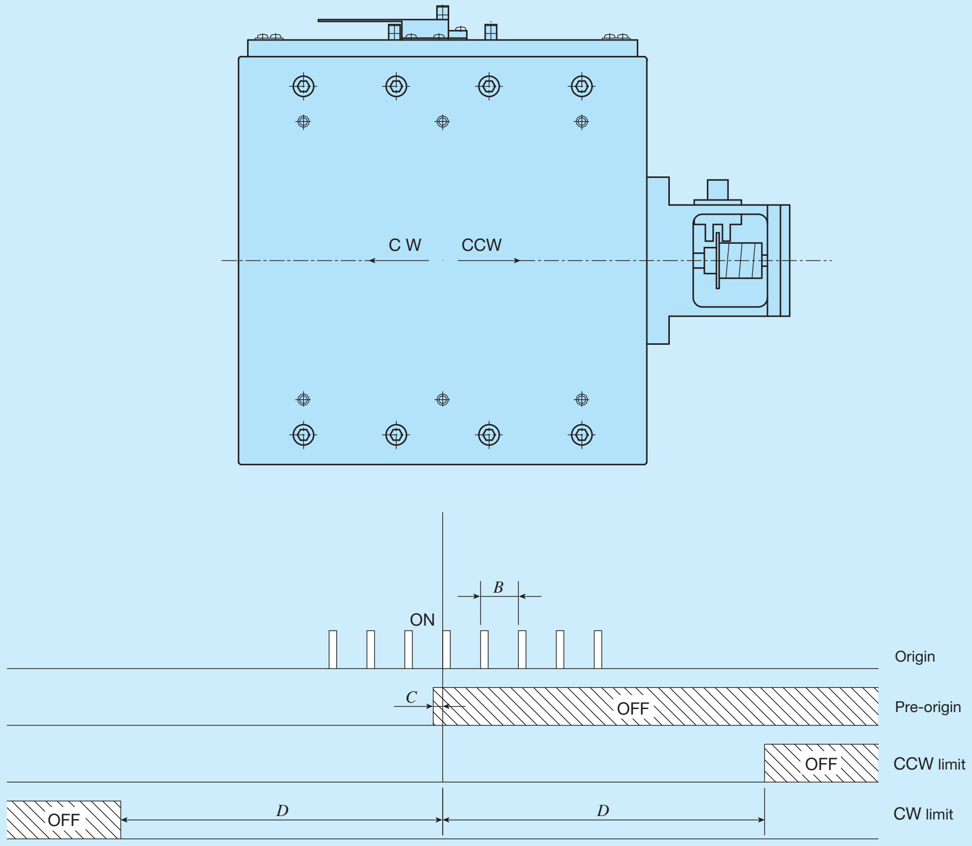
Identification number			Table inertia J_T ×10^{-5}kg·m^2			Starting torque T_s N·m
			Lead 1mm	Lead 2mm	Lead 5mm	
Single-axis specification	TS 55/ 55		0.01	–	–	0.03
	TS 75/ 75		0.01	–	–	0.03
	TS125/125		0.20	0.23	0.55	0.07
	TS125/220		–	0.40	0.95	0.07
	TS220/220		–	0.73	1.1	0.09
	TS220/310		–	1.3	2.1	0.09
	TS260/350		–	3.8	5.6	0.12
Two-axis specification	CT 55/ 55	X-axis	0.01	–	–	0.03
		Y-axis	0.01	–	–	
	CT 75/ 75	X-axis	0.01	–	–	0.07
		Y-axis	0.01	–	–	
	CT125/125	X-axis	0.20	0.28	0.85	0.07
		Y-axis	0.20	0.23	0.55	
	CT220/220	X-axis	–	0.85	1.9	0.09
		Y-axis	–	0.73	1.1	
	CT260/350	X-axis	–	4.6	6.8	0.12
		Y-axis	–	3.8	5.6	
	CT350/350	X-axis	–	4.9	8.0	0.12
		Y-axis	–	4.6	5.9	

Mounting

For the processing accuracy of the Precision Positioning Table mounting surface and the tightening torque of the fixing screws, see page Ⅲ-30.

Sensor Specification

Table 10.1 *Sensor timing chart for TS (single-axis specification)*

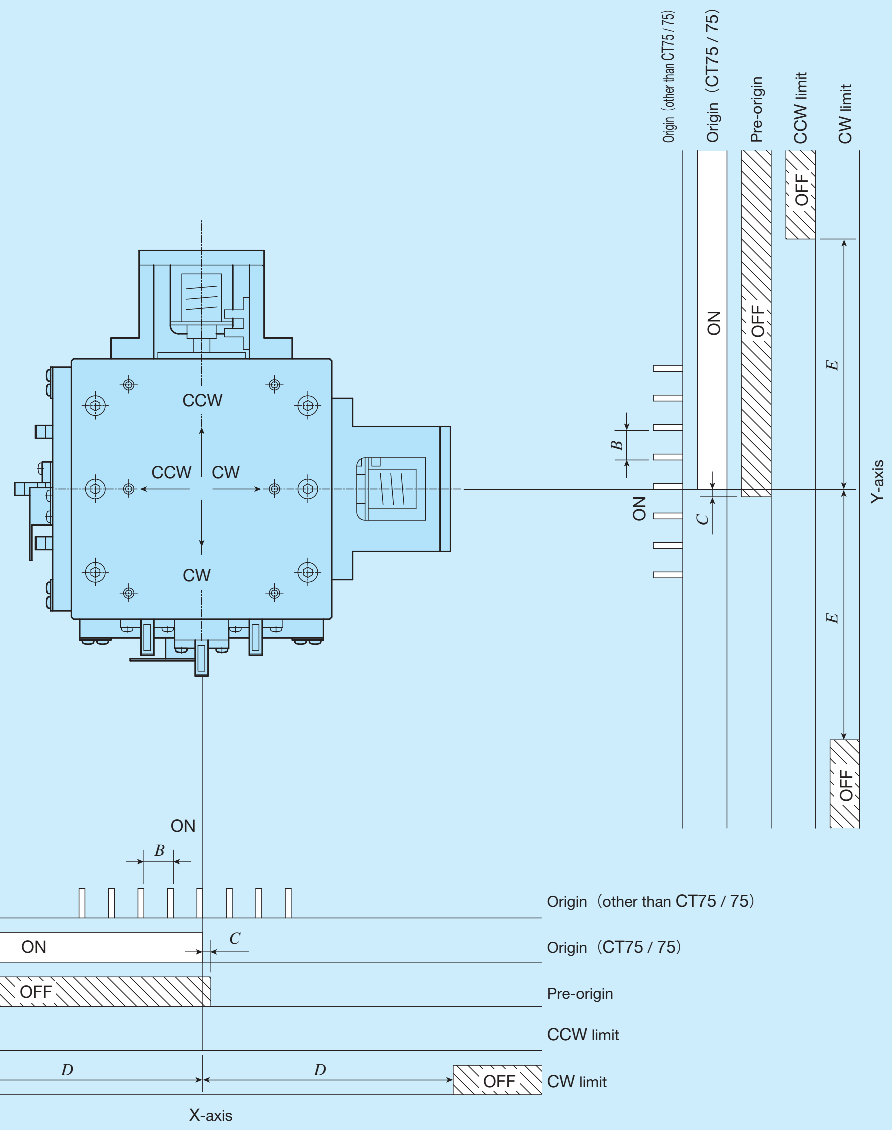


unit: mm

Identification number	Ball screw lead	*B*	*C*	*D*
TS 55/ 55	1	1	0.7	7.5
TS 75/ 75	1	1	0.7	12.5
TS125/125	1	1	0.7	25
	2	2	1.5	
	5	5	3	
TS125/220	2	2	1.5	60
	5	5	3	
TS220/220	2	2	1.5	60
	5	5	3	
TS220/310	2	2	1.5	90
	5	5	3	
TS260/350	2	2	1.5	125
	5	5	3	

Remarks 1. Mounting a sensor is specified using the corresponding identification number.
2. For the specifications of respective sensors, please see the section of sensor specification in General Explanation.
3. When selecting an AC servomotor attachment, an origin sensor is not provided. Please use the C-phase or Z-phase of the encoder.
4. Positions for mounting sensors vary depending on the identification numbers. For detailed information, please see the dimension tables of respective identification numbers.

Table 10.2 *Sensor timing chart for CT (two-axis specification)*



unit: mm

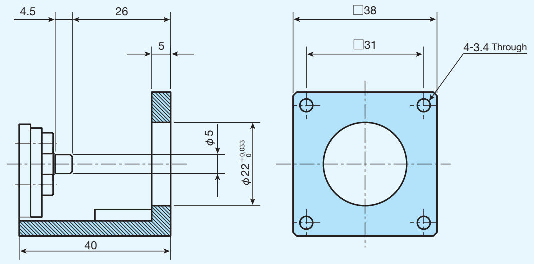
Identification number	Ball screw lead	*B*	*C*	*D*	*E*
CT 55/ 55	1	1	0.7	7.5	7.5
CT 75/ 75	1	–	0.7	12.5	12.5
CT125/125	1	1	0.7	25	25
	2	2	1.5		
	5	5	3		
CT220/220	2	2	1.5	60	60
	5	5	3		
CT260/350	2	2	1.5	75	125
	5	5	3		
CT350/350	2	2	1.5	125	125
	5	5	3		

Remarks 1. Mounting a sensor is specified using the corresponding identification number.
2. For the specifications of respective sensors, please see the section of sensor specification in General Explanation.
3. When selecting an AC servomotor attachment, an origin sensor is not provided. Please use the C-phase or Z-phase of the encoder.
4. Positions for mounting sensors vary depending on the identification numbers. For detailed information, please see the dimension tables of respective identification numbers.

Dimensions of Motor Attachment

TS55/55, CT55/55

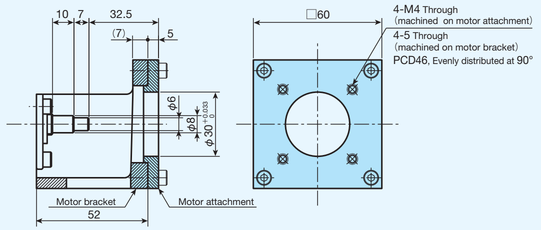
AT601



Note: This figure shows Y-axis. For X-axis, upside down.

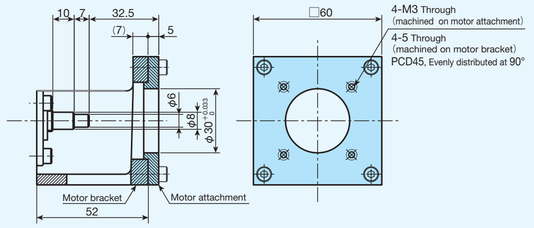
TS125/125, CT125/125

AT602



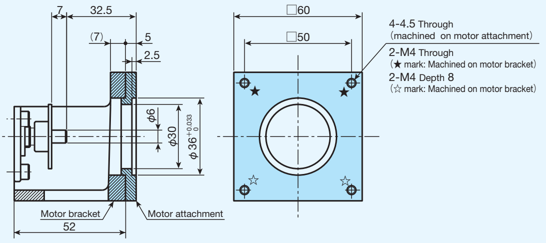
Note: This figure shows Y-axis. For X-axis, upside down.

AT603



Note: This figure shows Y-axis. For X-axis, upside down.

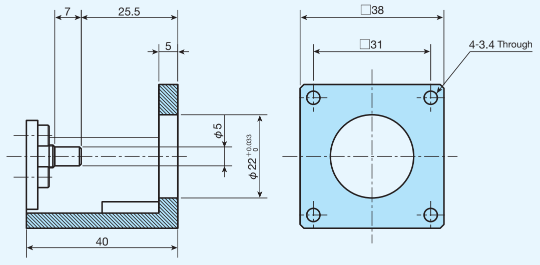
AT608



Note: This figure shows Y-axis. For X-axis, upside down.

TS75/75, CT75/75

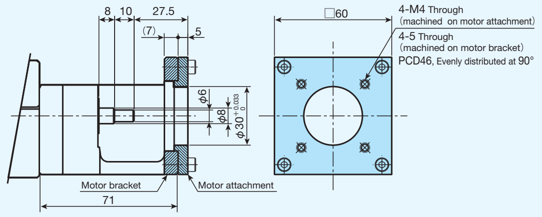
AT601



Note: This figure shows Y-axis. For X-axis, upside down.

TS125/220

AT602



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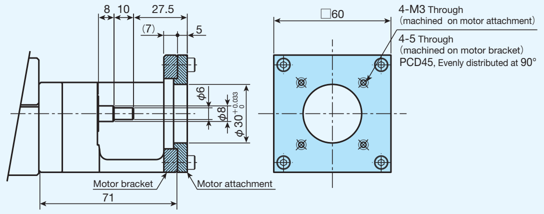

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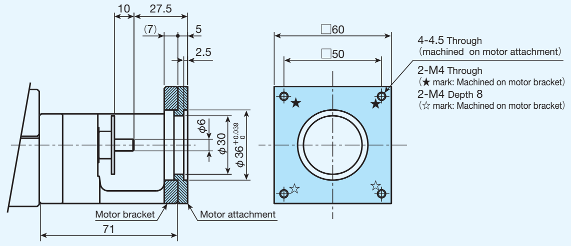
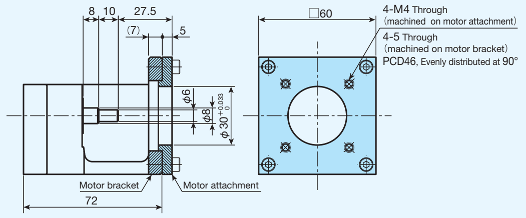


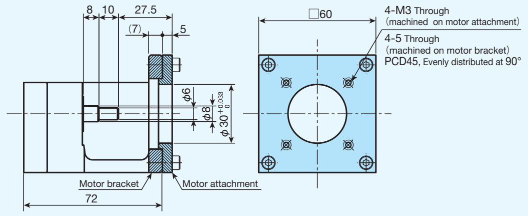
TS220/220, CT220/220

AT602



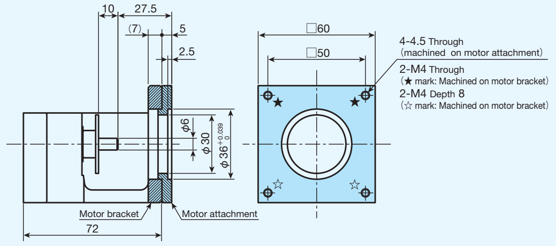
Note: This figure shows Y-axis. For X-axis, upside down.

AT603



Note: This figure shows Y-axis. For X-axis, upside down.

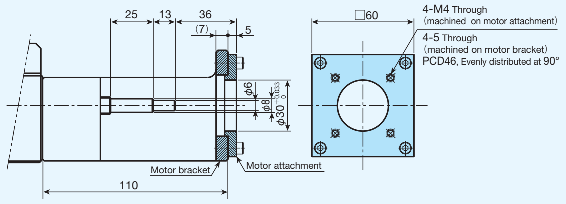
AT608



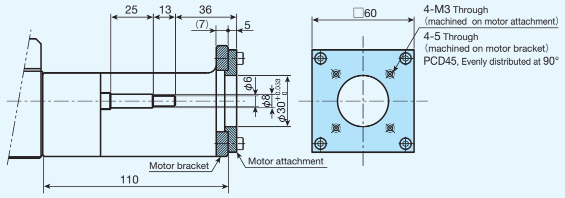
Note: This figure shows Y-axis. For X-axis, upside down.

TS220/310

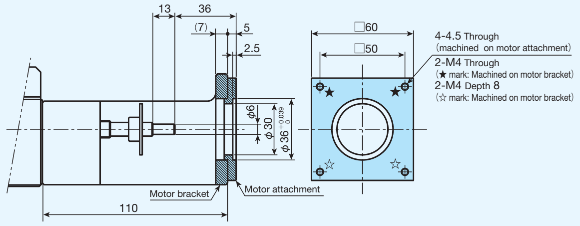
AT604



AT605

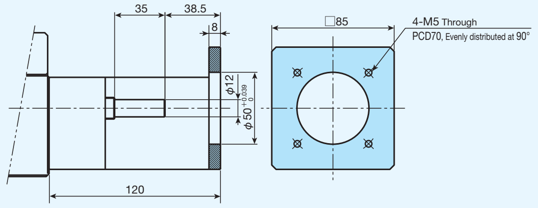


AT609



TS260/350

AT606



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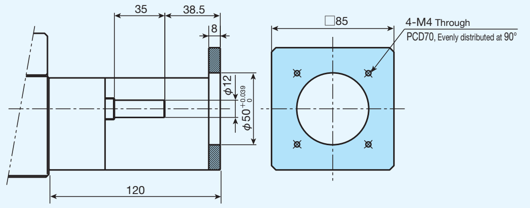
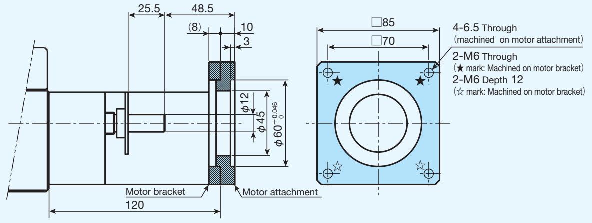
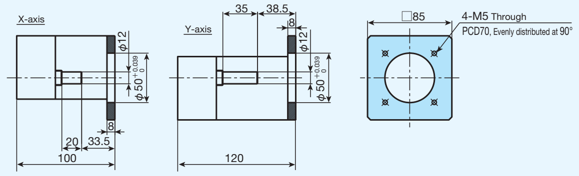


AT610

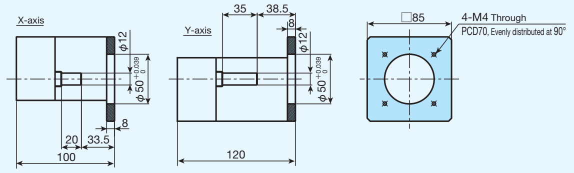


CT260/350

AT606



AT607



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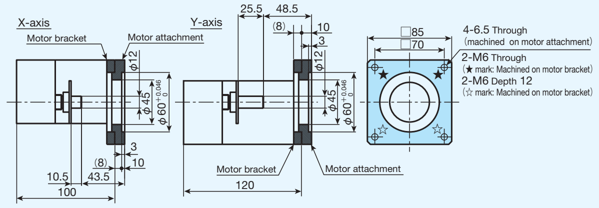
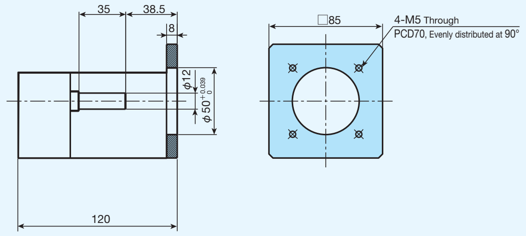


1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

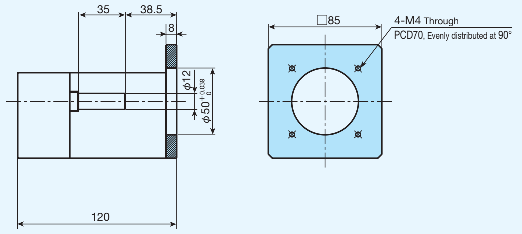
CT350/350

AT606



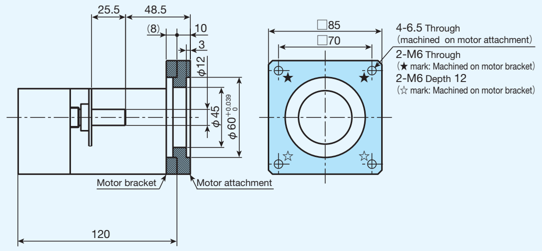
Note: This figure shows Y-axis. For X-axis, upside down.

AT607



Note: This figure shows Y-axis. For X-axis, upside down.

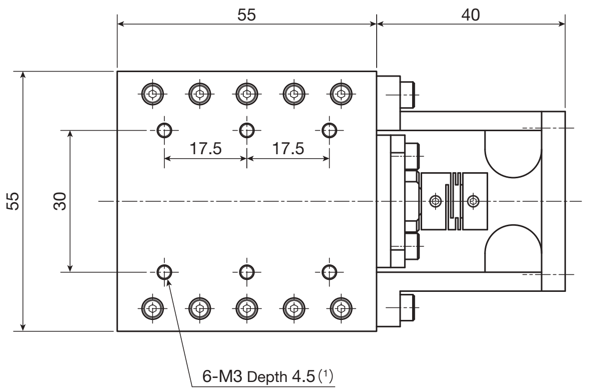
AT610

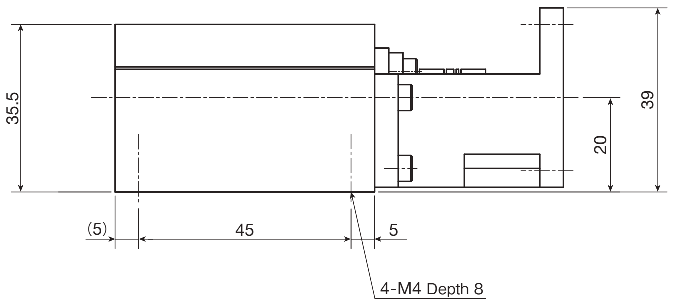


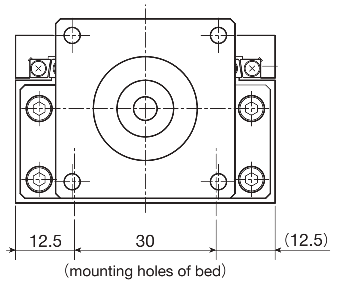
Note: This figure shows Y-axis. For X-axis, upside down.

TS55/55

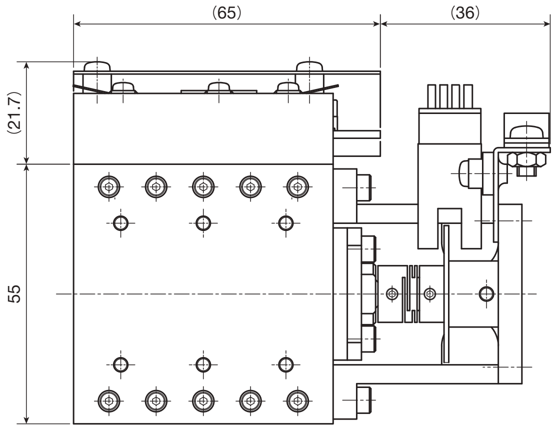
● Specification without sensor

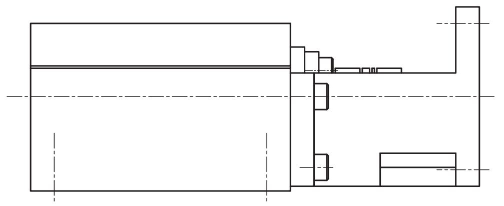


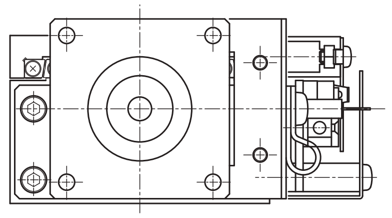




● Specification with sensor





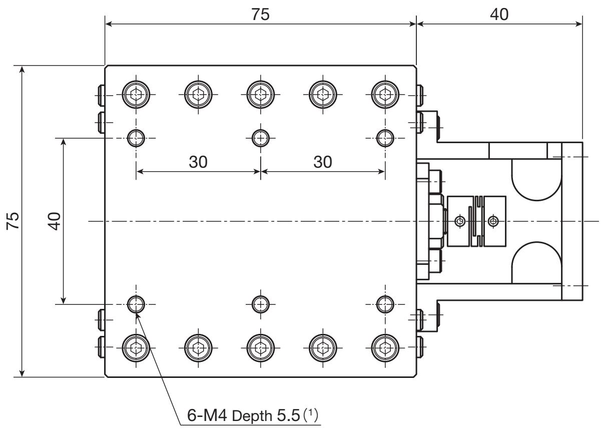


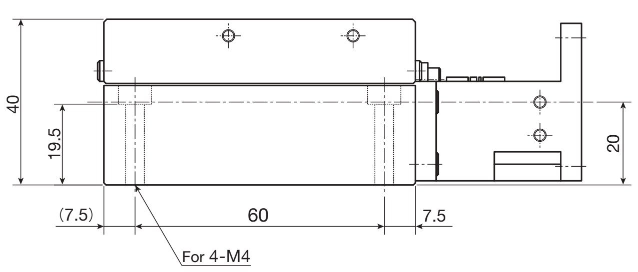
Stroke length: 15mm
Reference mass(2): 0.8kg

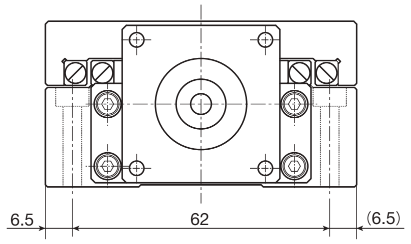
Notes (1) Too deep insertion depth of the mounting bolt may affect the running performance of the slide table, so never insert a bolt longer than the depth of the through hole.
(2) Mass of the sensor is not included.

TS75/75

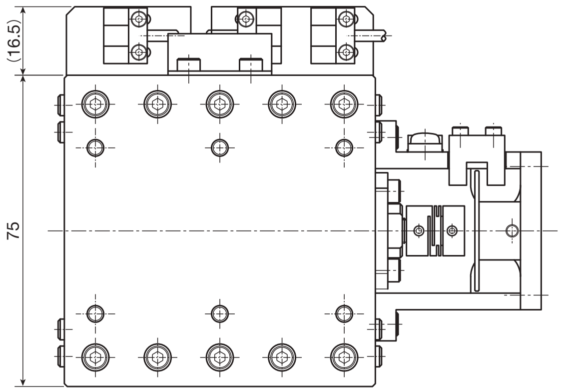
● Specification without sensor

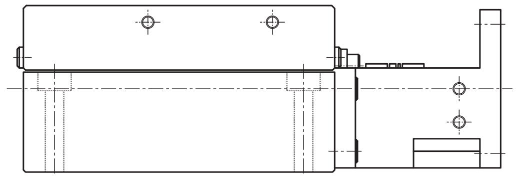


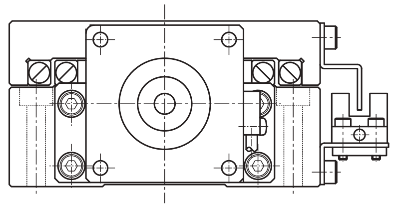




● Specification with sensor





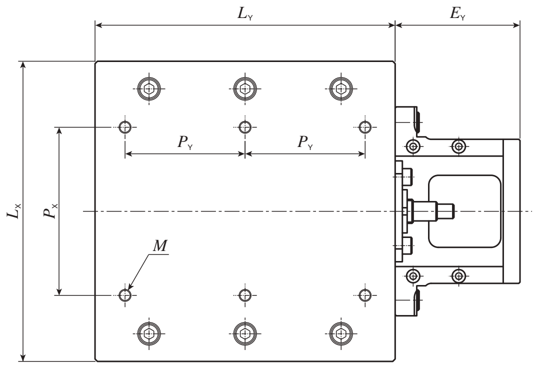


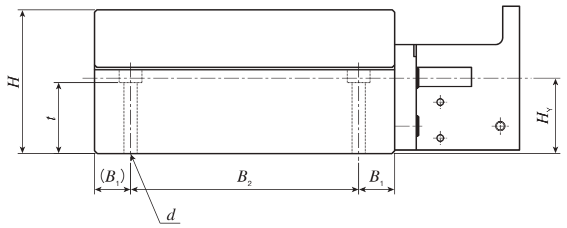
Stroke length: 25mm
Reference mass (2): 1.6kg

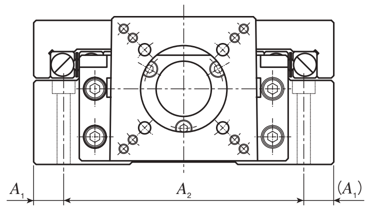
Notes (1) Too deep insertion depth of the mounting bolt may affect the running performance of the slide table, so never insert a bolt longer than the depth of the through hole.
(2) Mass of the sensor is not included.

TS125/125, TS220/220

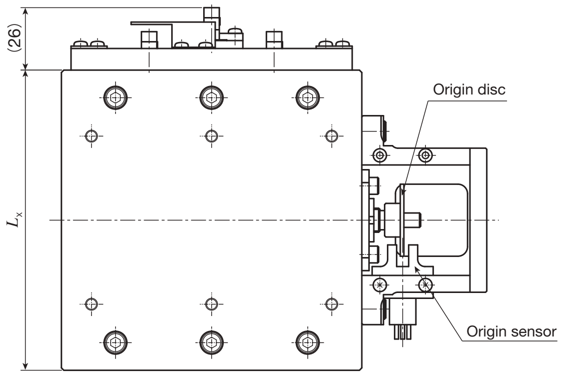
● Specification without sensor



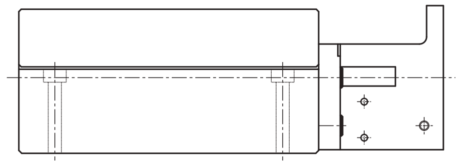


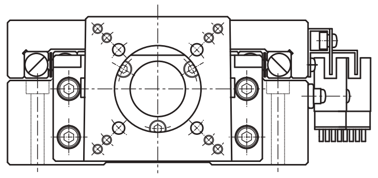


● Specification with sensor



Note) When selecting an AC servomotor attachment, an origin sensor and origin disc are not provided.





unit: mm

Identification number	Dimensions of table			Stroke length	E_Y	Height of shaft center H_Y
	L_X	L_Y	H			
TS125/125 (1)	125	125	60	50	52	31.5
TS220/220	220	220	65	120	72	33.5

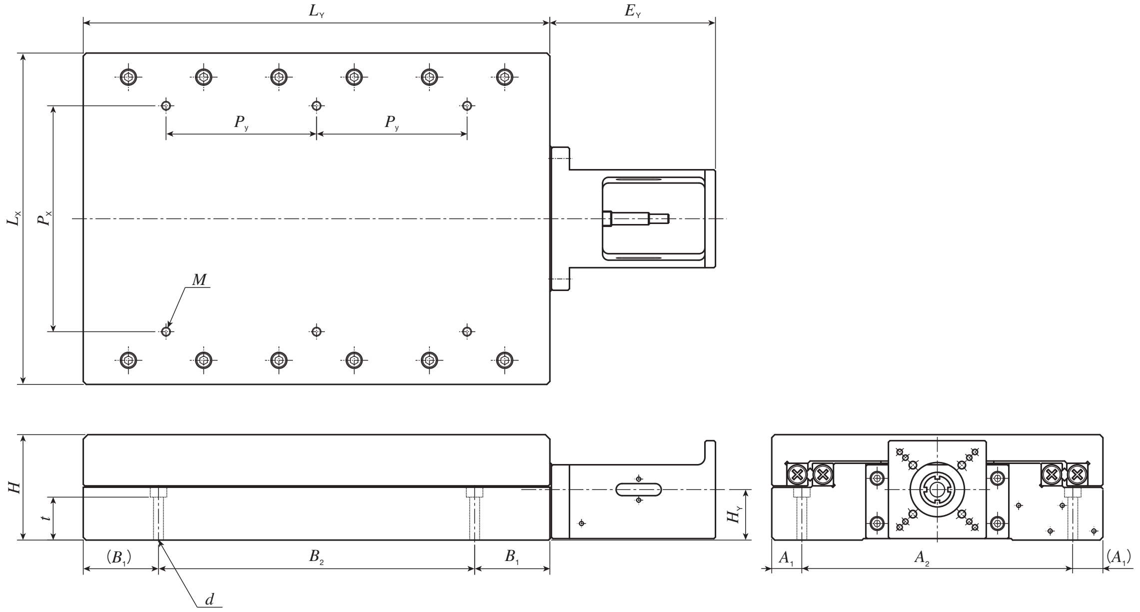
Identification number	Mounting bolt			Bed mounting-related dimensions						Reference mass (2) kg
	M (3)	P_X	P_Y	d	t	A_1	A_2	B_1	B_2	
TS125/125 (1)	6-M5 depth 10	70	50	For 4-M5	29.6	12.5	100	15	95	7.5
TS220/220	6-M6 depth 12	150	75	For 4-M6	27.5	20	180	20	180	16.0

Notes (1) The motor bracket is positioned 1.5mm higher than the upper surface of the table.
(2) Mass of the sensor is not included.
(3) Too deep insertion depth of the mounting bolt may affect the running performance of the slide table, so never insert a bolt longer than the depth of the through hole.

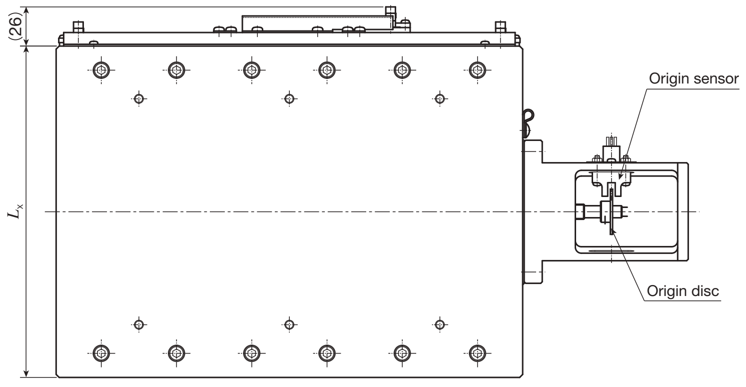
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

TS125/220, TS220/310, TS260/350

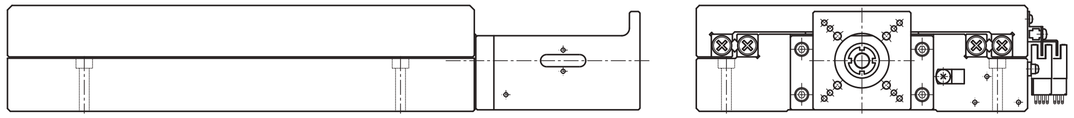
● Specification without sensor



● Specification with sensor



Note) When selecting an AC servomotor attachment, an origin sensor and origin disc are not provided.



unit: mm

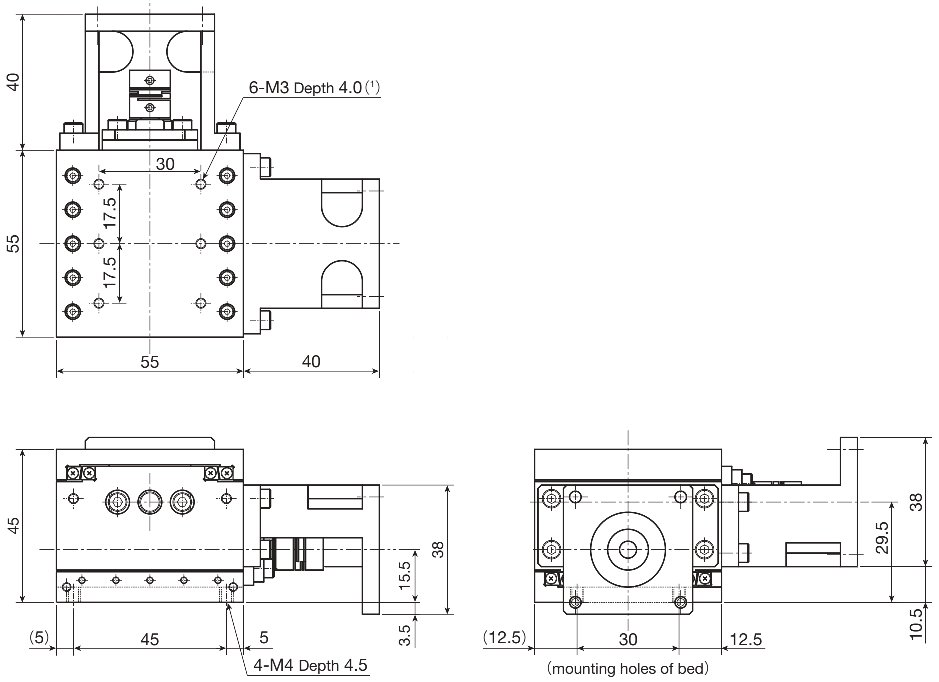
Identification number	Dimensions of table			Stroke length	E_Y	Height of shaft center H_Y
	L_X	L_Y	H			
TS125/220(1)	125	220	60	120	71	31.5
TS220/310	220	310	70	180	110	33.5
TS260/350	260	350	100	250	120	47.5

Identification number	Mounting bolt			Bed mounting-related dimensions						Reference mass(2) kg
	M(3)	P_X	P_Y	d	t	A_1	A_2	B_1	B_2	
TS125/220(1)	6-M5 depth 10	70	75	For 4-M5	29.6	12.5	100	20	180	11
TS220/310	6-M6 depth 12	150	100	For 4-M6	28.5	20	180	50	210	27
TS260/350	6-M6 depth 12	150	125	For 4-M8	45.4	22.5	215	50	250	48

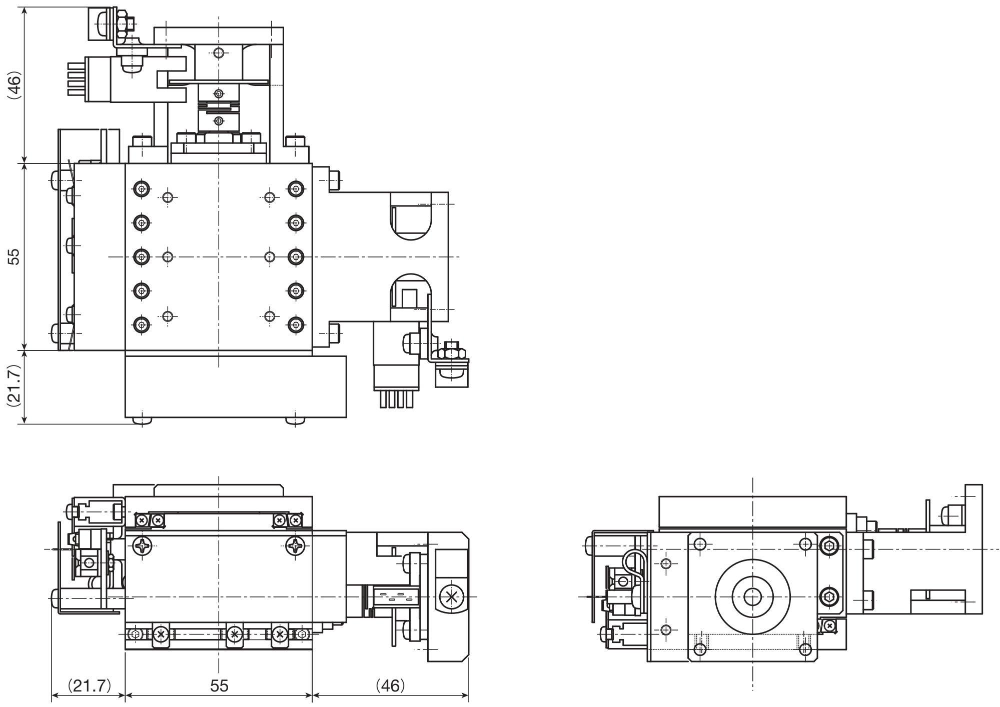
Notes (1) The motor bracket is positioned 1.5mm higher than the upper surface of the table.
(2) Mass of the sensor is not included.
(3) Too deep insertion depth of the mounting bolt may affect the running performance of the slide table, so never insert a bolt longer than the depth of the through hole.

CT55/55

● Specification without sensor



● Specification with sensor

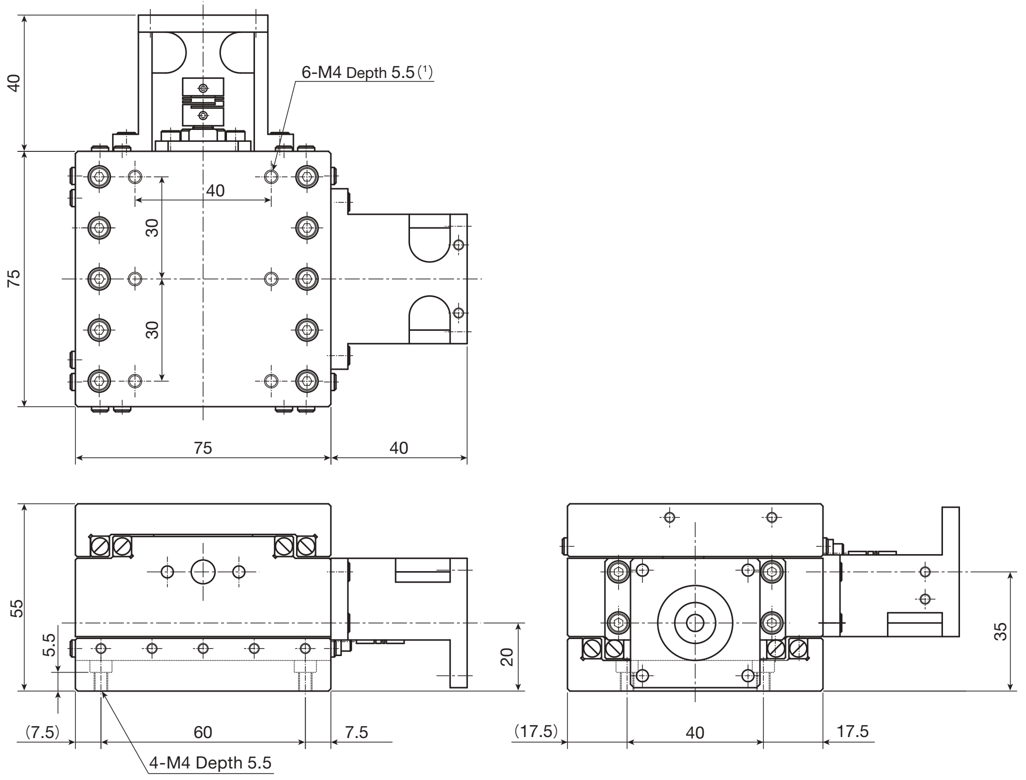


X- and Y-axis stroke length: 15mm
Reference mass(2): 1.7kg

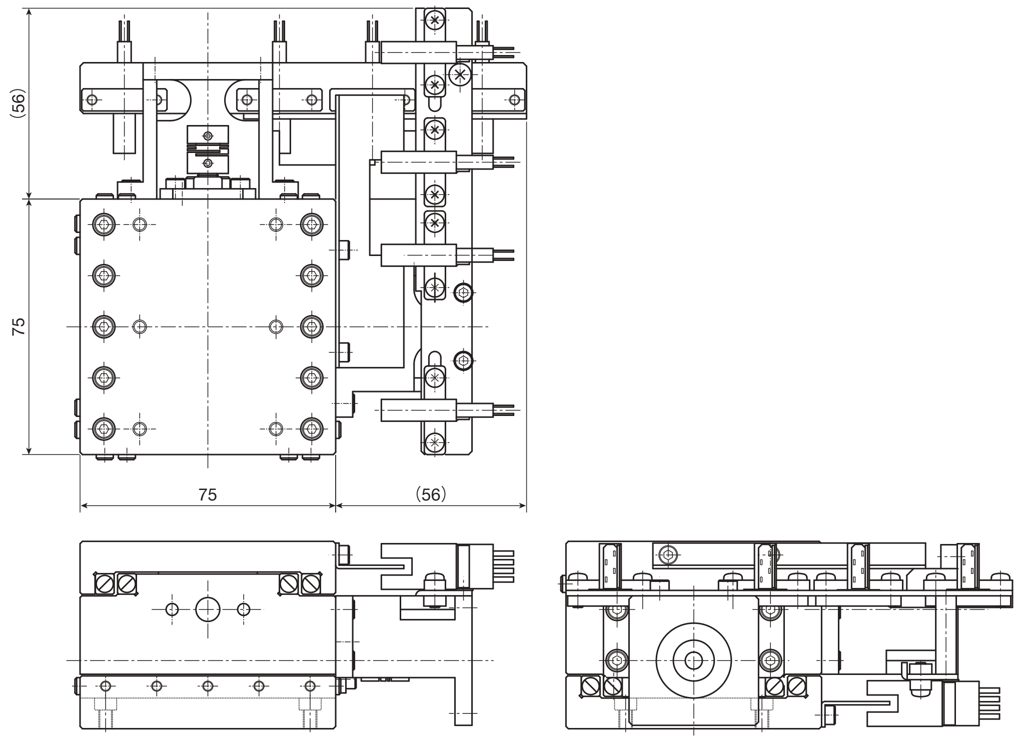
Notes (1) Too deep insertion depth of the mounting bolt may affect the running performance of the slide table, so never insert a bolt longer than the depth of the through hole.
(2) Mass of the sensor is not included.

CT75/75

● Specification without sensor



● Specification with sensor

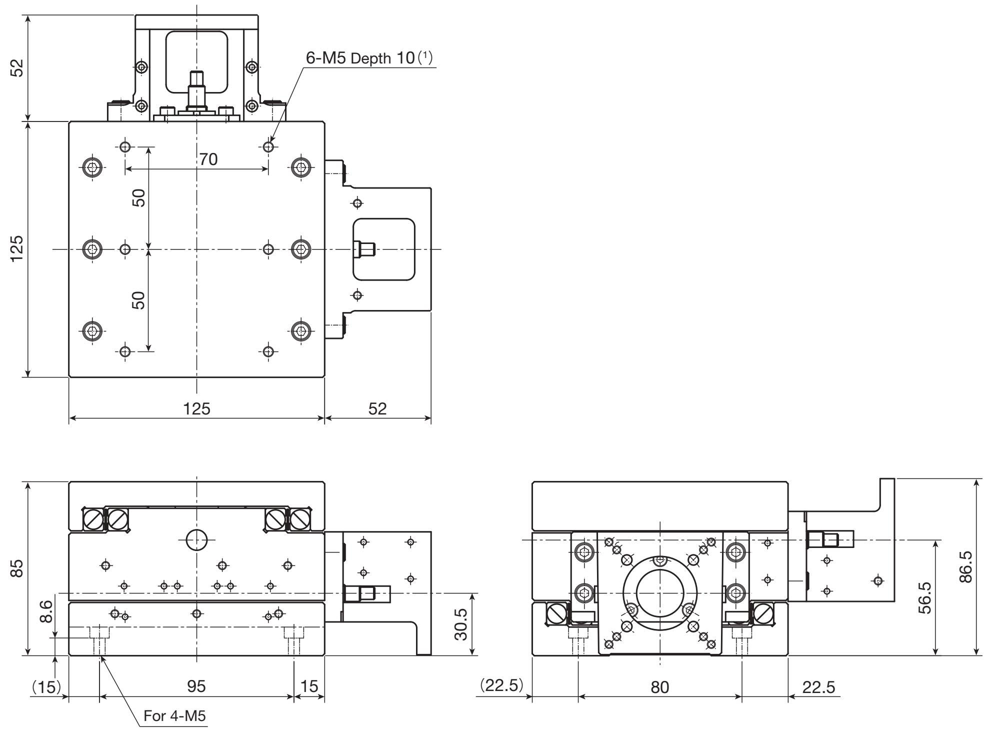


X- and Y-axis stroke length: 25mm
Reference mass(2): 2.0kg

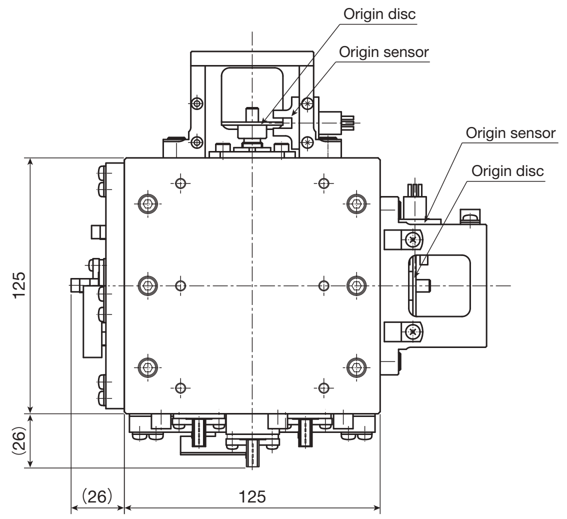
Notes (1) Too deep insertion depth of the mounting bolt may affect the running performance of the slide table, so never insert a bolt longer than the depth of the through hole.
(2) Mass of the sensor is not included.

CT125/125

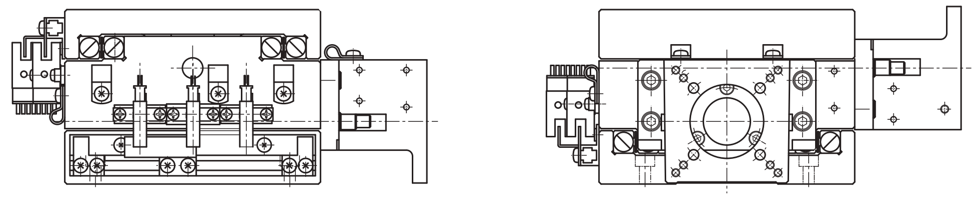
● Specification without sensor



● Specification with sensor



Note) When selecting an AC servomotor attachment, an origin sensor and origin disc are not provided.

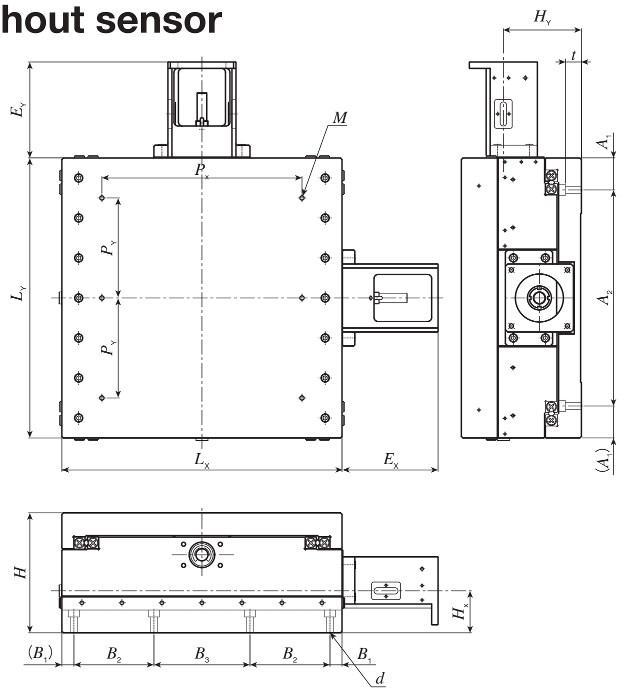


X- and Y-axis stroke length: 50mm
Reference mass(2): 1.7kg

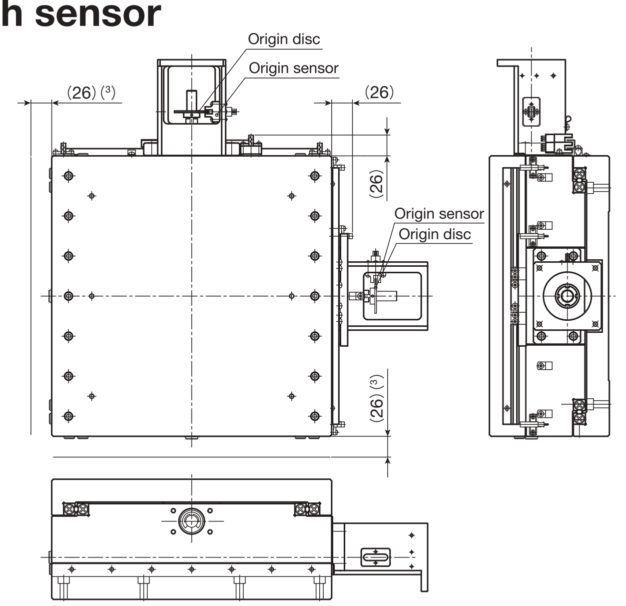
Notes (1) Too deep insertion depth of the mounting bolt may affect the running performance of the slide table, so never insert a bolt longer than the depth of the through hole.
(2) Mass of the sensor is not included.

CT220/220, CT260/350, CT350/350

● Specification without sensor



● Specification with sensor



Note) When selecting an AC servomotor attachment, an origin sensor and origin disc are not provided.

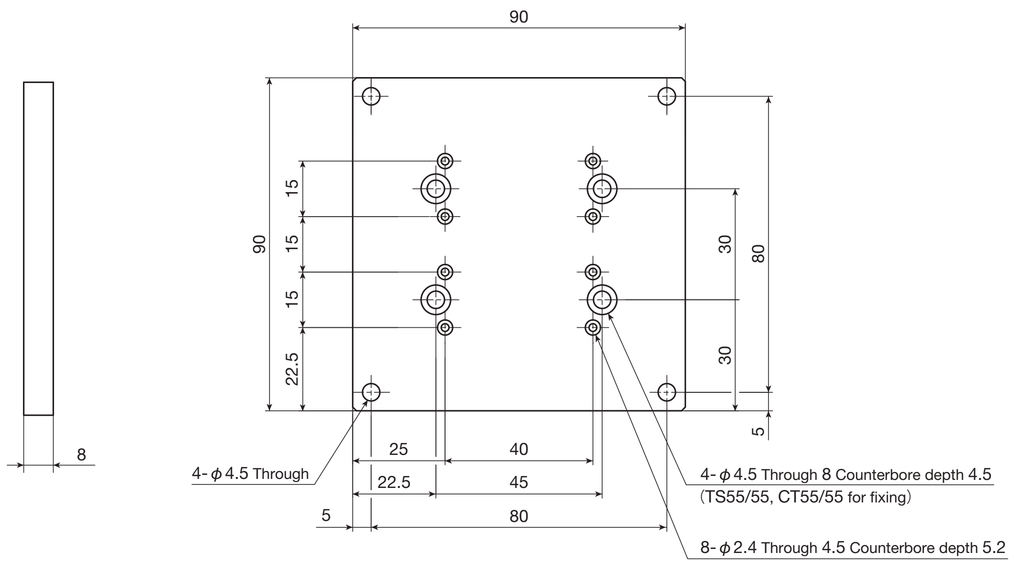
unit: mm

Identification number	Dimensions of table			Stroke length		E_X	E_Y	Height of shaft center	
	L_X	L_Y	H	X-axis	Y-axis			H_X	H_Y
CT220/220	220	220	100	120	120	72	72	31.5	68.5
CT260/350	260	350	150	150	250	100	120	52.5	97.5
CT350/350	350	350	150	250	250	120	120	52.5	97.5

Identification number	Mounting bolt			Bed mounting-related dimensions							Reference mass(2) kg
	M(1)	P_X	P_Y	d	t	A_1	A_2	B_1	B_2	B_3	
CT220/220	6-M6 depth 12	150	75	For 8-M6	7.5	30	160	15	40	110	20
CT260/350	6-M6 depth 12	150	125	For 8-M8	20	40	270	15	55	120	66
CT350/350	6-M6 depth 12	250	125	For 8-M8	20	40	270	15	100	120	77

Notes (1) Too deep insertion depth of the mounting bolt may affect the running performance of the slide table, so never insert a bolt longer than the depth of the through hole.
(2) Mass of the sensor is not included.
(3) Applicable to CT220/220. This shows the dimension when the sensor is attached.

●Option base dimensions for TS55/55 and CT55/55



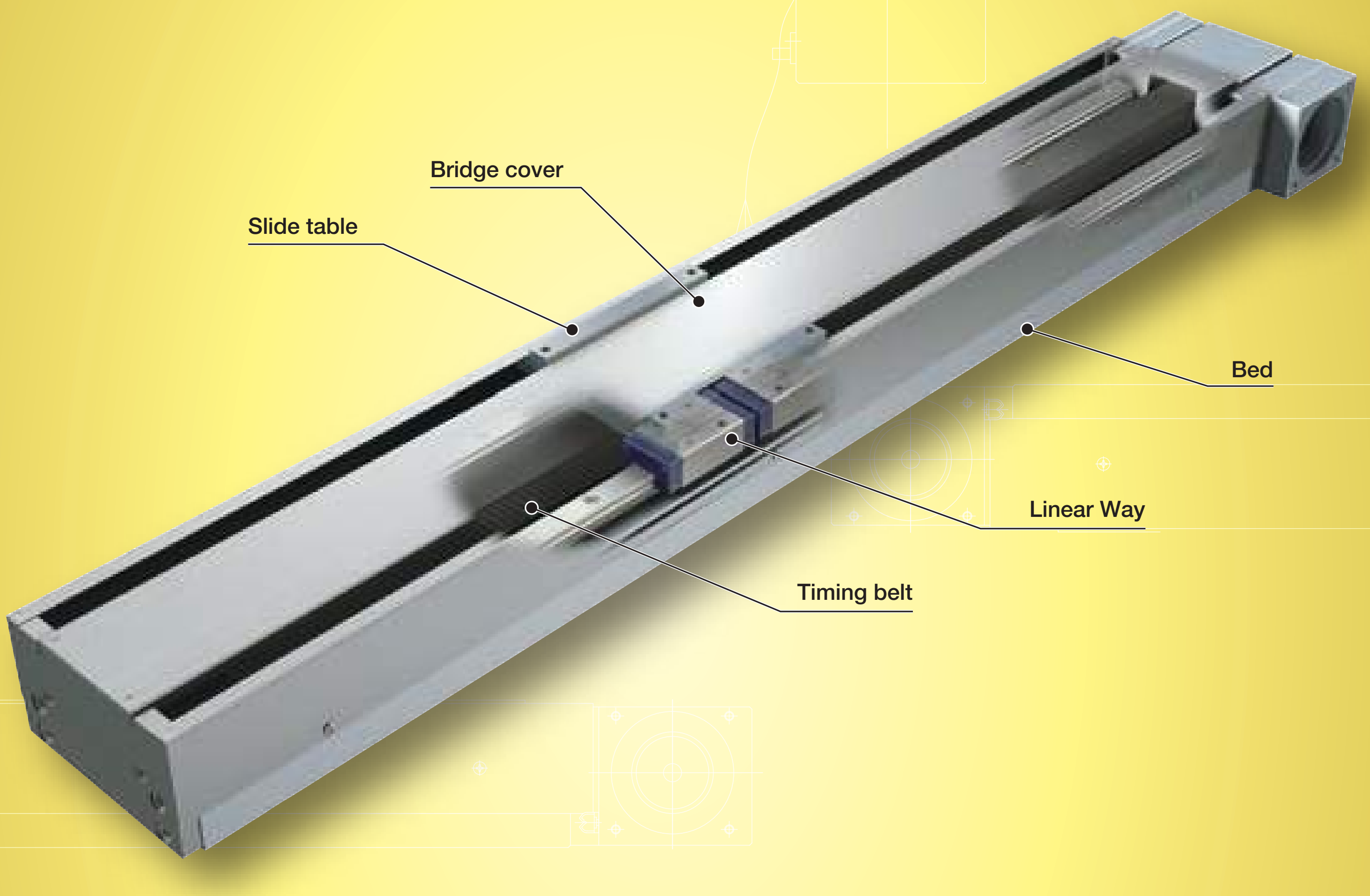
Option base for TS55/55 and CT55/55

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

TSLB

TSLB

Timing belt
Linear



Major product specifications

Driving method	High-tensile timing belt
Linear motion rolling guide	Linear Way（ball type）
Built-in lubrication part	No built-in
Material of table and bed	High-strength aluminum alloy
Sensor	Provided as standard

Accuracy

unit: mm

Positioning repeatability	±0.070～0.100
Positioning accuracy	–
Lost motion	–
Parallelism in table motion A	–
Parallelism in table motion B	0.050～0.070
Attitude accuracy	–
Straightness	–
Backlash	–

Points

● High speed and long stroke positioning table

1 High speed movement-enabled and long stroke positioning table with highly durable and high-tensile steel cord-contained timing belt incorporated into the feeding mechanism of the slide table.

● Light weight and long stroke

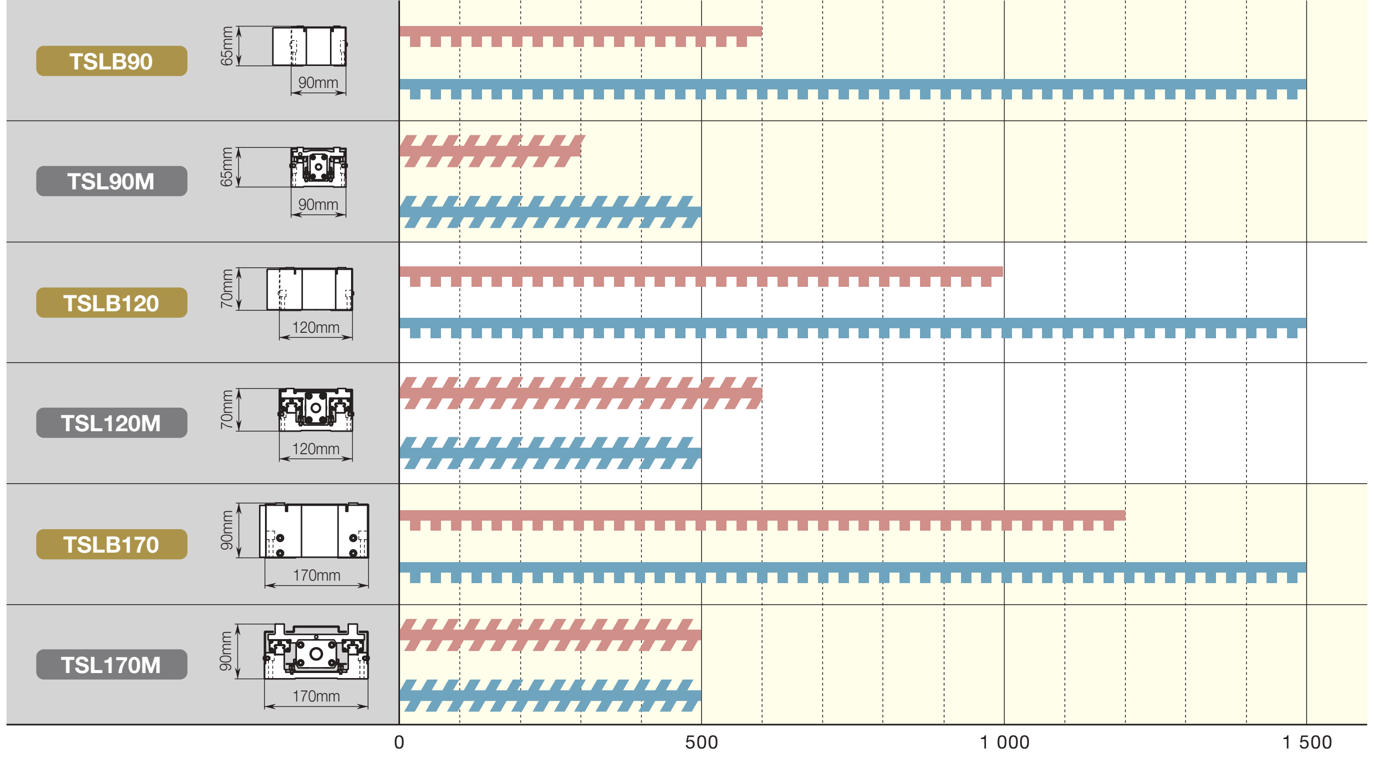
2 Lightweight solution is achieved by adopting the slide table and bed made from high-strength aluminum alloy.
Series of stroke length up to 1,200mm is available.

● Stable high running accuracy

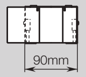
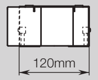
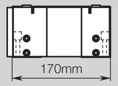
3 Incorporation of two sets of Linear Way in parallel realized stable and high running performance.

Comparison with Precision Positioning Table L

🟥 Stroke length（mm） 🟦 Maximum speed（mm/s）



Variation

Shape	Model and size	Table width（mm）	Stroke length（mm）								
			300	400	500	600	700	800	900	1 000	1 200
 90mm	TSLB 90	90	☆	☆	☆	☆	–	–	–	–	–
 120mm	TSLB120	120	–	–	–	☆	☆	☆	☆	☆	–
 170mm	TSLB170	170	–	–	–	–	–	☆	–	☆	☆

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Identification Number

Example of an Identification Number

1	2		3		4
TSLB	120	-	700	/	ATA01

1	**Model**	Page Ⅱ-246
2	**Size**	Page Ⅱ-246
3	**Stroke length**	Page Ⅱ-246
4	**Designation of motor attachment**	Page Ⅱ-246

Identification Number and Specification

1	**Model**	TSLB: Precision Positioning Table LB
2	**Size**	Size indicates table width. Select a size from the list of Table 1.
3	**Stroke length**	Select a stroke length from the list of Table 1.

Table 1 Sizes, table width dimensions, and stroke lengths unit: mm

Model and size	Table width	Stroke length
TSLB 90	90	300, 400, 500, 600
TSLB120	120	600, 700, 800, 900, 1 000
TSLB170	170	800, 1 000, 1 200

4 **Designation of motor attachment**

Motor attachment shown in Table 2 is attached.

- Motor should be prepared by customer.
- A coupling shown in Table 3 is mounted on the main body before shipment. However, the final position adjustment should be made by customer since it is only temporarily fixed.

Table 2 Application of motor attachment

Motor to be used				Flange size mm	Motor attachment	
Type	Manufacturer	Series	Model		TSLB 90 TSLB120	TSLB170
Stepper motor	ORIENTAL MOTOR Co., Ltd.	RKS CRK	**CRK56**(1)	□60	ATA01	–
			RKS59	□85	–	ATA02
			RKS56(2)	□60	ATA03	–

Note (1) Applicable to the outer diameter φ8 of motor output shaft.
(2) Applicable to the outer diameter φ10 of motor output shaft.

Remark: For detailed motor specifications, please see respective motor manufacturer's catalog.

Table 3 Coupling models

Model and size	Coupling models	Manufacturer	Coupling inertia J_c $\times10^{-5}$kg · m^2
ATA01	MOL-32C- 8×12	Nabeya Bi-tech Kaisha	1.4
ATA02	MOL-40C-12×14		4.1
ATA03	MOL-32C-10×12		1.4

Remark: For detailed coupling specifications, please see respective manufacturer's catalog.

Specifications

Table 4 Accuracy

unit: mm

Model and size	Stroke length	Positioning repeatability	Parallelism in table motion B
TSLB 90	300	±0.070	0.050
	400		
	500		
	600		0.070
TSLB120		±0.100	0.070
TSLB170		±0.100	0.070

Table 5 Maximum speed and resolution

Model and size	Maximum speed (1) mm/s	Resolution (2) mm
TSLB 90 TSLB120 TSLB170	1 500	0.1

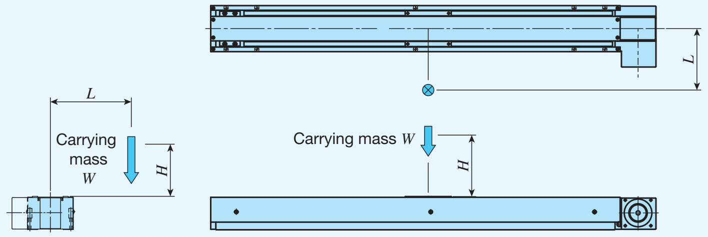
Notes (1) To measure the practical maximum speed, it is required to consider operation patterns based on the motor to be used and load conditions.

(2) This is a value given when the number of fraction sizes of the motor is 1,000 pulses/rev.

Table 6 Maximum carrying mass

Model and size	Carrying mass position mm Length L / Height H	Horizontal direction Maximum carrying mass kg			
		0	100	200	300
TSLB 90	0	5	2.0	1.1	0.7
	100	1.3	1.0	0.7	0.6
	200	0.7	0.6	0.5	0.4
	300	0.5	0.4	0.4	0.3
TSLB120	0	62	18	9	6
	100	16	11	7	5
	200	9	7	6	5
	300	6	5	4.9	4.2
TSLB170	0	46	17	9	6
	100	15	10	7	5
	200	9	7	5	4.9
	300	6	5	4.7	4.1

Remark: The maximum carrying mass is adjusted by the mass when the rating life of the linear motion rolling guide, ball screws, or bearings is 18,000 hours during continuous operation at a number of revolutions of the motor of 3000min^{-1} and an acceleration/deceleration time of 0.2s. The mass calculated is based upon the basic static load rating of the linear motion rolling guide.



Carrying mass position
(horizontal direction)

Table 7 Maximum load mass

Model and size	Horizontal direction Maximum load mass kg
TSLB 90	23
TSLB120	18
TSLB170	14

Remark: The maximum load mass is the maximum mass that ensures the number of revolutions of the motor of 900min^{-1} and acceleration/deceleration of 0.3G, when repeating operations with the same acceleration/deceleration time and stop time.

Table 8 Table inertia and starting torque

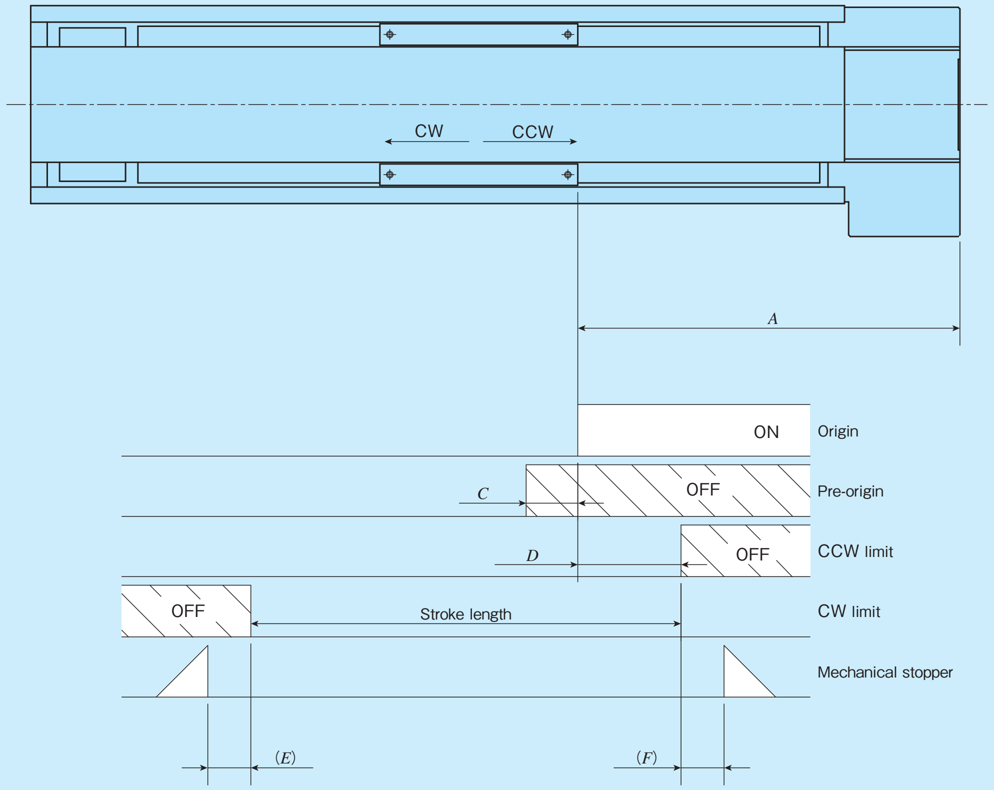
Model and size	Table inertia J_T $\times10^{-5}$kg·m^2	Starting torque T_S N·m
TSLB 90	19	0.3
TSLB120	42	0.5
TSLB170	64	0.6

Mounting

For the processing accuracy of the Precision Positioning Table mounting surface and the tightening torque of the fixing screws, see page Ⅲ-29.

Sensor Specification

Table 9 Sensor timing chart



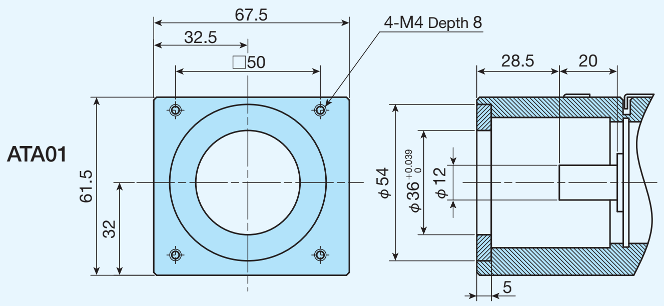
unit: mm

Model and size	A	C	D	E	F
TSLB 90	120	50	20	13	10
TSLB120	120	50	20	8	5
TSLB170	160	50	20	23	30

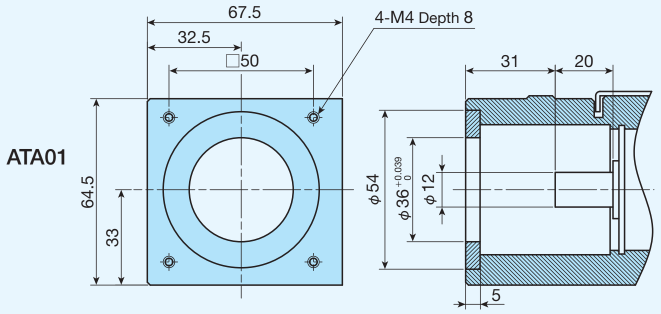
Remark: For detailed specifications of respective sensors, please see the section of sensor specification in General Explanation.

Dimensions of Motor Attachment

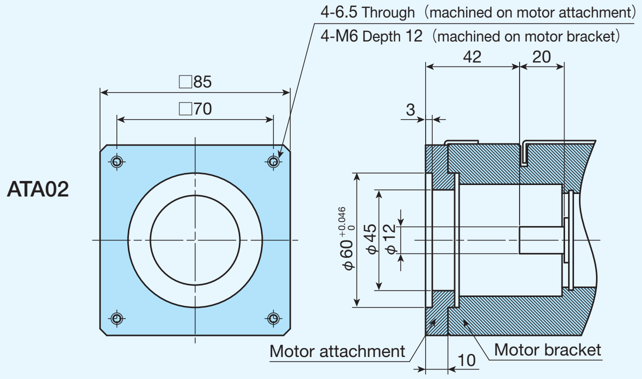
TSLB90



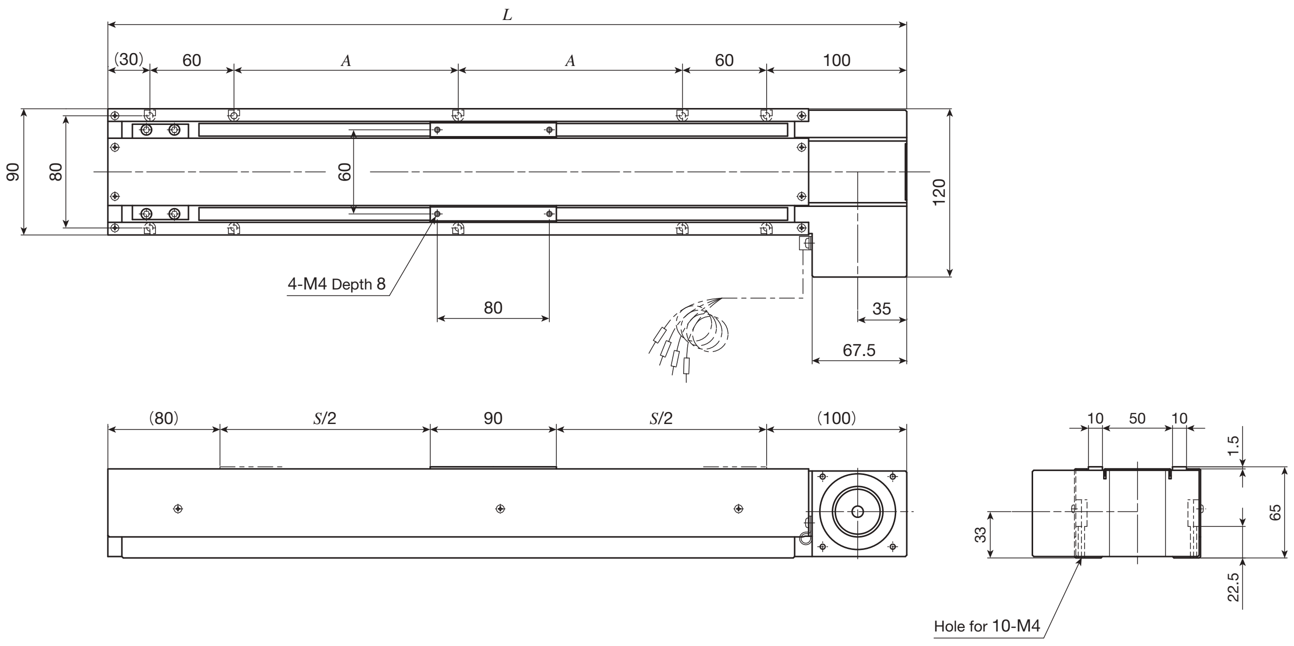
TSLB120



TSLB170



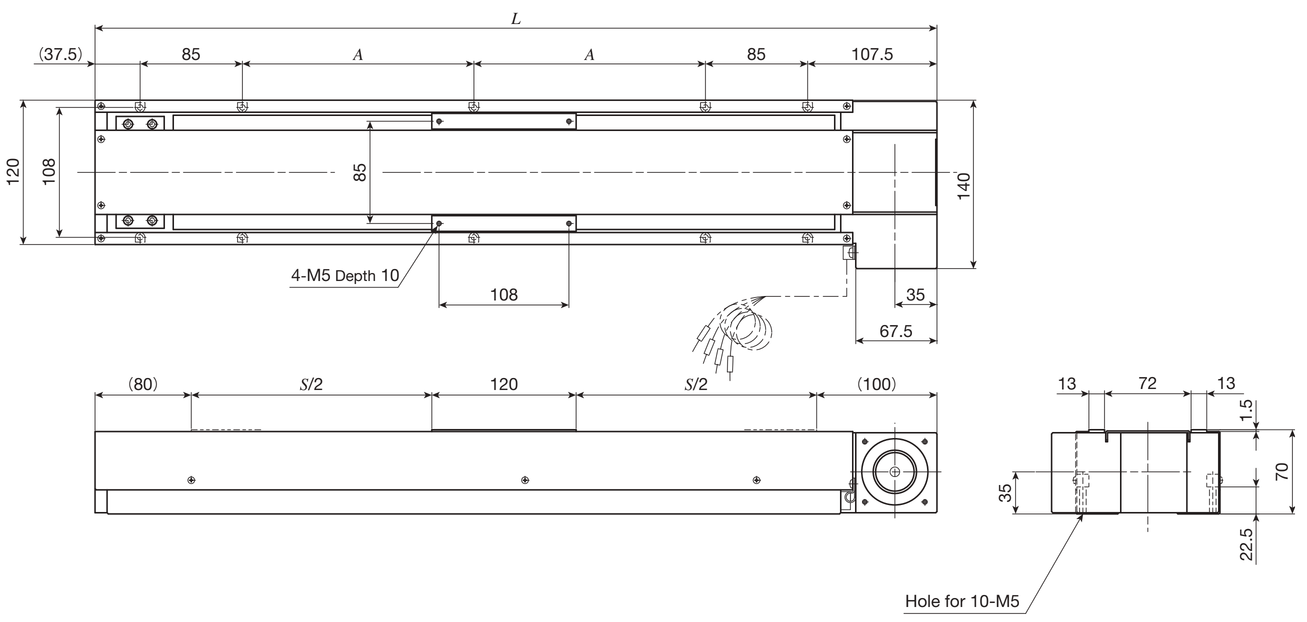
TSLB90



unit: mm

Identification number	Stroke length S	Overall length L	Mounting holes of bed A	Mass（Ref.） kg
TSLB90-300	300	570	160	6.5
TSLB90-400	400	670	210	7.5
TSLB90-500	500	770	260	8.5
TSLB90-600	600	870	310	9.5

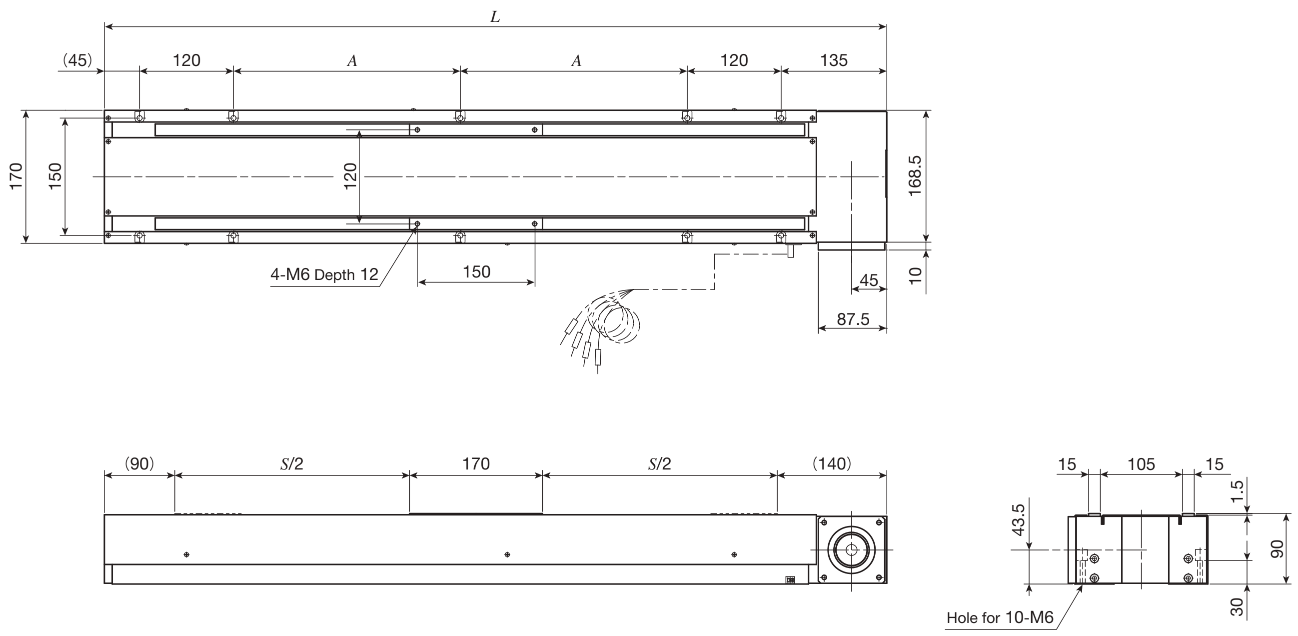
TSLB120



unit: mm

Identification number	Stroke length *S*	Overall length *L*	Mounting holes of bed *A*	Mass (Ref.) kg
TSLB120- 600	600	900	292.5	13
TSLB120- 700	700	1 000	342.5	14
TSLB120- 800	800	1 100	392.5	15
TSLB120- 900	900	1 200	442.5	16
TSLB120-1000	1 000	1 300	492.5	17

TSLB170



unit: mm

Identification number	Stroke length *S*	Overall length *L*	Mounting holes of bed *A*	Mass (Ref.) kg
TSLB170- 800	800	1 200	390	23
TSLB170-1000	1 000	1 400	490	26
TSLB170-1200	1 200	1 600	590	29

NT
(NT···V, NT···H, NT···XZ, NT···XZH)

NT

Linear motor

Linear motion

IKO C-Lube

Maintenance-free

Major product specifications

Driving method	Linear motor
Linear motion rolling guide	Linear Way(ball type) Crossed Roller Way(roller type)
Built-in lubrication part	Lubrication part "C-Lube" is built-in (except for NT38V, NT55V and NT···H)
Material of table and bed	High carbon steel
Sensor	Provided as standard

Accuracy

unit: mm

Positioning repeatability	±0.0001～0.0005
Positioning accuracy	–
Lost motion	–
Parallelism in table motion A	–
Parallelism in table motion B	–
Attitude accuracy	–
Straightness	–
Backlash	–

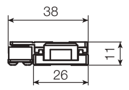
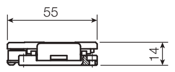
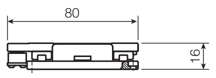
Ultracompact, state-of-the-art linear motor table NT series!

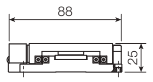
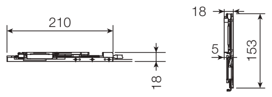
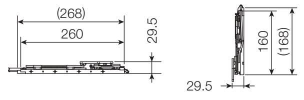
Nano Linear NT is a moving magnet type linear motor table with extremely low profile.

For guiding parts of the moving table, Linear Way or Crossed Roller Way well-established in the area of miniature linear motion rolling guides is used in combination with linear motor and high-resolution linear encoder to realize highly accurate positioning.

Thanks to adoption of high-performance neodymium magnet, large thrust force can be acquired and therefore high-speed and highly responsive positioning is possible, despite its very small body. In addition, high cleanliness is realized as the mechanical contact part is only the linear motion rolling guide thanks to adoption of a landmark driving method without moving cables.

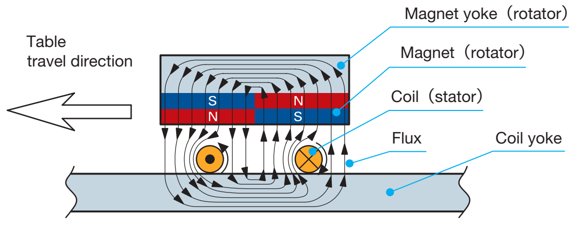
Nano Linear NT specifications list

Model and size		Standard type NT···V																		
		NT38V10		NT38V18		NT55V25			NT55V65			NT80V25			NT80V65			NT80V120		
																				
Sectional shape																				
Maximum thrust	N	3		3		25			25			36			36			36		
Rated thrust	N	0.6		0.8		7			7			8			8			8		
Maximum load mass	kg	0.5		0.5		5			5			5			5			5		
Effective stroke length	mm	10		18		25			65			25			65			120		
Resolution	μm	0.1	0.5	0.1	0.5	0.1		0.5	0.1		0.5	0.1		0.5	0.1		0.5	0.1		0.5
Maximum speed	mm/s	270	500	270	500	270	1000	1300	270	1000	1300	270	1000	1300	270	1000	1300	270	1000	1300
Positioning repeatability	μm	±0.5		±0.5		±0.5			±0.5			±0.5			±0.5			±0.5		

Model and size		High accuracy type NT···H				Pick and place unit NT···XZ						High thrust pick and place unit NT···XZH					
		NT88H25		NT88H65		NT80XZ4510						NT90XZH2510					
																	
Sectional shape																	
						X-axis			Z-axis			X-axis			Z-axis		
Maximum thrust	N	25		25		50			25			70			70		
Rated thrust	N	5		5		10			2.5			Natural air cooling: 16 Air cooling: 20			Natural air cooling: 16 Air cooling: 20		
Maximum load mass	kg	5		5		–			0.1			–			0.2		
Effective stroke length	mm	25		65		45			10			25			10		
Resolution	μm	0.01	0.05	0.01	0.05	0.1		0.5	0.1		0.5	0.1		0.5	0.1		0.5
Maximum speed	mm/s	90	400	90	400	270	1000	1300	270	800	800	270	1000	1300	270	1000	1000
Positioning repeatability	μm	±0.1		±0.1		±0.5			±0.5			±0.5			±0.5		

Operating principle of Nano Linear NT

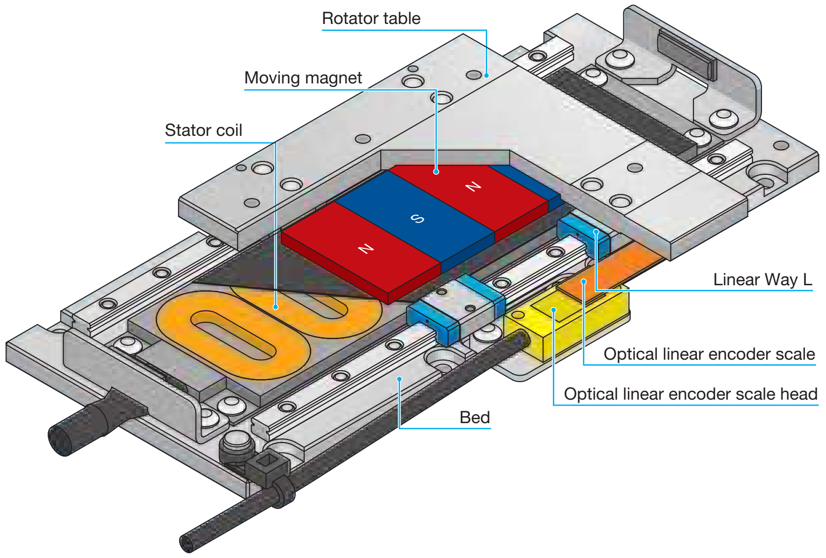
Nano Linear NT is structured with magnet and optical linear encoder scale deployed as a rotator, and an air-core coil and optical linear encoder scale head deployed as a stator within its compact body. As indicated in the right figure, the coil is subject to horizontal force due to flux that always works in vertical direction by the magnet and coil yoke, and rotational flux that is generated around the coil by the coil current (Fleming's left-hand rule). By switching the coil current to certain direction corresponding to the flux direction, continuous thrust force in a certain direction can be obtained and linear motions of the rotator is maintained. Traveling and accurate positioning are performed by acceleration control by current amount and feedback by linear encoder.



1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

NT…V [Standard type]

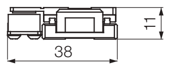
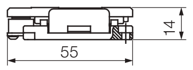
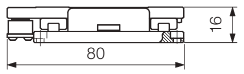
NT…V is a linear motor table with excellent cost effectiveness realized by use of Linear Way L for miniature linear motion rolling guide in the cable guiding parts, reduction of number of parts and review of parts shapes. NT38V10, the smallest in the series, is only 11mm in sectional height, 38mm in table width and 62mm in overall length. It contributes further miniaturization of positioning mechanism. Motion network EtherCAT compatible driver and SSCNETⅢ/H compatible driver are also available and smoother and higher speed and accuracy motions are realized by streamlined wiring.



Points

1 ● Ultracompact

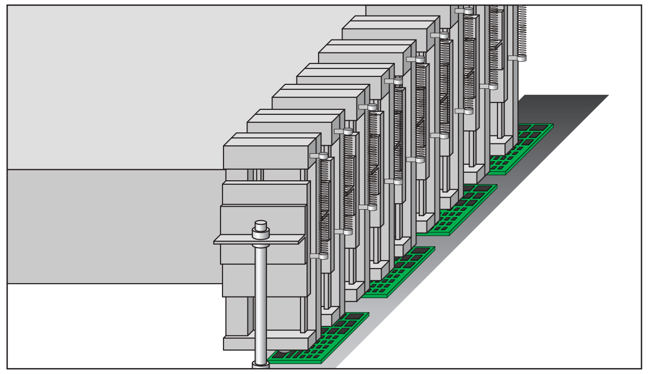
We pursued further miniaturization thoroughly. Especially, NT38V10, the smallest in the series, is only 11mm in sectional height, 38mm in table width and 62mm in overall length. The occupied space is not increased even when many tables are layered, so further miniaturization of the positioning mechanism is promoted.

Model and size	NT38V10	NT38V18	NT55V25	NT55V65	NT80V25	NT80V65	NT80V120
Sectional shape (mm)	 38 11		 55 14		 80 16		

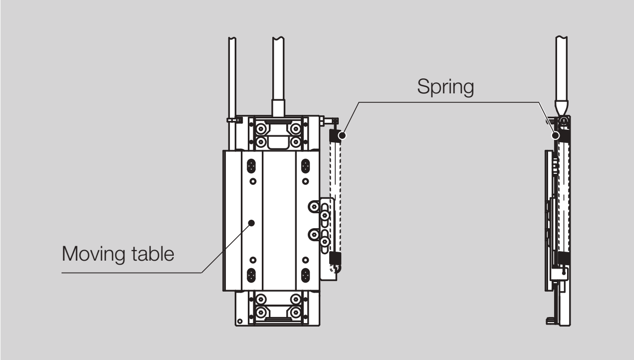
2 ● Compatible with vertical mounting structure

Falling of moving table in power shutdown is prevented by integration of individual spring system balance mechanism. Making use of low profile and compact characteristics of NT…V, multiple pick and place mechanism can be established.

Multiple pick and place mechanism (image)



Spring system balance mechanism



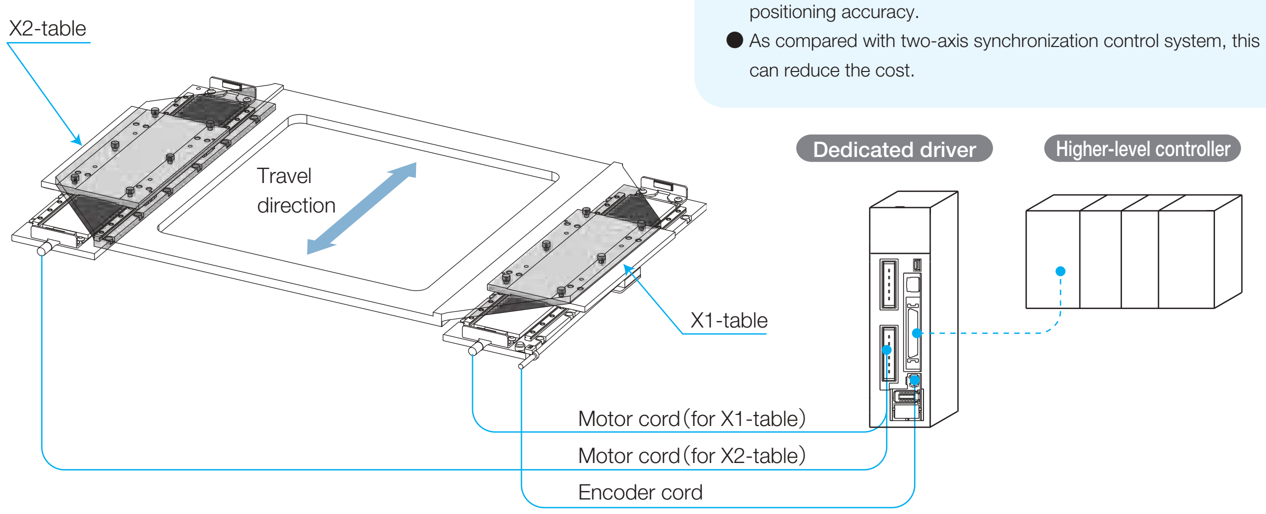
Remark: Vertical mounting structure is prepared based on respective usages. As we select spring according to your use conditions, please contact IKO.

3 ● Two-axis parallel operation

Performing rigid-connection of two units of NT…V arranged in parallel and driving with a single specific driver enables high thrust force and stable attitude accuracy.

Features of two-axis parallel operation

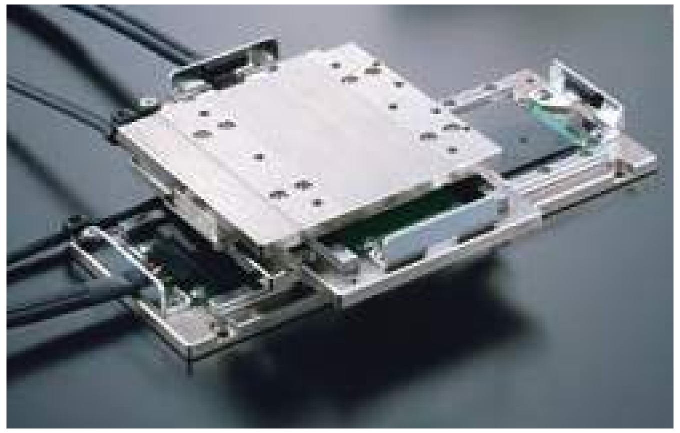
- Large thrust force can be obtained by two-axis driving.
- Driving right and left tables can minimize the table delay and flame torsion.
- Table delay and flame torsion are minimized, which ensures high positioning accuracy.
- As compared with two-axis synchronization control system, this can reduce the cost.

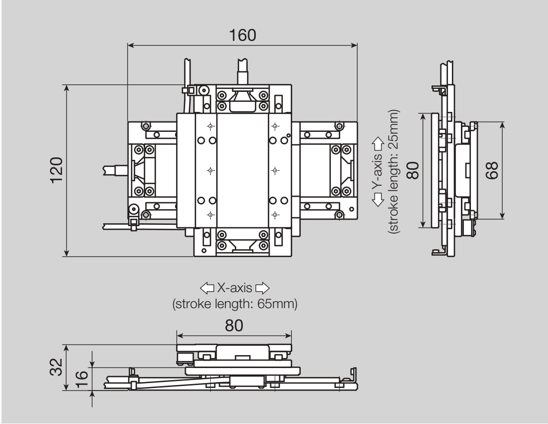


Remark: If two-axis parallel operation is required, please contact IKO.

4 ● XY two-axis combination specification

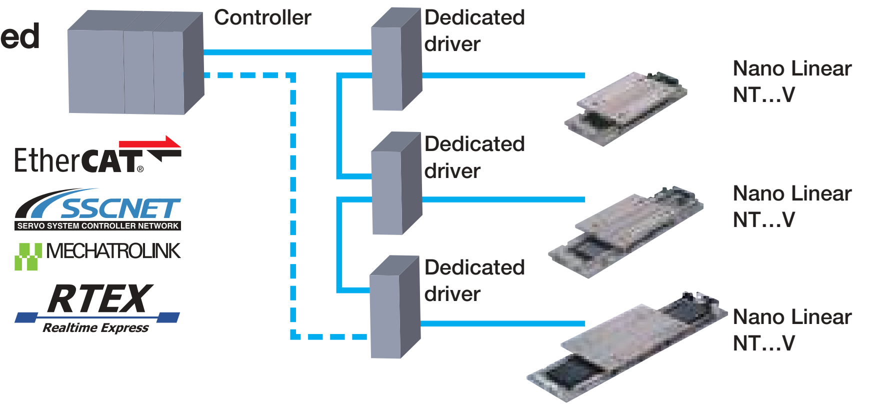
Two units of NT80V can be used in combination without any special attachment and XY-table with low profile can be easily established.





5 ● Motion network is supported

Drivers compatible with motion network EtherCAT, SSCNETⅢ/H, MECHATROLINK, and RTEX are also available, so an advanced system with streamlined wiring can be configured.

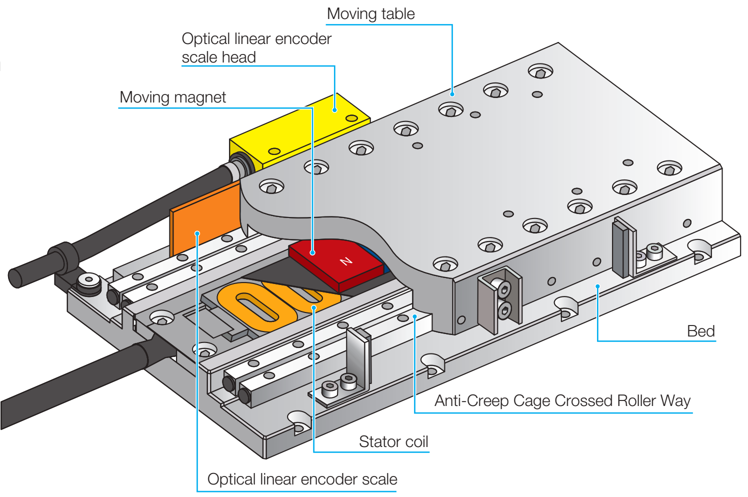


Remarks: EtherCAT® is registered trademark and patented technology, licensed by BeckhoffAutomation GmbH, Germany.
SSCNETⅢ/H is a motion network communication system for servo system control developed by Mitsubishi Electric Corporation.
MECHATROLINK is an open field network controlled by MECHATROLINK Members Association.
Realtime Express and RTEX are registered trademarks of Panasonic Corporation. Realtime Express is a high-speed synchronization motion network developed by Panasonic Corporation.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

NT···H [High accuracy type]

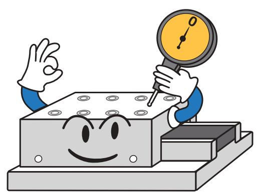
NT···H is a high-accuracy linear motor table that has realized high rigidity and smooth motions without pulsation comparative with air static pressure bearing by positioning accuracy and running straightness below 1 µm, using roller type Anti-Creep Cage Crossed Roller Way in the table guiding parts.

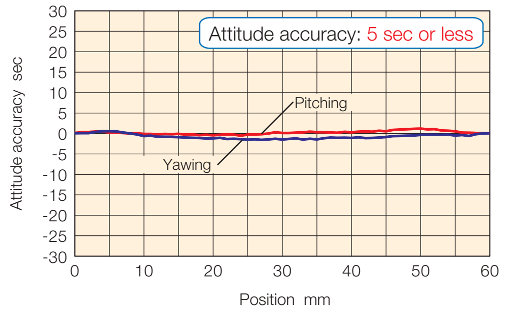


Points

1 ● High attitude accuracy

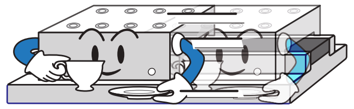
Combination of parts processed with high accuracy and Anti-Creep Cage Crossed Roller Way realizes attitude accuracy of 5 sec or less. Variations in attitude due to movement is minimized, which ensures high positioning repeatability.

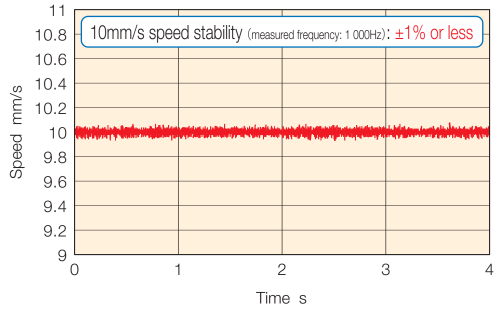




2 ● High speed stability

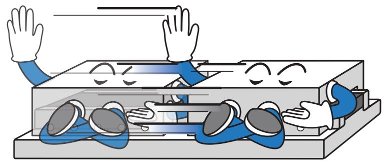
Speed stability is improved further thanks to smooth-motion Crossed Roller Way, coreless moving magnet type linear motor and high-performance servo driver.

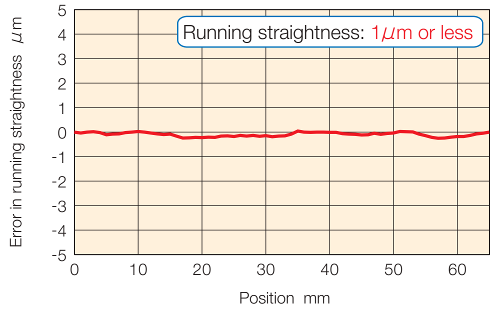




3 ● High running accuracy

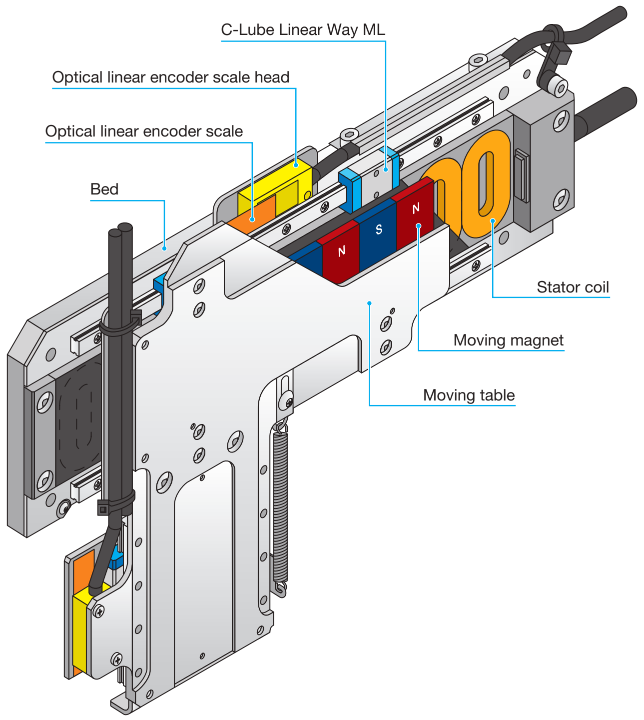
High running accuracy as good as less than 1 µm running straightness is realized by precise finishing and assembly of components.





NT···XZ [Pick and place unit]

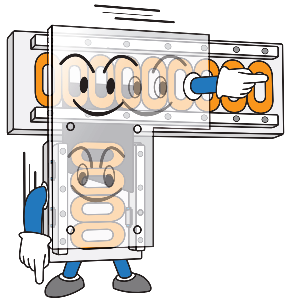
NT···XZ is a linear motor drive pick and place unit with ultra thin profile with 18mm thickness, realized by integrating X-axis moving table and Z-axis bed, using C-Lube Linear Way ML for miniature linear motion rolling guide in the table guiding parts. By entering a positioning program, you may set flexible operation patterns and change strokes according to works easily.



Points

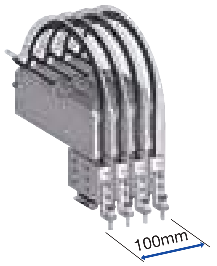
1 ● High-tact positioning

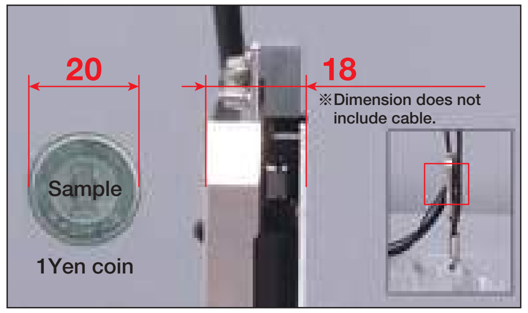
Pick & place unit of unparalleled structure with linear motor drive. Optical linear encoders are installed on both axes to realize accurate and high-tact positioning.



2 ● Ultrathin and space saving

Ultra thin profile of 18mm thickness is realized by integrating X-axis moving table and Z-axis bed. Parallel install of four units in a space of 100mm width is possible, and such space saving arrangement contributes to improvement of efficiency.

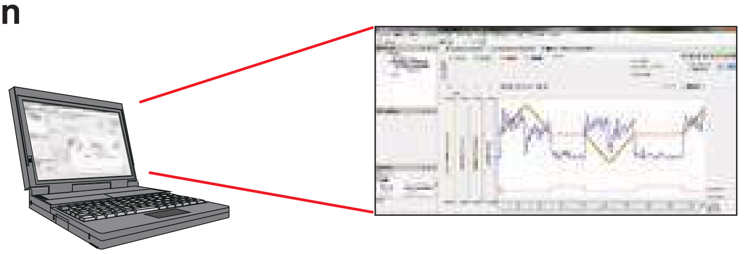




※Dimension does not include cable.

3 ● Operation monitoring function

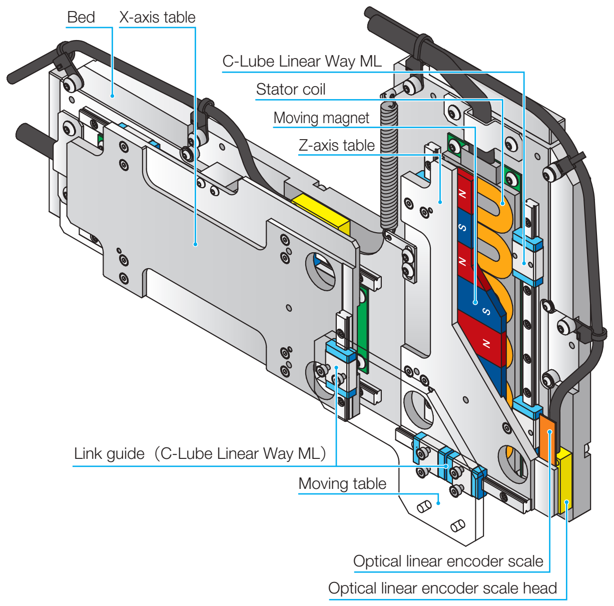
The track can be verified from PC by using the driver monitoring function.



1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

NT···XZH [High thrust pick and place unit]

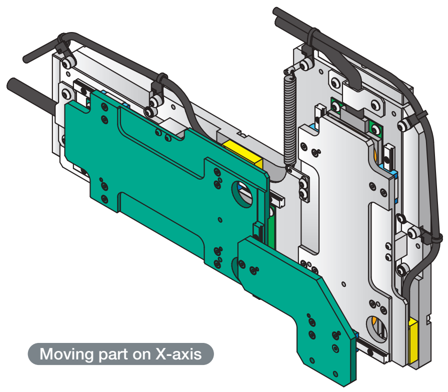
NT···XZH is a linear motor drive high thrust pick and place unit with compact integral X- and Z- axis, using C-Lube Linear Way ML for miniature linear motion rolling guide in the table guiding parts. Thanks to adoption of a system to drive moving table by using a link mechanism, it realizes both higher thrust force of the linear motor and weight reduction of the moving parts and reduces tact time. By entering a positioning program, you may set flexible operation patterns and change strokes according to works easily.

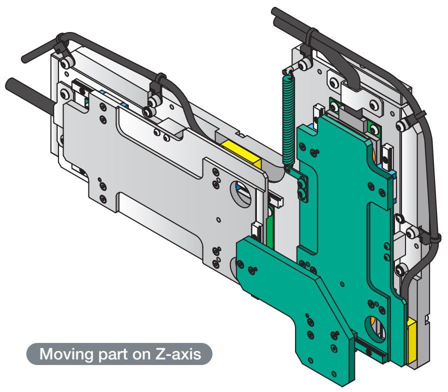


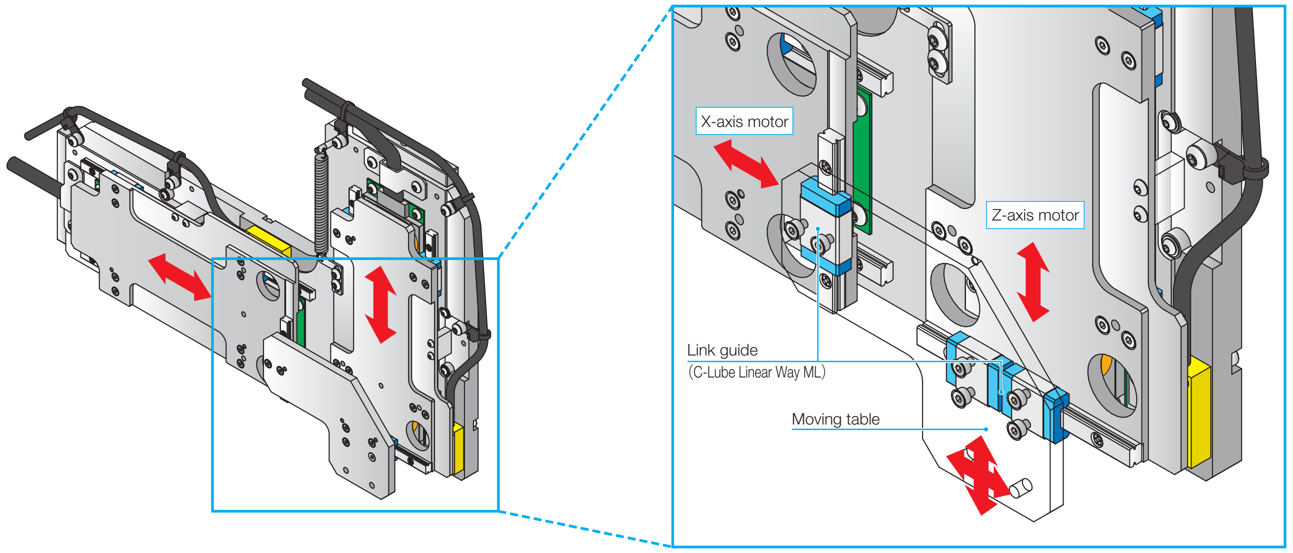
Points

1 High thrust and high tact

Thanks to X- and Z-axis motor located on the flat surface and adoption of a system to drive moving table by using a link mechanism, it realizes both higher thrust force of the linear motor and weight reduction of the moving parts and significantly reduces tact time.


Moving part on X-axis


Moving part on Z-axis



2 High resolution and high responsiveness

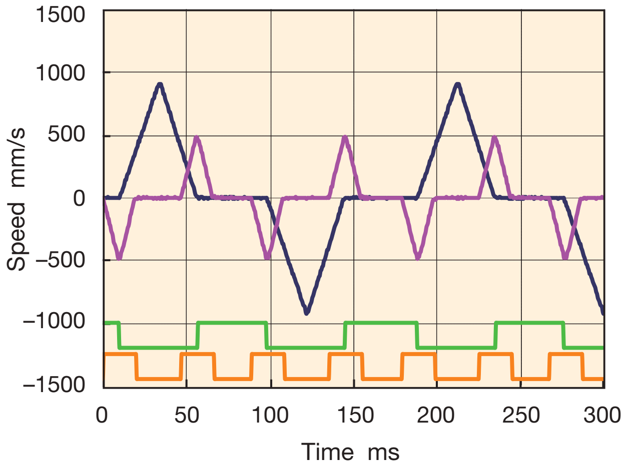
Performing fully-closed loop control by incorporating an optical linear encoder in both axes enables high resolution and high response.

Measuring condition

NT90XZH2510/5
Effective thrust force : X-axis; 14.8 N, Z-axis; 15.7 N
Carrying mass : 150 g
Stroke : X-axis; 22 mm, Z-axis; 5 mm
Acceleration / deceleration time : X-axis; 24 ms, Z-axis; 9 ms

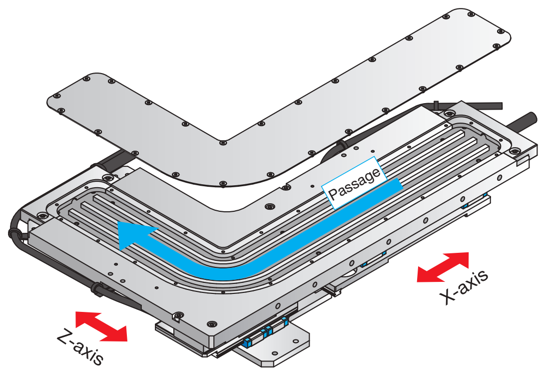
Enables high-speed positioning!

Settling time: 2 ms, Number of cycles: 334 times/min

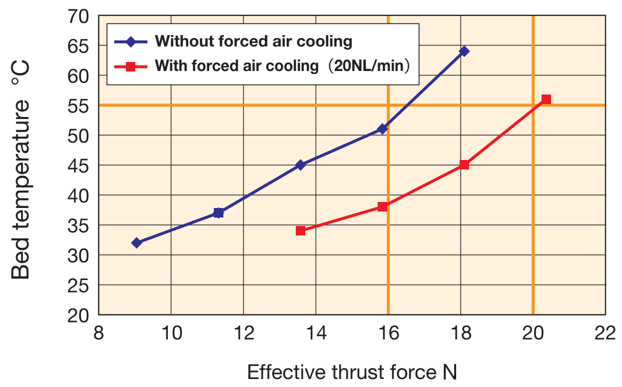


3 Air cooling

With the structure that heat-generating coils are converged at the stator, cooling and heat discharge to the mounting base are easy. When the air cooling option is specified, tact time can be shortened further.

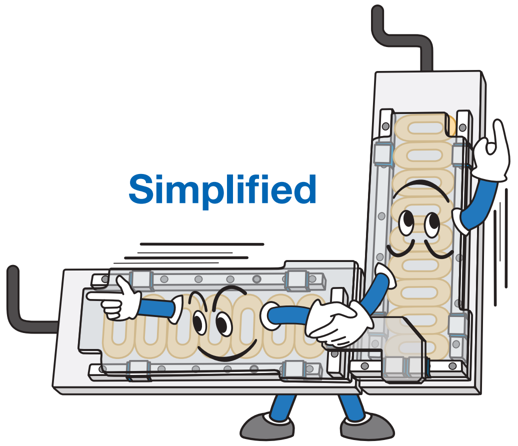


NT90XZH temperature (ambient temperature: 20°C)



4 Cableless moving parts

Though it is multi-axial unit, wiring is easy and higher cleanliness is realized by adopting cableless moving magnet system for the moving parts.



5 Operation monitoring function

As with NT···XZ, the track can be verified from PC by using the driver monitoring function.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Identification Number

Example of identification number of NT···V

①	②	①	③		④	⑤	⑥	⑦	⑧
NT	55	V	25	/	5		L	SC	1

① **Model**	Page Ⅱ-263
② **Size**	Page Ⅱ-263
③ **Stroke length**	Page Ⅱ-263
④ **Resolution of linear encoder**	Page Ⅱ-263
⑤ **Cover**	Page Ⅱ-263
⑥ **Cord direction**	Page Ⅱ-263
⑦ **Designation of sensor**	Page Ⅱ-263
⑧ **Specification number**	Page Ⅱ-263

Identification Number and Specification

① **Model**	NT···V: Nano Linear NT···V
② **Size**	38: Width 38mm 55: Width 55mm 80: Width 80mm
③ **Stroke length**	10: 10mm（applicable to NT38V） 18: 18mm（applicable to NT38V） 25: 25mm（applicable to NT55V and NT80V） 65: 65mm（applicable to NT55V and NT80V） 120: 120mm（applicable to NT80V）
④ **Resolution of linear encoder**	1 : 0.1μm 1F: 0.1μm High speed specification (applicable to NT55V and NT80V) When 1F is selected, a system configuration using dedicated driver ADVA is necessary. 5 : 0.5μm
⑤ **Cover**	No symbol: Without cover D: With cover（applicable to NT38V）
⑥ **Cord direction**	L : Leftward R: Rightward Select from the cord direction indicated in Fig. 1. (direction for pulling out a cord when placing an encoder on the lower side)
⑦ **Designation of sensor**	No symbol: Without sensor SC : With sensor（limit and pre-origin）and sensor bracket Applicable to NT55V and NT80V two types of dedicated drivers, ADVA and MR-J4-10B ready for SSCNETⅢ/H, are available for Nano Linear NT55V and NT80V. If MR-J4-10B is used, SC must be selected.
⑧ **Specification number**	1: Specification number 1 The specification number is limited to 1.

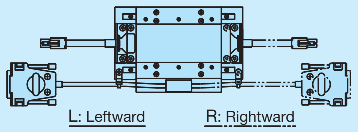


Fig. 1 NT···V cord direction

Identification Number

Example of identification number of NT···H

①	②	①	③		④	⑤	⑥
NT	88	H	65	/	05	R	1

① **Model**	Page Ⅱ-264
② **Size**	Page Ⅱ-264
③ **Stroke length**	Page Ⅱ-264
④ **Resolution of linear encoder**	Page Ⅱ-264
⑤ **Cord direction**	Page Ⅱ-264
⑥ **Specification number**	Page Ⅱ-264

Identification Number and Specification

① **Model**	NT···H: Nano Linear NT···H
② **Size**	88: Width 88mm
③ **Stroke length**	25: 25mm 65: 65mm
④ **Resolution of linear encoder**	01: 0.01μm 05: 0.05μm
⑤ **Cord direction**	L : Leftward R: Rightward Select from the direction indicated in Fig. 2. (direction for pulling out a cord when placing an encoder on the lower side)
⑥ **Specification number**	1 : Specification number 1 The specification number is limited to 1.

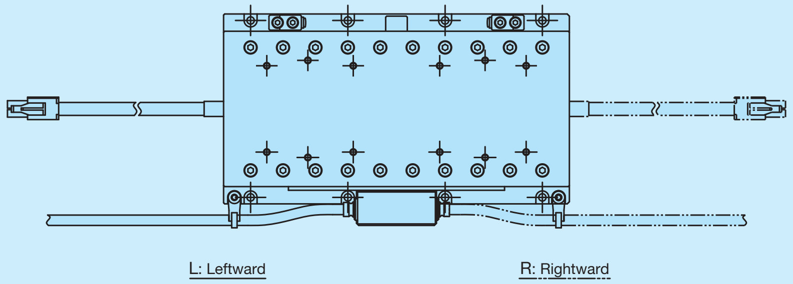
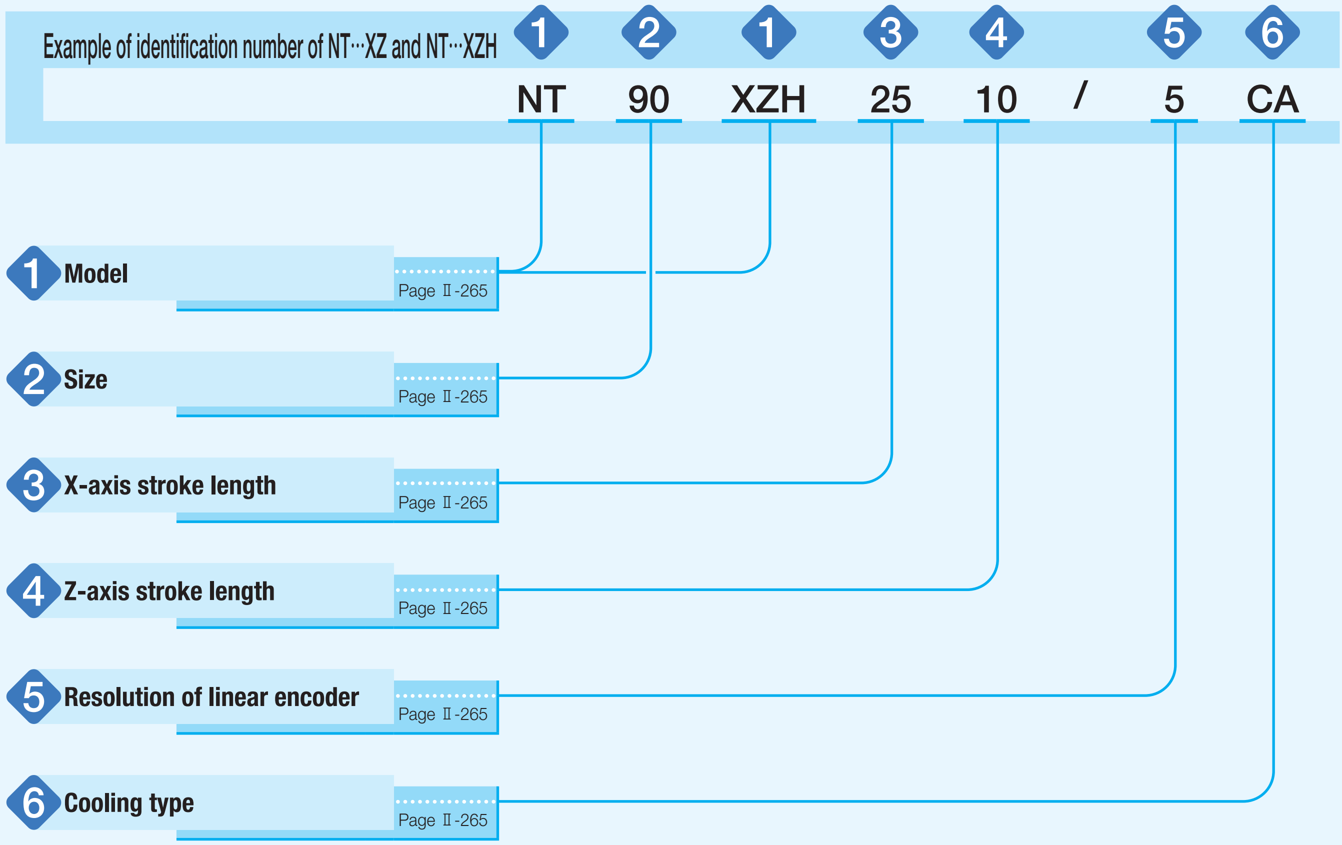


Fig. 2 NT88H cord direction

Identification Number



Identification Number and Specification

① **Model**	NT…XZ : Nano Linear NT…XZ NT…XZH: Nano Linear NT…XZH, high thrust type
② **Size**	80: Z-axis width of 80mm (applicable to NT…XZ) 90: Z-axis width of 90mm (applicable to NT…XZH)
③ **X-axis stroke length**	25: 25mm (applicable to NT…XZH) 45: 45mm (applicable to NT…XZ)
④ **Z-axis stroke length**	10: 10mm
⑤ **Resolution of linear encoder**	1 : 0.1μm 1F: 0.1μm High speed specification 5 : 0.5μm
⑥ **Cooling type**	No symbol: Natural air cooling CA : Air cooling (applicable to NT…XZH)

Specifications

Table 1 Specification / Performance of NT38V

Item	Model and size	NT38V10		NT38V18	
Maximum thrust(1)	N	3			
Rated thrust(2)	N	0.6		0.8	
Maximum load mass	kg	0.5			
Effective stroke length	mm	10		18	
Resolution	μm	0.1	0.5	0.1	0.5
Maximum speed(3)	mm/s	270	500	270	500
Positioning repeatability(4)	μm	±0.5			
Mass of moving table	kg	0.036 (with cover 0.040)		0.048 (with cover 0.052)	
Total mass(5)	kg	0.190 (with cover 0.198)		0.230 (with cover 0.239)	
Ambient temperature and humidity in operation		0~40℃・20~80%RH (keep dewdrop free)			

Notes (1) The duration of maximum thrust is up to 1 second.
(2) This is based on the case of mounting on a metal mating member material at an ambient temperature of 20℃.
(3) This maximum speed may not be reached depending on the maximum output frequency of the controller used, and the driver type or settings.
(4) When the temperature of the product is constant.
(5) Mass of the cord is not included.

Table 2 Specification / Performance of NT55V

Item	Model and size	NT55V25			NT55V65		
Maximum thrust(1)	N	25					
Rated thrust(2)	N	7					
Maximum load mass	kg	5					
Effective stroke length	mm	25			65		
Resolution	μm	0.1		0.5	0.1		0.5
Maximum speed(3)	mm/s	270	1 000(6)	1 300	270	1 000(6)	1 300
Positioning repeatability(4)	μm	±0.5					
Mass of moving table	kg	0.17			0.17		
Total mass(5)	kg	0.42			0.5		
Ambient temperature and humidity in operation		0~40℃・20~80%RH (keep dewdrop free)					

Notes (1) The duration of maximum thrust is up to 1 second.
(2) This is based on the case of mounting on a metal mating member material at an ambient temperature of 20℃.
(3) This maximum speed may not be reached depending on the maximum output frequency of the controller used, and the driver type or settings.
(4) When the temperature of the product is constant.
(5) Mass of the cord is not included.
(6) Applicable to high speed specification.

Table 3 Specification / Performance of NT80V

Item	Model and size	NT80V25			NT80V65			NT80V120		
Maximum thrust(1)	N	36								
Rated thrust(2)	N	8								
Maximum load mass	kg	5								
Effective stroke length	mm	25			65			120		
Resolution	μm	0.1		0.5	0.1		0.5	0.1		0.5
Maximum speed(3)	mm/s	270	1 000(6)	1 300	270	1 000(6)	1 300	270	1 000(6)	1 300
Positioning repeatability(4)	μm	±0.5								
Mass of moving table	kg	0.28			0.28			0.47		
Total mass(5)	kg	0.68			0.83			1.4		
Ambient temperature and humidity in operation		0~40℃・20~80%RH (keep dewdrop free)								

Notes (1) The duration of maximum thrust is up to 1 second.
(2) This is based on the case of mounting on a metal mating member material at an ambient temperature of 20℃.
(3) This maximum speed may not be reached depending on the maximum output frequency of the controller used, and the driver type or settings.
(4) When the temperature of the product is constant.
(5) Mass of the cord is not included.
(6) Applicable to high speed specification.

Table 4 Specification / Performance of NT···H

Item		NT88H25		NT88H65	
Maximum thrust(1)	N	25			
Rated thrust(2)	N	5			
Maximum load mass	kg	5			
Effective stroke length	mm	25		65	
Resolution	μm	0.01	0.05	0.01	0.05
Maximum speed (3)	mm/s	90	400	90	400
Positioning accuracy (4)	μm	1			
Positioning repeatability(5)	μm	±0.1			
Parallelism in motion A	μm	5			
Attitude accuracy(6)	Sec	5			
Straightness in vertical and straightness in horizontal	μm	1			
Mass of moving table	kg	0.7		0.9	
Total mass(7)	kg	1.6		2	
Ambient temperature and humidity in operation		0～40℃・20～80%RH（keep dewdrop free）			

Notes
(1) The duration of maximum thrust is up to 1 second.
(2) This is based on the case of mounting on a metal mating member material at an ambient temperature of 20℃.
(3) This maximum speed may not be reached depending on the maximum output frequency of the controller used, and the driver type or settings.
(4) The value is for the temperature of ambient and product being 20℃.
(5) When the temperature of the product is constant.
(6) This represents accuracy in pitching and yawing.
(7) Mass of the cord is not included.

Table 5 Specification / Performance of NT···XZ and NT···XZH

Item		NT80XZ4510						NT90XZH2510					
		X-axis			Z-axis			X-axis			Z-axis		
Maximum thrust(1)	N	50			25			70					
Rated thrust(2)	N	10			2.5			Natural air cooling: 16 Air cooling(6) : 20					
Maximum load mass	kg	0.1						0.2					
Effective stroke length	mm	45			10			25			10		
Resolution	μm	0.1		0.5	0.1		0.5	0.1		0.5	0.1		0.5
Maximum speed(3)	mm/s	270	1 000(7)	1 300	270	800(7)	800	270	1 000(7)	1 300	270	1 000(7)	1 000
Positioning repeatability(4)	μm	±0.5						±0.5					
Mass of moving table	kg	0.6(8)			0.12			0.38			0.35		
Total mass(5)	kg	1.6						2.8					
Ambient temperature and humidity in operation		0～40℃·20～80%RH（keep dewdrop free）											

Notes
(1) The duration of maximum thrust is up to 1 second.
(2) This is based on the case of mounting on a metal mating member material at an ambient temperature of 20℃.
(3) This maximum speed may not be reached depending on the maximum output frequency of the controller used, and the driver type or settings.
(4) When the temperature of the product is constant.
(5) Mass of the cord is not included.
(6) This is under air flow of 20NL/min.
(7) Applicable to high speed specification.
(8) Mass of moving table of Z-axis is included.

■ Thrust characteristics of NT···V

NT38V

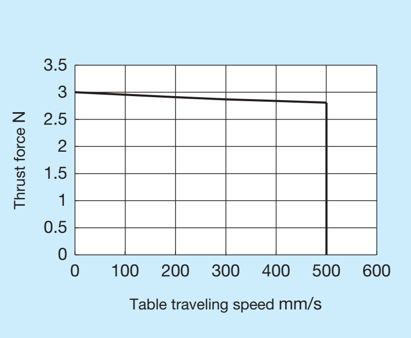


Fig. 3 Thrust characteristic of NT38V

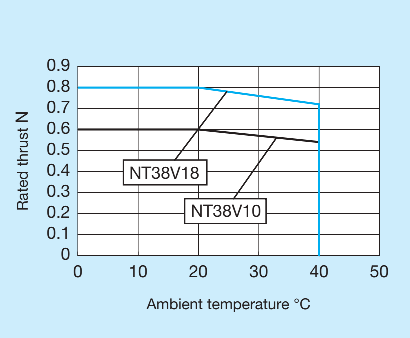


Fig. 4 Rated thrust characteristic of NT38V

Remark: This is a case when mounting on a metal mating member material.

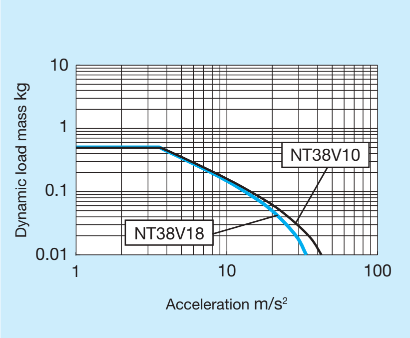


Fig. 5 Dynamic load mass of NT38V

Remark: This is a value calculated based on the thrust force with table moving speed set to 500mm/s.

NT55V

● Use with driver ADVA-01NL or MR-J4

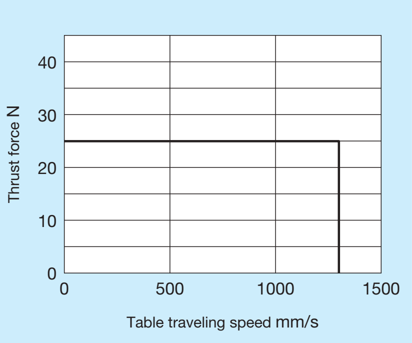


Fig. 6 Thrust characteristic of NT55V

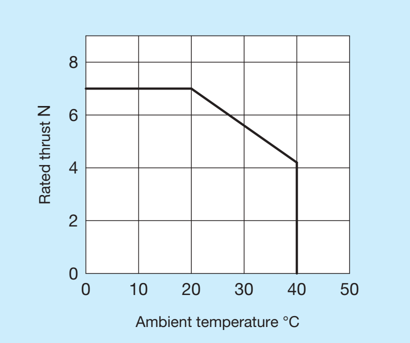


Fig. 7 Rated thrust characteristic of NT55V

Remark: This is a case when mounting on a metal mating member material.

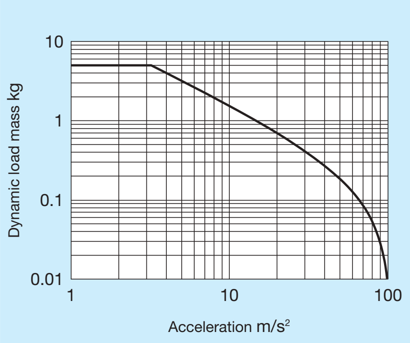


Fig. 8 Dynamic load mass of NT55V

Remark: This is a value calculated based on the thrust force with table moving speed set to 500mm/s.

● Use with driver ADVA-R5ML

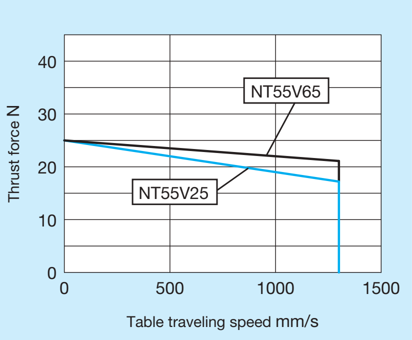


Fig. 9 Thrust characteristic of NT55V

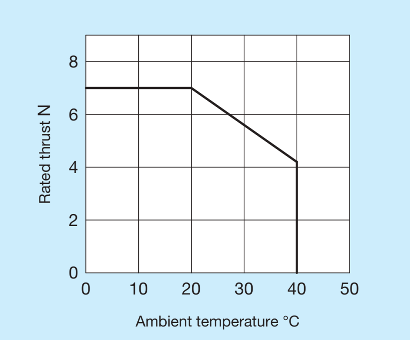


Fig. 10 Rated thrust characteristic of NT55V

Remark: This is a case when mounting on a metal mating member material.

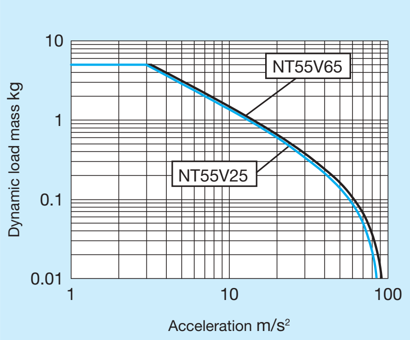


Fig. 11 Dynamic load mass of NT55V

Remark: This is a value calculated based on the thrust force with table moving speed set to 500mm/s.

NT80V

● Use with driver ADVA-01NL or MR-J4

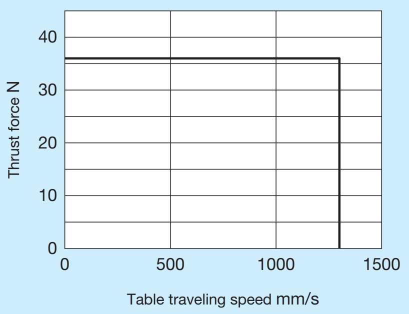


Fig. 12 Thrust characteristic of NT80V

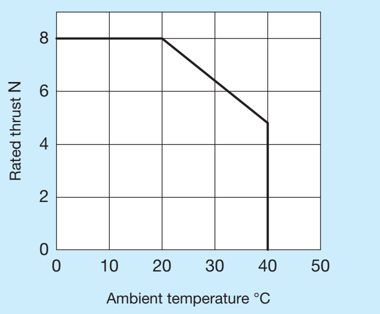


Fig. 13 Rated thrust characteristic of NT80V

Remark: This is a case when mounting on a metal mating member material.

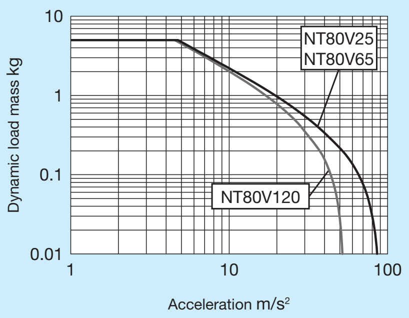


Fig. 14 Dynamic load mass of NT80V

Remark: This is a value calculated based on the thrust force with table moving speed set to 500mm/s.

● Use with driver ADVA-R5ML

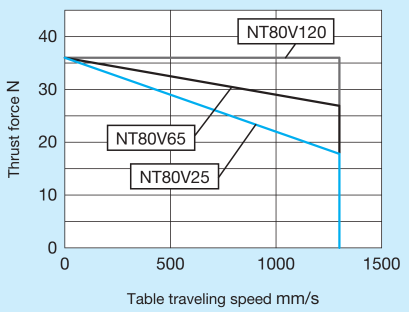


Fig. 15 Thrust characteristic of NT80V

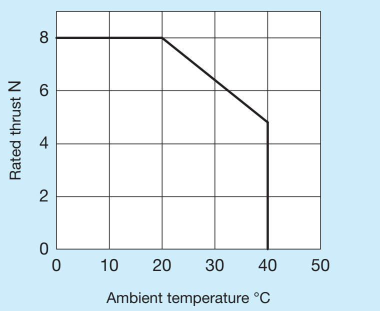


Fig. 16 Rated thrust characteristic of NT80V

Remark: This is a case when mounting on a metal mating member material.

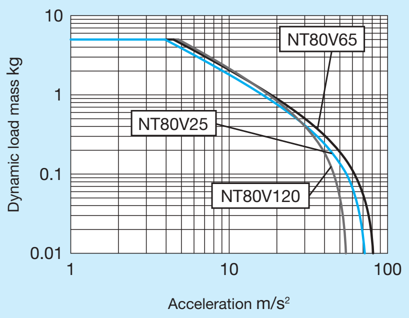


Fig. 17 Dynamic load mass of NT80V

Remark: This is a value calculated based on the thrust force with table moving speed set to 500mm/s.

Thrust characteristics of NT···H

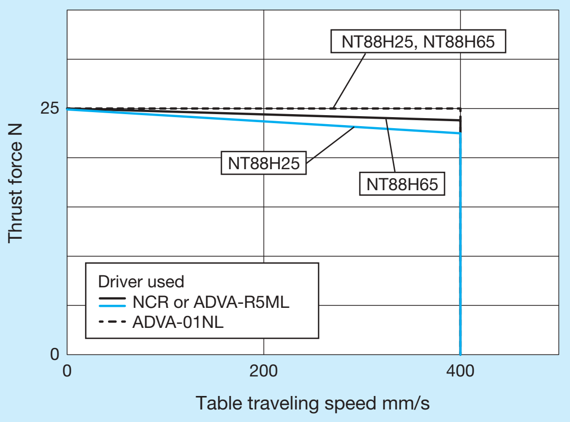


Fig. 18 Thrust characteristic of NT88H

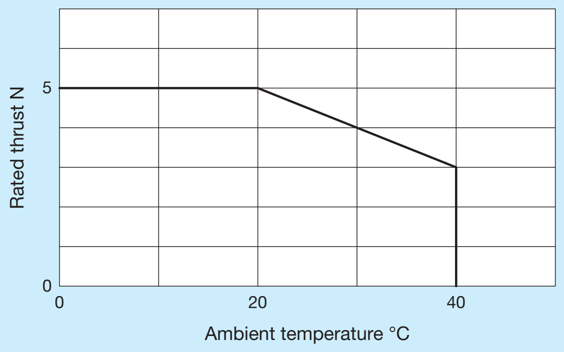


Fig. 19 Rated thrust characteristic of NT88H

Remark: This is a case when mounting on a metal mating member material.

Thrust characteristics of NT···XZ and NT···XZH

● Use with driver ADVA-01NL

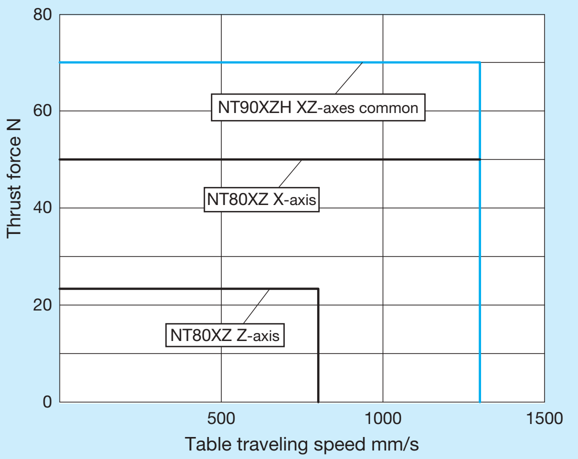


Fig. 20 Thrust characteristics of NT···XZ and NT···XZH

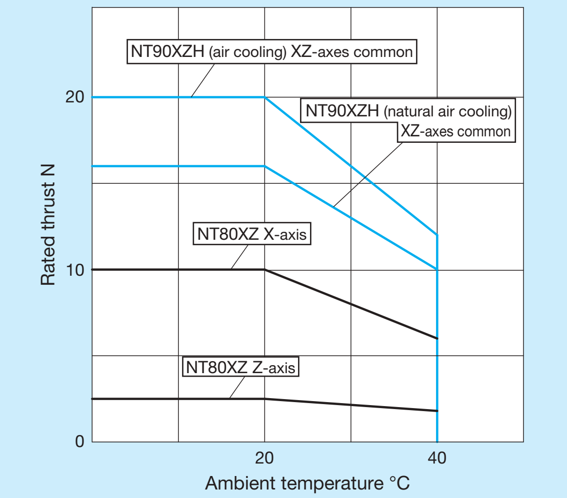


Fig. 21 Rated thrust characteristics of NT···XZ and NT···XZH

Remark: This is a case when mounting on a metal mating member material.

● Use with driver ADVA-R5ML

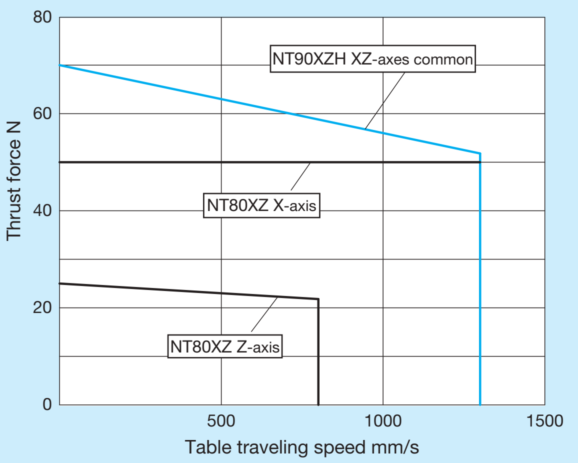


Fig. 22 Thrust characteristics of NT···XZ and NT···XZH

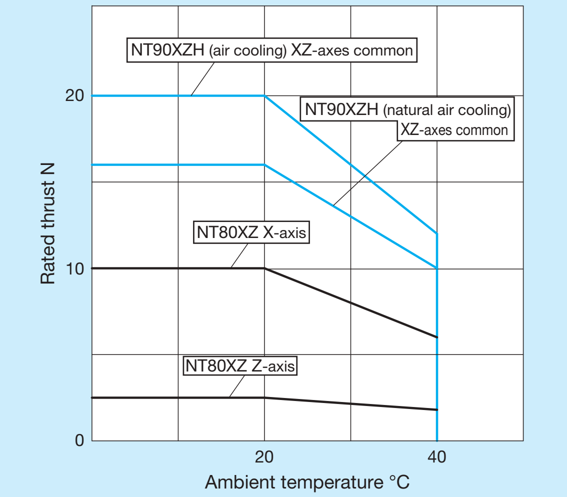


Fig. 23 Rated thrust characteristics of NT···XZ and NT···XZH

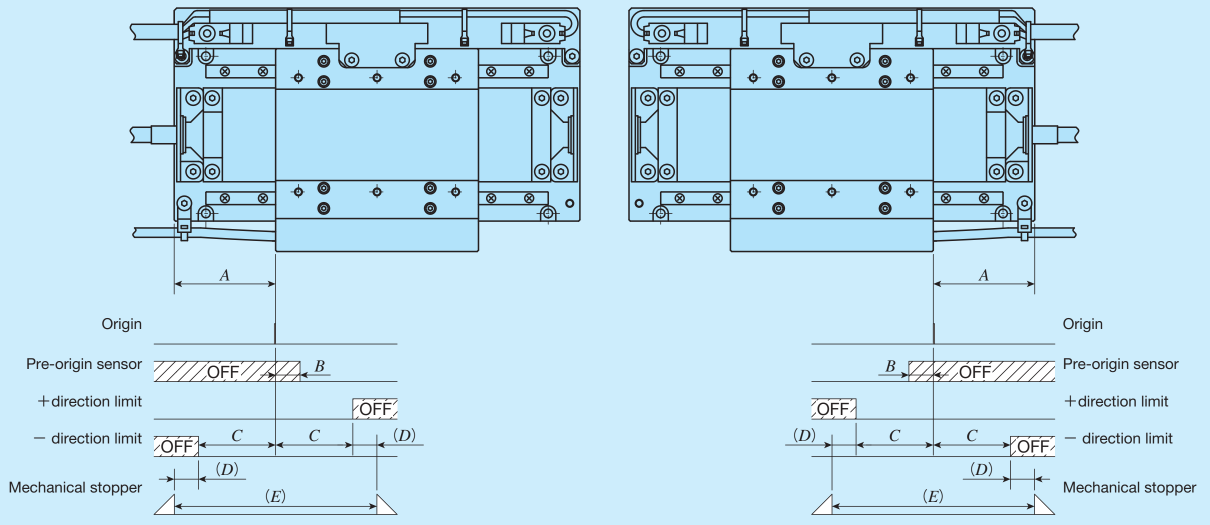
Remark: This is a case when mounting on a metal mating member material.

Mounting

For the processing accuracy of the Precision Positioning Table mounting surface and the tightening torque of the fixing screws, see page Ⅲ-30.

Sensor Specification

Table 6 Sensor timing chart for NT55V/SC and NT80V/SC



In case of NT···V/LSC

In case of NT···V/RSC

unit: mm

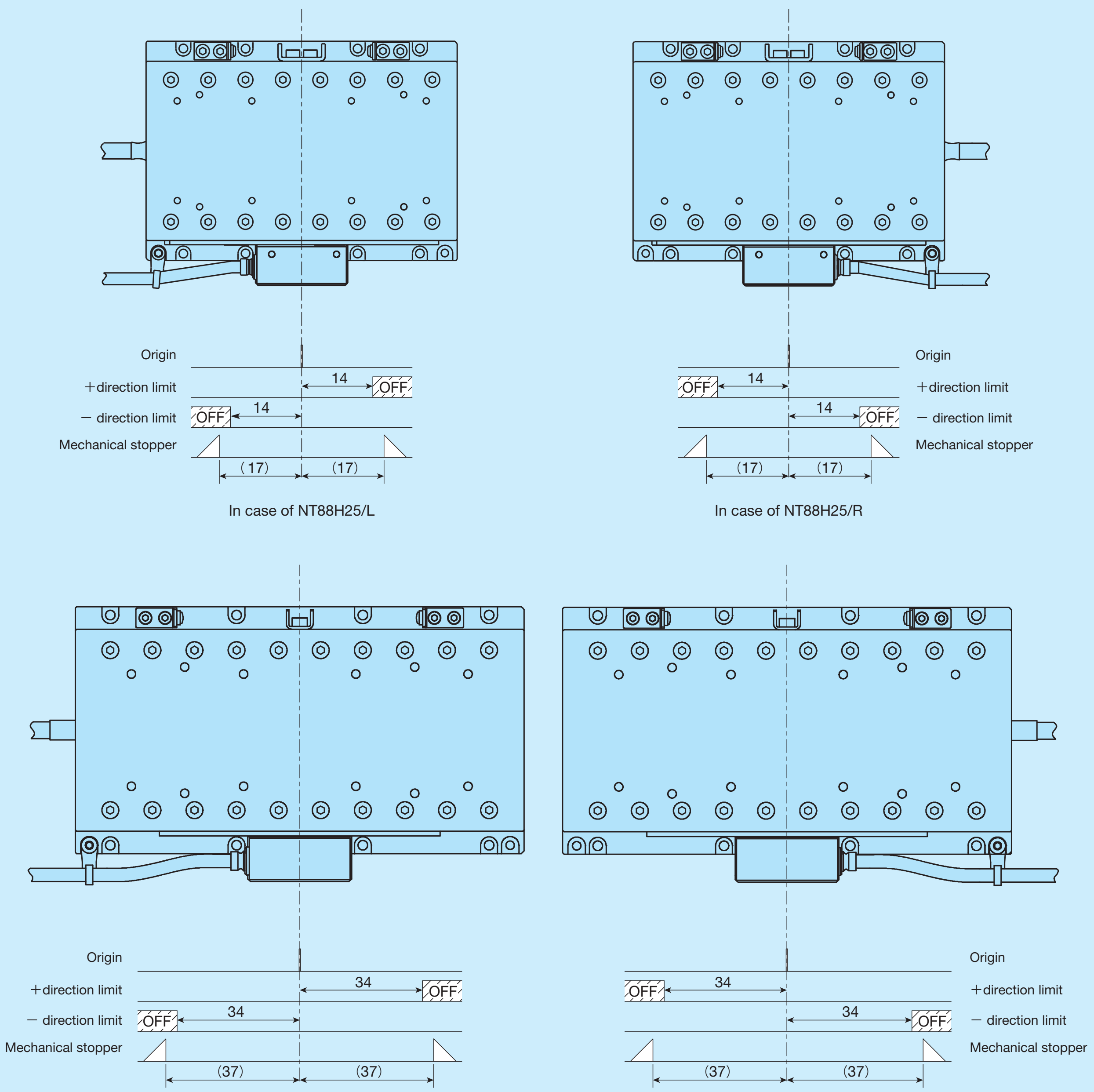
Model and size	*A*	*B* (¹)	*C* (¹)	*D* (¹)	*E* (¹)
NT55V 25/SC	20	4	12.5	3	31
NT55V 65/SC	40	4	32.5	3	71
NT80V 25/SC	20	4	12.5	3	31
NT80V 65/SC	40	4	32.5	3	71
NT80V120/SC	70	4	60	5.5	131

Note (¹) Respective values are for reference and are not guaranteed values.
For detailed dimensions, please contact IKO.

Remark: For the specifications of respective sensors, please see the section of sensor specification in General Explanation.

● NT···V, NT···XZ and NT···XZH do not have a built-in sensor

Return to origin operation in a system configuration using driver ADVA and the system configuration for NT38V is conducted by external input. In the return to origin operation, the moving table turns around after contacting the mechanical stopper, and then stops at the origin position. Since, however, a limit sensor and a pre-origin sensor can be mounted on NT55V and NT80V with a supplemental signal (/SC), the return to origin operation using each sensor is also possible.
Forward / backward direction limit detection in a system configuration using the driver ADVA is performed by driver's software limit function. The stroke range can be set by parameters for driver. In addition, the software limit function is only enabled in position control mode and return to origin must be completed. In case of speed control mode and thrust force control mode, mount an external sensor.



In case of NT88H65/L

In case of NT88H65/R

Fig. 24 Sensor timing chart for NT88H

Note (¹) Respective values are for reference and are not guaranteed values.
For detailed dimensions, please contact IKO.

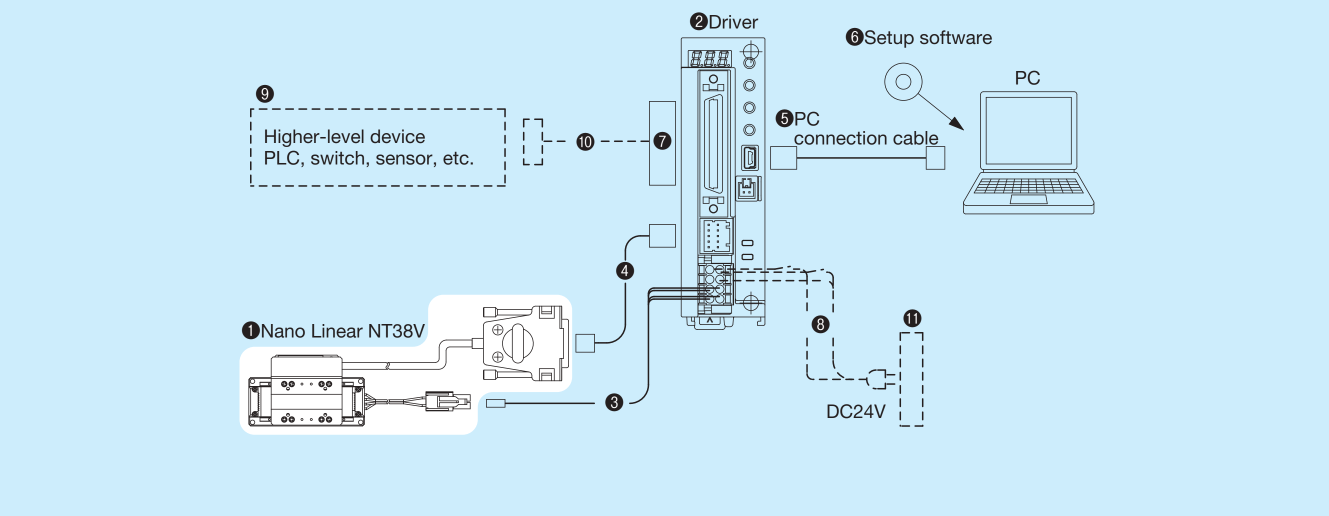
Remarks 1. For return to origin operation in a standard system configuration, use the return to origin function (limit inversion method) of the driver. It is necessary to input the limit signal output from the encoder interface to the driver.
2. Pre-origin sensor is not provided.
3. For the specifications of respective sensors, please see the section of sensor specification in General Explanation.

System Configuration

■ System configuration for NT38V

There are dedicated drivers for Nano Linear NT38V, and the system configuration is shown in Table 7. For detailed driver specifications, see the driver specification section on page Ⅱ-381. Please contact IKO if the use of other drivers is required.
When you place an order, please specify desired identification numbers from the list of Table 7.

Table 7 System configuration for NT38V



No.	Name	Identification number
❶	Nano Linear NT···V	NT38V
❷	Driver	MR-J4-03A6-NL156J154 (NT38V10) MR-J4-03A6-NL156J155 (NT38V18)
❸	Motor extension cord (3m(1))	TAE20W2-AM03
❹	Encoder extension cord (2m(1))	TAE20W3-EC02
❺	PC connection cable (3m)	MR-J3USBCBL3M
❻	Setup software	SW1DNC-MRC2-J
❼	Connectors for input & output signal	TAE20R5-CN (2)
❽	Power cord	This must be prepared by customer.
❾	Higher-level device, Sensor (3)	
❿	Higher-level device, Sensor connection cord (3)	
⓫	DC24V power supply	

Notes (1) For specific cord length, please contact IKO.
(2) Connectors for input & output signal TAE20R5-CN is a combined product of 10150-3000PE (connector) and 10350-52F0-008 (cover) from 3M Japan Limited.
(3) Depending on the higher-level device connected, a sensor may be required for return to origin. For details, contact IKO.

■ System configuration for Nano Linear NT (excluding NT38V)

There are dedicated drivers for each model of the Nano Linear NT (excluding NT38V), and the system configuration varies depending on the driver used. Table 8 shows the applicability of Nano Linear models and driver types. Table 9 shows the example of identification number for ADVA, and Table 10 shows the tables and model number of the applicable MR-J4. For detailed driver specifications, see the driver specifications on pages Ⅱ-381 to Ⅱ-385.
Please also note that the drivers compatible with MECHATROLINK will be prepared upon request. If needed, please contact IKO.

Table 8 Applicability table of Nano Linear models and driver types

Driver	Command type	Nano Linear model				
		NT55V	NT80V	NT88H	NT80XZ	NT90XZH
ADVA	EtherCAT	○ (1)	○ (1)	○ (2)	○ (2)	○ (2)
	Pulse train command	○	○	○	○	○
MR-J4	SSCNETⅢ/H	○ (1)	○ (1)	◇ (2)	—	—
	Pulse train command	◇ (1)	◇ (1)	◇ (2)	—	—
NCR (VCⅡ)	Pulse train command	—	—	○	—	—
SGD7S (Σ-7)	MECHATROLINKⅢ	◇ (1)	◇ (1)	—	◇ (2)	◇ (2)
	Pulse train command	◇ (1)	◇ (1)	—	◇ (2)	◇ (2)
MADL (MINAS A6)	EtherCAT	◇ (1)	◇ (1)	◇ (2)	◇ (2)	◇ (2)
	RTEX	◇ (1)	◇ (1)	◇ (2)	◇ (2)	◇ (2)
	Pulse train command	◇ (1)	◇ (1)	◇ (2)	◇ (2)	◇ (2)

Note (1) We recommend combination with sensor-included specification / SC. For non-sensor specifications, confirm the return to origin action of higher-level controller devices, or use an external sensor, etc., to enable a return to origin situation.
Note (2) Confirm the return to origin action of higher-level controller devices, or use an external sensor, etc., to enable a return to origin situation.
Remark: ◇ is individually corresponding. If needed, please contact IKO.

Table 9 Model number for ADVA

ADVA – 01NL EC / NT55V25
① Model ② ③ ④

② Power supply voltage	
01NL	Single-phase / Three-phase 200 V
R5ML	Single-phase 100 V

③ Command type	
No symbol	Pulse train command
EC	EtherCAT

④ Applicable Nano Linear model	
NT55V 25	NT55V 25
NT55V 65	NT55V 65
NT80V 25	NT80V 25
NT80V 65	NT80V 65
NT80V120	NT80V120
NT88H 25	NT88H 25
NT88H 65	NT88H 65
NT80XZ-X	NT80XZ X-axis
NT80XZ-Z	NT80XZ Z-axis
NT90XZH	For both NT90XZH X-axis and Z-axis

Table 10 Nano Linear NT55V, NT80V and model number of applicable MR-J4

Model number of table	Model number of driver
NT55V 25	MR-J4-10B-RJ/NT55V25
NT55V 65	MR-J4-10B-RJ/NT55V65
NT80V 25	MR-J4-10B-RJ/NT80V25
NT80V 65	MR-J4-10B-RJ/NT80V65
NT80V120	MR-J4-10B-RJ/NT80V120

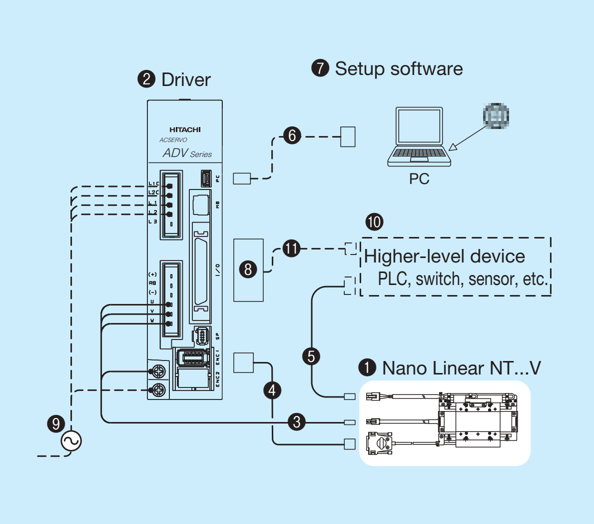
Remark: MR-J4-10B is only applicable to sensor-included specification / SC.

Table 11 NT55V, NT80V, NT88H, NT80XZ, NT90XZH and applicable MINAS A6 part numbers

Driver part no.	Power supply voltage	Command type	Type	Safety function
MADLN 05 SL	Single-phase / Three-phase 200V	Pulse train command	Position Control Type	None
MADLT 05 SM			Multifunction Type	Yes
MADLN 05 NL		RTEX	Standard Type	None
MADLT 05 NM			Multifunction Type	Yes
MADLN 05 BL		EtherCAT	Standard Type	None
MADLT 05 BM			Multifunction Type	Yes
MADLN 01 SL	Single-phase 100V	Pulse train command	Position Control Type	None
MADLT 01 SM			Multifunction Type	Yes
MADLN 01 NL		RTEX	Standard Type	None
MADLT 01 NM			Multifunction Type	Yes
MADLN 01 BL		EtherCAT	Standard Type	None
MADLT 01 BM			Multifunction Type	Yes

Remark: Available for purchase from Panasonic Corporation. Configure the parameters listed on the IKO website prior to use.

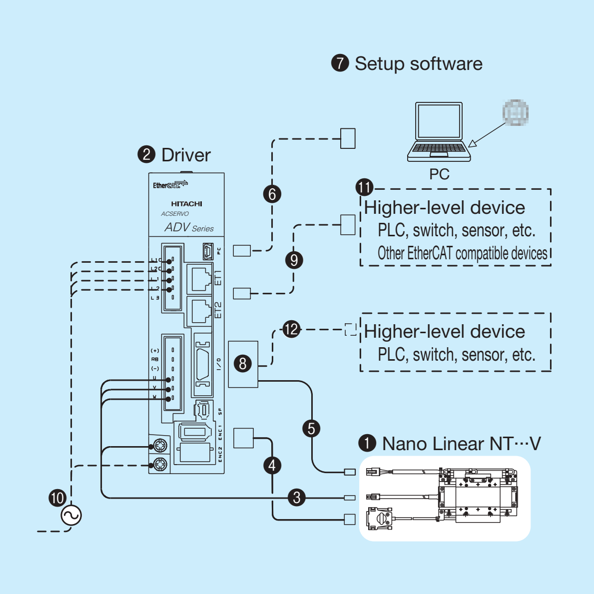
Table 12 System configuration for NT55V, NT80V with driver ADVA



No.	Name	Model and size
❸	Motor extension cord (3m) (1)	TAE20V3-AM03
❹	Encoder extension cord (2m) (1)	TAE20V4-EC02
❺	Sensor extension cord (2)	TAE10V8-LC□□
❻	PC connection cable	USB mini B cable This must be prepared by customer.
❼	Setup software	ProDriveNext Please download from the official website of Hitachi Industrial Equipment Systems Co., Ltd.
❽	I/O connector	TAE20R5-CN (3)
❾	Power cord	This must be prepared by customer.
❿	Higher-level device	
⓫	I/O connector connection cable	

Notes (1) For specific cord length, please contact IKO.
(2) The lengths of the sensor extension cord is specified in the fields of □□ located at the end of the identification number with a length from 3 to 10m in units of 1m.
(3) I/O connector TAE20R5-CN is a combined product of 10150-3000PE (connector) and 10350-52F0-008 (cover) from 3M Japan Limited.

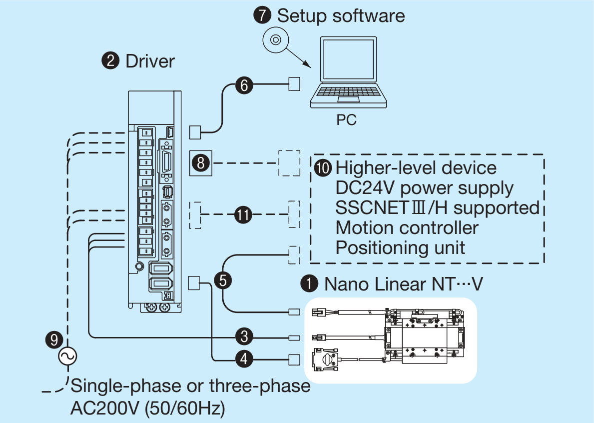
Table 13 System configuration for NT55V, NT80V with driver ADVA···EC



No.	Name	Model and size
❸	Motor extension cord (3m) (1)	TAE20V3-AM03
❹	Encoder extension cord (2m) (1)	TAE20V4-EC02
❺	Sensor extension cord (2)	TAE10V8-LC□□
❻	PC connection cable	USB mini B cable This must be prepared by customer.
❼	Setup software	ProDriveNext Please download from the official website of Hitachi Industrial Equipment Systems Co., Ltd.
❽	I/O connector	TAE20V5-CN (3)
❾	Ethernet cable	This must be prepared by customer.
❿	Power cord	
⓫	Higher-level device	
⓬	I/O connector connection cable	

Notes (1) For specific cord length, please contact IKO.
(2) The lengths of the sensor extension cord is specified in the fields of □□ located at the end of the identification number with a length from 3 to 10m in units of 1m.
(3) I/O connector TAE20V5-CN is a combined product of 10120-3000PE (connector) and 10320-52F0-008 (cover) from 3M Japan Limited.

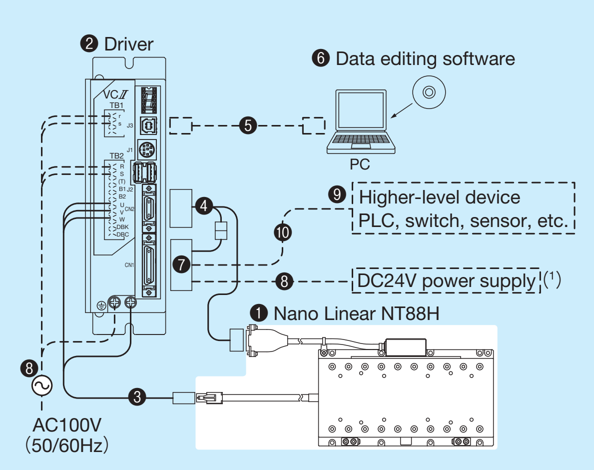
Table 14 System configuration for NT55V and NT80V with driver MR-J4-10B (SSCNET Ⅲ/H compatible)



No.	Name	Identification Number
❸	Motor extension cord (3m) (1)	TAE20V3-AM03
❹	Encoder extension cord (2m) (1)	TAE20V6-EC02
❺	Sensor extension cord (2)	TAE10V8-LC□□
❻	PC connection cable (3m)	MR-J3USBCBL3M
❼	Setup software	SW1DNC-MRC2-J
❽	I/O connection connector	MR-CCN1 (3)
❾	Power cord	This must be prepared by customer.
❿	Higher-level device (4)	
⓫	SSCNETⅢ/H connection cable	

Notes (1) For specific cord length, please contact IKO.
(2) The lengths of the sensor extension cord is specified in the fields of □□ located at the end of the identification number with a length from 3 to 10m in units of 1m.
(3) Connectors for input/output connection MR-CCN1 is a combined product of 10120-3000PE (connector) and 10320-52F0-008 (cover) from 3M Japan Limited.
(4) The higher-level devices are a motion controller, positioning unit and DC24V power supply ready for SSCNETⅢ/H from Mitsubishi Electric Corporation.

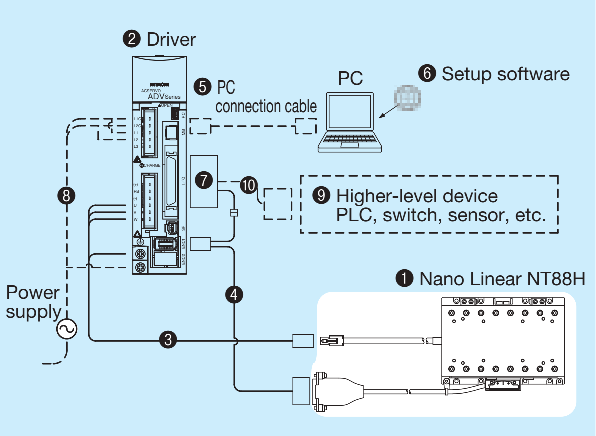
Table 15 System configuration for NT88H with driver NCR



No.	Name	Model number
❶	Nano Linear NT···H	NT88H
❷	Driver	NCR-DDA0A1A-051D-T08
❸	Motor extension cord (3m) (2)	TAE20T8-AM03
❹	Encoder extension cord (2m) (2)	TAE20T9-EC02
❺	PC connection cable	This must be prepared by customer. USB cable A plug - B plug
❻	Data editing software	NCR-XCR000-S135
❼	Connector set	TAE20U0-CN (3)
❽	Power cord	This must be prepared by customer.
❾	Higher-level device	
❿	I/O connector connection cable	

Notes (1) DC24V power supply must be prepared separately by customer.
(2) For specific cord length, please contact IKO.
(3) The connector set TAE20U0-CN is a set of I/O connector and connector for sensor (crimp wired (200mm)).
The I/O connector is a combined product of 10136-3000PE (connector) and 10336-52F0-008 (cover) from 3M Japan Limited.
The connector for sensor is a combined product of 170365-1 (contact) and 172157-1 (housing) from Tyco Electronics Japan G.K..

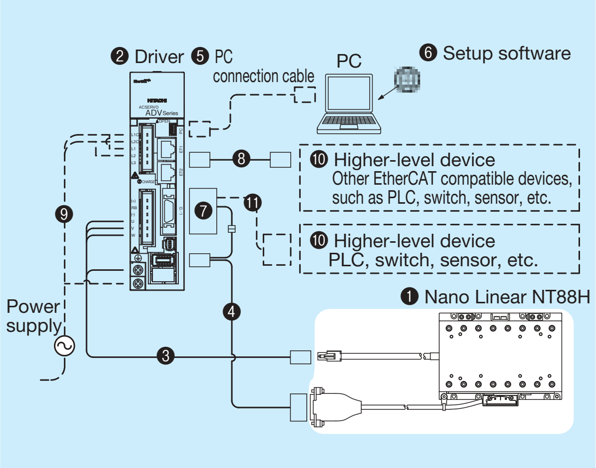
Table 16 System configuration for NT88H with driver ADVA



No.	Name	Identification number
❸	Motor extension cord	TAE20V3-AM03（3m）(1)
❹	Encoder extension cord	TAE20W5-EC02（2m）(1)
❺	PC connection cable	USB mini B cable This must be prepared by the customer.
❻	Setup software	ProDriveNext Please download from the official website of Hitachi Industrial Equipment Systems Co., Ltd.
❼	Connector set	TAE20W6-CN(2)
❽	Power cord	This must be prepared by the customer.
❾	Higher-level device	
❿	I/O connector connection cable	

Notes (1) For specific cord length, please contact IKO.
(2) The connector set TAE20W6-CN is a set of I/O connector and connector for sensor (crimp wired (200mm)).
The I/O connector is a combined product of 10150-3000PE (connector) and 10350-52F0-008 (cover) from 3M Japan Limited.
The connector for sensor is a combined product of 170365-1 (contact) and 172157-1 (housing) from Tyco Electronics Japan G.K..

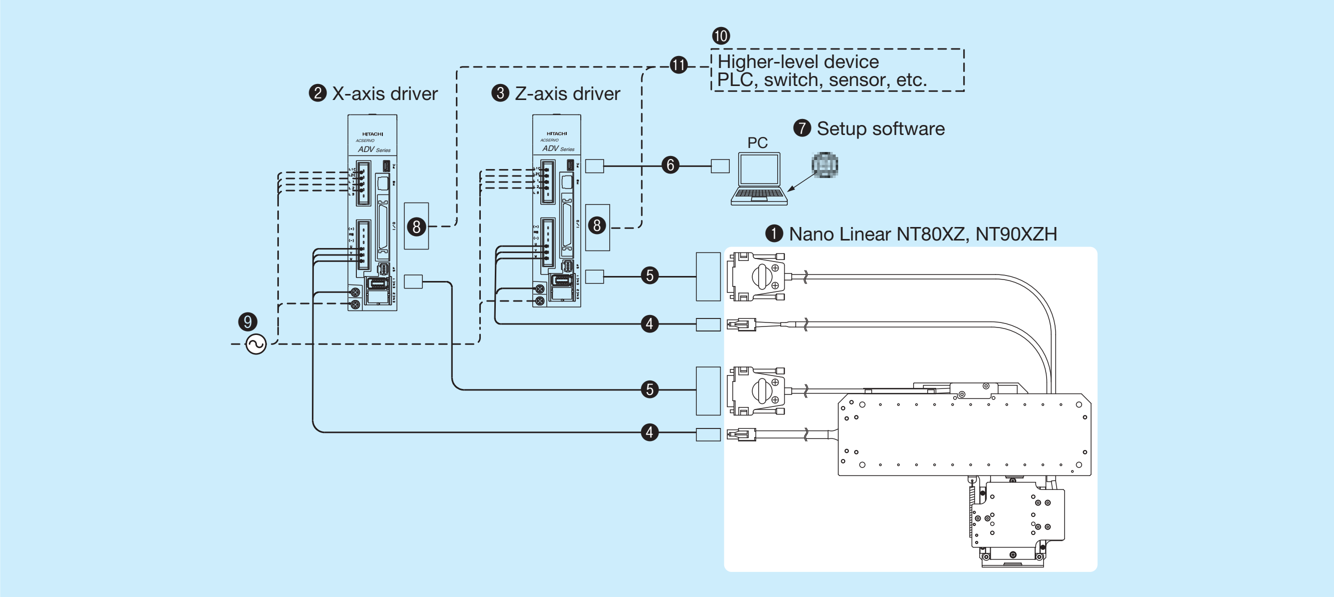
Table 17 System configuration for NT88H with driver ADVA···EC



No.	Name	Identification number
❸	Motor extension cord	TAE20V3-AM03（3m）(1)
❹	Encoder extension cord	TAE20W5-EC02（2m）(1)
❺	PC connection cable	USB mini B cable This must be prepared by the customer.
❻	Setup software	ProDriveNext Please download from the official website of Hitachi Industrial Equipment Systems Co., Ltd.
❼	Connector set	TAE20W7-CN(2)
❽	Ethernet cable	This must be prepared by the customer.
❾	Power cord	
❿	Higher-level device	
⓫	I/O connector connection cable	

Notes (1) For specific cord length, please contact IKO.
(2) The connector set TAE20W7-CN is a set of I/O connector and connector for sensor (crimp wired (200mm)).
The I/O connector is a combined product of 10120-3000PE (connector) and 10320-52F0-008 (cover) from 3M Japan Limited.
The connector for sensor is a combined product of 170365-1 (contact) and 172157-1 (housing) from Tyco Electronics Japan G.K..

Table 18 System configuration for NT80XZ, NT90XZH



No.	Name	数量	Model and size	
❶	Nano Linear NT80XZ, NT90XZH	1	NT80XZ4510	NT90XZH2510
❷	Driver for X-axis	1	ADVA-01NL/NT80XZ-X (200 V specs) ADVA-R5ML/NT80XZ-X (100 V specs)	ADVA-01NL/NT90XZH (200 V specs) ADVA-R5ML/NT90XZH (100 V specs)
❸	Driver for Z-axis	1	ADVA-01NL/NT80XZ-Z (200 V specs) ADVA-R5ML/NT80XZ-Z (100 V specs)	ADVA-01NL/NT90XZH (200 V specs) ADVA-R5ML/NT90XZH (100 V specs)
❹	Motor extension cord（3m）(1)	2	TAE20V3-AM03	
❺	Encoder extension cord（2m）(1)	2	TAE20V4-EC02	
❻	PC connection cable	1	USB mini B cable (This must be prepared by customer.)	
❼	Setup software	1	ProDriveNext Please download from the official website of Hitachi Industrial Equipment Systems Co., Ltd.	
❽	I/O connector	2	TAE20R5-CN(2)	
❾	Power cord	—	This must be prepared by customer.	
❿	Higher-level device	—		
⓫	I/O connector connection cable	—		

Notes (1) For specific cord length, please contact IKO.
(2) I/O connector TAE20R5-CN is a combined product of 10150-3000PE (connector) and 10350-52F0-008 (cover) from 3M Japan Limited.

● Setup software, data editing software

To operate Nano Linear NT, initial setting of driver parameters is required. Parameter setting for driver is performed using the setup software or data editing software.
In the driver, the setup software (or data editing software) and PC connection cable are not provided. These can be shared in plural drivers but at least 1 set is required. Please prepare these on your own or place an order separately according to your requirement.

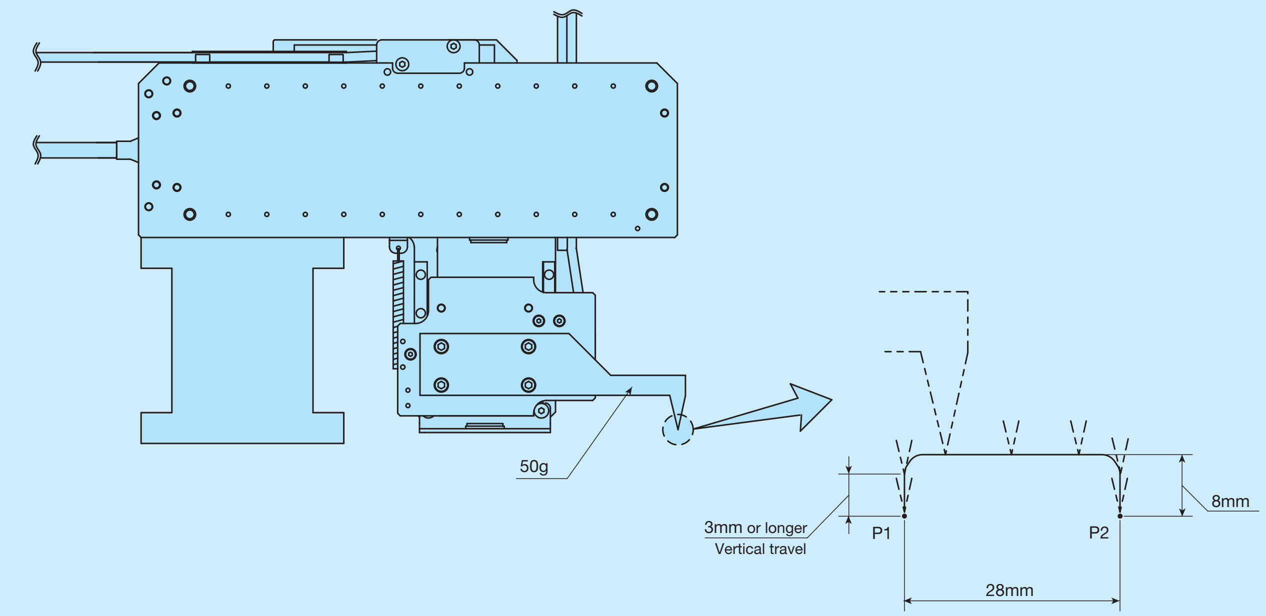
Example Operation Pattern

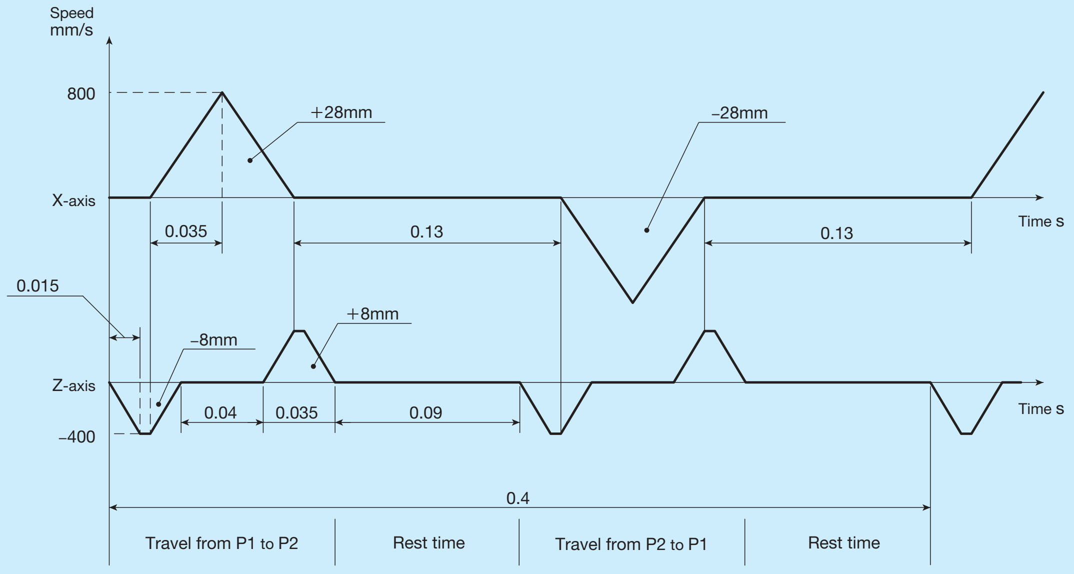
■ Example operation pattern of NT···XZ pick and place

Described below is a representative example of operation pattern of pick and place.

Table 19 Operational conditions

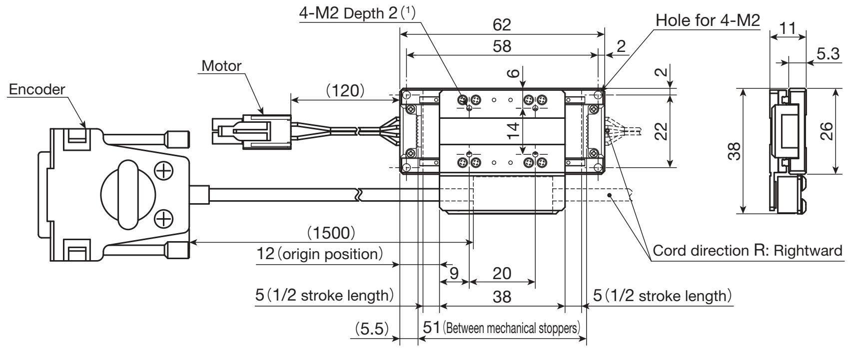
Item		Operational conditions
Carrying mass	g	50
X-axis travel distance	mm	28
Z-axis travel distance	mm	8
Rest time in P1 and P2	s	0.09
1 cycle time	s	0.4
X-axis effective thrust force	N	8.9
Z-axis effective thrust force	N	2.5



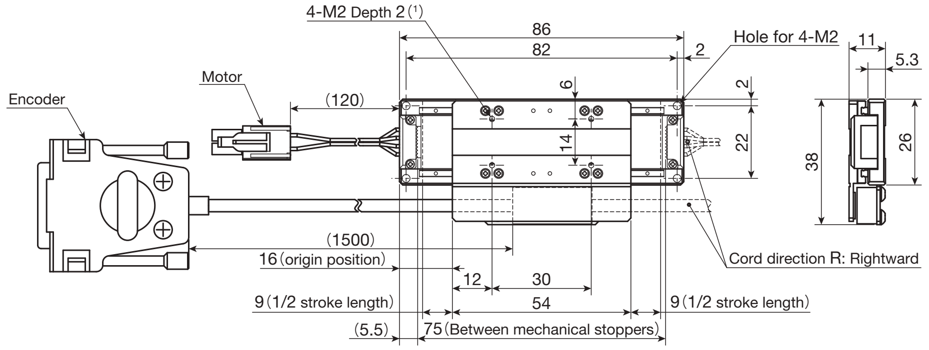


Remark: The speed pattern diagram shows a program pattern, not actual motions.

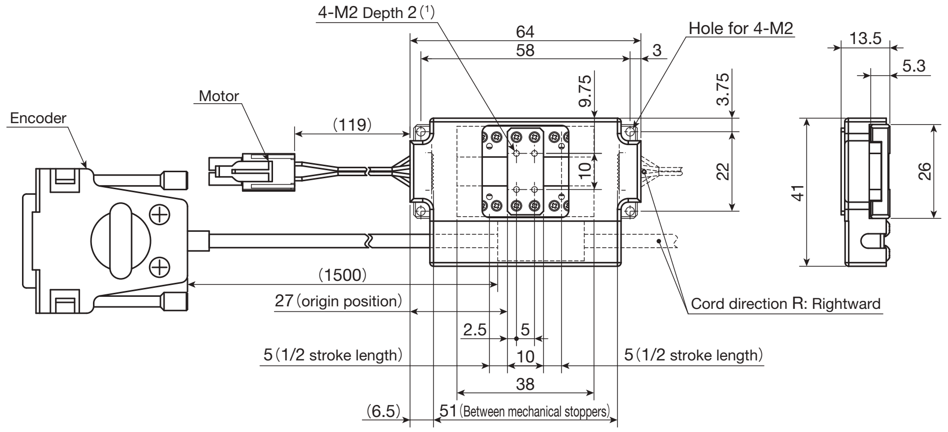
NT38V10



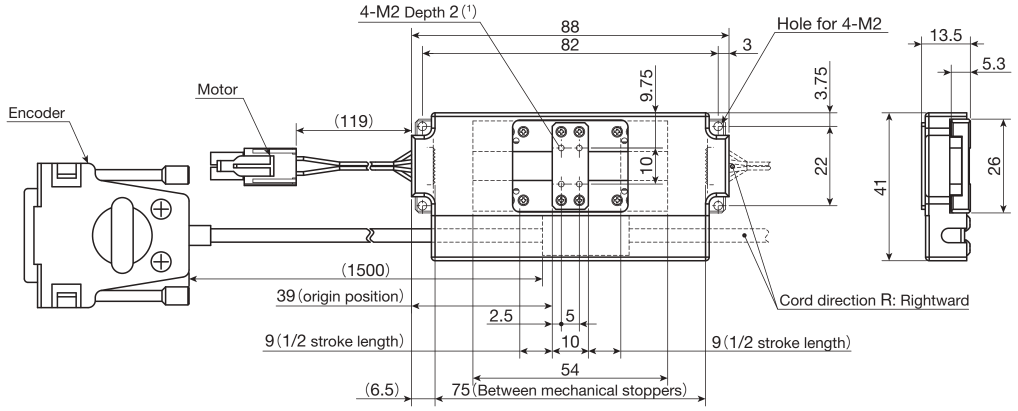
NT38V18



NT38V10/D



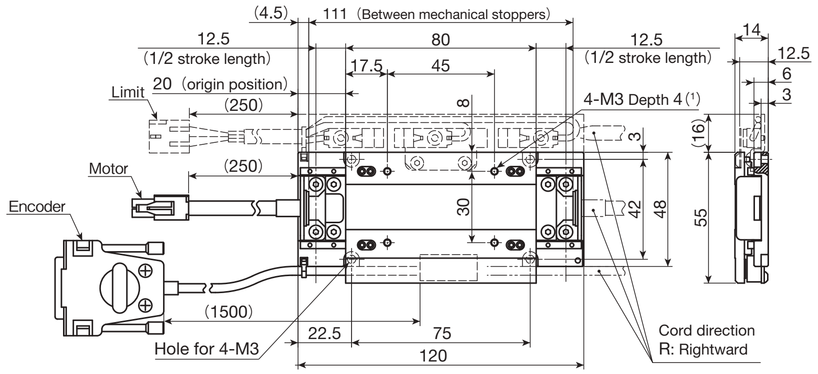
NT38V18/D



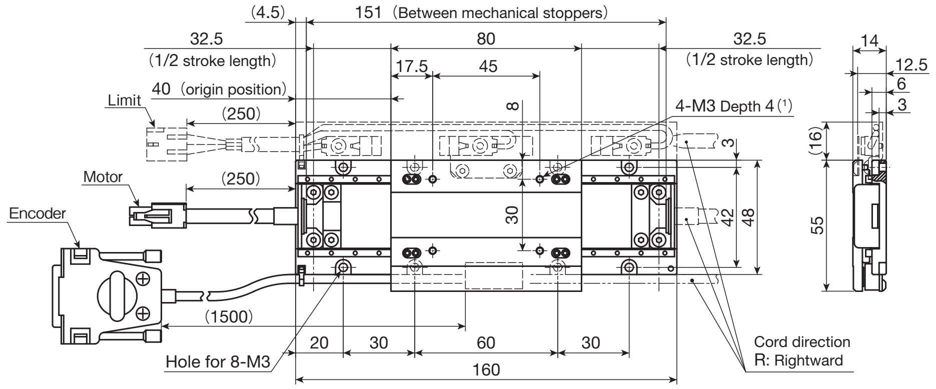
Note (1) Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the through hole.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

NT55V25



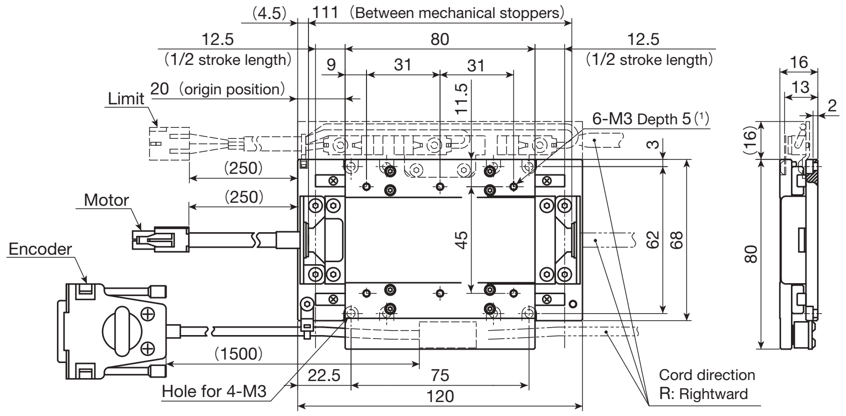
NT55V65



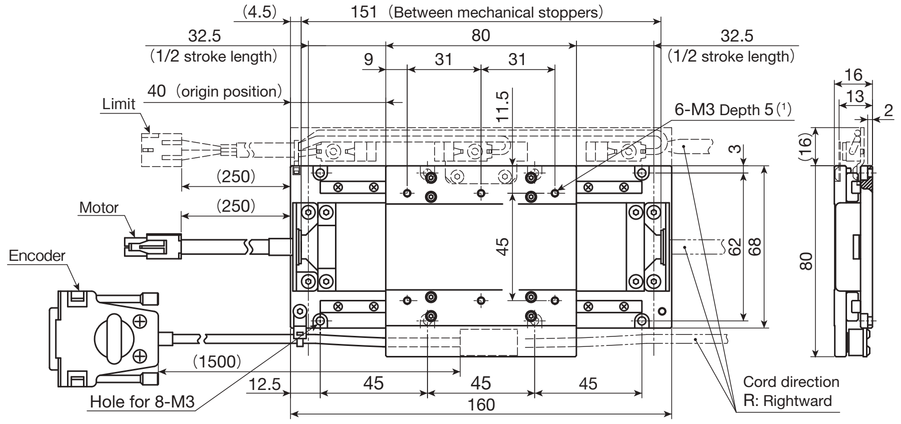
Note (1) Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the through hole.

Remark: Dashed line portions in the dimensional figures indicate the sensor-included specification / SC.

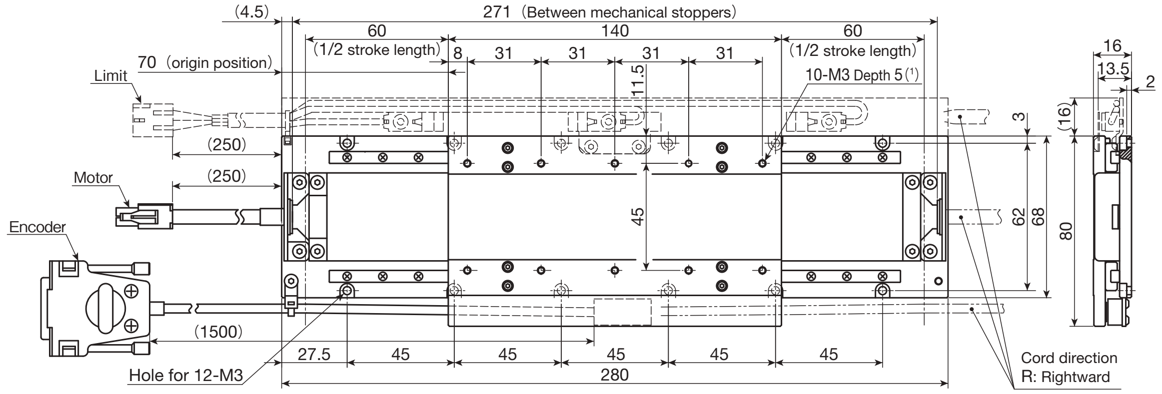
NT80V25



NT80V65



NT80V120



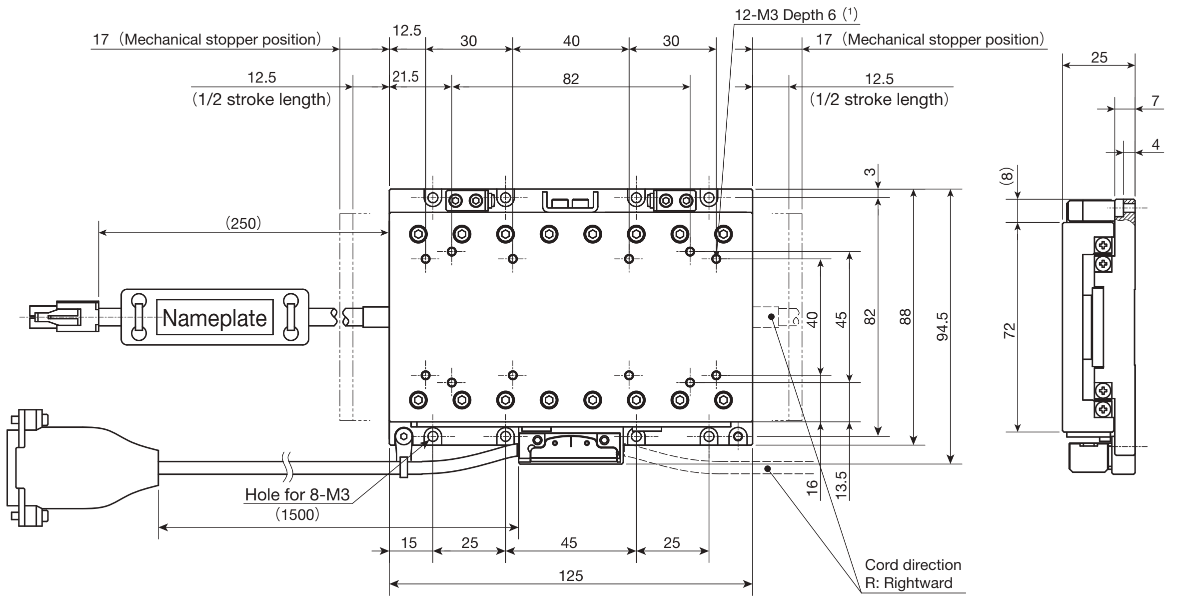
Note (1) Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the through hole.

Remarks 1. Dashed line portions in the dimensional figures indicate the sensor-included specification / SC.

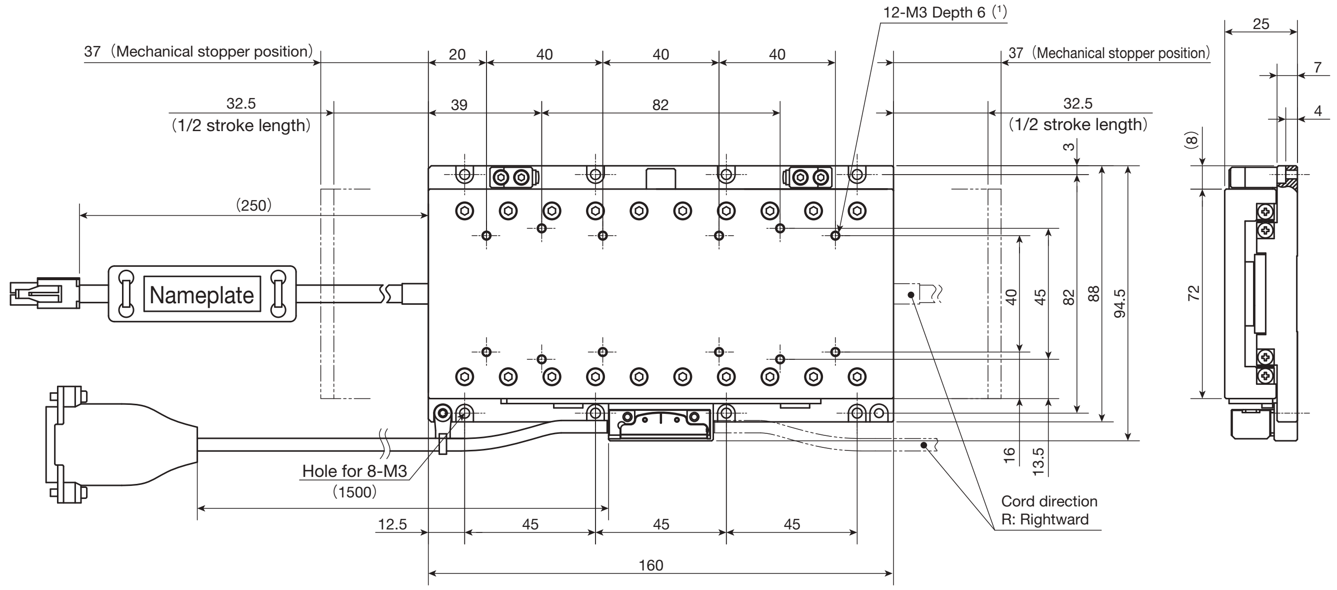
2. XY two-axis specification table combined with NT80V with NT80V25 used as an upper axis is assembled in IKO before shipping.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

NT88H25

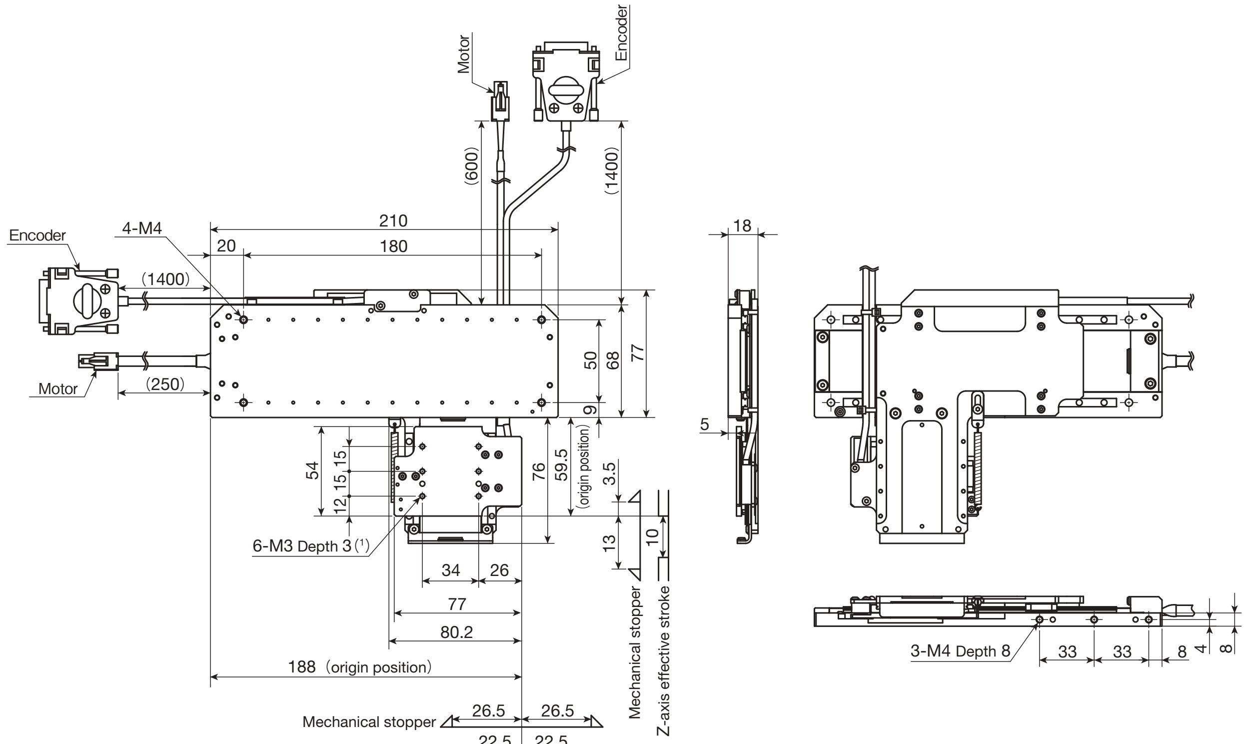


NT88H65

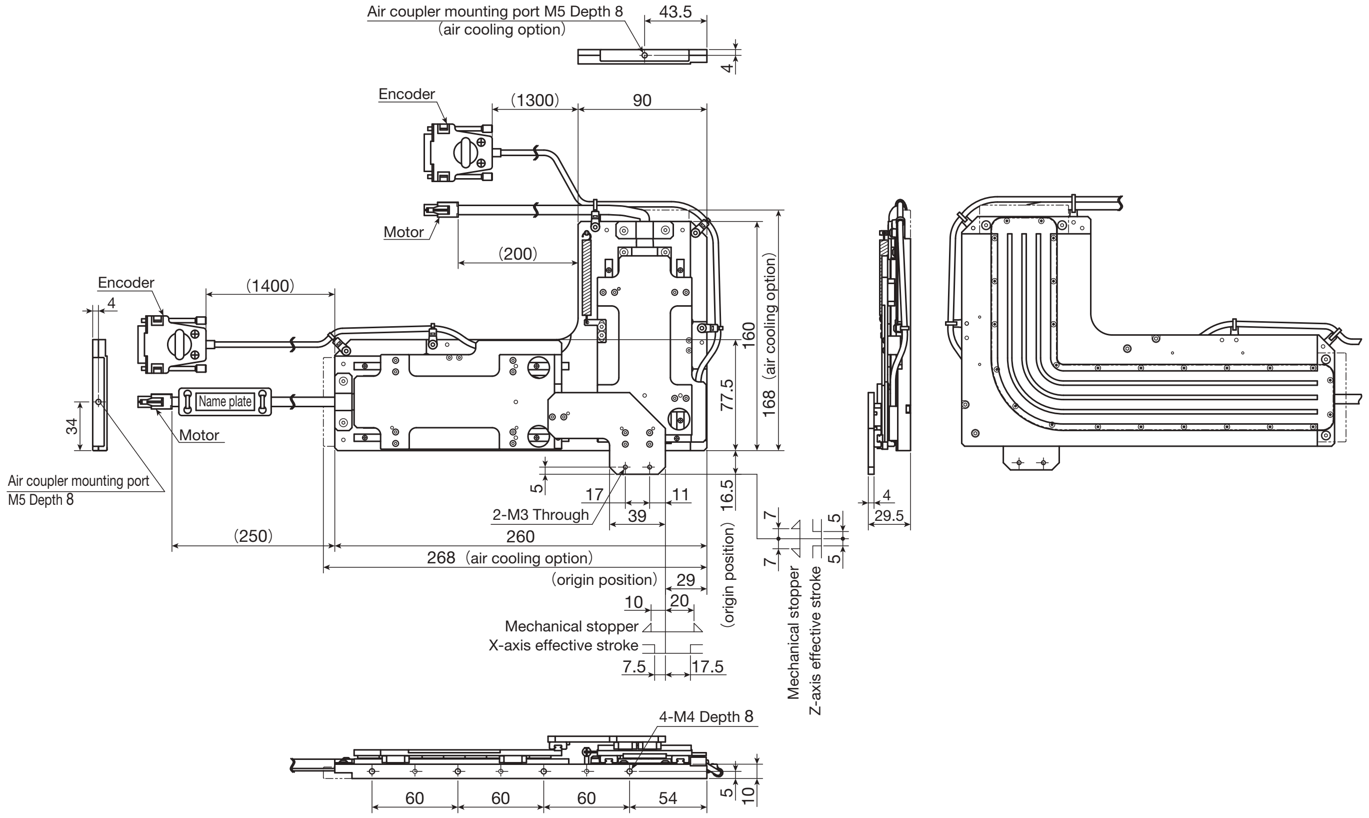


Note（1）Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the tapped hole.

NT80XZ



NT90XZH



Note（1）Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the through hole.

SA···DE

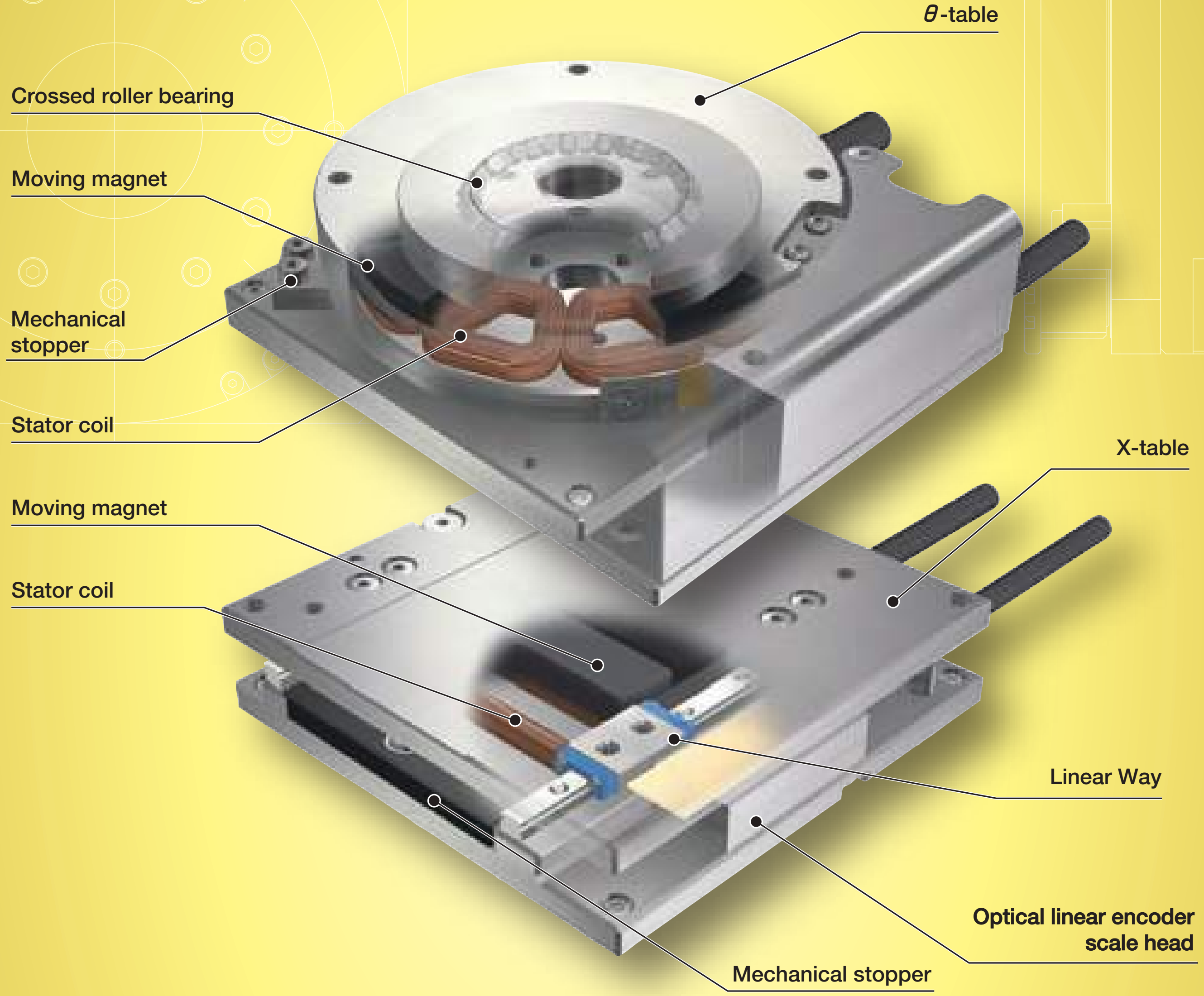
SA···DE

Linear motor drive

Linear

Alignment

C-Lube Maintenance-free



Major product specifications

Driving method	Linear motor
Linear motion rolling guide and bearing	XY-axis: Linear Way（ball type） θ-axis: Crossed Roller Bearing
Lubrication	Lubrication part "C-Lube" is built-in（except for θ-axis and SA65DE/X）
Material of table and bed	High carbon steel
Sensor	Provided as standard

Accuracy

unit: mm

Positioning repeatability	XY-axis: ±0.0005 θ-axis: ±0.5 ～ 1.3 sec
Positioning accuracy	–
Lost motion	–
Parallelism in table motion A	–
Parallelism in table motion B	–
Attitude accuracy	–
Straightness	–
Backlash	–

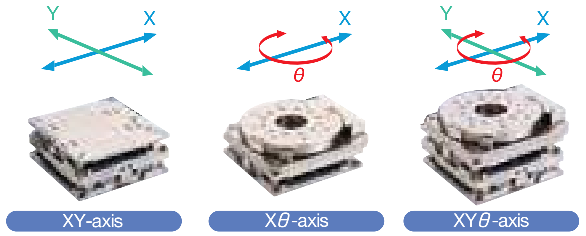
Points

Compact XYθ-table

1 Using a Linear Way L miniature linear motion rolling guide in the linear motion guiding parts and Crossed Roller Bearing in the rotation guiding parts respectively and adopting direct drive method in the drive section, this is an alignment stage for achieving low profile and compact XYθ motion.

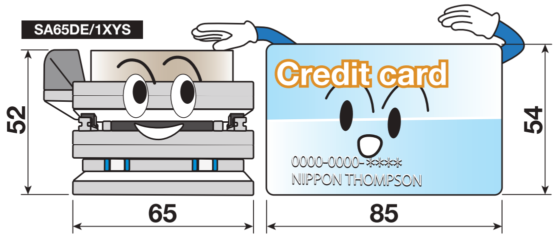
Flexible combination of XYθ

2 X-table for linear movement and θ-table serving as rotary positioning section are listed on lineup as basic configuration. Combination of X-axis and θ-axis and alignment table for XY-axis can be easily configured.



Thin and compact

3 Coreless linear motor, Linear Way L and Crossed Roller Bearing are adopted. As compared with ball screw-driven stage, extremely low profile is achieved.

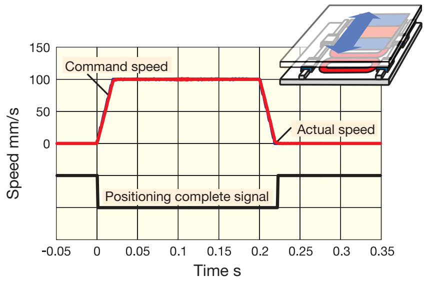


High resolution and high responsiveness

4 Performing full-closed loop control of direct drive-type stage with high resolution linear encoder built-in has achieved high resolution and high accuracy.

Drive conditions

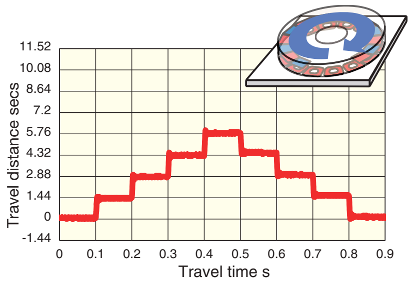
SA120DE/1X
Speed : 100mm/s
Acc./dec. time : 20ms
Stroke : 20mm
Carrying mass : 250g



Achieves high-speed positioning according to commands!

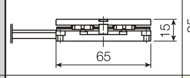
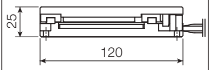
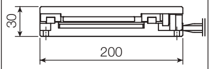
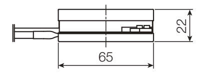
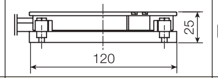
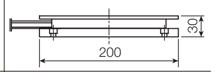
Measuring conditions

SA120DE/1S
Carrying mass : 1000g
Feed command : 1.44 sec



Precise steps for fine feeding!

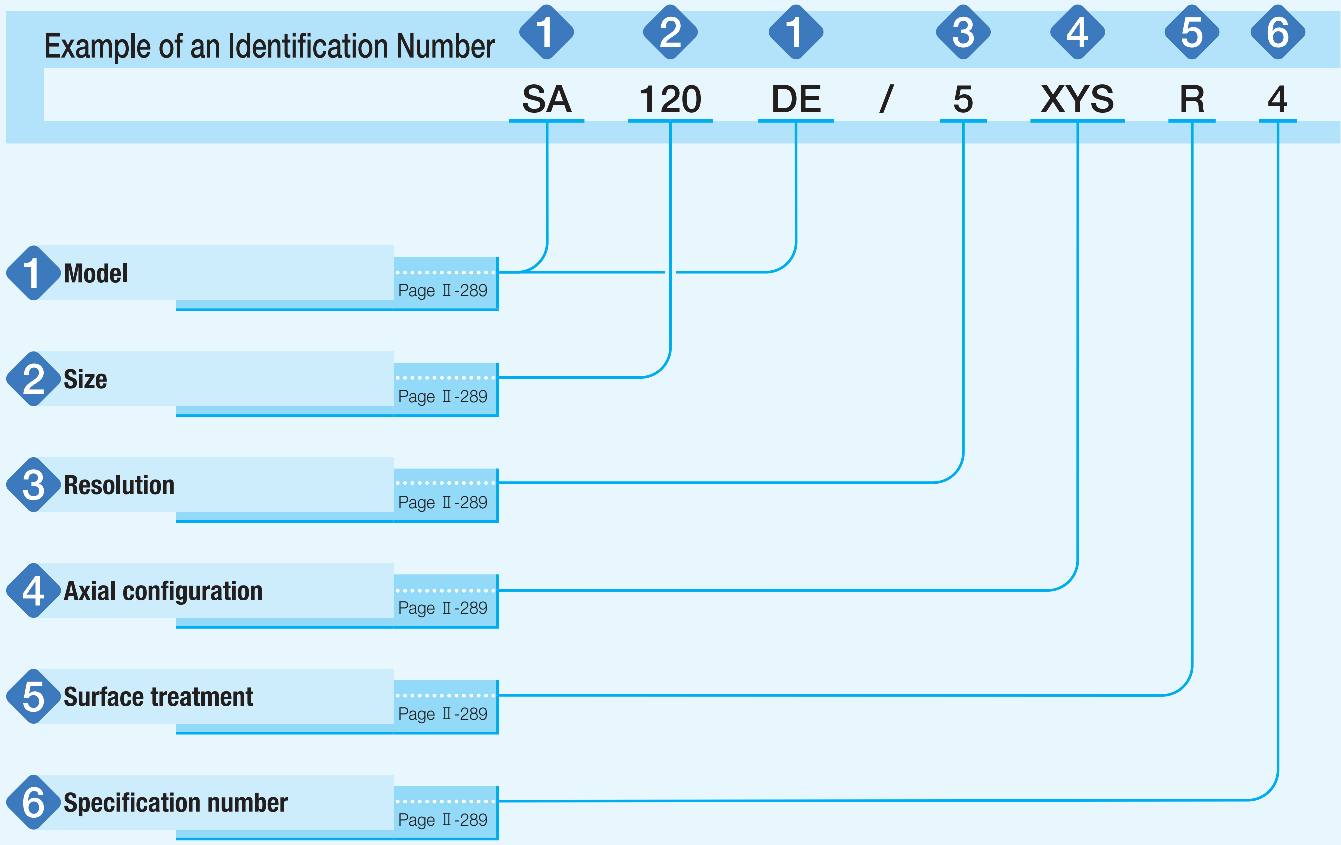
Alignment Stage SA specification list

Model and size	SA65DE/X		SA120DE/X		SA200DE/X (1)		SA65DE/S	SA120DE/S	SA200DE/S
									
Sectional shape									
Maximum thrust N	25		70		400		Max. torque 0.5N·m	Max. torque 2.0N·m	Max. torque 4.0N·m
Rated thrust N	3.5		15		70		Rated torque 0.06N·m	Rated torque 0.4N·m	Rated torque 1.2N·m
Maximum load mass kg	2.4		5.9		30.0		2.2	6.8	12.3
Effective stroke length mm	10		20		20		Effective operating angle 50degree	Effective operating angle 60degree	Effective operating angle 280degree
Resolution μm	0.1	0.5	0.1	0.5	0.1	0.5	0.64sec 5625pulse/deg	0.36sec 10000pulse/deg	0.25sec 14400pulse/deg
Maximum speed mm/s	270	500	270	800	270	800	720deg/sec	400deg/sec	270deg/sec
Positioning repeatability μm	±0.5		±0.5		±0.5		±1.3sec	±0.8sec	±0.5sec

Note (1) SA200DE/X can be manufactured as a custom product upon request. If needed, please contact IKO.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Identification Number



Identification Number and Specification

① Model

SA⋯DE: Alignment Stage SA

② Size

65: □ 65, ϕ 65
120: □120, ϕ120
200: ϕ200

③ Resolution

1: 0.1μm
5: 0.5μm
Specify the resolution of the encoder for X-axis or XY-axis.
When selecting only S: θ-axis in the entry of section ④, set "No symbol" for the resolution.

④ Axial configuration

Select an axial configuration from the list of Table 1.

Table 1 Axial configuration and application

Axial configuration	SA65DE	SA120DE	SA200DE
X : Only X-axis	○	○	– (1)
S : Only θ-axis	○	○	○
XY : XY-based two-axis configuration	○	○	– (1)
XS : Xθ-based two-axis configuration	○	○	
XYS : X, Y, and θ-based three-axis configuration	○	○	

Note (1) Can be manufactured as a custom product upon request. If needed, please contact IKO.

⑤ Surface treatment

No symbol: Electroless nickel plating
R : Black chrome surface treatment
Surface treatment is performed on the surfaces of table and bed.

⑥ Specification number

3: Specification number 3 (Only SA200DE/S)

4: Specification number 4

Specifications

Table 2.1 Specification / Performance

Item \ Identification number		SA65DE/1X	SA65DE/5X	SA120DE/1X	SA120DE/5X
Maximum thrust (1)	N	25		70	
Rated thrust (2)	N	3.5		15 (7)	
Effective stroke length	mm	10		20	
Maximum load mass	kg	2.4		5.9	
Resolution	μm	0.1	0.5	0.1	0.5
Maximum speed (3) (4)	mm/s	270	500	270	800
Positioning repeatability (5)	μm	±0.5			
Mass of moving table	kg	0.17		1.2	
Total mass (6)	kg	0.35		2.5	
Ambient temperature and humidity in operation		0～40℃・20～80%RH (keep dewdrop free)			

Notes (1) The duration of maximum thrust is up to 1 second.
(2) This is based on the case of mounting on a metal mating member material at an ambient temperature of 20℃.
(3) For the case of exceeding the displayed speed, please contact IKO.
(4) This maximum speed may not be reached depending on the maximum output frequency of the controller used, and the driver type or settings.
(5) When the temperature of the product is constant.
(6) Mass of the cord is not included.
(7) The rated thrust applies within the effective stroke range.

Table 2.2 Specification / Performance

Item \ Identification number		SA65DE/S	SA120DE/S	SA200DE/S
Maximum torque (1)	N・m	0.5	2.0	4.0
Rated torque (2)	N・m	0.06	0.4	1.2
Maximum load mass	kg	2.2	6.8	12.3
Effective operating angle	degree	50	60	280
Resolution	sec	0.64	0.36	0.25
	pulse/degree	5 625	10 000	14 400
Maximum speed (3) (4)	degree/sec	720	400	270
Positioning repeatability (5)	sec	±1.3	±0.8	±0.5
Inertia moment of moving table	kg・m²	0.00012	0.002	0.013
Total mass (6)	kg	0.5	2	6
Ambient temperature and humidity in operation		0～40℃・20～80%RH (keep dewdrop free)		

Notes (1) The duration of maximum torque is up to 1 second.
(2) This is based on the case of mounting on a metal mating member material at an ambient temperature of 20℃.
(3) For the case of exceeding the displayed speed, please contact IKO.
(4) This maximum speed may not be reached depending on the maximum output frequency of the controller used, and the driver type or settings.
(5) When the temperature of the product is constant.
(6) Mass of the cord is not included.

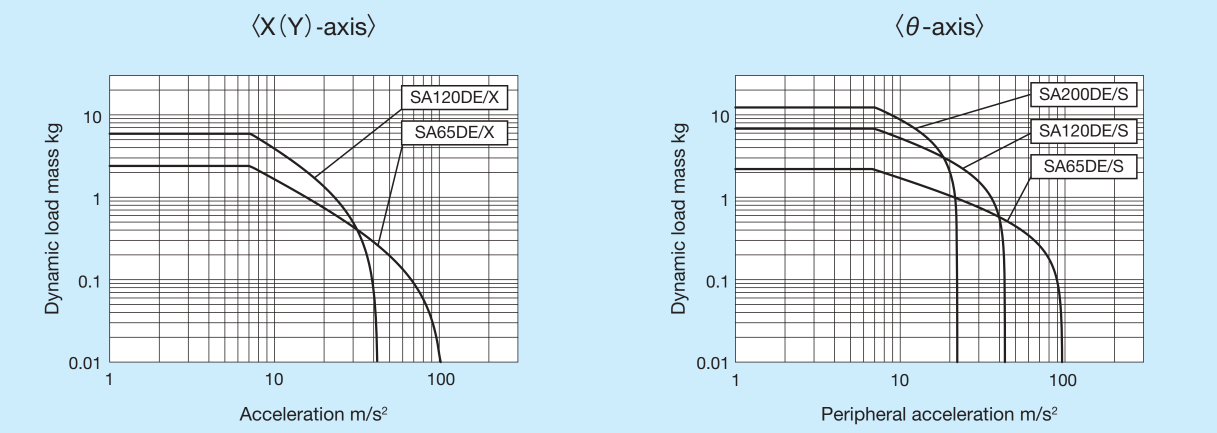


Fig. 1 Dynamic load mass

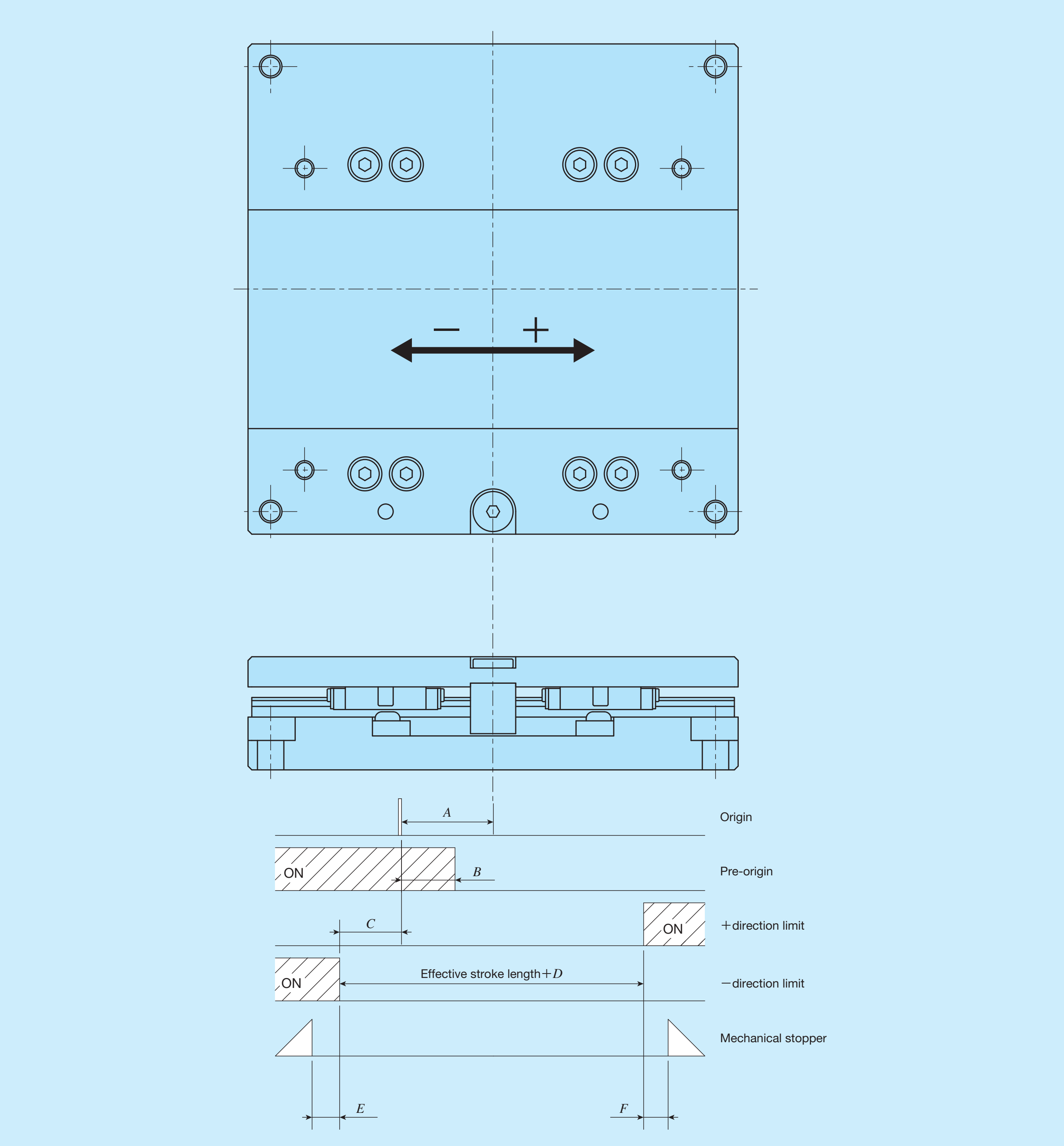
Remark: Dynamic load mass of θ-axis is a value calculated as cube of steel. And, the acceleration is converted as value of stage periphery.

Mounting

For the processing accuracy of the Precision Positioning Table mounting surface and the tightening torque of the fixing screws, see page Ⅲ-30.

Sensor Specification

Table 3.1 Sensor timing chart for SA···DE/X (X-axis)

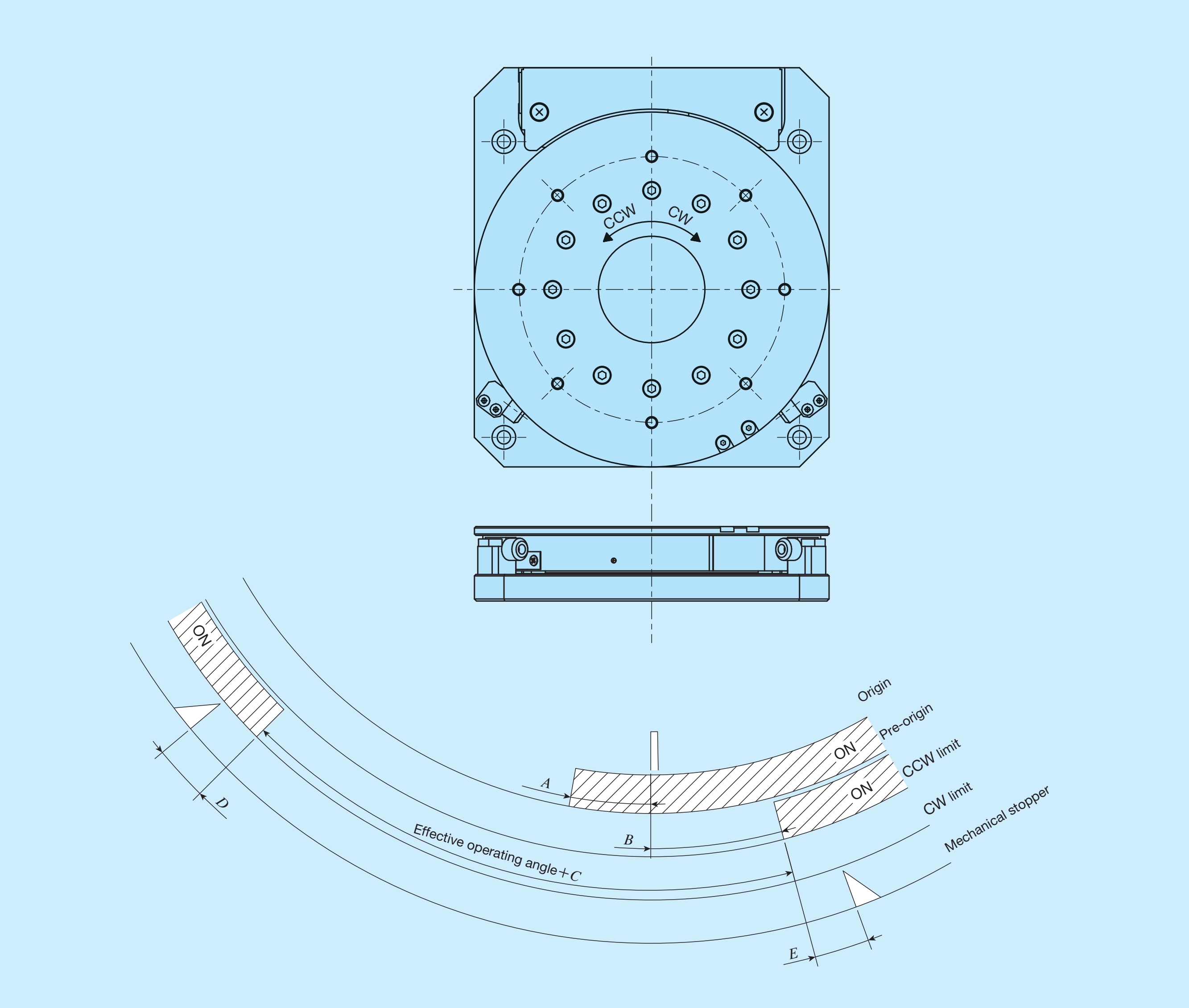


unit: mm

Model and size	*A*	*B*	*C*	*D*	*E*	*F*
SA65DE/X	5	2.5	1.5	3	1.5	1.5
SA120DE/X	0	3	12	4	2	2

Remarks 1. Respective values are for reference and are not guaranteed values. For detailed dimensions, please contact IKO.
2. For detailed specifications of respective sensors, please see the section of sensor specification in General Explanation.

Table 3.2 Sensor timing chart for SA···DE/S (θ-axis)



unit: degree

Model and size	*A*	*B*	*C*	*D*	*E*
SA65DE/S	4	11	10	5	5
SA120DE/S	3	3	6	3	3
SA200DE/S	2	4	0	4	4

Remarks 1. Respective values are for reference and are not guaranteed values. For detailed dimensions, please contact IKO.
2. For detailed specifications of respective sensors, please see the section of sensor specification in General Explanation.

System Configuration

Two series of dedicated drivers, ADVA and MR-J4, are available for the Alignment Stage SA, and the system configuration varies depending on the driver used. For ADVA, two types of specification, pulse train specification and high speed network EtherCAT specification, are available. For MR-J4, only high speed network SSCNET Ⅲ/H specification is available. Table 4 shows the example of identification number for ADVA, and Table 5 shows the tables and model number of applicable MR-J4. For detailed driver specification, please see the driver specification on page Ⅱ-381 to Ⅱ-385.

Table 4 Identification number for ADVA

ADVA	–	01NL	EC	/	SA65DE-S
(1) Model		(2)	(3)		(4)

(2) Power supply voltage	
01NL	Single-phase / Three-phase 200 V
R5ML	Single-phase 100 V

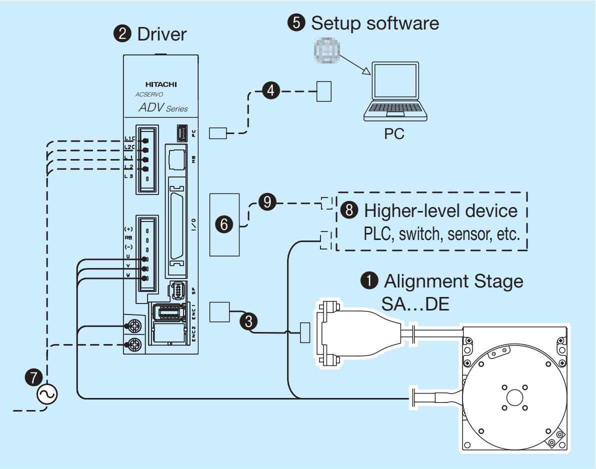
(3) Command type	
No symbol	Pulse train command
EC	EtherCAT

(4) Applicable alignment stage model	
SA65DE -S	SA65DE /S
SA65DE -X	SA65DE /X
SA120DE -S	SA120DE /S
SA120DE -X	SA120DE /X
SA200DE -S	SA200DE /S

Table 5 Identification numbers of SA...DE and applicable MR-J4

Identification number of table	Identification number of driver
SA65DE /S	MR-J4-10B-RJ /SA65DE -S
SA65DE /X	MR-J4-10B-RJ /SA65DE -X
SA120DE /S	MR-J4-10B-RJ /SA120DE -S
SA120DE /X	MR-J4-10B-RJ /SA120DE -X
SA200DE /S	MR-J4-10B-RJ /SA200DE -S

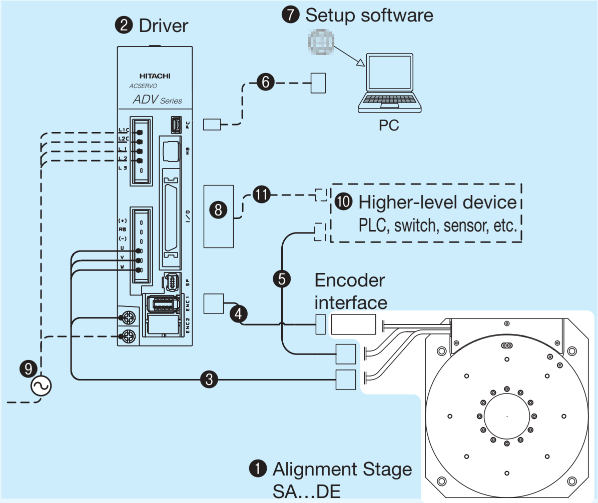
Table 6 System configuration for SA65DE, SA120DE with driver ADVA



No.	Name	Identification Number
❸	Encoder extension cord (2m) (1)	TAE20V4-EC02
❹	PC connection cable	USB mini B cable This must be prepared by customer.
❺	Setup software	ProDriveNext Please download from the official website of Hitachi Industrial Equipment Systems Co., Ltd.
❻	I/O connector	TAE20R5-CN (2)
❼	Power cord	This must be prepared by customer.
❽	Higher-level device	
❾	I/O connector connection cable	

Notes (1) For specific cord length, please contact IKO.
(2) I/O connector TAE20R5-CN is a combined product of 10150-3000PE (connector) and 10350-52F0-008 (cover) from 3M Japan Limited.

Table 7 System configuration for SA200DE/S with driver ADVA



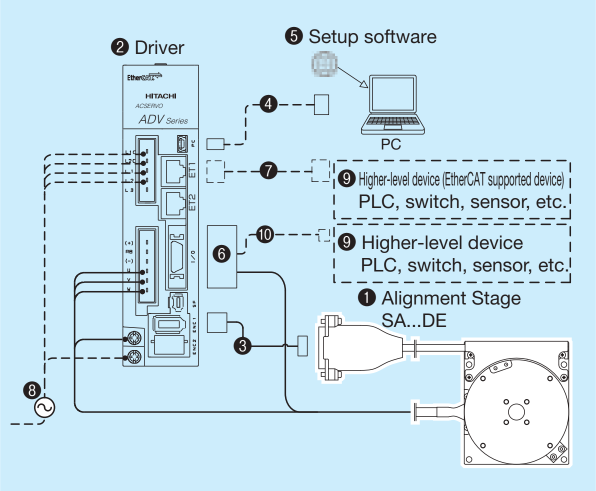
No.	Name	Identification Number
❸	Motor extension cord (3m) (1)	TAE20V3-AM03
❹	Encoder extension cord (2m) (1)	TAE20V4-EC02
❺	Sensor extension cord (2)	TAE10V8-LC□□
❻	PC connection cable	USB mini B cable This must be prepared by customer.
❼	Setup software	ProDriveNext Please download from the official website of Hitachi Industrial Equipment Systems Co., Ltd.
❽	I/O connector	TAE20R5-CN (3)
❾	Power cord	This must be prepared by customer.
❿	Higher-level device	
⓫	I/O connector connection cable	

Notes (1) For specific cord length, please contact IKO.
(2) The lengths of the sensor extension cord is specified in the fields of □□ located at the end of the identification number with a length from 3 to 10m in units of 1m.
(3) I/O connector TAE20R5-CN is a combined product of 10150-3000PE (connector) and 10350-52F0-008 (cover) from 3M Japan Limited.

● Setup software

To operate Alignment Stage SA, initial setting of driver parameters is required. Parameter setting for driver is performed using the setup software. It can also be used for gain adjustment and operational status check.
In the driver, the setup software and PC connection cable are not provided. These can be shared in plural drivers but at least 1 set is required. Please prepare these on your own or place an order separately according to your requirement.

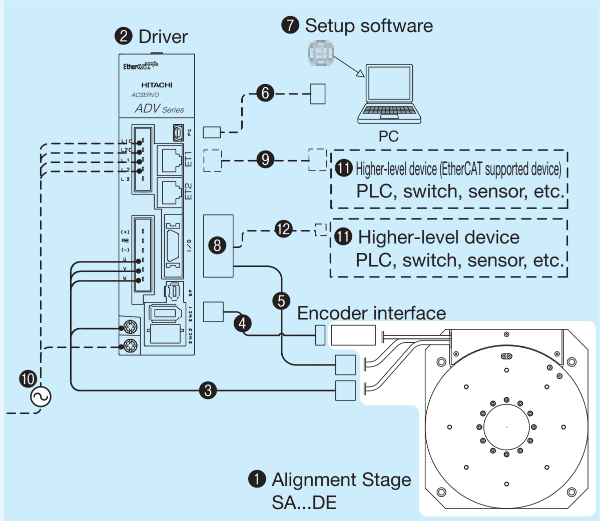
Table 8 System configuration for SA65DE, SA120DE with driver ADVA...EC



No.	Name	Identification Number
❸	Encoder extension cord (2m) (1)	TAE20V4-EC02
❹	PC connection cable	USB mini B cable This must be prepared by customer.
❺	Setup software	ProDriveNext Please download from the official website of Hitachi Industrial Equipment Systems Co., Ltd.
❻	I/O connector	TAE20V5-CN (2)
❼	Ethernet cable	This must be prepared by customer.
❽	Power cord	
❾	Higher-level device	
❿	I/O connector connection cable	

Notes (1) For specific cord length, please contact IKO.
(2) I/O connector TAE20V5-CN is a combined product of 10120-3000PE (connector) and 10320-52F0-008 (cover) from 3M Japan Limited.

Table 9 System configuration for SA200DE/S with driver ADVA...EC

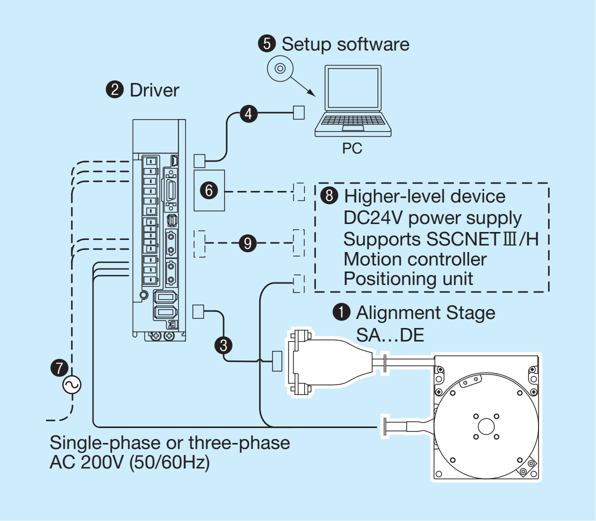


No.	Name	Identification Number
❸	Motor extension cord (3m) (1)	TAE20V3-AM03
❹	Encoder extension cord (2m) (1)	TAE20V4-EC02
❺	Sensor extension cord (2)	TAE10V8-LC□□
❻	PC connection cable	USB mini B cable This must be prepared by customer.
❼	Setup software	ProDriveNext Please download from the official website of Hitachi Industrial Equipment Systems Co., Ltd.
❽	I/O connector	TAE20V5-CN (3)
❾	Ethernet cable	This must be prepared by customer.
❿	Power cord	
⓫	Higher-level device	
⓬	I/O connector connection cable	

Notes (1) For specific cord length, please contact IKO.
(2) The lengths of the sensor extension cord is specified in the fields of □□ located at the end of the identification number with a length from 3 to 10m in units of 1m.
(3) I/O connector TAE20V5-CN is a combined product of 10120-3000PE (connector) and 10320-52F0-008 (cover) from 3M Japan Limited.

System configuration

Table 10 System configuration (SSCNET Ⅲ/H supported) for SA...DE with driver MR-J4-10B



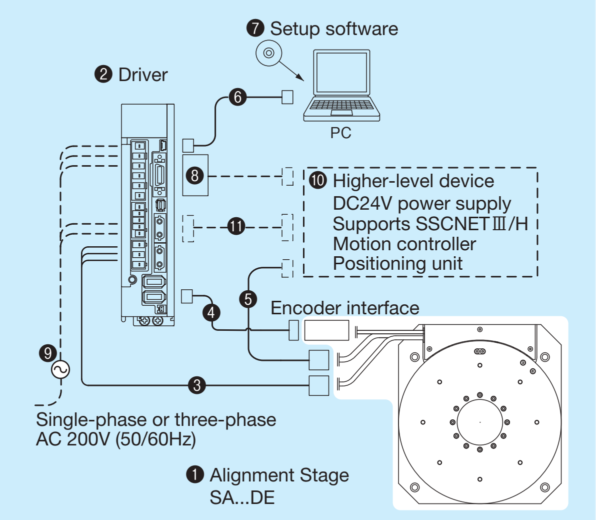
No.	Name	Identification Number
❸	Encoder extension cord (2m) (1)	TAE20V6-EC02
❹	PC connection cable (3m)	MR-J3USBCBL3M
❺	Setup software	SW1DNC-MRC2-J
❻	Connectors for input/output connection	MR-CCN1 (2)
❼	Power cord	This must be prepared by customer.
❽	Higher-level device (3)	
❾	Connection cable for SSCNET Ⅲ/H	

Notes (1) For specific cord length, please contact IKO.

(2) Connector for input/output connection MR-CCN1 is a combined product of 10120-3000PE (connector) and 10320-52F0-008 (cover) from 3M Japan Limited.

(3) The higher-level devices are a motion controller, positioning unit and DC24V power supply ready for SSCNET Ⅲ/H from Mitsubishi Electric Corporation.

Table 11 System configuration (SSCNET Ⅲ/H supported) for SA200DE/S with driver MR-J4-10B



No.	Name	Identification Number
❸	Motor extension cord (3m) (1)	TAE20V3-AM03
❹	Encoder extension cord (2m) (1)	TAE20V6-EC02
❺	Sensor extension cord (2)	TAE10V8-LC□□
❻	PC connection cable (3m)	MR-J3USBCBL3M
❼	Setup software	SW1DNC-MRC2-J
❽	Connectors for input/output connection	MR-CCN1 (3)
❾	Power cord	This must be prepared by customer.
❿	Higher-level device (4)	
⓫	Connection cable for SSCNET Ⅲ/H	

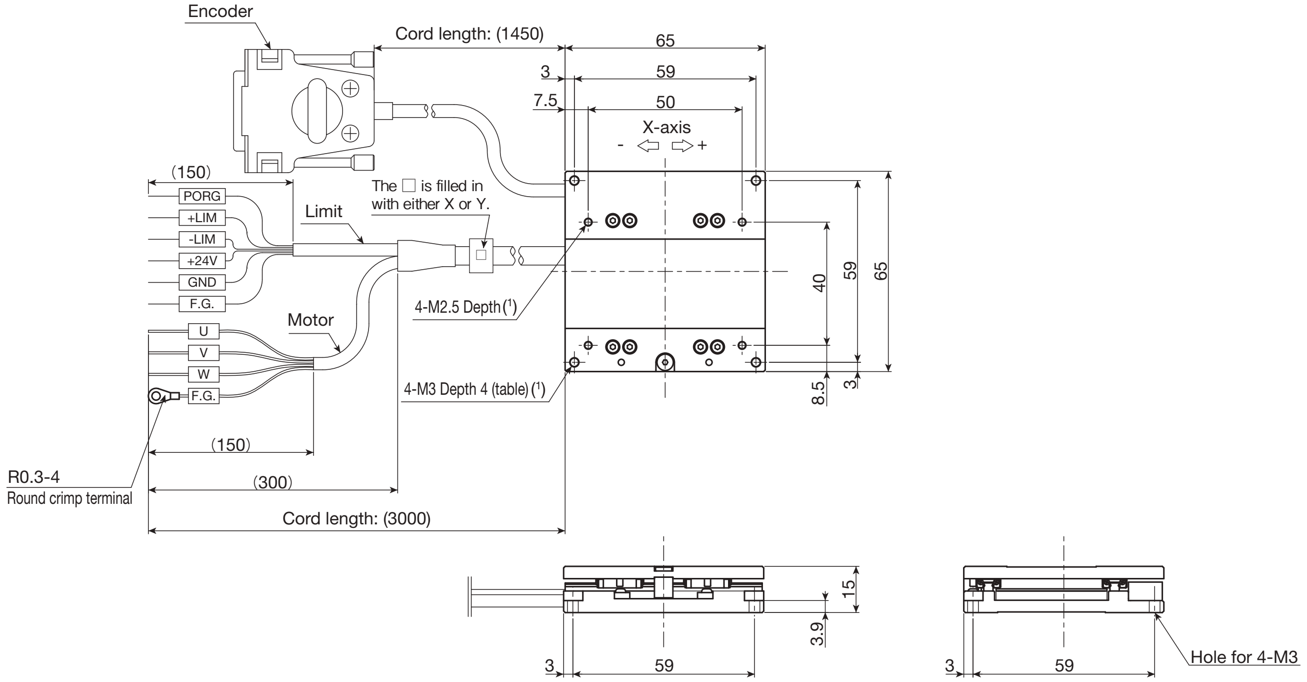
Notes (1) For specific cord length, please contact IKO.

(2) The lengths of the sensor extension cord is specified in the fields of □□ located at the end of the identification number with a length from 3 to 10m in units of 1m.

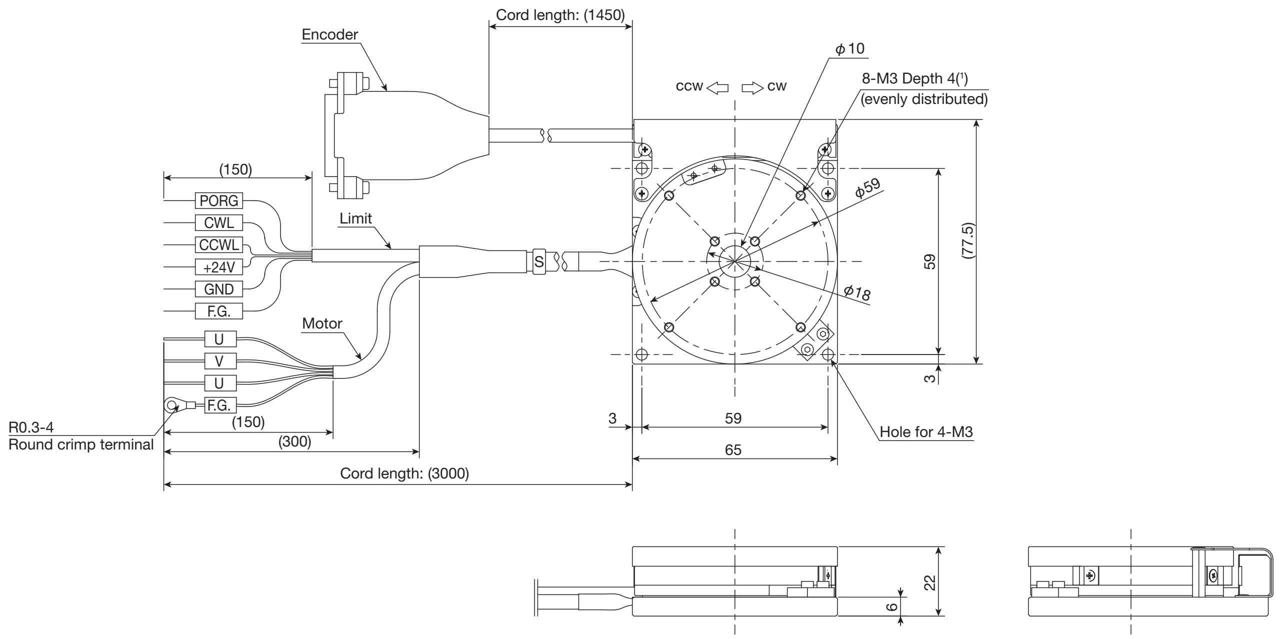
(3) Connector for input/output connection MR-CCN1 is a combined product of 10120-3000PE (connector) and 10320-52F0-008 (cover) from 3M Japan Limited.

(4) The higher-level devices are a motion controller, positioning unit and DC24V power supply ready for SSCNET Ⅲ/H from Mitsubishi Electric Corporation.

SA65DE/X



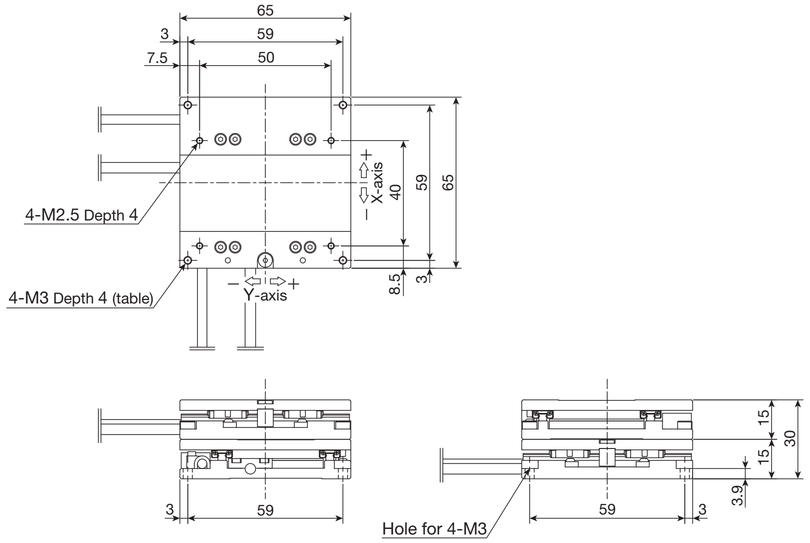
SA65DE/S



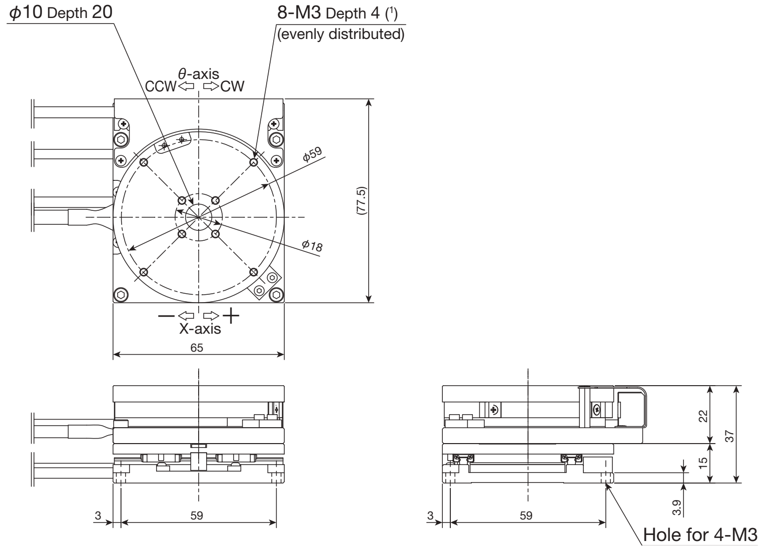
Note (1) Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the through hole.

Remark: The text direction on the mark tube of the motor / limit cord may vary by product.

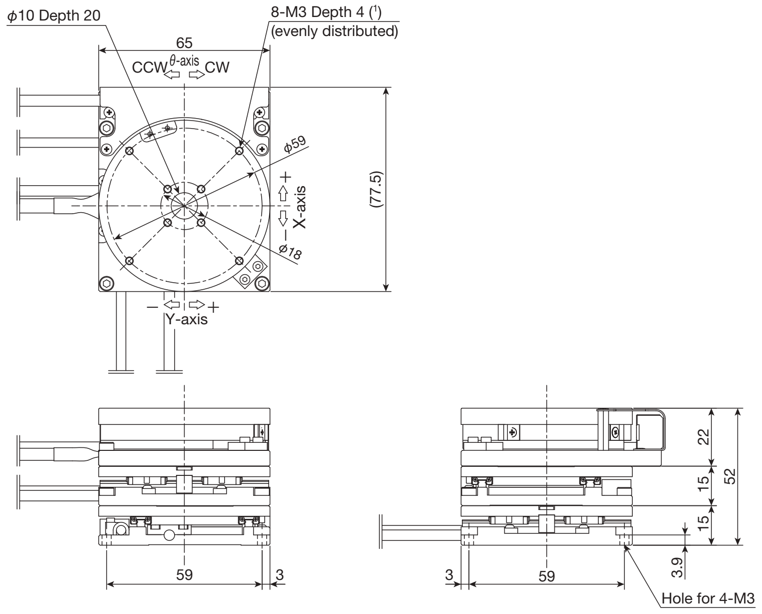
SA65DE/XY



SA65DE/XS

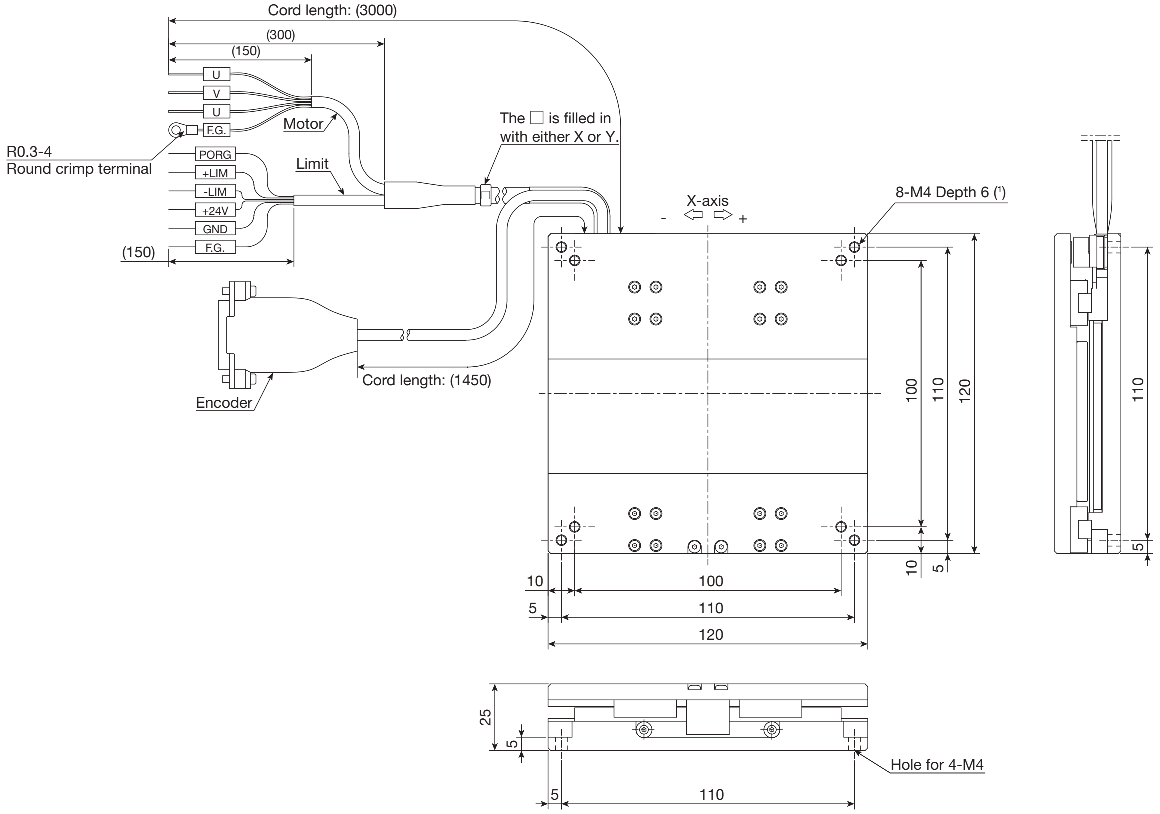


SA65DE/XYS

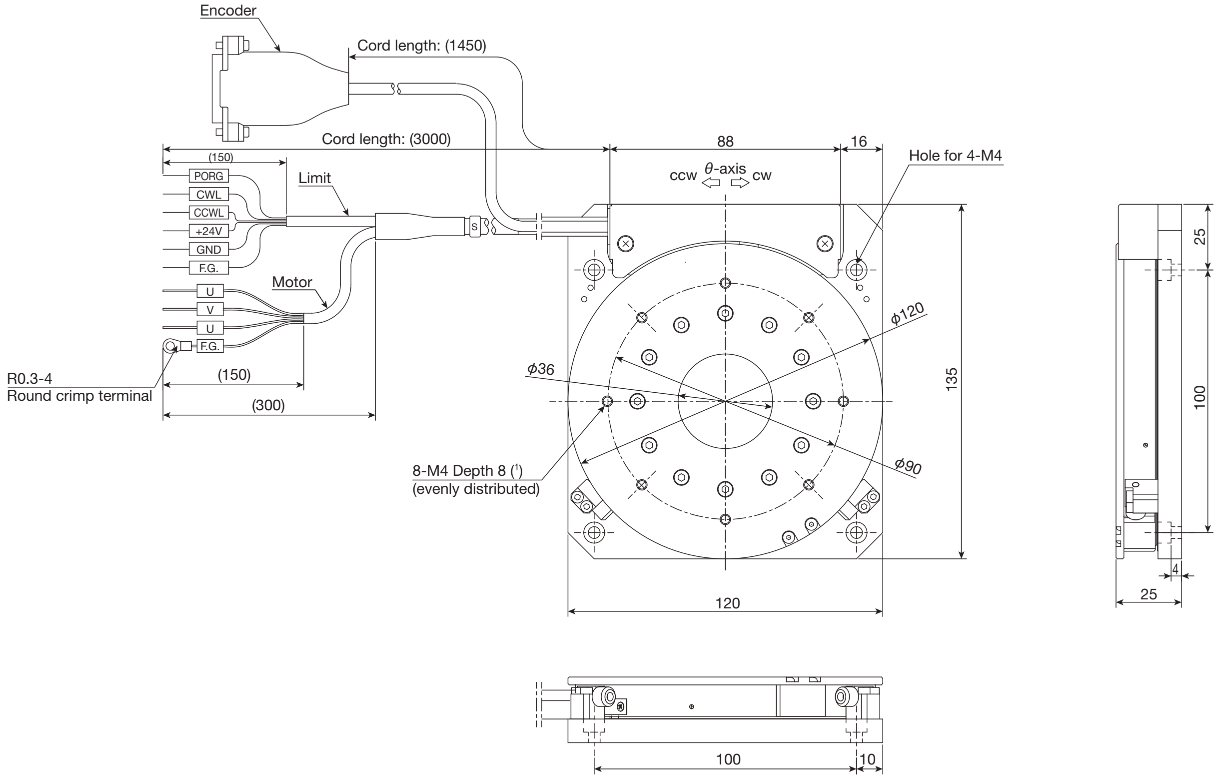


Note (1) Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the through hole.
Remark: For the cable length, please see the dimension tables for SA65DE/X and SA65DE/S.

SA120DE/X

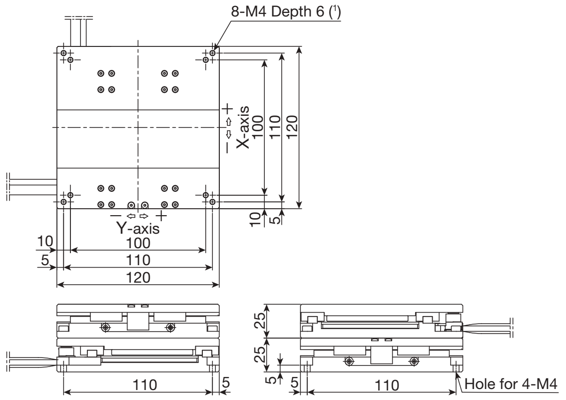


SA120DE/S

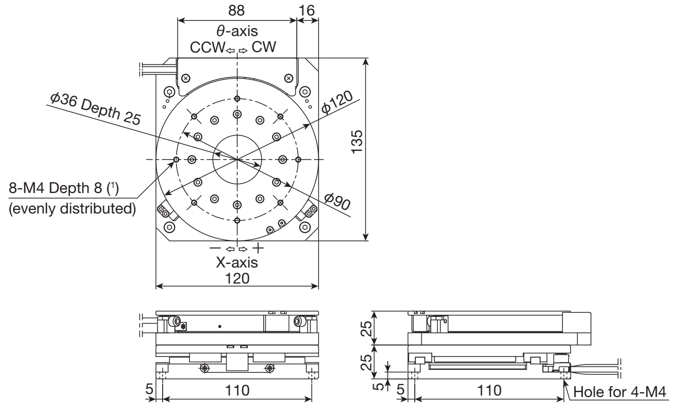


Note (1) Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the through hole.
Remark: The text direction on the mark tube of the motor / limit cord may vary by product.

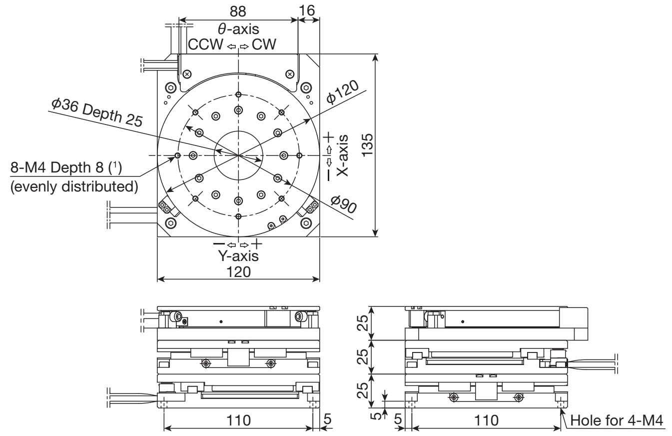
SA120DE/XY



SA120DE/XS

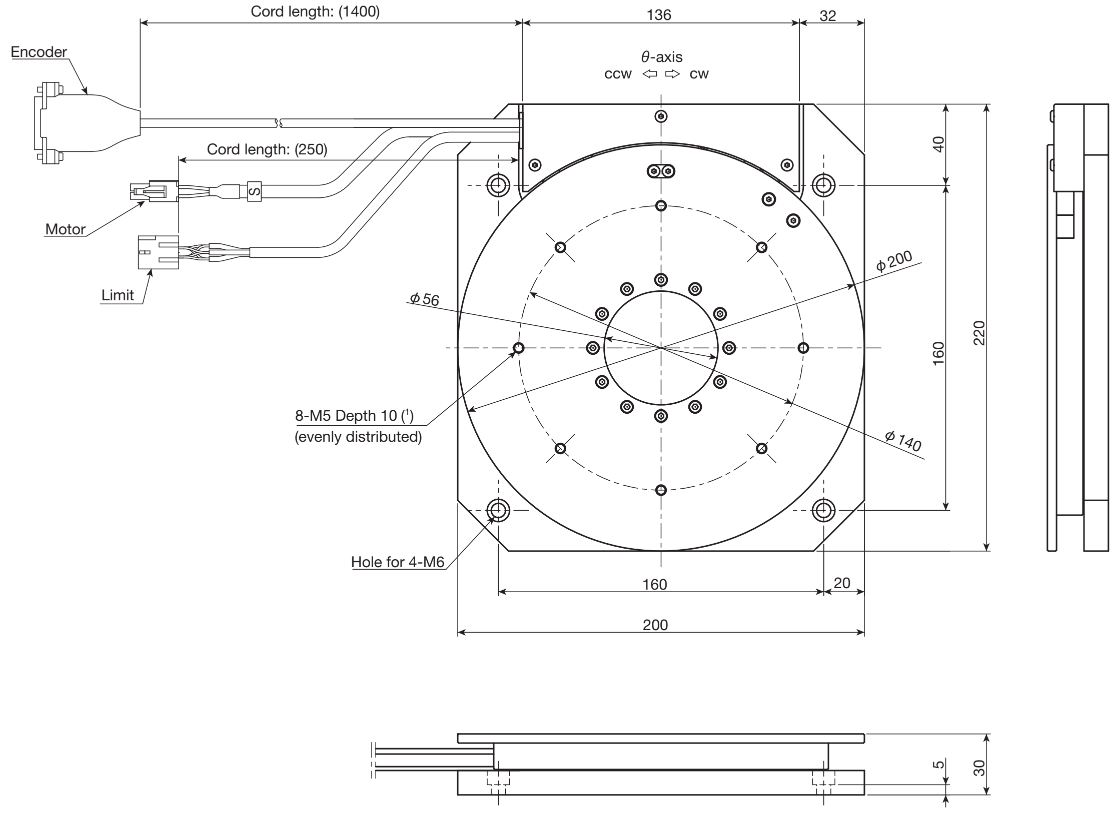


SA120DE/XYS



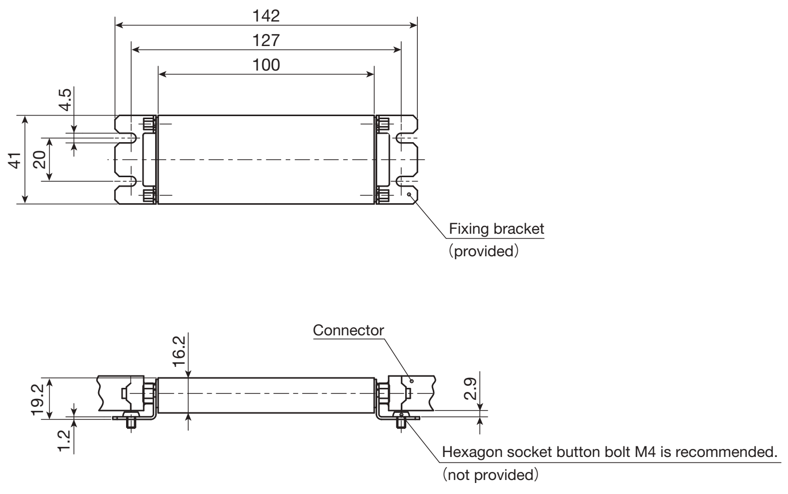
Note (1) Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the through hole.
Remark: For the cable length, please see the dimension tables for SA120DE/X and SA120DE/S.

SA200DE/S



Note (1) Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the through hole.

Encoder interface



LT
(LT···CE, LT···LD, LT···H)

LT

Linear motor

IKO C-Lube Maintenance-free

Linear

Major product specifications

Driving method	Linear motor
Linear motion rolling guide	Linear Way（ball type）
Built-in lubrication part	Lubrication part "C-Lube" is built-in
Material of table and bed	High-strength aluminum alloy (High carbon steel is used for the LT100CE bed)
Sensor	Select by identification number

Accuracy

unit: mm

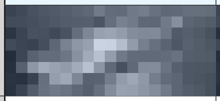
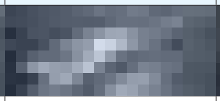
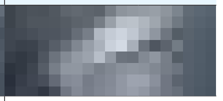
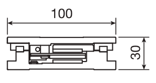
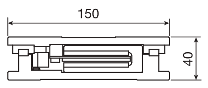
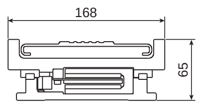
Positioning repeatability	±0.0005～0.0010
Positioning accuracy	–
Lost motion	–
Parallelism in table motion A	–
Parallelism in table motion B	–
Attitude accuracy	–
Straightness	–
Backlash	–

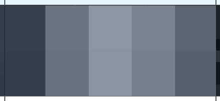
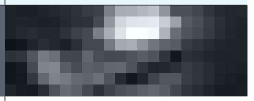
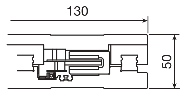
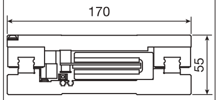
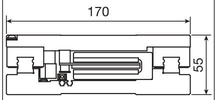
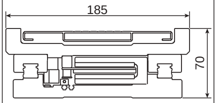
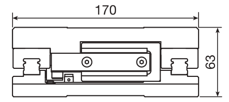
Compact, high thrust, and long stroke LT series!

Linear Motor Table LT is a compact and high-precision positioning table with an optical linear encoder built in and with AC linear servomotor incorporated between moving table and bed. Lightweight moving table and large thrust force enables the operation of high acceleration / deceleration and high response. And, the advanced servo technology achieves high static stability and speed stability.

Three types, consisting of Compact type LT···CE, Long stroke type LT···LD, and High thrust type LT···H, are listed on lineup, which allows customers to select the most suitable model depending on the usage.

Linear Motor Table LT specification list

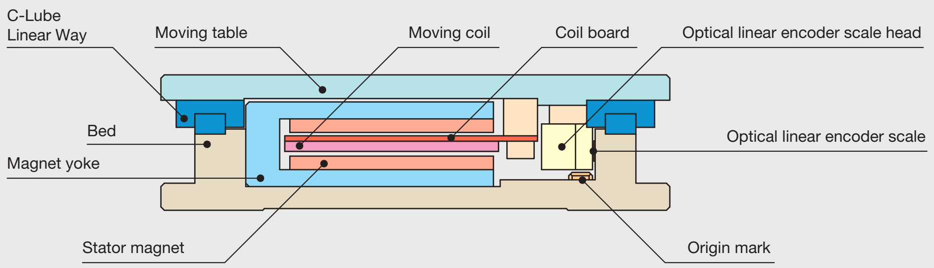
Model and size		Compact type LT···CE								
		LT100CEG			LT150CEG			LT150CETF		
										
Thrust / speed specification		High thrust specification			High thrust specification 1			High thrust specification 2		
Sectional shape										
Maximum thrust	N	120			350			390		
Rated thrust	N	15			60			70		
Maximum load mass	kg	12			35			39		
Effective stroke length	mm	1000			1200			1200		
Resolution	μm	0.1	0.5	1.0	0.1	0.5	1.0	0.1	0.5	1.0
Maximum speed	mm/s	700	2000	2000	700	2000	2000	700	2000	2000
Positioning repeatability	μm	±0.5	±0.5	±1.0	±0.5	±0.5	±1.0	±0.5	±0.5	±1.0

Model and size		Long stroke type LT···LD												High thrust type LT···H		
		LT130LDG			LT170LDG			LT170LDV			LT170LDTF			LT170H		
																
Thrust / speed specification		High thrust specification			High thrust specification 1			High speed specification			High thrust specification 2			—		
Sectional shape																
Maximum thrust	N	120			350			145			390			900		
Rated thrust	N	15			60			25			70			Natural air cooling : 120 Air cooling : 150		
Maximum load mass	kg	12			35			20			39			90		
Effective stroke length	mm	2760			2720			2720			1640			2670		
Resolution	μm	0.1	0.5	1.0	0.1	0.5	1.0	0.1	0.5	1.0	0.1	0.5	1.0	0.1	0.5	1.0
Maximum speed	mm/s	700	2000	3000	700	2000	2000	700	2000	3000	700	2000	2000	700	1500 (2000)	1500 (2000)
Positioning repeatability	μm	±0.5	±0.5	±1.0	±0.5	±0.5	±1.0	±0.5	±0.5	±1.0	±0.5	±0.5	±1.0	±0.5	±0.5	±1.0

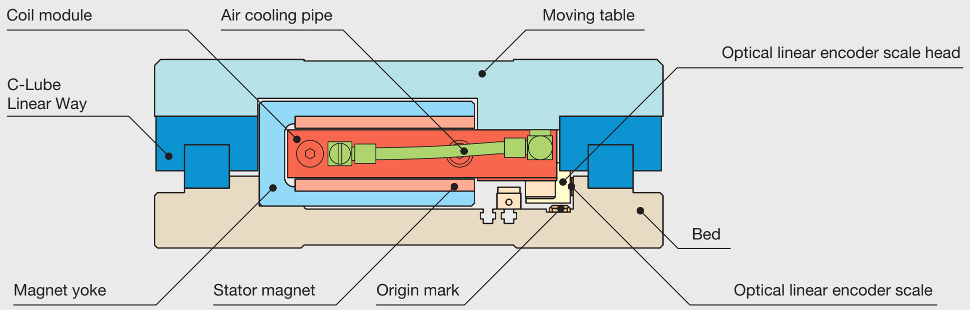
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Sectional Structure of Linear Motor Table LT

Structures of LT···CE and LT···LD



Structure of LT···H

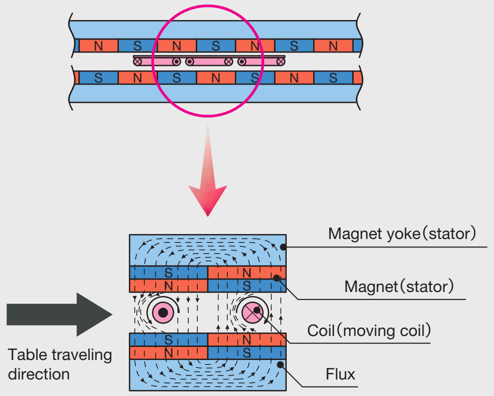


Operating principle of Linear Motor Table LT

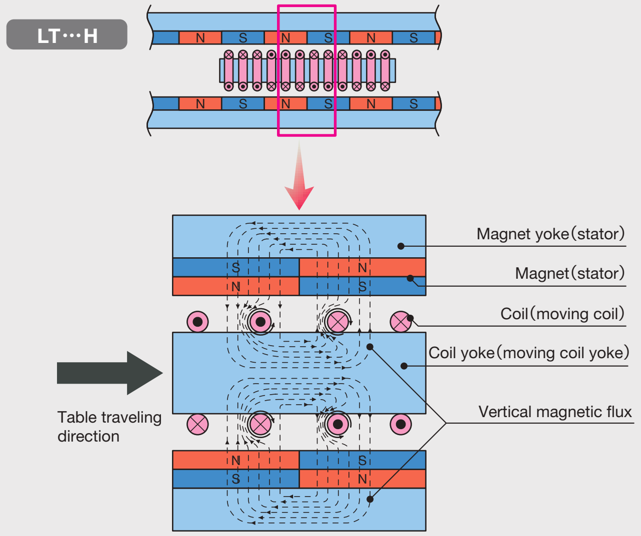
Linear Motor Table LT consists of moving field coil and stator having a magnet arranged facing the inside of C-type yoke. Magnetic flux vertically exerted by magnet and rotational flux generated around the coil by electric current causes the coil to be forced horizontally. (Fleming's left-hand rule)

By switching the coil current to certain direction corresponding to the flux direction, continuous thrust force in a certain direction can be obtained and linear motions of the rotator is maintained. In the High Thrust Series, as the coils are densely arranged in vertical magnetic flux generated by a pair of coil yokes arranged one above the other, it can produce extremely high thrust force although it is small.

LT···CE and LT···LD

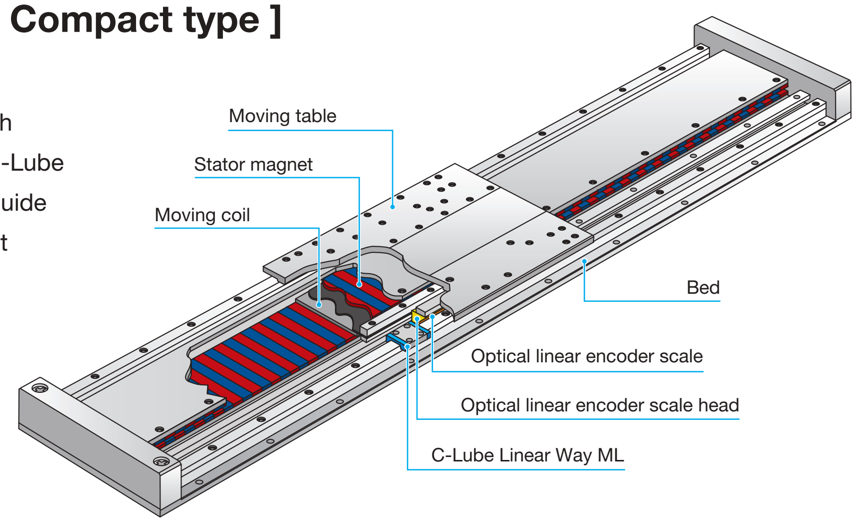


LT···H



LT···CE [Compact type]

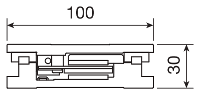
LT···CE is a compact linear motor table with high thrust force generating capability, which uses C-Lube Linear Way ML, miniature linear motion rolling guide in the table guiding parts and adopts lightweight aluminum alloy in the moving table.



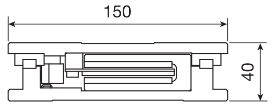
Points

1 Compact

Low profile design with downsizing thoroughly pursued by adopting C-Lube Linear Way ML and small optical linear encoder. Minimum sectional height of 30mm (LT100CE) is achieved.



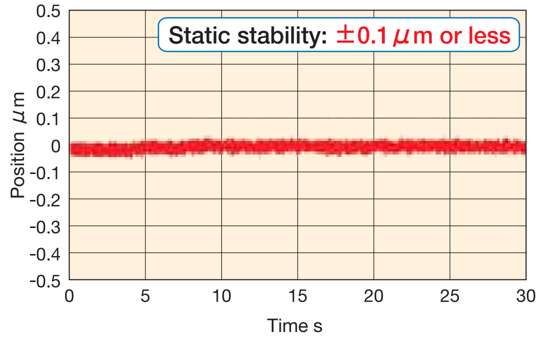
LT100CE



LT150CE

2 Static stability

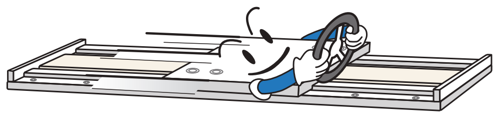
Advanced servo technology has achieved high static stability.

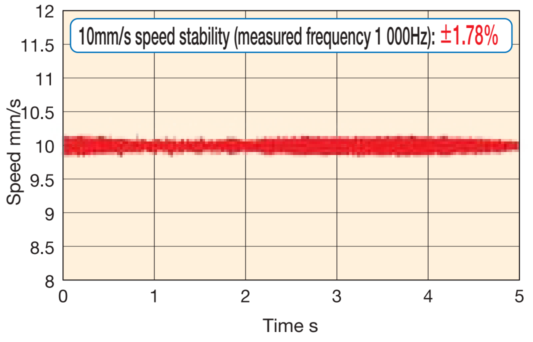


* Value when using ADVA driver.

3 High speed stability

Direct drive and advanced servo technology has achieved high speed stability.

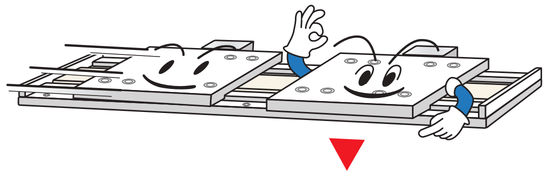




* Value when using ADVA driver.

4 High acceleration / deceleration and high response

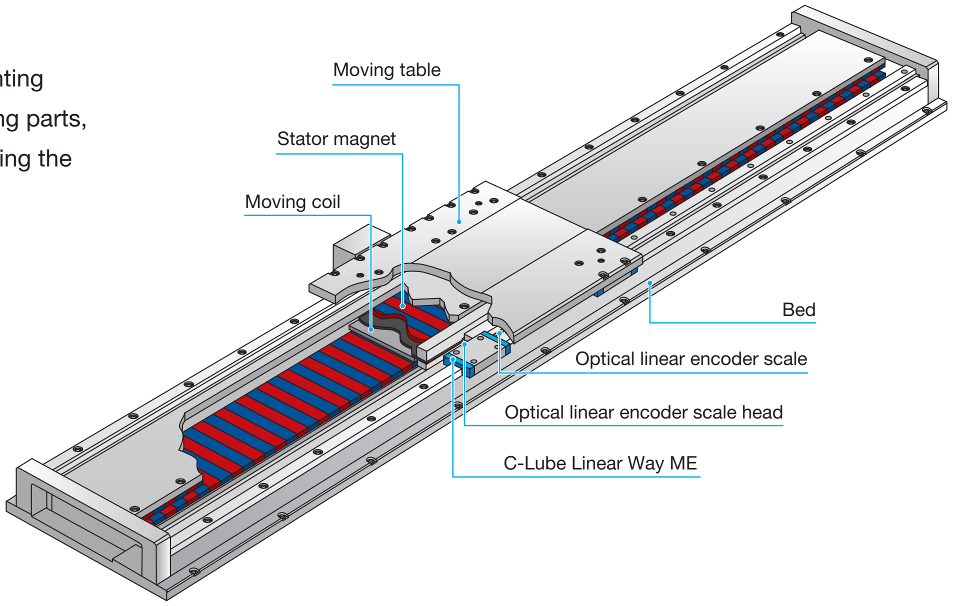
This unit is small but can produce a great thrust force. Aluminum alloy-made and lightweight moving table has achieved the positioning by high acceleration / deceleration and high response. It contributes to shortening of tact time.



1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

LT···LD [Long stroke type]

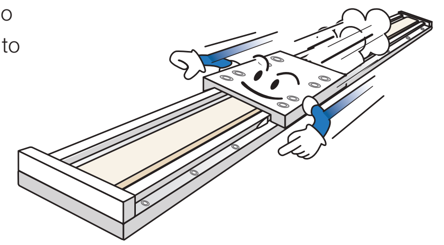
Using C-Lube Linear Way ME of the jointing specification track rail in the table guiding parts, the LT···LD is a linear motor table enabling the long stroke and high-speed operation.

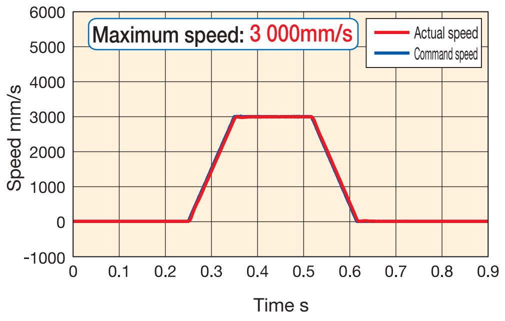


Points

1 ● High speed

Direct drive enables both high-precision positioning and high speed. Supports high speed operation required for long stroke motion. It is possible to perform high-speed motion of up to 3,000mm/s.

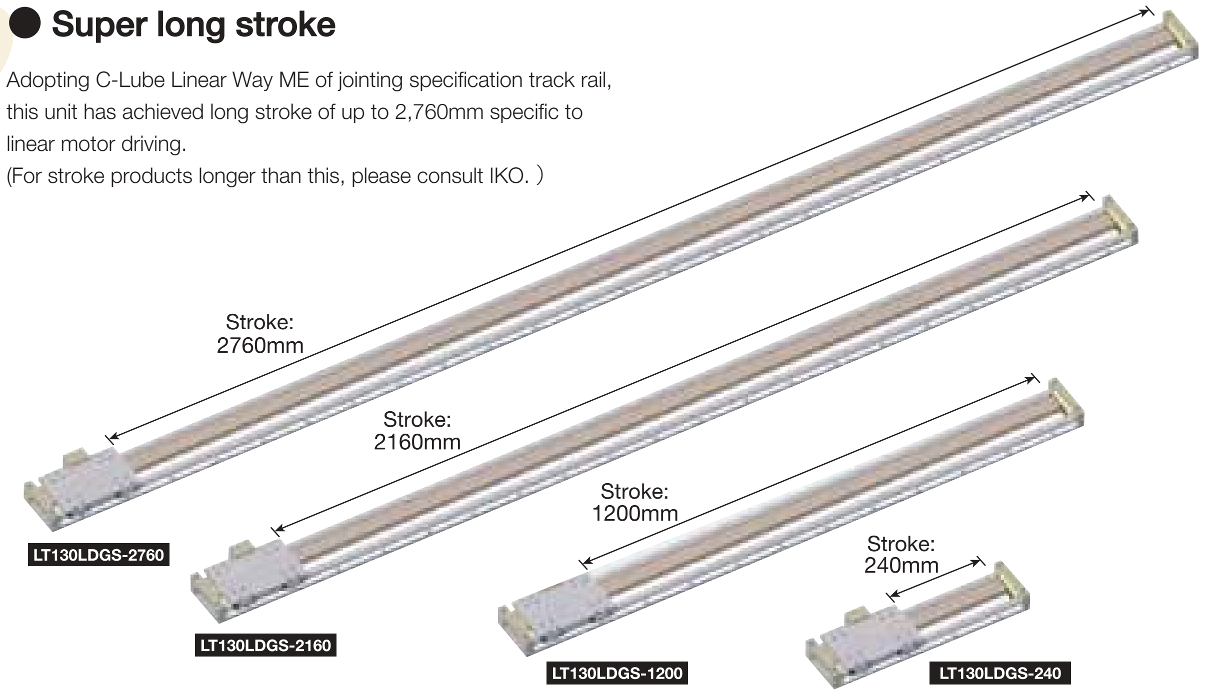




∗ Value when using ADVA driver.

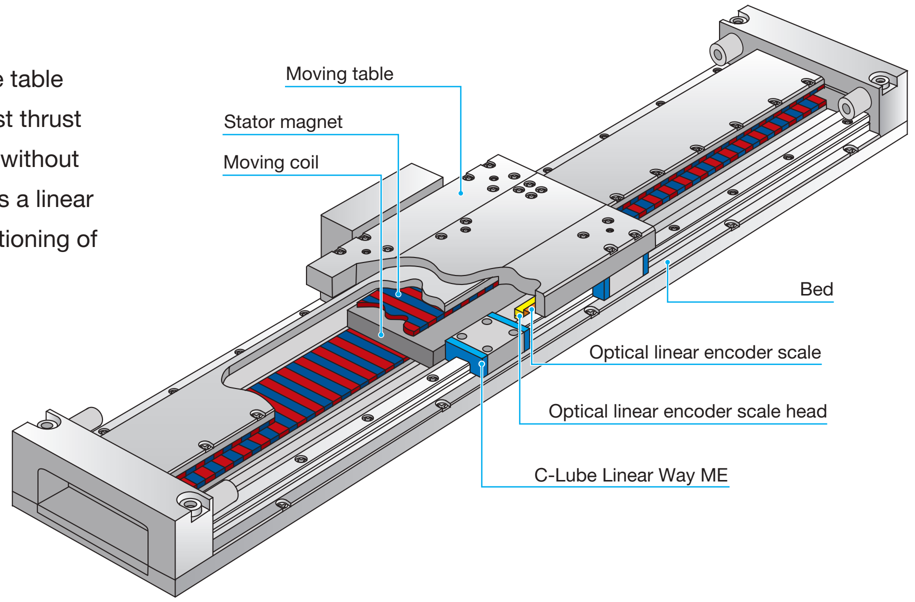
2 ● Super long stroke

Adopting C-Lube Linear Way ME of jointing specification track rail, this unit has achieved long stroke of up to 2,760mm specific to linear motor driving.
(For stroke products longer than this, please consult IKO.)



LT···H [High thrust type]

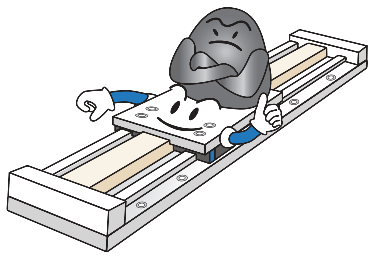
LT···H uses C-Lube Linear Way ME in the table guiding parts and can produce the biggest thrust force among Linear Motor Table LT units without impairing the compact feature, so that it is a linear motor table best suited for precision positioning of a heavy load.

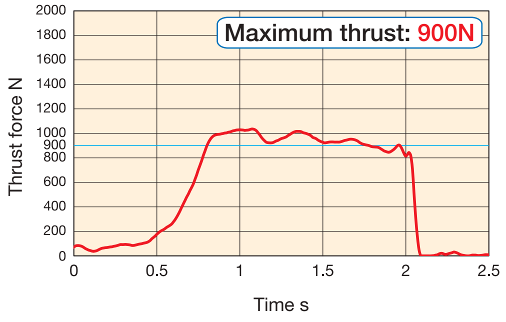


Points

1 ● High thrust

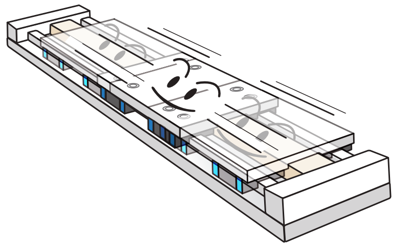
Although this table is compact in shape, it can produce maximum thrust force of 900N. This unit is best suited to the precision positioning of heavy load.

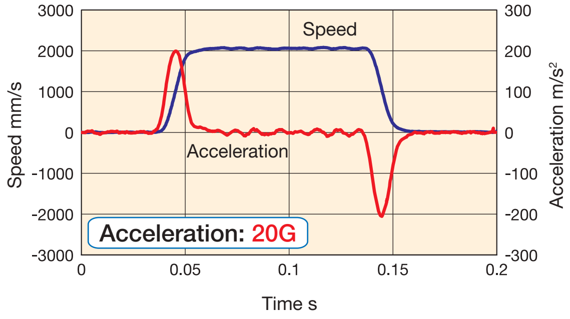




2 ● High acceleration / deceleration

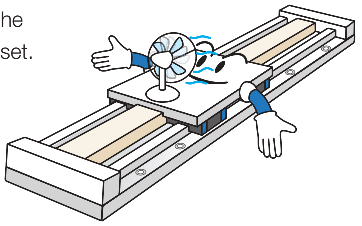
Lightweight table and high thrust have achieved high acceleration / deceleration and high response.

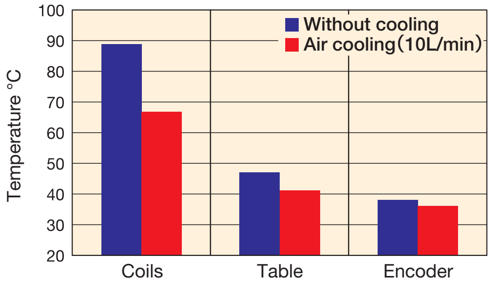




3 ● Air cooling

Cooling mechanism for suppressing the heating of motor section is optionally set. It enables shortening of tact time and contributes to improving the production efficiency.





Cooling effect by LT170H at effective thrust force 120N

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Identification Number

Example of an Identification Number

1 2 1 3 4 5 6 7 8 9 10 11

LT 100 CE G F - 430 / 5 __ D SC T2 1

1	**Model**	Page Ⅱ-309
2	**Size**	Page Ⅱ-309
3	**Specification of thrust and speed**	Page Ⅱ-309
4	**Shape of moving table**	Page Ⅱ-310
5	**Stroke length**	Page Ⅱ-310
6	**Resolution**	Page Ⅱ-310
7	**Cooling type**	Page Ⅱ-310
8	**Designation of cover**	Page Ⅱ-310
9	**Designation of sensor**	Page Ⅱ-310
10	**Specification of moving table**	Page Ⅱ-310
11	**Specification number**	Page Ⅱ-310

Identification Number and Specification

1 Model

LT···CE: Linear Motor Table LT compact series
LT···LD: Linear Motor Table LT long stroke series
LT···H : Linear Motor Table LT high thrust series

2 Size

100: Width 100mm (applicable to LT···CE)
150: Width 150mm (applicable to LT···CE)

130: Width 130mm (applicable to LT···LD)
170: Width 170mm (applicable to LT···LD and LT···H)

3 Specification of thrust and speed

G : High thrust (high speed) specification 1
T : High thrust (high speed) specification 2
V : High speed specification
No symbol

For application of respective specifications, please see Table 1.

When selecting T, select F in the entry of section 4 Shape of moving table.

Table 1 Application of thrust force and speed symbols

Model	Size	Thrust / speed specification			
		G	T	V	No symbol
LT···CE	100	○	–	–	–
	150	○	○(1)	–	–
LT···LD	130	○	–	–	–
	170	○	○(1)	○	–
LT···H	170	–	–	–	○

Note (1) Applicable only for type with flange.

4 Shape of moving table

S: Standard
F: With flange

When selecting S, set "No symbol" in the entry of section 8 "Designation of cover".
When selecting F, select D in the entry of section 8 "Designation of cover".

5 Stroke length

Select a stroke length from the list of Table 2.

Table 2 Stroke length

Model and size	Stroke length mm
LT100CEG(S, F)	200, 400, 600, 800, 1 000
LT100CEG(S, F)···/T2	230, 430, 630, 830
LT150CEG(S, F)	400, 600, 800, 1 000, 1 200
LT150CEG(S, F)···/T2	350, 550, 750, 950
LT150CETF	400, 600, 800, 1 000, 1 200
LT150CETF···/T2	350, 550, 750, 950
LT130LDGS	240, 720, 1 200, 1 680, 2 160, 2 640, 2 760
LT130LDGS···/T2	500, 980, 1 460, 1 940, 2 420, 2 540
LT130LDGF	240, 720, 1 200, 1 680
LT130LDGF···/T2	500, 980, 1 460
LT170LD(G, V)S	680, 1 160, 1 640, 2 120, 2 600, 2 720
LT170LD(G, V)S···/T2	420, 900, 1 380, 1 860, 2 340, 2 460
LT170LD(G, T, V)F	680, 1 160, 1 640
LT170LD(G, T, V)F···/T2	420, 900, 1 380
LT170HS	650, 1 130, 1 610, 2 090, 2 570, 2 670
LT170HS···T2	410, 890, 1 370, 1 850, 2 330, 2 430
LT170HF	650, 1 130, 1 610
LT170HF···T2	410, 890, 1 370

6 Resolution

1: 0.1 μm
5: 0.5 μm
10: 1.0 μm

7 Cooling type

No symbol : Natural air cooling
CA : Air cooling (applicable to LT···H)

8 Designation of cover

No symbol : Without cover (applicable to standard moving table)
D : With cover (applicable to moving table with flange)

9 Designation of sensor

No symbol : Without sensor
SC : Sensor (limit and pre-origin), with sensor rail (applicable to LT···CE)

LT···LD and LT···H have a sensor built-in. For the entry of section 9, set "No symbol".

10 Specification of moving table

No symbol : Single table
T2 : Twin table

11 Specification number

1 : Specification number 1

The specification number is limited to 1.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Specifications

Table 3 LT···CE performance

Model and size / Item		LT100CEG			LT150CEG			LT150CETF		
Maximum thrust (1)	N	120			350			390		
Rated thrust	N	15			60			70		
Maximum load mass	kg	12			35			39		
Resolution	μm	0.1	0.5	1.0	0.1	0.5	1.0	0.1	0.5	1.0
Maximum speed (2)	mm/s	700	2 000	2 000	700	2 000	2 000	700	2 000	2 000
Positioning repeatability (3)	μm	±0.5	±0.5	±1.0	±0.5	±0.5	±1.0	±0.5	±0.5	±1.0

Notes (1) The duration of maximum thrust is up to 1 second.

(2) This maximum speed may not be reached depending on the maximum output frequency of the controller used, and the driver type or settings.

(3) When the temperature of the product is constant.

Table 4 LT···LD performance

Model and size / Item		LT130LDG			LT170LDG			LT170LDV			LT170LDTF		
Maximum thrust (1)	N	120			350			145			390		
Rated thrust	N	15			60			25			70		
Maximum load mass	kg	12			35			20			39		
Resolution	μm	0.1	0.5	1.0	0.1	0.5	1.0	0.1	0.5	1.0	0.1	0.5	1.0
Maximum speed (2)	mm/s	700	2 000	3 000	700	2 000	2 000	700	2 000	3 000	700	2 000	2 000
Positioning repeatability (3)	μm	±0.5	±0.5	±1.0	±0.5	±0.5	±1.0	±0.5	±0.5	±1.0	±0.5	±0.5	±1.0

Notes (1) The duration of maximum thrust is up to 1 second.

(2) This maximum speed may not be reached depending on the maximum output frequency of the controller used, and the driver type or settings.

(3) When the temperature of the product is constant.

Table 5 LT···H performance

Model and size / Item			LT170H		
Maximum thrust (1)		N	900		
Rated thrust (2)	Natural air cooling	N	120		
	Air cooling (3)	N	150		
Maximum load mass		kg	90		
Resolution		μm	0.1	0.5	1.0
Maximum speed (4) (5)		mm/s	700	1 500(2 000)	1 500(2 000)
Positioning repeatability (6)		μm	±0.5	±0.5	±1.0

Notes (1) The duration of maximum thrust is up to 1 second.

(2) In the case where the unit is fixed on a steel-made cradle under ambient temperature of 0 to 25℃. For more information, please see Fig. 12 on page Ⅱ-314.

(3) This is under air flow rate of 30NL/min.

(4) For the speed exceeding 1,500mm/s, please contact IKO.

(5) This maximum speed may not be reached depending on the maximum output frequency of the controller used, and the driver type or settings.

(6) When the temperature of the product is constant.

■ Thrust characteristics of LT···CE

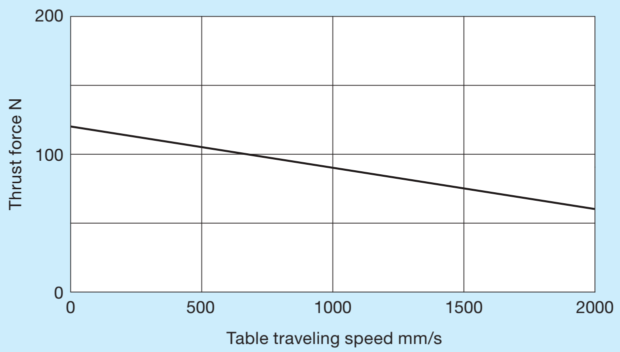


Fig.1 Thrust characteristics of LT100CEG

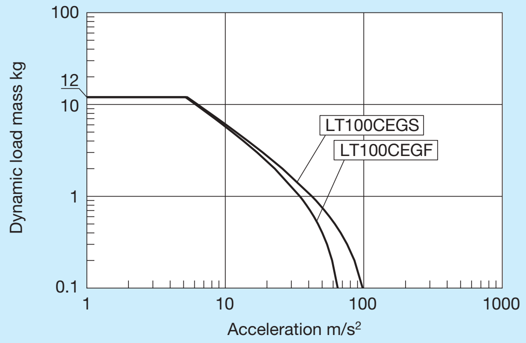


Fig. 2 Dynamic load mass of LT100CEG

Remark: These are values calculated based on the thrust force with table moving speed set to 1,000mm/s.

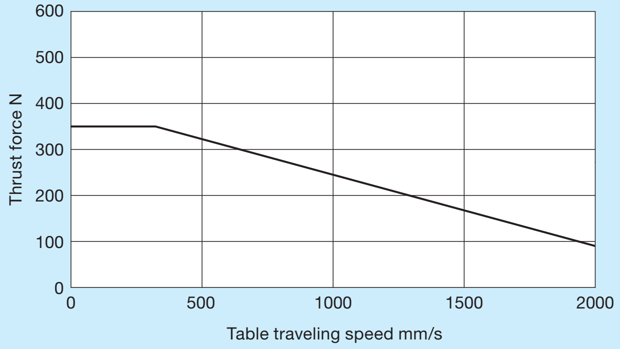


Fig. 3 Thrust characteristics of LT150CEG

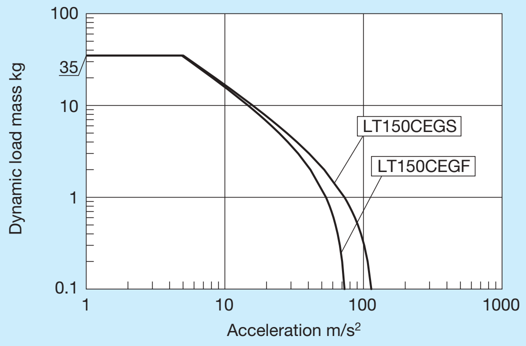


Fig.4 Dynamic load mass of LT150CEG

Remark: These are values calculated based on the thrust force with table moving speed set to 1,000mm/s.

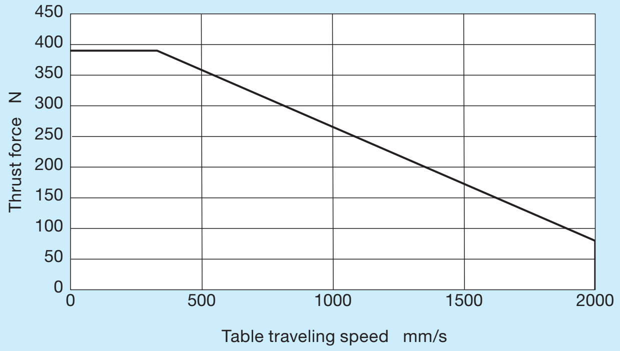


Fig.5 Thrust characteristics of LT150CETF

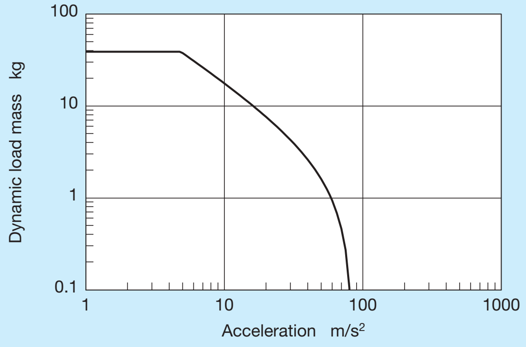


Fig.6 Dynamic load mass of LT150CETF

Remark: These are values calculated based on the thrust force with table moving speed set to 1,000mm/s.

Thrust characteristics of LT･･･LD

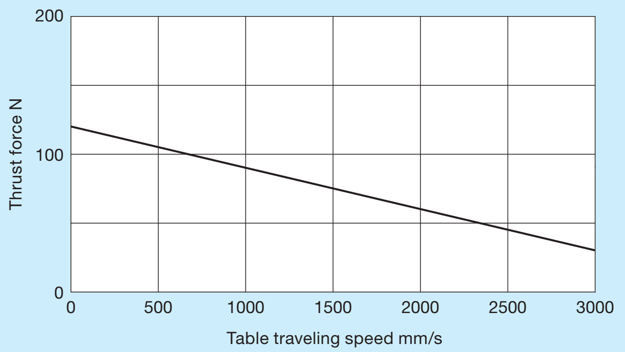


Fig. 7 Thrust characteristics of LT130LDG

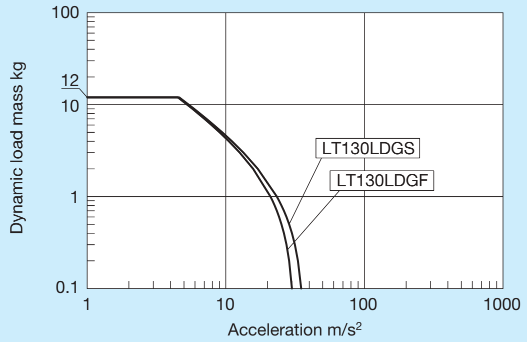


Fig. 8 Dynamic load mass of LT130LDG

Remark: These are values calculated based on the thrust force with table moving speed set to 1,000mm/s.

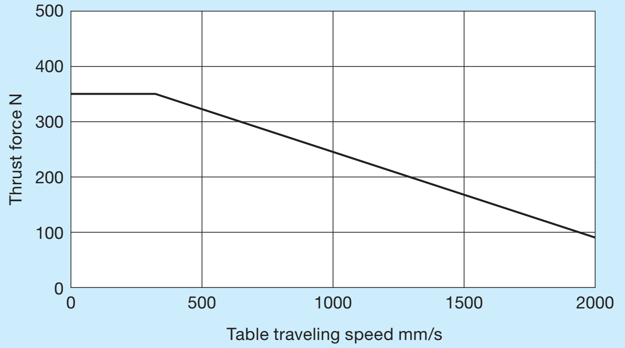


Fig. 9 Thrust characteristics of LT170LDG

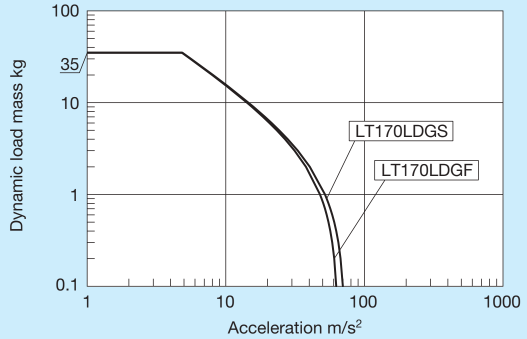


Fig. 10 Dynamic load mass of LT170LDG

Remark: These are values calculated based on the thrust force with table moving speed set to 1,000mm/s.

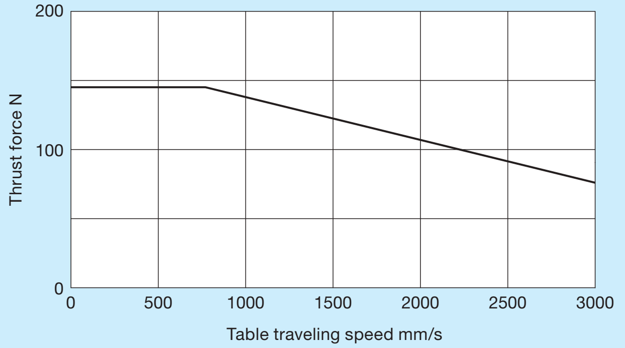


Fig. 11 Thrust characteristics of LT170LDV

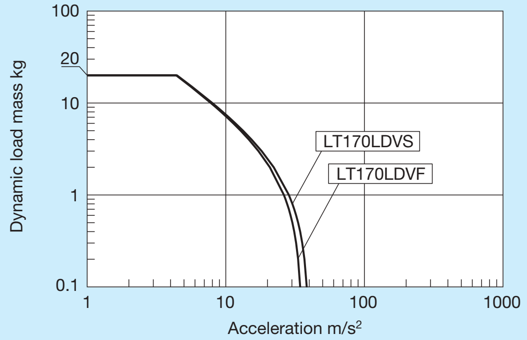


Fig. 12 Dynamic load mass of LT170LDV

Remark: These are values calculated based on the thrust force with table moving speed set to 1,000mm/s.

Thrust characteristics of LT･･･LD

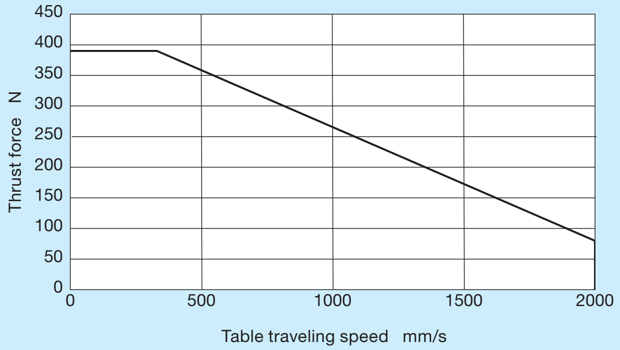


Fig.13 Thrust characteristics of LT170LDTF

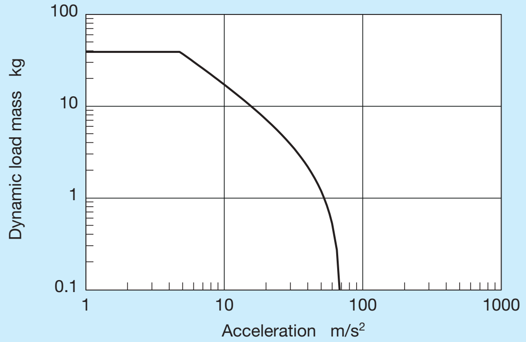


Fig.14 Dynamic load mass of LT170LDTF

Remark: These are values calculated based on the thrust force with table moving speed set to 1,000mm/s.

Thrust characteristics of LT･･･H

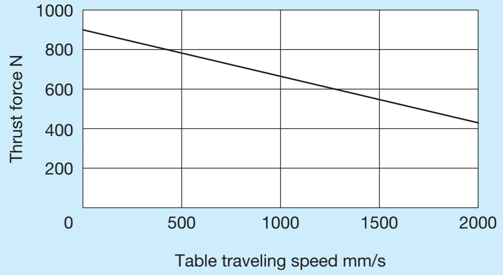


Fig. 15 Trust characteristics of LT170H

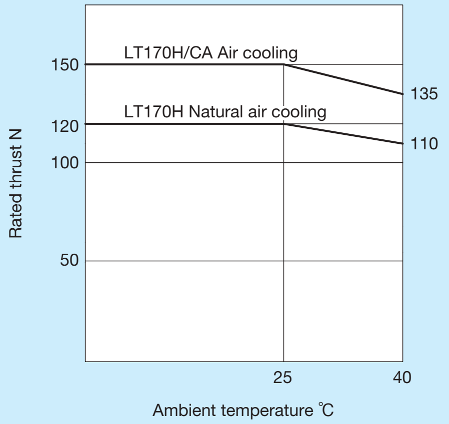


Fig. 16 Rated thrust characteristics of LT170H

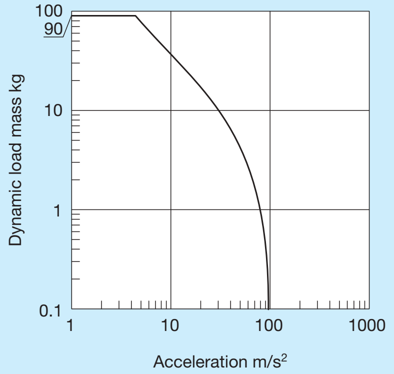


Fig. 17 Dynamic load mass of LT170H

Remark: These are values calculated based on the thrust force with table moving speed set to 1,000mm/s.

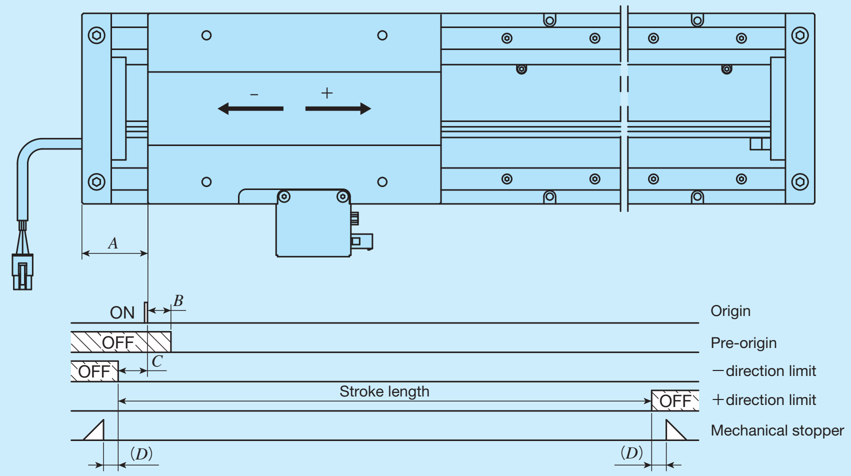
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Mounting

For the processing accuracy of the Precision Positioning Table mounting surface and the tightening torque of the fixing screws, see page Ⅲ-30.

Sensor Specification

Table 6.1 Sensor timing chart for single table of LT···CE, LT···LD, and LT···H

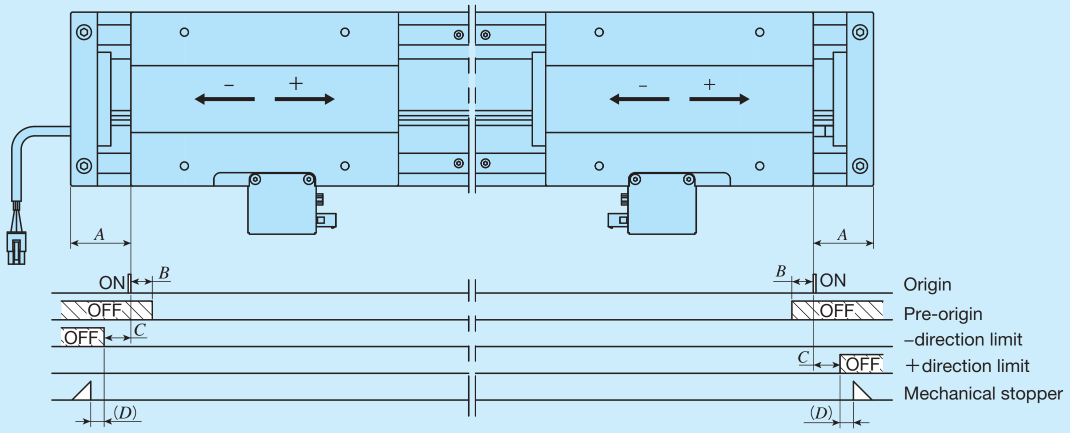


unit: mm

Model and size	*A*	*B* (1)	*C* (1)	*D* (1)
LT100CE···/SC	34	3	5	16
LT150CE···/SC	44	3	5	16
LT130LD	45	3	5	10
LT170LD	44	3	5	9
LT170H	92	3	17	20

Note (1) Respective values are for reference and are not guaranteed values. For detailed dimensions, please contact IKO.
Remark: For the specifications of respective sensors, please see the section of sensor specification in General Explanation.

Table 6.2 Sensor timing chart for twin tables of LT···CE, LT···LD, and LT···H



unit: mm

Model and size	*A*	*B* (1)	*C* (1)	*D* (1)
LT100CE···/SCT2	34	3	5	16
LT150CE···/SCT2	44	3	5	16
LT130LD···/T2	45	3	5	10
LT170LD···/T2	44	3	5	9
LT170H ···/T2	92	3	17	20

Note (1) Respective values are for reference and are not guaranteed values. For detailed dimensions, please contact IKO.
Remark: For the specifications of respective sensors, please see the section of sensor specification in General Explanation.

System Configuration

ADVA is available as a dedicated driver for Linear Motor Table LT; for its system configuration there are two available specification types, pulse train specification and high speed network EtherCAT specification. Table 7 shows an example of identification number for ADVA, and Table 8 shows its system configuration. For detailed ADVA specifications, see the driver specifications on pages Ⅱ-383 to Ⅱ-384.
Please also note that the driver (MR-J4-10B made by Mitsubishi Electric Corporation) compatible with SSCNET III/H and that compatible with MECHATROLINK (Σ-7 Series AC servo amplifier made by Yaskawa Electric Corporation) will be prepared based on usage. If needed, please contact IKO.

Table 7 Identification number for ADVA

ADVA	–	01NL	EC	/	LT100CEG
(1) Model		(2)	(3)		(4)

(2) Power supply voltage/maximum applicable motor capacity	
01NL	Single-phase / Three-phase 200 V, 100 W (Applicable to LT···CE, LT···LD)
08NL	Single-phase / Three-phase 200 V, 750 W (Applicable to LT170H)

(3) Command type	
No symbol	Pulse train command
EC	EtherCAT

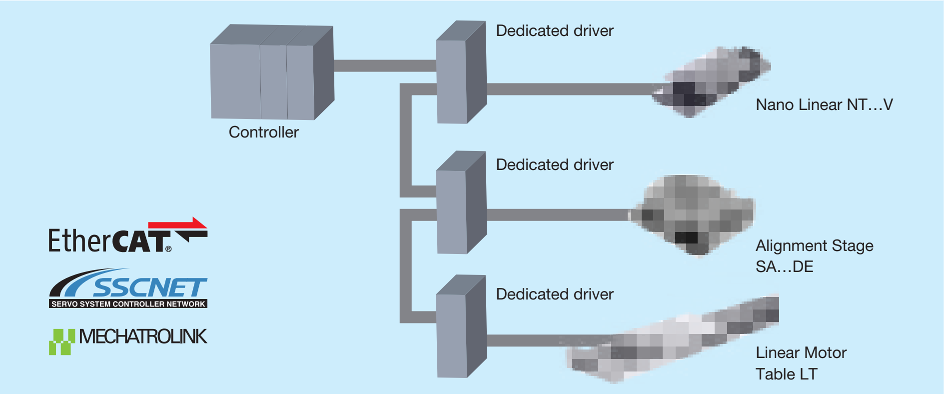
(4) Applicable Linear Motor Table model	
LT100CEG	LT100CEG
LT150CEG	LT150CEG (high thrust specification 1)
LT150CET	LT150CET (high thrust specification 2)
LT130LDG	LT130LDG
LT170LDG	LT170LDG (high thrust specification 1)
LT170LDT	LT170LDT (high thrust specification 2)
LT170LDV	LT170LDV (high speed specification)
LT170H	LT170H

● Setup Software

When operating Linear Motor Table LT through ADVA, initial setting of driver parameters is required. Parameter setting for driver is performed using the setup software. It can also be used for gain adjustment and operational status check.
In the driver, the setup software and PC connection cable are not provided. These can be shared in plural drivers but at least 1 set is required. Please prepare these on your own or place an order separately according to your requirement.

●Motion Network

The ADVA driver for Linear Motor Drive Table LT supports motion network EtherCAT.
Motion network realizes higher performance and higher accuracy of devices free from pulse frequency constraint in pulse train command, noise effects in analog command (voltage command), voltage drop due to cable length and effects of temperature drifting. Reduction of wiring can also be achieved, so synchronization system with more than one table can easily be established.

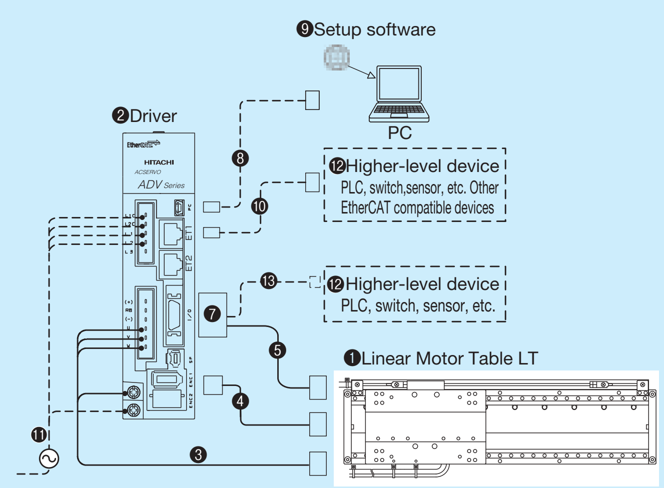


Remark: Please also note that the driver（MR-J4-10B made by Mitsubishi Electric Corporation）compatible with SSCNET Ⅲ/H and that compatible with MECHATROLINK（Σ-7 Series AC servo amplifier made by Yaskawa Electric Corporation） will be prepared based on usage. If needed, please contact IKO.

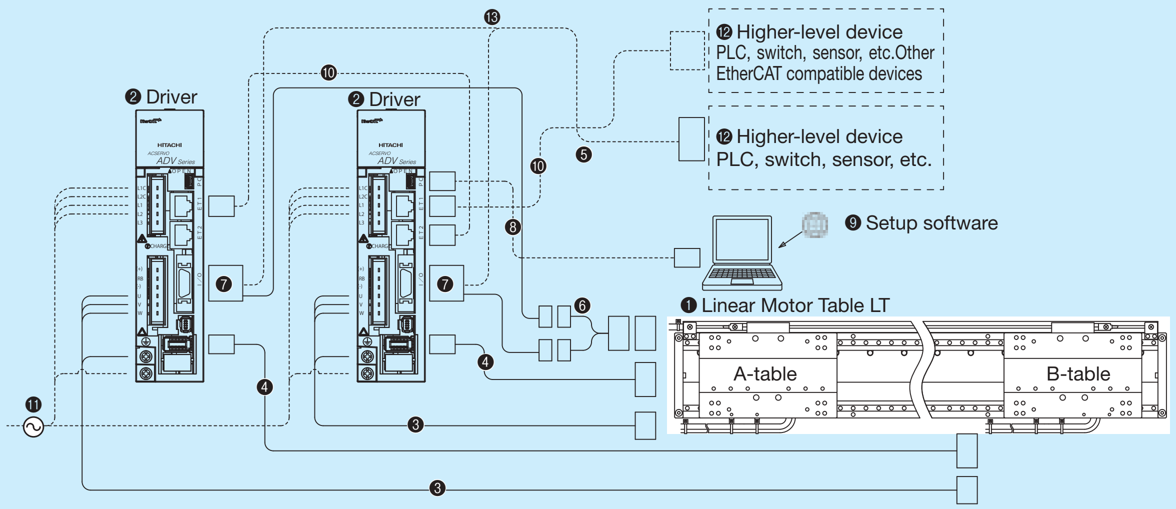
Model	Features
EtherCAT	This is an Ethernet-based open network communication system developed by Beckhoff of Germany, allowing real time control. High speed communication and high accuracy inter-node synchronization provide higher performance and higher accuracy of devices. In addition, Ethernet cables available on the market can be used and various wiring types can be supported.
SSCNET Ⅲ/H	This is a motion network communication system for servo system control developed by Mitsubishi Electric Corporation. It applies the optical fiber cables, so noise immunity is improved relative to conventional SSCNET.
MECHATROLINK	The open field network communication that connects the controller and various components. Developed by Yaskawa Electric Corporation and managed by MECHATROLINK Members Association.

Table 8 System configuration for LT with driver ADVA (···EC)

● Example of system configuration for single table



● Example of system configuration for twin table

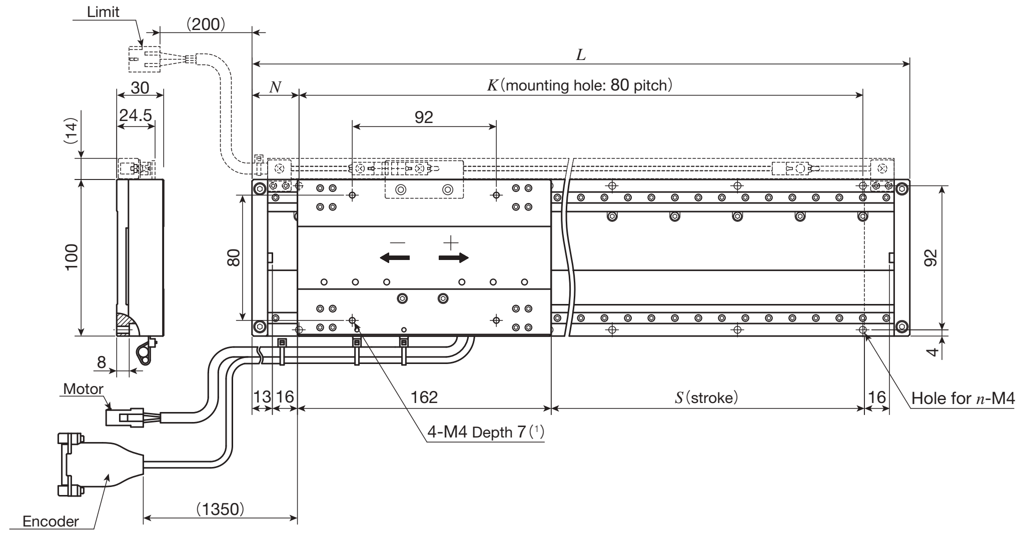


No.	Name	Identification number
❶	Linear motor table	Please see pages of Ⅱ-318 to Ⅱ-328.
❷	Driver	Please see Table 7 to select suitable driver for Linear Motor Table model.
❸	Motor extension cord	TAE20V7-AM□□ (applicable to LT···CE, LT···LD) TAE20V9-AM□□ (applicable to LT···H)
❹	Encoder extension cord	TAE20V8-EC□□ (applicable to LT···CE, LT···LD) TAE20W0-EC□□ (applicable to LT···H)
❺	Sensor extension cord (3)	TAE10V8-LC□□
❻	Limit branch cord (0.1m)	TAE20V2-BC
❼	I/O connector	TAE20R5-CN (1) (applicable to driver for pulse train command) TAE20V5-CN (2) (applicable to driver for EtherCAT)
❽	PC connection cable	USB mini B cable This must be prepared by customer.
❾	Setup software	ProDriveNext Please download from the official website of Hitachi Industrial Equipment Systems Co., Ltd.
❿	Ethernet cable	This must be prepared by customer.
⓫	Power cord	
⓬	Higher-level device	
⓭	I/O connector connection cable	

Note (1) I/O connector TAE20R5-CN is a combined product of 10150-3000PE (connector) and 10350-52F0-008 (cover) from 3M Japan Limited.
(2) I/O connector TAE20V5-CN is a combined product of 10120-3000PE (connector) and 10320-52F0-008 (cover) from 3M Japan Limited.
(3) Signal lines #9 and #11 of the sensor extension cord for the B-table are not in use.

Remark The lengths of motor extension cord, encoder extension cord, and sensor extension cord are specified in the □□ located at the end of the identification number for length of 3 to 10m in units of 1m.
The cord length is specified in two digits even when the length is less than 10m. (For 3m: TAE20V7-AM03)

LT100CEGS Single table



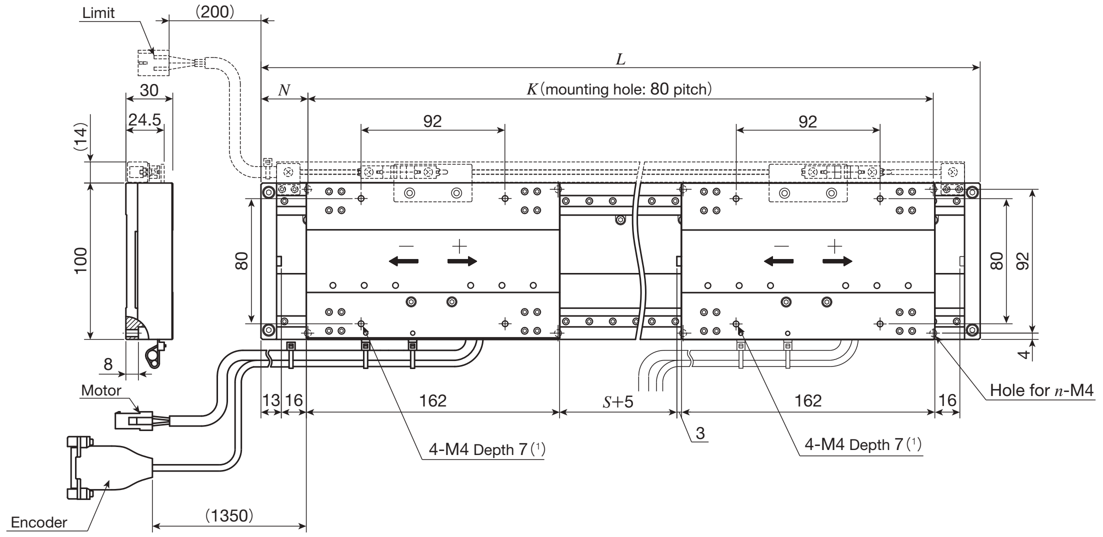
unit: mm

Identification number	Stroke length S(2)	Overall length L	Mounting holes of bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT100CEGS- 200	200	420	50	320	10	4.9	0.58
LT100CEGS- 400	400	620	30	560	16	6.9	
LT100CEGS- 600	600	820	50	720	20	9.0	
LT100CEGS- 800	800	1 020	30	960	26	11.1	
LT100CEGS-1000	1 000	1 220	50	1 120	30	13.1	

Notes (1) Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the through hole.
(2) For other stroke lengths, please contact IKO.

Remark: Dashed line portions in the dimensional figures indicate the sensor-included specification / SC.

LT100CEGS/T2 Twin table



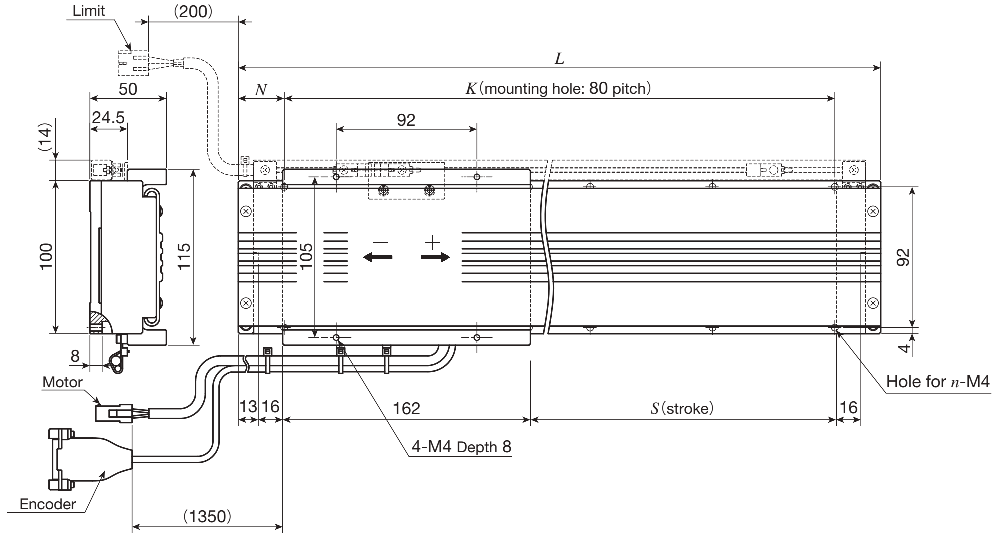
unit: mm

Identification number	Stroke length S(2)	Overall length L	Mounting holes of bed			Total mass of table kg	Mass of moving table kg
			N	K	n		
LT100CEGS-230/T2	230	620	30	560	16	7.5	0.58
LT100CEGS-430/T2	430	820	50	720	20	9.6	
LT100CEGS-630/T2	630	1 020	30	960	26	11.7	
LT100CEGS-830/T2	830	1 220	50	1 120	30	13.7	

Notes (1) Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the through hole.
(2) For other stroke lengths, please contact IKO.

Remark: Dashed line portions in the dimensional figures indicate the sensor-included specification / SC.

LT100CEGF/D Single table with cover



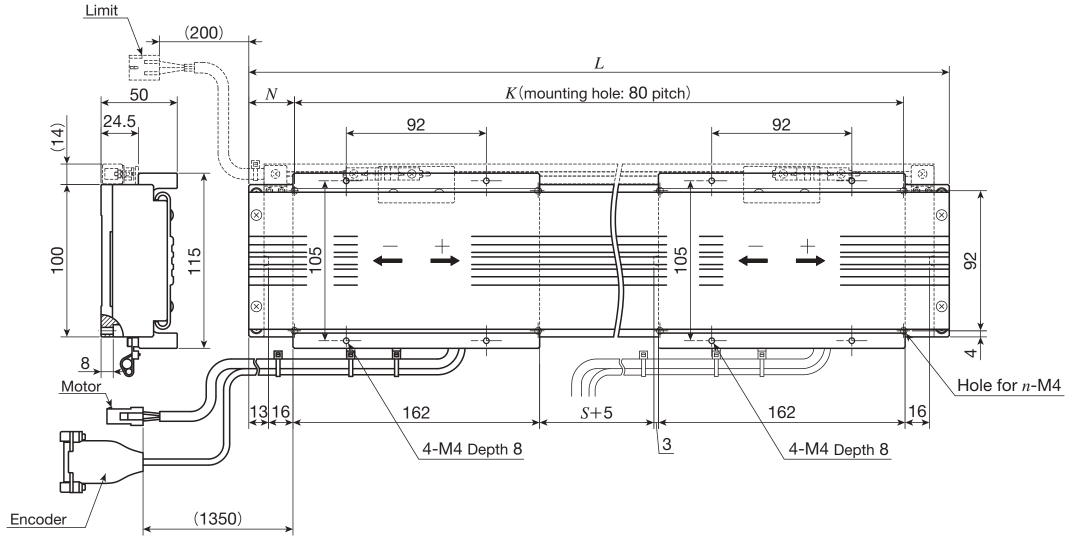
unit: mm

Identification number	Stroke length S(1)	Overall length L	Mounting holes of bed N	K	n	Total mass of table kg	Mass of moving table kg
LT100CEGF- 200/D	200	420	50	320	10	5.6	0.93
LT100CEGF- 400/D	400	620	30	560	16	7.8	
LT100CEGF- 600/D	600	820	50	720	20	10.0	
LT100CEGF- 800/D	800	1 020	30	960	26	12.2	
LT100CEGF-1000/D	1 000	1 220	50	1 120	30	14.4	

Note (1) For other stroke lengths, please contact IKO.

Remark: Dashed line portions in the dimensional figures indicate the sensor-included specification / SC.

LT100CEGF/DT2 Twin table with cover



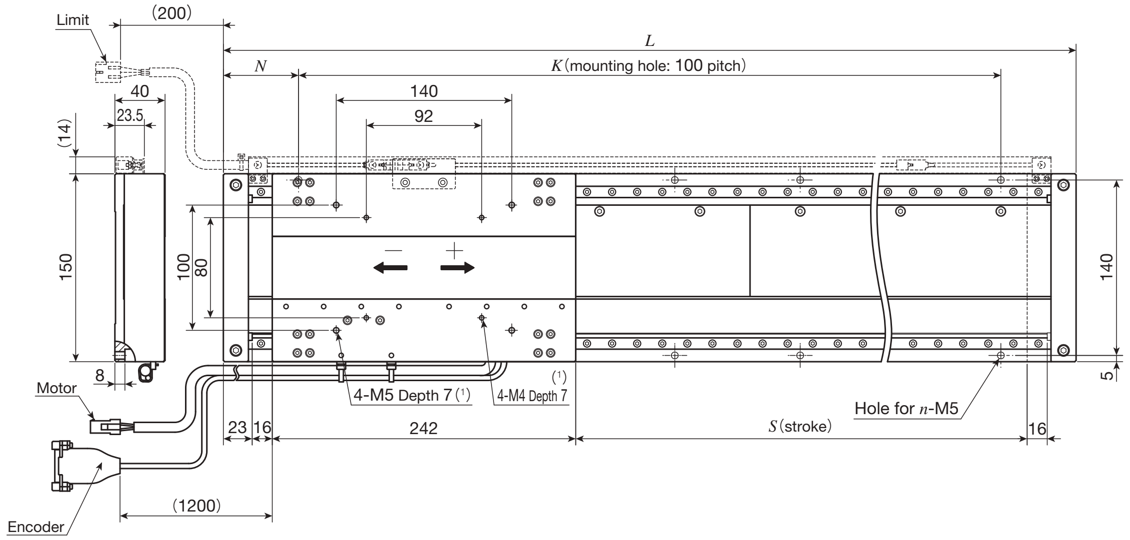
unit: mm

Identification number	Stroke length S(1)	Overall length L	Mounting holes of bed N	K	n	Total mass of table kg	Mass of moving table kg
LT100CEGF-230/DT2	230	620	30	560	16	8.7	0.93
LT100CEGF-430/DT2	430	820	50	720	20	10.9	
LT100CEGF-630/DT2	630	1 020	30	960	26	13.2	
LT100CEGF-830/DT2	830	1 220	50	1 120	30	15.4	

Note (1) For other stroke lengths, please contact IKO.

Remark: Dashed line portions in the dimensional figures indicate the sensor-included specification / SC.

LT150CEGS Single table



unit: mm

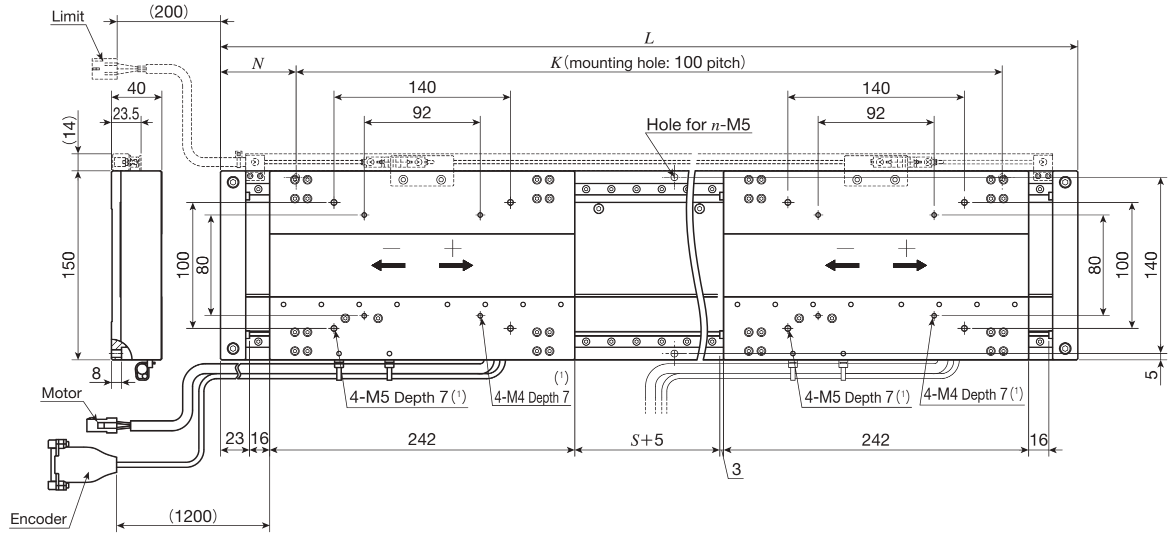
Identification number	Stroke length S(2)	Overall length L	Mounting holes of bed N	K	n	Total mass of table kg	Mass of moving table kg
LT150CEGS- 400	400	720	60	600	14	12.4	1.5
LT150CEGS- 600	600	920	60	800	18	15.5	
LT150CEGS- 800	800	1 120	60	1 000	22	18.6	
LT150CEGS-1000	1 000	1 320	60	1 200	26	21.6	
LT150CEGS-1200	1 200	1 520	60	1 400	30	24.7	

Notes (1) Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the through hole.

(2) For other stroke lengths, please contact IKO.

Remark: Dashed line portions in the dimensional figures indicate the sensor-included specification / SC.

LT150CEGS/T2 Twin table



unit: mm

Identification number	Stroke length S(2)	Overall length L	Mounting holes of bed N	K	n	Total mass of table kg	Mass of moving table kg
LT150CEGS-350/T2	350	920	60	800	18	17.0	1.5
LT150CEGS-550/T2	550	1 120	60	1 000	22	20.1	
LT150CEGS-750/T2	750	1 320	60	1 200	26	23.1	
LT150CEGS-950/T2	950	1 520	60	1 400	30	26.2	

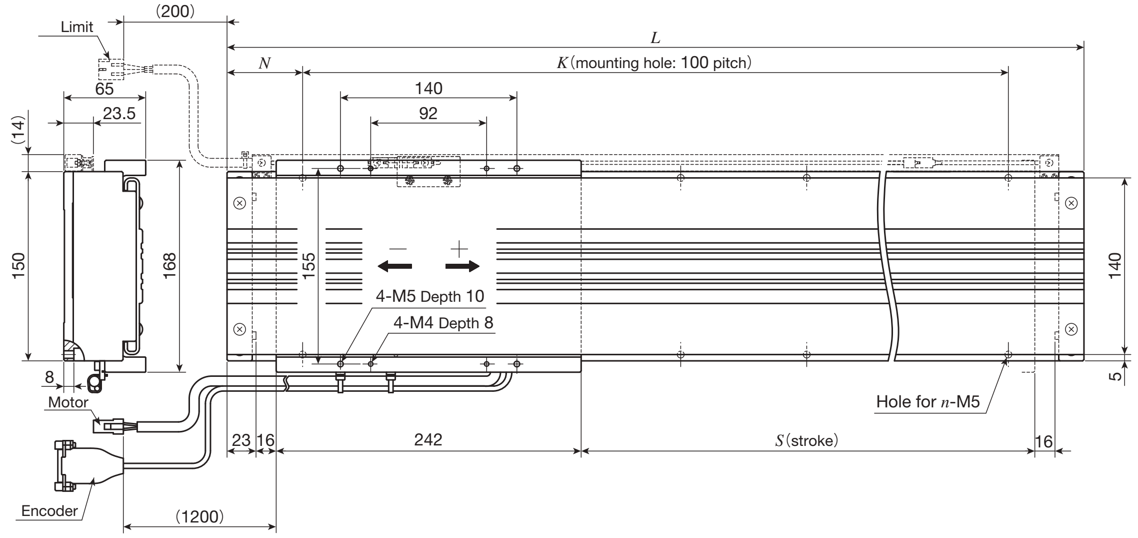
Notes (1) Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the through hole.

(2) For other stroke lengths, please contact IKO.

Remark: Dashed line portions in the dimensional figures indicate the sensor-included specification / SC.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

LT150CEGF/D Single table with cover / High thrust specification 1
LT150CETF/D Single table with cover / High thrust specification 2



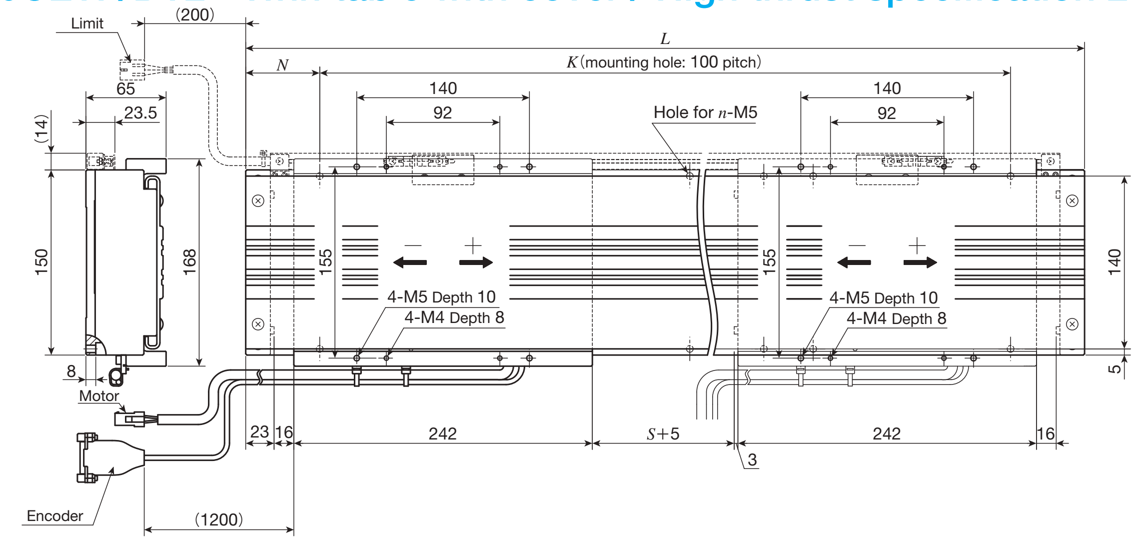
unit: mm

Identification number	Stroke length S(1)	Overall length L	Mounting holes of bed N	K	n	Total mass of table kg	Mass of moving table kg
LT150CEGF- 400/D	400	720	60	600	14	14.8	2.4
LT150CEGF- 600/D	600	920	60	800	18	18.1	
LT150CEGF- 800/D	800	1 120	60	1 000	22	21.5	
LT150CEGF-1000/D	1 000	1 320	60	1 200	26	24.8	
LT150CEGF-1200/D	1 200	1 520	60	1 400	30	28.2	
LT150CETF- 400/D	400	720	60	600	14	15.3	
LT150CETF- 600/D	600	920	60	800	18	18.7	
LT150CETF- 800/D	800	1 120	60	1 000	22	22.5	
LT150CETF-1000/D	1 000	1 320	60	1 200	26	25.7	
LT150CETF-1200/D	1 200	1 520	60	1 400	30	29.2	

Note (1) For other stroke lengths, please contact IKO.

Remark: Dashed line portions in the dimensional figures indicate the sensor-included specification / SC.

LT150CEGF/DT2 Twin table with cover / High thrust specification 1
LT150CETF/DT2 Twin table with cover / High thrust specification 2



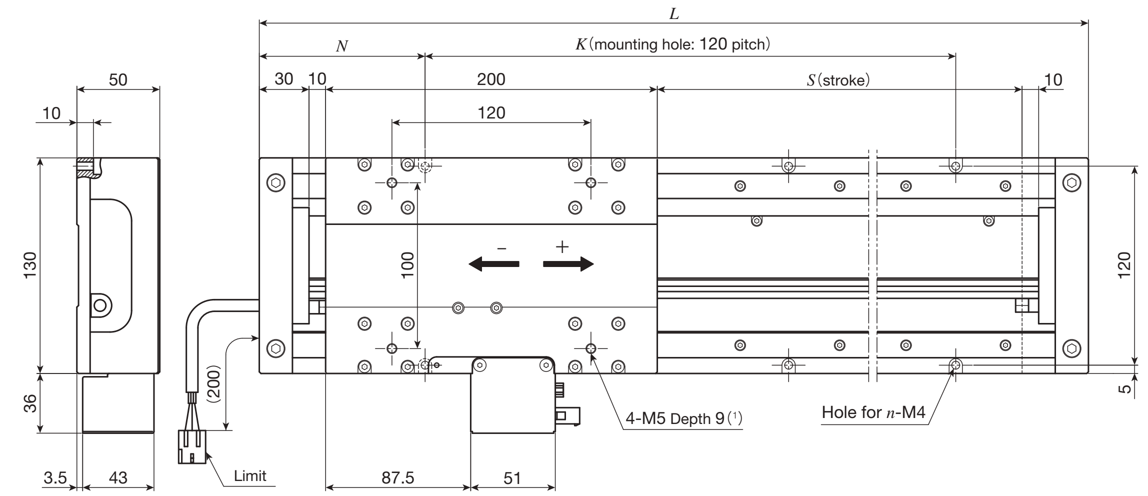
unit: mm

Identification number	Stroke length S(1)	Overall length L	Mounting holes of bed N	K	n	Total mass of table kg	Mass of moving table kg
LT150CEGF-350/DT2	350	920	60	800	18	20.5	2.4
LT150CEGF-550/DT2	550	1 120	60	1 000	22	23.9	
LT150CEGF-750/DT2	750	1 320	60	1 200	26	27.3	
LT150CEGF-950/DT2	950	1 520	60	1 400	30	30.6	
LT150CETF-350/DT2	350	920	60	800	21	20.5	
LT150CETF-550/DT2	550	1 120	60	1 000	24.5	23.9	
LT150CETF-750/DT2	750	1 320	60	1 200	28	27.3	
LT150CETF-950/DT2	950	1 520	60	1 400	31.5	30.6	

Note (1) For other stroke lengths, please contact IKO.

Remark: Dashed line portions in the dimensional figures indicate the sensor-included specification / SC.

LT130LDGS Single table

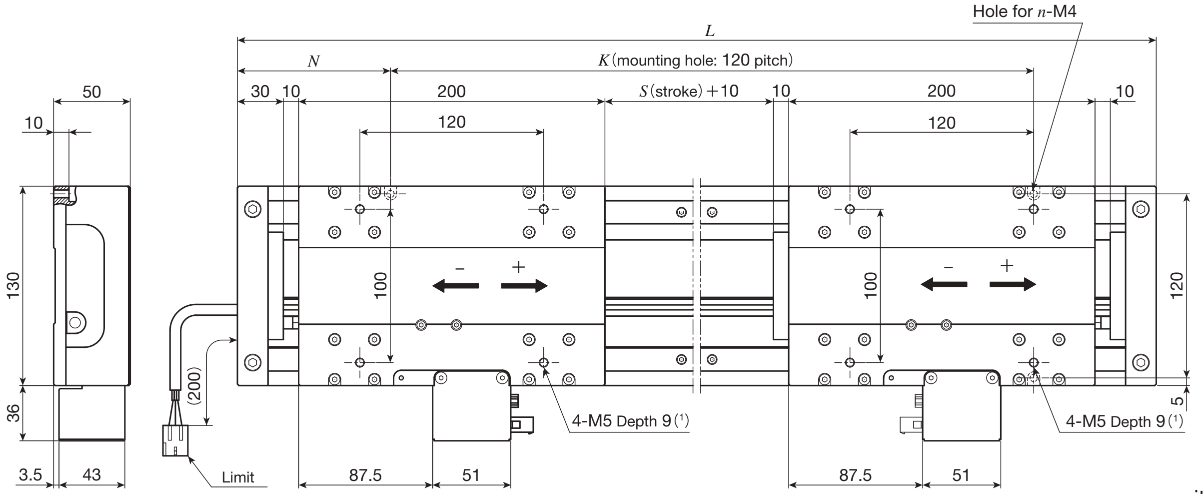


unit: mm

Identification number	Stroke length S(2)	Overall length L	Mounting holes of bed N	K	n	Total mass of table kg	Mass of moving table kg
LT130LDGS- 240	240	520	80	360	8	7.6	1.7
LT130LDGS- 720	720	1 000	80	840	16	13.5	
LT130LDGS-1200	1 200	1 480	80	1320	24	19.4	
LT130LDGS-1680	1 680	1 960	80	1800	32	25.3	
LT130LDGS-2160	2 160	2 440	80	2280	40	31.2	
LT130LDGS-2640	2 640	2 920	80	2760	48	37.1	
LT130LDGS-2760	2 760	3 040	80	2880	50	38.6	

Notes (1) Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the through hole.
(2) For other stroke lengths, please contact IKO.

LT130LDGS/T2 Twin table

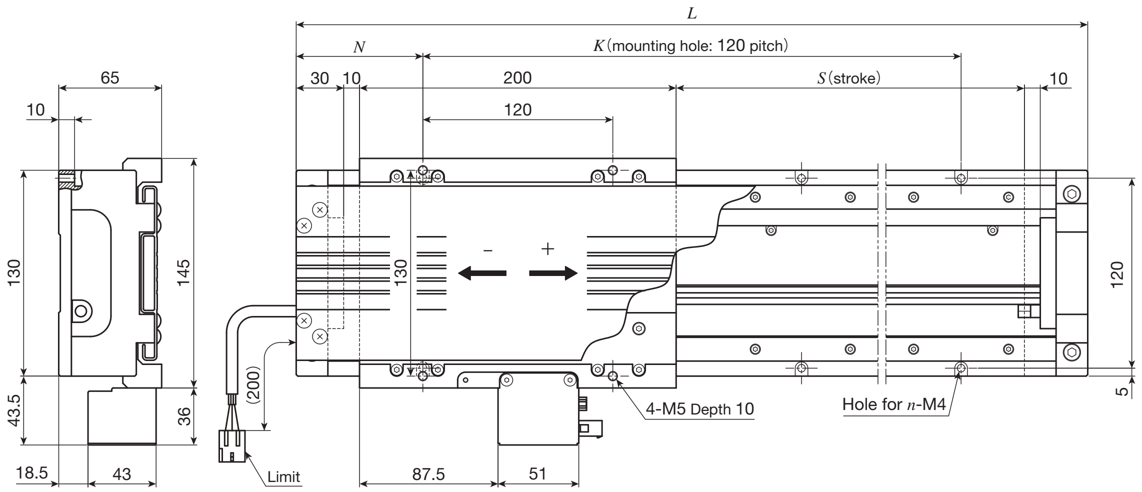


unit: mm

Identification number	Stroke length S(2)	Overall length L	Mounting holes of bed N	K	n	Total mass of table kg	Mass of moving table kg
LT130LDGS- 500/T2	500	1 000	80	840	16	15.2	1.7
LT130LDGS- 980/T2	980	1 480	80	1 320	24	21.1	
LT130LDGS-1460/T2	1 460	1 960	80	1 800	32	27.0	
LT130LDGS-1940/T2	1 940	2 440	80	2 280	40	32.9	
LT130LDGS-2420/T2	2 420	2 920	80	2 760	48	38.8	
LT130LDGS-2540/T2	2 540	3 040	80	2 880	50	40.3	

Notes (1) Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the through hole.
(2) For other stroke lengths, please contact IKO.

LT130LDGF/D Single table with cover

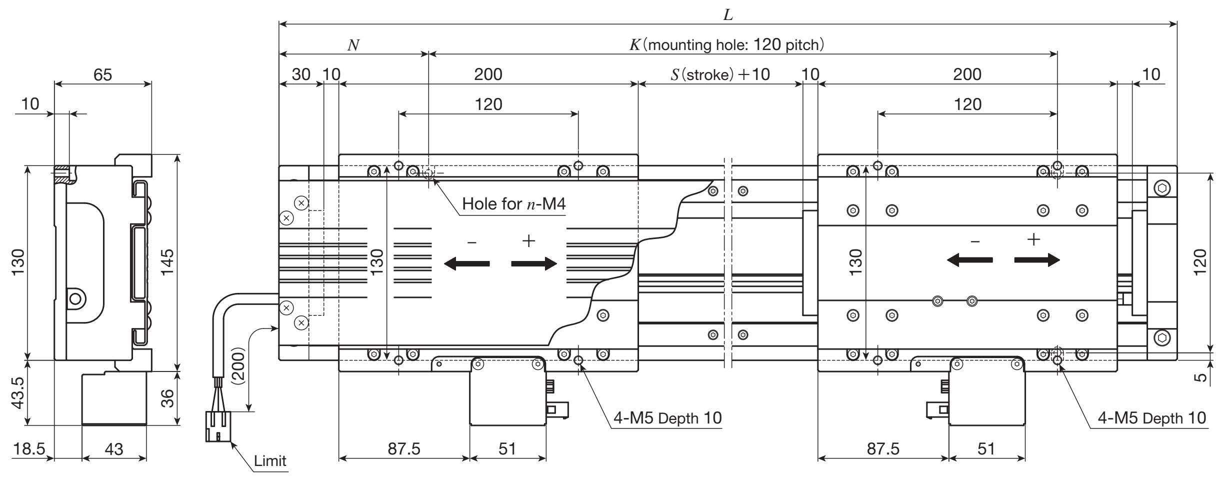


unit: mm

Identification number	Stroke length *S* (1)	Overall length *L*	Mounting holes of bed			Total mass of table kg	Mass of moving table kg
			N	*K*	*n*		
LT130LDGF- 240/D	240	520	80	360	8	8.3	2.0
LT130LDGF- 720/D	720	1 000	80	840	16	14.6	
LT130LDGF-1200/D	1 200	1 480	80	1 320	24	20.9	
LT130LDGF-1680/D	1 680	1 960	80	1 800	32	27.2	

Note (1) For other stroke lengths, please contact IKO.

LT130LDGF/DT2 Twin table with cover

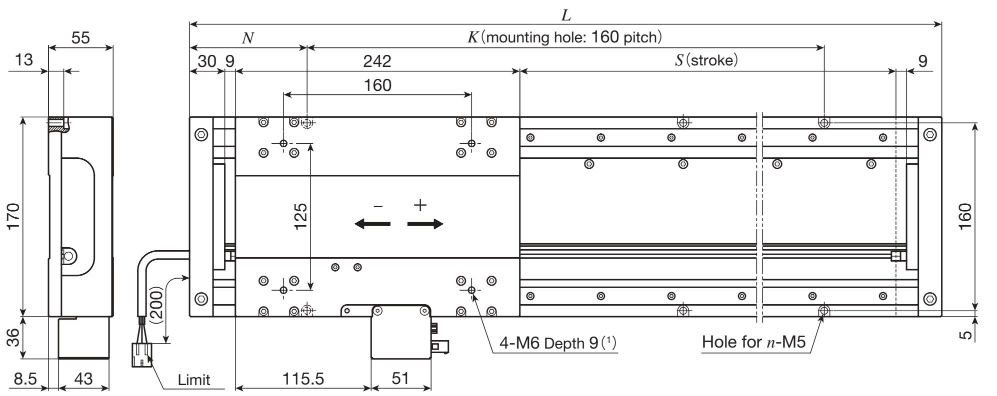


unit: mm

Identification number	Stroke length *S* (1)	Overall length *L*	Mounting holes of bed			Total mass of table kg	Mass of moving table kg
			N	*K*	*n*		
LT130LDGF- 500/DT2	500	1 000	80	840	16	16.6	2.0
LT130LDGF- 980/DT2	980	1 480	80	1 320	24	22.8	
LT130LDGF-1460/DT2	1 460	1 960	80	1 800	32	29.1	

Note (1) For other stroke lengths, please contact IKO.

LT170LDGS Single table / High thrust specification
LT170LDVS Single table / High speed specification

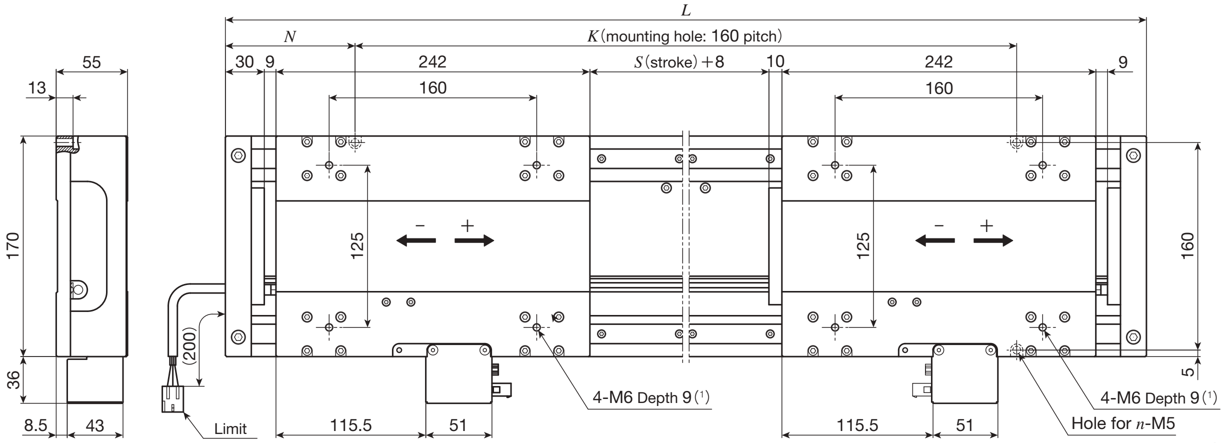


unit: mm

Identification number	Stroke length *S* (2)	Overall length *L*	Mounting holes of bed			Total mass of table kg	Mass of moving table kg
			N	*K*	*n*		
LT170LDGS- 680 LT170LDVS- 680	680	1 000	100	800	12	22.6	2.5
LT170LDGS-1160 LT170LDVS-1160	1 160	1 480	100	1 280	18	32.7	
LT170LDGS-1640 LT170LDVS-1640	1 640	1 960	100	1 760	24	42.7	
LT170LDGS-2120 LT170LDVS-2120	2 120	2 440	100	2 240	30	52.8	
LT170LDGS-2600 LT170LDVS-2600	2 600	2 920	100	2 720	36	62.9	
LT170LDGS-2720 LT170LDVS-2720	2 720	3 040	80	2 880	38	65.4	

Notes (1) Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the through hole.
(2) For other stroke lengths, please contact IKO.

LT170LDGS/T2 Twin table / High thrust specification
LT170LDVS/T2 Twin table / High speed specification

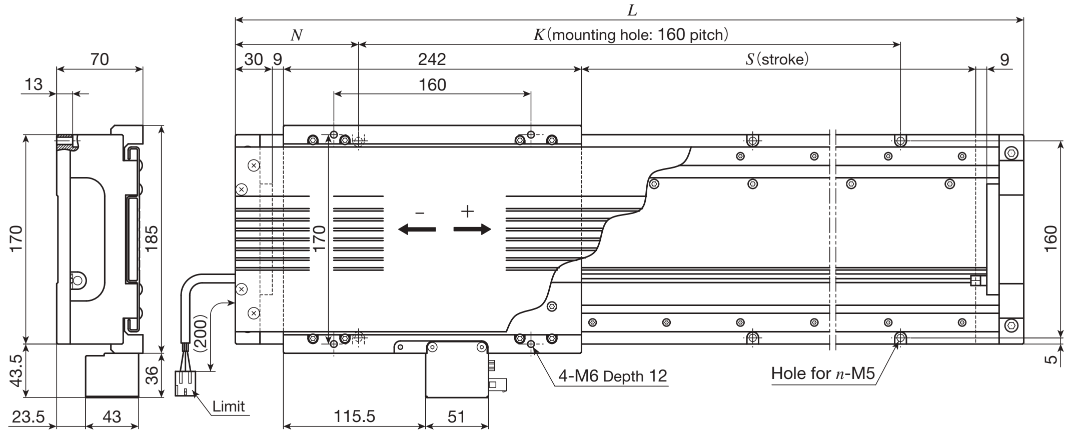


unit: mm

Identification number	Stroke length *S* (2)	Overall length *L*	Mounting holes of bed			Total mass of table kg	Mass of moving table kg
			N	*K*	*n*		
LT170LDGS- 420/T2 LT170LDVS- 420/T2	420	1 000	100	800	12	25.1	2.5
LT170LDGS- 900/T2 LT170LDVS- 900/T2	900	1 480	100	1 280	18	35.2	
LT170LDGS-1380/T2 LT170LDVS-1380/T2	1 380	1 960	100	1 760	24	45.2	
LT170LDGS-1860/T2 LT170LDVS-1860/T2	1 860	2 440	100	2 240	30	55.3	
LT170LDGS-2340/T2 LT170LDVS-2340/T2	2 340	2 920	100	2 720	36	65.4	
LT170LDGS-2460/T2 LT170LDVS-2460/T2	2 460	3 040	80	2 880	38	67.9	

Notes (1) Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the through hole.
(2) For other stroke lengths, please contact IKO.

LT170LDGF/D Single table with cover / High thrust specification 1
LT170LDTF/D Single table with cover / High thrust specification 2
LT170LDVF/D Single table with cover / High speed specification

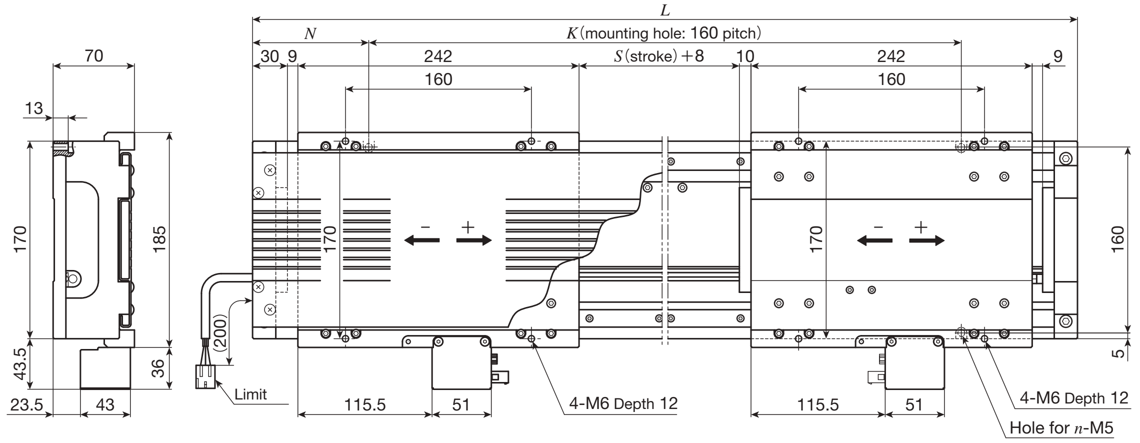


unit: mm

Identification number	Stroke length	Overall length	Mounting holes of bed			Total mass of table	Mass of moving table
	S(1)	L	N	K	n	kg	kg
LT170LDGF- 680/D LT170LDVF - 680/D	680	1 000	100	800	12	24.0	2.8
LT170LDGF-1160/D LT170LDVF -1160/D	1 160	1 480	100	1 280	18	34.6	
LT170LDGF-1640/D LT170LDVF -1640/D	1 640	1 960	100	1 760	24	45.2	
LT170LDTF- 680/D	680	1 000	100	800	12	24.7	
LT170LDTF-1160/D	1 160	1 480	100	1 280	18	35.6	
LT170LDTF-1640/D	1 640	1 960	100	1 760	24	46.5	

Note (1) For other stroke lengths, please contact IKO.

LT170LDGF/DT2 Twin table with cover / High thrust specification 1
LT170LDTF/DT2 Twin table with cover / High thrust specification 2
LT170LDVF/DT2 Twin table with cover / High speed specification

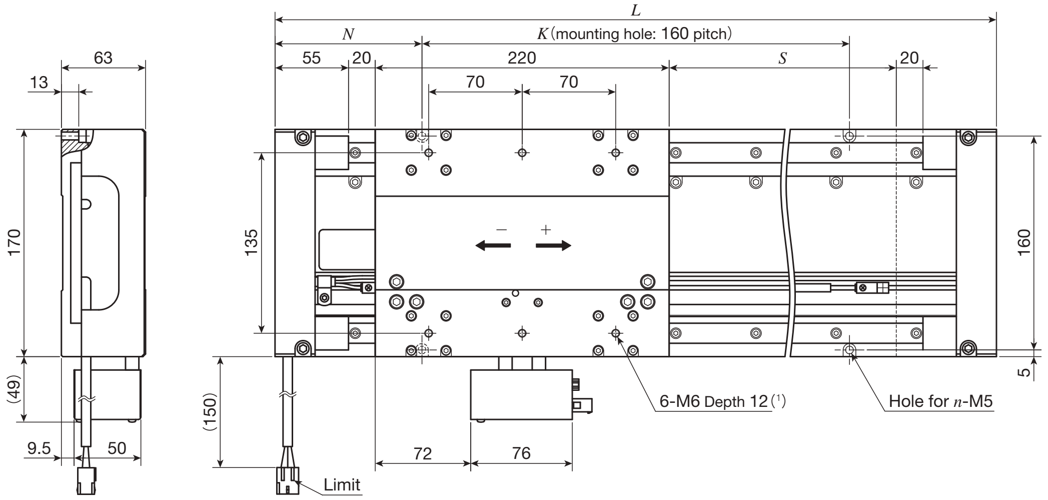


unit: mm

Identification number	Stroke length	Overall length	Mounting holes of bed			Total mass of table	Mass of moving table
	S(1)	L	N	K	n	kg	kg
LT170LDGF- 420/DT2 LT170LDVF - 420/DT2	420	1 000	100	800	12	26.9	2.8
LT170LDGF- 900/DT2 LT170LDVF - 900/DT2	900	1 480	100	1 280	18	37.5	
LT170LDGF-1380/DT2 LT170LDVF -1380/DT2	1 380	1 960	100	1 760	24	48.0	
LT170LDTF- 420/DT2	420	1 000	100	800	12	27.6	
LT170LDTF- 900/DT2	900	1 480	100	1 280	18	38.5	
LT170LDTF-1380/DT2	1 380	1 960	100	1 760	24	49.3	

Note (1) For other stroke lengths, please contact IKO.

LT170HS Single table

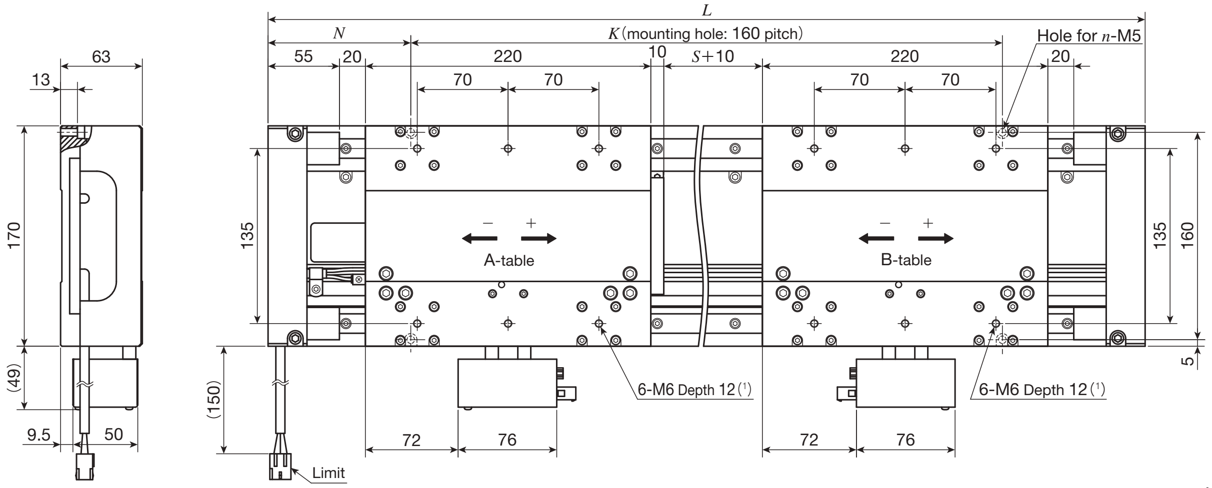


unit: mm

Identification number	Stroke length	Overall length	Mounting holes of bed			Total mass of table	Mass of moving table
	S(2)	L	N	K	n	kg	kg
LT170HS- 650	650	1 020	110	800	12	25.1	4.0
LT170HS-1130	1 130	1 500	110	1 280	18	34.9	
LT170HS-1610	1 610	1 980	110	1 760	24	44.6	
LT170HS-2090	2 090	2 460	110	2 240	30	54.4	
LT170HS-2570	2 570	2 940	110	2 720	36	64.1	
LT170HS-2670	2 670	3 040	80	2 880	38	66.4	

Notes (1) Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the through hole.
(2) For other stroke lengths, please contact IKO.

LT170HS/T2 Twin table

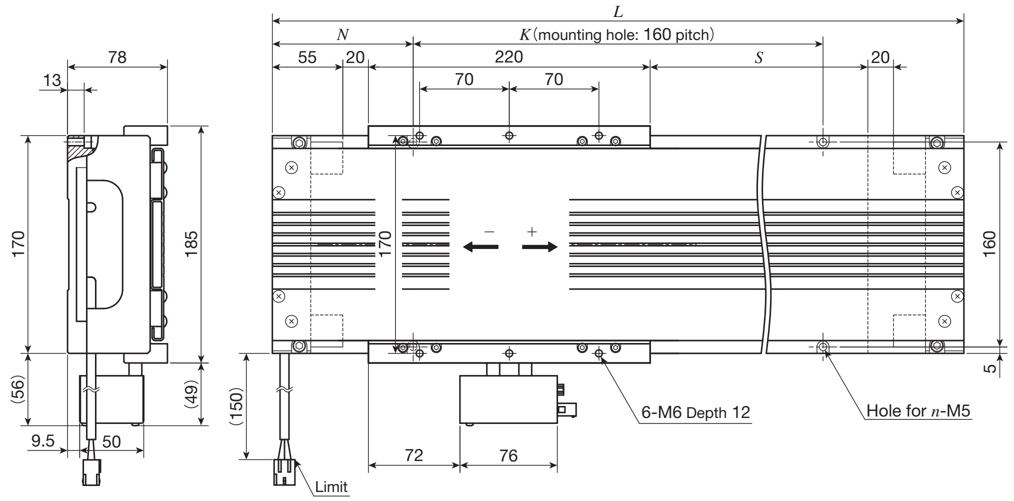


unit: mm

Identification number	Stroke length	Overall length	Mounting holes of bed			Total mass of table	Mass of moving table
	S(2)	L	N	K	n	kg	kg
LT170HS- 410/T2	410	1 020	110	800	12	29.1	4.0
LT170HS- 890/T2	890	1 500	110	1280	18	38.9	
LT170HS-1370/T2	1 370	1 980	110	1760	24	48.6	
LT170HS-1850/T2	1 850	2 460	110	2240	30	58.4	
LT170HS-2330/T2	2 330	2 940	110	2720	36	68.1	
LT170HS-2430/T2	2 430	3 040	80	2880	38	70.4	

Notes (1) Too deep insertion depth of the mounting bolt may affect the running performance of the moving table, so never insert a bolt longer than the depth of the through hole.
(2) For other stroke lengths, please contact IKO.

LT170HF/D Single table with cover

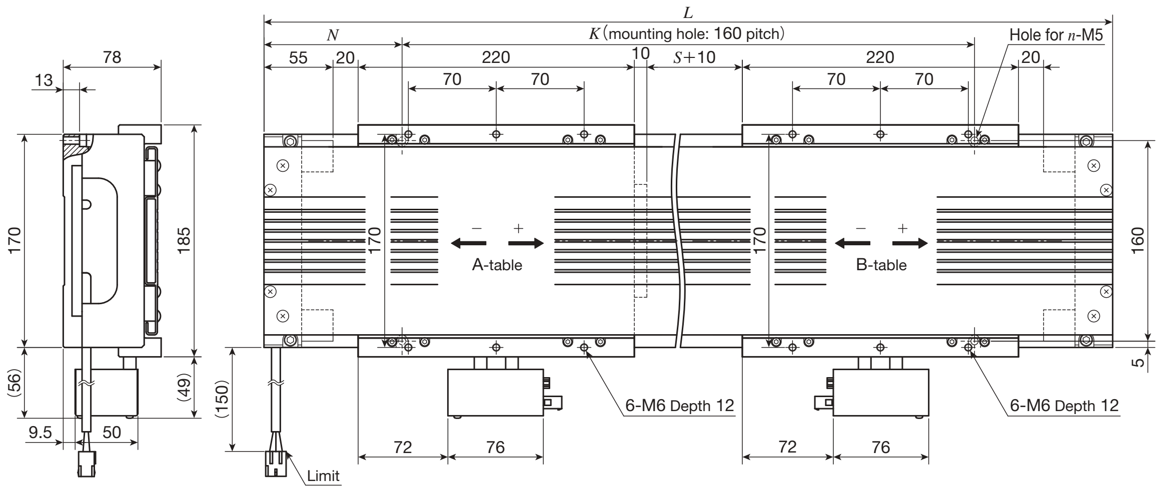


unit: mm

Identification number	Stroke length S(1)	Overall length L	Mounting holes of bed N	K	n	Total mass of table kg	Mass of moving table kg
LT170HF- 650/D	650	1 020	110	800	12	25.5	4.4
LT170HF-1130/D	1 130	1 500	110	1 280	18	35.2	
LT170HF-1610/D	1 610	1 980	110	1 760	24	45.0	

Note (1) For other stroke lengths, please contact IKO.

LT170HF/DT2 Twin table with cover



unit: mm

Identification number	Stroke length S(1)	Overall length L	Mounting holes of bed N	K	n	Total mass of table kg	Mass of moving table kg
LT170HF- 410/DT2	410	1 020	110	800	12	29.9	4.4
LT170HF- 890/DT2	890	1 500	110	1 280	18	39.6	
LT170HF-1370/DT2	1 370	1 980	110	1 760	24	49.4	

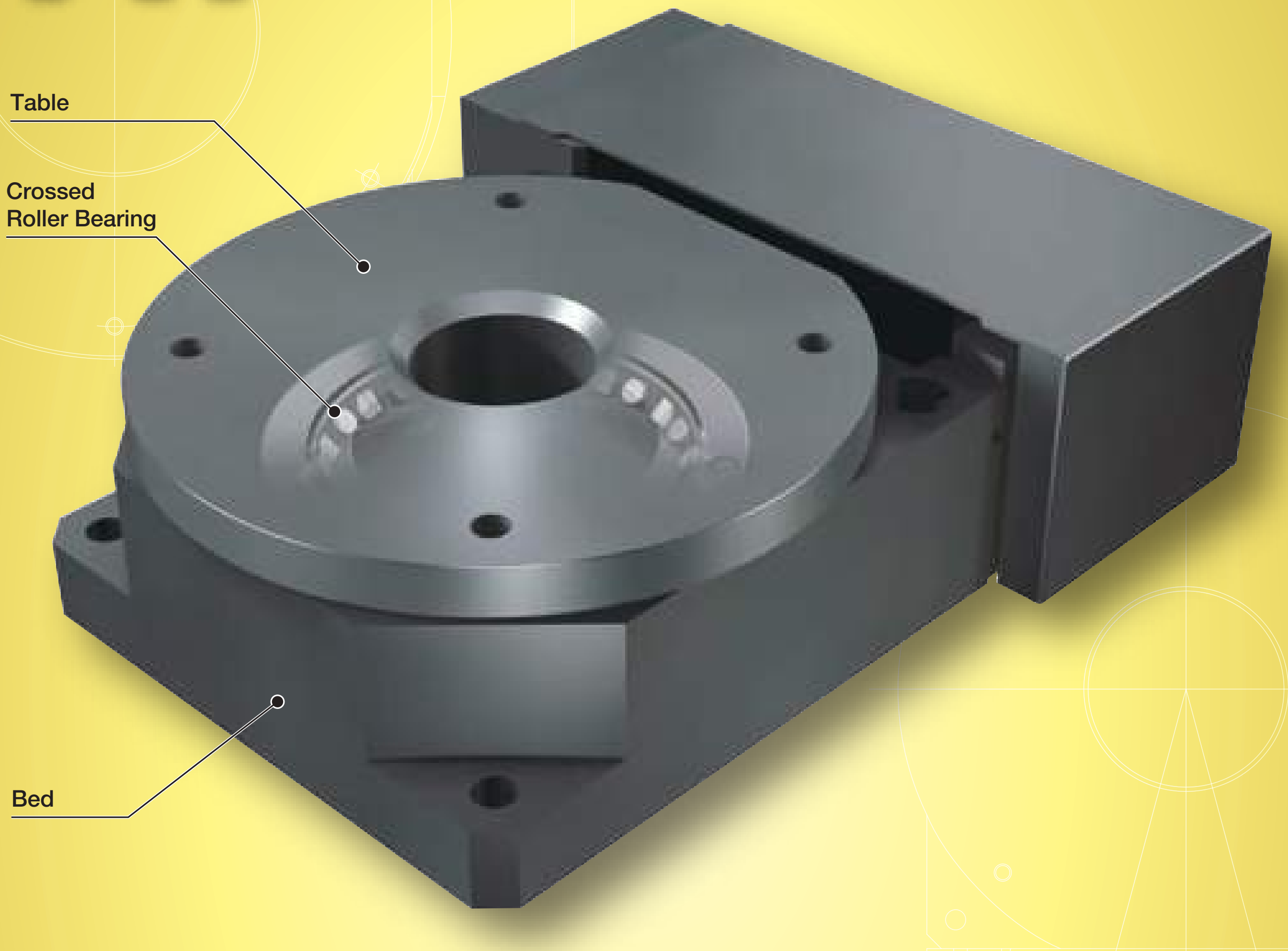
Note (1) For other stroke lengths, please contact IKO.

AT

AT

Ball screw

Rotation



Major product specifications

Driving method	Precision ball screw
Linear motion rolling guide and bearing	Linear Way (ball type) Crossed Roller Bearing
Built-in lubrication part	No built-in
Material of table and bed	High carbon steel
Sensor	Provided as standard

Accuracy

unit: sec

Positioning repeatability	±1
Positioning accuracy	–
Lost motion	–
Parallelism in table motion A	–
Parallelism in table motion B	–
Attitude accuracy	–
Straightness	–
Backlash	–

Points

● Rotary positioning table for converting linear motion to rotary motion

1 This is a positioning table that allows precise angle correction by converting the linear motion to the rotational motion through the rotator mechanism combining the Linear Way and ball screws.High rigidity steel-made table and bed are used and a Crossed Roller Bearing is incorporated in the bearing supporting the table.

● Low profile design with high rigidity

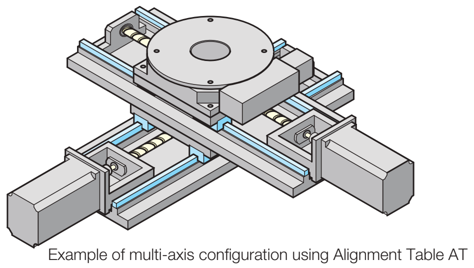
2 Adoption of Crossed Roller Bearing capable of exerting high rigidity in all direction has achieved low profile, high rigidity, and high precision.

● Positioning repeatability of ±1 sec

3 A rotator for converting linear motion to rotary motion is accurately guided by the combination of Linear Way L and precision ball screw, thus achieving the high positioning repeatability of ±1 sec.

● Available as multi-axis configured alignment table

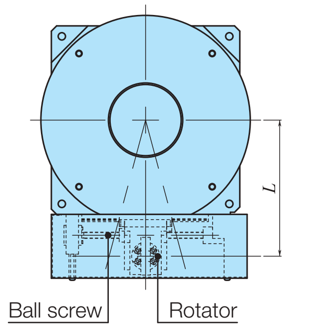
4 Placing this unit on the slide table of Precision Positioning Table LH enables the configuration of low height XY-θ multi-axis positioning mechanism.



Example of multi-axis configuration using Alignment Table AT

Driving mechanism of Alignment Table AT

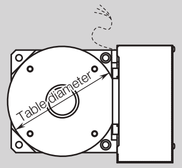
Alignment Table AT is driven by stroking a rotator linked to table's outer periphery by driving of ball screw in a linear direction. In order to adjust the distance L and angle from the center of table varied by rotator movement, linear and rotary motion mechanism that follows according to the table angle is incorporated in the rotator. Therefore, in Alignment Table, even when moving the rotator at a same pitch, the table's rotation angle tends to vary depending on the position, so that even when moving it at a constant speed, the rotation speed does not stay constant.



Distance from the center of table L unit: mm

Identification number	L
AT120	100
AT200	130
AT300	186

Variation

Shape	Model and size	Table diameter (mm)	Operating angle range (degree)
 Table diameter	AT120	120	± 5
	AT200	200	
	AT300	300	±10

Identification Number

Example of an Identification Number

① AT ② 120 / ③ AT701

① **Model** Page Ⅱ-334

② **Size** Page Ⅱ-334

③ **Designation of motor attachment** Page Ⅱ-334

Identification Number and Specification

① **Model**	AT: Alignment Table AT
② **Size**	120: Table diameter 120mm 200: Table diameter 200mm 300: Table diameter 300mm
③ **Designation of motor attachment**	As for a motor attachment, select it from the list of Table 1. ・Motor should be prepared by customer. ・Please specify motor attachment applicable to motor for use. ・A coupling shown in Table 2 is temporarily fixed in the main body before shipment, so that final position adjustment should be performed by customer.

Table 1 Application of motor attachment

Models of motor to be used					Flange size mm	Motor attachment	
Type	Manufacturer	Series	Model	Rated output W		AT120 AT200	AT300
AC servo motor	YASKAWA ELECTRIC CORPORATION	Σ-7	**SGM7J-A5A**	**50**	□40	AT701	–
			SGM7A-A5A			AT701	–
			SGM7J-01A	**100**		AT701	AT702
			SGM7A-01A			AT701	AT702
	Mitsubishi Electric Corporation	J4/J5	**HG-MR053**	**50**	□40	AT701	–
			HG-KR053/HK-KT053W			AT701	–
			HG-MR13	**100**		AT701	AT702
			HG-KR13/HK-KT13W			AT701	AT702
	Panasonic Corporation	MINAS A6	**MSMF5A**	**50**	□38	AT703	–
			MSMF01	**100**		AT703	AT704
	Hitachi Industrial Equipment Systems Co., Ltd	AD	**ADMA-R5L**	**50**	□40	AT701	–
			ADMA-01L	**100**		AT701	AT702
Stepper motor	ORIENTAL MOTOR Co., Ltd.	α step	**ARM46**		□42	AT705	–
			ARM66		□60	–	AT706
			ARM69		□60	–	AT706
		CRK	**CRK54**		□42	AT707	–
			CRK56 (1)		□60	–	AT708

Note (1) Applicable to the outer diameter ϕ8 of motor output shaft.
Remark: For detailed motor specifications, please see respective motor manufacturer's catalog.

Table 2 Coupling models

Motor attachment	Coupling models	Manufacturer	Coupling inertia J_c $\times 10^{-5}$kg・m^2
AT701	MSTS-16-5×8	Nabeya Bi-tech Kaisha	0.084
AT702	UA-25C-8×8	Sakai Manufacturing Co., Ltd	0.290
AT703	MSTS-16-5×8	Nabeya Bi-tech Kaisha	0.084
AT704	UA-25C-8×8	Sakai Manufacturing Co., Ltd	0.290
AT705	MSTS-16-5×6	Nabeya Bi-tech Kaisha	0.084
AT706	MSTS-25C-8×10	Nabeya Bi-tech Kaisha	0.71
AT707	MSTS-16-5×5	Nabeya Bi-tech Kaisha	0.084
AT708	MSTS-25C-8×8	Nabeya Bi-tech Kaisha	0.71

Remark: For detailed coupling specifications, please see respective manufacturer's catalog.

Specifications

Table 3 Specifications of ball screw

unit: mm

Model and size	Shaft dia.	Overall length
AT120	6	103.5
AT200	6	103.5
AT300	10	183

Table 4 Specification

Item / Size	Ball screw lead mm	Rotator resolution μm	Operating angle rance degree	Positioning repeatability sec.	Table inertia J_T $\times10^{-5}$kg·m^2	Starting torque T_S N·m
AT120	1	1 (1)	± 5	±1	0.012	0.03
AT200					0.014	0.03
AT300	2	2 (1)	±10		0.18	0.04

Note (1) This is a value given when fraction sizes of the motor are 1,000 pulses/rev.

Table 5 Maximum carrying mass

Model and size	Carrying mass position mm	Maximum carrying mass kg							
		Horizontal direction				Vertical direction			
	Length L / Height H	0	100	200	300	0	100	200	300
AT120	0	22	22	22	22	22	22	22	22
	100	22	22	22	22	22	22	22	22
	200	22	22	22	22	22	22	22	22
	300	22	22	22	22	16	16	16	16
AT200	0	12	12	12	12	12	12	12	12
	100	12	12	12	12	12	12	12	12
	200	12	12	12	12	12	12	12	12
	300	12	12	12	12	12	12	12	12
AT300	0	44	44	44	44	44	44	44	44
	100	44	44	44	44	44	44	44	44
	200	44	44	44	44	44	44	44	44
	300	44	44	44	44	44	44	44	44

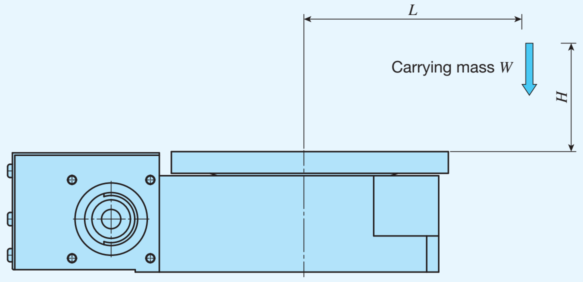
Remark: The maximum carrying mass is adjusted by the mass when the rating life of the linear motion rolling guide, ball screws, or bearings is 18,000 hours during continuous operation at a number of revolutions of the motor of 3000min^{-1} and an acceleration/deceleration time of 0.2s. The mass calculated is based upon the basic static load rating of the linear motion rolling guide.

Table 6 Maximum load mass

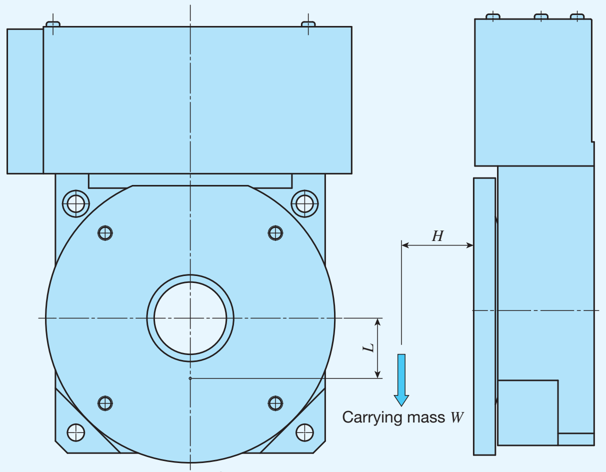
Model and size	Ball screw lead mm	Maximum load mass kg	
		Horizontal direction	Vertical direction
AT120	1	370	370
AT200	1	622	622
AT300	2	761	761

Remarks 1. The maximum load mass shows the mass that ensures acceleration/deceleration of 0.3G.

2. The values shown in this table were calculated with the motor with the highest rated torque installed, selected from the AC servomotor models listed in Table 1.



Carrying mass position
(horizontal direction)



Carrying mass position
(vertical direction)

Mounting

For the processing accuracy of the Precision Positioning Table mounting surface and the tightening torque of the fixing screws, see page Ⅲ-30.

Sensor specification

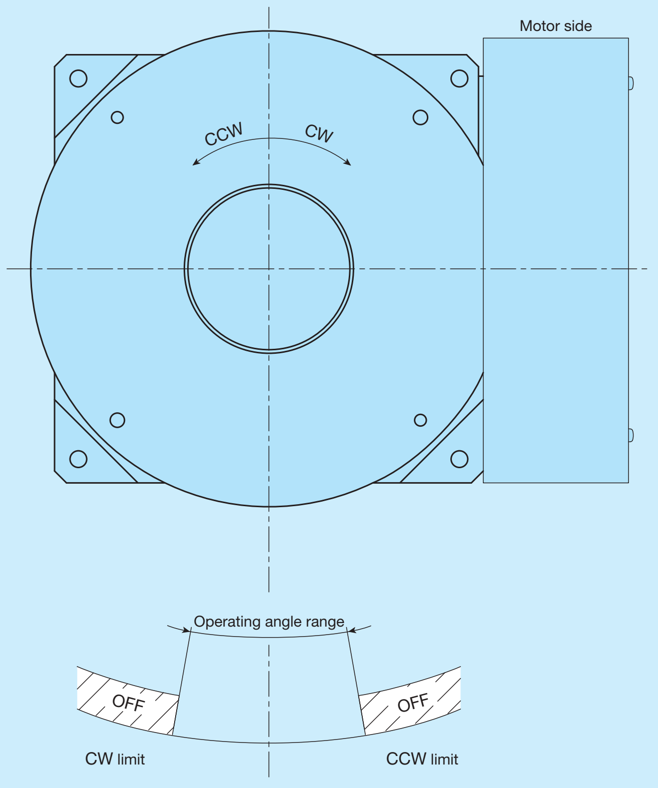


Fig. 1 Sensor timing chart

Example of Combination

■ Configuration of XY-θ multi-axis positioning mechanism

Combining the Alignment Table AT with IKO precision positioning table of single-axis specification or multi-axis specification enables you to easily configure the XY-θ multi-axis positioning mechanism. Low assembling height, compactness, and high-precision positioning capability enable the table to be used as alignment table for precision measuring equipment, inspection equipment, and assembling device.

Table 7 Configuration example of multi-axis positioning mechanism

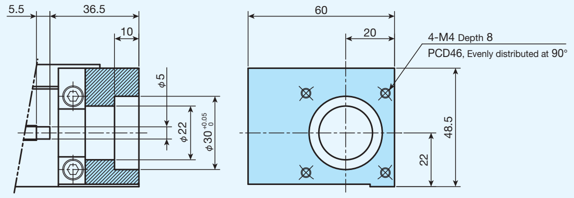
unit: mm

Appearance of multi-axis positioning mechanism	Models of IKO precision positioning tables combined with Alignment Table AT			Stroke length	
				X-axis	Y-axis
	Precision Positioning Table TS/CT	Single-axis specification	TS125/125	50	
			TS125/220	120	
			TS220/220	120	
			TS220/310	180	
			TS260/350	250	
		Two-axis specification	CT125/125	50	50
			CT220/220	120	120
			CT260/350	150	250
			CT350/350	250	250
	Precision Positioning Table LH	Single-axis specification	TSLH120M	100, 150	
				200	
				250	
				300	
			TSLH220M	150	
				200, 250, 300	
				400	
			TSLH320M	300	
				400, 500	
			TSLH420M	500	
				600	
				800	
		Two-axis specification	CTLH120M	100	100
				200	100
				200	200
				300	200
				300	300
			CTLH220M	200	200
				300	200
				300	300
				400	300
				400	400
			CTLH320M	300	300
				400	300
				400	400
				500	400
				500	500

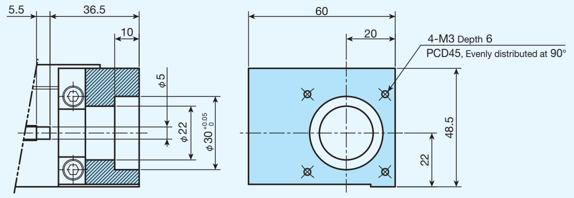
Dimensions of Motor Attachment

AT120, AT200

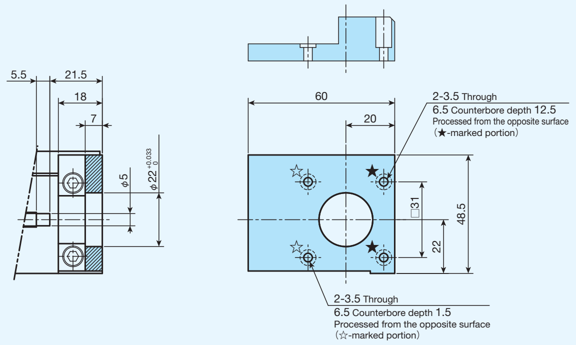
AT701



AT703

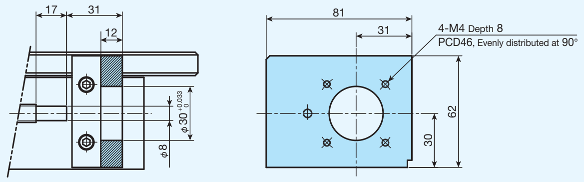


AT705
AT707

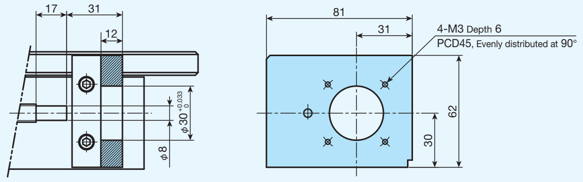


AT300

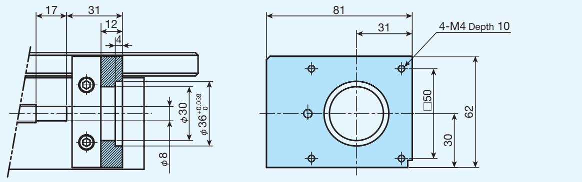
AT702



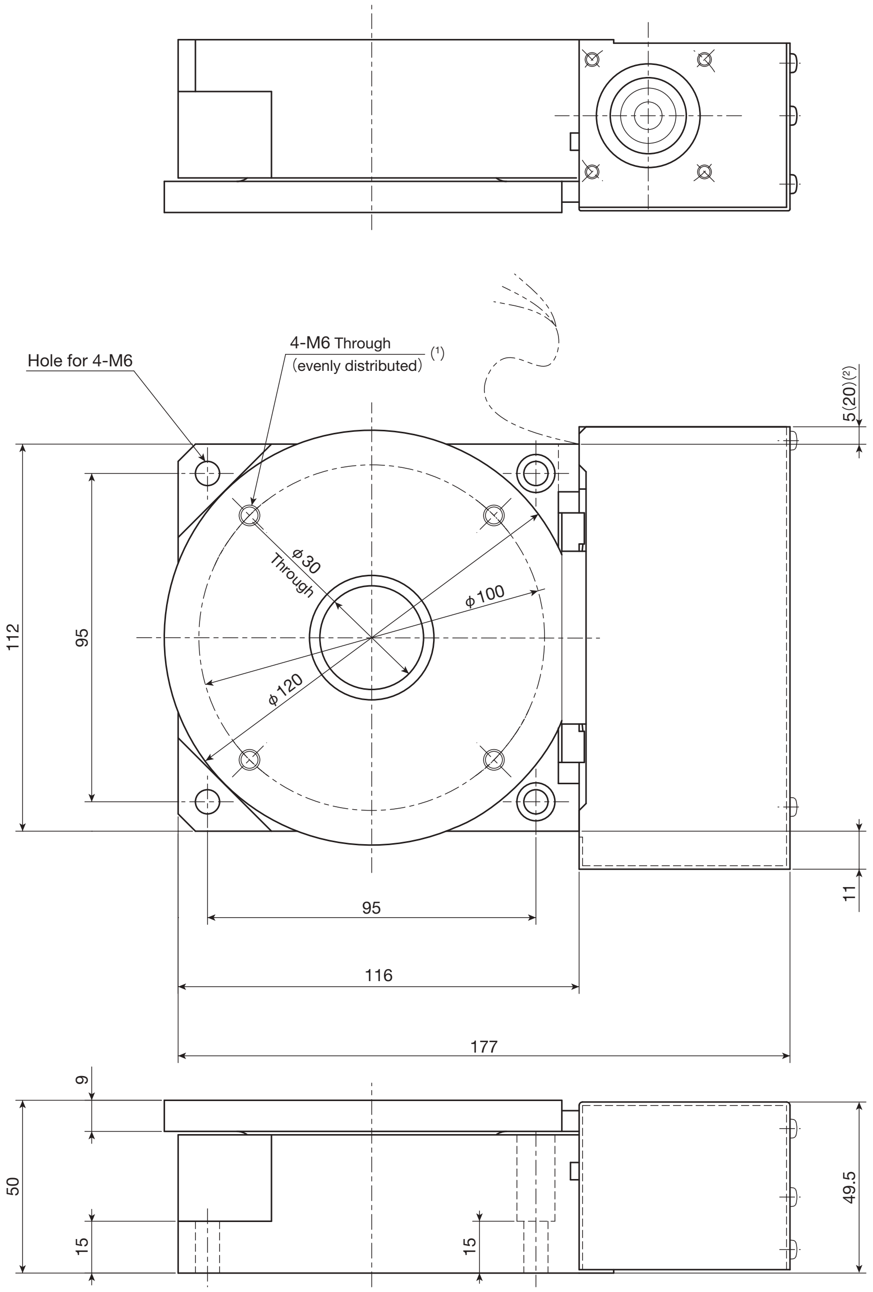
AT704



AT706
AT708



AT120

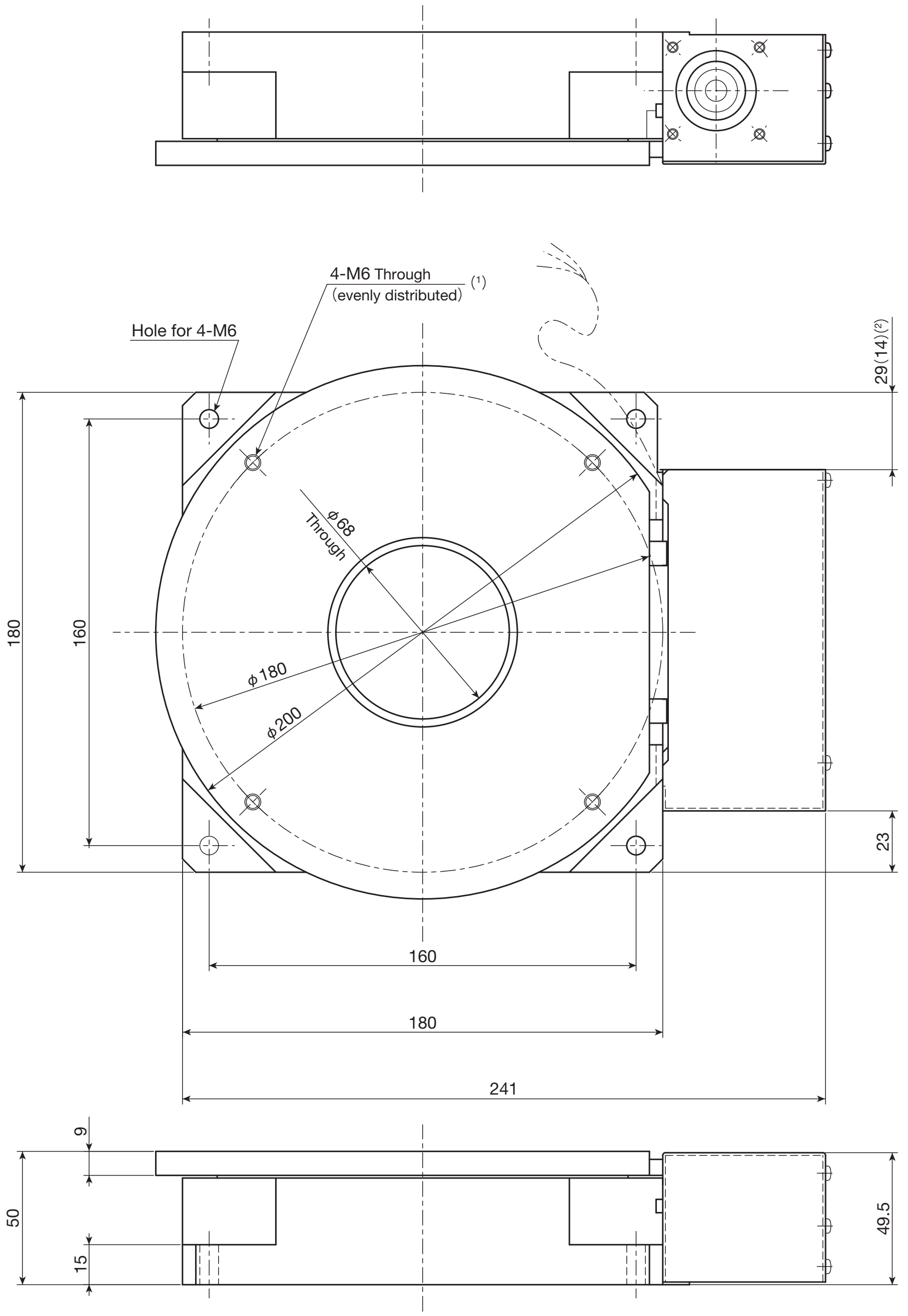


mass: 4.4kg

Notes (1) Too deep insertion depth of the mounting bolt may affect the rotation performance of the table, so never insert a bolt longer than the depth of the through hole.

(2) The dimension in ( ) is applicable to AT701 and AT703.

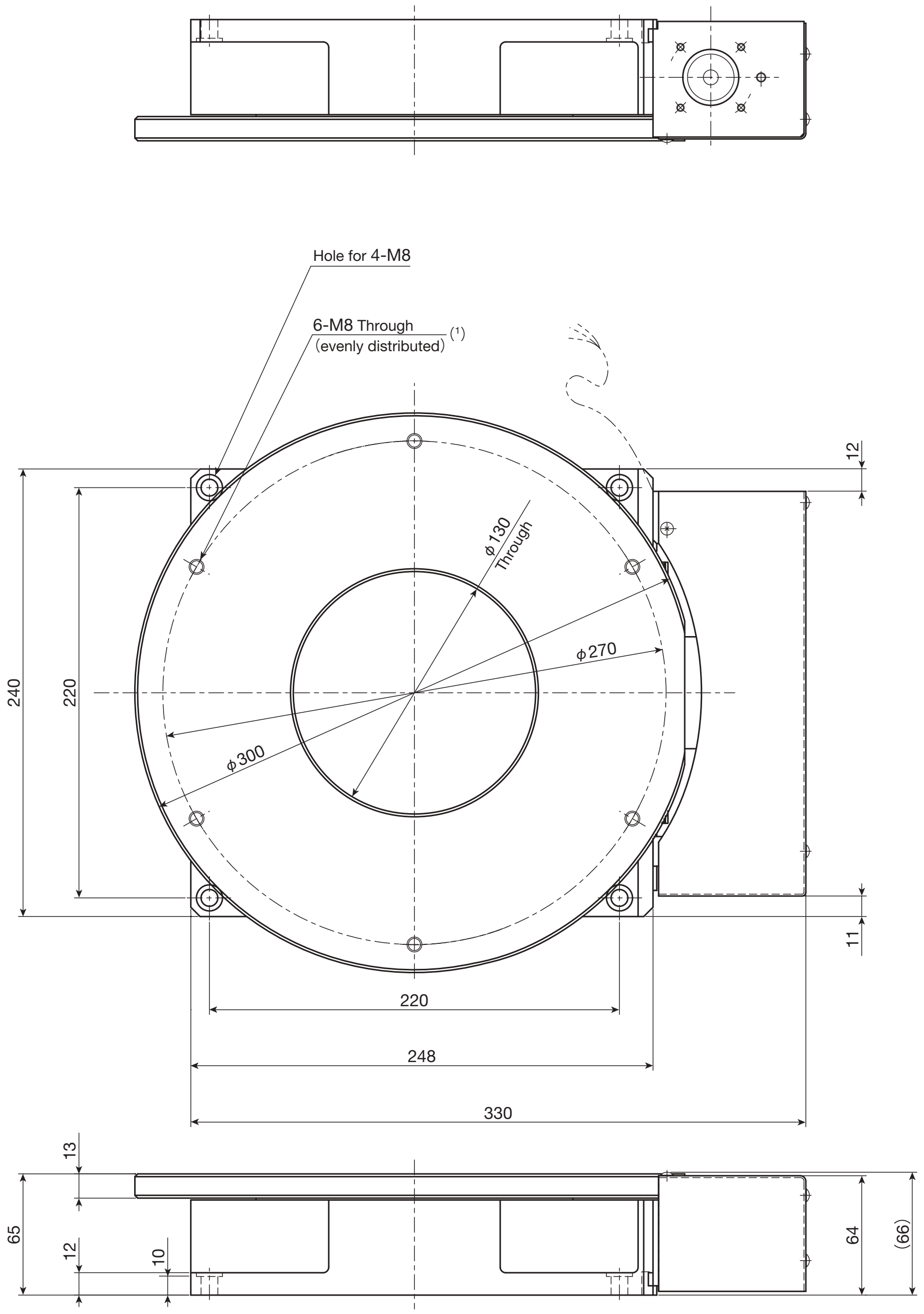
AT200



mass: 9.9kg

Notes (1) Too deep insertion depth of the mounting bolt may affect the rotation performance of the table, so never insert a bolt longer than the depth of the through hole.
(2) The dimension in ( ) is applicable to AT701 and AT703.

AT300



mass: 21.0kg

Note (1) Too deep insertion depth of the mounting bolt may affect the rotation performance of the table, so never insert a bolt longer than the depth of the through hole.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SK…W

SK…W

Worm gear drive

Rotation

Major product specifications

Driving method	Worm gear
Bearings	Crossed Roller Bearing
Built-in lubrication part	No built-in
Material of table and bed	Table : High carbon steel Bed : Aluminum alloy
Sensor	For origin : Provided as standard Limit : Select by identification number

Accuracy

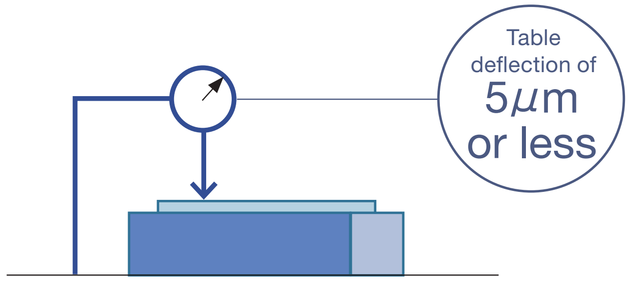
unit: sec

Positioning repeatability	±7.2
Positioning accuracy	21.6
Lost motion	32.4
Parallelism in table motion A	–
Parallelism in table motion B	–
Attitude accuracy	–
Straightness	–
Backlash	32.4

Points

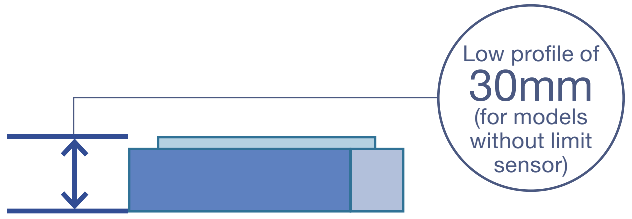
High Accuracy

1 IKO Crossed Roller Bearings are used in the rotation guiding parts and can achieve deflection on the table upper surface of 5μm or less.



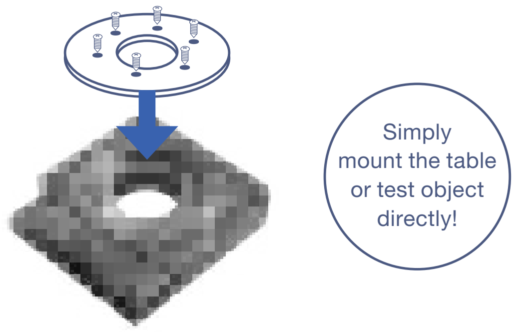
Low profile, high rigidity

2 IKO Crossed Roller Bearings are used in the rotation guiding parts and offer high rigidity in any direction.
In addition, since Crossed Roller Bearings are used directly as the table, a low profile is achieved.



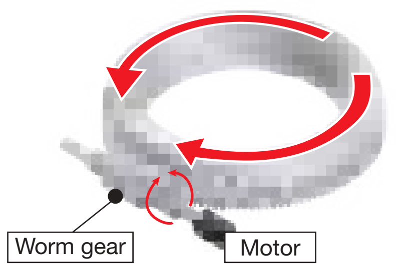
Reduced Design Work

3 The device table or test object can be mounted directly to the table. The use of mechanical parts reduces the labor hours required to design rotating tables from scratch.



Rotation Stage SK…W drive mechanism

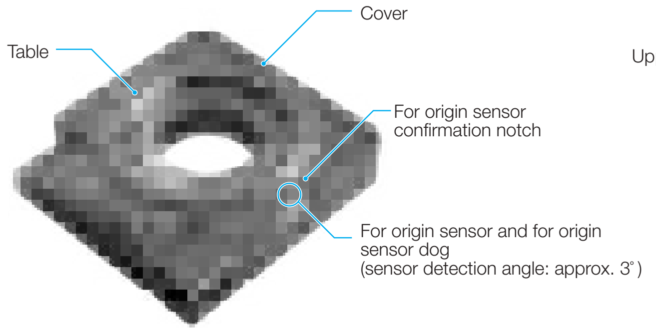
The SK…W is an unlimited rotation stage that employs a worm gear mechanism.
IKO Crossed Roller Bearings are used in the rotation guiding parts and utilized directly as a table to achieve high-precision rotational runout, high rigidity and a low profile.



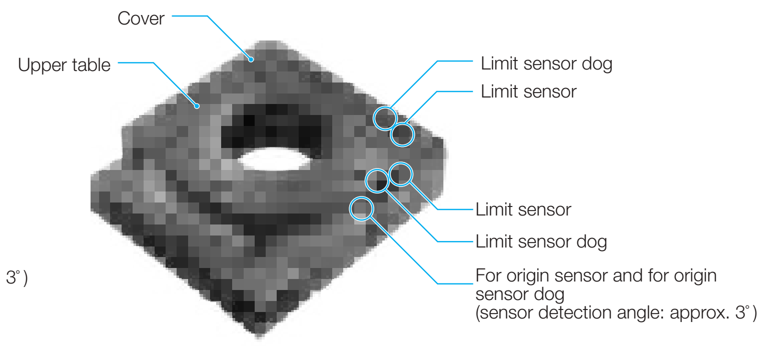
Variation

The SK…W is available with or without a limit sensor.
For models with a limit sensor, the operating range can be set to any position up to 320 degrees.

Without limit sensor



With limit sensor



Identification Number

Example of an Identification Number

①	②	①		③	④
SK	120	W	/	ATB01	SC

① **Model** Page Ⅱ-347

② **Size** Page Ⅱ-347

③ **Designation of motor attachment** Page Ⅱ-347

④ **Limit sensor designation** Page Ⅱ-347

Identification Number and Specification

① **Model**	SK···W: Rotation Stage SK···W
② **Size**	120: Table diameter of 115mm (120mm) Remarks: Dimensions in parentheses are for models with a limit sensor.
③ **Designation of motor attachment**	As for a motor attachment, select it from the list of Table 1. · Motor should be prepared by customer. · Please specify motor attachment applicable to motor for use. · A coupling shown in Table 2 is temporarily fixed in the main body before shipment, final position adjustment should be performed by customer.
④ **Limit sensor designation**	No symbol: No limit sensor (built-in for origin sensor is included) SC: With limit sensor (includes upper table)

Table 1 Application of motor attachment

Motor to be used					Flange size mm	Motor attachment symbol
Type	Manufacturer	Series	Model	Rated output W		
Five-phase stepper motor	ORIENTAL MOTOR Co., Ltd.	PK	PK525HPB(²)		□28	ATB01
Two-phase stepper motor (bi-polar)	MinebeaMitsumi Inc.	10PM-K	10PM-K406CNVA6098(¹)(²)		□25	ATB02
AC servo motor	Mitsubishi Electric Corporation	J4	HG-AK0136	30	□25	ATB03

Note (¹) Dedicated IKO model number. Available for purchase from NMB Sales Co., Ltd.
Note (²) Dual-axis model

Table 2 Coupling models

Motor attachment	Coupling models	Manufacturer	Coupling inertia J_c $\times 10^{-5}$kg·m^2
ATB01, ATB02	MSTS-12C-5×5	Nabeya Bi-tech Kaisha	0.022
ATB03	XGS-15C-5×5	Nabeya Bi-tech Kaisha	0.020

Specifications

Table 3 Specifications

Operating angle range (¹)	degree	360
Resolution (²)	sec	1.08
Maximum number of table revolutions	min^{-1}	5
Maximum number of worm axis revolutions	min^{-1}	600
Moment rigidity	s/N·cm	0.04
Allowable load (³)	N	50

Note (¹) Values shown are for models without a limit sensor. When models with a limit sensor are used, adjustments can be performed to any angle within a range of up to 320 degrees.
(²) The resolution indicates a value when fraction sizes of the motor are 10,000 pulses/rev.
(³) Allowable load refers to the maximum load that can be applied without affecting functions or performance.

Table 4 Accuracy

Positioning accuracy	sec	21.6
Positioning repeatability	sec	±7.2
Lost motion	sec	32.4
Backlash	sec	32.4
Parallelism of table to mounting surface	μm	20 (40)
Radial runout of table diameter	μm	5 (15)
Deflection on table upper surface	μm	5 (25)

Remark: Values in parentheses are for models with a limit sensor.

Mounting

For the processing accuracy of the Precision Positioning Table mounting surface and the tightening torque of the fixing screws, see page Ⅲ-30.

Sensor Specification

The SK···W is fitted with a for origin sensor (E2S-W13B 1M produced by OMRON Corporation) as standard.
There is no precision regulation of the relative positions of the for origin sensor and the table mounting hole, precise adjustment of the return to origin position should be performed by performing offset adjustment through a higher-level controller. For models with a limit sensor, a limit sensor (E2S-W14 1M produced by OMRON Corporation) and an upper table are added. The position of the limit sensor dog can be adjusted. The operating range can be set to any position up to 320 degrees.

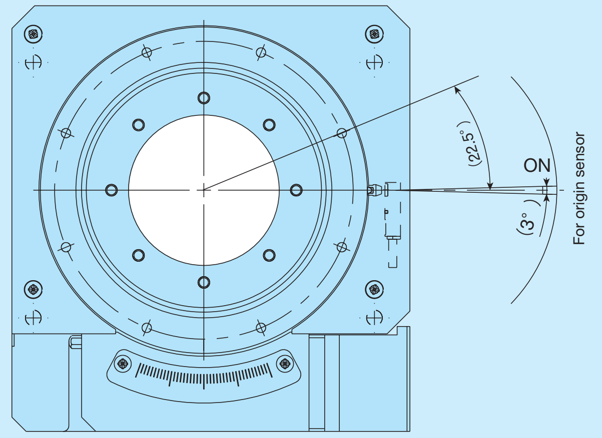
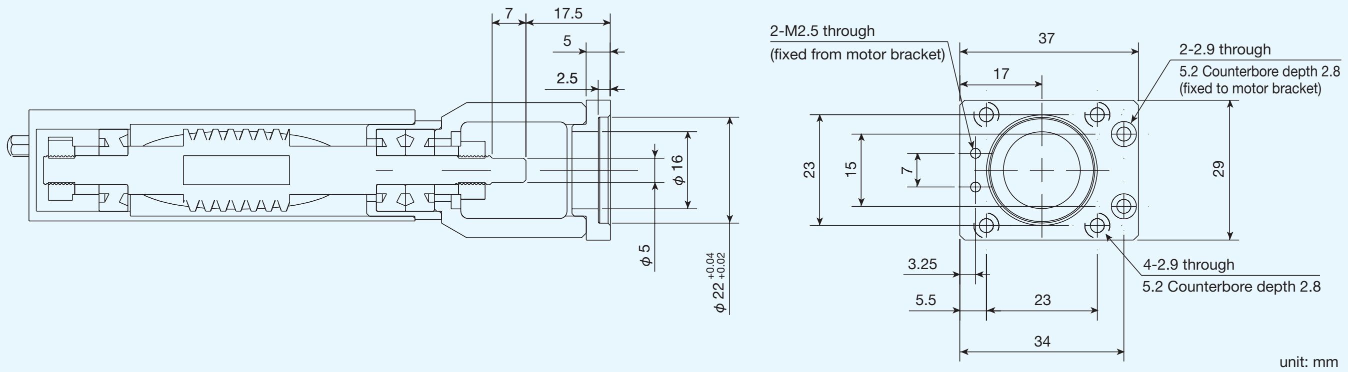


Fig.1 For origin sensor timing chart

* For models without a limit sensor, the for origin sensor dog position can be checked from the cover notch.
* For models with a limit sensor, check the position of the for origin sensor dog with the cover removed.
* The cover cannot be removed after limit sensor dog adjustment. Perform limit sensor dog adjustment after fixing the base of the product to the mounting surface and mounting the cover.

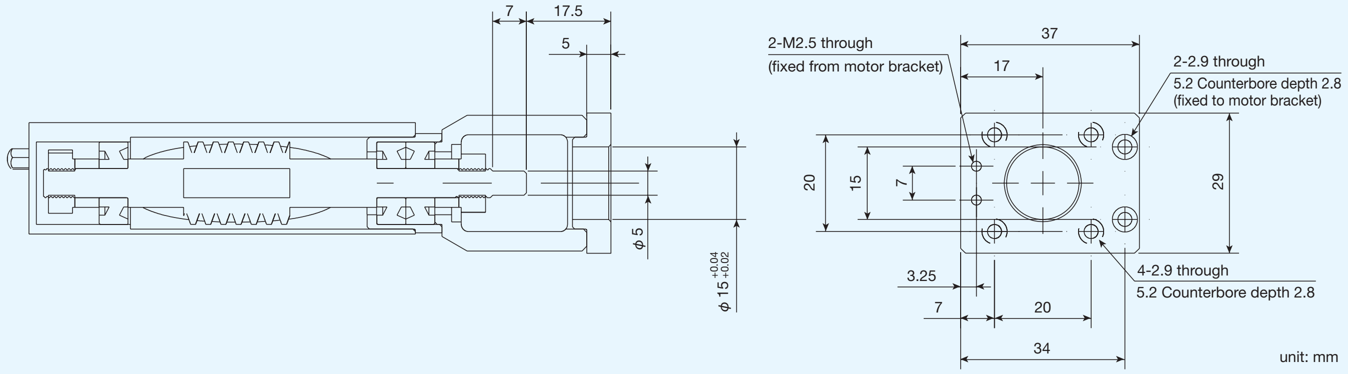
Dimensions of Motor Attachment

ATB01



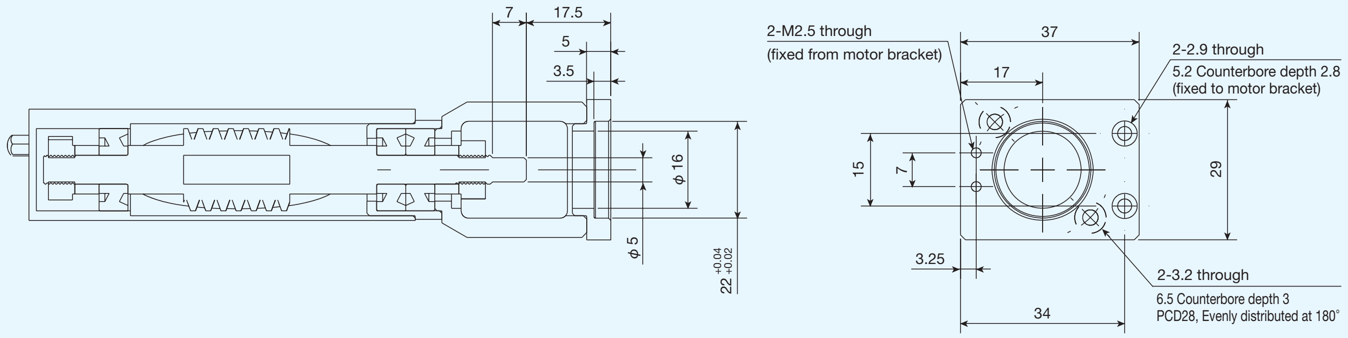
unit: mm

ATB02



unit: mm

ATB03

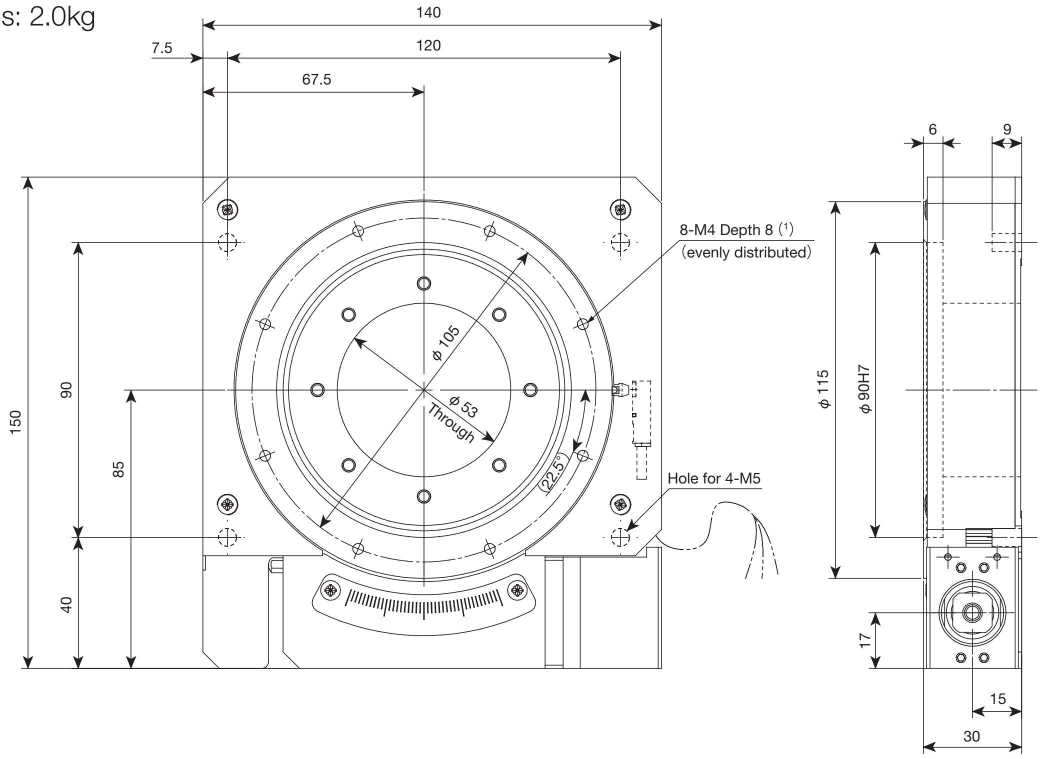


unit: mm

IKO Rotation Stage SK…W

SK120W Without limit sensor

Mass: 2.0kg

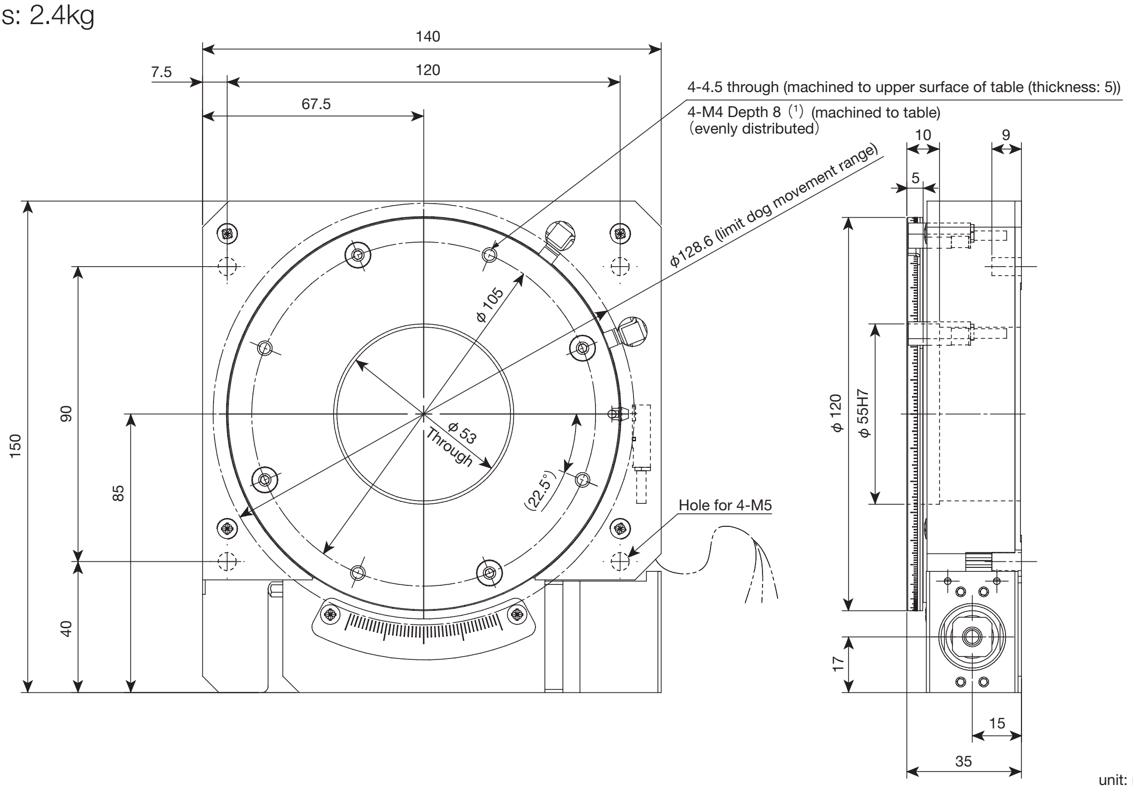


unit: mm

Notes (1) Too deep insertion depth of the mounting bolt may affect the rotation performance of the table, so never insert a bolt longer than the depth of the through hole.

SK120W With limit sensor/with upper table

Mass: 2.4kg



unit: mm

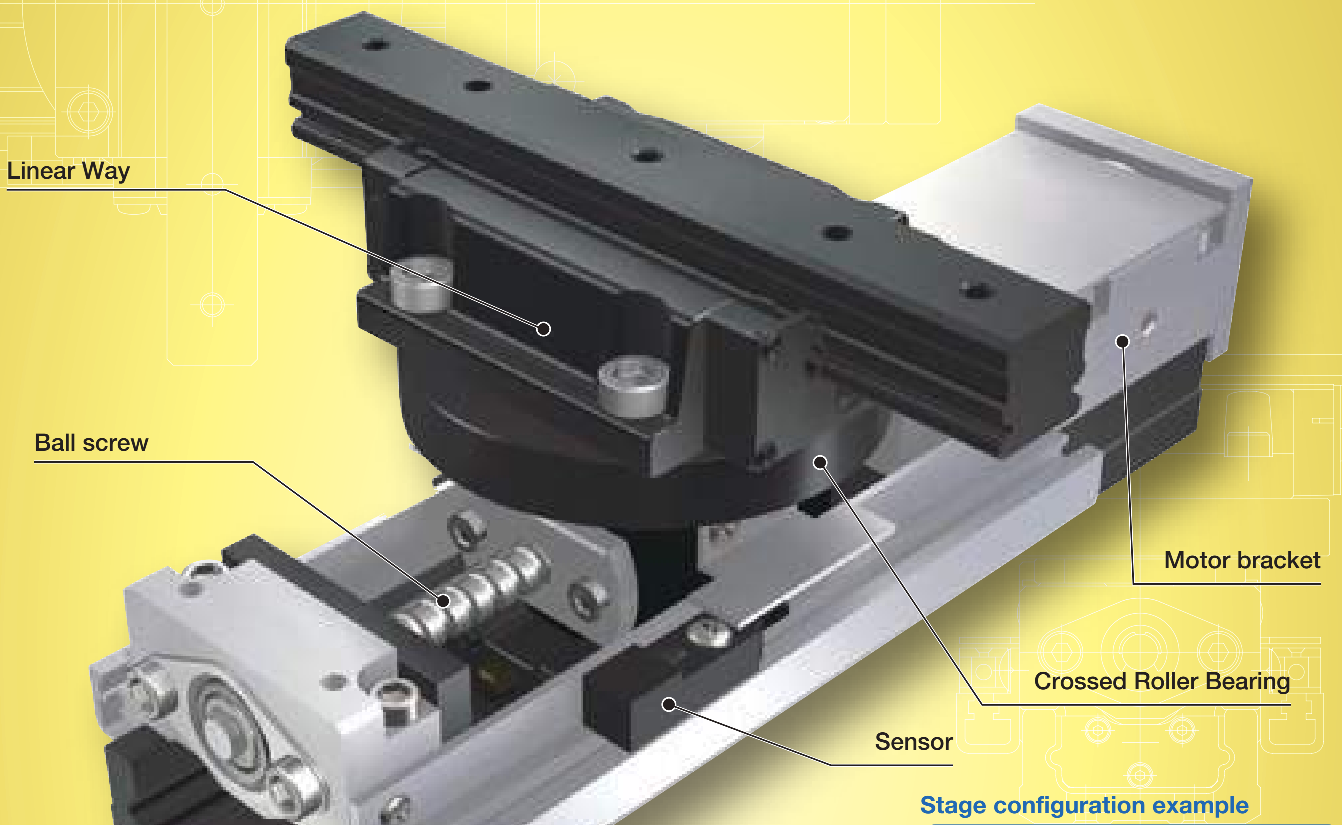
Notes (1) Too deep insertion depth of the mounting bolt may affect the rotation performance of the table, so never insert a bolt longer than the depth of the through hole.

AM

AM

Ball screw

Linear / Rotation



Stage configuration example

Major product specifications

Driving method	Precision ball screw
Linear motion rolling guide and bearing	Linear Way (ball type) Crossed Roller Bearing
Built-in lubrication part	No built-in
Material of table and bed	High carbon steel
Sensor	Provided as standard

Accuracy

unit: mm

Positioning repeatability	±0.002
Positioning accuracy	0.020
Lost motion	–
Parallelism in table motion A	–
Parallelism in table motion B	0.008
Attitude accuracy	–
Straightness	–
Backlash	0.003

Points

● Positioning module enabling various motions

1

This is a positioning module developed for alignment stage by combining the high rigidity Crossed Roller Bearing and Linear Way based on the Precision Positioning Table TU.

● Height adjustment is not required.

2

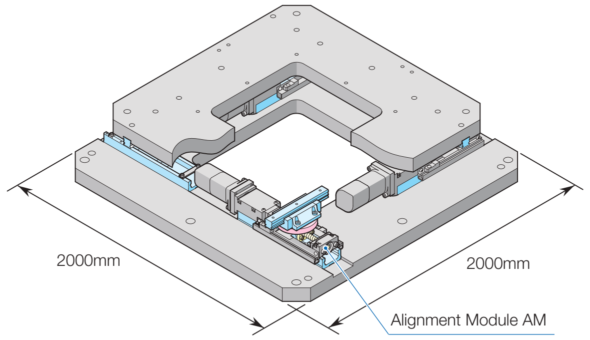
Tolerance of height dimension is managed at high precision of ±10μm. Alignment stage can be configured without adjusting the heights of respective Alignment Module AM.

● Flexibility of freely designing the stage according to the usage

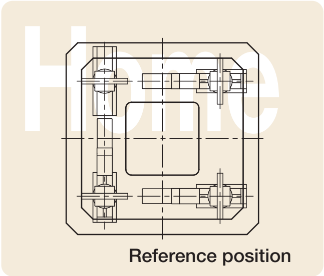
3

This unit helps you freely design the alignment stage according to the usage by combining various stages and bases into the Alignment Module AM.

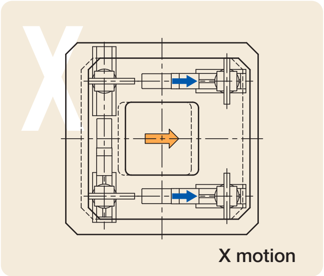
● Large stage of □2,000 class is also supported!



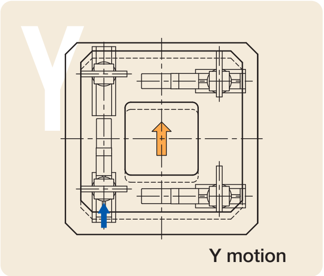
Configuration example and operating principle of alignment stage



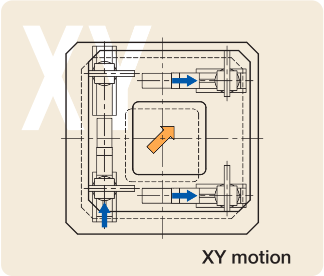
Reference position



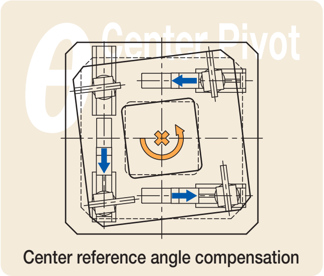
X motion



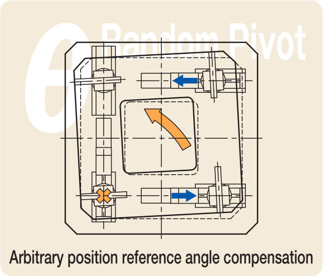
Y motion



XY motion

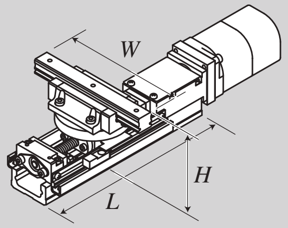


Center reference angle compensation



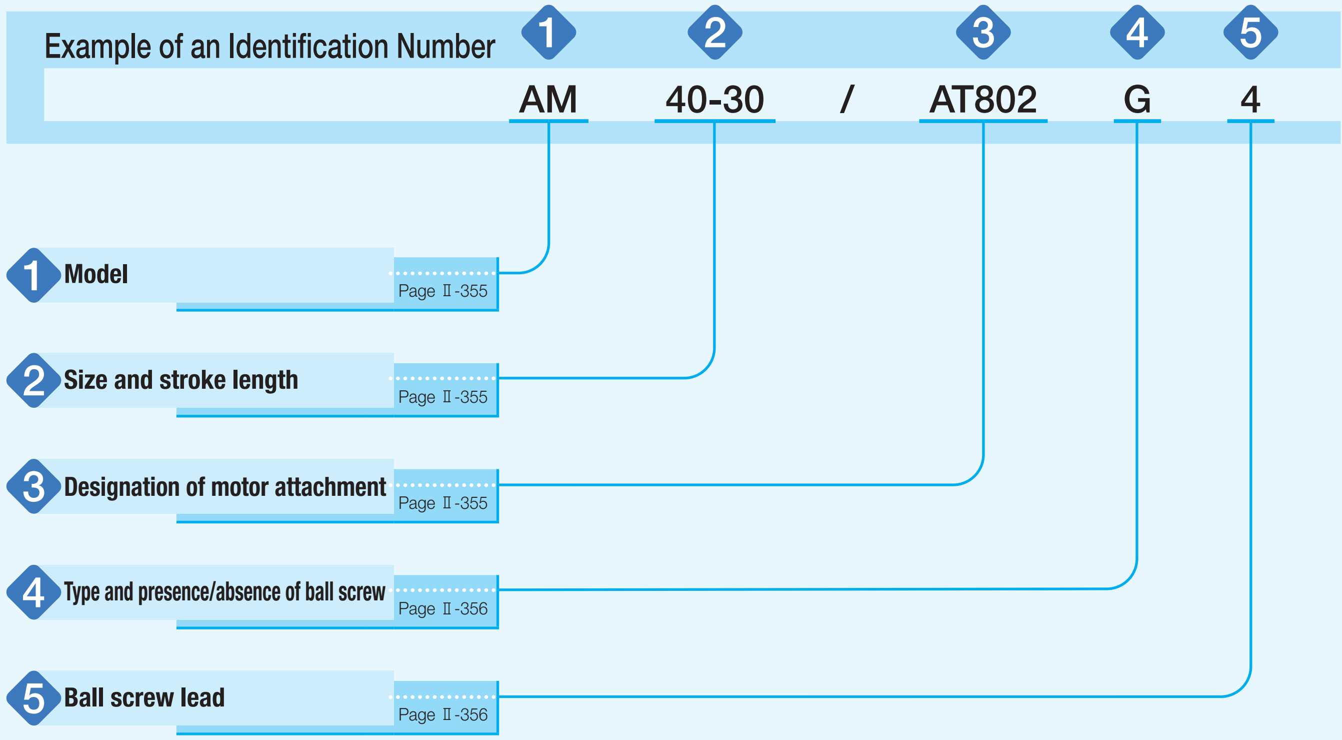
Arbitrary position reference angle compensation

Variation

Shape	Model and size	Size $W \times L \times H$ (mm)	Stroke length (mm)
	AM25	86×130× 47	30
	AM40	120×180× 78	30
	AM60	220×290×110	90
	AM86	350×390×148	120

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Identification Number



Identification Number and Specification

1 Model

AM: Alignment Module AM

2 Size and stroke length

25- 30: Width 25mm, stroke length 30mm, height 47mm
40- 30: Width 40mm, stroke length 30mm, height 78mm
60- 90: Width 60mm, stroke length 90mm, height 110mm
86-120: Width 86mm, stroke length 120mm, height 148mm

3 Designation of motor attachment

AT800: Without motor attachment
To specify the motor attachment, select it from the list of Table 1.

- Motor should be prepared by customer.
- Please specify motor attachment applicable to motor for use.
- If motor attachment is specified, a coupling shown in Table 2 is mounted on the main body before shipment. However, the final position adjustment should be made by customer since it is only temporarily fixed.
- For a product without motor attachment (AT800), no coupling is attached.

Table 1 Application of motor attachment

Motor to be used					Flange size mm	Motor attachment			
Type	Manufacturer	Series	Model	Rated output W		AM25	AM40	AM60	AM86
AC servo motor	YASKAWA ELECTRIC CORPORATION	Σ-7	SGM7M-A2A	22	□25	AT801	–	–	–
			SGM7M-A3A	33		AT801	–	–	–
			SGM7J-A5A	50	□40	–	AT802	–	–
			SGM7A-A5A			–	AT802	–	–
			SGM7J-01A	100		–	AT802	AT803	–
			SGM7A-01A			–	AT802	AT803	–
			SGM7A-C2A	150		–	–	AT803	–
			SGM7J-02A	200	□60	–	–	–	AT804
			SGM7A-02A			–	–	–	AT804
			SGM7J-04A	400		–	–	–	AT805
			SGM7A-04A			–	–	–	AT805
	Mitsubishi Electric Corporation	J4/J5	HG-AK0236	20	□25	AT801	–	–	–
			HG-AK0336	30		AT801	–	–	–
			HG-MR053	50	□40	–	AT802	–	–
			HG-KR053/HK-KT053W			–	AT802	–	–
			HG-MR13	100		–	AT802	AT803	–
			HG-KR13/HK-KT13W			–	AT802	AT803	–
			HG-MR23	200	□60	–	–	–	AT804
			HG-KR23/HK-KT23W			–	–	–	AT804
			HG-MR43	400		–	–	–	AT805
			HG-KR43/HK-KT43W			–	–	–	AT805
	Panasonic Corporation	MINAS A6	MSMF5A	50	□38	–	AT807	–	–
			MSMF01	100		–	AT807	AT808	–
			MSMF02	200	□60	–	–	–	AT809
			MSMF04	400		–	–	–	AT810
	Hitachi Industrial Equipment Systems Co., Ltd	AD	ADMA-R5L	50	□40	–	AT802	–	–
			ADMA-01L	100		–	AT802	AT803	–
			ADMA-02L	200	□60	–	–	–	AT804
			ADMA-04L	400		–	–	–	AT805

Remark: For detailed motor specifications, please see respective motor manufacturer's catalog.

Table 2 Coupling models

Motor attachment	Coupling models	Manufacturer	Coupling inertia J_c $\times 10^{-5}$kg · m^2
AT801	UA-15C- 5× 5	Sakai Manufacturing Co., Ltd	0.024
AT802	UA-20C- 5× 8	Sakai Manufacturing Co., Ltd	0.086
AT803	UA-25C- 8× 8	Sakai Manufacturing Co., Ltd	0.290
AT804	UA-30C-10×14	Sakai Manufacturing Co., Ltd	0.603
AT805	UA-35C-10×14	Sakai Manufacturing Co., Ltd	1.34
AT807	UA-20C- 5× 8	Sakai Manufacturing Co., Ltd	0.086
AT808	UA-25C- 8× 8	Sakai Manufacturing Co., Ltd	0.290
AT809	UA-30C-10×11	Sakai Manufacturing Co., Ltd	0.603
AT810	UA-35C-10×14	Sakai Manufacturing Co., Ltd	1.34

Remark: For detailed coupling specification, please see the manufacturer's catalog.

4 Type and presence/absence of ball screw

G: Ground ball screw
N: Without ball screw

When selecting N, specify AT800 for ③ and set "No symbol" for ⑤.

5 Ball screw lead

4: Lead 4mm (applicable to AM25 and AM40)
5: Lead 5mm (applicable to AM60 and AM86)

Specifications

Table 3 Accuracy unit: mm

Model and size	Stroke length(1)	Length of track rail	Positioning repeatability(1)	Positioning accuracy (1)	Parallelism in motion B	Backlash (1)
AM25	30	130	±0.002	0.020	0.008	0.003
AM40	30	180				
AM60	90	290				
AM86	120	390				

Note (1) Not applicable to "Without ball screw" specification.

Table 4 Height unit: mm

Model and size	Module height	Tolerance of height
AM25	47	±0.010
AM40	78	
AM60	110	
AM86	148	

Remark: These are values of distance between mounting surface and the center of module upper surface under the condition where upper and lower axis intersect orthogonally and the linear motion rolling guide of each axis stays at the center of the stroke.

Table 5 Maximum speed

Model and size	Ball screw lead mm	Maximum speed mm/s
AM25	4	200
AM40		
AM60	5	250
AM86		

Remark: To measure the practical maximum speed, it is required to consider operation patterns based on the motor to be used and load conditions.

Table 6 Specifications of ball screw unit: mm

Model and size	Shaft dia.	Overall length
AM25- 30	6	146
AM40- 30	8	158
AM60- 90	12	263
AM86-120	20	359

Table 7 Maximum carrying mass

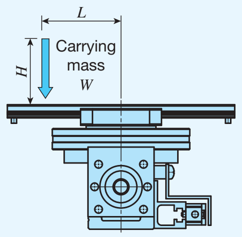
Model and size	Carrying mass position mm	Maximum carrying mass kg							
		Horizontal direction				Vertical direction			
	Length L / Height H	0	100	200	300	0	100	200	300
AM25	0	11	1.2	0.6	0.4	4.6	0.4	0.2	0.1
	100	6	1.1	0.6	0.4	0.6	0.3	0.2	0.1
	200	3.7	1.0	0.6	0.4	0.3	0.2	0.1	0.1
	300	2.6	0.9	0.5	0.4	0.2	0.1	0.1	0.1
AM40	0	39	11	5	4.0	10	4.9	2.5	1.7
	100	39	9	5	3.9	4.6	3.0	2.0	1.4
	200	25	8	5	3.7	2.4	1.9	1.5	1.2
	300	18	7	4.9	3.5	1.6	1.4	1.2	1.0
AM60	0	88	30	16	11	13	13	8	5
	100	88	27	15	11	13	9	6	4.6
	200	59	23	14	10	7	6	4.9	3.9
	300	44	21	13	10	5	4.4	3.8	3.3
AM86	0	210	93	52	36	23	23	23	21
	100	210	84	49	35	23	23	23	17
	200	192	76	47	34	23	22	19	15
	300	150	69	44	32	20	17	14	13

Remark: The maximum carrying mass is adjusted by the mass when the rating life of the linear motion rolling guide, ball screws, or bearings is 18,000 hours during continuous operation at a number of revolutions of the motor of 3000min^{-1} and an acceleration/deceleration time of 0.2s. The mass calculated is based upon the basic static load rating of the linear motion rolling guide.

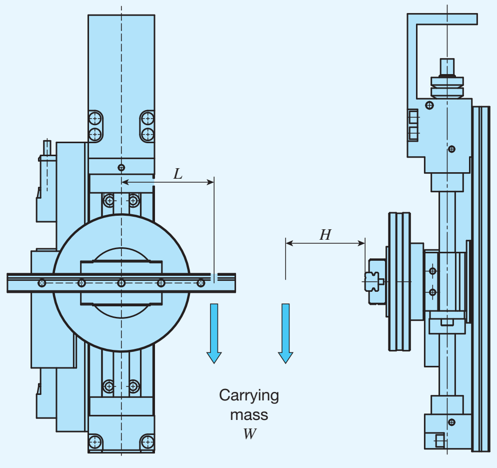
Table 8 Maximum load mass

Model and size	Ball screw lead mm	Maximum load mass kg	
		Horizontal direction	Vertical direction
AM25	4	75	17
AM40	4	218	55
AM60	5	244	58
AM86	5	616	174

Remarks 1. The maximum load mass shows the mass that ensures acceleration/deceleration of 0.3G.
2. The values shown in this table were calculated with the motor with the highest rated torque installed, selected from the AC servomotor models listed in Table 1.



Carrying mass position
(horizontal direction)



Carrying mass position
(vertical direction)

Table 9 Table inertia and starting torque

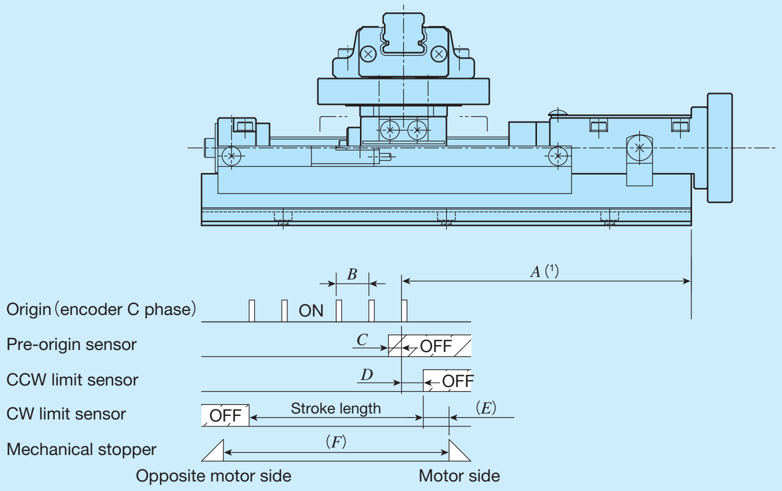
Model and size	Table inertia J_T ×10^{-5}kg·m^2	Starting torque T_S N·m
AM25	0.028	0.02
AM40	0.08	0.04
AM60	0.59	0.09
AM86	4.97	0.13

Mounting

For the processing accuracy of the Precision Positioning Table mounting surface and the tightening torque of the fixing screws, see page Ⅲ-30.

Sensor Specification

Table 10 Sensor timing chart



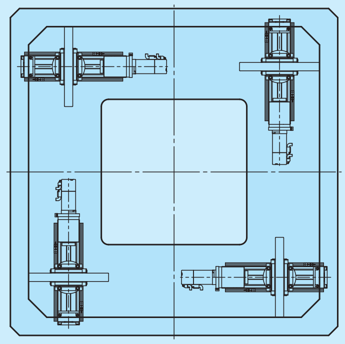
unit: mm

Model and size	*A*	*B*	*C*	*D*	*E*	*F*
AM25	90	4	2	15	8	46.4
AM40	90	4	2	15	8	48.5
AM60	133	5	3	45	16	117.6
AM86	155	5	3	60	8	135

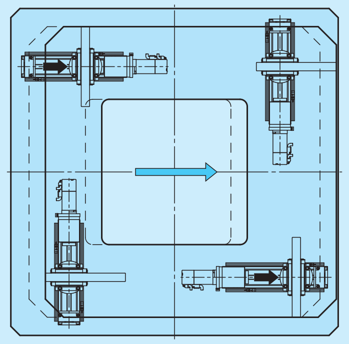
Note (1) The origin is the center of stroke.

Example of Motion Specification

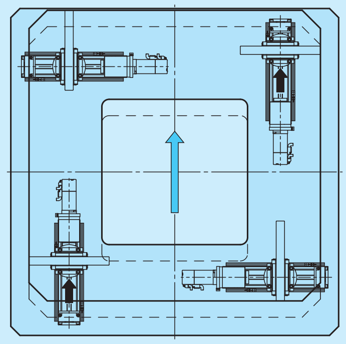
Combining the AM enables the following table configurations.
And, as it is possible to attach this unit to the device to be delivered, if you are interested, please contact IKO.



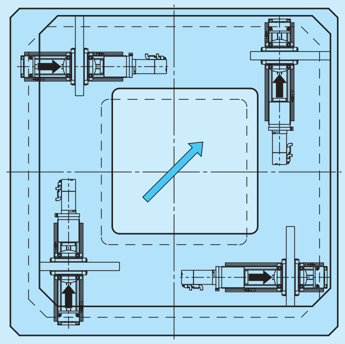
Reference position



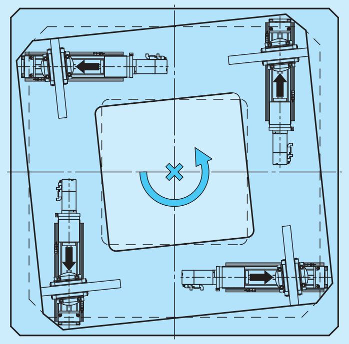
X motion



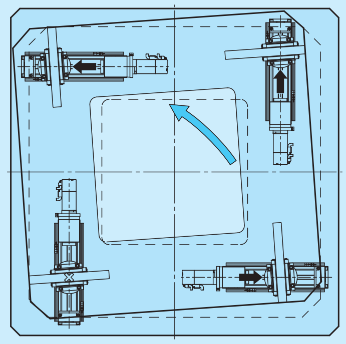
Y motion



XY motion



Center reference angle compensation

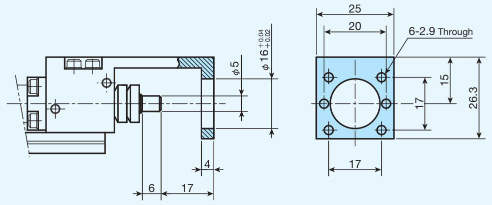


Arbitrary position reference angle compensation

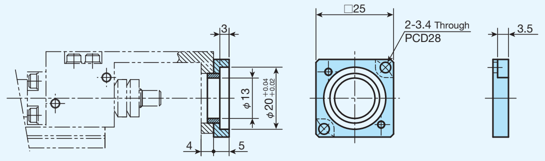
Dimensions of Motor Attachment

AM25

AT800
(without attachment)

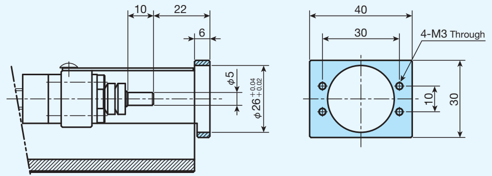


AT801

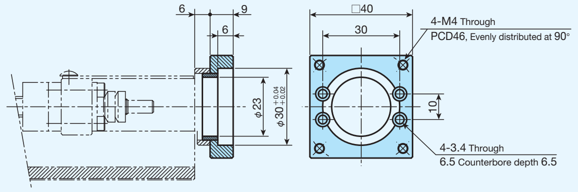


AM40

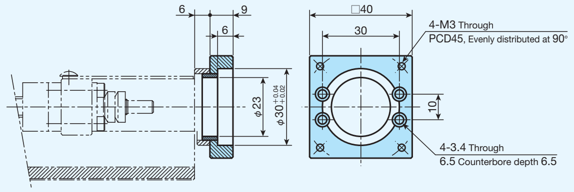
AT800
(without attachment)



AT802

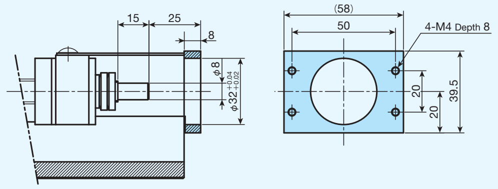


AT807

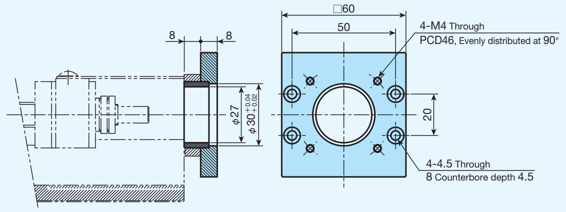


AM60

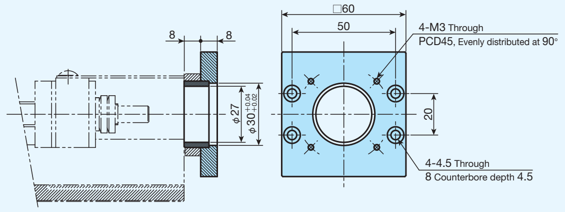
AT800
(without attachment)



AT803

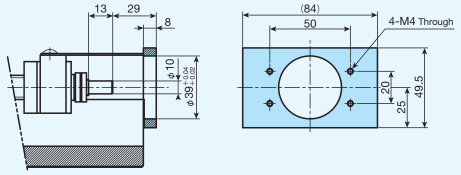


AT808

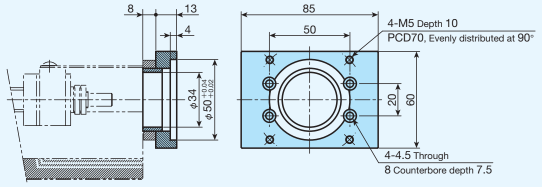


AM86

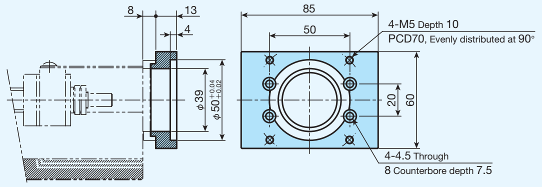
AT800
(without attachment)



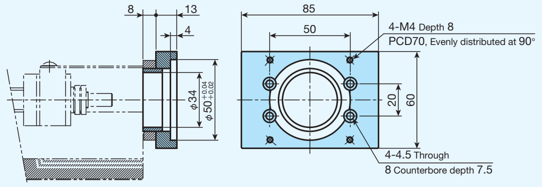
AT804



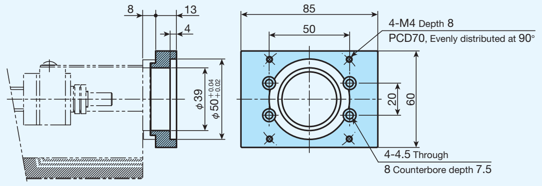
AT805



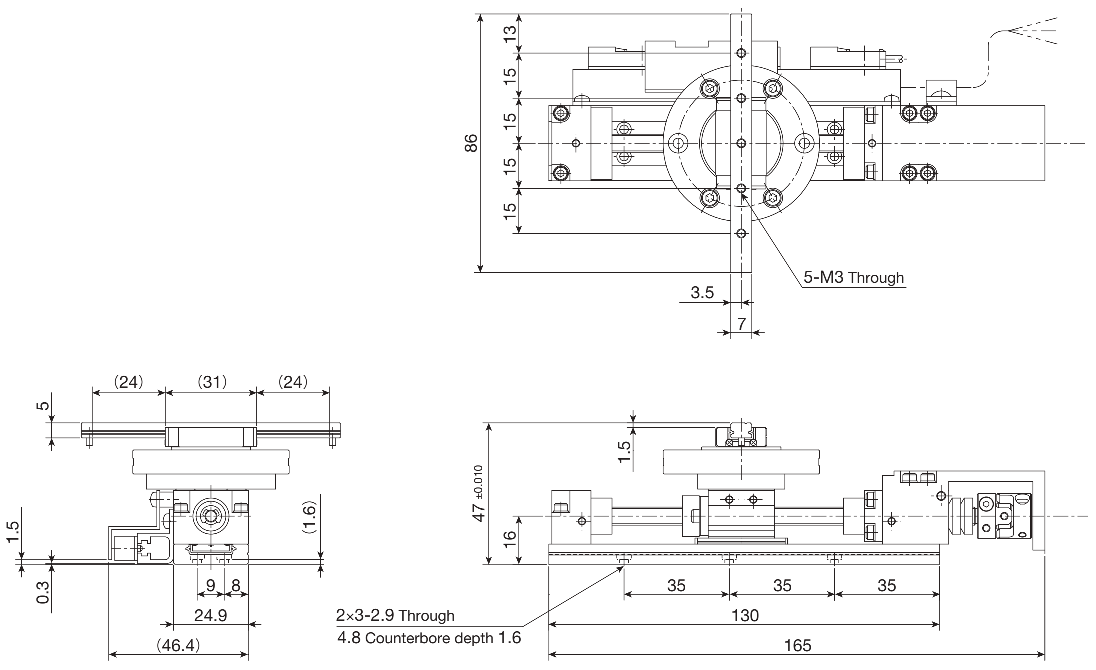
AT809



AT810

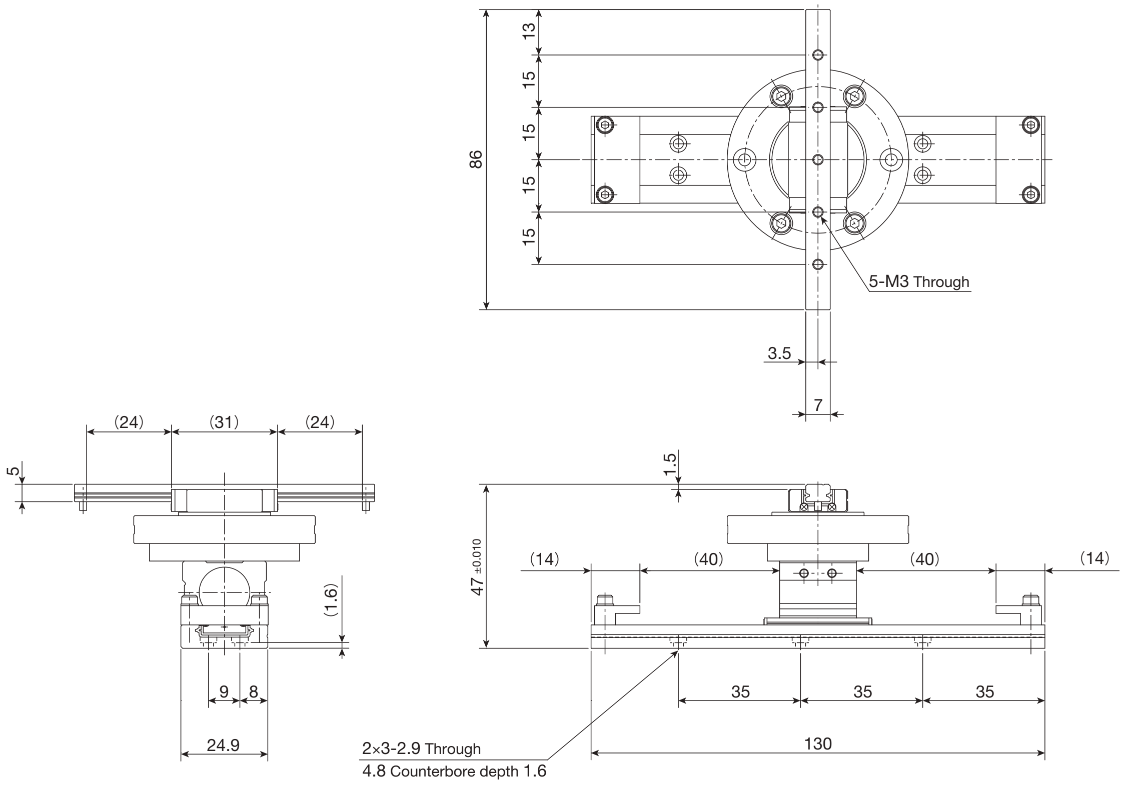


AM25 Without motor attachment and with ball screw



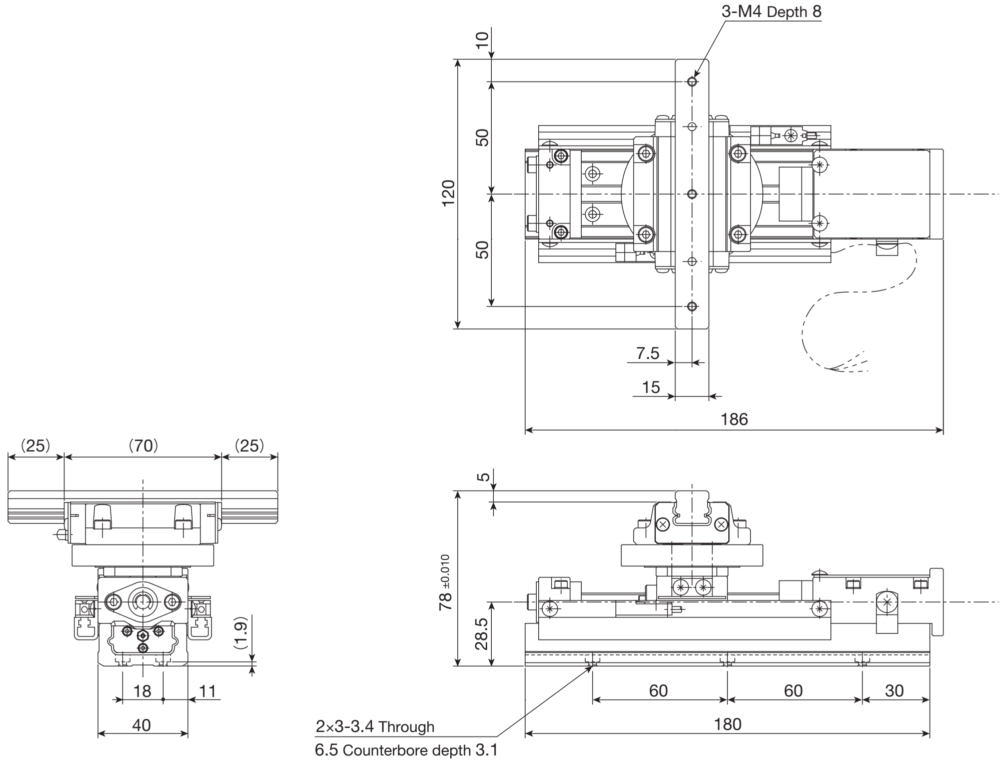
mass: 0.6kg

AM25 Without ball screw



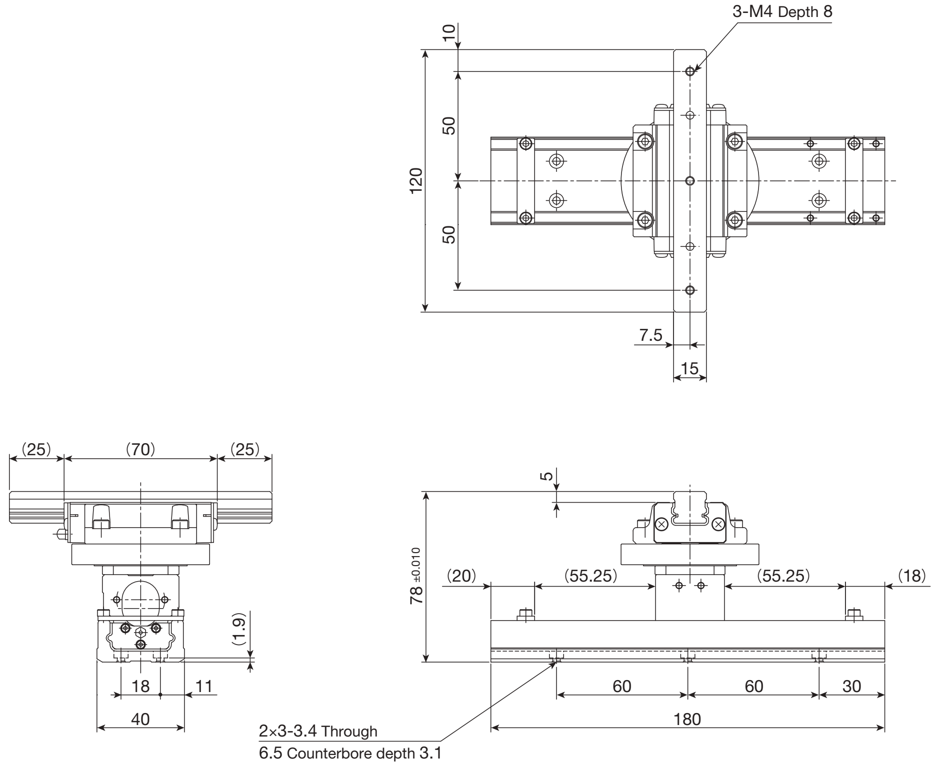
mass: 0.4kg

AM40 Without motor attachment and with ball screw



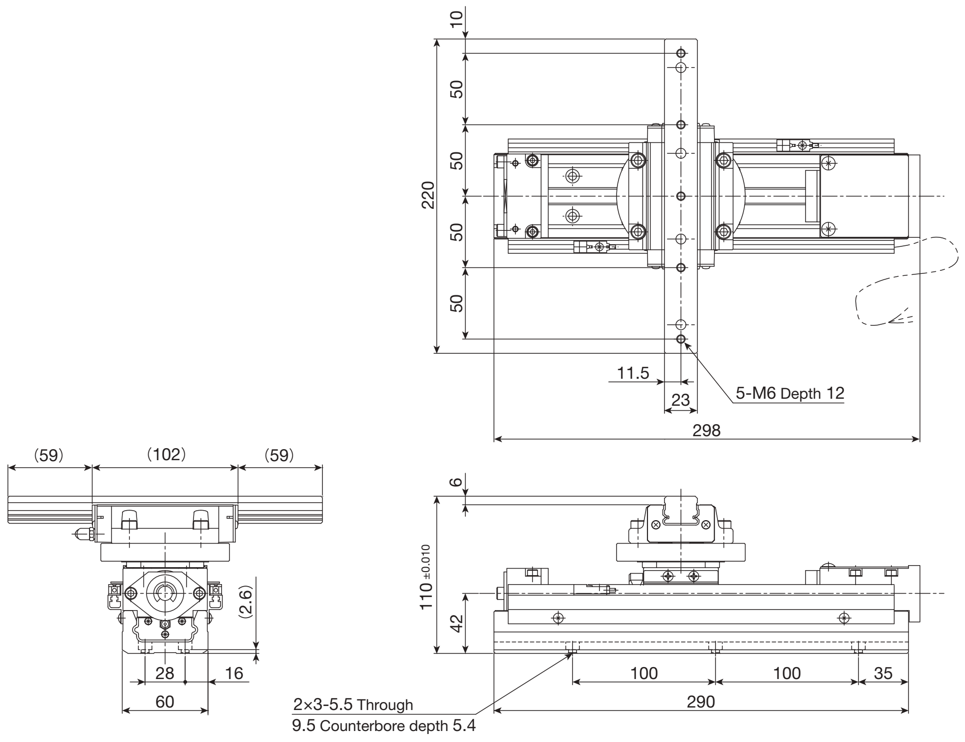
mass: 2.0kg

AM40 Without ball screw



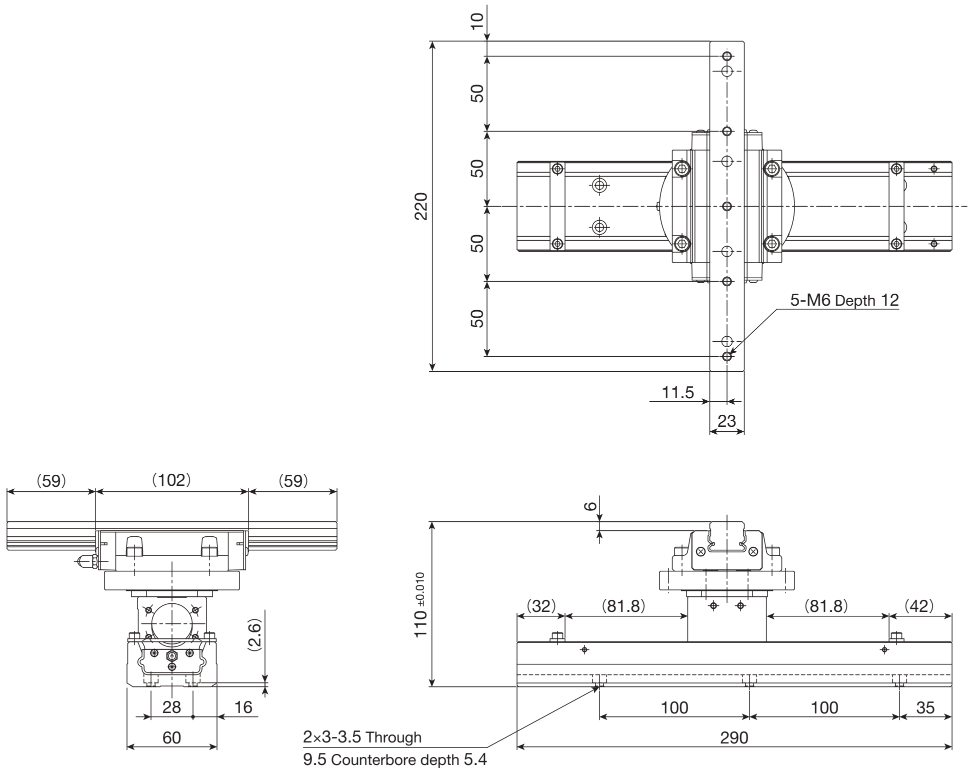
mass: 1.5kg

AM60 Without motor attachment and with ball screw



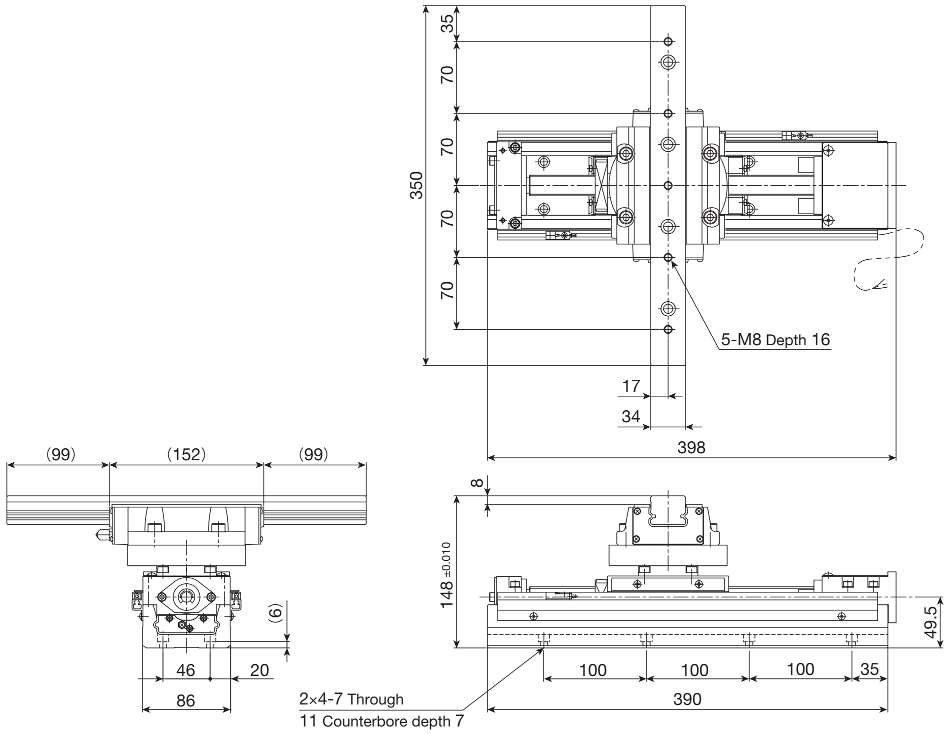
mass: 6kg

AM60 Without ball screw



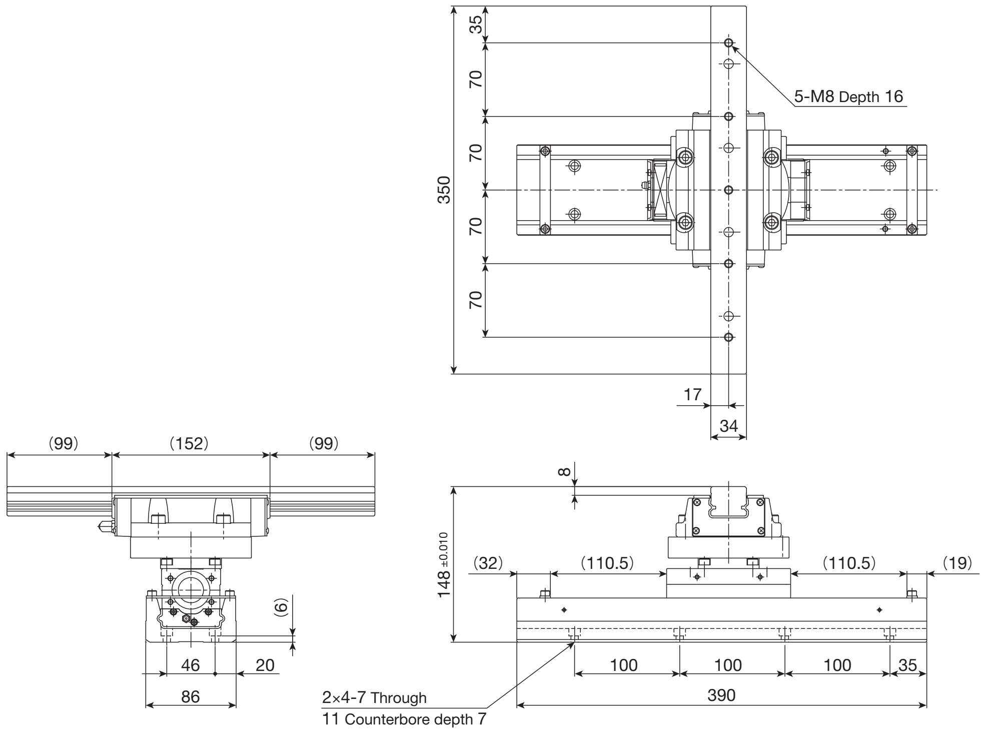
mass: 5kg

AM86 Without motor attachment and with ball screw



mass: 17kg

AM86 Without ball screw



mass: 15kg

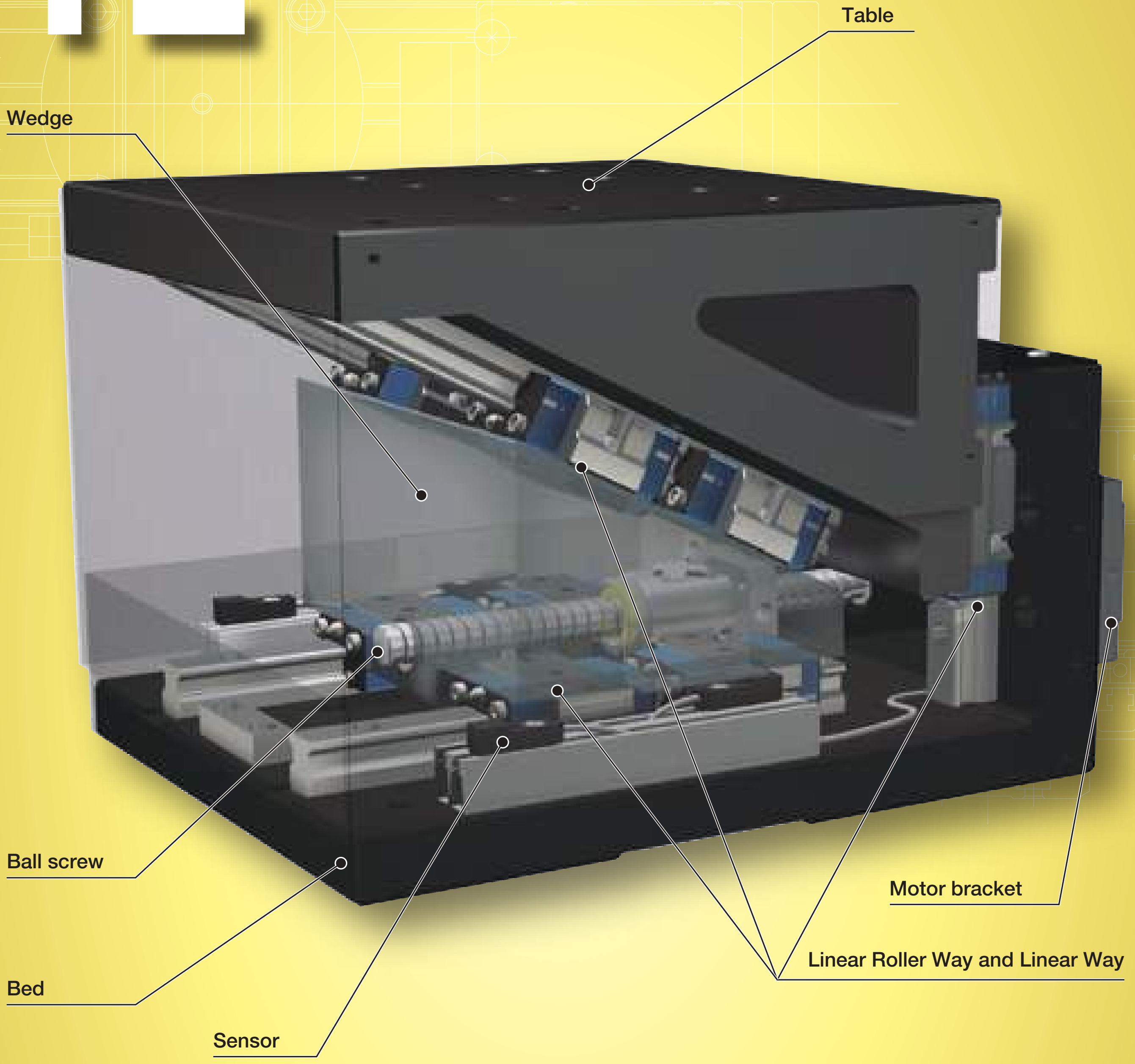
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

TZ

TZ

Ball screw

Linear



Major product specifications

Driving method	Precision ball screw
Linear motion rolling guide	Linear Roller Way（roller type） Linear Way（ball type）
Built-in lubrication part	Lubrication part "C-Lube" is built-in
Material of table and bed	Aluminum extruded material (Alumite)
Sensor	Provided as standard

Accuracy

unit: mm

Positioning repeatability	±0.001
Positioning accuracy	0.005
Lost motion	0.001
Parallelism in table motion A	–
Parallelism in table motion B	–
Attitude accuracy	–
Straightness	–
Backlash	–

Points

● Compact precision elevating table

1 This is an elevating table for performing compact yet high precision vertical positioning with unique wedge mechanism adopted.

● Two types and two sizes selectable depending on the usage

2 Table dimensions of □120 mm and □200 mm have been added to our lineup, including the high accuracy/high rigidity type with roller-type linear motion rolling guide incorporated and the standard type with superior cost performance. Two kinds of wedge reduction ratio are prepared, thus enabling vertical positioning of up to 24mm in stroke.

● Installation of linear encoder enables the positioning of a rank higher level.

3 Specifying an optional linear encoder attached unit and performing the fully-closed loop control enables the positioning of even higher precision.

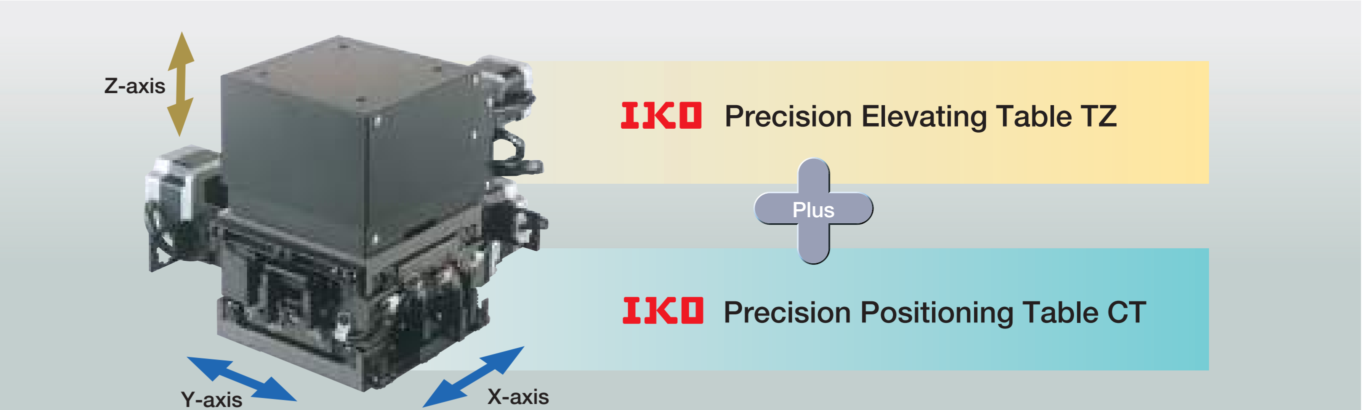
● Sensor provided as standard

4 Limit sensor and origin / pre-origin sensors are provided as standard. The sensor is compactly built in the main unit, thus facilitating the incorporation into a machine or device.

● Available as multi-axis configured Z-axis

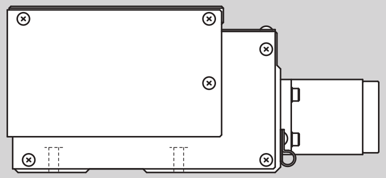
5 Placing the unit on a slide table of precision positioning table makes the unit available as Z-axis positioning mechanism of the multi-axis table.

Example of combination with XYZ positioning table using the Precision Elevating Table TZ

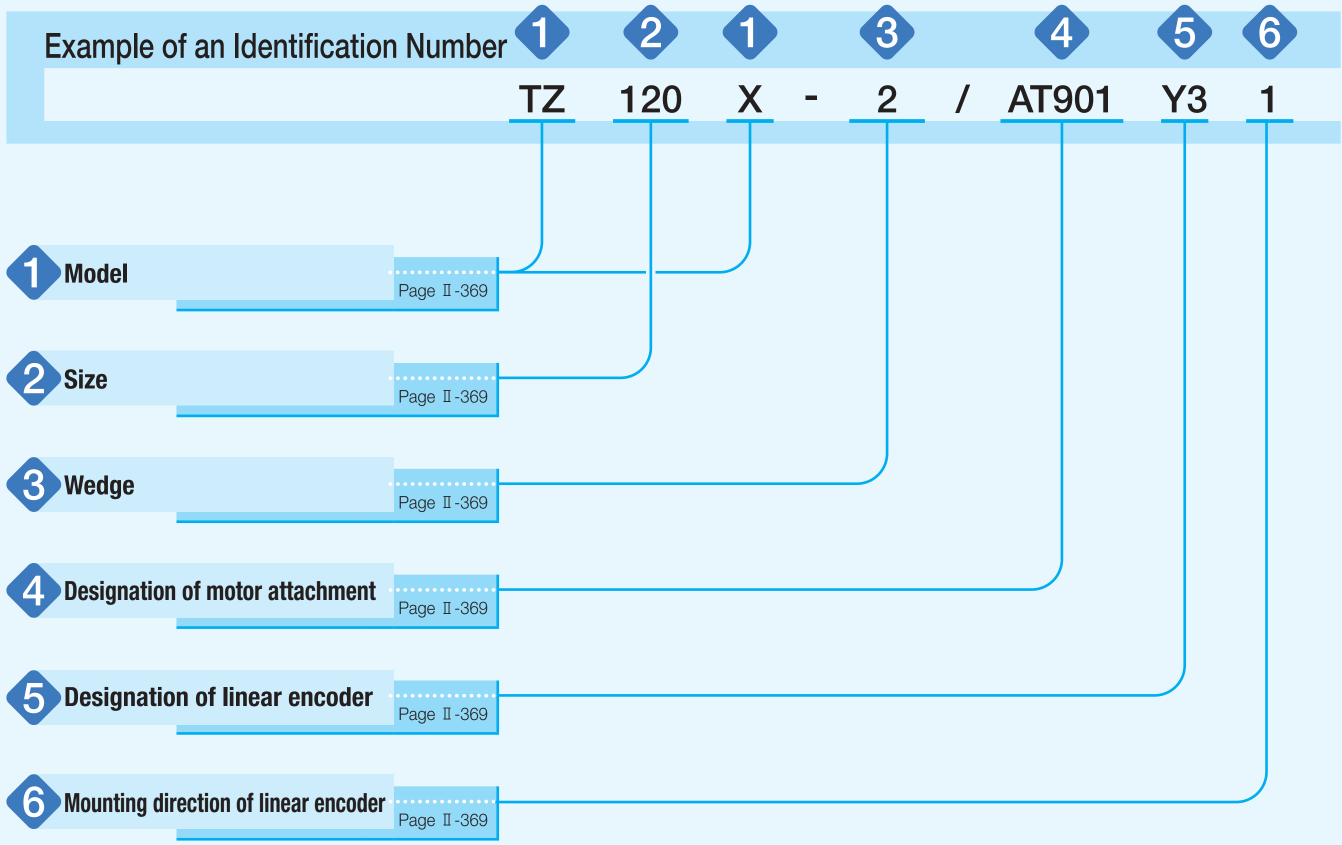


Combination of TZ120X and CT125 / 125

Variation

Shape	Model and size	Table width (mm)	Linear motion rolling guide type	Wedge reduction ratio
	TZ120X-2	□120	Roller Type	1：2
	TZ120X-4			1：4
	TZ200H-2	□200	Ball type	1：2
	TZ200H-4			1：4
	TZ200X-2		Roller Type	1：2
	TZ200X-4			1：4

Identification Number



Identification Number and Specification

① **Model**	TZ···H: Precision Elevating Table（applicable to size 200） TZ···X: Precision Elevating Table, high precision and high rigidity type（applicable to size 120, 200）
② **Size**	120: Table size □120mm 200: Table size □200mm
③ **Wedge**	2: Wedge reduction ratio 1 : 2 4: Wedge reduction ratio 1 : 4 This ratio indicates the reduction ratio of vertical travel distance to the ball screw feed rate.
④ **Designation of motor attachment**	As for a motor attachment, select it from the list of Table 1. ・Motor should be prepared by customer. ・Please specify motor attachment applicable to motor for use. ・A coupling shown in Table 2 is mounted on the main body before shipment. However, the final position adjustment should be made by customer since it is only temporarily fixed. ・When specifying an AC servomotor attachment, an origin sensor is not provided.
⑤ **Designation of linear encoder**	No symbol: Without linear encoder When specifying the linear encoder, see Table 3. ・"With linear encoder" is only applicable to AC Servomotor specification. For applicable models and motor attachments, see Table 1.
⑥ **Mounting direction of linear encoder**	No symbol: On the right as viewed from the side opposite the motor 1 : On the left as viewed from the side opposite the motor ・The mounting direction of the linear encoder and pull-out direction of the sensor cord are the same.

Identification Number and Specification

Table 1 Application of motor attachment

Motor model					Flange size mm	Motor attachment	
Type	Manufacturer	Series	Model	Rated output W		TZ120X	TZ200H TZ200X
AC servo motor	YASKAWA ELECTRIC CORPORATION	Σ-7	SGM7J-A5A	50	□40	AT901	–
			SGM7A-A5A			AT901	–
			SGM7J-01A	100		AT901	AT902
			SGM7A-01A			AT901	AT902
			SGM7A-C2A	150		–	AT902
	Mitsubishi Electric Corporation	J4/J5	HG-MR053	50	□40	AT901	–
			HG-KR053/HK-KT053W			AT901	–
			HG-MR13	100		AT901	AT902
			HG-KR13/HK-KT13W			AT901	AT902
	Panasonic Corporation	MINAS A6	MSMF5A	50	□38	AT903	–
			MSMF01	100		AT903	AT904
Stepper motor	ORIENTAL MOTOR Co., Ltd.	α step	ARM46		□42	AT905	–
			ARM66		□60	–	AT906
			ARM69		□60	–	AT906
		CRK	CRK54		□42	AT907	–
			CRK56 (1)		□60	–	AT908

Note (1) Applicable to the outer diameter $\phi 8$ of motor output shaft.
Remark: For detailed motor specifications, please see respective motor manufacturer's catalog.

Table 2 Coupling models

Motor attachment	Coupling models	Manufacturer	Coupling inertia J_c $\times 10^{-6}$kg・m^2
AT901	UA-20C-5× 8	Sakai Manufacturing Co., Ltd	0.086
AT902	UA-25C-8× 8	Sakai Manufacturing Co., Ltd	0.29
AT903	UA-20C-5× 8	Sakai Manufacturing Co., Ltd	0.086
AT904	UA-25C-8× 8	Sakai Manufacturing Co., Ltd	0.29
AT905	UA-20C-5× 6	Sakai Manufacturing Co., Ltd	0.086
AT906	UA-25C-8×10	Sakai Manufacturing Co., Ltd	0.29
AT907	UA-20C-5× 5	Sakai Manufacturing Co., Ltd	0.086
AT908	UA-25C-8× 8	Sakai Manufacturing Co., Ltd	0.29

Remark: For detailed coupling specifications, please see respective manufacturer's catalog.

Table 3 Linear encoder models

Item \ Target models		TZ120X			TZ200H、TZ200X		
Designation code of linear encoder		Y3	J3	P3	Y4	J4	P4
Manufacturers of compatible drivers		YASKAWA ELECTRIC CORPORATION	Mitsubishi Electric Corporation	Panasonic Corporation	YASKAWA ELECTRIC CORPORATION	Mitsubishi Electric Corporation	Panasonic Corporation
Linear encoder	Manufacturer	Renishaw plc			Renishaw plc		
	Head	T1031-30A	V2BCY30D04F		T1031-30A	V2BCY30D04F	
	Interface	Ti0000A00V	–		Ti0000A00V	–	
	Scale	A-9715-0004			A-9715-0007		

Specifications

Table 4 Specifications

Model and size	Wedge reduction ratio	Ball screw lead mm	Resolution (1) μm/pulse	Stroke length mm
TZ120X-2	1 : 2	4	2.0 (0.1)	10
TZ120X-4	1 : 4		1.0 (0.1)	5
TZ200H-2	1 : 2	5	2.5 (0.1)	24
TZ200H-4	1 : 4		1.25 (0.1)	12
TZ200X-2	1 : 2		2.5 (0.1)	24
TZ200X-4	1 : 4		1.25 (0.1)	12

Note (1) The resolution indicates a value when fraction sizes of the motor are 1,000 pulses/rev.

Remark: The values in ( ) indicate values with linear encoder and Panasonic Corporation MINAS A5 system selected. If the ΣV system of YASKAWA ELECTRIC CORPORATION is selected, it should be 0.078125μm/pulse.

Table 5 Accuracy

unit: mm

Model and size	Wedge reduction ratio	Positioning repeatability	Positioning accuracy	Lost motion	Parallelism in table elevating	Squareness in table elevating
TZ120X-2	1 : 2	±0.001	– (0.005)	0.001	0.010	0.010
TZ120X-4	1 : 4					
TZ200H-2	1 : 2	±0.001	– (0.005)	–	–	–
TZ200H-4	1 : 4					
TZ200X-2	1 : 2	±0.001	– (0.005)	0.001	0.010	0.010
TZ200X-4	1 : 4					

Remark: The values in ( ) indicate values with a linear encoder.

Table 6 Maximum speed

Model and size	Wedge reduction ratio	Ball screw lead mm	Maximum speed mm/s	
			AC servomotor	Stepper motor
TZ120X-2	1 : 2	4	100	60
TZ120X-4	1 : 4		50	30
TZ200H-2	1 : 2	5	125	75
TZ200H-4	1 : 4		62.5	37.5
TZ200X-2	1 : 2		125	75
TZ200X-4	1 : 4		62.5	37.5

Remark: To measure the practical maximum speed, it is required to consider operation patterns based on the motor to be used and load conditions.

Table 7 Maximum carrying mass

Model and size	Wedge reduction ratio	Carrying mass position mm	Maximum carrying mass kg							
			Horizontal direction				Vertical direction			
		Length L / Height H	0	100	200	300	0	100	200	300
TZ120X	1:2	0	146	45	25	18	10	10	6	4.5
		100	95	37	23	16	10	7	5	3.8
		200	61	31	20	15	6	5	4.1	3.3
		300	45	26	18	14	4.4	3.7	3.2	2.8
	1:4	0	146	46	26	18	10	10	6	4.6
		100	98	37	23	16	10	8	5	3.8
		200	63	31	20	15	6	5	4.2	3.3
		300	46	26	18	14	4.5	3.8	3.2	2.8
TZ200H	1:2	0	109	59	35	25	9	9	7	5
		100	88	45	30	22	9	7	5	4.3
		200	59	36	26	20	6	5	4.2	3.6
		300	44	30	23	18	4.5	3.8	3.3	2.9
	1:4	0	109	62	37	26	10	10	8	5
		100	95	47	31	23	10	8	6	4.6
		200	62	38	27	20	7	5	4.7	3.9
		300	46	31	23	18	5	4.3	3.7	3.2
TZ200X	1:2	0	159	123	72	51	9	9	9	9
		100	159	119	71	51	9	9	9	9
		200	159	112	70	50	9	9	9	9
		300	159	103	67	49	9	9	9	9
	1:4	0	160	124	73	51	10	10	10	10
		100	160	120	72	51	10	10	10	10
		200	160	113	70	50	10	10	10	10
		300	160	105	68	49	10	10	10	10

Remark: The maximum carrying mass is adjusted by the mass when the rating life of the linear motion rolling guide, ball screws, or bearings is 18,000 hours during continuous operation at a number of revolutions of the motor of 3000min^{-1} and an acceleration/deceleration time of 0.2s. The mass calculated is based upon the basic static load rating of the linear motion rolling guide.

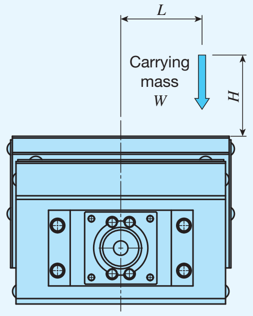
Specifications

Table 8 Maximum load mass

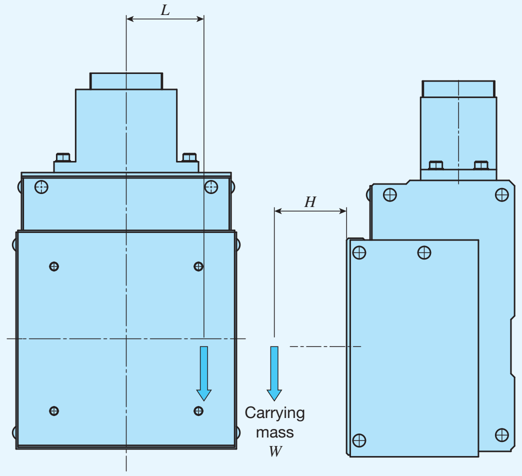
Model and size	Wedge reduction ratio	Maximum load mass kg	
		Horizontal direction	Vertical direction
TZ120X-2	1:2	118	116
TZ120X-4	1:4	246	237
TZ200H-2	1:2	126	124
TZ200H-4	1:4	261	251
TZ200X-2	1:2	126	124
TZ200X-4	1:4	261	251

Remarks 1. The maximum load mass shows the mass that ensures acceleration/deceleration of 0.3G.

2. The values shown in this table were calculated with the motor with the highest rated torque installed, selected from the AC servomotor models listed in Table 1.



Carrying mass position
(horizontal direction)



Carrying mass position
(vertical direction)

Table 9 Specifications of ball screw unit: mm

Model and size	Shaft dia.	Overall length
TZ120X	8	168
TZ200H	12	215
TZ200X	12	215

Table 10 Table inertia and starting torque

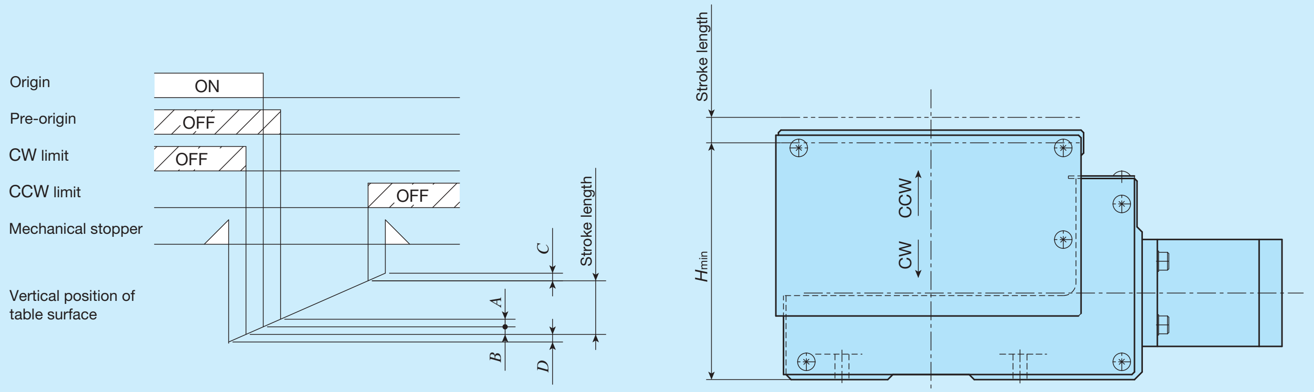
Model and size	Wedge reduction ratio	Table inertia J_T $\times 10^{-5}$kg·m²	Starting torque T_S N·m
TZ120 -2	1 : 2	0.076	0.03
TZ120 -4	1 : 4	0.061	0.02
TZ120X-2	1 : 2	0.076	0.03
TZ120X-4	1 : 4	0.064	0.02
TZ200H-2	1 : 2	0.581	0.07
TZ200H-4	1 : 4	0.473	0.06
TZ200X-2	1 : 2	0.581	0.07
TZ200X-4	1 : 4	0.473	0.06

Mounting

For the fixing screw tightening torque of the Precision Positioning Table, see page Ⅲ-30.

Sensor Specification

Table 11 Sensor timing chart



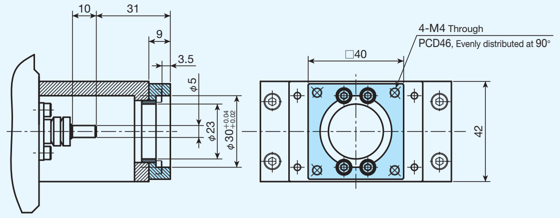
unit: mm

Identification number	A	B	C	D
TZ120X-2	1	1	1	1
TZ120X-4	0.5	0.5	0.5	0.5
TZ200H-2 TZ200X-2	1.5	1	2.5	1
TZ200H-4 TZ200X-4	0.75	0.5	1.25	0.5

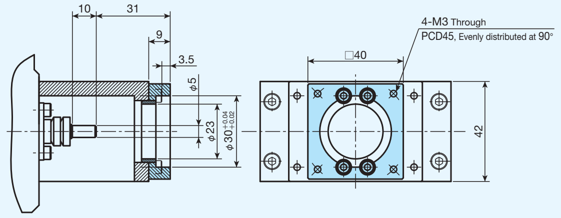
Dimensions of Motor Attachment

TZ120X

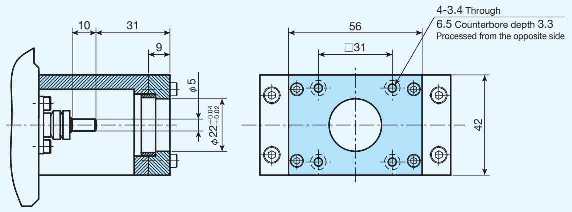
AT901



AT903

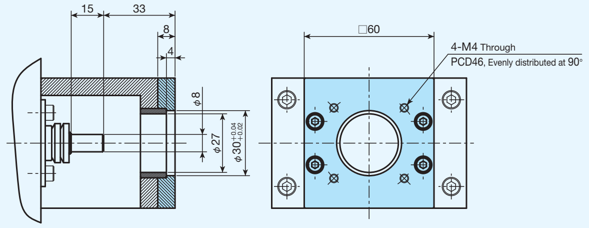


AT905
AT907

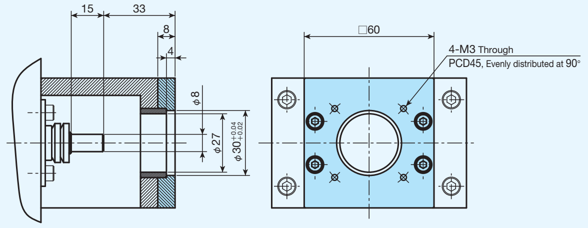


TZ200H, TZ200X

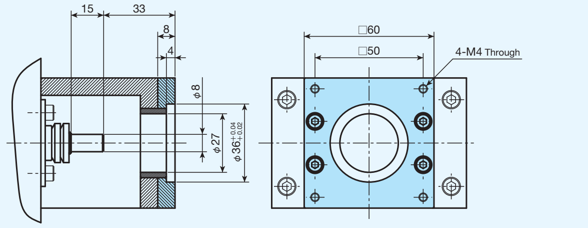
AT902



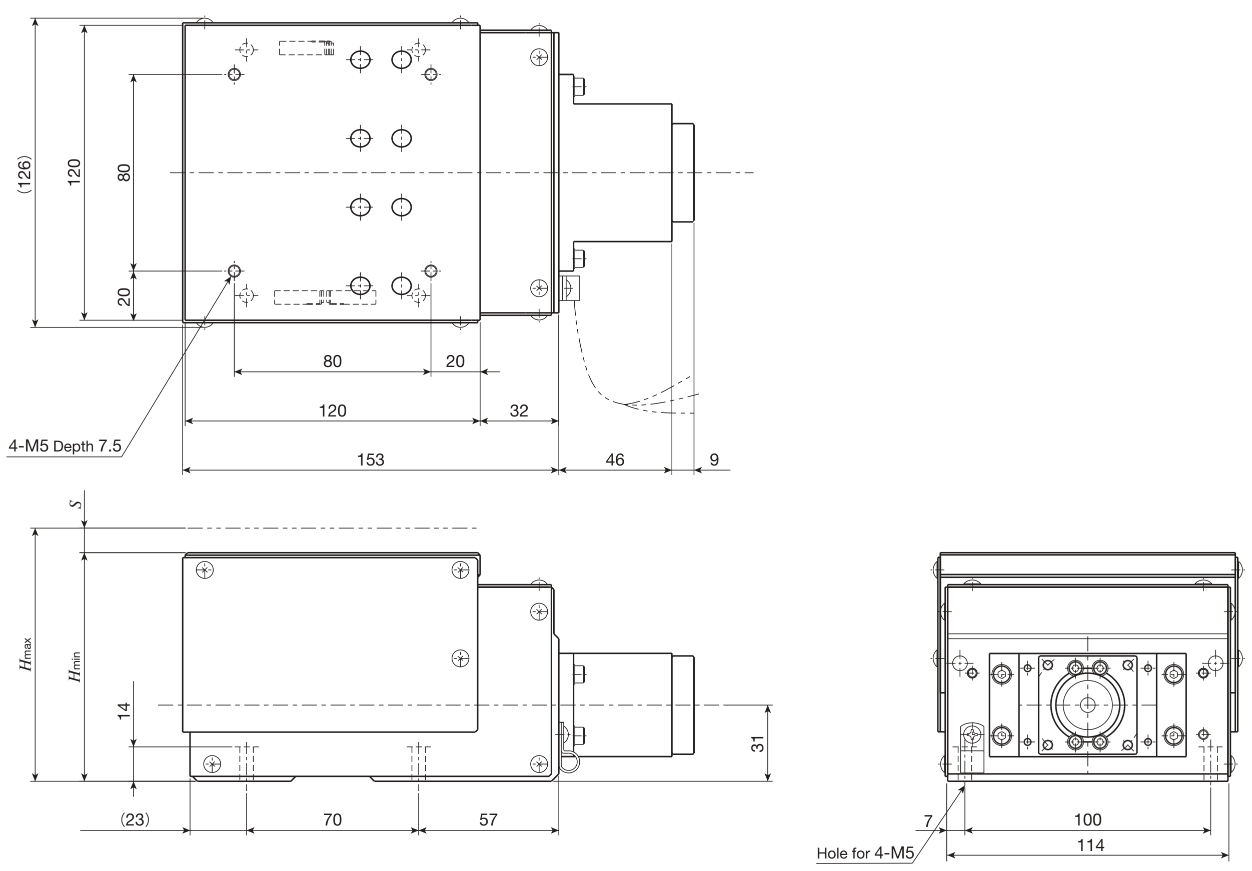
AT904



AT906
AT908



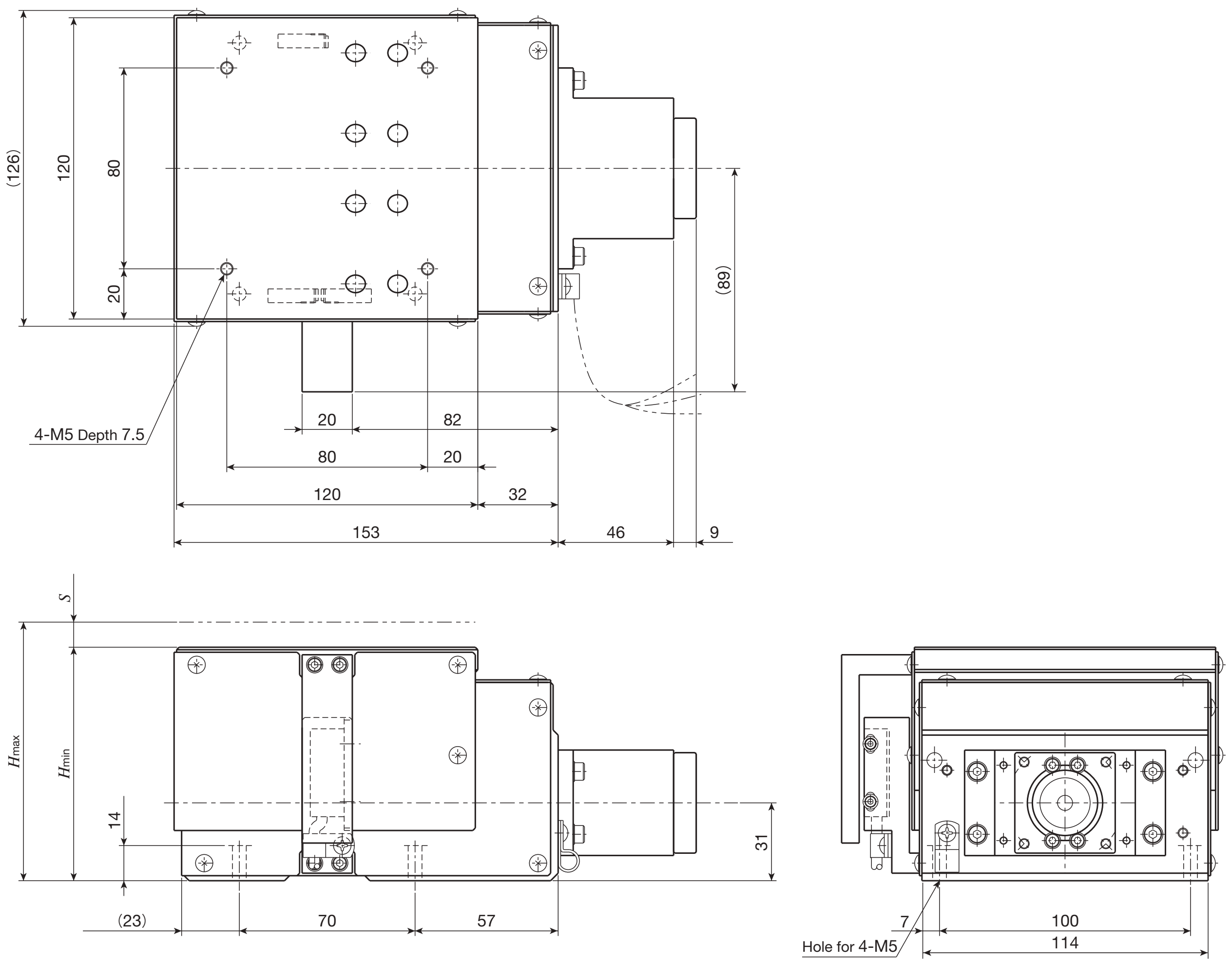
TZ120X without linear encoder



unit: mm

Identification number	Wedge reduction ratio	Mass (Ref.) kg	Height H_{min} (CW limit position)	Height H_{max} (CCW limit position)	Stroke length S
TZ120X-2	1 : 2	3.8	93	103	10
TZ120X-4	1 : 4	3.4	84.5	89.5	5

TZ120X with linear encoder

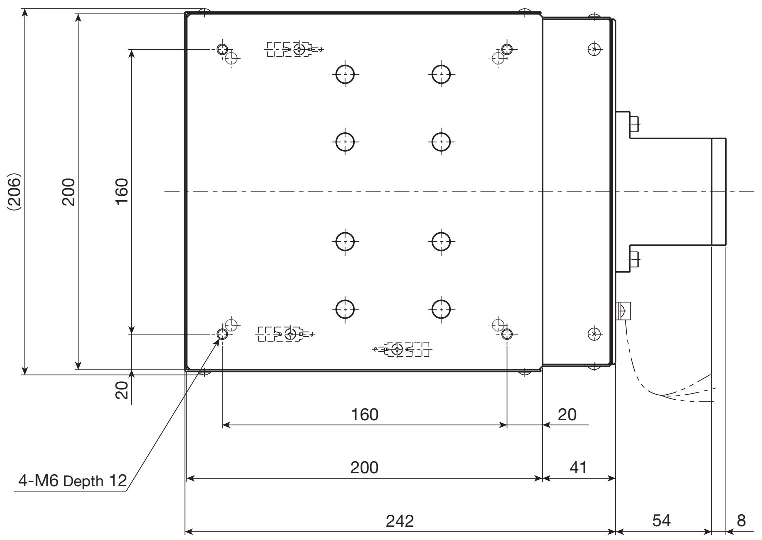


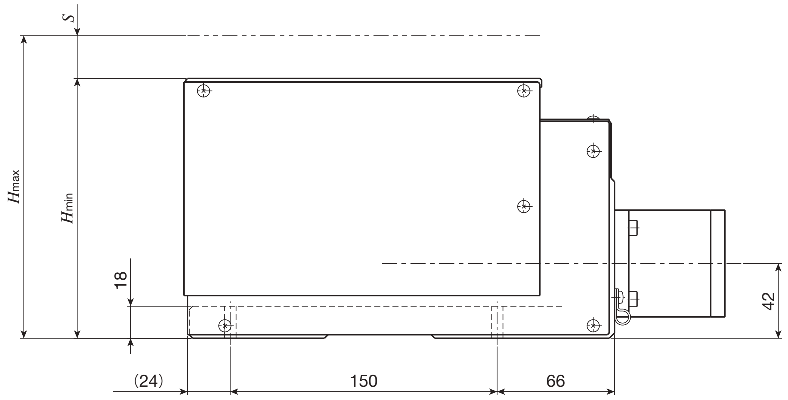
unit: mm

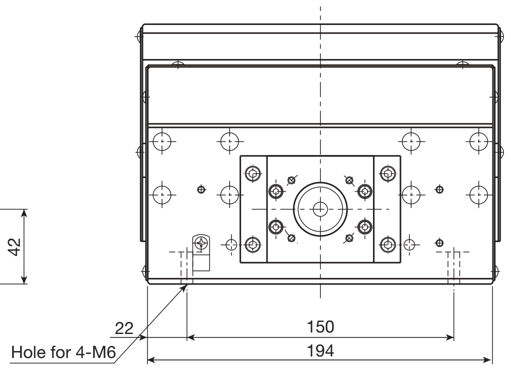
Identification number	Wedge reduction ratio	Mass (Ref.) kg	Height H_{min} (CW limit position)	Height H_{max} (CCW limit position)	Stroke length S
TZ120X-2	1 : 2	4.5	93	103	10
TZ120X-4	1 : 4	4.1	84.5	89.5	5

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

TZ200H, TZ200X without linear encoder



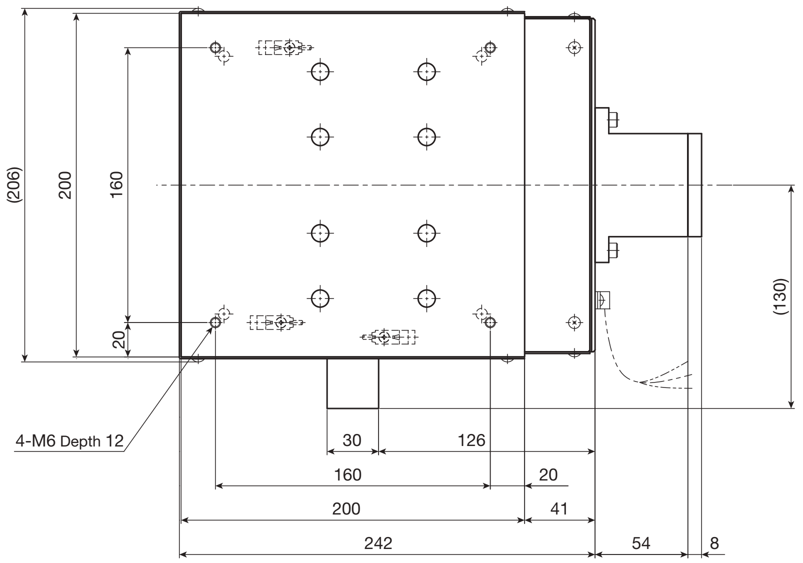


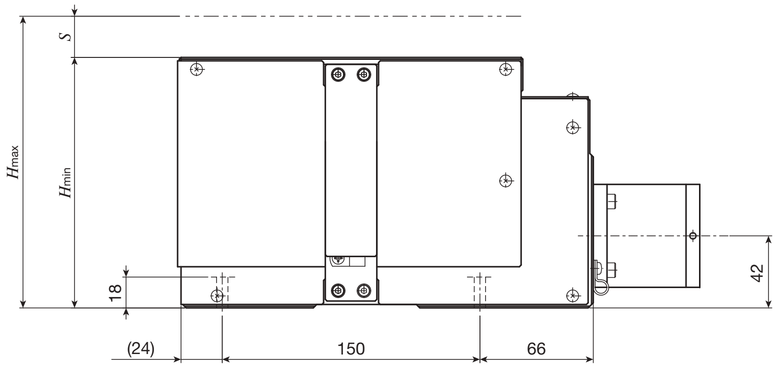


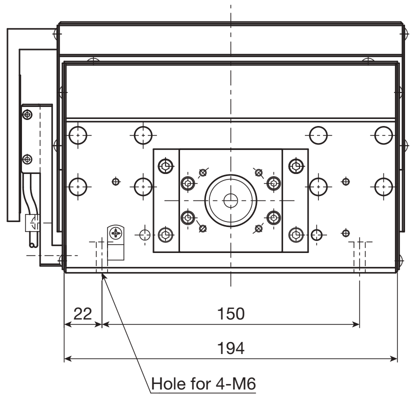
unit: mm

Identification number	Wedge reduction ratio	Mass (Ref.) kg	Height H_{min} (CW limit position)	Height H_{max} (CCW limit position)	Stroke length S
TZ200H-2	1 : 2	13.2	146	170	24
TZ200H-4	1 : 4	12.2	132	144	12
TZ200X-2	1 : 2	13.3	146	170	24
TZ200X-4	1 : 4	12.3	132	144	12

TZ200H, TZ200X with linear encoder







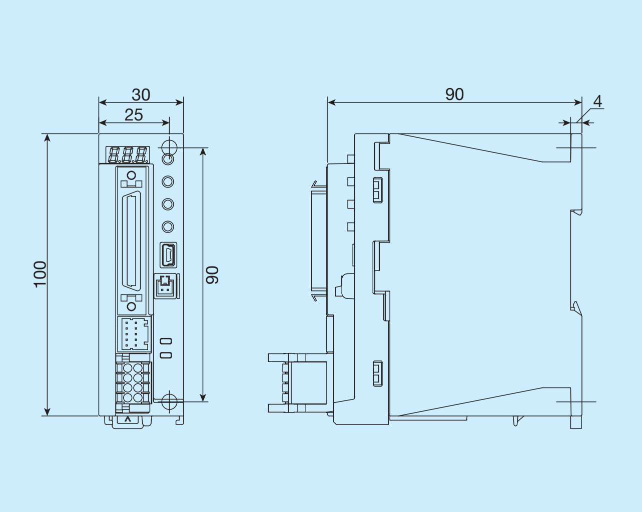
unit: mm

Identification number	Wedge reduction ratio	Mass (Ref.) kg	Height H_{min} (CW limit position)	Height H_{max} (CCW limit position)	Stroke length S
TZ200H-2	1 : 2	14.2	146	170	24
TZ200H-4	1 : 4	13.2	132	144	12
TZ200X-2	1 : 2	14.3	146	170	24
TZ200X-4	1 : 4	13.3	132	144	12

Driver Specification for Linear Motor Drive Tables

MR-J4

■ Specification of MR-J4, a driver for NT38V



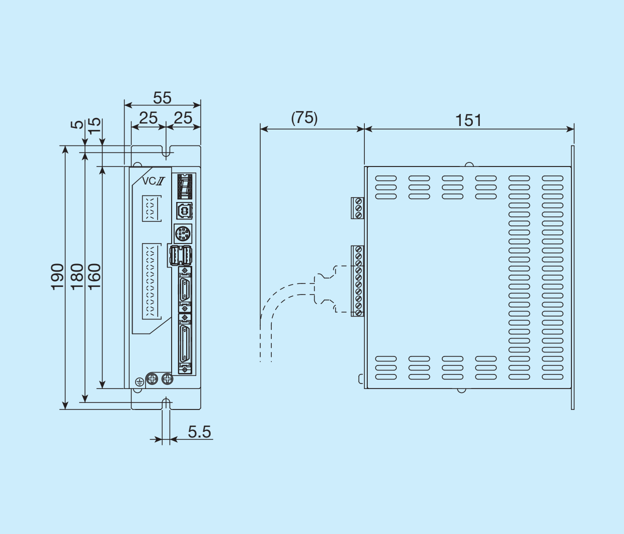
- ● Low-voltage (DC24V) specification and compact design of 100×90×30 mm. It contributes to miniaturization of devices and compactness.
- ● Servo gain adjustment, including machine resonance suppression filter, advanced vibration control Ⅱ, and robust filter, can be completed simply by turning on the one-touch tuning function. Easy driving of the cutting-edge vibration suppression function allows the machine to produce its best performance.
- ● Machine diagnosis, startup and adjustment of the linear motor can be easily performed thanks to parameter settings, monitor display and machine analyzer of the setup software (MR Configurator2).

Table 1 Specifications for MR-J4

Identification Number Item		MR-J4-03A6-NL156J154/ MR-J4-03A6-NL156J155
Output	Rated voltage	Three-phase AC13V
	Rated current	2.4A
Main circuit power supply input	Voltage	DC24V
	Rated current	2.4A
	Allowable power fluctuation	DC21.6V to 26.4V
Control circuit power supply input	Voltage	DC24V
	Rated current	0.2A
	Allowable power fluctuation	DC21.6V to 26.4V
	Power consumption	5.0W
Power supply for interface		DC24V ±10% (required current capacity: 0.3 A)
Control method		Sine wave PWM control/current control method
Allowable regenerative power for servo amplifier built-in regenerative resistor		0.7W
Dynamic brake		Built-in
Communication function		USB: connection with personal computer, etc. (MR Configurator2 supported)
Encoder output pulse		Supported (ABZ-phase pulse)
Analog monitor		2-channel
Position control mode	Maximum input pulse frequency	4 Mpulses/s (with differential receiver), 200 kpulses/s (with open collector)
	Command pulse magnification	Electronic gears A/Bx A = 1 to 1.6777215, B = 1 to 16777215, 1/10 < A/B < 4000
	Positioning complete width setting	0 pulses to ±65535 pulses (command pulse unit)
Positioning mode		Point table method
Protective function		Overcurrent interrupt, regeneration overvoltage interrupt, overloading interrupt (electric thermal), servomotor overheat protection, encoder error protection, regeneration error protection, undervoltage protection, momentary power failure protection, overspeed protection, excessive error protection, magnetic pole detection protection, linear servo control error protection
Compliant overseas standards	CE marking	LVD:EN 61800-5-1/EN 60959-1 EMC:EN 61800-3
	UL standard	UL 508C（NMM S2）
Structure (protection degree)		Natural air cooling and opening (IP20)
Environmental conditions	Ambient temperature	Operation: 0 to 55˚C (keep freeze free), Storage: -20 to 65˚C (keep freeze free)
	Ambient humidity	Operation/storage: 5% to 90% RH or lower (keep condensation free)
	Atmosphere	Indoors (no exposure to direct sunlight) Must be free from corrosive gas, flammable gas, oil mist and dust
	Altitude	1,000 m or lower
	Vibration resistance	5.9 m/s^2 or less, 10 Hz to 55 Hz (X, Y, Z directions)
Mass		0.2 kg

NCR

■ Specification of NCR, a driver for NT...H



- ● The driver and positioning unit are integrated, and the system is miniaturized with its wiring streamlined.
- ● Higher reliability and usability such as driftless, elimination of adjustment fluctuation, improvement of man-machine interface have been pursued with digital control.
- ● Easy positioning operation and pulse train operation are supported by mode selection, for applications to wide range of usages.
- ● Torque control and speed control are available.
- ● Control suitable for machine rigidity is made possible by full-scale software servo functions such as linear / S-curve acceleration and deceleration, feed forward, torque command filter, gain switching at shutdown and low speed, disturbance compensation control, etc.
- ● Peripheral devices such as touch panel, higher-level controller, etc. can be connected via serial communication.
- ● Dedicated editing software can be connected via USB 2.0 (full speed).

Table 2 Specifications for NCR

Identification Number Item			NCR-DDA0A1A-051D-T08
Basic specification	Maximum rated current		1.1 Arms
	Max. momentary current		3.3 Arms
	Power plant capacity		0.15kVA
	Input power (main circuit and control circuit)		Single-phase AC100～115V (allowable power fluctuation AC90～121V) 50/60Hz ±5%
	Control method		Three-phase sine wave PWM method
	Control mode		Position (position control data / pulse train)
Input/ Output function	Command input	Pulse train command	Line driver system is supported The maximum input frequency is indicated below (1) Pulse with 90-degree phase difference: 4Mpps (16Mpps after 4-time multiplication) (2) Directional pulse: 4Mpps (3) Directional + shift pulse: 4 Mpps
		Speed control operation	Analog speed command and internal speed command (3 points)
		Torque control operation	Analog torque command and internal torque command (3 points)
		Easy positioning operation	3 positioning modes: Manual mode / Return to origin mode / Easy positioning mode
	Contact input signal		[8 basic input signal points (initial value)] Servo on, reset, command pulse input prohibition, mode selection 1, mode selection 2, startup, speed selection, torque selection <Following signals are used by assigning remote control or input signals> Emergency stop, proportional control, address specification, speed override, deviation clear, torque limit, forward direction overtravel, reverse direction overtravel, etc.
	Contact output signal		[4 basic output signal points (initial value)] Servo ready, alarm, warning, positioning complete <Following signals are used by assigning remote control or output signals> Torque limit, speed zero, in speed operation mode, in torque operation mode, in easy positioning mode, in pulse train operation mode, encoder marker, etc.
	Encoder feedback pulse output		Pulse train output with 90-degree phase difference (frequency dividing output allowed. The maximum output frequency of 2 signals of A / B phase is 20Mpps after 4-time multiplication)
	Encoder feedback pulse input		Pulse train input with 90-degree phase difference (The maximum input frequency of 2 signals of A / B phase is 20Mpps after 4-time multiplication)
	Monitor output		(1) Analog monitor: 2 points (2 points selected by parameters from various motion status can be monitored.) (2) Various types of monitoring is possible with USB-ready dedicated editing software.
Internal function	Protective function		IPM failure, overvoltage, undervoltage, overspeed, overload, regeneration resistance overload, deviation overflow, communication failure, data error, CPU failure, encoder failure, automatic magnetic pole detection failure, absolute encoder failure, etc.
	Communication function		Various data can be transmitted / received via serial communication (RS-422A). Dedicated editing software can be connected via USB 2.0 (full speed)
Operating environment	Ambient temperature in operation / Storage temperature		0 to 55˚C / -20 to 66˚C
	Operating humidity		85%RH or lower (keep condensation free)
	Vibration resistance		0.5G 10～55Hz
	Service space		Altitude of 1000 m or below, indoor (no corrosive gas and dust)
Mass			1.0kg

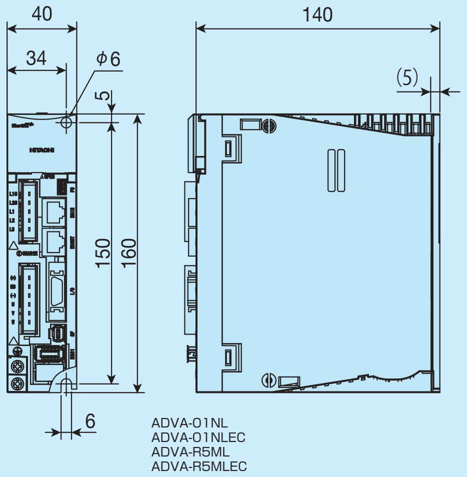
ADVA

■ Specifications for ADVA

■ Applicable model numbers

NT series: NT55V, NT80V, NT88H, NT...XZ, NT...XZH
SA series: all model numbers
LT series: all model numbers

- In addition to the conventional pulse train command input, high speed motion network EtherCAT is also supported.
- 10 input terminals, 6 output terminals, and analog input (0 to ±10 V) can be controlled by intelligent terminals.
- The high controllability shortens the settling time, realizing further improvement of productivity.
- Machine diagnosis, startup and adjustment of linear motor can be easily performed thanks to parameter settings, monitor display, operation trace and automatic tuning function of the setup software.



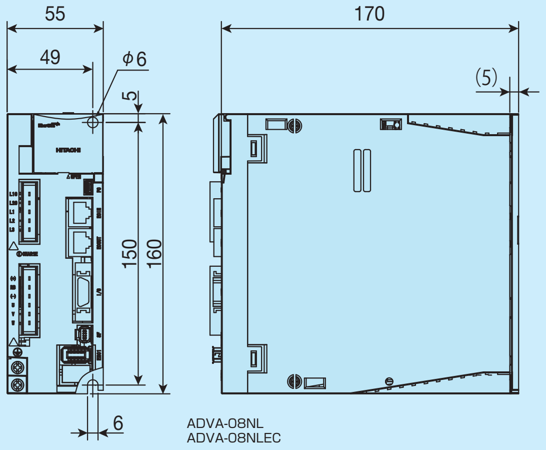


Table 3 Specifications for ADVA

Item	Identification number	ADVA-01NL ADVA-01NLEC	ADVA-08NL ADVA-08NLEC	ADVA-R5ML ADVA-R5MLEC
Basic specification	Input power	Single-phase / Three-phase AC 200 to 230 V 50 / 60Hz		Single-phase AC100 to 115V 50 / 60Hz
	Rated current / momentary current	1.2Arms / 3.6Arms	5.1Arms / 15.3Arms	1.2Arms / 3.6Arms
	Power plant capacity	0.3kVA	1.3kVA	0.3kVA
	Protective structure (1)	Semi-enclosed IP20		
	Control mode	Position control / Speed control / Thrust force control		
Input/Output relation function	Speed command	Analog input: 0 to ±10 V / Maximum speed (gain configurable) or EtherCAT		
	Thrust force command	Analog input: 0 to ±10 V / Maximum thrust force (gain configurable) or EtherCAT		
	Position command	Line driver signal: 20 Mpps (non-isolated input / after 4-time multiplication) Open collector signal: 2 Mpps (isolated input / after 4-time multiplication) or EtherCAT		
	Contact input / output	[Input] Intelligent terminal selects 10 input terminal (6 input terminal for EtherCAT specification) function by parameter DC12 / 24 V Contact signal / Open collector signal input (with internal DC24 V power supply) [Output] Intelligent terminal selects 6 output terminal (4 output terminal for EtherCAT specification) function by parameter (Open collector signal output: sink output)		
Internal function	Built-in operator	Pulse train command specification: Five digit numeric display, five key push button / DIP switch (Modbus communication setting) EtherCAT specification: 2-digit numeric display, DIP switch (node address setting for EtherCAT)		
	External operator	Windows 7/8 (32-bit, 64-bit) PC can be connected (USB 2.0 full speed)		
	Regenerative braking circuit	Built-in		
	Dynamic brake (2)	Built-in (motion condition configurable)		
	Protective function	Overcurrent, overload, braking resistor overload, main circuit overvoltage, memory error, main circuit under voltage, CT failure, CPU error 1, external trip (motor temperature error), servo ON ground detection, control circuit under voltage, servo amplifier temperature error, drive prohibition error, power module failure, safety circuit failure, emergency shutdown, encoder failure, mismatch error, power reactivation request, magnetic pole position estimation error, magnetic pole position estimation not executed, position deviation error, speed deviation error, overspeed error, momentary power failure, main circuit power supply failure, drive range error (network communication error, DC synchronization error, under voltage display)		
Operating environment	Ambient temperature in operation/ Storage temperature (3)	0 ～ 55℃ / −10 ～ 70℃		
	Operating humidity	20 to 90% RH (keep condensation free)		
	Vibration resistance (4)	5.9m/s² (0.6G) 10 to 55Hz		
	Service space	Altitude of 1000 m or below, indoor (no corrosive gas and dust)		
Mass		0.7kg	1.2kg	0.7kg

Notes (1) Protection method is compliant with JEM1030.
(2) Use the dynamic brake for emergency stop
(3) The storage temperature is the temperature during transportation.
(4) Compliant with JIS C60068-2-6:2010.

● Setup software

- Used for setting, referencing, changing, printing and saving driver parameters.
- Allows for real-time monitoring of operational status and output status.
- Indicates speed and current, etc. on charts.
- Supports commissioning and gain tuning.

Table 4 Operating environment of the setup software

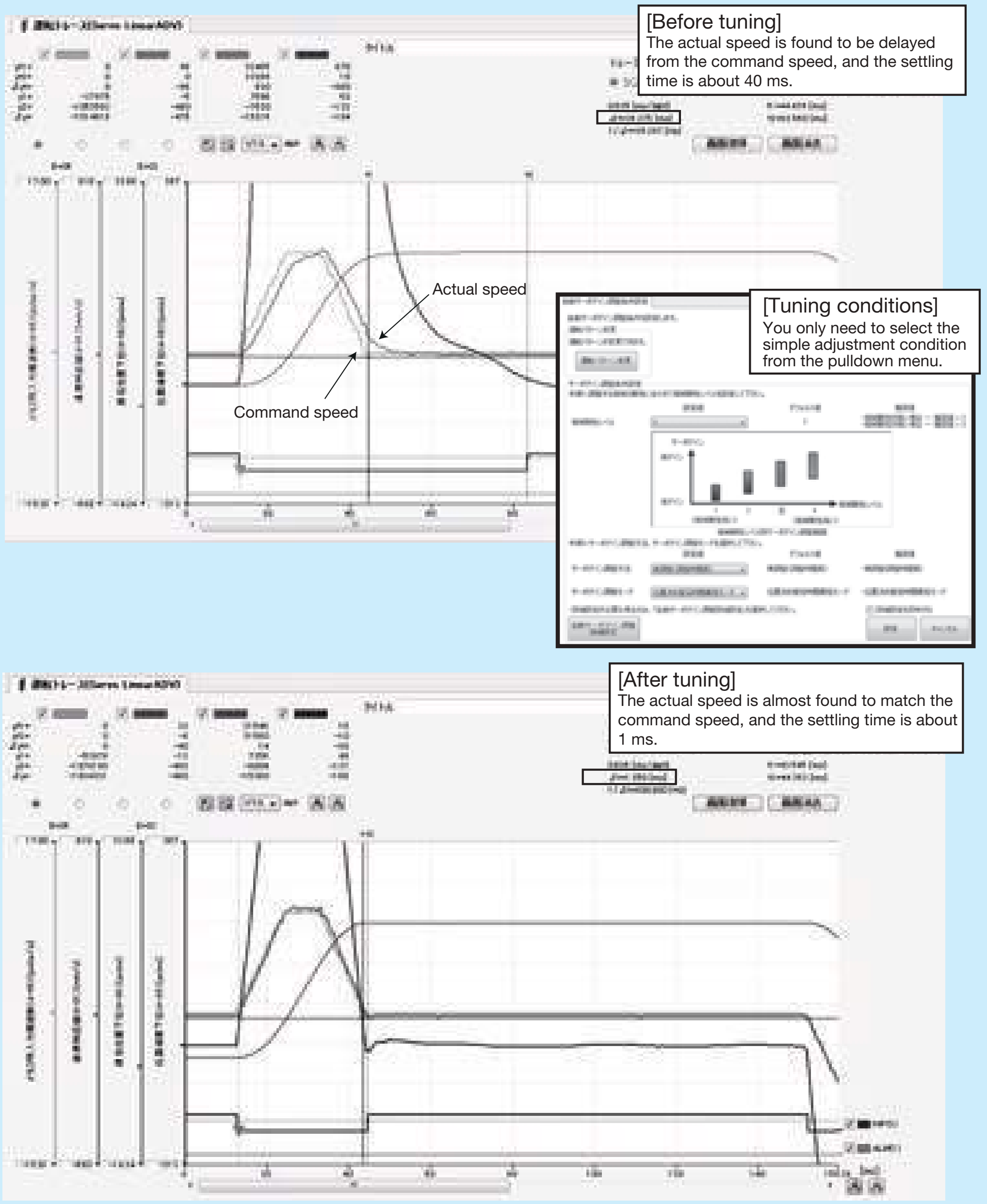
Item	Operating conditions
PC	CPU: Pentium 4 1.8 GHz or higher HDD free space: 1 GB or more Display resolution: 1024x768 or higher recommended
OS	Windows Vista 32-bit SP1 Windows 7 (32-bit, 64-bit) Windows 8 (32-bit, 64-bit)

Remark: Windows® is a registered trademark of Microsoft Corporation in USA and other countries.
Pentium is a registered trademark of Intel Corporation in USA and other countries.

● Automatic tuning function

By using the automatic tuning function of the setup software for ADVA, non-expert users can easily perform high-accuracy gain adjustment.

<Operating conditions>
Main body: NT55V25/05R + ADVA-01NL/NT55V25
Carrying mass: 200g　Speed: 500mm/s　Positioning complete width: ±5μm　Traveling distance: 10mm
Acceleration/deceleration time: 12ms



[Before tuning]
The actual speed is found to be delayed from the command speed, and the settling time is about 40 ms.

[Tuning conditions]
You only need to select the simple adjustment condition from the pulldown menu.

[After tuning]
The actual speed is almost found to match the command speed, and the settling time is about 1 ms.

Fig. 2 Automatic tuning

MR-J4

■ Specifications for MR-J4

■ Applicable model numbers
NT series: NT55V, NT80V
SA series: all model numbers

- Supports SSCNET Ⅲ/H (high-speed serial bus). Higher speed and accuracy are realized by optical communication system.
- Servo gain adjustment, including machine resonance suppression filter, advanced vibration control II, and robust filter, can be completed simply by turning on the one-touch tuning function. Easy driving of the cutting-edge vibration suppression function allows the machine to produce its best performance.
- Machine diagnosis, startup and adjustment of linear motor can be easily performed thanks to parameter settings, monitor display and machine analyzer of the setup software (MR Configurator2).

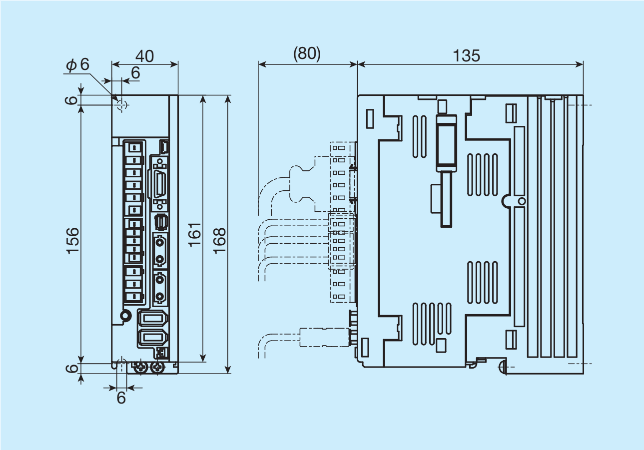
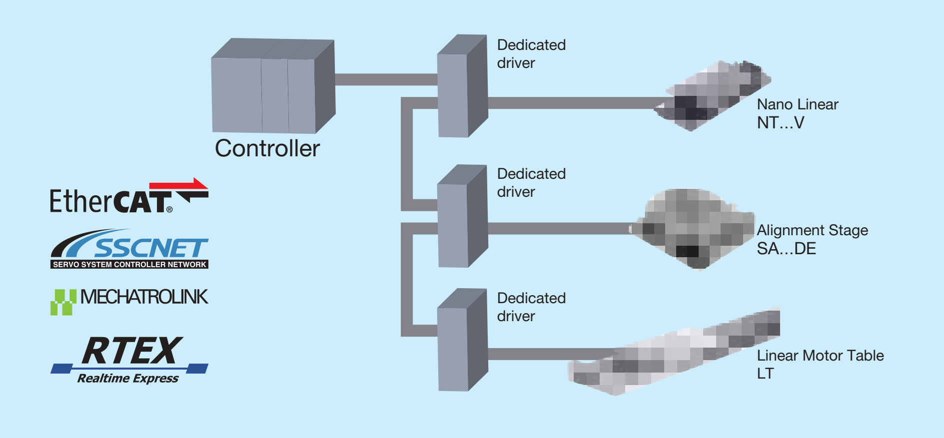


Table 5 Specifications for MR-J4

Item (Identification Number)			MR-J4-10B-RJ
Basic specification	Output	Rated voltage	Three-phase AC170V
		Rated current	1.1A
	Main circuit power supply	Voltage / Frequency	Single-phase / Three-phase AC200-240V 50/60Hz
		Allowable power fluctuation	Single-phase / Three-phase AC170-264V
		Allowable frequency fluctuation	Within ± 5%
	Control circuit power supply	Voltage / Frequency	Single-phase AC200-240V 50/60Hz
		Allowable power fluctuation	Single-phase AC170-264V
		Allowable frequency fluctuation	Within ± 5%
		Power consumption	30W
	Power supply for interface		DC24V ± 10% (required current capacity: 0.3A (includes CN8 connector signal))
	Structure (protection class)		Natural air cooling and opening (IP20)
	Control method		Sine wave PWM control/current control method
	Machine end encoder interface		Mitsubishi high-speed serial communication / ABZ-phase differential input signal
Input/Output function	Encoder output pulse		Supported (ABZ-phase pulse)
	Analog monitor		2ch
Internal function	Communication function		USB: connection with personal computer, etc. (MR Configurator2 supported)
	Dynamic brake		Built-in
	Protective function		Overcurrent interrupt, regeneration overvoltage interrupt, overloading interrupt (electric thermal), servomotor overheat protection, encoder error protection, regeneration error protection, undervoltage protection, momentary power failure protection, overspeed protection, excessive error protection, magnetic pole detection protection, linear servo control error protection
Operating environment	Ambient temperature		0 to 55° C (keep freeze free), Storage: 20 to 65° C (keep freeze free)
	Ambient humidity		90%RH or lower (keep condensation free), Storage: 90%RH or lower (keep condensation free)
	Atmosphere		Indoor (no exposure to direct sun light), must be free from corrosive gas, flammable gas, oil mist and dust
	Altitude		1 000m or lower
	Vibration resistance		5.9m/s^2 or less, 10Hz to 55Hz (X, Y, Z directions)
Mass			0.8kg

Motion Network

Drivers for linear motor drive tables include those supporting motion networks EtherCAT, SSCNET Ⅲ/H, MECHATROLINK, and RTEX. Motion networks realize higher performance and higher accuracy of devices free from pulse frequency constraint in pulse train command, noise effects in analog command (voltage command), voltage drop due to cable length and effects of temperature drifting. Reduction of wiring can also be achieved, so a synchronization system with more than one table can easily be established.

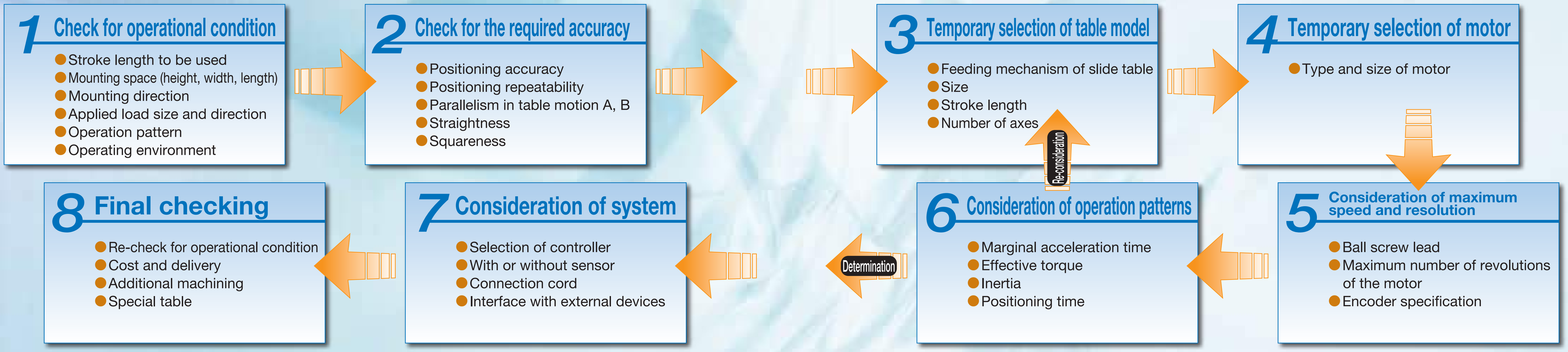


Model	Features
EtherCAT	This is an Ethernet-based open network communication system developed by Beckhoff of Germany, allowing the real time control. High speed communication and high accuracy inter-node synchronization realize the higher performance and higher accuracy of devices. In addition, Ethernet cables available on the market can be used and various wiring types can be supported.
SSCNET Ⅲ/H	This is a motion network communication system for servo system control developed by Mitsubishi Electric Corporation. It applies the optical fiber cables, so noise immunity is improved relative to conventional SSCNET.
MECHATROLINK	The open field network communication that connects the controller and various components. Developed by Yaskawa Electric Corporation and managed by MECHATROLINK Members Association.
RTEX	RTEX (Realtime Express) is an advanced network developed independently by Panasonic Corporation, in order to deliver the high real time performance required for servos. It offers extremely high-speed communication (100Mbps), and supports commercially available LAN cables to help reduce system costs.

General Explanation

IKO Selection of Precision Positioning Table

IKO Precision Positioning Table should be selected taking the points related to the required conditions into careful consideration. Typical selection procedure is shown below.



1 Check for operational condition

- Stroke length to be used
- Mounting space (height, width, length)
- Mounting direction
- Applied load size and direction
- Operation pattern
- Operating environment

2 Check for the required accuracy

- Positioning accuracy
- Positioning repeatability
- Parallelism in table motion A, B
- Straightness
- Squareness

3 Temporary selection of table model

- Feeding mechanism of slide table
- Size
- Stroke length
- Number of axes

4 Temporary selection of motor

- Type and size of motor

5 Consideration of maximum speed and resolution

- Ball screw lead
- Maximum number of revolutions of the motor
- Encoder specification

6 Consideration of operation patterns

- Marginal acceleration time
- Effective torque
- Inertia
- Positioning time

7 Consideration of system

- Selection of controller
- With or without sensor
- Connection cord
- Interface with external devices

8 Final checking

- Re-check for operational condition
- Cost and delivery
- Additional machining
- Special table

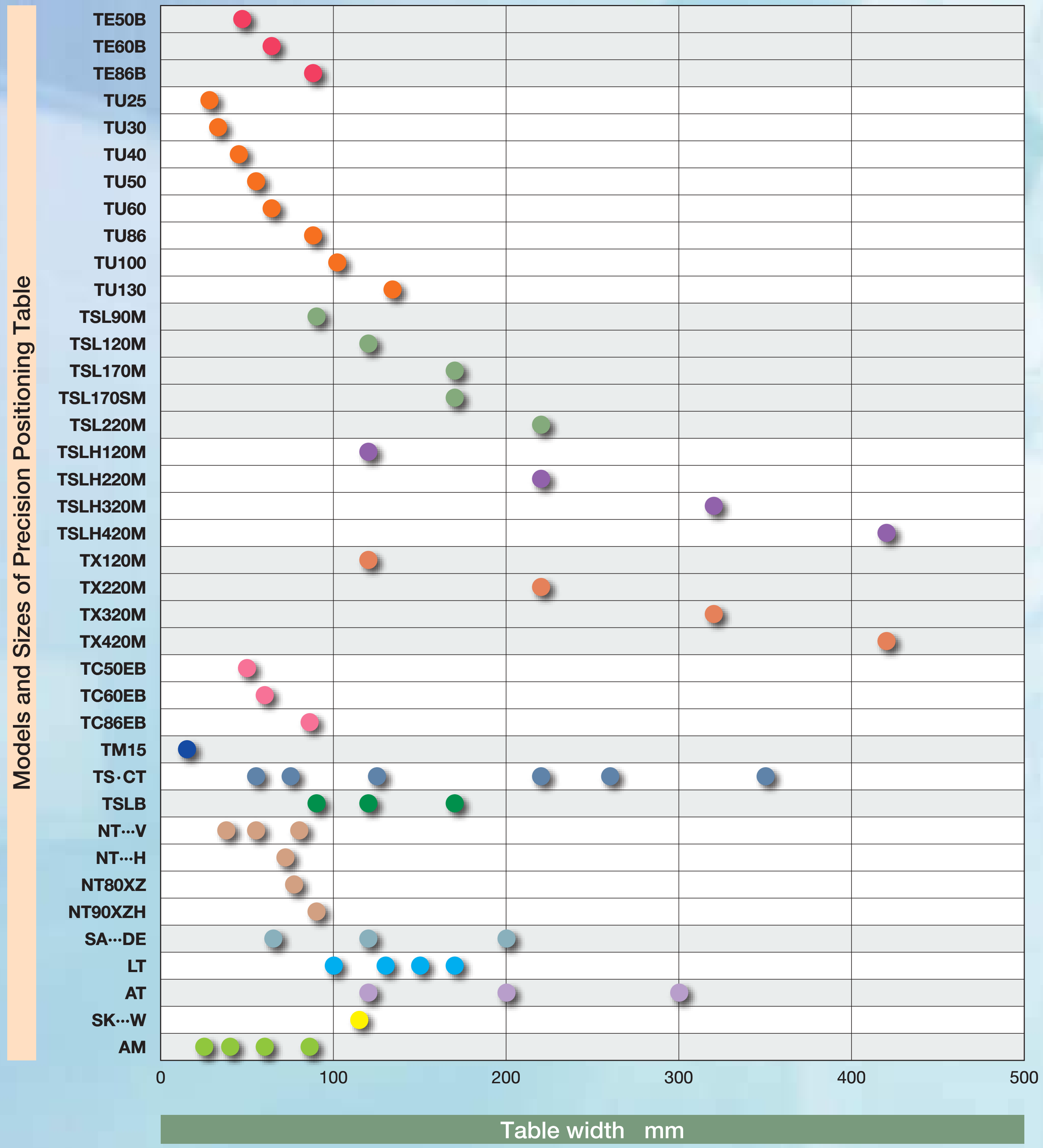
IKO Characteristics of Precision Positioning Table

Series	Model	Stroke length mm	Positioning repeatability	Positioning accuracy	High speed	Rigidity
Precision Positioning Table TE	TE…B	50 ～ 800	○	○	○	○
Precision Positioning Table TU	TU	30 ～ 1 400	○	○	○	○
Precision Positioning Table L	TSL…M	50 ～ 1 000	○	○	○	○
Precision Positioning Table LH	TSLH…M	100 ～ 800	○	○	○	◎
	CTLH…M	100 ～ 500	○	○	○	◎
Super Precision Positioning Table TX	TX…M	100 ～ 800	◎	◎	○	◎
	CTX…M	100 ～ 400	◎	◎	○	◎
Cleanroom Precision Positioning Table TC	TC…EB	50 ～ 800	○	○	○	△
Micro Precision Positioning Table TM	TM	10 ～ 60	○	○	△	△
Precision Positioning Table TS/CT	TS	25 ～ 250	○	○	△	△
	CT	15 ～ 250	○	○	△	△
Precision Positioning Table LB	TSLB	300 ～ 1 200	△	△	◎	○
Nano Linear NT	NT…V, XZ, XZH	10 ～ 120	◎	△	◎	△
	NT…H	25 ～ 65	◎	◎	○	○
Alignment Stage SA	SA…DE/X	10 ～ 20	◎	△	○	△
Linear Motor Table LT	LT…CE	200 ～ 1 200	◎	△	◎	△
	LT…LD	240 ～ 2 760	◎	△	◎	○
	LT…H	410 ～ 2 670	◎	△	◎	○
Alignment Module AM	AM	30 ～ 120	○	○	○	○

Feeding mechanism	Applied motor	With or without sensor	Linear motion rolling guide	Applications
C-Lube ball screw	AC servomotor/ Stepper motor	Selection	U-shaped Track Rail Linear Way with C-Lube built in	Assembler, Processing machine, Measuring equipment
Ball screw			U-shaped Track Rail Linear Way	Assembler, Processing machine, Measuring equipment
C-Lube ball screw		Provided as standard	C-Lube Linear Way Parallel arrangement of 2 ways	Assembler, Processing machine, Measuring equipment
				Precision processing machine, Precision measuring equipment Machine tool, Assembler
	AC servomotor		C-Lube Linear Roller Way Super *MX* Parallel arrangement of 2 ways	Precision processing machine, Precision measuring equipment Machine tool, Assembler
	AC servomotor/ Stepper motor	Selection	U-shaped Track Rail Linear Way with C-Lube built in	Semiconductor related device, LCD related device
Ball screw			Linear Way Parallel arrangement of 2 ways	Precision measuring equipment, Assembling machine
			Anti-Creep Cage Crossed Roller Way Crossed Roller Way	Precision measuring equipment, Prober Image processing unit, Exposure equipment
Timing belt	Stepper motor	Provided as standard	Linear Way Parallel arrangement of 2 ways	High speed conveyor, Palette changer
AC linear servomotor			C-Lube Linear Way Linear Way Parallel arrangement of 2 ways	Semiconductor related device, Medical equipment
			Anti-Creep Cage Crossed Roller Way	Semiconductor related system, Precision measuring equipment
			C-Lube Linear Way Parallel arrangement of 2 ways	Semiconductor related device, Medical equipment
				Semiconductor related device, High speed conveyor
Ball screw	AC servomotor/Stepper motor		U-shaped Track Rail Linear Way	Semiconductor related device, LCD related device

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

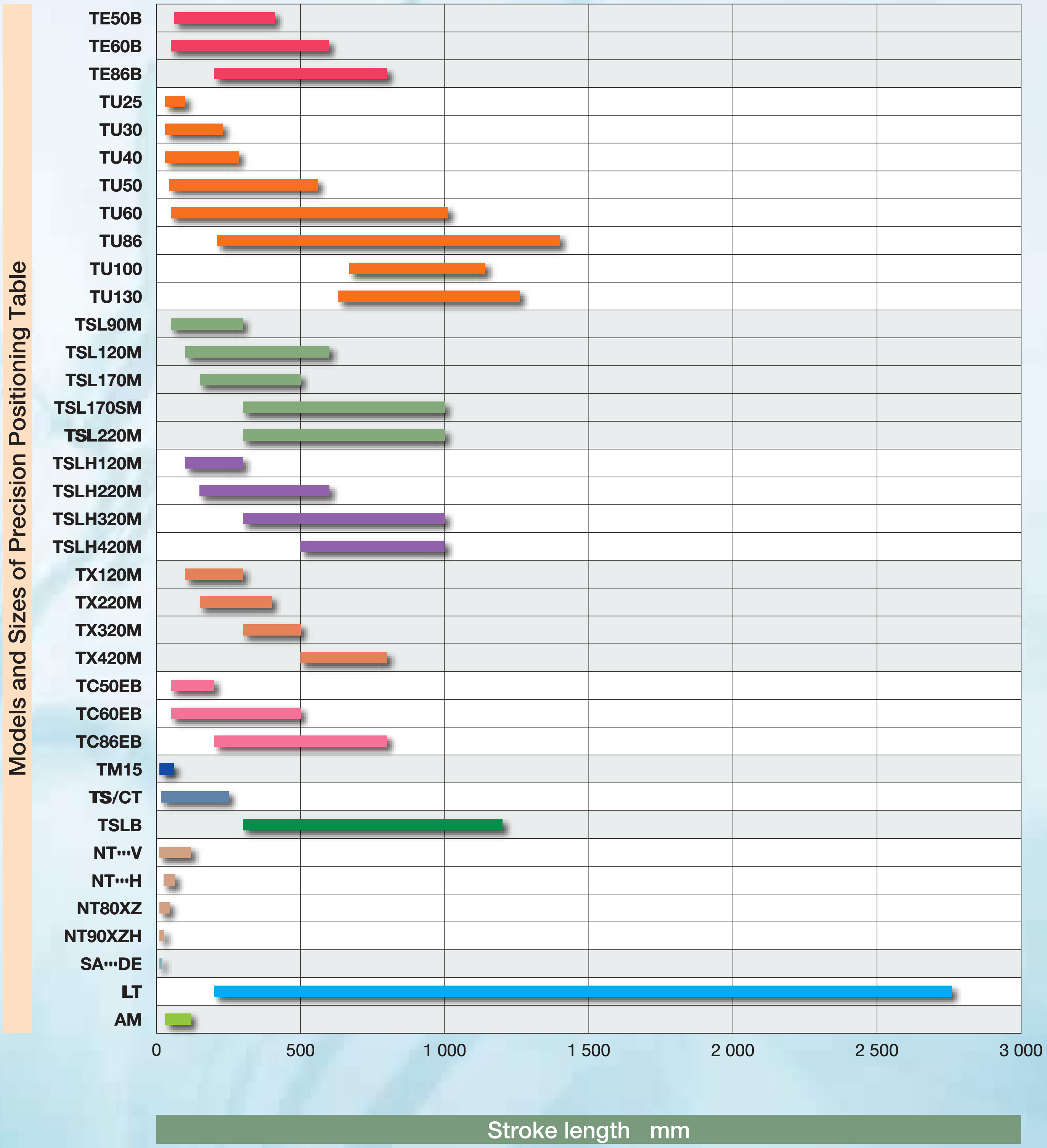
Size of Precision Positioning Table



How to see the above graph

- ● The values shown in the graph are for reference. For details, see the explanation of each model.

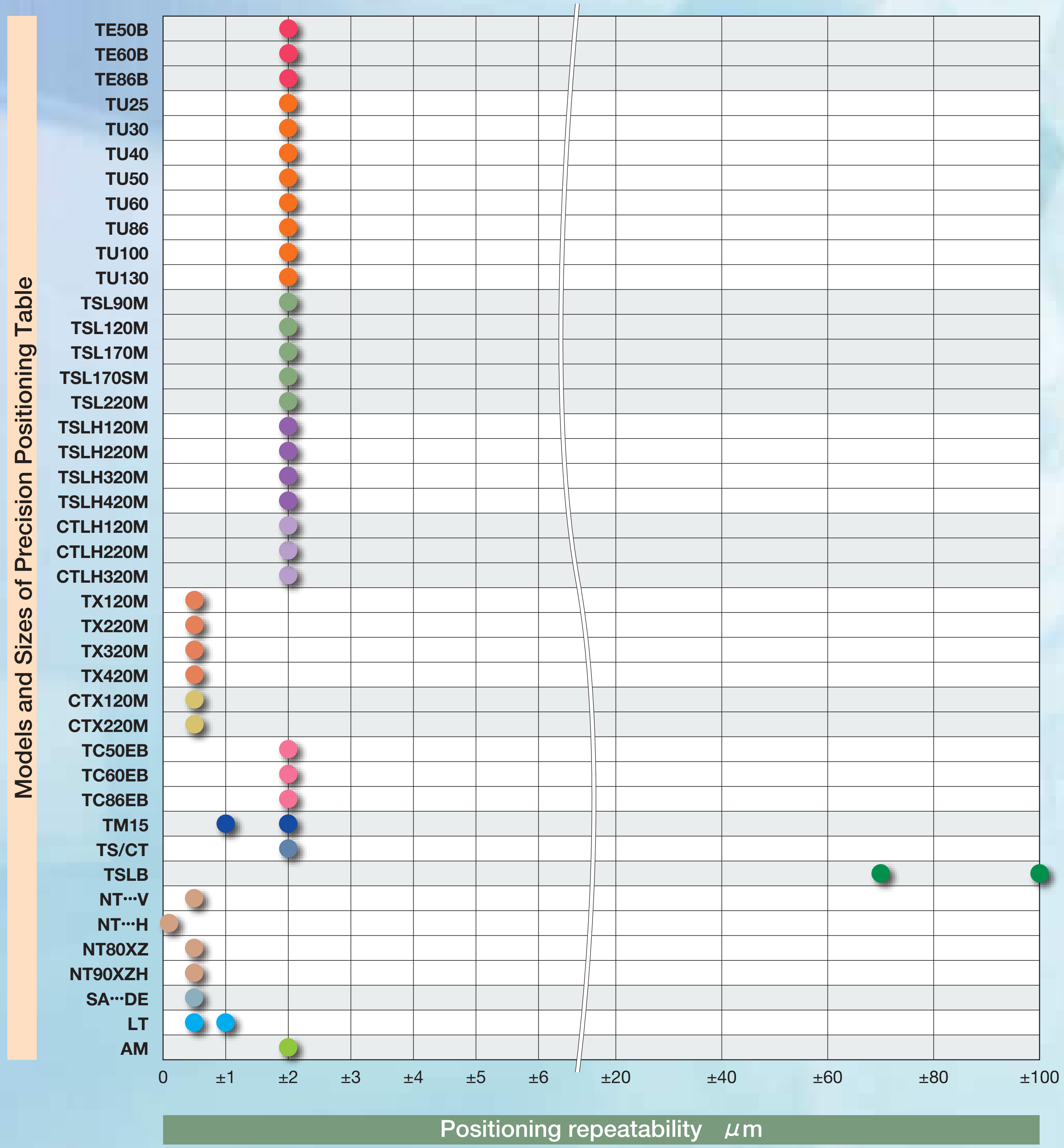
Stroke Length of Precision Positioning Table



How to see the above graph

- ● The values shown in the graph are for reference. For details, see the explanation of each model.
- ● Length of a bar represents a standardized range of stroke length.

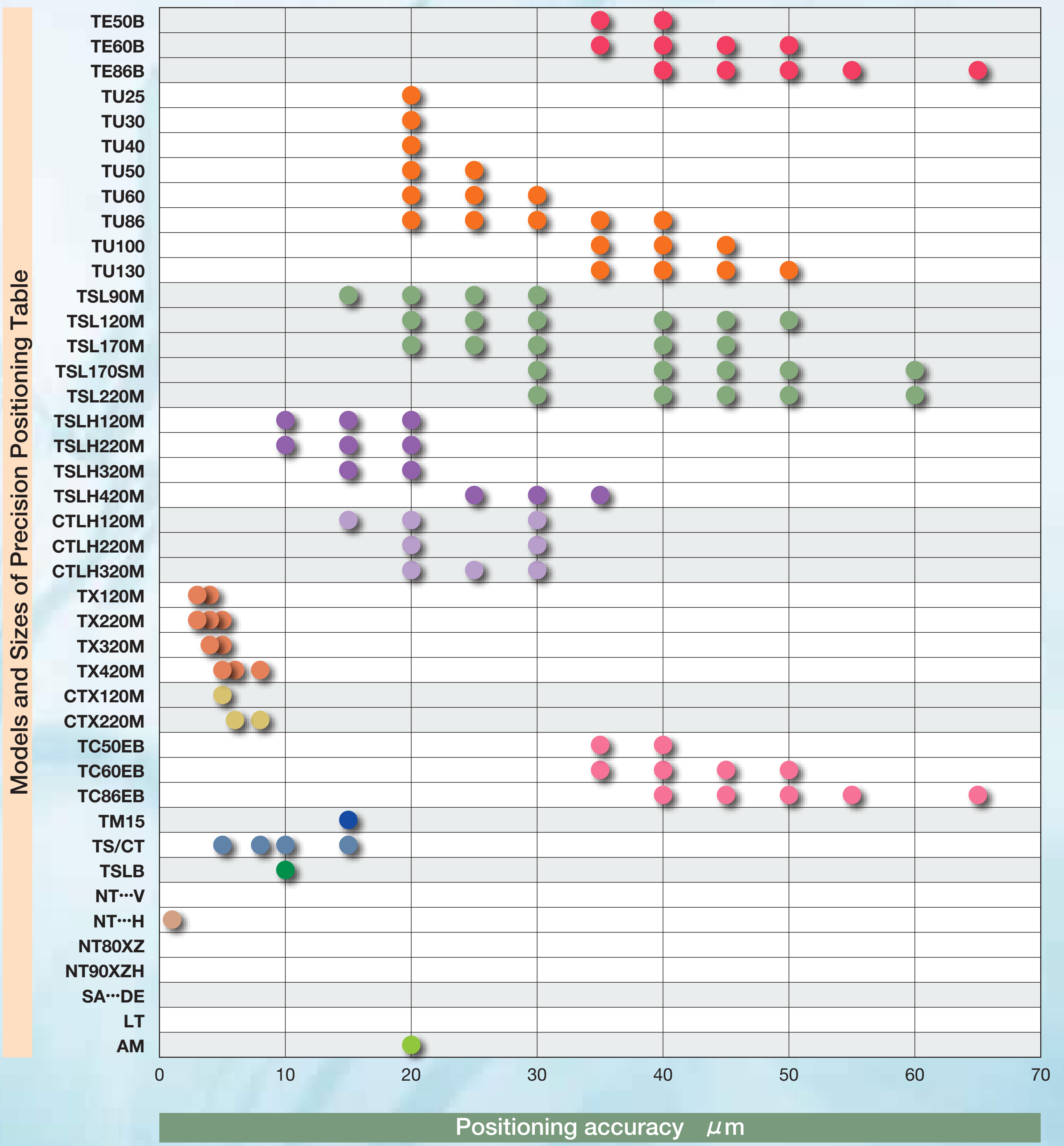
Positioning Repeatability of Precision Positioning Table



How to see the above graph

- The values shown in the graph are for reference. For details, see the explanation of each model.
- For models of ball screw drive, the value of the case selected ground ball screw is indicated.
- When two or more values are indicated for a model, this means that the applicable value depends on the stroke length.
- For TU, the value of the standard table is indicated.
- CTLH…M, CTX…M and CT are tables of two-axis specification.
- SA…DE represents value in X-axis.

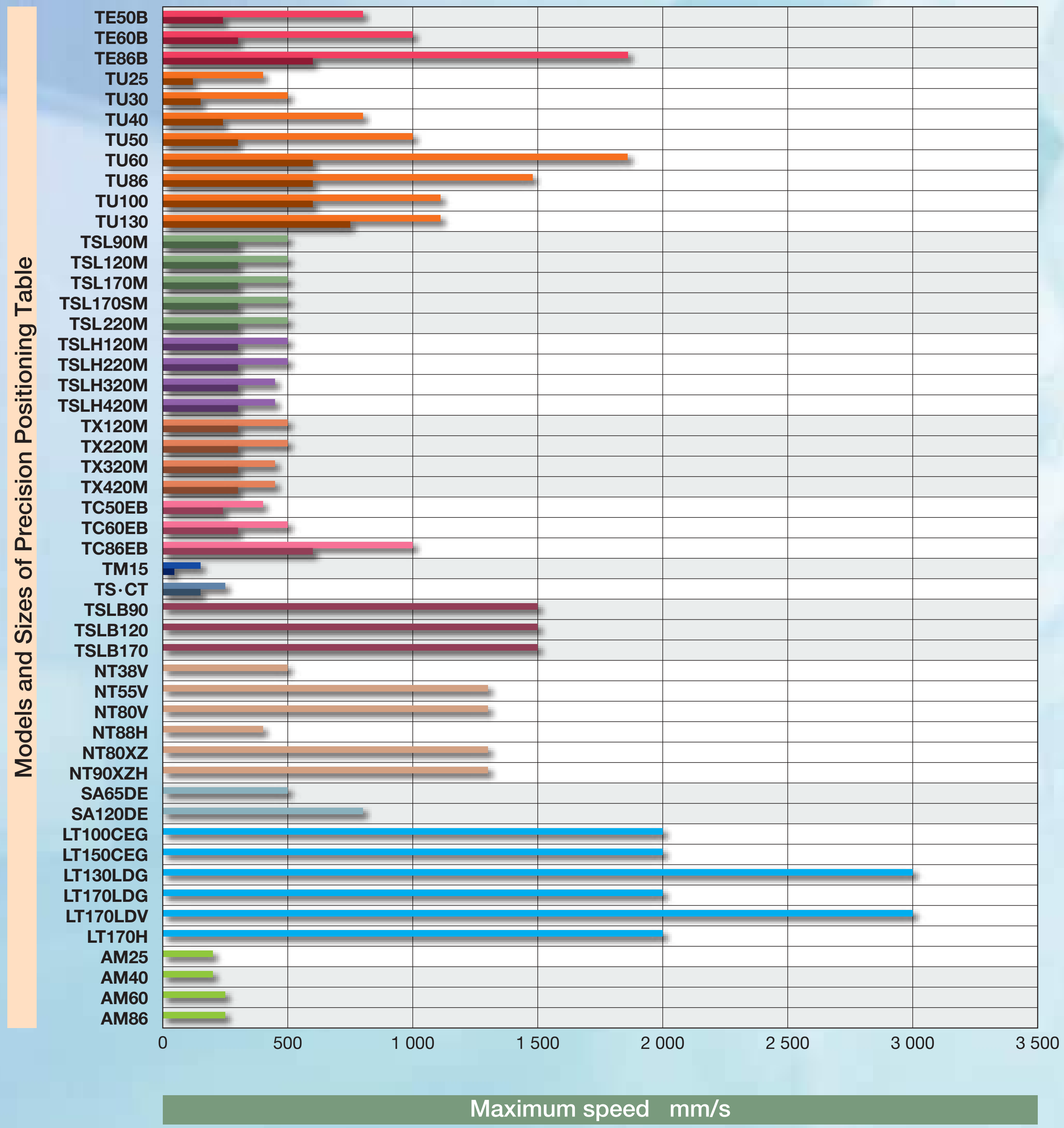
Positioning Accuracy of Precision Positioning Table



How to see the above graph

- The values shown in the graph are for reference. For details, see the explanation of each model.
- For models of ball screw drive, the value of the case selected ground ball screw is indicated.
- When two or more values are indicated for a model, this means that the applicable value depends on the stroke length.
- For TU, the value of the standard table is indicated.
- CTLH…M, CTX…M and CT are tables of two-axis specification.

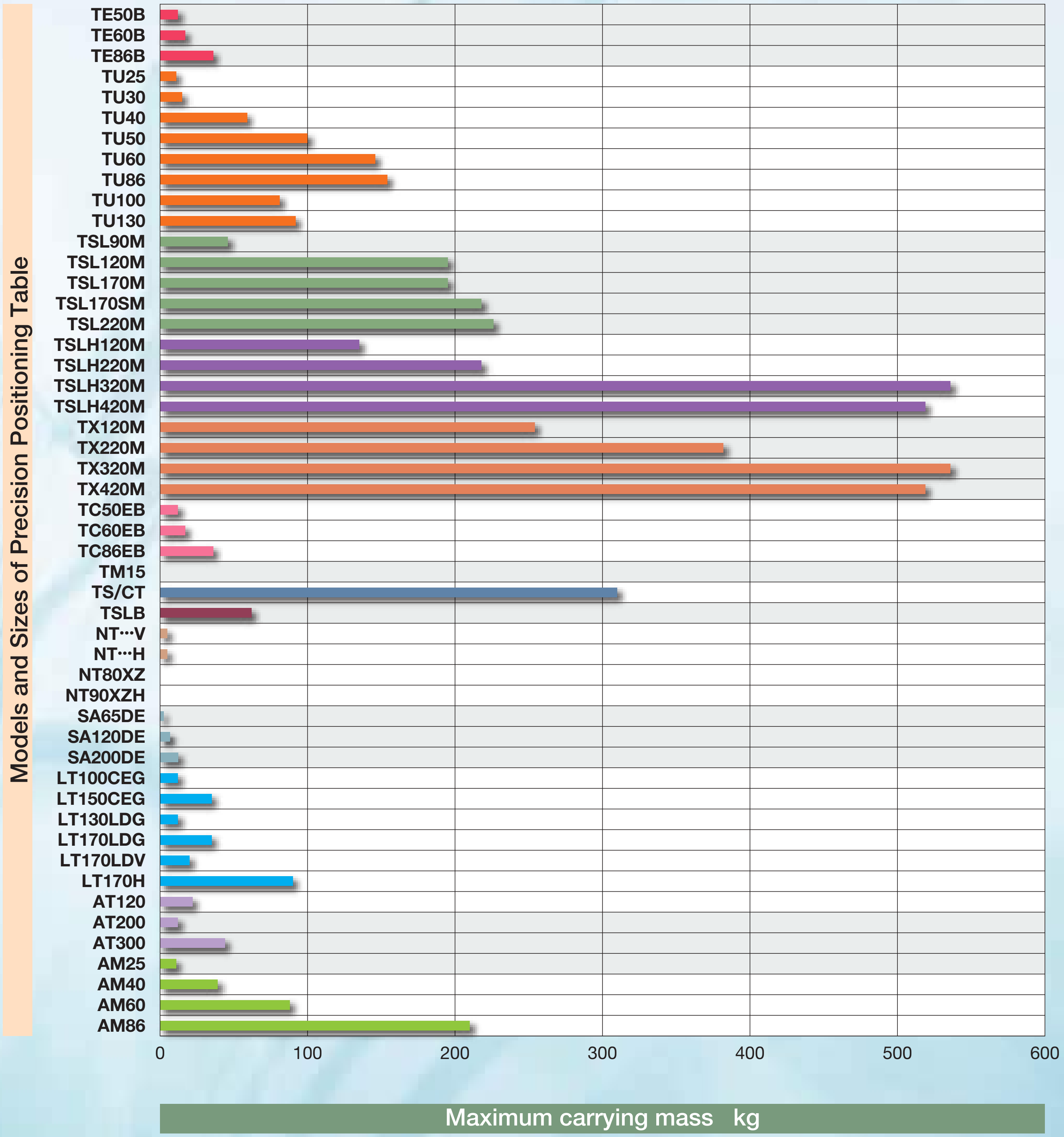
Maximum Speed of Precision Positioning Table



How to see the above graph

- ● The values shown in the graph are for reference. For details, see the explanation of each model.
- ● For models of ball screw drive, the value with the longest ball screw lead allowable is indicated.
- ● The upper sections indicate values of AC servomotor, whereas the lower sections indicate values of stepper motor specification.
- ● The ball screw drive type may sometimes be restricted by the allowable number of revolution of ball screw depending on the stroke length.

Carrying Mass of Precision Positioning Table



How to see the above graph

- ● The values shown in the graph are for reference. For details, see the explanation of each model.
- ● Values of LT, NT···V, NT···H, NT···XZ, NT···XZH, and SA···DE indicate the maximum load masses.
- ● The values shown in the graph are for a position of the mass to load of 0mm (length) and 0mm (height).

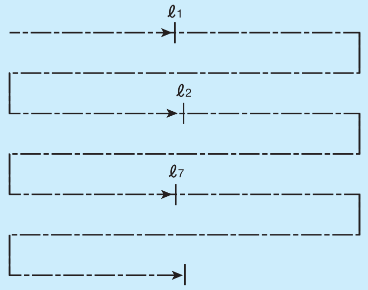
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Accuracy

Accuracy standard of precision positioning table varies depending on models and measurement methods are described below. In addition, model testing according to the use conditions such as dynamics testing may be conducted on request. Please contact IKO for details.
Precision positioning table is supplied with an inspection sheet or certificate of passing inspection regarding accuracy standard of each model.

Positioning repeatability

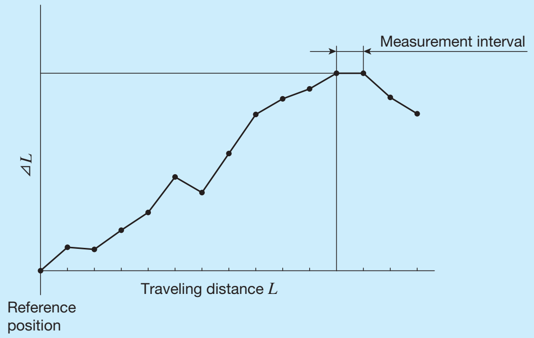
Repeat positioning to any one point from one direction 7 times to measure the stop position and obtain 1/2 of the maximum reading difference.
In principle, perform this measurement at the center and each end of the stroke length and take the maximum obtained value as the measurement value. Indicate the 1/2 of the maximum difference with ±.



1/2 of largest difference in measurement values, ℓ_1, ℓ_2, $\cdots\ell_7$

Positioning accuracy

Perform positioning successively in the certain direction from the reference position, measure the difference between actual travel distance at each position and the theoretical travel distance, and indicate the maximum difference within the stroke length as an absolute value.



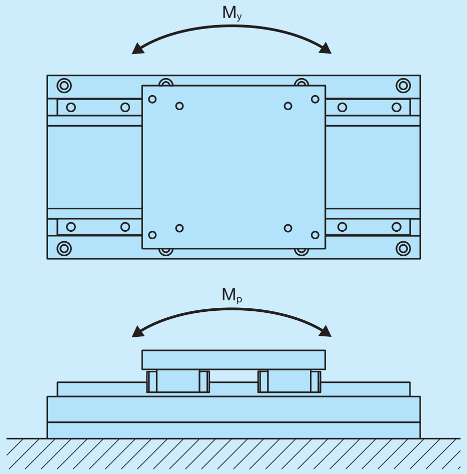
$\varDelta L$= (Distance actually traveled) – (Command value for traveling distance)

Attitude accuracy (pitching and yawing)

The tilt angles for pitching direction(Mp) and yawing direction(My) of the table within the stroke range are measured with a laser angle measurement system, and the measured value is the value of the maximum reading error.

● Pitching (M_p)
Vertical angle change on table travel axis

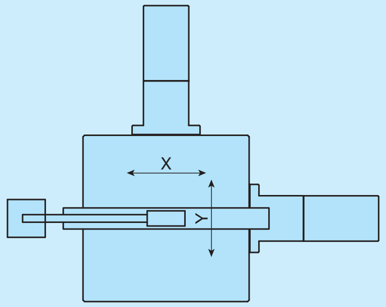
● Yawing (M_y)
Horizontal angle change on table travel axis



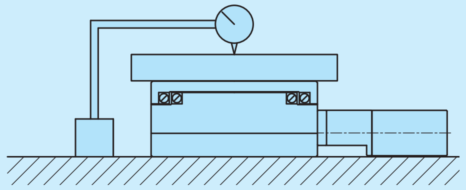
Parallelism in table motion A

Refers to parallelism (indicator fix) of the slide table motion and flat surface (precision positioning table mounting surface).

● When the stroke is shorter than the slide table length
Fix the test indicator on the stool on which the precision positioning table is mounted, place the straight-edge on the slide table, and apply the test indicator at the center of the slide table. Make a measurement across almost whole area of the stroke length in X and Y directions, and take the maximum reading difference as a measurement value.

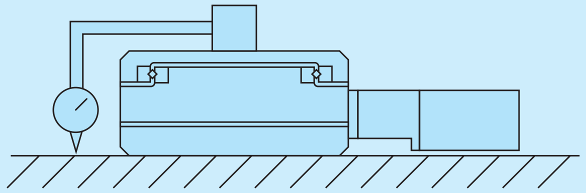


● When the stroke is longer than the slide table length
Fix the test indicator on the stool on which the precision positioning table is mounted, place the straight-edge on the slide table, and apply the test indicator at the center of the slide table. Make a measurement across almost whole area of the stroke length while moving the table by the length of the table during strokes in X and Y directions, and take the maximum reading difference as a measurement value.



Parallelism in table motion B

Refers to parallelism (indicator travel) of the slide table motion and flat surface (table mounting surface).
Fix the indicator at the center of the slide table, apply the test indicator on the stool on which the precision positioning table is mounted, make a measurement across almost whole area of the stroke length in X and Y directions, and take the maximum reading difference as a measurement value.

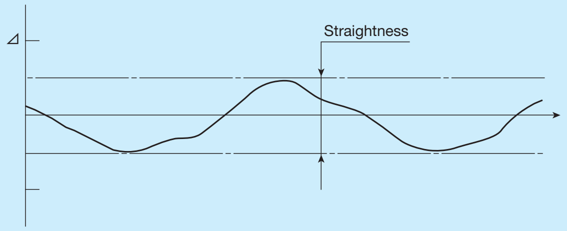


Straightness

Refers to an extent of deviation from the ideal straight line of the slide table motion, which should be linear.

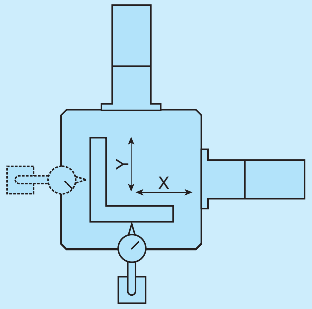
· Straightness in horizontal:	Motion of the slide table travel axis in left and right (horizontal) direction.
· Straightness in vertical:	Motion of the slide table travel axis in up and down (vertical) direction.

These are measured by a test bar and indicator or laser running straightness measurement system. The measurement value is represented by the interval between two straight lines in parallel with each other, when placed so that the interval becomes minimal.



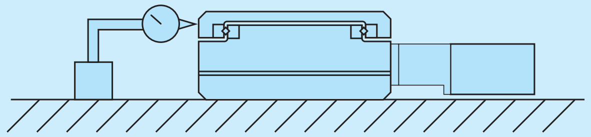
Squareness of XY motion

Refers to squareness of X-and Y-axis motions.
Fix a square scale on the slide table taking either travel axis direction as a reference, apply the test indicator perpendicular to the reference travel axis and take the maximum reading difference within the stroke length of the axis as a measurement value.



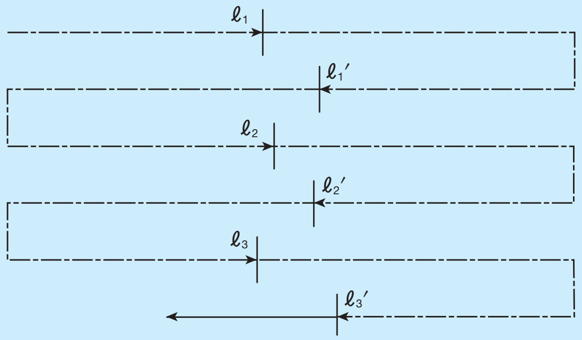
Backlash

Feed to the slide table and take reading of the test indicator when it is moved slightly as a reference. Then, move the slide table in the same direction with the given load from such condition without the feed gear and release the load. Obtain the difference from the reference value at this point.
Perform this measurement at the center and each end of the stroke length and take the maximum obtained value as the measurement value.



Lost motion

Perform positioning in the forward direction for one position and measure the position (ℓ_1 in the figure). Then give a command to move it in the same direction and give the same command in the backward direction from the position to perform positioning in the backward direction. Measure the position (ℓ_1' in the figure). Further, give a command to move it in the backward direction and give the same command in the forward direction from the position to perform positioning in the forward direction. Measure the position (ℓ_2 in the figure). Subsequently, repeat these motions and measurements and obtain the difference between average values of stop position of the 7 positionings in forward and backward directions.
Perform this measurement at the center and each end of the motion and take the maximum obtained value as the measurement value.



Measurement value of lost motion

$$= \left|\frac{1}{7}(\ell_1+\ell_2+\cdots\ell_7)-\frac{1}{7}\left(\ell_1'+\ell_2'+\cdots+\ell_7'\right)\right|\max$$

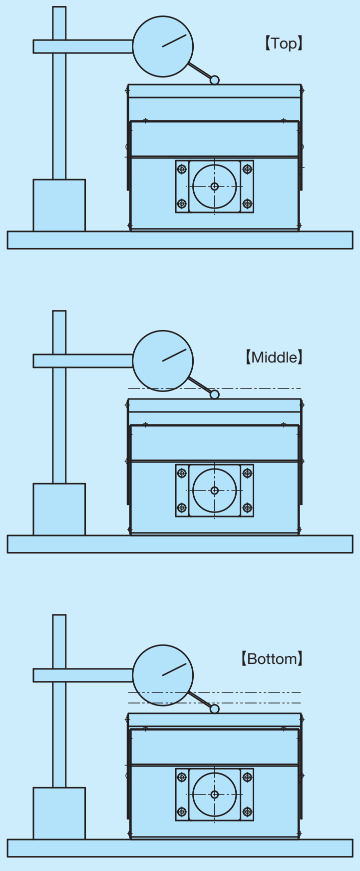
Measurement of parallelism during table elevating

At the lower most step of the table (H_{min}), align the indicator with 0 value at the measurement point E on the table upper surface with the table mounting surface as a reference, and measure heights at the remaining 8 points (A to I) with the value as a reference.
Lift up the table and perform the same measurement at middle (H_{mid}) and upper (H_{max}) steps. Then obtain each maximum difference between measurement values at the same point at lower, middle and upper steps.
Take the maximum difference value among all the 9 points as the parallelism during table elevating.

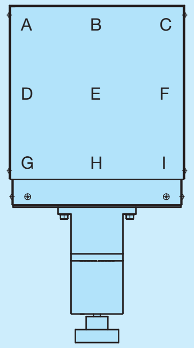
[Sample calculation of parallelism during table elevating]

Measuring point	Measurement value (μm)			
	Lower	Middle	Upper	Maximum difference
A	1	2	1	1
B	2	−1	3	4
C	3	4	5	2
D	4	2	1	3
E	0	0	0	0
F	−1	2	3	4
G	−2	3	3	5
H	−3	2	3	6
I	−4	−2	−4	2

If measurement values are as those indicated in the table, the maximum difference value among all points should be 6μm at the point H.
As a result, the parallelism during elevating of this table is 6μm.



【Measuring method】

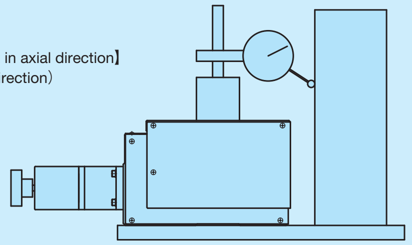


【Measuring point】

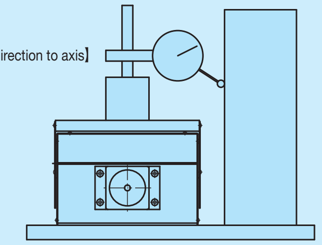
Measurement of squareness during table elevating

The squareness during table elevating relative to a square scale shall be the squareness during table elevating.
At the lower step of the table (H_{min}), align the indicator with 0 relative to a square scale. The maximum difference in pick test deflection at the time when it is stroked from the lower step of the table (H_{min}) to the upper step (H_{max}) in the condition shall be the squareness during table elevating. (Straightness component at the time of table stroke is included.)
Place a square scale at the position 10mm away from the table edge, make a measurement for 2 directions, ball screw axial direction and direction perpendicular to the axis - and take the maximum value between the 2 values as the straightness during table elevating.

【Measurement in axial direction】
(X direction)

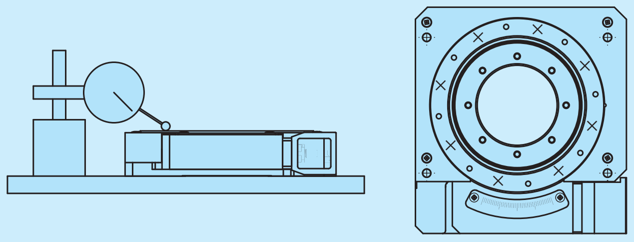


【Measurement in perpendicular direction to axis】
(Y direction)



Parallelism of the table to the mounting surface

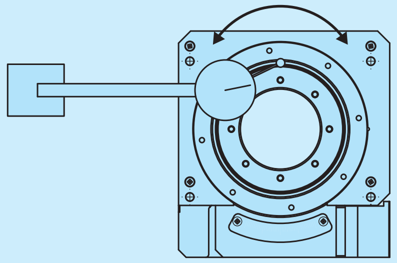
Using the table mounting surface as a reference, the entire height of the upper surface of the table is measured with an indicator. The maximum reading difference is taken as the measurement value.



【X: Measuring point】

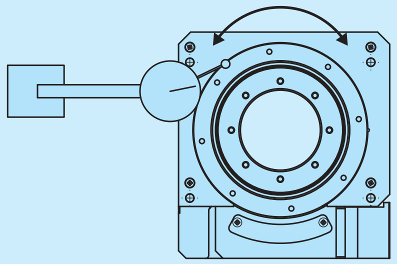
Radial runout of the table diameter

An indicator is placed against the radial surface of the table while the table is rotated a full revolution. The maximum reading difference is taken as the measurement value.



Deflection on the upper surface of the table

An indicator is placed against the upper surface of the table while the table is rotated a full revolution. The maximum reading difference is taken as the measurement value.



Carrying Mass, Load Mass, Allowable Load

■ Maximum carrying mass

The maximum carrying mass is the mass satisfying conditions ① and ② below, and is a reference maximum mass that can be loaded when the precision positioning table is used horizontally or vertically. The size varies depending on the position of mass to be carried (height: H, length: L).

①The mass when the rating life of the linear motion rolling guide, ball screws, or bearings is 18,000 hours during continuous operation at a number of revolutions of the motor of 3000min^{-1} (900min^{-1} for TSLB) and an acceleration/deceleration time of 0.2s.

②The mass calculated is based upon the basic static load rating of the linear motion rolling guide you are using.

It is set for TE…B, TU, TSL…M, TSLH…M, TX…M, TC…EB, TM, TS/CT, TSLB, AT, AM, and TZ.

■ Maximum load mass

The maximum load mass refers to the maximum mass that ensures necessary acceleration.

For ball screw drive and timing belt drive, this will be the maximum mass that ensures a number of revolutions of the motor of 3000min^{-1} (900min^{-1} for TSLB) and acceleration/deceleration of 0.3G, when repeating operations with the same acceleration/deceleration time and stop time.

It is set for TE…B, TU, TSL…M, TSLH…M, TX…M, TC…EB, TM, TS/CT, TSLB, AT, AM, and TZ.

For linear motor drive, this will be the maximum mass that ensures an acceleration of 0.5G (for linear motor) or a peripheral acceleration of 0.5G (for rotary motion).

It is restricted by thrust (torque) characteristics of the motor used, and the larger the carrying mass is, the longer the marginal acceleration time becomes.

For linear motor drive models (LT, NT…V, NT…H, NT…XZ, NT…XZH) and direct drive models (SA…DE), the dynamic load mass representing the relation between acceleration and load mass in standard traveling models is set.

■ Allowable load

Allowable load refers to the maximum static load that can be applied without affecting functions or performance when used horizontally. It is set for SK…W.

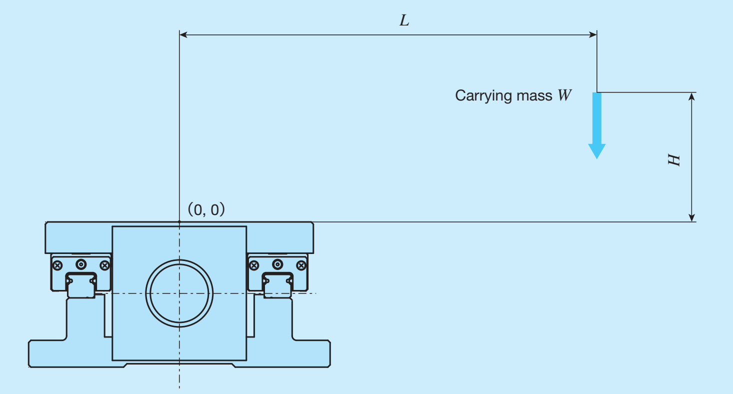


Fig. 1 Carrying mass position

Maximum Speed and Resolution

■ Maximum speed

The maximum speed of a precision positioning table is defined by the following equation.

The ball screw drive type is restricted by the allowable number of ball screw revolutions, which vary by the stroke length. For the timing belt drive, it is calculated with the maximum number of motor revolutions of 900（min^{-1}）. See the specifications of each model for details.

Each linear motor drive model has a fixed maximum speed. See the specifications of each model for more details.

Ball screw drive

$$\text{Maximum speed (mm/s)} = \text{Ball screw lead (mm)} \times \frac{\text{Allowable number of revolutions of ball screw (min}^{-1}\text{)}}{60}$$

Timing belt drive

$$\text{Maximum speed (mm/s)} = \text{Pulley pitch diameter} \times \pi \text{ (mm)} \times \frac{\text{Maximum number of revolutions of the motor (min}^{-1}\text{)}}{60}$$

(Pulley pitch diameter × π = 100mm)

To obtain the actual positioning time, the operation pattern must be considered based on conditions such as acceleration/deceleration time, and stroke length. See the section on consideration of operation patterns.

■ Resolution

Resolution refers to the minimum feed rate allowed for precision positioning tables and can be obtained by the following equation. Each linear motor drive model has a fixed resolution. See the specifications of each model for more details.

Ball screw drive

$$\text{Resolution (mm/pulse)} = \frac{\text{Ball screw lead (mm)}}{\text{Number of fraction sizes per motor rotation (pulse)}}$$

Timing belt drive

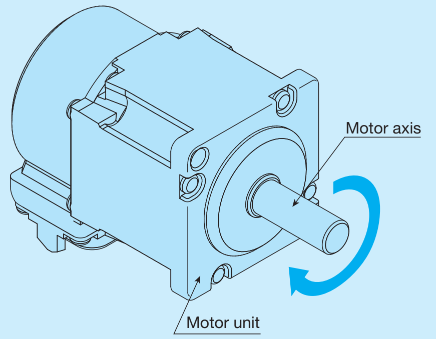
$$\text{Resolution (mm/pulse)} = \frac{\text{Pulley pitch diameter} \times \pi \text{ (mm)}}{\text{Number of fraction sizes per motor rotation (pulse)}}$$

(Pulley pitch diameter × π = 100mm)

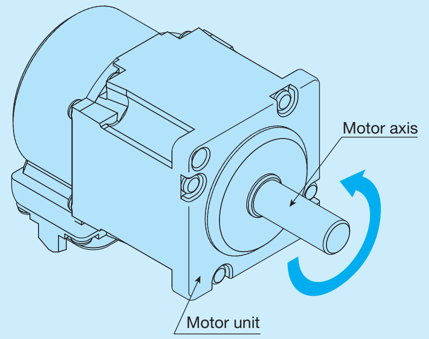
Motor Axis Rotation Directions

Motor axis (shaft) rotation directions are defined as shown below.

When a reducer is mounted to the motor, the rotation direction of the reducer output shaft may be the opposite of that shown for CW and CCW below.



CW



CCW

Motor axis rotation direction CW (Clockwise Rotation)
Rotates to the right (clockwise) when looking at the motor unit from the motor axis.

Motor axis rotation direction CCW (Counter Clockwise Rotation)
Rotates to the left (counter clockwise) when looking at the motor unit from the motor axis.

Consideration of Operation Patterns

Calculation of positioning time

The positioning time taken when the precision positioning table actually moves can be obtained by the following equation. For applications requiring high precision positioning, the settling time from completion of command pulse input to full stop of the table at the positioning point and vibration damping time of the machine device must be considered in addition to the constant speed traveling time and acceleration / deceleration time.

Long-distance positioning

Long distance in this context refers to the distance for which there is enough constant speed traveling time when taking into account the acceleration / deceleration time.

$$t=\frac{L_1}{V_1}+\frac{t_a+t_b}{2}+t_d$$

where t : Positioning time s

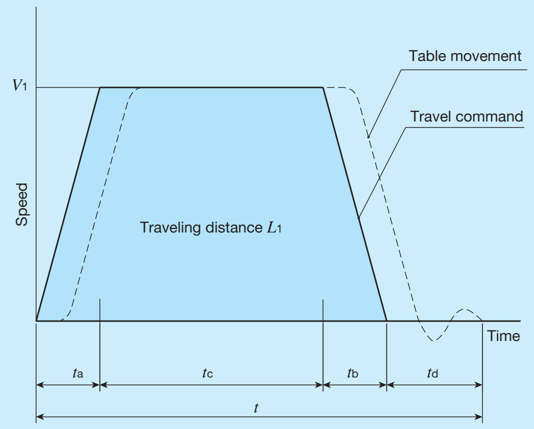
t_a, t_b : Acceleration/deceleration time s

t_c : Constant speed traveling time s

t_d : Settling time s

L_1 : Traveling distance mm

V_1 : Traveling speed (set speed) mm/s



Short-distance positioning

Short distance in this context refers to the distance for which there is no constant speed traveling time because deceleration occurs before reaching constant speed.

$$t=\frac{L_2}{V_2}+\frac{t_a+t_b}{2}+t_d$$

where t : Positioning time s

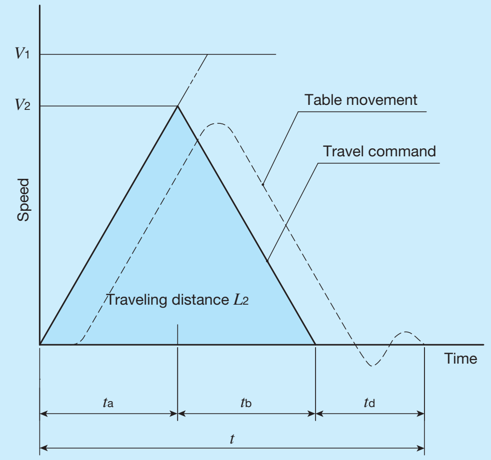
t_a, t_b : Acceleration/deceleration time s

t_d : Settling time s

L_2 : Traveling distance mm

V_1 : Set speed mm/s

V_2 : Traveling speed mm/s



Calculation of marginal acceleration time

Torque (thrust force) required for driving of precision positioning table comes to the highest during acceleration. Torque (thrust force) required for this acceleration is limited by motor output torque (linear motor thrust force). Therefore, the marginal acceleration time with table used horizontally is calculated by the following equation.

For ball screw drive and timing belt drive

● Applied torque T_L

$T_L=T_0+\mu Wg\cdot\frac{\ell}{2\pi\eta}$ [N·m] ……Ball screw drive

$T_L=T_0+(Wg\times\text{Wedge reduction ratio})\cdot\frac{\ell}{2\pi\eta}$ [N·m] …Applicable to TZ

$T_L=T_0+\mu Wg\cdot\frac{r}{\eta}$ [N·m] ……Timing belt drive

● Acceleration torque T_a

$T_a=(J_T+J_M+J_C+J_L)\cdot\frac{2\pi N}{60t_a}$ [N·m]

$J_L=W\cdot\left(\frac{\ell}{2\pi}\right)^2$ [kg·m²] ………Ball screw drive

$J_L=W\cdot\left(\frac{\ell}{2\pi}\right)^2\times\text{Wedge reduction ratio}^2$ [kg·m²] ……Applicable to TZ

$J_L=W\cdot r^2$ [kg·m²] ………Timing belt drive

● Torque required for acceleration T_P

$T_P=T_L+T_a$ [N·m] $(T_P\times k<T_M)$

● Marginal acceleration time t_a

$t_a=(J_T+J_M+J_C+J_L)\cdot\frac{2\pi N}{60}\cdot\frac{k}{T_M-T_L}$ [s]

[In case of AT]

● Applied torque T_L

$T_L=T_0+\mu Wg\cdot\frac{\ell}{2\pi\eta}$

● Carrying mass inertia J_L

$J_L=W\cdot\left(\frac{\ell\cdot R_0}{2\pi L}\right)^2$

● Distance to rotator L

Model	ℓ [m]	L [m]
AT120A	0.001	0.100
AT200A	0.001	0.130
AT300A	0.002	0.186

T_0 : Starting torque N·m

μ : Friction coefficient of rolling guide (0.01)

W : Carrying mass kg

ℓ : Ball screw lead m

r : Pulley pitch radius (0.0159m)

η : Efficiency 0.9

J_T : Table inertia kg·m²

J_M : Motor inertia kg·m²

J_C : Coupling inertia

J_L : Carrying mass inertia kg·m²

N : Number of revolutions of motor min⁻¹

t_a : Acceleration time s

g : Gravity acceleration (9.8m/s²)

T_M : Motor output torque N·m

- For the stepper motor, it is the output torque at the number of motor revolutions N.
- For the AC servomotor, it is the maximum (momentary) torque at the number of revolutions N.

k : Factor of safety
(AC servomotor : 1.3)
(stepper motor : 1.5~2)

Wedge reduction ratio: 0.5 in case of 1 : 2
: 0.25 in case of 1 : 4

R_0 : Distance from the center of the table to the center of gravity of the load m

L : Distance from the center of the table to the rotator m

In case of linear motor drive

- Force from acceleration F_a

$$F_a=(W_L+W_T)\cdot\frac{V}{t_a}\ [N]$$

- Thrust force required for acceleration F_P

$$F_P=F_a+F_L\ [N]$$

- Marginal acceleration time t_a

$$t_a=\frac{(W_L+W_T)\cdot V\cdot k}{F_M-F_L}\ [s]$$

μ : Friction coefficient of rolling guide (0.01)
W_T: Mass of moving table kg
W_L: Carrying mass kg
F_R : Running resistance N
(LT170H: 40N)
F_c : Cord pull-resistance (1) N
(LT Series: About 1.0N)
(NT Series: None)
F_M: Linear motor thrust force N
(maximum thrust at traveling speed V)
t_a : Acceleration time s
V : Traveling speed m/s
g : Gravity acceleration 9.8 m/s²
k : Factor of safety (1.3)

Note (1) Cord pull-resistance varies depending on cord mass and how to pull it. Use the an expected resistance value for calculation.

[In case of LT···CE, LT···LD]

- Friction resistance of rolling guide F_f

$$F_f=\mu\ (W_L+W_T)\ g\ [N]$$

However, minimum value of F_f shall be as follows.
For LT100CE: 2.5N
For LT150CE: 5.0N
For LT130LD: 6.0N
For LT170LD: 6.0N

- Force from running resistance F_L

$$F_L=F_f+F_c\ [N]$$

[In case of LT···H]

- Running resistance F_R

LT170H: 40N

- Speed coefficient f_V

Traveling speed V[m/s]	LT170H
0.5 or less	1
Above 0.5 and below 1.0	1.5
Above 1.0 and below 1.5	2.25

- Force from running resistance F_L

$$F_L=f_V\cdot F_R+F_c\ [N]$$

[In case of NT38V]

- Force from running resistance F_L

F_L = 0.25N

[In case of NT55V/NT80V]

- Force from running resistance F_L

F_L = 1.5N

[In case of NT80XZ]

- Force from running resistance F_L

Horizontal axis: F_L = 1.5N
Vertical axis: F_L = 0.5N (2)

[In case of NT90XZH]

- Force from running resistance F_L

Horizontal axis: F_L = 2.0N
Vertical axis: F_L = 2.0N (2)

[In case of NT88H]

- Force from running resistance F_L

F_L = 0.5N

Note (2) It is the resistance value for the stroke of ±5mm from the equilibrium point in the center area of the stroke range, assuming the spring system balance mechanism of the vertical axis.
The value changes depending on the spring mounting position or the stroke width in the actual calculation. Please verify using the actual machine.

In case of direct drive (SA···DE)

[In case of SA···DE/X(Y)]

- Friction resistance of rolling guide F_f

F_f value shall be as follows.
In case of SA65DE/X 0.5N
In case of SA120DE/X 3.0N

- Force from running resistance F_L

$$F_L=F_f+F_c\ [N]$$

- Force from acceleration F_a

$$F_a=(W_L+W_T)\cdot\frac{V}{t_a}\ [N]$$

- Thrust force required for acceleration F_P

$$F_P=F_a+F_L\ [N]$$

- Marginal acceleration time t_a

$$t_a=\frac{(W_L+W_T)\cdot V\cdot k}{F_M-F_L}\ [s]$$

W_T: Mass of moving table kg
W_L: Carrying mass kg
F_c : Cord pull-resistance (1) N
F_M: Linear motor thrust force N
(maximum thrust at traveling speed V)
t_a : Acceleration time s
V : Traveling speed m/s
k : Factor of safety (1.3)

Note (1) Cord pull-resistance varies depending on cord mass and how to pull it. Use the an expected resistance value for calculation.

[In case of SA···DE/S]

- Friction resistance of rolling guide M_f

M_f value shall be as follows.
In case of SA65DE/S 0.03N·m
In case of SA120DE/S 0.1N·m
In case of SA200DE/S 0.2N·m

- Torque from rotation resistance M_L

$$M_L=M_f+M_c\ [N\cdot m]$$

- Torque from acceleration M_a

$$M_a=(J_L+J_T)\cdot\frac{R}{t_a}\ [N\cdot m]$$

- Torque required for acceleration M_P

$$M_P=M_a+M_L\ [N\cdot m]$$

- Marginal acceleration time t_a

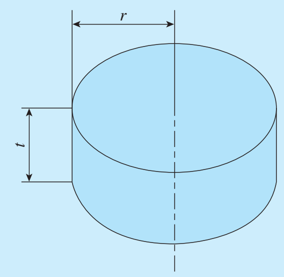
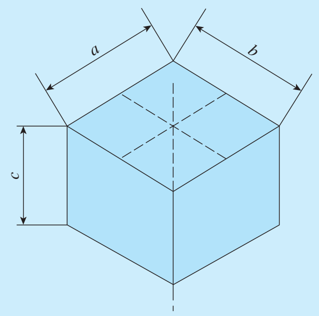
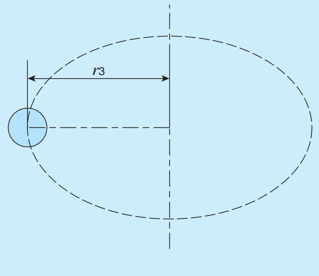
$$t_a=\frac{(J_L+J_T)\cdot R\cdot k}{M_M-M_L}\ [s]$$

J_L : Inertia moment of load kg·m²
J_T : Inertia moment of moving table kg·m²
M_c : Cord pull-resistance (2) N·m
M_M: Alignment stage torque N·m
t_a : Acceleration time s
R : Traveling speed rad/s
k : Factor of safety (1.3)

Note (2) As there is no cord for θ-axis moving table, set the cord pull-resistance to 0 if the load does not pull cord.
Calculate the inertia moment of load by referencing calculation formulas below.

Calculation of inertia moment

p: density, m: mass

Cylinder	Quadrangular prism	Offset rotation
		
$J_L=\frac{1}{2}\cdot\pi\cdot p\cdot t\cdot r^4$ $=\frac{1}{2}\cdot m\cdot r^2$	$J_L=\frac{1}{12}\cdot p\cdot a\cdot b\cdot c\cdot(a^2+b^2)$ $=\frac{1}{12}\cdot m\cdot(a^2+b^2)$	$J_L'=J_L+m\cdot r_3^2$ J_L': Inertia moment from rotation center J_L : Inertia moment when rotating around the center of gravity

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

■ Calculation of effective torque and effective thrust force

As a large torque (thrust force) is required for acceleration / deceleration when the precision positioning table is driven, the effective torque (effective thrust force) may become larger than the motor's rated torque (rated thrust) depending on the operation rate of each pattern in case the AC servomotor or linear motor drive is used. Continuing the operation in this condition may cause overheating and seizure of the motor. So ensure that the effective torque (effective thrust force) is smaller than motor's rated torque (rated thrust). The effective torque (effective thrust force) by the operation pattern of table is calculated by the following equation.
If the rated torque (rated thrust) of the motor is larger than the effective torque (effective thrust force), continuous operation according to the operation pattern is possible.

If AC servomotor is used

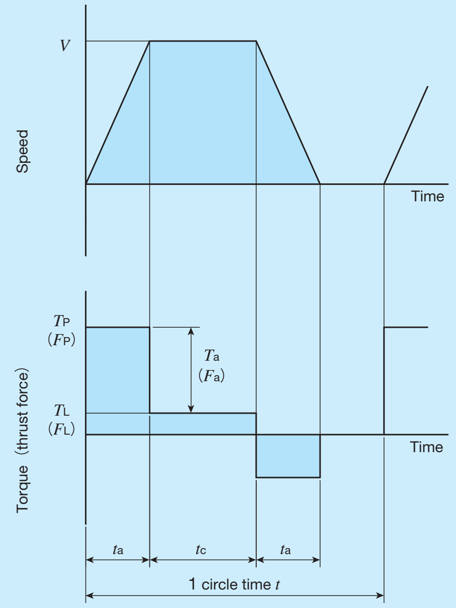
- Effective torque T_{rms}

$$T_{rms}=\sqrt{\frac{T_P^2\times t_a+(T_P-2\times T_L)^2\times t_a+T_L^2\times t_c}{t}}\ [\mathrm{N\cdot m}]$$

In case of linear motor drive

- Effective thrust force F_{rms}

$$F_{rms}=\sqrt{\frac{F_P^2\times t_a+(F_P-2\times F_L)^2\times t_a+F_L^2\times t_c}{t}}\ [\mathrm{N}]$$



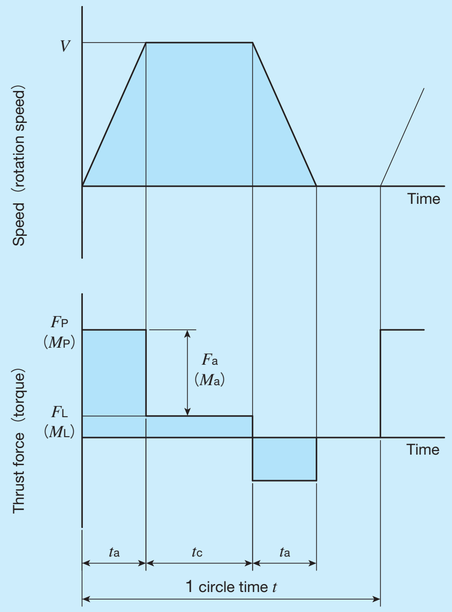
In case of direct drive (SA···DE)

- Effective thrust force (applicable to SA···DE/X(Y)) F_{rms}

$$F_{rms}=\sqrt{\frac{F_P^2\times t_a+(F_P-2\times F_L)^2\times t_a+F_L^2\times t_c}{t}}\ [\mathrm{N}]$$

- Effective torque (applicable to SA···DE/S) M_{rms}

$$M_{rms}=\sqrt{\frac{M_P^2\times t_a+(M_P-2\times M_L)^2\times t_a+M_L^2\times t_c}{t}}\ [\mathrm{N\cdot m}]$$

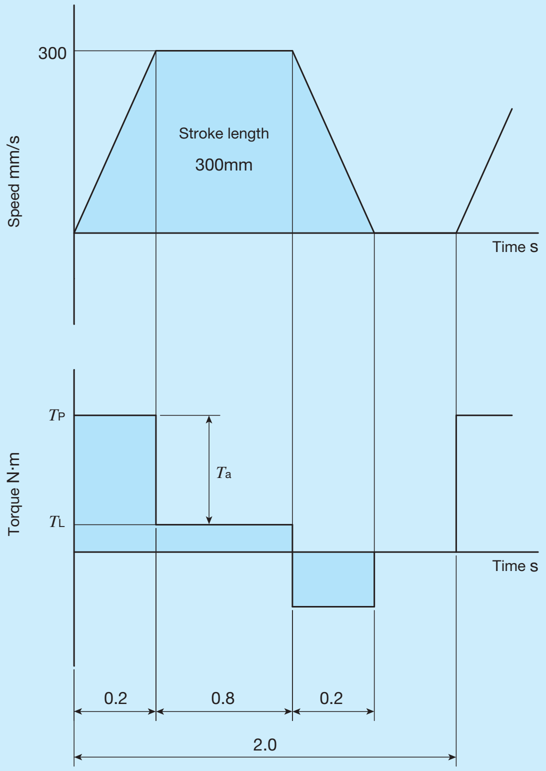


■ Consideration example of operation pattern

If AC servomotor is used

- Usage conditions

Mounting direction	Horizontal usage
Carrying mass W	30kg
Stroke length L	300mm
Traveling speed (set speed) V	300mm/s
Acceleration/deceleration time t_a	0.2s
Constant speed traveling time t_c	0.8s
1 cycle time t	2.0s



- Temporary selection of positioning table
  Temporarily select TU60S49/AT103G10S03.

Basic specification

Ball screw lead ℓ	10mm
Stroke length	300mm
Maximum speed	500mm/s
Starting torque T_s	0.08N·m
Table inertia J_T	0.93×10⁻⁵kg·m²
Coupling inertia J_C	0.290×10⁻⁵kg·m²

- Motor specification

AC servomotor used	SGMAV-01A
Rated torque	0.318N·m
Motor inertia J_M	0.380×10⁻⁵kg·m²

- Calculation of torque required for acceleration

· Applied torque T_L

$$T_L=T_s+\mu Wg\cdot\frac{\ell}{2\pi\eta}$$
$$=0.08+0.01\times30\times9.8\times\frac{0.01}{2\times\pi\times0.9}$$
$$\fallingdotseq0.09\mathrm{N\cdot m}$$

· Acceleration torque T_a

$$J_L=W\cdot\left(\frac{\ell}{2\pi}\right)^2$$
$$=30\times\left(\frac{0.01}{2\times\pi}\right)^2\fallingdotseq7.60\times10^{-5}\mathrm{kg\cdot m^2}$$
$$N=V\times\frac{60}{\ell}=0.3\times\frac{60}{0.01}=1800\mathrm{min^{-1}}$$
$$T_a=(J_T+J_M+J_C+J_L)\cdot\frac{2\pi N}{60t_a}$$
$$=(0.93+0.380+0.290+7.60)\times10^{-5}\times\frac{2\times\pi\times1800}{60\times0.2}$$
$$\fallingdotseq0.09\mathrm{N\cdot m}$$

· Torque required for acceleration T_P

$$T_P=T_L+T_a=0.09+0.09=0.18\mathrm{N\cdot m}$$

At this point, check that the $T_P\times k$ (factor of safety) is smaller than motor's output torque T_M.
If this value is exceeded, review the maximum speed and acceleration / deceleration time.
For the operation pattern under consideration, it is smaller than the output torque T_M as indicated below.

$$T_M=0.318\times3\fallingdotseq0.95\mathrm{N\cdot m}$$
$$T_P\times k=0.18\times1.3=0.23\mathrm{N\cdot m}<T_M$$

- Consideration of effective torque

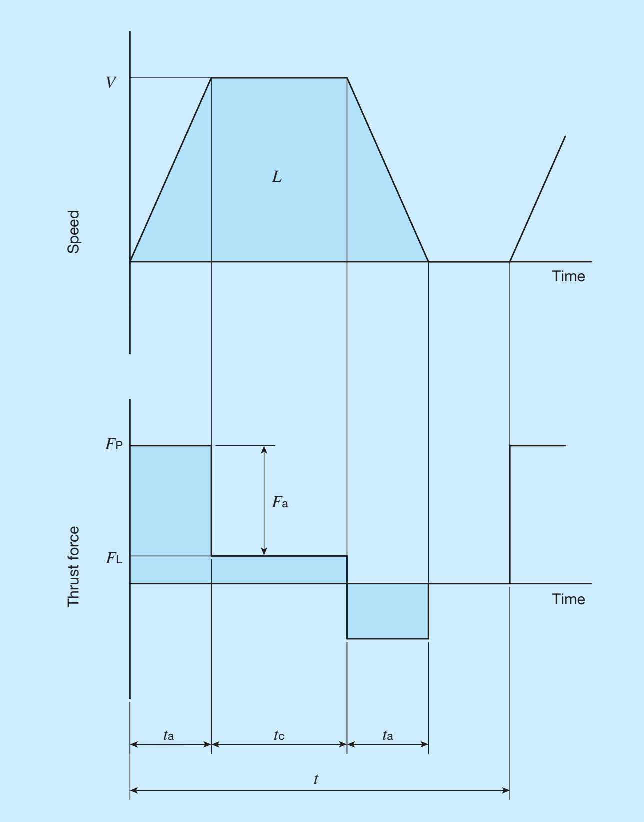
· Effective torque T_{rms}

$$T_{rms}=\sqrt{\frac{T_P^2\times t_a+(T_P-2\times T_L)^2\times t_a+T_L^2\times t_c}{t}}$$
$$=\sqrt{\frac{0.23^2\times0.2+(0.23-2\times0.09)^2\times0.2+0.09^2\times0.8}{2.0}}$$
$$\fallingdotseq0.09\mathrm{N\cdot m}$$

As motor's rated torque is larger than the effective torque T_{rms}, it can be judged that continuous operation in the operation pattern under consideration is possible.

In case of linear motor drive

The effective thrust force may exceed the rated thrust depending on the operation rate of Linear Motor Table, leading to motor overheating and seizure that may cause breakage and human injury. Before operations, ensure that the effective thrust force is below the rated thrust.
Described below is an example of consideration of operation pattern with LT170HS. Temporarily set the operation pattern as indicated below considering the carrying mass and acceleration from the dynamic load mass chart in page Ⅱ-294.



Setting items

Table specification	Model		LT170HS (natural air cooling)
	Mass of moving table	W_T	4.0kg See page Ⅱ-306
	Maximum thrust at traveling speed V	F_M	About 550N See page Ⅱ-294
	Running resistance	F_R	See [In case of LT···H] in the section of calculation of marginal acceleration time.
	Speed coefficient	f_V	
Carrying mass		W_L	30kg
Traveling distance		L	1.2m
Traveling speed (set speed)		V	1.5m/s
Time		t_a	0.3s
		t_c	0.5s
		t	2.5s
Cord pull-resistance		F_c	1.0N Expected value
Factor of safety		k	1.3
Ambient temperature			30℃

STEP1 Calculation of thrust force required for acceleration

①Force from running resistance F_L

$$F_L = f_V \times F_R + F_c = 2.25 \times 40 + 1 = 91\text{N}$$

②Force from acceleration F_a

$$F_a = (WL + WT) \cdot \frac{V}{t_a}$$

$$= (30 + 4.0) \times \frac{1.5}{0.3} = 170\text{N}$$

③Thrust force required for acceleration F_P

$$F_P = F_a + F_L$$

$$= 170 + 91 = 261\text{N}$$

At this point, check that the $F_P \times k$ (factor of safety) is below the thrust characteristics curve in page Ⅱ-294. If this value is exceeded, review the maximum speed for operating pattern and acceleration / deceleration time.
You can see in the example pattern that it is below the thrust characteristics curve.
Maximum thrust F_M at 1.5m/s=About 550N

$F_P \times k = 261 \times 1.3 = 339.3\text{N} < F_M$

STEP2 Consideration of effective thrust force

- Effective thrust force F_{rms} can be obtained as follows.

$$F_{rms} = \sqrt{\frac{F_P^2 \times t_a + (F_P - 2 \times F_L)^2 \times t_a + F_L^2 \times t_c}{t}}$$

$$= \sqrt{\frac{261^2 \times 0.3 + (261 - 2 \times 91)^2 \times 0.3 + 91^2 \times 0.5}{2.5}}$$

$$\fallingdotseq 103\text{N}$$

At this point, check that F_{rms} is below the rated thrust. If the rated thrust is exceeded, review the maximum speed for operating pattern and acceleration / deceleration time. (For LT···H, thrust characteristics vary depending on ambient temperature. See the rated thrust characteristics diagram.)

For the example pattern, the rated thrust is about 117N at the ambient temperature of 30℃, so the value is 103N< 117N (rated thrust) and it can be judged that continuous operation is possible.

In case of Alignment Stage SA

The effective thrust force may exceed the rated thrust (or the effective torque exceeds the rated torque) depending on the operation rate of Alignment Stage SA, leading to motor overheating and seizure that may cause breakage and human injury. Before operations, ensure that the effective thrust force is below the rated thrust (or the effective torque is below the rated torque).
Described below is an example of consideration of operation pattern with Alignment Stage SA120DE/XYS.
Temporarily set an operation pattern as indicated below considering the marginal acceleration time.

Setting items

Table model			SA120DE/XYS
Load mass		W_L	5.0kg
Inertia moment of load		J_L	1.0×10⁻²kg·m²
X-axis operation pattern	Mass of moving table	W_T	5.9kg
	Set stroke	L	0.01m
	Maximum speed	V	0.1m/s
	Acceleration/deceleration time	t_a	0.05s
	Constant speed traveling time	t_c	0.05s
	Cycle time	t	0.4s
	Cord pull-resistance	F_c	1.0N
Y-axis operation pattern	Mass of moving table	W_T	3.4kg
	Set stroke	L	0.01m
	Maximum speed	V	0.1m/s
	Acceleration / deceleration time	t_a	0.05s
	Constant speed traveling time	t_c	0.05s
	Cycle time	t	0.4s
	Cord pull-resistance	F_c	1.0N
θ-axis operation pattern	Inertia moment of moving table	J_T	2.0×10⁻³kg·m²
	Set operating angle	L	0.1πrad
			18°
	Maximum speed	R	πrad/s
			180°/s
	Acceleration/deceleration time	t_a	0.05s
	Constant speed traveling time	t_c	0.05s
	Cycle time	t	0.4s
	Cord pull-resistance	M_c	0.0N·m
Factor of safety		k	1.3

STEP1 Calculation of thrust force required for X-axis acceleration

①Force from running resistance F_L

$$F_L = F_f + F_c = 3.0 + 1.0 = 4.0\text{N}$$

②Force from acceleration F_a

$$F_a = (W_L + W_T) \cdot \frac{V}{t_a}$$

$$= (5.0 + 5.9) \times \frac{0.1}{0.05} = 21.8\text{N}$$

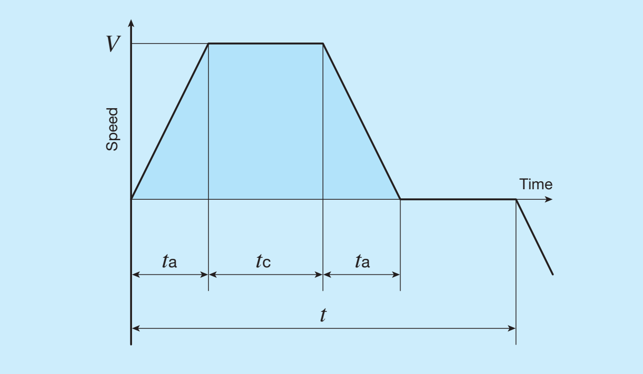
③Thrust force required for acceleration F_P

$$F_P = F_a + F_L$$

$$= 21.8 + 4.0 = 25.8\text{N}$$

At this point, check that the $F_P \times k$ (factor of safety) is below the maximum thrust in page Ⅱ-270. If this value is exceeded, review the maximum speed for operating pattern and acceleration / deceleration time.
You can see in the example pattern that it is below the maximum thrust.
The maximum thrust F_M of SA120DE/X=70N

$F_P \times k = 25.8 \times 1.3 = 33.54\text{N} < F_M$



STEP2 Consideration of effective thrust force

- Effective thrust force F_{rms} can be obtained as follows.

$$F_{rms} = \sqrt{\frac{F_P^2 \times t_a + (F_P - 2 \times F_L)^2 \times t_a + F_L^2 \times t_c}{t}}$$

$$= \sqrt{\frac{25.8^2 \times 0.05 + (25.8 - 2 \times 4.0)^2 \times 0.05 + 4.0^2 \times 0.05}{0.4}}$$

$$\fallingdotseq 11.17\text{N}$$

At this point, check that F_{rms} is below the rated thrust. If the rated thrust is exceeded, review the maximum speed for operating pattern and acceleration / deceleration time. In the example pattern, it can be judged that continuous operation is possible.

STEP3 Consideration of thrust force and effective thrust force required for Y-axis acceleration

Perform the same calculation as X-axis.
If the operation pattern is the same, the condition is lighter for Y-axis as its mass of moving table is smaller. So that is omitted in this example.

STEP4 Consideration of torque required for θ-axis acceleration

①Torque from rotation resistance M_L

$M_L = M_f + M_c$

$= 0.1 + 0.0 = 0.1$ N·m

②Torque from acceleration M_a

$$M_a = (J_L + J_T) \cdot \frac{R}{t_a}$$

$$= (0.01 + 0.002) \times \frac{\pi}{0.05} \fallingdotseq 0.754 \text{ N·m}$$

③Torque required for acceleration M_P

$M_P = M_a + M_L$

$= 0.754 + 0.1 = 0.854$ N·m

At this point, check that the $M_P \times k$ (factor of safety) is below the maximum torque in page Ⅱ-270. If this value is exceeded, review the maximum speed for operating pattern and acceleration / deceleration time. You can see in the example pattern that it is below the maximum torque.

Maximum torque M_M of SA120DE/S=2.0N·m
$M_P \times k = 0.854 \times 1.3 \fallingdotseq 1.11 \text{ N·m} < M_M$

STEP5 Consideration of effective torque

· Effective torque M_{rms} can be obtained as follows.

$$M_{rms} = \sqrt{\frac{M_P^2 \times t_a + (M_P - 2 \times M_L)^2 \times t_a + M_L^2 \times t_c}{t}}$$

$$= \sqrt{\frac{0.854^2 \times 0.05 + (0.854 - 2 \times 0.1)^2 \times 0.05 + 0.1^2 \times 0.05}{0.4}}$$

$\fallingdotseq 0.38$ N·m

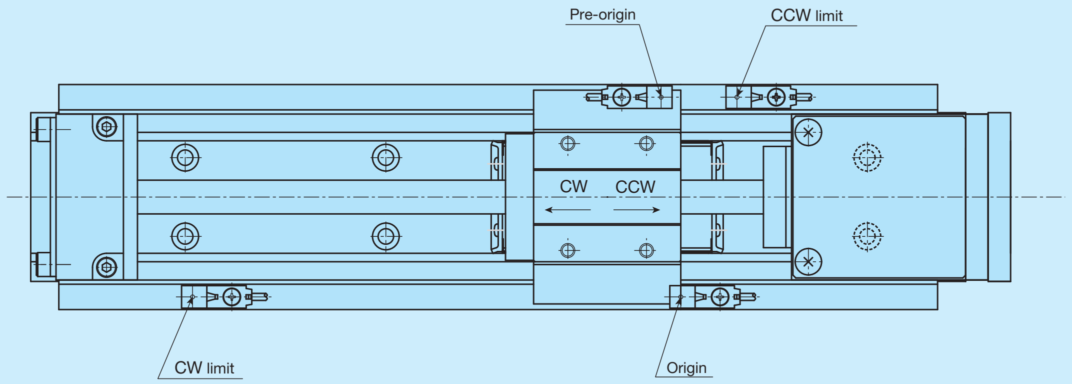
At this point, check that M_{rms} is below the rated torque. If the rated torque is exceeded, review the maximum speed for operating pattern and acceleration / deceleration time. In the example pattern, it can be judged that continuous operation is possible.

※Caution If the load is offset from the rotation center, X- and Y-axis acceleration / deceleration generates torque load on the θ-axis. So extra care must be exercised.

Sensor Specification

Precision positioning table is equipped with CW and CCW limit sensors for overrun prevention and pre-origin, origin and for origin sensors for machine origin detection. For some table models, these sensors are provided as standard equipment, and for the other models, mounting is specified by identification numbers.
Types of sensors used for Precision positioning table are listed in Table 1 and specifications of each sensor in Table 2 to 4.
For connector specifications for NT···V, SA200DE/S, LT and TM, see Table 5.1 to 5.2. For other tables, wires are unbound, so that the sensor output connector and mating-side must be prepared separately by customer.
For sensor timing chart, please see section of sensor specifications of each model. In addition, unless otherwise stated, sensor positions can be fine-adjusted. Please make adjustment on your own.

Table 1 Sensor types

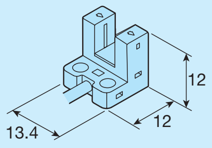
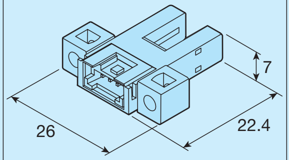
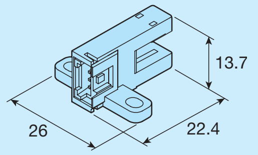
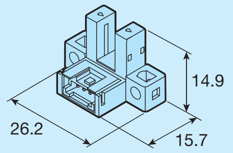
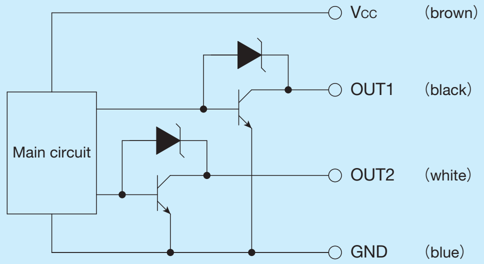


A mark tube with engraved signal name (ORG, PORG, CW or CCW) is inserted into the unbound-wire specification sheath.

Sensor Table model		CW limit	CCW limit	Pre-origin (PORG)	Origin (ORG)	For origin (PORG)
TE···B(1)		Proximity sensor	Proximity sensor	Proximity sensor	Proximity sensor	–
TU(1)		Proximity sensor	Proximity sensor	Proximity sensor	Proximity sensor	–
TSL···M		Proximity sensor	Proximity sensor	Proximity sensor	Photo sensor ④(2)	–
TSLH···M · CTLH···M		Photo sensor ③	Photo sensor ③	Photo sensor ③	Photo sensor ④(2)	–
TX···M · CTX···M		Photo sensor ③	Photo sensor ③	Photo sensor ③	Photo sensor ④(2)	–
TC···EB(1)		Proximity sensor	Proximity sensor	Proximity sensor	Proximity sensor	–
TM(1) (4)		Magnetic sensor(5)	Magnetic sensor(5)	Magnetic sensor(5)	Magnetic sensor(5)	–
TS/CT(1)	**TS55/55 · CT55/55**	Micro switch(6)	Micro switch(6)	Proximity sensor	Photo sensor ③	–
	TS75/75	Photo sensor ①	Photo sensor ①	Photo sensor ①	Photo sensor ①	–
	CT75/75	Photo sensor ③	Photo sensor ③	Photo sensor ③(5)	Photo sensor ③(5)	–
	Other than listed above	Photo sensor ③	Photo sensor ③	Photo sensor ③	Photo sensor ②(2)	–
TSLB		Proximity sensor	Proximity sensor	Proximity sensor	Proximity sensor	–
LT···CE(1)		Proximity sensor(3)	Proximity sensor(3)	Proximity sensor(3)	Encoder(3) (5)	–
LT···LD		Proximity sensor(3) (5)	Proximity sensor(3) (5)	Proximity sensor(3) (5)	Encoder(3) (5)	–
LT···H		Proximity sensor(3) (5)	Proximity sensor(3) (5)	Proximity sensor(3) (5)	Encoder(3) (5)	–
NT···V(1)		Proximity sensor	Proximity sensor	Proximity sensor	Encoder(3) (5)	–
NT···H		Encoder(3) (5)	Encoder(3) (5)	–	Encoder(3) (5)	–
AT		Proximity sensor(5)	Proximity sensor(5)	–	–	–
SK···W		Proximity sensor	Proximity sensor	–	–	Proximity sensor
AM		Proximity sensor	Proximity sensor	Proximity sensor	–(2)	–
SA···DE	**SA200DE/S**	Proximity sensor(5)	Proximity sensor(5)	Proximity sensor(5)	Encoder(3) (5)	–
	Other than listed above	Magnetic sensor(5) (6)	Magnetic sensor(5) (6)	Magnetic sensor(5) (6)	Encoder(3) (5) (6)	–
TZ		Proximity sensor(5)	Proximity sensor(5)	Proximity sensor(5)	Proximity sensor(2) (5)	–

Notes (1) Mounting a sensor is specified using the corresponding identification number. For the other models, sensors are equipped as standard equipment.
(2) No origin sensor is provided if an attachment for AC servomotor or linear encoder is selected. Use C phase or Z phase signal of AC servomotor or linear encoder to be installed on your own. For AM, only AC servomotor is selected.
(3) Each signal is output from applicable dedicated programmable control unit or dedicated driver.
(4) Sensors are built in the table and each signal is output from a dedicated sensor amplifier. When the AC servomotor is used, use encoder's C phase for origin signals.
(5) Sensor (encoder) positions cannot be fine-adjusted.
(6) This is built in the substrate.

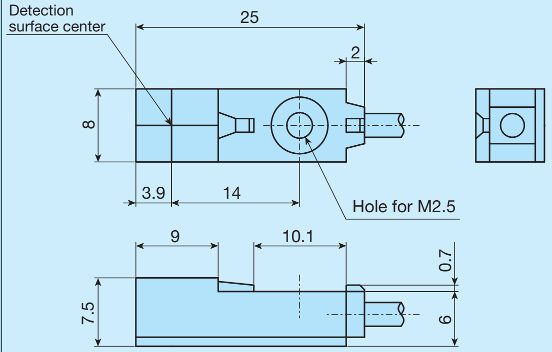
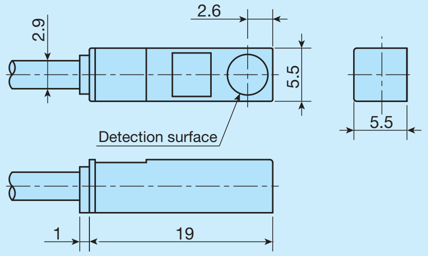
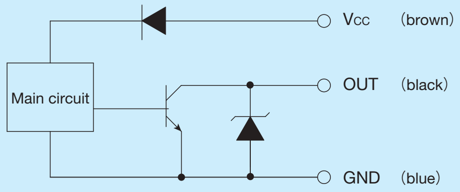
Table 2 Photo sensor specifications

Sensor Item	Limit, pre-origin and origin			
	① PM-L25	② PM-K65	③ PM-T65	④ PM-L65
Manufacturer	Panasonic Industrial Devices SUNX Co., Ltd.			
Shape (mm)				
Output connector models (1)	–	CN-14A-C1 (lead length: 1 m) or CN-14A-C3 (lead length: 3 m)		
Power supply voltage	DC5～24V ±10%			
Current consumption	15mA or less			
Output	NPN transistor open collector · Maximum input current : 50mA · Applied voltage : 30VDC or less · Residual voltage : 2V or less at input current of 50mA 1V or less at 16mA			
Output operation	ON/OFF upon light entrance; selective (2)			
Operation indication	Orange LED (ON upon light entrance)			
Circuit diagram				

Notes (1) Selected according to the applicable models.
(2) For CT75/75, use OUT1 (black) for CW limit and CCW limit and OUT2 (white) for pre-origin and origin. For the other models, use OUT1 (black) for all.

Remarks 1. Wire the sensor cords on your own.
2. Lead runs off by at least 200mm from the table end. Actual length varies depending on stroke length.

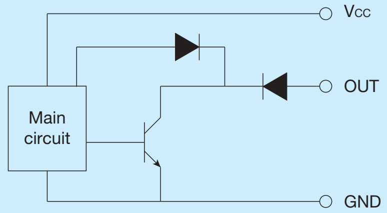
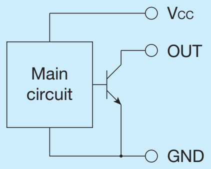
Table 3 Specifications of proximity sensor

Target model Item		SA200DE/S	TZ200H and TZ200X	Other models	SK···W	TZ120X
Manufacturer		Azbil Corporation			OMRON Corporation	
Model(1)	Pre-origin	APM-D3A1F-S	APM-D3B1F-S	APM-D3B1-S APM-D3B1F-S	–	E2S-W14 1M
	CW limit	APM-D3A1-S	APM-D3B1-S	APM-D3B1-S	E2S−W14 1M	E2S-W14 1M
	CCW limit		APM-D3B1F-S		E2S−W14 1M	E2S-W14 1M
	Origin	Encoder	APM-D3A1-S	APM-D3A1-S	–	E2S-W13B 1M
	For origin	–	–	–	E2S−W13B 1M	–
Shape mm						
Power supply voltage		DC12～24V ±10%				
Current consumption		10mA or less			13mA or less	
Output		NPN open collector · Maximum input current: 30mA or less (resistance load) · Applied voltage : DC26.4V or less · Residual voltage : 1V or less at input current of 30mA			NPN open collector · Maximum input current: 50mA · Applied voltage : DC30V or less · Residual voltage : 1V or less at input current of 50mA	
Output operation	Pre-origin	ON in proximity	OFF in proximity			
	Limit	ON in proximity	OFF in proximity			
	Origin/For origin	Encoder	ON in proximity			
Operation indication	Pre-origin	Orange LED (ON upon detection)	Orange LED (OFF upon detection)			
	Limit	Orange LED (ON upon detection)	Orange LED (OFF upon detection)			
	Origin/For origin	—	Orange LED (ON upon detection)			
Circuit diagram						

Remarks: 1. Wire the sensor cords on your own (except for NT···V/SC).
2. Lead runs off by at least 200mm from the table end. Actual length varies depending on stroke length.
3. For information about PNP sensor options, please contact IKO.

Note (1) Model numbers apply to manufacturer standard products. Depending on the total length of the product, the cable length may be a different from that of standard products.

Table 4 Specifications of magnetic sensor

Item \ Sensor		TM	SA65DE, SA120DE
Power supply voltage		DC12 to 24V ±10%	DC5 to 24V ±10%
Current consumption		65mA or less (1)	10mA or less
Output (2)		NPN open collector · Maximum input current: 12mA · Applied voltage : DC36V or less · Residual voltage: 1.7V or less at input current of 12mA : 1.1V or less at input current of 4mA	NPN open collector · Maximum input current: 10mA · Applied voltage: DC26.4V or less · Residual voltage: 1V or less at input current of 10mA
Output operation	Pre-origin	OFF in proximity	ON in proximity
	Limit	OFF in proximity	ON in proximity
	Origin	ON in proximity	Encoder
Operation indication	Pre-origin	Red LED (ON upon detection)	—
	CW (+) limit	Yellow LED (ON upon detection)	—
	CCW (-) limit	Red LED (ON upon detection)	—
	Origin	Red LED (ON upon detection)	—
Circuit diagram			

Notes (1) Current consumption of the whole system including sensor amplifier.
(2) Output per circuit.

Table 5.1 Connector specifications
(NT55V/SC, NT80V/SC, SA200DE/S and LT)

Pin No.	Signal name	Connector used (Product of Molex Japan)	
		Body side	Mating side
1	Pre-origin (1)	Housing 1625-12R1 Terminal 1855TL	Housing 1625-12P1 Terminal 1854TL
2	Pre-origin		
3	+direction limit		
4	−direction limit		
5	Power input (for pre-origin) (1)		
6	GND (for pre-origin) (1)		
7	Power input (for pre-origin)		
8	GND (for pre-origin)		
9	Power input (for +direction limit)		
10	GND (for +direction limit)		
11	Power input (for −direction limit)		
12	GND (for −direction limit)		

Note (1) For B-table of LT/T2.

Table 5.2 Connector specifications (for TM)

Pin No.	Signal name	Connector used (Product of Molex Japan)	
		Body side	Mating side
1	Origin	Housing 43020-0600 Terminal 43031-0010	Housing 43025-0600 Terminal 43030-0007
2	Pre-origin		
3	CW limit		
4	CCW limit		
5	Power input		
6	GND		

Remark: When the AC Servomotor is used, use encoder's C phase for origin signals.

Mounting

■ Processing accuracy of mounting surface

Accuracy and performance of Precision positioning table are affected by accuracy of mating mounting surface. Therefore, processing accuracy of the mounting surface must be considered according to usage conditions such as required motion performance and positioning accuracy.

Reference flatness of the mating mounting surface under general usage conditions is indicated in Table 6.

In addition, the base on which a table is mounted receives a large reactive force, so take enough care about the rigidity of the base.

Table 6 Accuracy of mounting surface unit: μm

Model	Flatness of the mounting surface
NT…H	5
TX TM	8
TS/CT NT…V NT…XZ NT…XZH SA…DE SK…W	10
TSLH…M	15
TE…B TU TSL…M TC…EB LT AM	30
TSLB	50

■ Tightening torque for fixing screw

Typical tightening torque to fix the Precision positioning table is indicated in Table 7. If sudden acceleration / deceleration occurs frequently or moment is applied, it is recommended to tighten them to 1.3 times higher torque than that indicated in the table. In addition, when high accuracy is required with no vibration and shock, it is recommended to tighten the screws to torque smaller than that indicated in the table and use adhesive agent to prevent looseness of screws.

Table 7 Screw tightening torque unit: N·m

Bolt size	Female thread component		
	Steel	Aluminum alloy	
			Screw insert
M2 ×0.4	0.31	About 60% of steel value	About 80% of steel value
M3 ×0.5	1.7 (1)		
M4 ×0.7	4.0		
M5 ×0.8	7.9		
M6 ×1	13.3		
M8 ×1.25	32.0		
M10×1.25	62.7		

Note (1) As tightening torque for NT…V, 1.1N·m is recommended. (When using a steel base)

Precaution for Use

■ Safety precautions

- Be sure to earth the ground terminal (The grounding resistance is 100Ω or less.). It may lead to electric shock and fire.
- Use only the power voltage indicated on the device. Otherwise, it may lead to fire and malfunction.
- Do not touch any electrical component with wet hand. It may lead to electric shock.
- Do not bend forcibly, twist, pull, heat or apply heavy load on the cord. It may lead to electric shock and fire.
- Do not put your finger into any opening during table operations. It may lead to injury.
- Do not touch any moving part during table operations. It may lead to injury.
- When removing the electrical component cover, be sure to turn the power off and disconnect the power plug. It may lead to electric shock.
- Do not touch the terminal for 5 minutes after shutting down the power. Otherwise, electric shock due to residual voltage may occur.
- When installing / removing the connection terminal, be sure to turn the power off and disconnect the power plug in advance.Otherwise, it may lead to electric shock and fire.

■ Precaution for Use

- As precision positioning table is a precision machine, excessive load or shock may impair accuracy and damage the parts. Take extra care when handling it.
- Check that the table mounting surface is free from dust and harmful projection.
- Use it in a clean environment where it is not exposed to water, oil and dust particles.
- As grease is applied to the linear motion rolling guide integrated with precision positioning table and ball screws, take dust protection measures to prevent dust and other foreign matters from entering into the unit. If foreign matters get mixed, thoroughly eliminate the contaminated grease and apply clean grease again.
- Though lubrication frequency for precision positioning table varies depending on usage conditions, wipe off old grease and apply clean grease again biannually for normal cases or every three months for applications with constant reciprocating motions in long distance. In addition, the Precision Positioning Table in which C-Lube is built delivers long-term maintenance free performance. This reduces the need for the lubrication mechanism and workload which used to be necessary for linear motion rolling guides and ball screws, allowing large-scale reduction of maintenance cost.
- As precision positioning table is assembled through precise processing and adjustments, do not disassemble or alter it.
- Linear motor drive products have strong magnets inside. Note that any magnetic object around such product may be attracted. For use around any device vulnerable to magnetism, please contact IKO.
- Linear motor drive products require parameter settings of programmable control unit or driver for driving. Securely configure parameter settings suitable for the drive motor.
- For Linear Motor Table LT series, motor cord, etc. is connected to moving table, so a space for wiring of cord must be ensured in addition to the installation space for the main body. In addition, arrange cord wiring with sufficient curvature so that the running resistance does not increase or no excessive force is applied.
- Rust prevention oil or grease is used on the linear motion rolling guide, bearings, and ball screws incorporated in mechatronics products. Therefore, oil may drip or spatter depending on the operating conditions. Consider installing a shielding plate if necessary.

◎ The external appearance / specifications of this product can be modified for improvements without notices.

Introducing the IKO Mechatronics Series Special Site

The IKO Mechatronics Series Special Site is easily accessible from the homepage of the IKO website (www.ikont.co.jp/eg). Various services are available to help with mechatronics product selection, including a Simple Selection Tool. Feel free to utilize this site as often as needed.

https://www.ikont.co.jp/eg/

1. Technical Calculations

With the Life Calculation tool on the Mechatronics Series Special Site, you can calculate the rating life by load by entering usage conditions. In addition, you can calculate the required motor torque by using the Motor Torque Calculation, and calculate the effective thrust force by using the Linear Motor Table Operational Thrust Calculation. Calculation results can be output in PDF format.

2. Simple Selection Tool for Mechatronics Series Products

The Simple Selection Tool on the Mechatronics Series Special Site helps you select the ideal mechatronics product based on your usage. It takes into account speed, stroke and carrying mass and is able to select specifications from selected part numbers and provide an identification number to you for easy ordering. You can also check specifications, download CAD data and calculate product life. Selection results can be output in PDF format.

3. CAD Data Download

2- and 3-dimensional CAD data

It is linked to the mechanical parts CAD library "PART community". Enter your specifications in the Detail area and then review the 2D/3D CAD data that meets those specifications, free of charge.

4. Product Catalog and Instruction Manual Downloads

Mechatronics Series product catalogs and instruction manuals in PDF format*, and support software* for Precision Positioning Tables can be downloaded from the IKO website. If you would like a printed catalog, please visit our website to request one, or contact your local branch or sales office.

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* Mechatronics Series instruction manuals and support software can be downloaded from the IKO Technical Service Site of the IKO website.

Oil Minimum

IKO Gentle to The Earth

Nippon Thompson Co., Ltd. is working to develop global environment-friendly products.
It is committed to developing products that make its customers' machinery and
equipment more reliable, thereby contributing to preserving the global environment.
This development stance manifests well in the keyword "**Oil Minimum.**"
Our pursuit of Oil Minimum has led to the creation of
IKO's proprietary family of lubricating parts as "C-Lube."

- IKO Linear Motion Rolling Guides are manufactured through a control system that alleviates their impact on the global environment to meet the quality requirements of ISO 14001 in compliance with the quality requirements level of ISO 9001 for quality improvement.
- The standard products listed in this catalog comply with the specifications of the ten hazardous materials cited in the European RoHS Directive.

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