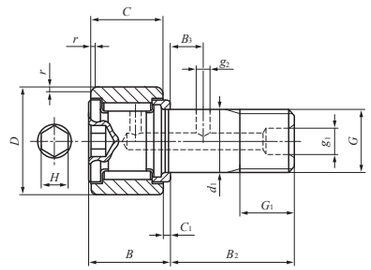
CAM FOLLOWERS

Inch Series Heavy Duty Cam Followers Full Complement Type/Stud Head Hex Hole

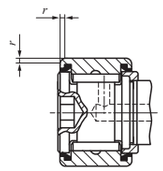


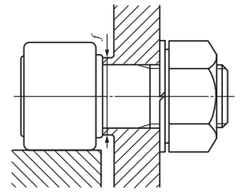


CRH···VB

Stud dia. 6.350 — 50.800mm

Stud dia. mm (inch)	Identification number Shield type With cylindrical outer ring	Identification number Sealed type With cylindrical outer ring	Mass (Ref.) g(2)	D	C	d_1	G UNF	G_1	B max
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)
	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)
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)
	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)
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)
	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)
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)
	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)
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)
	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)
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)
	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)
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)
	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)
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)
	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)
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)
	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)
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)
	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)
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)
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)





CRH···VBUU(1)

Boundary dimensions mm(inch) 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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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

Note(1) For dimensions other than the chamfer dimension (*r*) and the shape of the outside surface of the outer ring outside surface, refer to the CRH···VB drawing.

(2) This is the value for the product body only. The values for the accessories shown in Table 13 on page I14 are not included.

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.

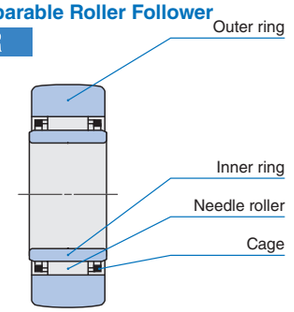
In Roller Followers, there are two types of bearings available, the caged type and the full complement type. The caged type is useful for applications at high-speed rotation. The full complement type, on the other hand, is suitable for heavy-load applications at low-speed rotation or oscillating motions.

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.

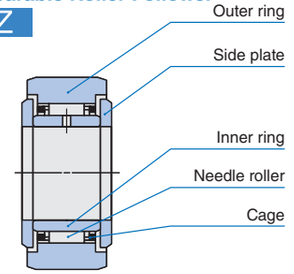
These bearings are available in a variety of types to suit almost any kind of application. They are widely used for cam mechanisms and for linear motions of conveying equipment.

Structures of Roller Followers

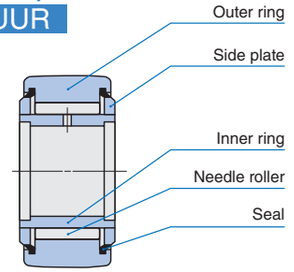
Structure of Separable Roller Follower
NAST···R



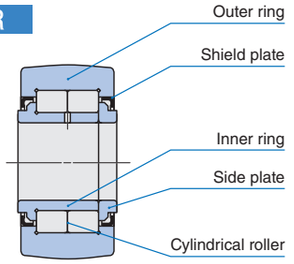
Structure of Separable Roller Follower
NAST···ZZ



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(1)	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	—	—	CRY … V R	CRY … V
			Sealed type	—	—	CRY … VUUR	CRY … VUU

Note(1) For the Roller Followers (Open Type) with inner rings, the roller followers and inner rings will be delivered separately. Please contact IKO if in need of delivery as an integrated product.

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.

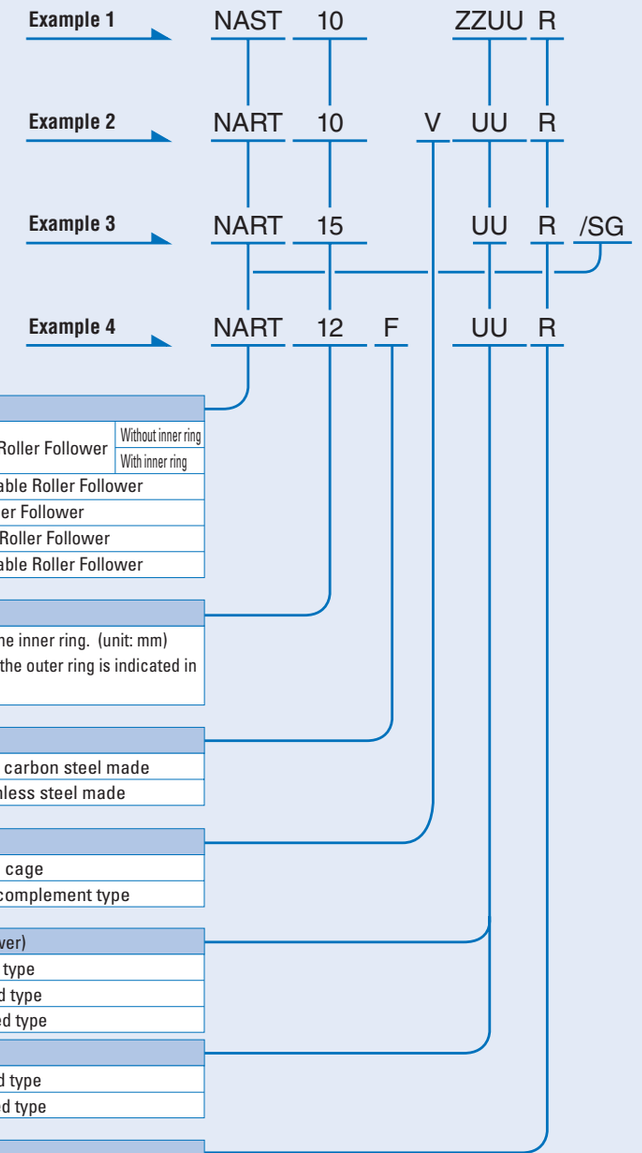
Cylindrical Roller Followers

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



Model code		
Metric series	RNAST	Separable Roller Follower (Without inner ring)
	NAST	Separable Roller Follower (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

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

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: μm

Dimensions and symbols \ Series		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: μm

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: μm

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: μm

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: μm

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.

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

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/mm²). 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/mm²	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 contact IKO.

Table 10 dn values of Roller 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 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.)
In addition, the mounting part should make even contact with the entire side plate surface. Uneven contact may cause increased rotational torque and shorten the service life.

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 0.2 μ mR_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.

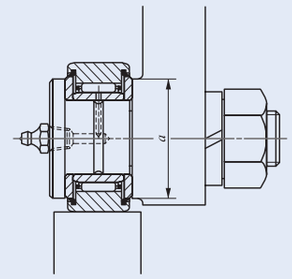


Fig. 1 Mating seating dimension "a"

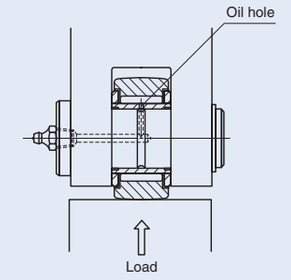


Fig. 2 Position of oil hole and load direction

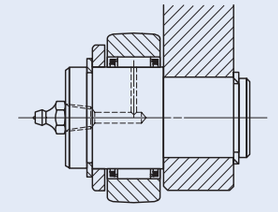


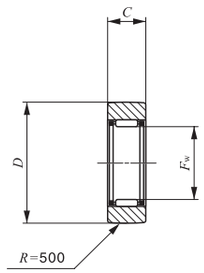
Fig. 3 Mounting example of Roller Follower without inner ring

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

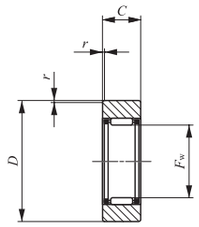
ROLLER FOLLOWERS

Separable Roller Followers, Open Type With Cage/Without Inner Ring





RNAST ··· R



RNAST

Shaft dia. 7 — 60mm

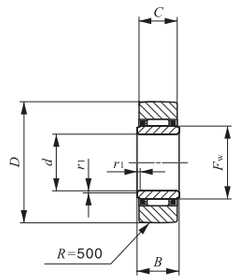
Shaft dia. mm	Identification number Open type Crowned outer ring	Cylindrical outer ring	Mass (Ref.) g	Boundary dimensions mm F_w	D	C	$r_{s\,min}$ (1)	Basic dynamic load rating C N	Basic static load rating C_0 N
7	RNAST 5 R	RNAST 5	8.9	7	16	7.8	0.3	2 710	2 390
10	RNAST 6 R	RNAST 6	13.9	10	19	9.8	0.3	4 160	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

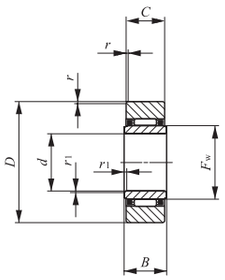
Remarks1. No oil hole is provided.
2. Not provided with prepacked grease. Perform proper lubrication for use.

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	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.

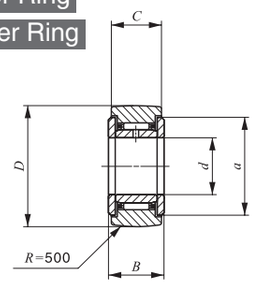
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

ROLLER FOLLOWERS

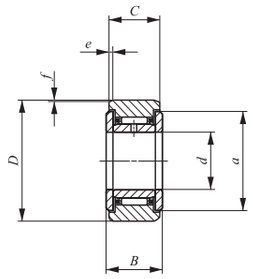
Separable Roller Followers, Shield Type **With Cage/With Inner Ring**
Separable Roller Followers, Sealed Type **With Cage/With Inner Ring**



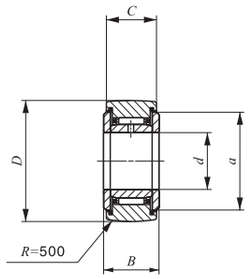




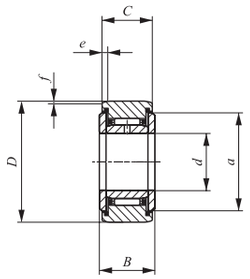
NAST ··· ZZR



NAST ··· ZZ



NAST ··· ZZUUR



NAST ··· ZZUU

Shaft dia. 6 — 50mm

Shaft dia. mm	Identification number: Shield type, Crowned outer ring	Identification number: Shield type, Cylindrical outer ring	Identification number: Sealed type, Crowned outer ring	Identification number: Sealed type, Cylindrical outer ring	Mass (Ref.) g
6	NAST 6 ZZR	NAST 6 ZZ	NAST 6 ZZUUR	NAST 6 ZZUU	24.5
8	NAST 8 ZZR	NAST 8 ZZ	NAST 8 ZZUUR	NAST 8 ZZUU	39
10	NAST 10 ZZR	NAST 10 ZZ	NAST 10 ZZUUR	NAST 10 ZZUU	65
12	NAST 12 ZZR	NAST 12 ZZ	NAST 12 ZZUUR	NAST 12 ZZUU	75
15	NAST 15 ZZR	NAST 15 ZZ	NAST 15 ZZUUR	NAST 15 ZZUU	83
17	NAST 17 ZZR	NAST 17 ZZ	NAST 17 ZZUUR	NAST 17 ZZUU	135
20	NAST 20 ZZR	NAST 20 ZZ	NAST 20 ZZUUR	NAST 20 ZZUU	195
25	NAST 25 ZZR	NAST 25 ZZ	NAST 25 ZZUUR	NAST 25 ZZUU	225
30	NAST 30 ZZR	NAST 30 ZZ	NAST 30 ZZUUR	NAST 30 ZZUU	400
35	NAST 35 ZZR	NAST 35 ZZ	NAST 35 ZZUUR	NAST 35 ZZUU	550
40	NAST 40 ZZR	NAST 40 ZZ	NAST 40 ZZUUR	NAST 40 ZZUU	710
45	NAST 45 ZZR	NAST 45 ZZ	NAST 45 ZZUUR	NAST 45 ZZUU	760
50	NAST 50 ZZR	NAST 50 ZZ	NAST 50 ZZUUR	NAST 50 ZZUU	830

Boundary dimensions mm d	D	B	C	a	e	f	Basic dynamic load rating C N	Basic static load rating C_0 N
6	19	14	13.8	14	2.5	0.8	4 160	4 550
8	24	14	13.8	17.5	2.5	0.8	5 650	5 890
10	30	16	15.8	23.5	2.5	0.8	9 790	9 680
12	32	16	15.8	25.5	2.5	0.8	10 500	10 900
15	35	16	15.8	29	2.5	0.8	12 400	14 300
17	40	20	19.8	32.5	3	1	17 600	20 900
20	47	20	19.8	38	3	1	19 400	24 500
25	52	20	19.8	43	3	1	20 800	28 400
30	62	25	24.8	50.5	4	1.2	30 500	45 400
35	72	25	24.8	53.5	4	1.2	32 400	50 600
40	80	26	25.8	61.5	4	1.2	35 900	61 100
45	85	26	25.8	66.5	4	1.2	37 400	66 400
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.

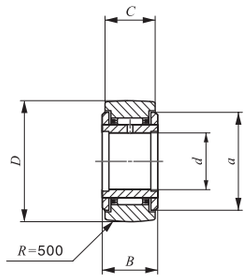
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

ROLLER FOLLOWERS

Non-separable Roller Followers · With Cage/With Inner Ring
High carbon steel made · Full Complement Type/With Inner Ring





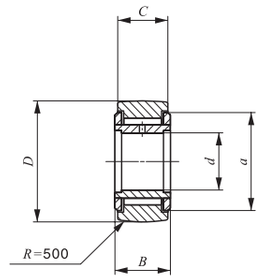


NART ··· R

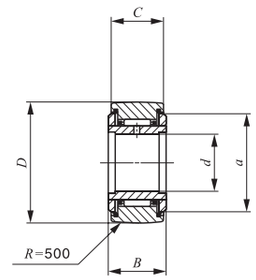
Shaft dia. 5 — 40mm

Shaft dia. mm	Identification number: Shield type, Crowned outer ring, With cage	Identification number: Shield type, Crowned outer ring, Full complement	Identification number: Sealed type, Crowned outer ring, With cage	Identification number: Sealed type, Crowned outer ring, Full complement	Mass (Ref.) g
5	NART 5 R	—	NART 5 UUR	—	14.5
	—	NART 5 VR	—	NART 5 VUUR	15.1
6	NART 6 R	—	NART 6 UUR	—	20.5
	—	NART 6 VR	—	NART 6 VUUR	21.5
8	NART 8 R	—	NART 8 UUR	—	41.5
	—	NART 8 VR	—	NART 8 VUUR	42.5
10	NART 10 R	—	NART 10 UUR	—	64.5
	—	NART 10 VR	—	NART 10 VUUR	66.5
12	NART 12 R	—	NART 12 UUR	—	71
	—	NART 12 VR	—	NART 12 VUUR	73
15	NART 15 R	—	NART 15 UUR	—	102
	—	NART 15 VR	—	NART 15 VUUR	106
17	NART 17 R	—	NART 17 UUR	—	149
	—	NART 17 VR	—	NART 17 VUUR	155
20	NART 20 R	—	NART 20 UUR	—	250
	—	NART 20 VR	—	NART 20 VUUR	255
25	NART 25 R	—	NART 25 UUR	—	285
	—	NART 25 VR	—	NART 25 VUUR	295
30	NART 30 R	—	NART 30 UUR	—	470
	—	NART 30 VR	—	NART 30 VUUR	485
35	NART 35 R	—	NART 35 UUR	—	640
	—	NART 35 VR	—	NART 35 VUUR	655
40	NART 40 R	—	NART 40 UUR	—	845
	—	NART 40 VR	—	NART 40 VUUR	865

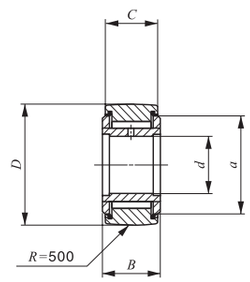
Remarks1. The inner ring has an oil hole.
2. The sealed type is provided with prepacked grease. The shield type is not provided with prepacked grease. Perform proper lubrication for use.



NART ··· VR



NART ··· UUR



NART ··· VUUR

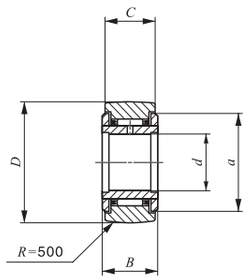
Boundary dimensions mm d	D	B	C	a	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
5	16	12	11	12	3 650	3 680	3 680
5	16	12	11	12	6 810	8 370	7 310
6	19	12	11	14	4 250	4 740	4 740
6	19	12	11	14	7 690	10 300	10 300
8	24	15	14	17.5	5 640	5 900	5 900
8	24	15	14	17.5	11 800	15 600	15 600
10	30	15	14	23.5	8 030	7 540	7 540
10	30	15	14	23.5	15 600	18 100	17 500
12	32	15	14	25.5	8 580	8 470	8 470
12	32	15	14	25.5	16 800	20 500	18 600
15	35	19	18	29	13 700	16 400	16 400
15	35	19	18	29	25 200	36 400	24 000
17	40	21	20	32.5	17 600	21 000	21 000
17	40	21	20	32.5	32 000	46 300	33 100
20	47	25	24	38	23 000	30 700	30 700
20	47	25	24	38	41 600	67 300	67 300
25	52	25	24	43	24 700	35 400	35 400
25	52	25	24	43	45 500	79 100	79 100
30	62	29	28	50.5	33 600	51 400	51 400
30	62	29	28	50.5	59 900	110 000	92 500
35	72	29	28	53.5	35 700	57 400	57 400
35	72	29	28	53.5	63 100	121 000	121 000
40	80	32	30	61.5	44 900	81 500	81 500
40	80	32	30	61.5	76 300	164 000	164 000

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



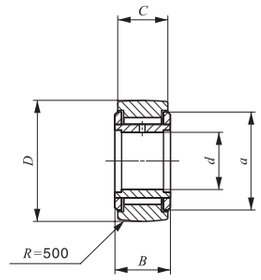


NART ··· R

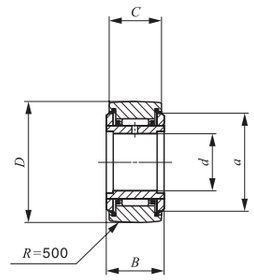
Shaft dia. 45 — 50mm

Shaft dia. mm	Identification number: Shield type, Crowned outer ring, With cage	Identification number: Shield type, Crowned outer ring, Full complement	Identification number: Sealed type, Crowned outer ring, With cage	Identification number: Sealed type, Crowned outer ring, Full complement	Mass (Ref.) g
45	**NART 45 R**	—	**NART 45 UUR**	—	915
	—	**NART 45 VR**	—	**NART 45 VUUR**	935
50	**NART 50 R**	—	**NART 50 UUR**	—	980
	—	**NART 50 VR**	—	**NART 50 VUUR**	1 010

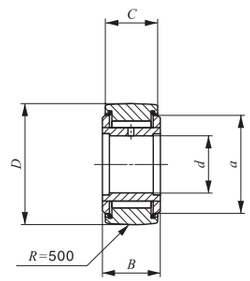
Remarks1. The inner ring has an oil hole.
2. The sealed type is provided with prepacked grease. The shield type is not provided with prepacked grease. Perform proper lubrication for use.



NART ··· VR



NART ··· UUR



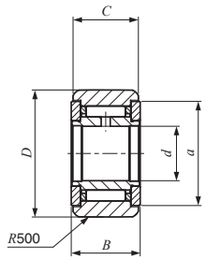
NART ··· VUUR

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
45	85	32	30	66.5	46 800	88 600	88 600
45	85	32	30	66.5	80 300	181 000	181 000
50	90	32	30	76	48 600	95 600	95 600
50	90	32	30	76	84 300	198 000	198 000

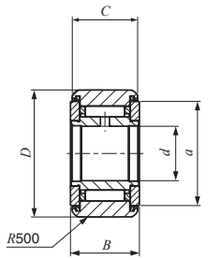
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Non-separable Roller Followers · Stainless Steel Made With Cage/With Inner Ring





NART ··· FR



NART ··· FUUR

Shaft dia. 5 — 30mm

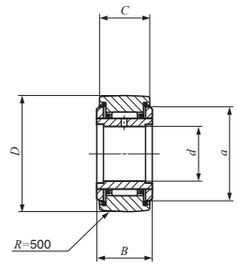
Shaft dia. mm	Identification number		Mass (Ref.)	Boundary dimensions mm					Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
	Shield type	Sealed type	g	d	D	B	C	a			
5	NART 5 FR	NART 5 FUUR	13	5	16	12	11	12	2 930	2 920	2 920
6	NART 6 FR	NART 6 FUUR	19	6	19	12	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.

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

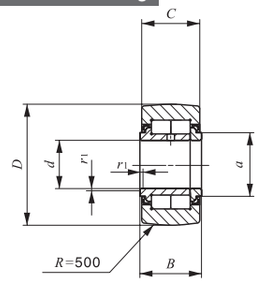
Remark This bearing cannot be re-lubricated as thermosetting solid-type lubricant C-Lube fills its inner space.

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

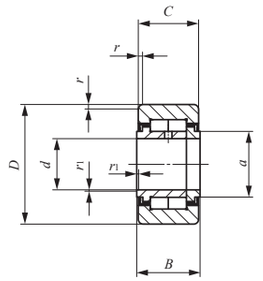
ROLLER FOLLOWERS

Cylindrical Roller Followers Full Complement Type/With Inner Ring





NURT ··· R



NURT

Shaft dia. 15 — 50mm

Shaft dia. mm	Identification number: Crowned outer ring	Identification number: Cylindrical outer ring	Mass (Ref.) g	Boundary dimensions mm: d	D	B	C	a	$r_{s\ min}$(1)	$r_{1s\ min}$(1)	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum allowable static load N
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

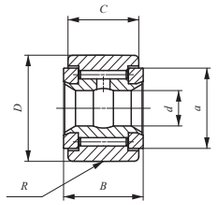
Note(1) Minimum allowable value of chamfer dimension r or r_1
Remarks1. The inner ring has an oil hole.
2. Provided with prepacked grease.

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

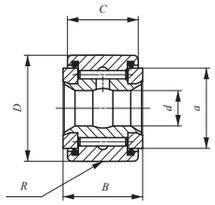
ROLLER FOLLOWERS

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: Shield type Crowner outer ring	Identification number: Sealed type Crowned outer ring	Mass (Ref.) g	Boundary dimensions mm(inch): *d*	*D*	*B*	*C*
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)
	CRY 14 VR	**CRY 14 VUUR**	34	6.350 (1/4)	22.225 (7/8)	14.288(0.5625)	12.700 (1/2)
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)
	CRY 18 VR	**CRY 18 VUUR**	72	7.938 (5/16)	28.575 (1 1/8)	17.463(0.6875)	15.875 (5/8)
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)
	CRY 22 VR	**CRY 22 VUUR**	128	9.525 (3/8)	34.925 (1 3/8)	20.638(0.8125)	19.050 (3/4)
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)
	CRY 26 VR	**CRY 26 VUUR**	210	11.112 (7/16)	41.275 (1 5/8)	23.813(0.9375)	22.225 (7/8)
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)
	CRY 30 VR	**CRY 30 VUUR**	321	12.700 (1/2)	47.625 (1 7/8)	26.988(1.0625)	25.400 (1)
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)
	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)
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)
	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)
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)
	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)
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)
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)

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
14.4(0.567)	250 (10)	6.332	6.342	6.348	6.358	6.353	6.363	8 710	12 300
14.4(0.567)	250 (10)	6.332	6.342	6.348	6.358	6.353	6.363	8 710	12 300
19.6(0.772)	300 (12)	7.920	7.930	7.935	7.945	7.940	7.950	13 100	22 700
19.6(0.772)	300 (12)	7.920	7.930	7.935	7.945	7.940	7.950	13 100	22 700
25.0(0.984)	360 (14)	9.507	9.517	9.523	9.533	9.528	9.538	23 600	31 700
25.0(0.984)	360 (14)	9.507	9.517	9.523	9.533	9.528	9.538	23 600	31 700
28.8(1.134)	500 (20)	11.095	11.105	11.110	11.120	11.115	11.125	28 200	40 100
28.8(1.134)	500 (20)	11.095	11.105	11.110	11.120	11.115	11.125	28 200	40 100
32.7(1.287)	500 (20)	12.682	12.692	12.698	12.708	12.708	12.718	35 300	55 600
32.7(1.287)	500 (20)	12.682	12.692	12.698	12.708	12.708	12.718	35 300	55 600
36.0(1.417)	600 (24)	15.857	15.867	15.873	15.883	15.883	15.893	45 700	80 600
36.0(1.417)	600 (24)	15.857	15.867	15.873	15.883	15.883	15.893	45 700	80 600
43.3(1.705)	760 (30)	19.032	19.042	19.048	19.058	19.058	19.068	61 400	116 000
43.3(1.705)	760 (30)	19.032	19.042	19.048	19.058	19.058	19.068	61 400	116 000
54.0(2.125)	760 (30)	25.377	25.390	25.397	25.410	25.408	25.420	77 600	172 000
54.0(2.125)	760 (30)	25.377	25.390	25.397	25.410	25.408	25.420	77 600	172 000
61.9(2.437)	760 (30)	28.522	28.565	28.572	28.585	28.583	28.595	111 000	239 000
71.0(2.797)	760 (30)	31.727	31.740	31.747	31.760	31.758	31.770	142 000	317 000

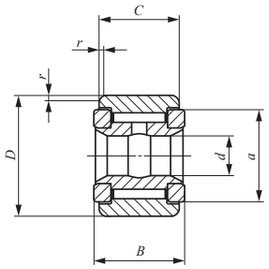
Remarks1. The inner ring has an oil groove and an oil hole.
2. Provided with prepacked grease.

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

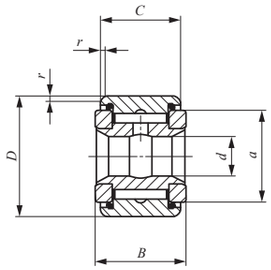
ROLLER FOLLOWERS

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

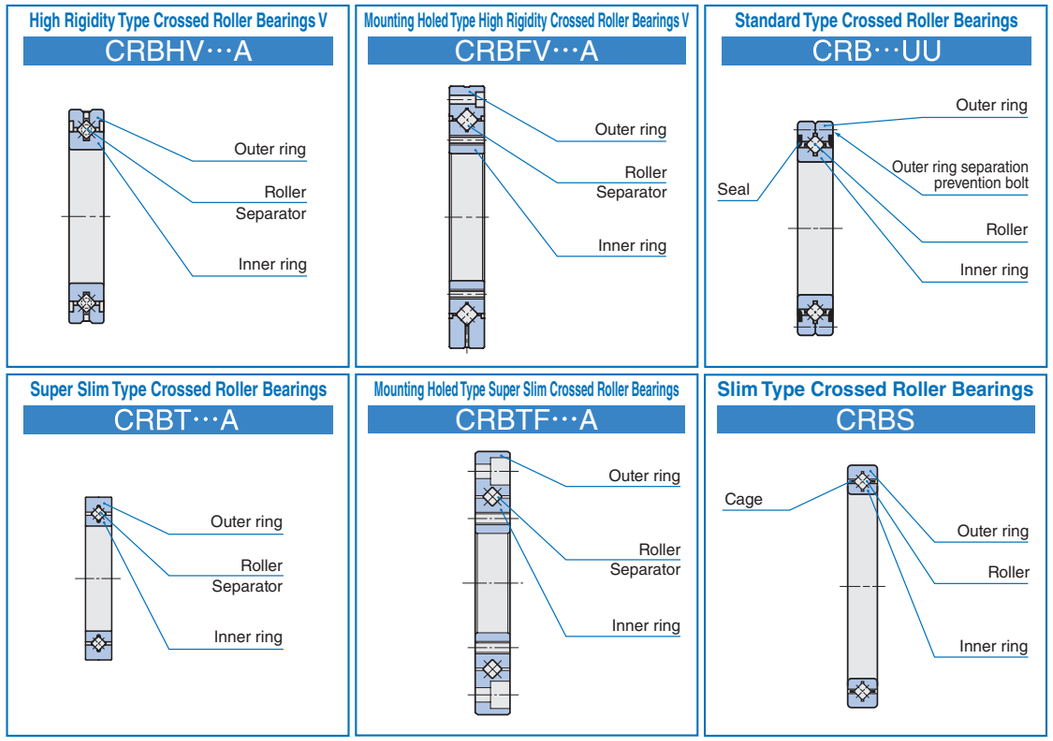
- ●High Rigidity Type Crossed Roller Bearings V
- ●Mounting Holed Type High Rigidity Crossed Roller Bearings V
- ●Standard Type Crossed Roller Bearings
- ●Super Slim Type Crossed Roller Bearings
- ●Mounting Holed Type Super Slim Crossed Roller Bearings
- ●Slim Type Crossed Roller Bearings



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



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

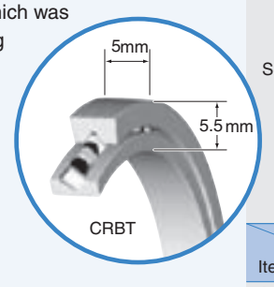
These bearings are slim bearings having a small outside diameter, in comparison with the bore diameter, and a narrow width. The type with cage and the type with separator provide smooth rotation and are suitable for applications where rotational speed is comparatively high.

Features of Super Slim Type Crossed Roller Bearing CRBT

The world's thinnest roller type!

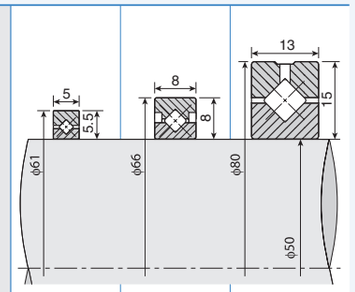
Very low cross sectional height of 5.5 mm

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.



■Comparison of bearing bore diameter 50 mm

Sectional shape



Item \ Series		Super Slim CRBT505A	Slim CRBS508	High rigidity CRBHV5013A
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

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).

Features of Mounting Holed Type Crossed Roller Bearings CRBFV, CRBTF

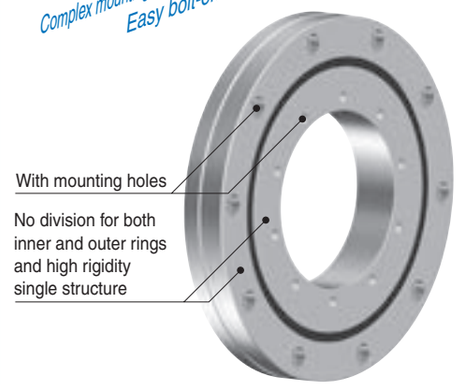
High rigidity and high accuracy

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

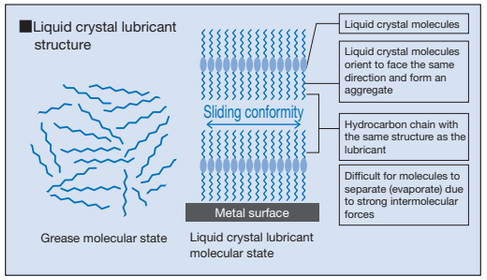
CRBFV, CRBTF

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

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.

Superior vacuum characteristics
The outgassing characteristics under high vacuum environments show excellent performance even at high temperatures. The durability in a vacuum environment shows results that are more than twice as positive as those of fluorine grease.

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 manufactured to order. If other products prepacked with LCL are needed, please contact IKO.

■ Internal Structures and Shapes

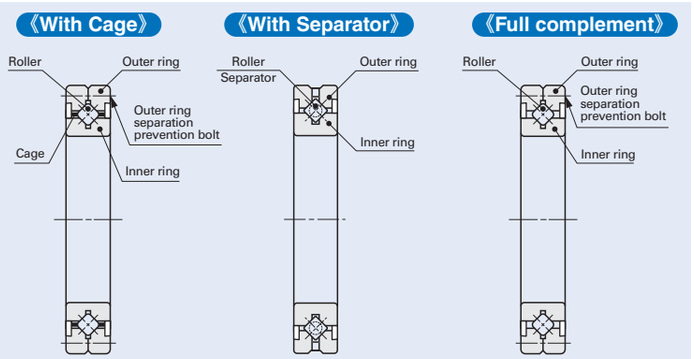
Various types are lined up in Crossed Roller Bearing series, including the type with cage, the type with separator, open type, sealed type, etc.

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.



■ 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	Dimensions			Supplemental code		Classification symbol
Example 1	CRBHV	150	25	A	UU	C1	P6
Example 2	CRBC	150	25		UU	C1	P6
Example 3	CRBT	30	5	A		C1	
Example 4	CRBS	150	8	A	UU	C1	
Example 5	CRBFV	115	28	A	D UU	C1	RP6

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).

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

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.

$$P_r = X\left(F_r + \frac{2M}{D_{pw}}\right) + YF_a \quad \cdots\cdots(1)$$

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.)

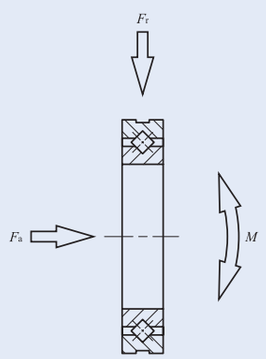


Fig. 1 Load direction

Table 5 Radial load factor and axial load factor

Conditions	X	Y
$\frac{F_a}{F_r + 2M/D_{pw}} \leqq 1.5$	1	0.45
$\frac{F_a}{F_r + 2M/D_{pw}} > 1.5$	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.

$$P_{0r} = F_r + \frac{2M}{D_{pw}} + 0.44\,F_a \quad \cdots\cdots(2)$$

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 is shown in Table 6 and Table 7. However, Table 8 is applicable to Super Slim Type Crossed Roller Bearings and Mounting Holed Type Super Slim Crossed Roller Bearings, Table 9 is applicable to Slim Type Crossed Roller Bearings, and Tables 10.1 and 10.2 are applicable to Mounting Holed Type High Rigidity Crossed Roller Bearings V. 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: μm

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	P6	P5	P4	P2	Class	P6	P5	P4	P2
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	0	RP6	RP5	RP4	RP2	0	RP6	RP5	RP4	RP2
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 Super Slim Type 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.

Table 7 Tolerances and allowable values of outer ring unit: μm

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	P6	P5	P4(2)	P2(2)	Class	P6	P5	P4(2)	P2(2)
Over	Incl.	High	Low	High	Low	High	Low	High	Low	0	RP6	RP5	RP4	RP2	0	RP6	RP5	RP4	RP2
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 Super Slim Type 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.

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

Table 8 Tolerances and allowable values of Super Slim Type Crossed Roller Bearings and Mounting Holed Type Super Slim Crossed Roller Bearings unit: μm

d Nominal bore diameter mm	Δ_{dmp} Single plane mean bore dia. deviation		Δ_{Dmp} Single plane mean outside dia. deviation		Δ_{Bs} and Δ_{Cs} Deviations of a single inner ring width and outer ring width		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
	High	Low	High	Low	High	Low		
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 parentheses are for Mounting Holed Type Super Slim Crossed Roller Bearings.

Table 9 Tolerances and allowable values of Slim Type Crossed Roller Bearings unit: μm

d Nominal bore diameter mm	Δ_{dmp} Single plane mean bore dia. deviation		Δ_{Dmp} Single plane mean outside dia. deviation		Δ_{Bs} and Δ_{Cs} Deviations of a single inner ring width and outer ring width		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
	High	Low	High	Low	High	Low		
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: μm

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: μm

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 are shown in Table 11.1. However, Table 11.2 is applicable to Super Slim Type Crossed Roller Bearings and Mounting Holed Type Super Slim Crossed Roller Bearings, Table 11.3 is applicable to Slim Type Crossed Roller Bearings, and Table 11.4 is applicable to Mounting Holed Type High Rigidity Crossed Roller Bearings V.

Table 11.1 Radial internal clearances unit: μm

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 Super Slim Type 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.

Table 11.2 Radial internal clearances of Super Slim Type Crossed Roller Bearings and Mounting Holed Type Super Slim Crossed Roller Bearings unit: μm

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: μm

d Nominal bore diameter mm	Radial internal clearance					
	T1		C1		Normal	
	Min.	Max.	Min.	Max.	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

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

Table 11.4 Radial internal clearances of Mounting Holed Type High Rigidity Crossed Roller Bearings V

unit: μm

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
T1 clearance	g5	H7	g5	J7 (1)
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: μm

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

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

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 lubrication will increase the wear on the rolling contact surfaces and greatly affect noise and heat generation, leading to a shorter 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.

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. However, this is not applicable to Super Slim Type Crossed Roller Bearings and Mounting Holed Type Super Slim Crossed Roller Bearings. Slim Crossed Roller Bearings. 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.

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

Example 1 When the inner ring has 4 oil holes

CRBC 10020 / 4OH C1

4OH: 4 Oil holes In inner ring

Example 2 When the outer ring has a single oil hole

CRBC 10020 - OH C1

OH: 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

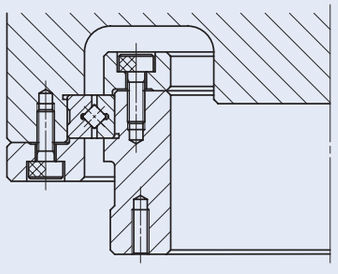


Fig. 2 Mounting example

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

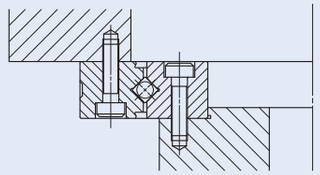


Fig. 3 Example of direct mounting to the mating surface of Mounting Holed Type High Rigidity Crossed Roller Bearings V

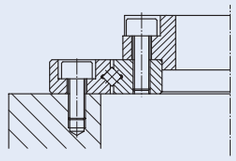


Fig. 4 Example of direct mounting to the mating surface of Mounting Holed Type Super Slim Crossed Roller Bearings

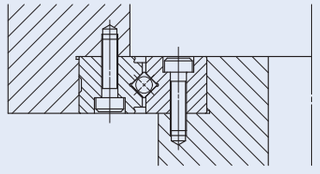


Fig. 5 Example of mounting to the housing of Mounting Holed Type High Rigidity Crossed Roller Bearings V

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)

❷Housing is provided when positioning accuracy is required or when a large radial load or moment is loaded. (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.

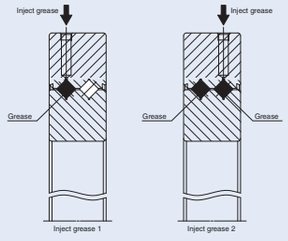


Fig. 6 Grease

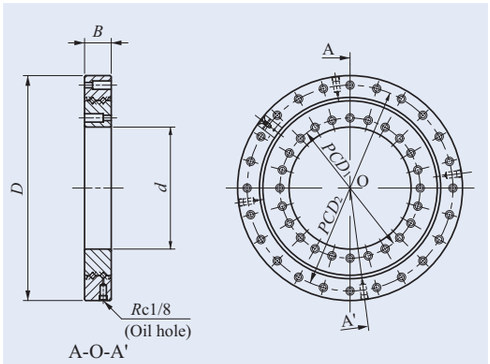
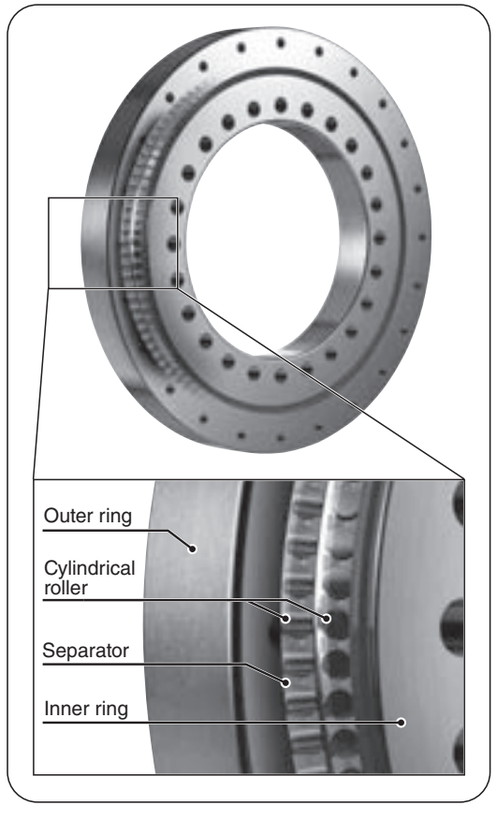


Fig. 7 Manufacturing example

Table 17 Example of manufacturing dimensions

Boundary dimensions mm						Basic dynamic load rating	Basic static load rating
d	D	B	r_{min}	PCD_1	PCD_2	C N	C_0 N
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



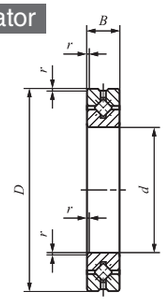
CROSSED ROLLER BEARINGS

High Rigidity Type Crossed Roller Bearings V

Open Type/With Separator

Sealed Type/With Separator





CRBHV ··· A

Shaft dia. 20 — 300mm

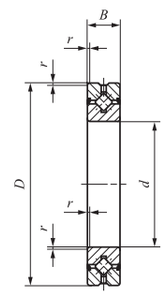
Shaft dia. mm	Identification number High Rigidity Type Crossed Roller Bearings V Open Type	Sealed Type	Mass (Ref.) kg	Boundary dimensions mm d	D	B	r_{min} (1)
20	CRBHV 208 A	CRBHV 208 A UU	0.04	20	36	8	0.3
25	CRBHV 258 A	CRBHV 258 A UU	0.05	25	41	8	0.3
30	CRBHV 3010 A	CRBHV 3010 A UU	0.12	30	55	10	0.3
35	CRBHV 3510 A	CRBHV 3510 A UU	0.13	35	60	10	0.3
40	CRBHV 4010 A	CRBHV 4010 A UU	0.15	40	65	10	0.3
45	CRBHV 4510 A	CRBHV 4510 A UU	0.16	45	70	10	0.3
50	CRBHV 5013 A	CRBHV 5013 A UU	0.29	50	80	13	0.6
60	CRBHV 6013 A	CRBHV 6013 A UU	0.33	60	90	13	0.6
70	CRBHV 7013 A	CRBHV 7013 A UU	0.38	70	100	13	0.6
80	CRBHV 8016 A	CRBHV 8016 A UU	0.74	80	120	16	0.6
90	CRBHV 9016 A	CRBHV 9016 A UU	0.81	90	130	16	0.6
100	CRBHV 10020 A	CRBHV 10020 A UU	1.45	100	150	20	0.6
110	CRBHV 11020 A	CRBHV 11020 A UU	1.56	110	160	20	0.6
120	CRBHV 12025 A	CRBHV 12025 A UU	2.62	120	180	25	1
130	CRBHV 13025 A	CRBHV 13025 A UU	2.82	130	190	25	1
140	CRBHV 14025 A	CRBHV 14025 A UU	2.96	140	200	25	1
150	CRBHV 15025 A	CRBHV 15025 A UU	3.16	150	210	25	1
200	CRBHV 20025 A	CRBHV 20025 A UU	4.00	200	260	25	1
250	CRBHV 25025 A	CRBHV 25025 A UU	4.97	250	310	25	1.5
300	CRBH 30025 A	CRBH 30025 A UU	5.29	300	360	25	1.5

Note(1) Minimum allowable single value of chamfer dimension r

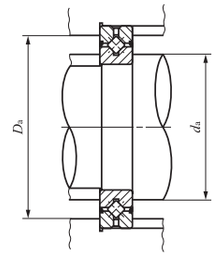
Remarks1. The outer ring has an oil groove and two oil holes.

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.



CRBHV ··· AUU



Mounting dimensions mm d_a	D_a	Basic dynamic load rating C N	Basic static load rating C_0 N
24	31	2 910	2 430
29	36	3 120	2 810
36.5	48.5	7 600	8 370
41.5	53.5	7 900	9 130
46.5	58.5	8 610	10 600
51.5	63.5	8 860	11 300
56	74	17 300	20 900
66	84	18 800	24 300
76	94	20 100	27 700
88	112	32 100	43 400
98	122	33 100	46 800
110	140	50 900	72 200
120	150	52 400	77 400
132	168	73 400	108 000
142	178	75 900	115 000
152	188	81 900	130 000
162	198	84 300	138 000
212	248	92 300	169 000
262	298	102 000	207 000
312	348	112 000	245 000

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

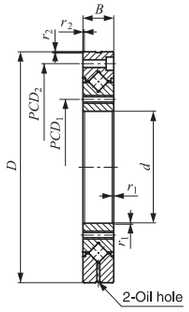
CROSSED ROLLER BEARINGS

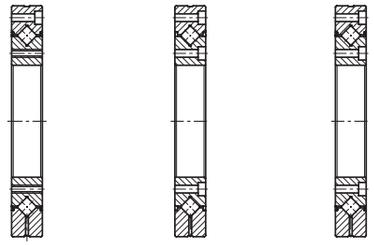
Mounting Holed Type High Rigidity Crossed Roller Bearings V

Open Type/With Separator
Sealed Type/With Separator



Shaft dia. 10 — 115mm

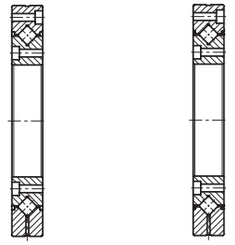




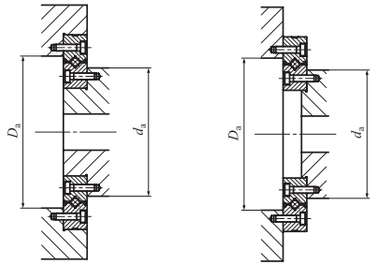
CRBFV ··· AT　CRBFV ··· ATUU　CRBFV ··· A　CRBFV ··· AUU

Shaft dia. mm	Identification number Mounting Holed Type High Rigidity Crossed Roller Bearing V Open Type	Sealed Type	Mass (Ref.) kg	Boundary dimensions mm d	D	B	r_{1min} (1)	r_{2min} (1)
10	CRBFV 108 AT	CRBFV 108 AT UU	0.12	10	52	8	0.3	0.3
20	CRBFV 2012 AT	CRBFV 2012 AT UU	0.31	20	70	12	0.3	0.3
25	CRBFV 2512 AT	CRBFV 2512 AT UU	0.40	25	80	12	0.6	0.6
35	CRBFV 3515 AT	CRBFV 3515 AT UU	0.66	35	95	15	0.6	0.6
55	CRBFV 5515 AT	CRBFV 5515 AT UU	0.96	55	120	15	0.6	0.6
80	CRBFV 8022 AT	CRBFV 8022 AT UU	2.63	80	165	22	0.6	1
	CRBFV 8022 A	CRBFV 8022 A UU	2.60					
	CRBFV 8022 AD	CRBFV 8022 AD UU						
90	CRBFV 9025 AT	CRBFV 9025 AT UU	4.83	90	210	25	1.5	1.5
	CRBFV 9025 A	CRBFV 9025 A UU	4.67					
	CRBFV 9025 AD	CRBFV 9025 AD UU						
115	CRBFV 11528 AT	CRBFV 11528 AT UU	6.81	115	240	28	1.5	1.5
	CRBFV 11528 A	CRBFV 11528 A UU	6.63					
	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.



CRBFV ··· AD　CRBFV ··· ADUU



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
16	4-M3 through	42	6-ϕ3.4 through ϕ6.5 counter bore depth 3.3	24	31	2 910	2 430
28	6-M3 through	57	6-ϕ3.4 through ϕ6.5 counter bore depth 3.3	36.5	48.5	7 600	8 370
35	6-M3 through	67	6-ϕ3.4 through ϕ6.5 counter bore depth 3.3	46.5	58.5	8 610	10 600
45	8-M4 through	83	8-ϕ4.5 through ϕ8 counter bore depth 4.4	56	74	17 300	20 900
65	8-M5 through	105	8-ϕ5.5 through ϕ9.5 counter bore depth 5.4	76	94	20 100	27 700
97	10-M5 through 10- ϕ 5.5 through ϕ 9.5 counter bore depth 5.4	148	10-ϕ5.5 through ϕ9.5 counter bore depth 5.4	107	137	51 100	72 000
112	12-M8 through 12- ϕ 9 through ϕ 14 counter bore depth 12	187	12-ϕ9 through ϕ14 counter bore depth 12	132	168	73 400	108 000
139	12-M8 through 12- ϕ 9 through ϕ 14 counter bore depth 13.5	217	12-ϕ9 through ϕ14 counter bore depth 13.5	162	198	84 300	138 000

J
CRBHV
CRBFV
CRB(C)
CRBT
CRBTF
CRBS

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

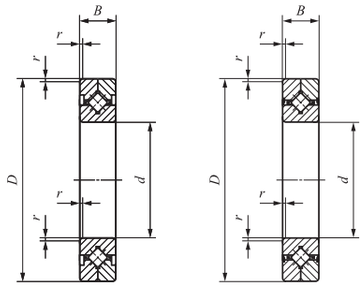
CROSSED ROLLER BEARINGS

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

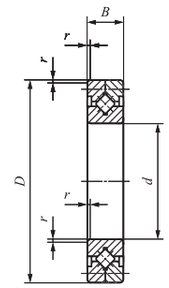
Shaft dia. 30 — 200mm

Shaft dia. mm	Identification number With Cage Open Type	With Cage Sealed Type	Full complement Open Type	Full complement Sealed Type	Mass (Ref.) kg	Boundary dimensions mm d	D	B
30	CRBC 3010	CRBC 3010 UU	CRB 3010	CRB 3010 UU	0.12	30	55	10
40	CRBC 4010	CRBC 4010 UU	CRB 4010	CRB 4010 UU	0.15	40	65	10
50	CRBC 5013	CRBC 5013 UU	CRB 5013	CRB 5013 UU	0.29	50	80	13
60	CRBC 6013	CRBC 6013 UU	CRB 6013	CRB 6013 UU	0.33	60	90	13
70	CRBC 7013	CRBC 7013 UU	CRB 7013	CRB 7013 UU	0.38	70	100	13
80	CRBC 8016	CRBC 8016 UU	CRB 8016	CRB 8016 UU	0.74	80	120	16
90	CRBC 9016	CRBC 9016 UU	CRB 9016	CRB 9016 UU	0.81	90	130	16
100	CRBC 10020	CRBC 10020 UU	CRB 10020	CRB 10020 UU	1.45	100	150	20
110	CRBC 11020	CRBC 11020 UU	CRB 11020	CRB 11020 UU	1.56	110	160	20
120	CRBC 12025	CRBC 12025 UU	CRB 12025	CRB 12025 UU	2.62	120	180	25
130	CRBC 13025	CRBC 13025 UU	CRB 13025	CRB 13025 UU	2.82	130	190	25
140	CRBC 14025	CRBC 14025 UU	CRB 14025	CRB 14025 UU	2.96	140	200	25
150	CRBC 15025	CRBC 15025 UU	CRB 15025	CRB 15025 UU	3.16	150	210	25
	CRBC 15030	CRBC 15030 UU	CRB 15030	CRB 15030 UU	5.30	150	230	30
200	CRBC 20025	CRBC 20025 UU	CRB 20025	CRB 20025 UU	4.00	200	260	25
	CRBC 20030	—	CRB 20030	—	6.70	200	280	30
	CRBC 20035	—	CRB 20035	—	9.58	200	295	35

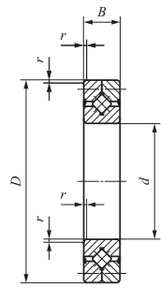
Note(1) Minimum allowable single value of chamfer dimension r

Remarks1. No oil hole is provided.

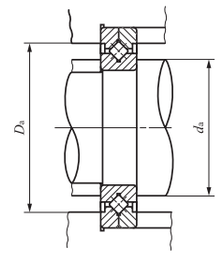
2. No grease is prepacked for Open Type. Perform proper lubrication. Grease is prepacked for Sealed Type.



CRB



CRB ··· UU



r_{min} (1)	Mounting dimensions mm d_a	D_a	CRBC Basic dynamic load rating C N	CRBC Basic static load rating C_0 N	CRB Basic dynamic load rating C N	CRB Basic static load rating C_0 N
0.3	34	44	3 830	4 130	5 290	6 350
0.3	44	54	4 280	5 140	5 980	8 040
0.6	55	71	10 700	12 600	14 200	18 400
0.6	64	81	11 600	14 600	15 400	21 500
0.6	75	91	12 300	16 700	17 000	25 500
0.6	86	107	18 200	25 500	24 300	37 500
1	98	118	19 400	28 600	25 900	42 100
1	108	134	31 500	45 100	39 400	61 100
1	118	144	33 500	50 700	41 200	66 700
1.5	132	164	47 700	70 500	59 900	95 400
1.5	140	172	49 200	74 800	61 000	99 800
1.5	151	183	50 700	79 200	64 100	108 000
1.5	160	192	53 800	87 700	65 000	113 000
1.5	166	202	69 200	108 000	85 900	144 000
2	208	239	60 200	110 000	75 300	148 000
2	218	262	108 000	178 000	133 000	234 000
2	221	274	137 000	215 000	168 000	282 000

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

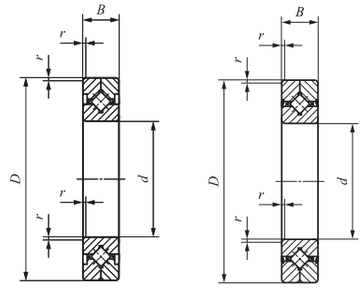
CROSSED ROLLER BEARINGS

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
CRBC 30025UU

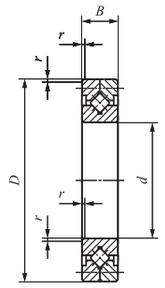
Shaft dia. 250 — 800mm

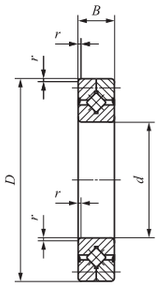
Shaft dia. mm	Identification number: With Cage Open Type	With Cage Sealed Type	Full complement Open Type	Full complement Sealed Type	Mass (Ref.) kg	Boundary dimensions mm d	D	B
250	CRBC 25025	CRBC 25025 UU	CRB 25025	CRB 25025 UU	4.97	250	310	25
	CRBC 25030	—	CRB 25030	—	8.10	250	330	30
	CRBC 25040	—	CRB 25040	—	14.8	250	355	40
300	CRBC 30025	CRBC 30025 UU	CRB 30025	CRB 30025 UU	5.88	300	360	25
	CRBC 30035	—	CRB 30035	—	13.4	300	395	35
	CRBC 30040	—	CRB 30040	—	17.2	300	405	40
400	CRBC 40035	—	CRB 40035	—	14.5	400	480	35
	CRBC 40040	—	CRB 40040	—	23.5	400	510	40
	CRBC 40070	—	CRB 40070	—	72.4	400	580	70
500	CRBC 50040	—	CRB 50040	—	26.0	500	600	40
	CRBC 50050	—	CRB 50050	—	41.7	500	625	50
	CRBC 50070	—	CRB 50070	—	86.1	500	680	70
600	CRBC 60040	—	CRB 60040	—	30.6	600	700	40
	CRBC 60070	—	CRB 60070	—	102	600	780	70
	CRBC 600120	—	CRB 600120	—	274	600	870	120
700	CRBC 70045	—	CRB 70045	—	46.5	700	815	45
	CRBC 70070	—	CRB 70070	—	115	700	880	70
	CRBC 700150	—	CRB 700150	—	478	700	1 020	150
800	CRBC 80070	—	CRB 80070	—	109	800	950	70
	CRBC 800100	—	CRB 800100	—	247	800	1 030	100

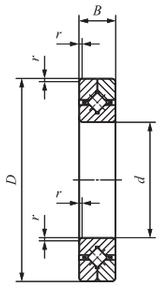
Note(1) Minimum allowable single value of chamfer dimension r

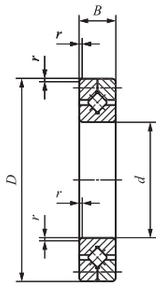
Remarks1. No oil hole is provided.

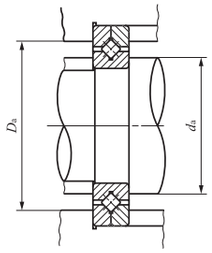
2. No grease is prepacked for Open Type. Perform proper lubrication. Grease is prepacked for Sealed Type.











CRB 25025
CRB 30025

CRB 25025UU
CRB 30025UU

CRBC

CRB

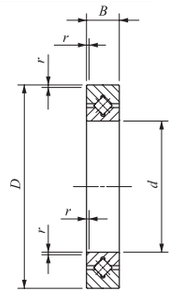
r_{min} (1)	Mounting dimensions mm d_a	D_a	CRBC Basic dynamic load rating C N	CRBC Basic static load rating C_0 N	CRB Basic dynamic load rating C N	CRB Basic static load rating C_0 N
2.5	259	290	67 200	136 000	83 900	183 000
2.5	265	310	116 000	208 000	146 000	283 000
2.5	271	330	179 000	299 000	215 000	382 000
2.5	310	341	73 800	162 000	91 900	217 000
2.5	318	372	163 000	299 000	205 000	408 000
2.5	321	381	194 000	351 000	235 000	451 000
2.5	414	457	133 000	300 000	165 000	400 000
2.5	423	483	222 000	455 000	270 000	590 000
2.5	430	532	470 000	811 000	576 000	1 060 000
2.5	517	573	212 000	497 000	259 000	648 000
2.5	531	592	247 000	561 000	306 000	747 000
2.5	530	633	536 000	1 020 000	653 000	1 330 000
3	621	676	231 000	581 000	287 000	774 000
3	630	734	591 000	1 230 000	700 000	1 540 000
3	643	817	1 250 000	2 210 000	1 490 000	2 800 000
3	730	785	250 000	681 000	313 000	917 000
3	731	834	630 000	1 390 000	766 000	1 810 000
3	751	953	1 660 000	3 010 000	1 980 000	3 820 000
4	831	907	417 000	1 090 000	513 000	1 440 000
4	840	972	936 000	2 040 000	1 140 000	2 640 000

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

CROSSED ROLLER BEARINGS

Super Slim Type Crossed Roller Bearings Open Type/With Separator



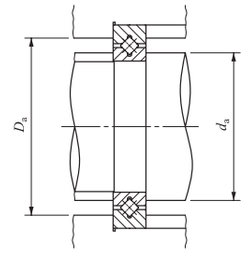


CRBT ··· A

Shaft dia. 10 — 50mm

Shaft dia. mm	Identification number	Mass (Ref.) g	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
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.

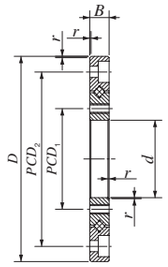


1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

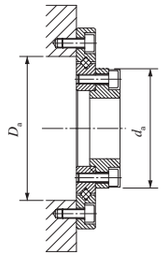
CROSSED ROLLER BEARINGS

Mounting Holed Type Super Slim Crossed Roller Bearings Open type/With Separator





CRBTF ··· A



Shaft dia 10 — 40mm

Shaft dia. mm	Identification number	Mass (Ref.) g	Boundary dimensions mm d	D	B	(1) r_{min}	Inner ring PCD_1	Inner ring Mounting holes	Mounting holes mm Outer ring PCD_a	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	**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

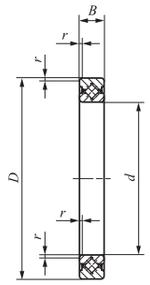
CROSSED ROLLER BEARINGS

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

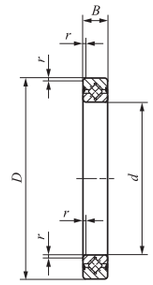
Shaft dia. mm	Identification number: With Cage, Open Type	With Separator, Sealed Type	Full complement, Open Type	Full complement, Sealed Type	Mass (Ref.) g
50	CRBS 508	CRBS 508 A UU	CRBS 508 V	CRBS 508 V UU	84
60	CRBS 608	CRBS 608 A UU	CRBS 608 V	CRBS 608 V UU	94
70	CRBS 708	CRBS 708 A UU	CRBS 708 V	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

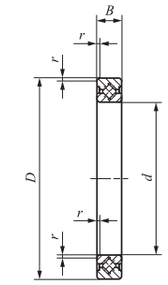
(2) No grease is prepacked. Perform proper lubrication.

(3) Grease is prepacked.

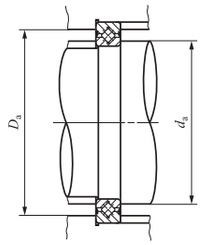
Remark No oil hole is provided.



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

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

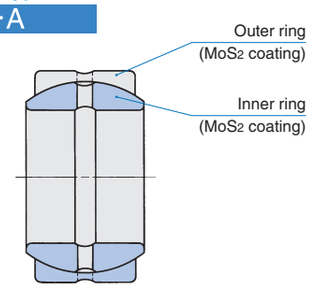
Spherical Bushings are available in various types shown in Table 1.

Table 1 Type of bearing

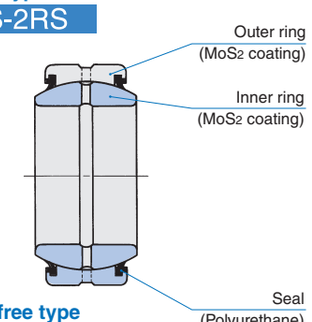
Type / Series	Steel-on-steel		Maintenance-free	
	Without seals	With seals	Without seals	With seals
Metric	SB	—	GE ··· EC	GE ··· EC-2RS
	SB ··· A	—		
	GE ··· E, ES	GE ··· ES-2RS		
	GE ··· G, GS	GE ··· GS-2RS		
Inch	SBB	SBB ··· -2RS	—	—

Structures of Spherical Bushings

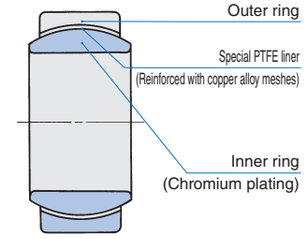
Steel-on-steel type
SB···A



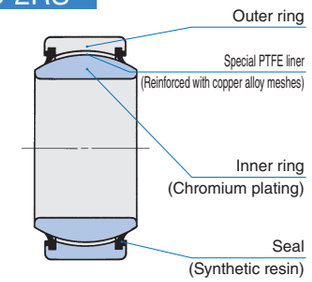
Steel-on-steel type
GE···ES-2RS



Maintenance-free type
GE···EC



Maintenance-free type
GE···EC-2RS



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

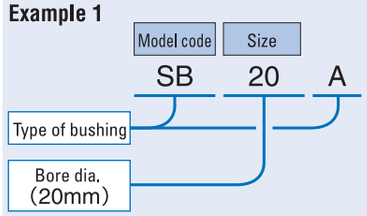
These bushings have the same boundary dimensions as the GE ··· ES type and can be used internationally. A special PTFE liner reinforced with copper alloy meshes is used on the sliding surface. Therefore, creep deformation due to compressive loads is small, and wear resistance is superior. These bushings 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

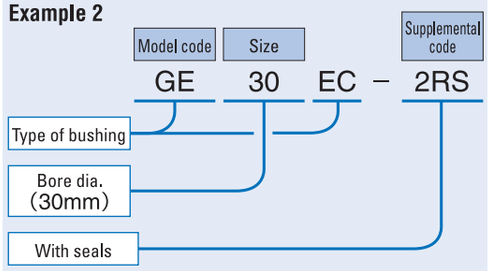
The identification number of Spherical Bushings consists of a model code, a size and any supplemental codes. Examples are shown below.

Examples of identification number

Example 1



Example 2



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				
25			50	100
30				
35	85	150		
40			60	120
45				
50				
55	90	160		
60				
65			72	142
70	95	170		
75				
80				
85	100	185		
90				
95				
100			85	165
110	110	200		
115				
120				
130	120	215	100	192
150				

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

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	–	32	68
5	–		
6	–		
8	6		
10	8		
12	10		
15	12	40	82
17	15		
20	17		
25	20	50	100
30	25		
35	30		
40	35	60	120
45	40		
50	45		
60	50		
70	60	72	142
80	70		
90	80		
100	90	85	165
110	100		
120	110		
140	120		
160	140	100	192
180	160		
200	180		
220	200		
240	220		
260	240	110	214
280	260		
300	280		

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	0	40
17		
20		
25	0	50
30		
35		
40	0	60
45		
50		
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.

$$C_{dt}=f_t C_d \quad \cdots\cdots(1)$$

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.

$$P = F_r + YF_a \quad \cdots\cdots(2)$$

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.

$$p=\frac{100P}{C_{dt}} \quad \cdots\cdots(3)$$

$$V=5.82\times10^{-4}d_k\beta f \quad \cdots\cdots(4)$$

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}

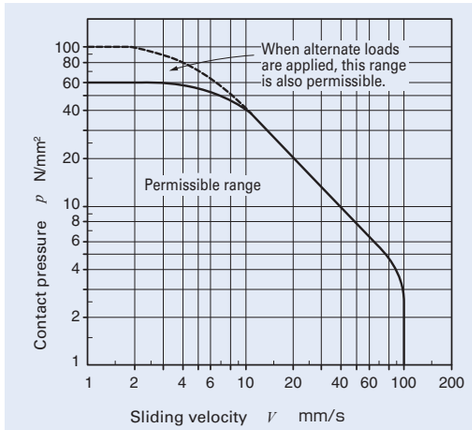


Fig.1 pV diagram of Steel-on-steel spherical bushings

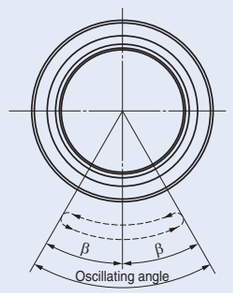


Fig.2 Oscillating angle

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

［2］Life calculation

The life of steel-on-steel spherical bushings can be calculated from the following equations.

$$G = \frac{3.18 b_1 b_2 b_3}{\sqrt{d_k \beta}} \left(\frac{C_{dt}}{P}\right)^2 \times 10^5 \quad \cdots\cdots (5)$$

$$L_h = \frac{G}{60f} \quad \cdots\cdots (6)$$

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

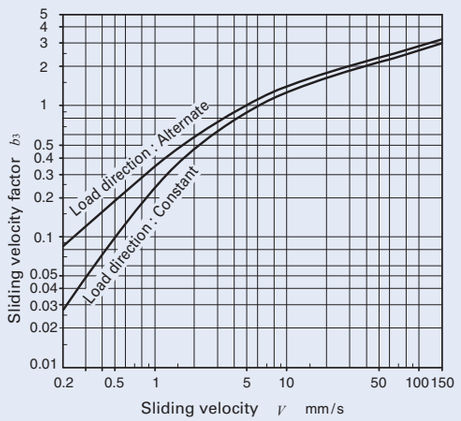


Fig.3 Sliding velocity factor

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.

$$G = 16.67 \times b_1 \frac{Sf}{V} \quad \cdots\cdots (7)$$

$$L_h = \frac{G}{60f} \quad \cdots\cdots (8)$$

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

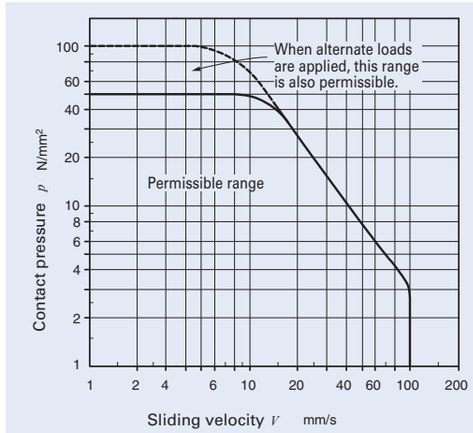


Fig.4 pV diagram of Maintenance-free spherical bushings

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.

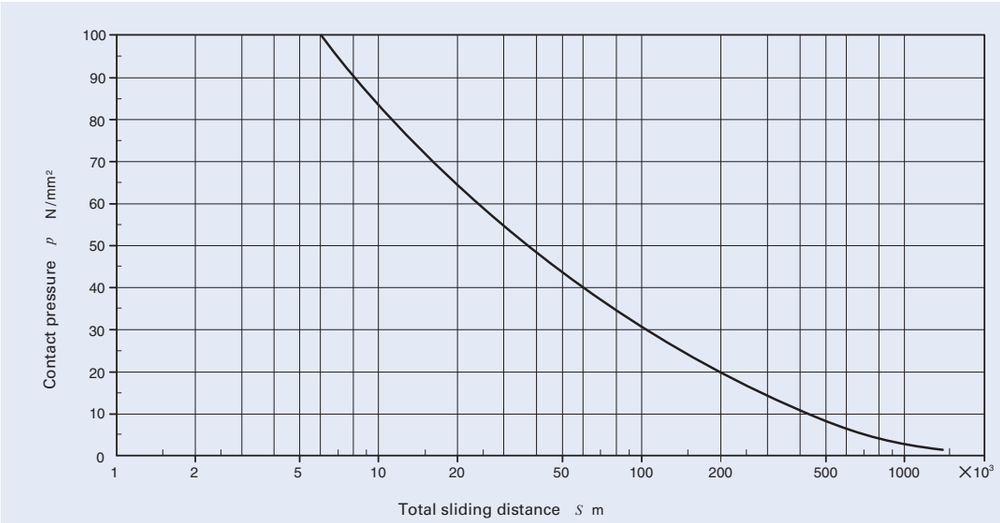


Fig.5 Total sliding distance against contact pressure of Maintenance-free spherical bushings

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.

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

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.

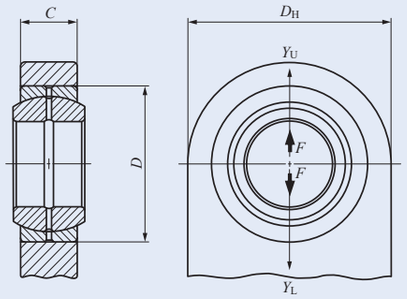


Fig.6 Shape of housing

❶ When the load acts in the Y_L direction;
Select the housing material considering the compressive stress obtained from the following equation.

$$\sigma_1 = \frac{F}{CD} \quad \cdots\cdots(9)$$

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.

$$\sigma_2 = \frac{F}{C\ (D_H - D)}\ k \quad \cdots\cdots(10)$$

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.)

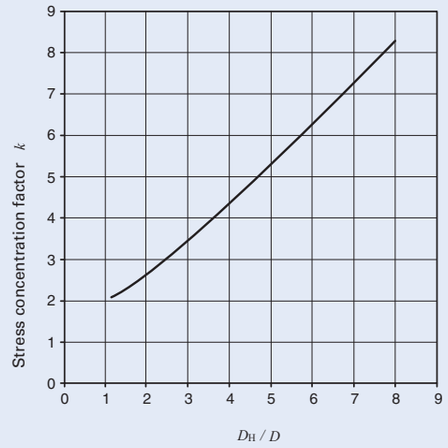


Fig.7 Stress concentration factor

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.

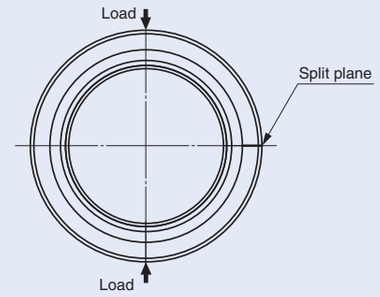
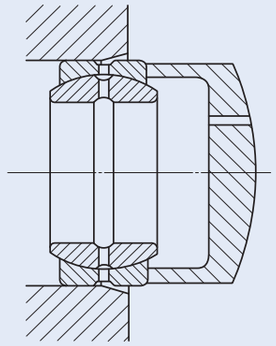


Fig.8 Relationship between the split plane and the loading direction

When setting the interference fit side



When the inner and outer rings are assembled at the same time

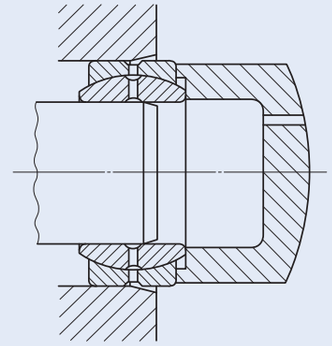


Fig.9 Mounting method

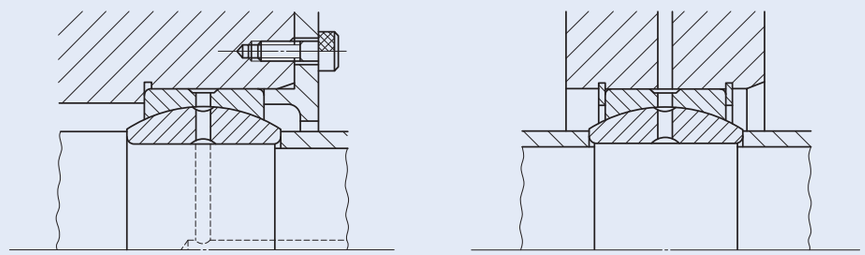


Fig.10 Mounting examples

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

SPHERICAL BUSHINGS

Steel-on-steel Spherical Bushings

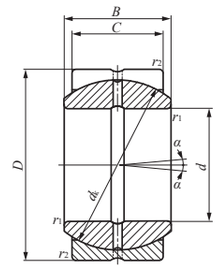




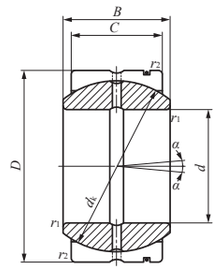
Shaft dia. 12 — 100mm

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
12	SB 12A	SB 122211	0.019	12	22	11	9	18	0.3	7
15	SB 15A	SB 152613	0.028	15	26	13	11	22	0.3	6
20	SB 20A	SB 203216	0.053	20	32	16	14	28	0.3	4
22	SB 22A	SB 223719	0.085	22	37	19	16	32	0.3	6
25	SB 25A	SB 254221	0.116	25	42	21	18	36	0.3	5
30	SB 30A	SB 305027	0.225	30	50	27	23	45	0.6	6
35	SB 35A	SB 355530	0.300	35	55	30	26	50	0.6	5
40	SB 40A	SB 406233	0.375	40	62	33	28	55	0.6	6
45	SB 45A	SB 457236	0.600	45	72	36	31	62	0.6	5
50	SB 50A	SB 508042	0.870	50	80	42	36	72	0.6	5
55	SB 55A	SB 559047	1.26	55	90	47	40	80	0.6	5
60	SB 60A	SB 6010053	1.70	60	100	53	45	90	0.6	6
65	SB 65A	SB 6510555	2.05	65	105	55	47	94	0.6	5
70	SB 70A	SB 7011058	2.22	70	110	58	50	100	0.6	5
75	SB 75A	SB 7512064	3.02	75	120	64	55	110	0.6	5
80	SB 80A	SB 8013070	3.98	80	130	70	60	120	0.6	5
85	SB 85A	SB 8513574	4.29	85	135	74	63	125	0.6	6
90	SB 90A	SB 9014076	4.71	90	140	76	65	130	0.6	5
95	SB 95A	SB 9515082	6.05	95	150	82	70	140	0.6	5
100	SB 100A	SB 10016088	7.42	100	160	88	75	150	1	5

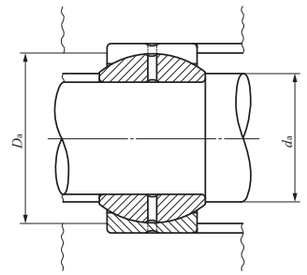
Notes(1) Minimum allowable value of chamfer dimensions r_1 and r_2
(2) When Spherical Bushings are used with full tilting angle, the shaft shoulder dimesion must be less than the maximum value of d_a.
Remarks1. The inner ring and the outer ring have an oil groove and two oil holes, respectively.
2. No grease is prepacked. Perform proper lubrication.



SB···A



SB



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
14	14	19.5	17	15 900	95 300
17.5	17.5	23.5	21	23 700	142 000
22.5	23	29.5	26	38 400	231 000
24.5	25.5	34.5	30	50 200	301 000
27.5	29	39.5	34	63 500	381 000
34.5	36	45.5	42	101 000	609 000
39.5	40	50.5	46.5	127 000	765 000
44	44	57.5	51.5	151 000	906 000
49.5	50.5	67.5	58	188 000	1 130 000
54.5	58.5	75.5	67	254 000	1 530 000
59.5	64.5	85.5	74.5	314 000	1 880 000
64.5	72.5	95.5	83.5	397 000	2 380 000
69.5	76	100.5	87	433 000	2 600 000
74.5	81.5	105.5	93	490 000	2 940 000
79.5	89.5	115.5	102	593 000	3 560 000
84.5	97.5	125.5	112	706 000	4 240 000
89.5	100.5	130.5	116	772 000	4 630 000
94.5	105.5	135.5	121	829 000	4 970 000
99.5	113.5	145.5	130	961 000	5 770 000
105.5	121.5	154.5	139	1 100 000	6 620 000

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

SPHERICAL BUSHINGS

Steel-on-steel Spherical Bushings

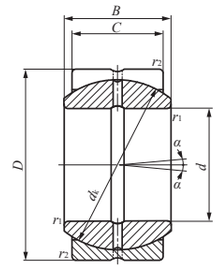




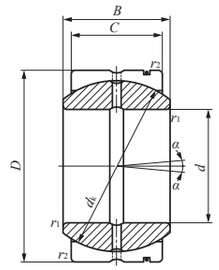
Shaft dia. 110 — 150mm

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
110	**SB 110A**	**SB 11017093**	8.55	110	170	93	80	160	1	5
115	**SB 115A**	**SB 11518098**	10.3	115	180	98	85	165	1	5
120	**SB 120A**	**SB 120190105**	12.4	120	190	105	90	175	1	5
130	**SB 130A**	**SB 130200110**	13.8	130	200	110	95	185	1	5
150	**SB 150A**	**SB 150220120**	17.0	150	220	120	105	205	1	5

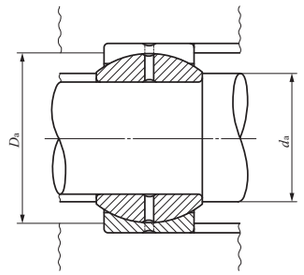
Notes(1) Minimum allowable value of chamfer dimensions r_1 and r_2
(2) When Spherical Bushings are used with full tilting angle, the shaft shoulder dimension must be less than the maximum value of d_a.
Remarks1. The inner ring and the outer ring have an oil groove and two oil holes, respectively.
2. No grease is prepacked. Perform proper lubrication.



SB···A



SB



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
115.5	130	164.5	149	1 260 000	7 530 000
120.5	132.5	174.5	152	1 380 000	8 250 000
125.5	140	184.5	162	1 540 000	9 270 000
135.5	148.5	194.5	171	1 720 000	10 300 000
155.5	166	214.5	189	2 110 000	12 700 000

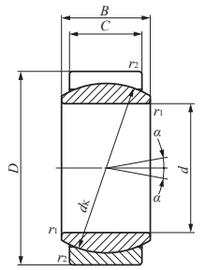
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SPHERICAL BUSHINGS

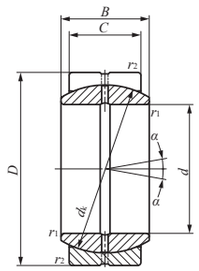
Steel-on-steel Spherical Bushings



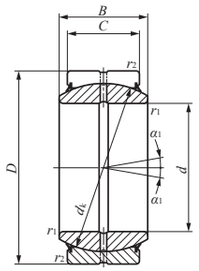




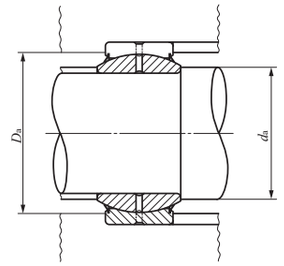
GE ··· E



GE ··· ES



GE ··· ES-2RS



Shaft dia. 4 — 100mm

Shaft dia. mm	Identification number Without seals	Identification number With seals	Mass (Ref.) kg	Boundary dimensions mm d	D	B	C	d_k	$r_{1s\,min}$ (1)	$r_{2s\,min}$ (1)	Permissible tilting angle degree α	α_1
4	**GE 4E**	—	0.003	4	12	5	3	8	0.3	0.3	16	—
5	**GE 5E**	—	0.004	5	14	6	4	10	0.3	0.3	13	—
6	**GE 6E**	—	0.004	6	14	6	4	10	0.3	0.3	13	—
8	**GE 8E**	—	0.008	8	16	8	5	13	0.3	0.3	15	—
10	**GE 10E**	—	0.012	10	19	9	6	16	0.3	0.3	12	—
12	**GE 12E**	—	0.017	12	22	10	7	18	0.3	0.3	11	—
15	**GE 15ES**	**GE 15ES-2RS**	0.032	15	26	12	9	22	0.3	0.3	8	5
17	**GE 17ES**	**GE 17ES-2RS**	0.049	17	30	14	10	25	0.3	0.3	10	7
20	**GE 20ES**	**GE 20ES-2RS**	0.065	20	35	16	12	29	0.3	0.3	9	6
25	**GE 25ES**	**GE 25ES-2RS**	0.115	25	42	20	16	35.5	0.6	0.6	7	4
30	**GE 30ES**	**GE 30ES-2RS**	0.160	30	47	22	18	40.7	0.6	0.6	6	4
35	**GE 35ES**	**GE 35ES-2RS**	0.258	35	55	25	20	47	0.6	1	6	4
40	**GE 40ES**	**GE 40ES-2RS**	0.315	40	62	28	22	53	0.6	1	7	4
45	**GE 45ES**	**GE 45ES-2RS**	0.413	45	68	32	25	60	0.6	1	7	4
50	**GE 50ES**	**GE 50ES-2RS**	0.560	50	75	35	28	66	0.6	1	6	4
60	**GE 60ES**	**GE 60ES-2RS**	1.10	60	90	44	36	80	1	1	6	3
70	**GE 70ES**	**GE 70ES-2RS**	1.54	70	105	49	40	92	1	1	6	4
80	**GE 80ES**	**GE 80ES-2RS**	2.29	80	120	55	45	105	1	1	6	4
90	**GE 90ES**	**GE 90ES-2RS**	2.82	90	130	60	50	115	1	1	5	3
100	**GE 100ES**	**GE 100ES-2RS**	4.43	100	150	70	55	130	1	1	7	5

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
6	6	9.5	8	2 350	14 100
7.5	8	11.5	10	3 920	23 500
8	8	11.5	10	3 920	23 500
10	10	13.5	13	6 370	38 200
12.5	13	16.5	15.5	9 410	56 500
14.5	15	19.5	17	12 400	74 100
17.5	18	23.5	22.5	19 400	117 000
19.5	20.5	27.5	26	24 500	147 000
22.5	24	32.5	30.5	34 100	205 000
29	29	37.5	37	55 700	334 000
34	34	42.5	41.5	71 800	431 000
39.5	39.5	49.5	48	92 200	553 000
44.5	45	56.5	54.5	114 000	686 000
49.5	50.5	62.5	60	147 000	883 000
54.5	56	69.5	66	181 000	1 090 000
65.5	66.5	84.5	79	282 000	1 690 000
75.5	77.5	99.5	91	361 000	2 170 000
85.5	89	114.5	103	463 000	2 780 000
95.5	98	124.5	112	564 000	3 380 000
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





Shaft dia. 110 — 300mm

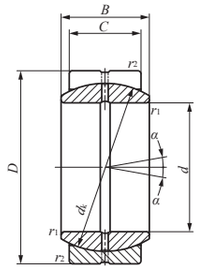
Shaft dia. mm	Identification number		Mass (Ref.)	Boundary dimensions mm							Permissible tilting angle degree	
	Without seals	With seals	kg	d	D	B	C	d_k	$r_{1s\ min}$ (1)	$r_{2s\ min}$ (1)	α	α_1
110	**GE 110ES**	**GE 110ES-2RS**	4.94	110	160	70	55	140	1	1	6	4
120	**GE 120ES**	**GE 120ES-2RS**	8.12	120	180	85	70	160	1	1	6	4
140	**GE 140ES**	**GE 140ES-2RS**	11.4	140	210	90	70	180	1	1	7	5
160	**GE 160ES**	**GE 160ES-2RS**	14.4	160	230	105	80	200	1	1	8	6
180	**GE 180ES**	**GE 180ES-2RS**	18.9	180	260	105	80	225	1.1	1.1	6	5
200	**GE 200ES**	**GE 200ES-2RS**	28.1	200	290	130	100	250	1.1	1.1	7	6
220	**GE 220ES**	**GE 220ES-2RS**	36.1	220	320	135	100	275	1.1	1.1	8	6
240	**GE 240ES**	**GE 240ES-2RS**	40.4	240	340	140	100	300	1.1	1.1	8	6
260	**GE 260ES**	**GE 260ES-2RS**	52.0	260	370	150	110	325	1.1	1.1	7	6
280	**GE 280ES**	**GE 280ES-2RS**	66.0	280	400	155	120	350	1.1	1.1	6	5
300	**GE 300ES**	**GE 300ES-2RS**	76.0	300	430	165	120	375	1.1	1.1	7	6

Notes(1) Minimum allowable value of chamfer dimensions r_1 and r_2

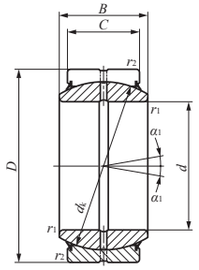
(2) When Spherical Bushings are used with full tilting angle, the shaft shoulder dimension must be less than the maximum value of d_a.

Remarks1. The inner ring and the outer ring have an oil groove and two oil holes, respectively.

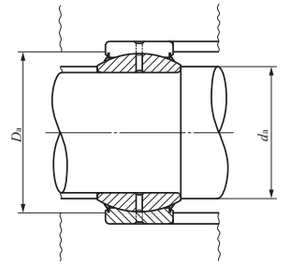
2. No grease is prepacked. Perform proper lubrication.



GE ··· ES



GE ··· ES-2RS



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
115.5	121	154.5	138	755 000	4 530 000
125.5	135.5	174.5	154	1 100 000	6 590 000
145.5	155.5	204.5	176	1 240 000	7 410 000
165.5	170	224.5	195	1 570 000	9 410 000
187	199	253	221	1 770 000	10 600 000
207	213.5	283	244	2 450 000	14 700 000
227	239.5	313	269	2 700 000	16 200 000
247	265	333	296	2 940 000	17 700 000
267	288	363	320	3 510 000	21 000 000
287	313.5	393	345	4 120 000	24 700 000
307	336.5	423	371	4 410 000	26 500 000

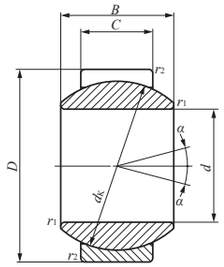
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

SPHERICAL BUSHINGS

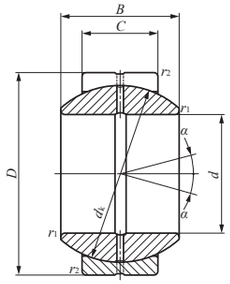
Steel-on-steel Spherical Bushings



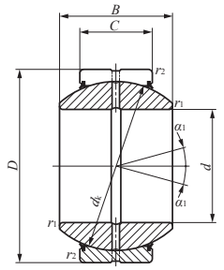




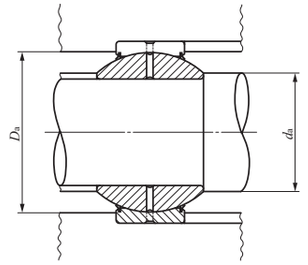
GE···G



GE···GS



GE···GS-2RS



Shaft dia. 6 — 120mm

Shaft dia. mm	Identification number Without seals	With seals	Mass (Ref.) kg	Boundary dimensions mm d	D	B	C	d_k	$r_{1s\,min}$ (1)	$r_{2s\,min}$ (1)	Permissible tilting angle degree α	α_1
6	**GE 6G**	—	0.010	6	16	9	5	13	0.3	0.3	21	—
8	**GE 8G**	—	0.015	8	19	11	6	16	0.3	0.3	21	—
10	**GE 10G**	—	0.022	10	22	12	7	18	0.3	0.3	18	—
12	**GE 12G**	—	0.041	12	26	15	9	22	0.3	0.3	18	—
15	**GE 15GS**	**GE 15GS-2RS**	0.059	15	30	16	10	25	0.3	0.3	16	13
17	**GE 17GS**	**GE 17GS-2RS**	0.083	17	35	20	12	29	0.3	0.3	19	16
20	**GE 20GS**	**GE 20GS-2RS**	0.155	20	42	25	16	35.5	0.3	0.6	17	16
25	**GE 25GS**	**GE 25GS-2RS**	0.215	25	47	28	18	40.7	0.6	0.6	17	15
30	**GE 30GS**	**GE 30GS-2RS**	0.330	30	55	32	20	47	0.6	1	17	16
35	**GE 35GS**	**GE 35GS-2RS**	0.400	35	62	35	22	53	0.6	1	16	15
40	**GE 40GS**	**GE 40GS-2RS**	0.515	40	68	40	25	60	0.6	1	17	14
45	**GE 45GS**	**GE 45GS-2RS**	0.660	45	75	43	28	66	0.6	1	15	13
50	**GE 50GS**	**GE 50GS-2RS**	1.50	50	90	56	36	80	0.6	1	17	16
60	**GE 60GS**	**GE 60GS-2RS**	2.05	60	105	63	40	92	1	1	17	15
70	**GE 70GS**	**GE 70GS-2RS**	3.00	70	120	70	45	105	1	1	16	14
80	**GE 80GS**	**GE 80GS-2RS**	3.60	80	130	75	50	115	1	1	14	13
90	**GE 90GS**	**GE 90GS-2RS**	5.41	90	150	85	55	130	1	1	15	14
100	**GE 100GS**	**GE 100GS-2RS**	6.15	100	160	85	55	140	1	1	14	12
110	**GE 110GS**	**GE 110GS-2RS**	9.70	110	180	100	70	160	1	1	12	11
120	**GE 120GS**	**GE 120GS-2RS**	15.5	120	210	115	70	180	1	1	16	15

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
8.5	9	13.5	13	6 370	38 200
10.5	11.5	16.5	15.5	9 410	56 500
12.5	13	19.5	17	12 400	74 100
14.5	16	23.5	21	19 400	117 000
17.5	19	27.5	26	24 500	147 000
19.5	21	32.5	30.5	34 100	205 000
22.5	25	37.5	37	55 700	334 000
29.5	29.5	42.5	41.5	71 800	431 000
34	34	49.5	48	92 200	553 000
39.5	39.5	56.5	54.5	114 000	686 000
44.5	44.5	62.5	60	147 000	883 000
49.5	50	69.5	66	181 000	1 090 000
54.5	57	84.5	79	282 000	1 690 000
65.5	67	99.5	91	361 000	2 170 000
75.5	78	114.5	103	463 000	2 780 000
85.5	87	124.5	112	564 000	3 380 000
95.5	98	144.5	127	701 000	4 210 000
105.5	111	154.5	138	755 000	4 530 000
115.5	124.5	174.5	154	1 100 000	6 590 000
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





Shaft dia. 140 — 280mm

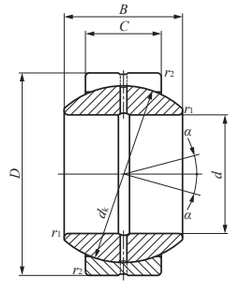
Shaft dia. mm	Identification number		Mass (Ref.)	Boundary dimensions mm							Permissible tilting angle degree	
	Without seals	With seals	kg	d	D	B	C	d_k	$r_{1s\,min}$ (1)	$r_{2s\,min}$ (1)	α	α_1
140	**GE 140GS**	**GE 140GS-2RS**	19.2	140	230	130	80	200	1	1	16	15
160	**GE 160GS**	**GE 160GS-2RS**	25.4	160	260	135	80	225	1	1.1	16	14
180	**GE 180GS**	**GE 180GS-2RS**	34.7	180	290	155	100	250	1.1	1.1	14	13
200	**GE 200GS**	**GE 200GS-2RS**	43.8	200	320	165	100	275	1.1	1.1	15	14
220	**GE 220GS**	**GE 220GS-2RS**	51.3	220	340	175	100	300	1.1	1.1	16	14
240	**GE 240GS**	**GE 240GS-2RS**	66.1	240	370	190	110	325	1.1	1.1	15	14
260	**GE 260GS**	**GE 260GS-2RS**	81.8	260	400	205	120	350	1.1	1.1	15	14
280	**GE 280GS**	**GE 280GS-2RS**	97.4	280	430	210	120	375	1.1	1.1	15	14

Notes(1) Minimum allowable value of chamfer dimensions r_1 and r_2

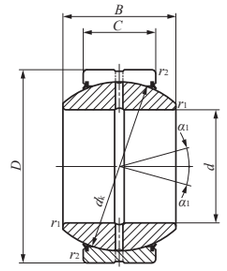
(2) When Spherical Bushings are used with full tilting angle, the shaft shoulder dimension must be less than the maximum value of d_a.

Remarks1. The inner ring and the outer ring have an oil groove and two oil holes, respectively.

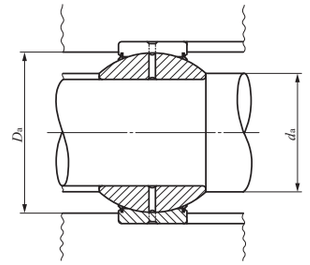
2. No grease is prepacked. Perform proper lubrication.



GE···GS



GE···GS-2RS



Mounting dimensions mm				Dynamic load capacity	Static load capacity
d_a		D_a		C_d	C_s
Min.	Max.(2)	Max.	Min.	N	N
145.5	152	224.5	195	1 570 000	9 410 000
165.5	180	253	221	1 770 000	10 600 000
187	196	283	244	2 450 000	14 700 000
207	220	313	269	2 700 000	16 200 000
227	243.5	333	296	2 940 000	17 700 000
247	263.5	363	320	3 510 000	21 000 000
267	283.5	393	345	4 120 000	24 700 000
287	310.5	423	371	4 410 000	26 500 000

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

SPHERICAL BUSHINGS

Steel-on-steel Spherical Bushings Inch Series





Shaft dia. 12.700 — 63.500mm

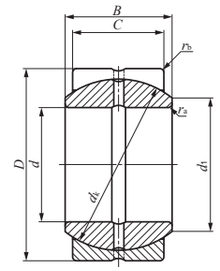
Shaft dia. mm (inch)	Identification number Without seal	With seals	Mass (Ref.) kg	Boundary dimensions mm(inch) d	D	B	C
12.700 (1/2)	**SBB 8**	—	0.020	12.700 (1/2)	22.225 (7/8)	11.10(.437)	9.52(.375)
15.875 (5/8)	**SBB 10**	—	0.036	15.875 (5/8)	26.988 (1 1/16)	13.89(.547)	11.91(.469)
19.050 (3/4)	**SBB 12**	**SBB 12-2RS**	0.057	19.050 (3/4)	31.750 (1 1/4)	16.66(.656)	14.27(.562)
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)
25.400 (1)	**SBB 16**	**SBB 16-2RS**	0.125	25.400 (1)	41.275 (1 5/8)	22.22(.875)	19.05(.750)
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)
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)
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)
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)
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)
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)
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)

Note(1) Maximum allowable corner radius of the shaft or housing

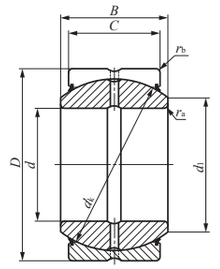
Remarks1. The value with mark * is applicable to types without seals. For types with seals, the value is 0.4 mm.

2. The inner ring and the outer ring have an oil groove and two oil holes, respectively.

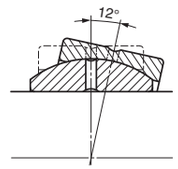
3. No grease is prepacked. Perform proper lubrication.



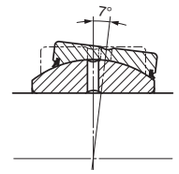
SBB



SBB ··· -2RS



SBB



SBB ··· -2RS

Permissible tilting angle

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
18 (.709)	0.05 / 0.15	14.0	0.2	0.6	16 800	101 000
23 (.906)	0.05 / 0.15	17.9	0.2	0.8	26 900	161 000
27.5(1.083)	0.08 / 0.18	21.4	0.6	*0.8	38 500	231 000
32 (1.260)	0.08 / 0.18	25.0	0.6	*0.8	52 300	314 000
36 (1.417)	0.08 / 0.18	28.0	0.6	*0.8	67 300	404 000
45 (1.772)	0.08 / 0.18	35.1	0.6	0.8	105 000	630 000
49 (1.929)	0.08 / 0.18	38.5	0.6	0.8	126 000	755 000
55 (2.165)	0.08 / 0.18	43.3	0.6	0.8	154 000	925 000
64 (2.520)	0.08 / 0.18	50.4	0.6	0.8	209 000	1 250 000
73 (2.874)	0.08 / 0.18	57.6	0.6	0.8	273 000	1 640 000
82 (3.228)	0.10 / 0.20	64.9	0.6	0.8	345 000	2 070 000
91 (3.583)	0.10 / 0.20	72.0	0.6	0.8	425 000	2 550 000

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

SPHERICAL BUSHINGS

Steel-on-steel Spherical Bushings Inch Series

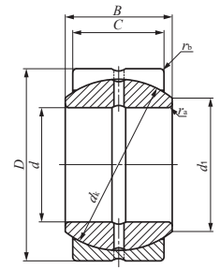




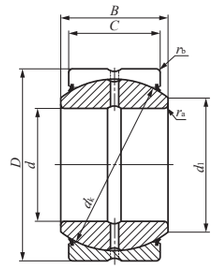
Shaft dia. 69.850 — 152.400mm

Shaft dia. mm (inch)	Identification number Without seal	With seals	Mass (Ref.) kg	Boundary dimensions mm(inch) d	D	B	C
69.850 (2¾)	**SBB 44**	**SBB 44-2RS**	2.44	69.850 (2¾)	111.125 (4⅜)	61.11(2.406)	52.37(2.062)
76.200 (3)	**SBB 48**	**SBB 48-2RS**	3.12	76.200 (3)	120.650 (4¾)	66.68(2.625)	57.15(2.250)
82.550 (3¼)	**SBB 52**	**SBB 52-2RS**	3.92	82.550 (3¼)	130.175 (5⅛)	72.24(2.844)	61.90(2.437)
88.900 (3½)	**SBB 56**	**SBB 56-2RS**	4.83	88.900 (3½)	139.700 (5½)	77.77(3.062)	66.68(2.625)
95.250 (3¾)	**SBB 60**	**SBB 60-2RS**	5.87	95.250 (3¾)	149.225 (5⅞)	83.34(3.281)	71.42(2.812)
101.600 (4)	**SBB 64**	**SBB 64-2RS**	7.07	101.600 (4)	158.750 (6¼)	88.90(3.500)	76.20(3.000)
107.950 (4¼)	**SBB 68**	**SBB 68-2RS**	8.46	107.950 (4¼)	168.275 (6⅝)	94.46(3.719)	80.95(3.187)
114.300 (4½)	**SBB 72**	**SBB 72-2RS**	9.94	114.300 (4½)	177.800 (7)	100.00(3.937)	85.72(3.375)
120.650 (4¾)	**SBB 76**	**SBB 76-2RS**	11.6	120.650 (4¾)	187.325 (7⅜)	105.56(4.156)	90.47(3.562)
127.000 (5)	**SBB 80**	**SBB 80-2RS**	13.5	127.000 (5)	196.850 (7¾)	111.12(4.375)	95.25(3.750)
152.400 (6)	**SBB 96**	**SBB 96-2RS**	17.6	152.400 (6)	222.250 (8¾)	120.65(4.750)	104.78(4.125)

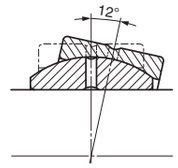
Note(1) Maximum allowable corner radius of the shaft or housing
Remarks1. The inner ring and the outer ring have an oil groove and two oil holes, respectively.
2. No grease is prepacked. Perform proper lubrication.



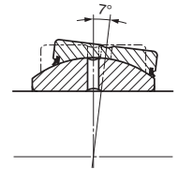
SBB



SBB ··· -2RS



SBB



SBB ··· -2RS

Permissible tilting angle

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
100(3.937)	0.10 ／ 0.20	79.0	0.6	0.8	514 000	3 080 000
110(4.331)	0.10 ／ 0.20	86.5	0.6	0.8	616 000	3 700 000
119(4.685)	0.13 ／ 0.23	94.1	0.6	0.8	722 000	4 330 000
128(5.039)	0.13 ／ 0.23	101.6	0.6	0.8	837 000	5 020 000
137(5.394)	0.13 ／ 0.23	108.4	0.6	0.8	960 000	5 760 000
146(5.748)	0.13 ／ 0.23	115.8	0.6	0.8	1 090 000	6 550 000
155(6.102)	0.13 ／ 0.23	122.6	0.8	1.1	1 230 000	7 380 000
164(6.457)	0.13 ／ 0.23	129.8	0.8	1.1	1 380 000	8 270 000
173(6.811)	0.13 ／ 0.23	136.8	0.8	1.1	1 530 000	9 210 000
183(7.205)	0.13 ／ 0.23	144.9	0.8	1.1	1 710 000	10 300 000
207(8.150)	0.13 ／ 0.23	167.5	0.8	1.1	2 130 000	12 800 000

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

SPHERICAL BUSHINGS

Maintenance-free Spherical Bushings

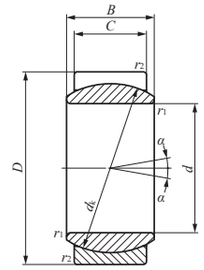




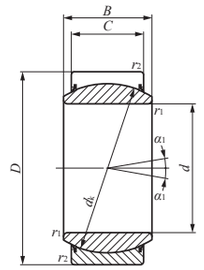
Shaft dia. 15 — 70mm

Shaft dia. mm	Identification number		Mass (Ref.)	Boundary dimensions mm							Permissible tilting angle degree	
	Without seals	With seals	kg	d	D	B	C	d_k	$r_{1s\,min}$ (1)	$r_{2s\,min}$ (1)	α	α_1
15	**GE 15EC**	—	0.032	15	26	12	9	22	0.3	0.3	8	—
17	**GE 17EC**	—	0.049	17	30	14	10	25	0.3	0.3	10	—
20	**GE 20EC**	—	0.065	20	35	16	12	29	0.3	0.3	9	—
25	**GE 25EC**	—	0.115	25	42	20	16	35.5	0.6	0.6	7	—
30	**GE 30EC**	**GE 30EC-2RS**	0.160	30	47	22	18	40.7	0.6	0.6	6	4
35	—	**GE 35EC-2RS**	0.258	35	55	25	20	47	0.6	1	—	4
40	—	**GE 40EC-2RS**	0.315	40	62	28	22	53	0.6	1	—	4
45	—	**GE 45EC-2RS**	0.413	45	68	32	25	60	0.6	1	—	4
50	—	**GE 50EC-2RS**	0.560	50	75	35	28	66	0.6	1	—	4
60	—	**GE 60EC-2RS**	1.10	60	90	44	36	80	1	1	—	3
70	—	**GE 70EC-2RS**	1.54	70	105	49	40	92	1	1	—	4

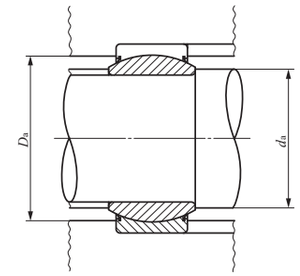
Notes(1) Minimum allowable value of chamfer dimensions r_1 and r_2
(2) When Spherical Bushings are used with full tilting angle, the shaft shoulder dimension must be less than the maximum value of d_a.
Remark No oil hole is provided.



GE ··· EC



GE ··· EC-2RS



Mounting dimensions mm				Dynamic load capacity	Static load capacity
d_a		D_a		C_d	C_s
Min.	Max.(2)	Max.	Min.	N	N
17.5	18	23.5	21.5	19 400	48 500
19.5	20.5	27.5	24.5	24 500	61 300
22.5	24	32.5	28	34 100	85 300
29	29	37.5	34	55 700	139 000
34	34	42.5	41.5	71 800	180 000
39.5	39.5	49.5	48	92 200	230 000
44.5	45	56.5	54.5	114 000	286 000
49.5	50.5	62.5	60	147 000	368 000
54.5	56	69.5	66	181 000	453 000
65.5	66.5	84.5	79	282 000	706 000
75.5	77.5	99.5	91	361 000	902 000

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

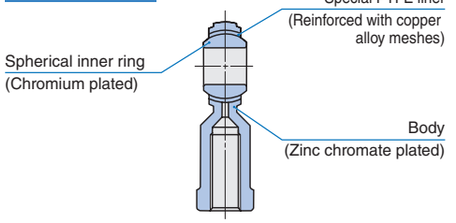


Structure and Features

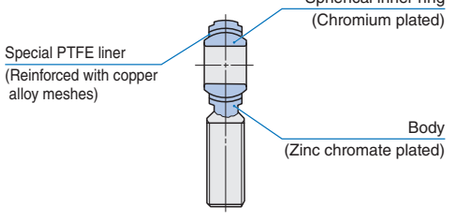
IKO PILLOBALLs are compact self-aligning spherical bushings that can support a large radial load and a bi-directional axial load at the same time.
These bushings are classified by sliding surface types, namely, insert type, die-cast type and maintenance-free type. In the insert type, a spherical inner 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

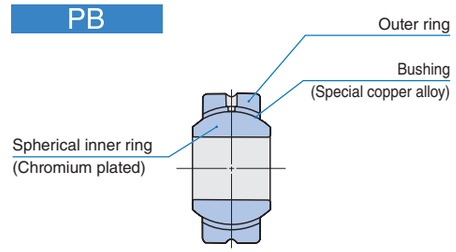


POS···EC

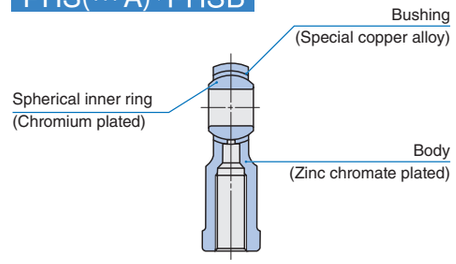


Structures of lubrication type PILLOBALLs

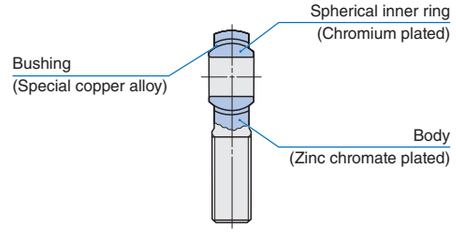
PB



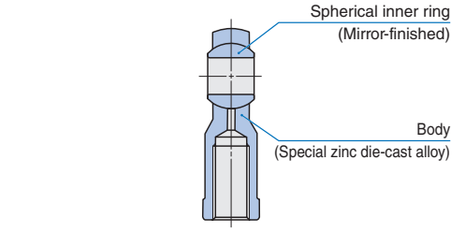
PHS(···A)·PHSB



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.

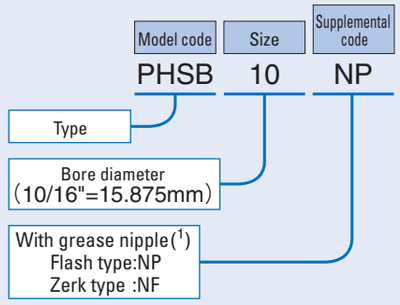
PHS ··· EC, which has a female thread in the body, and POS ··· EC, which has a male thread on the body, are available.

Identification number

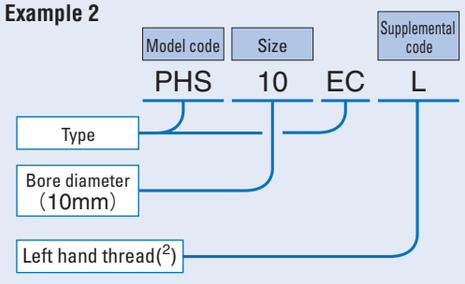
The identification number of PILLOBALLs consists of a model code, a size and any supplemental codes as shown in the examples.

Examples of identification number

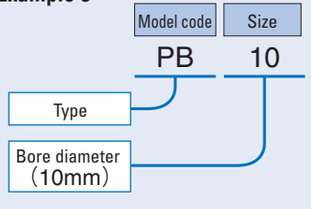
Example 1



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.

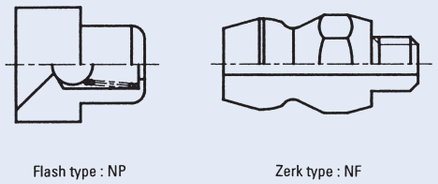


Fig. 1 Shapes of grease nipple

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.

$$C_{dt} = f_t C_d \quad \cdots\cdots (1)$$

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 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.

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

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

Type \ F_a/F_r	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 $\beta < 5°$, $\beta = 5$
when rotating, $\beta = 90$
f : Number of oscillations per minute, min⁻¹

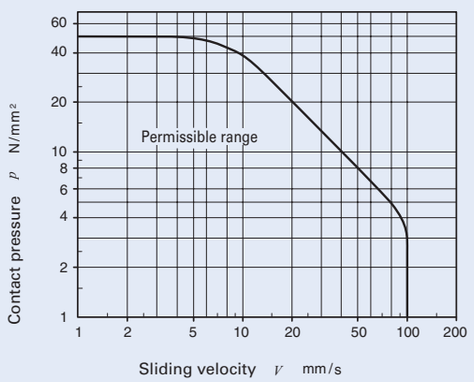


Fig. 2 pV diagram of lubrication type PILLOBALLs

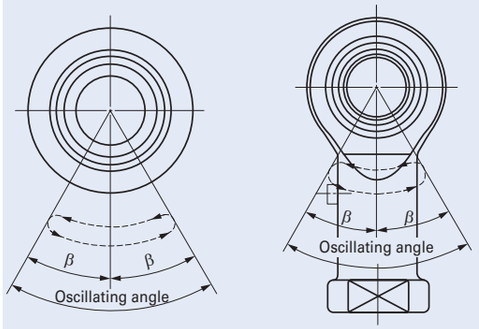


Fig. 3 Oscillating angle

[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

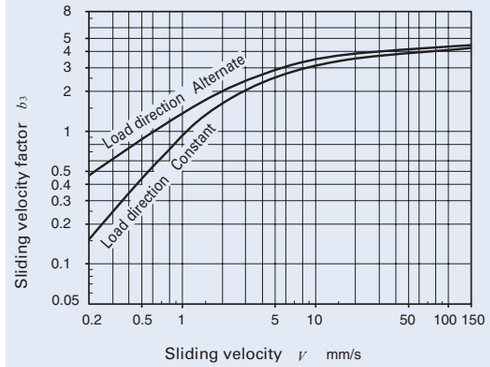


Fig. 4 Sliding velocity factor for lubrication type PILLOBALLs

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).

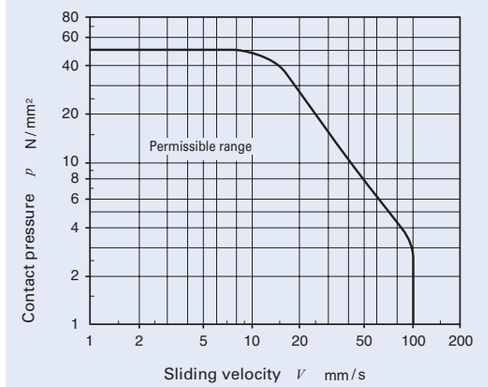


Fig. 5 pV diagram for maintenance-free type PILLOBALL Rod Ends

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

[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.6 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.

$$G = 16.67 \times b_1 \times \frac{Sf}{V} \quad \cdots\cdots(7)$$

$$L_h = \frac{G}{60f} \quad \cdots\cdots(8)$$

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.

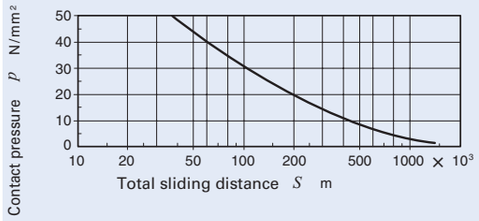


Fig. 6 Contact pressure and total sliding distance for maintenance-free type PILLOBALL Rod Ends

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.

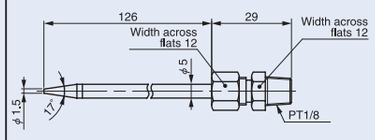
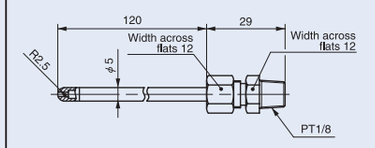
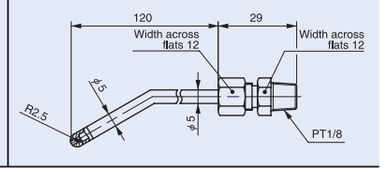
For PILLOBALLs without an oil hole and grease nipple, apply grease directly on the spherical surface.

Table 10 Specifications of oil hole and grease nipple

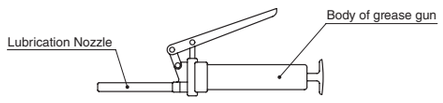
Type	Bore diameter of inner ring d mm	Specification
PB		1 oil hole + oil groove
PHS(···A)	$d \leqq 4$	None
	$4 < d$	With grease nipple
POS(···A)	$d \leqq 4$	None
	$4 < d \leqq 6$	1 oil hole
	$6 < d$	With grease nipple
PHSB · POSB		None(1)
PHSA		With grease nipple
PHS ··· EC, POS ··· EC		None

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 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.

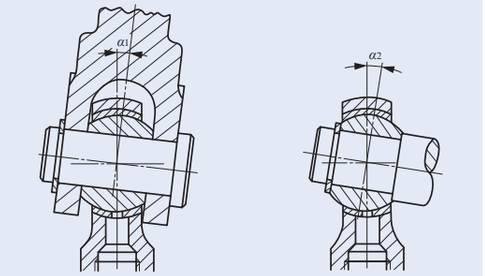
Insert type and maintenance-free type: 1.25 times the nominal thread dia. or more.

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

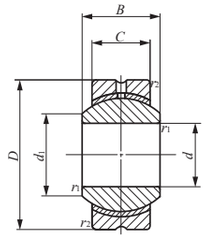
With female thread	With male thread	α_1	α_2
PHSB 2	POSB 2	8	16
PHSB 2.5	POSB 2.5	7	12
PHSB 3	POSB 3	6	10
PHSB 4	POSB 4	7	13
PHSB 5	POSB 5	6	10
PHSB 6	POSB 6	6	11
PHSB 7	POSB 7	7	11
PHSB 8	POSB 8	6	9
PHSB 10	POSB 10	7	11
PHSB 12	POSB 12	6	10
PHSB 16	POSB 16	7	14

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

PILLOBALL

Lubrication Type PILLOBALL Spherical Bushings Insert Type





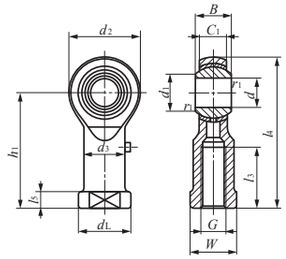
PB

Identification number	Mass (Ref.) g	Boundary dimensions mm d	D	C	B	d_1	$r_{s\,min}$ (1)	Ball dia. mm (inch)	Dynamic load capacity C_d N	Static load capacity C_s N
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 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)	Dynamic load capacity C_d N	Static load capacity C_s N
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

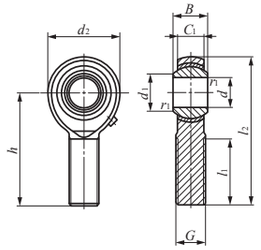
Note(1) Minimum allowable value of chamfer dimension r_1
Remarks1. Neither oil hole nor grease nipple is provided for PHS with an inner ring bore diameter d of 4 mm or less.
For others, a grease nipple is provided on the body.
2. No grease is prepacked. Perform proper lubrication.
3. When a metric fine thread specification for inner ring bore deameter d of 8 mm to 14 mm is required, please contact IKO.

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

PILLOBALL

Lubrication Type PILLOBALL Rod Ends Insert Type/With Male Thread





POS(···A)

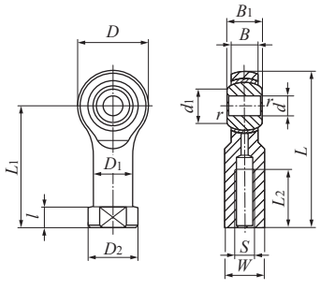
Identification number	Mass (Ref.)	Boundary dimensions mm										Dynamic load capacity	Static load capacity
		d	Thread G	d_2	C_1	B	d_1	l_2	h	l_1	$r_{1s\,min}$ (1)	Ball dia. mm (inch)	C_d N	C_s N
POS 3	5.0	3	M 3×0.5	12	4.5	6	5.2	33	27	15	0.2	7.938 (5/16)	1 750	1 220
POS 4	8.1	4	M 4×0.7	14	5.3	7	6.5	37	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.)	Boundary dimensions mm(inch)														Dynamic load capacity	Static load capacity
		d	Thread S class 3B	D	B	B_1	d_1	L	l	L_1	L_2	W	D_1	D_2	r_{smin} (1)	Ball dia. mm (inch)	C_d N	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.

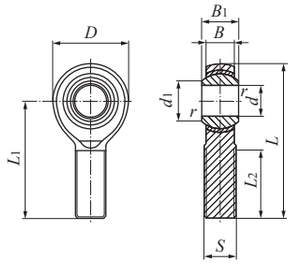
Remark No grease is prepacked. Perform proper lubrication.

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

PILLOBALL

Inch series PILLOBALL Rod Ends Insert Type/With Male Thread





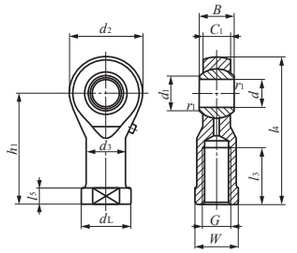
POSB

Identification number	Mass (Ref.)	Boundary dimensions mm(inch)											Dynamic load capacity	Static load capacity
		d	Thread S class 3A	D	B	B_1	d_1	L	L_1	L_2	$r_{s\,min}$ (1)	Ball dia. mm (inch)	C_d	C_s
	g												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
		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)	C_s
	g																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

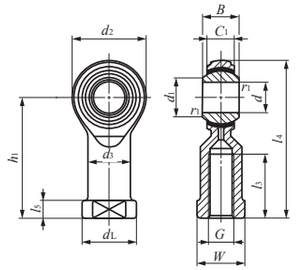
Note(1) Minimum allowable value of chamfer dimension r_1
Remarks1. A grease nipple is provided on the body.
2. No grease is prepacked. Perform proper lubrication.
3. When a metric fine thread specification for inner ring bore deameter d of 8 mm to 14 mm is required, please contact IKO.

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

PILLOBALL

Maintenance-free Type PILLOBALL Rod Ends With Female Thread





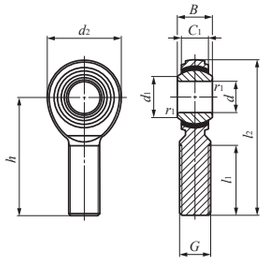
PHS ··· EC

Identification number	Mass (Ref.)	Boundary dimensions mm															Dynamic load capacity	Static load capacity
		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)	C_d	C_s
	g																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	Static load capacity
		d	Thread G	d_2	C_1	B	d_1	l_2	h	l_1	$r_{1s\,min}$ (1)	Ball dia. mm (inch)	C_d	C_s
	g												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

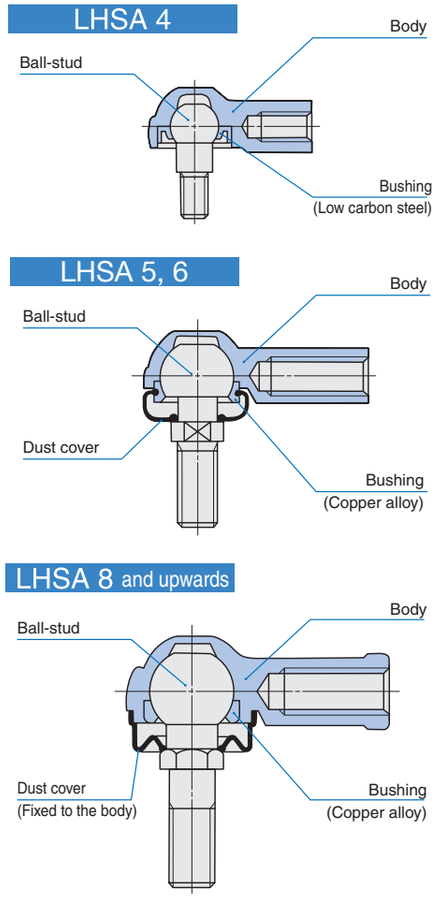
L-Ball LHSA

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.

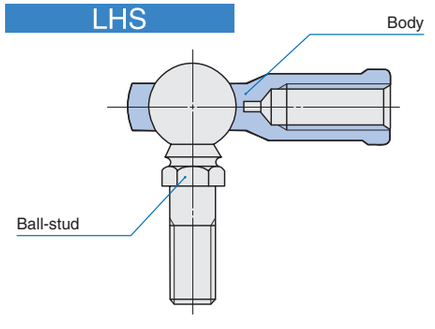
L-Ball LHS

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

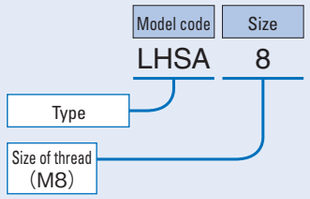
This is for the L-Ball LHS series. It is made of special synthetic rubber which has excellent resistance to oil and ozone. The cover offers very effective dust protection and prevents grease leakage.

Identification Number

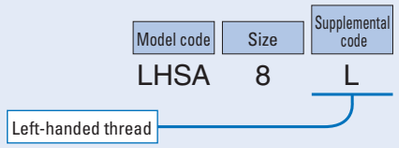
The identification number of L-Balls consists of a model code, a size and any supplemental codes as shown in the examples.

Examples of identification number

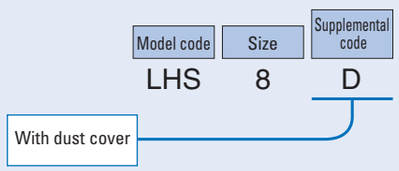
Example 1 (Female thread of the body : In case of right-hand threaded)



Example 2 (Female thread of the body : In case of left threaded)



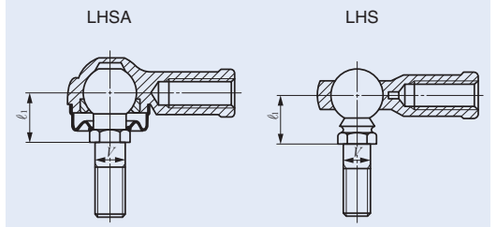
Example 3 (when a dust cover PRC is attached to LHS)



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.

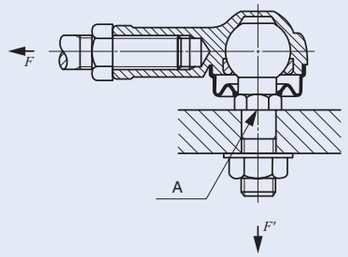


Fig. 1

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

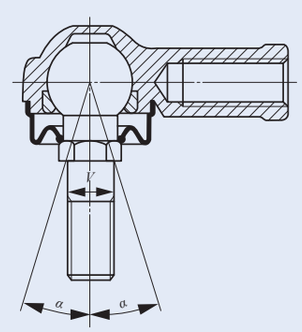
The maximum allowable temperature for L-Balls is +80℃ .

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



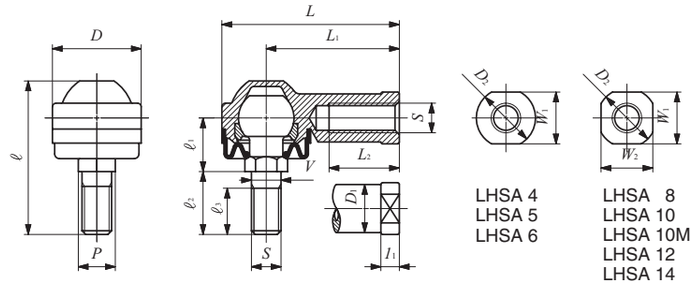
unit: degree

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

L-BALL





Identification number	Mass (Ref.)	Boundary dimensions mm												
	g	Thread S	V	D	L	L_1	L_2	l_1	W_1	W_2	D_1	D_2	ℓ	P
LHSA 4	11	M 4×0.7	*4	14	25	18	8	4	8	—	8	10	19.5	**5.5
LHSA 5	27	M 5×0.8	5	17	38.5	30	16	5	10	—	10	12	32.5	8
LHSA 6	27	M 6×1	6	19	39.5	30	16	5	10	—	10	12	32.5	8
LHSA 8	64	M 8×1.25	8	24	48	36	19	5	14	14	13	16	41.5	10
LHSA 10	106	M10×1.25	10	28	57	43	23	6.5	17	17	15	19	49	12
LHSA 10M	106	M10×1.5	10	28	57	43	23	6.5	17	17	15	19	49	12
LHSA 12	180	M12×1.75	12	34	67	50	27	6.5	19	19	17.5	22	64	14
LHSA 14	260	M14×2	14	38	76	57	30	8	22	22	20	25	72	17

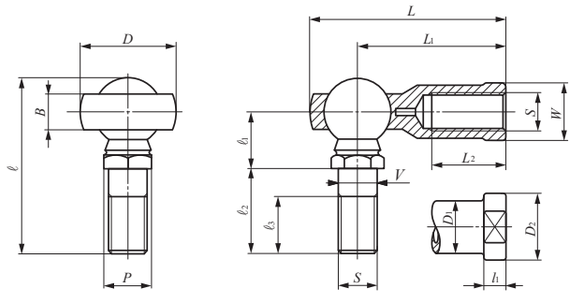
ℓ_1	ℓ_2	ℓ_3	Ball dia.	Static load capacity C_s N
7	7	5	8	880
12	13	10	11.112	1 180
12	13	10	11.112	1 670
14.5	17	12.5	15	4 380
16	21	17	19.05	7 400
16	21	17	19.05	7 400
16	21	17	19.05	7 400
20	30	20	22.225	9 900
22.5	33.5	22	25.4	14 600

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.

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

L-BALL





LHS

Identification number	Mass (Ref.)	Boundary dimensions mm												
	g	Thread S	V	D	B	L	L_1	L_2	l_1	W	D_1	D_2	ℓ	P
LHS 5	22	M 5×0.8	5	17	6	35.5	27	16	4	9	9	11	30.5	8
LHS 6	32	M 6×1	6	19.5	6.75	39.7	30	16	5	11	10	13	36.5	10
LHS 8	60	M 8×1.25	8	24	9	48	36	19	5	14	12.5	16	44	11
LHS 10	102	M10×1.5	10	28	10.5	57	43	23	6.5	17	15	19	52.5	13
LHS 12	160	M12×1.75	12	32	12	66	50	27	6.5	19	17.5	22	61	17
LHS 14	227	M14×2	14	36	13.5	75	57	30	8	22	20	25	69	17
LHS 16	300	M16×2	16	40	15	84	64	36	8	22	22	27	74	19
LHS 18	445	M18×1.5	18	45	16.5	93.5	71	40	10	27	25	31	84	22
LHS 20	580	M20×1.5	20	49	18	101.5	77	43	10	30	27.5	34	90.5	24
LHS 22	765	M22×1.5	22	54	20	111	84	47	12	32	30	37	99	27

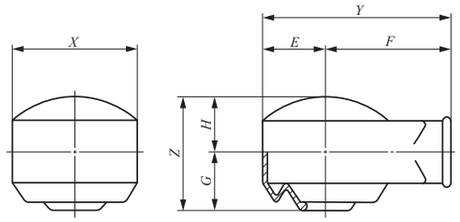
ℓ_1	ℓ_2	ℓ_3	Ball dia.	Static load capacity C_s N
10	15	11	11.112	2 080
11.5	18.5	14	12.7	3 290
14.5	21.5	15	15.875	4 900
17	26	18	19.05	7 640
20	30	20	22.225	12 400
22.5	33.5	22	25.4	14 600
24.5	35.5	23	28.575	19 500
27.5	40.5	25	31.75	25 600
30	43	27	34.925	31 600
32.5	47.5	30	38.1	39 800

Remark No grease is prepacked. Perform proper lubrication.

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

L-Ball 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

IKO



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

SUPER FLEXIBLE NOZZLES



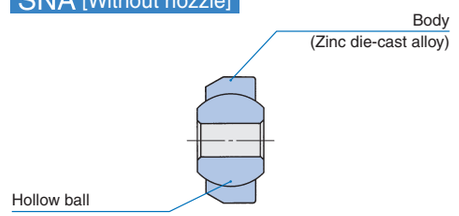
Structure and Features

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.

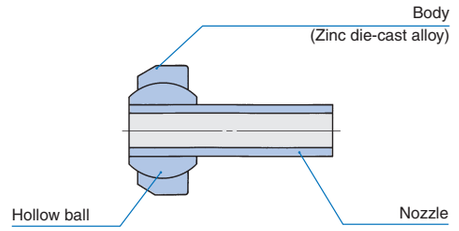
The features of Super Flexible Nozzle are as follows.
❶A spherical bushing is incorporated to adjust the tilting angle of nozzle easily.
❷The Super Flexible Nozzle is compact in size, and the design on parts around the spindle and tool can be made simple.
❸The nozzle length is short, and winding of cutting 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

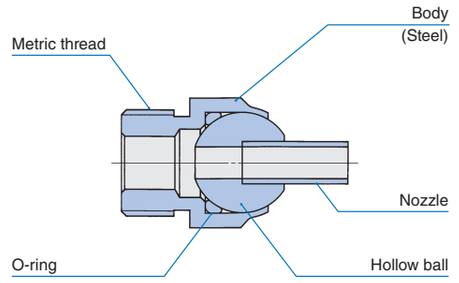
SNA [Without nozzle]



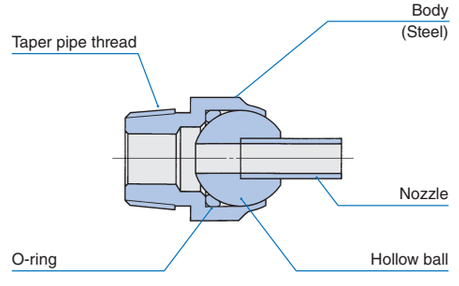
SNA [With nozzle]



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

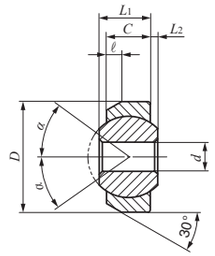
Super Flexible Nozzles with special length are also available. In this case, specify the necessary nozzle length in units of 1 mm, but do not exceed the maximum length shown in the dimension table as "L".

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

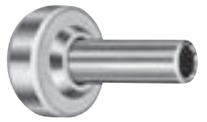


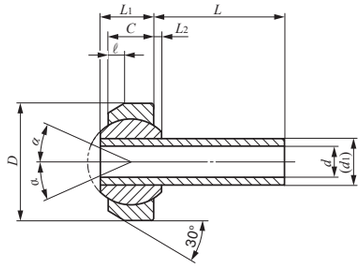


SNA

Identification number	Boundary dimensions mm d	D	L_1	L_2	C	ℓ	Ball dia. mm (inch)	Allowable tilting angle α degree
SNA 4	4	15	7	1	6	2	11.112 (7/16)	36
SNA 6	6							24

Press Fitting Type With Nozzle



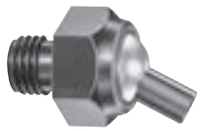


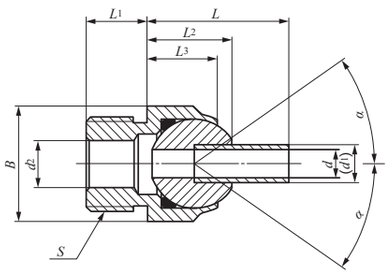
SNA

Identification number	Boundary dimensions mm d	D	L	L_1	L_2	C	ℓ	d_1	Ball dia. mm (inch)	Allowable tilting angle 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							

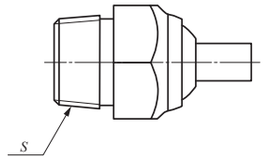
SUPER FLEXIBLE NOZZLE

Screw Fitting Type





SNM



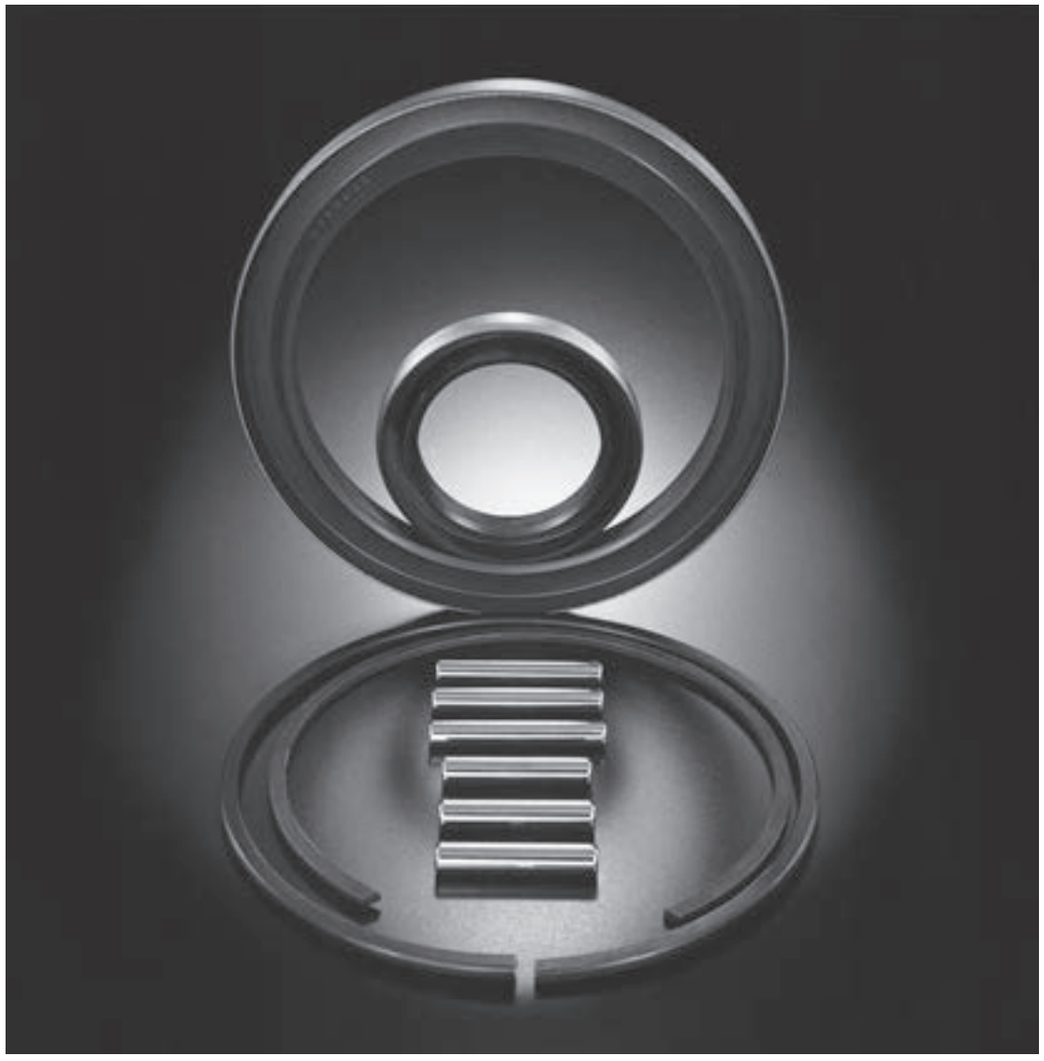
SNPT

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)	
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)	35
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										

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

PARTS FOR NEEDLE ROLLER BEARINGS

- Seals for Needle Roller Bearings
- Cir-clips for Needle Roller Bearings
- Needle Rollers



Seals for Needle Roller Bearings

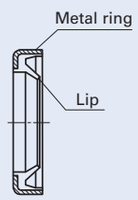
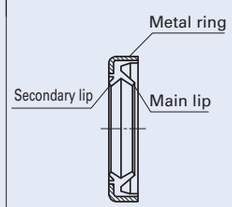
Features

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.

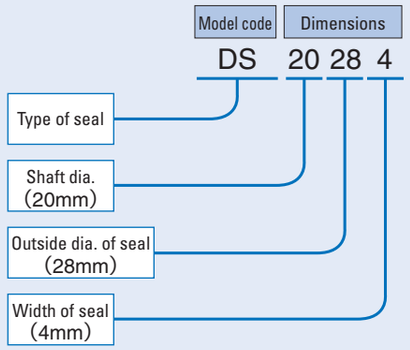
Table 1 Seal type

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.

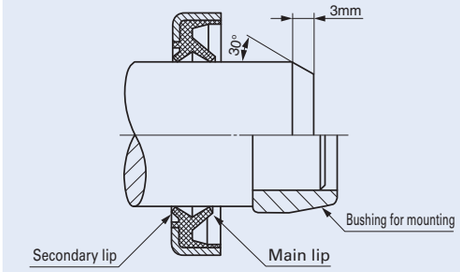
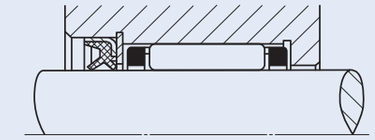


Fig.1



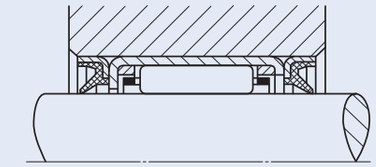


Fig.2 Mounting examples

L
OS
DS

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

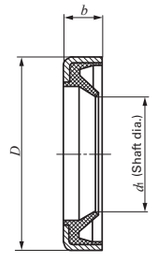
SEALS FOR NEEDLE ROLLER BEARINGS



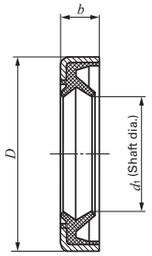


Shaft dia. 6 — 15mm

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	—



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
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	—

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

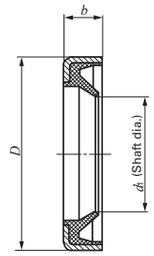
SEALS FOR NEEDLE ROLLER BEARINGS



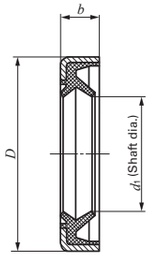


Shaft dia. 16 — 19mm

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**	—	—

L

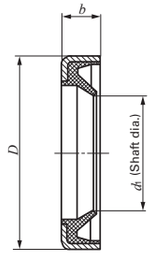
OS
DS

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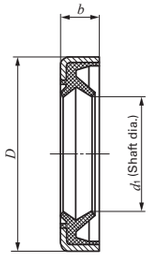
SEALS FOR NEEDLE ROLLER BEARINGS







OS



DS

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**	—	—
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**	—	—

L

OS
DS

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

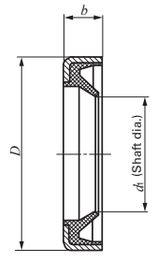
SEALS FOR NEEDLE ROLLER BEARINGS



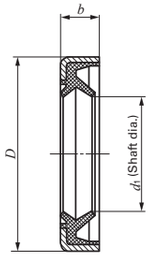


Shaft dia. 25 — 29mm

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	—	—



OS



DS

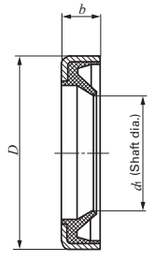
Shaft dia. mm	Identification number		Boundary dimensions mm			Combinable bearings			
	Single lip	Double lips	d_1	D	b	TA···Z YT TLA···Z YTL	RNA TR TAF GTR	RNAF	NAX NBX
28	OS 28354	DS 28354	28	35	4	TLA 2816Z TLA 2820Z	—	—	—
	OS 28374	DS 28374	28	37	4	TA 2820Z TA 2830Z YT 2820	TAF 283720 TAF 283730	—	—
	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	—	—

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

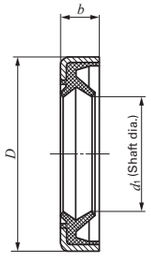
SEALS FOR NEEDLE ROLLER BEARINGS







OS



DS

Shaft dia. 30 — 38mm

Shaft dia. mm	Identification number: Single lip	Identification number: Double lips	Boundary dimensions mm: d_1	D	b	Combinable bearings: 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	—	—
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	—	—	—	—

L

OS
DS

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

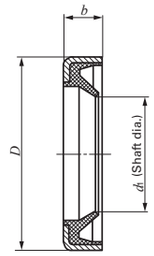
SEALS FOR NEEDLE ROLLER BEARINGS



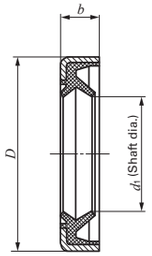


Shaft dia. 40 — 50mm

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**	—	—



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
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**	—

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

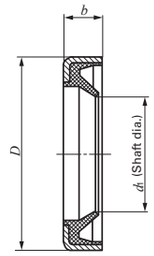
SEALS FOR NEEDLE ROLLER BEARINGS



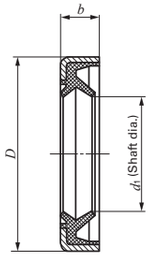


Shaft dia. 52 — 72mm

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	—	—



OS



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	—	

L

OS
DS

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

Cir-clips for Needle Roller Bearings

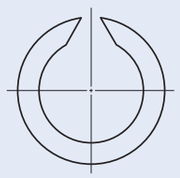
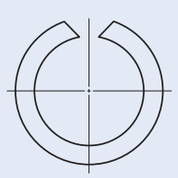
Features

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

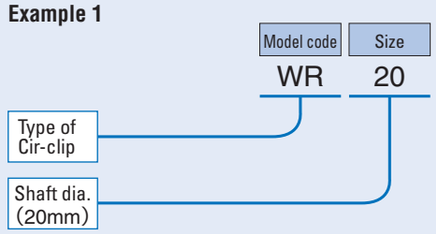
Type	For shaft	For bore
Shape		
Model code	WR	AR

Identification number

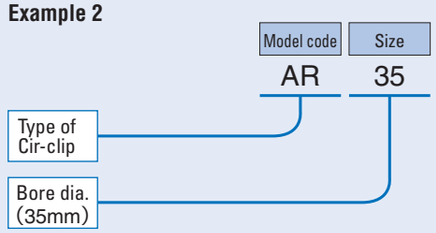
The identification number of Cir-clips consists of a model code and a size as shown below.

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.

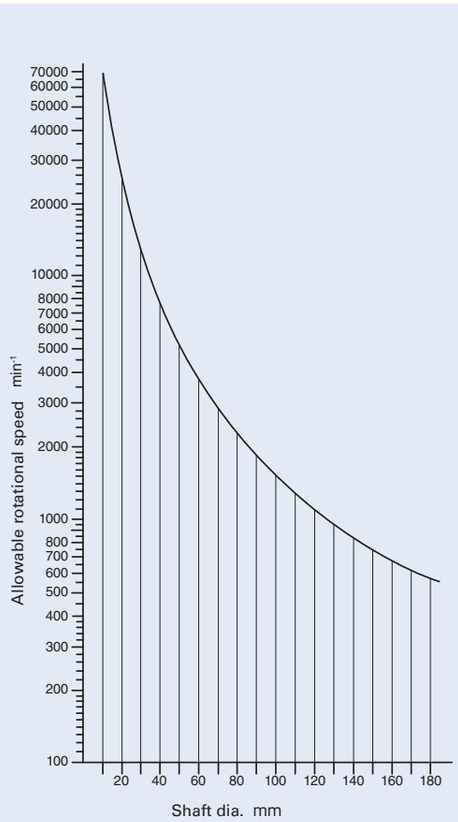


Fig.1 Allowable rotational speed

Mounting

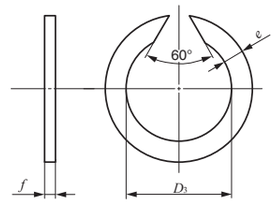
The mounting dimensions for Cir-clips for Needle Roller Bearings are shown in the dimension table.
When using these Cir-clips to restrict the movement of the needle roller cage in the axial direction, it is recommended that a spacer be used between the Cir-clip and the cage. Spacers are not required 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.

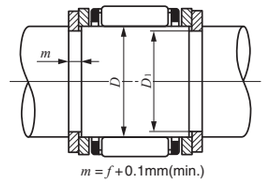
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

CIR-CLIPS FOR NEEDLE ROLLER BEARINGS

For Shaft







$m = f + 0.1$mm(min.)

WR

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	
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	0 −0.09
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	
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	0
WR 15	15	14	1.75	1.2	14.4	−0.11
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	
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	0 −0.13
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	
WR 35	35	33.2	2.3	1.5	33.8	
WR 36	36	34.2	2.3	1.5	34.8	0
WR 37	37	35.2	2.3	1.5	35.8	−0.16
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	
WR 43	43	40.8	2.3	1.5	41.5	
WR 45	45	42.8	2.3	1.5	43.5	0 −0.16
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	
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	0 −0.19
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	
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	0 −0.22
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	
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	0 −0.25
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	

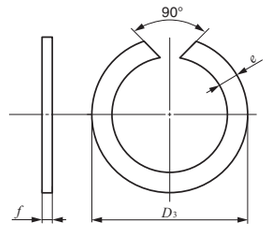
Identification number	Boundary dimensions mm					
	Shaft dia. D	D_3 (Max.)	e	f	Groove dia. D_1	Tolerance
WR 170	170	166.6	4	2.5	167.4	0 −0.25
WR 175	175	171.6	4	2.5	172.4	
WR 180	180	175.6	5	3	177	
WR 185	185	180.6	5	3	182	
WR 190	190	185.6	5	3	187	
WR 195	195	190.6	5	3	192	
WR 200	200	195.6	5	3	197	0 −0.29
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	
WR 265	265	258	7.5	4	260	
WR 270	270	263	7.5	4	265	
WR 280	280	273	7.5	4	275	0 −0.32
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	
WR 340	340	333	7.5	4	335	
WR 350	350	343	7.5	4	345	0 −0.36
WR 360	360	353	7.5	4	355	
WR 370	370	363	7.5	4	365	
WR 390	390	383	7.5	4	385	

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

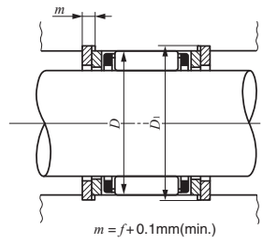
CIR-CLIPS FOR NEEDLE ROLLER BEARINGS

For Bore





AR



Bore dia. 7 — 440mm

Identification number	Boundary dimensions mm					
	Bore dia. D	D_3 (Min.)	e	f	Groove dia. D_1	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	
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	+0.11 0
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	
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	+0.13 0
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	
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	+0.16 0
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	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	
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	+0.19 0
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	
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	+0.22 0
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	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	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	
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	+0.29 0
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	

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

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

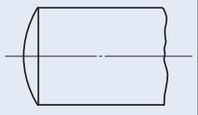
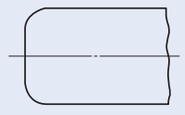
Nominal diameter D_w mm		Hardness	
Over	Incl.	HRC	HV
—	3	(60 ～ 67)	697 ～ 900
3	—	58 ～ 66	(653 ～ 865)

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: μm

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 μm for Class 2
0.8 μm for Class 3
1 μm for Class 5

Table 4 Classification of needle rollers unit: μm

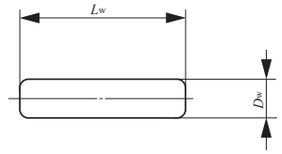
Classification symbol	Tolerance for mean dia.
C 3	0 ～− 3
B 2	0 ～− 2
B 4	− 2 ～− 4
B 6	− 4 ～− 6
B 8	− 6 ～− 8
B10	− 8 ～− 10

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.

Needle Rollers





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

Nominal dimensions mm		Mass (Ref.)
D_w	L_w	g
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

Nominal dimensions mm		Mass (Ref.)
D_w	L_w	g
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 M33

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
SI units	m	kg	s	m/s^2	N	Pa	Pa
CGS units	cm	g	s	Gal	dyn	dyn/cm^2	dyn/cm^2
Grav. units	m	$kgf \cdot s^2/m$	s	m/s^2	kgf	kgf/m^2	kgf/m^2

Conversion rates into SI units

Item	Unit name	Symbol	Conversion rate into SI	SI unit name	Symbol
Angle	Degree	°	$\pi/180$	Radian	rad
	Minute	′	$\pi/10\,800$		
	Second	″	$\pi/648\,000$		
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	$9.806\,65 \times 10^6$		

Energy	Power	Temperature	Viscosity	Kinematic viscosity	Magnetic flux	Magnetic flux density	Magnetic field intensity
J	W	K	Pa·s	m^2/s	Wb	T	A/m
erg	erg/s	°C	P	St	Mx	Gs	Oe
kgf·m	kgf·m/s	°C	$kgf \cdot s/m^2$	m^2/s	—	—	—

Item	Unit name	Symbol	Conversion rate into SI	SI unit name	Symbol
Pressure	Hydro-column meter	mH_2O	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_{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	$kgf \cdot s/m^2$	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 Fraction	inch 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 Fraction	inch Decimal	0″	1″	2″	3″	4″	5″	6″	7″	8″
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	Vickers' hardness	Brinell hardness		Rockwell hardness		Shore hardness
HRC	HV	Standard ball	Tungsten carbide ball	A scale Load 588.4N Diamond circular cone	B scale Load 980.7N 1/16" ball	HS
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	Vickers' hardness	Brinell hardness		Rockwell hardness		Shore hardness
HRC	HV	Standard ball	Tungsten carbide ball	A scale Load 588.4N Diamond circular cone	B scale Load 980.7N 1/16" ball	HS
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

M

● 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

unit : μm

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																

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

M

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)

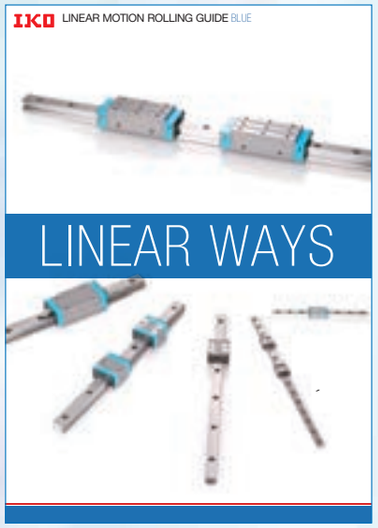
Sort	Name	Supplier	Thickener of metallic soap	Con-sistency	Dropping point (℃)	Service range(1) (℃)	Remarks
General purpose	ALVANIA GREASE S1	SHELL LUBRICANTS JAPAN	Li	323	182	−35〜+120	General, Centralized greasing
	ALVANIA GREASE S2	SHELL LUBRICANTS JAPAN	Li	283	185	−25〜+120	General, Centralized greasing
	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 OIL LUBRICANTS CO., LTD.	Li	280	188	−20〜+120	General
	MULTINOC GREASE 2	ENEOS	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
Wide temperature range	Unirex N3	EMG LUBRICANTS	Li Complex	235	230	(+190) −20〜+140	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	ENEOS	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	DuPont Toray Specialty Materials	Li	265	185	−30〜+150	With MoS_2, Extreme pressure
	Molub-Alloy 777-2 ES	CASTROL	Li	280	180	−30〜+120	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,

IKO Linear Motion Rolling Guide Series General Catalog Consists of **BLUE** (CAT-1604E) and **RED** (CAT-1605E), the two volumes.

BLUE



CAT-1604E

【Models】

- Rail Guide Type
  Endless Linear Motion Type

RED



CAT-1605E

【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

Configuration of General Catalog

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



M

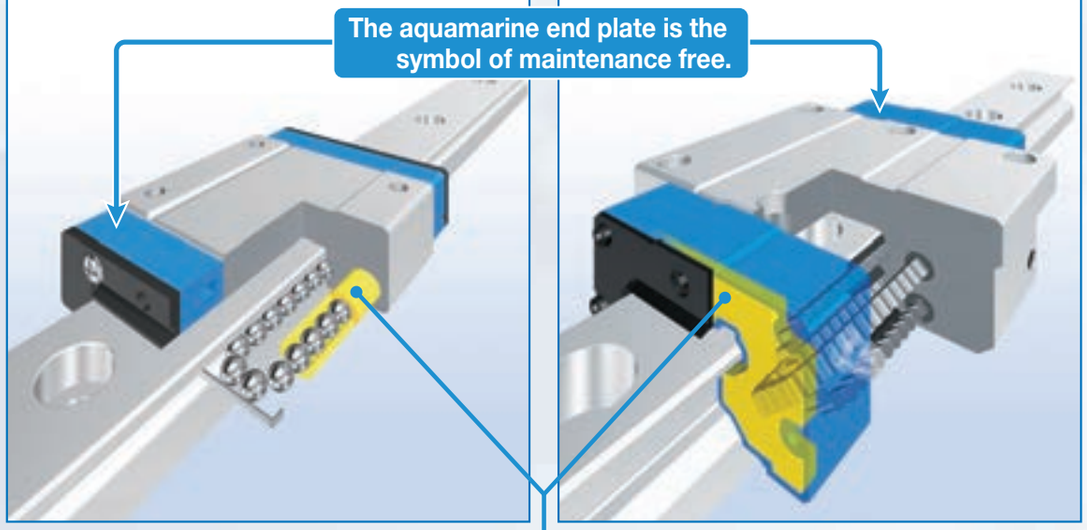
Oil Minimum
IKO Gentle to The Earth

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

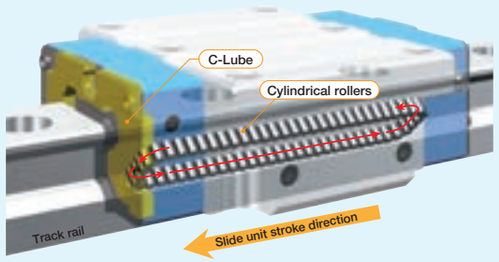
C-Lube Linear Roller Way



C-Lube integrated

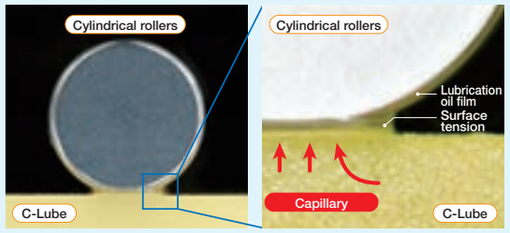
Lubrication oil is carried through circulation of rolling elements

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

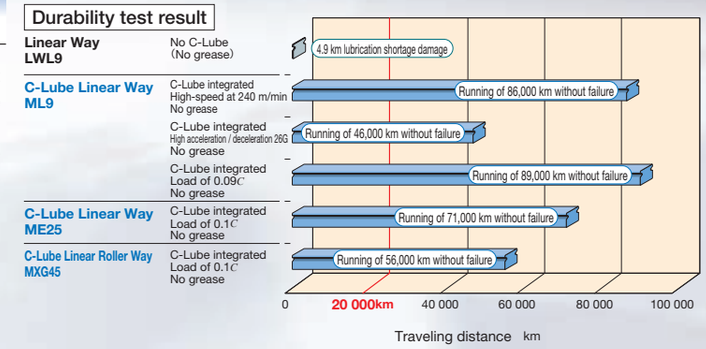
Maintenance free

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

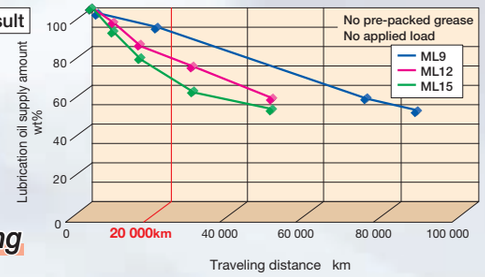


Eco-friendly

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!

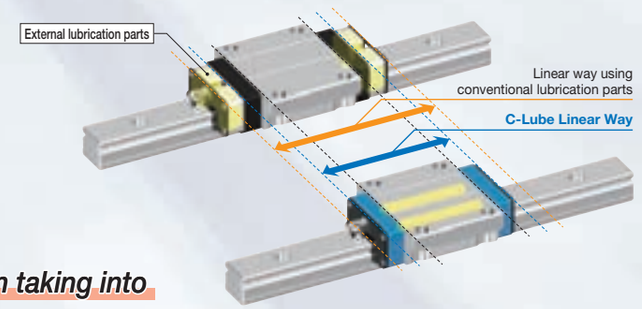
Oil supply test result



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!

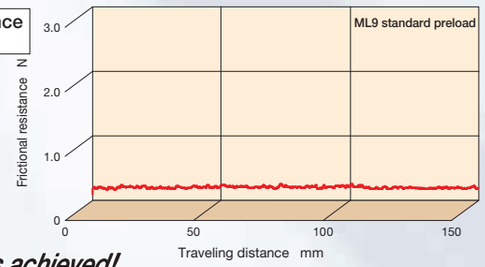


Smooth

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



M

A variety of models and size variations



Ball Type Miniature Series

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

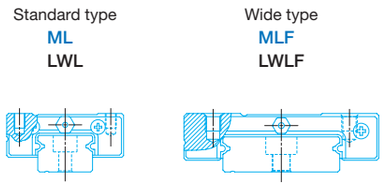
Thanks to the structure with two rows of balls to contact with the way at four points, stable accuracy and rigidity can be achieved even in applications where load has variable direction and size or complex load is applied, despite its very small body.



Micro Linear Way L

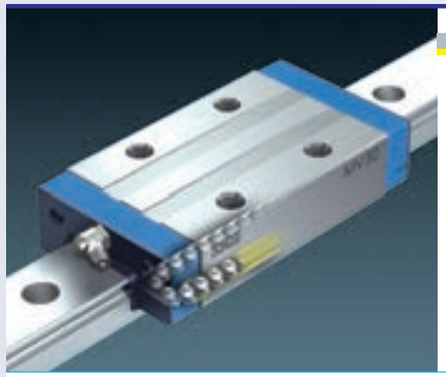
As the lineup of track rail width from 1 mm to 6 mm is available, you can select an optimal product for the specifications of your machine and device. For LWL1, world's smallest size is realized: track rail width of 1 mm, slide unit width of 4 mm and assembly height of 2.5 mm.

Standard type	Wide type
ML LWL	MLF LWLF



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

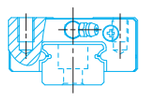
Size	
Standard type	1, 2, 3, 5, 7, 9, 12, 15, 20, 25
Wide type	4, 6, 10, 14, 18, 24, 30, 42



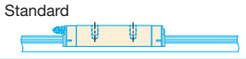
Ball Type Low Profile/Light Weight Series

C-Lube Linear Way MV

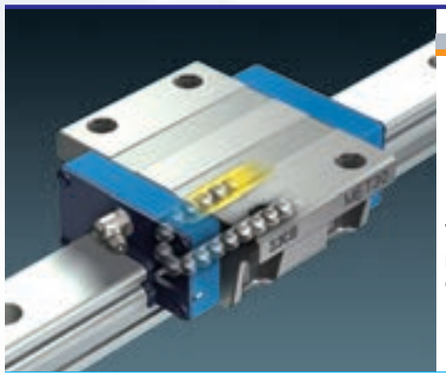
Despite its extra low profile and extra light weight, this linear motion rolling guide has the maximum load rating among the ball types while achieving high load capacity.



Length of slide unit	
Standard	



Size
20, 25, 30

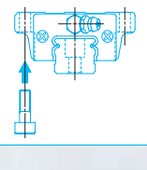


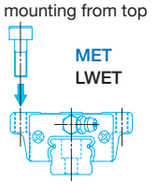
Ball Type Compact Series

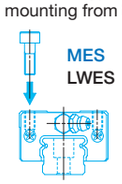
C-Lube Linear Way ME
Linear Way E
Low Decibel Linear Way E

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	Flange type mounting from top	Block type mounting from top
ME LWE	MET LWET	MES LWES

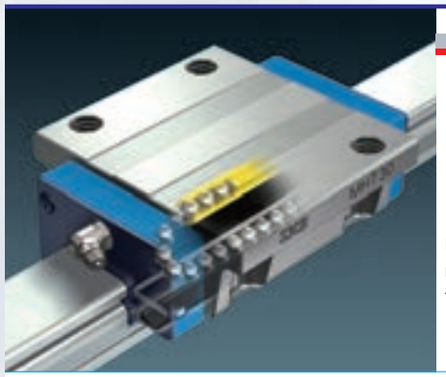






Length of slide unit	
C	Short
No symbol	Standard
G	Long

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

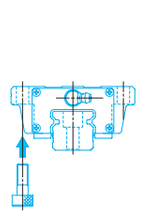


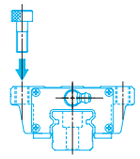
Ball Type High Rigidity Series

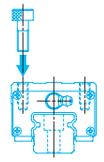
C-Lube Linear Way MH
Linear Way H

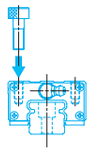
High rigidity linear motion rolling guides designed to evenly support high load capacity by incorporating large-diameter balls. Stable accuracy and rigidity can be achieved even in applications where load with variable direction and size and complex load are applied.

Flange type mounting from bottom	Flange type mounting from top[1]	Block type mounting from top	Compact block type mounting from top
MH LWH	MHT LWHT	MHD LWHD	MHS LWHS









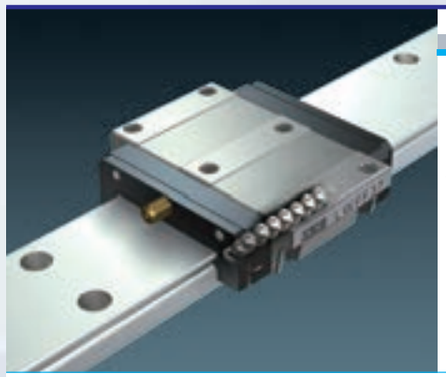
Note [1] Some models may be mounted from bottom.

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

M

A variety of models and size variations

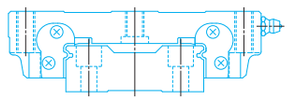


Ball Type Wide Type Series

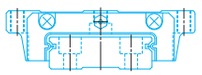
Linear Way F

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.

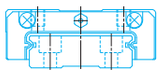
Flange type
mounting from top / bottom
LWFH



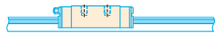
Flange type
mounting from top / bottom
LWFF



Block type
mounting from top
LWFS



Length of slide unit	
No symbol	Standard



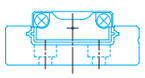
Size	
LWFH	40,60,90
LWFF	33,37,42,69
LWFS	33,37,42

Ball Type U-Shaped Track Rail Series

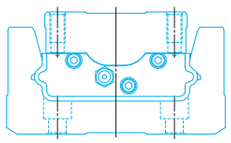
C-Lube Linear Way MUL
Linear Way U

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

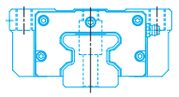


Roller Type

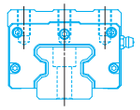
C-Lube Linear Roller Way Super MX
Linear Roller Way Super X

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.

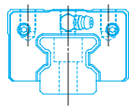
Flange type
mounting from top / bottom
MX(1)
LRX(1)



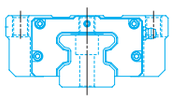
Block type
mounting from top
MXD
LRXD



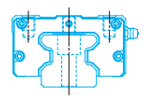
Compact block type
mounting from top
MXS
LRXS



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



M

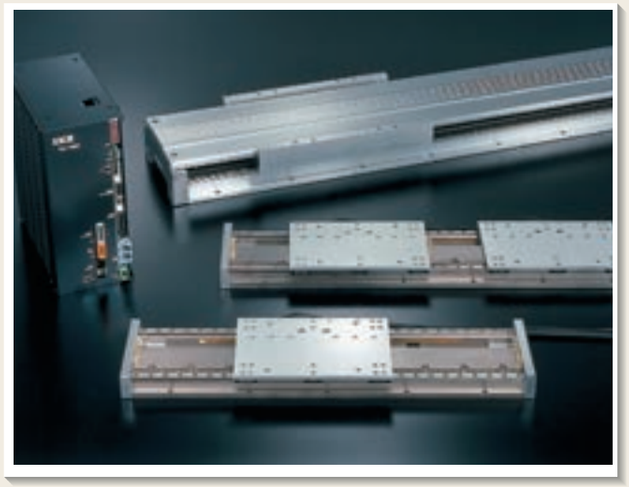
Mechatronics Series

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

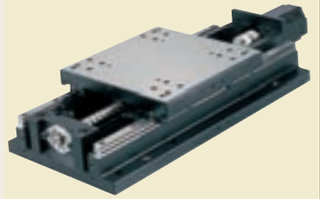
- Standard type which has been practically used in many fields.
- Stable characteristics in parallel use together with Linear Way



TSL···M

High-rigidity Series

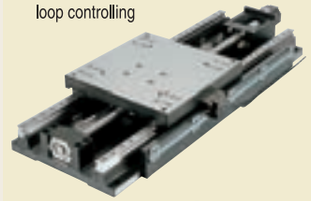
- High reliability and high accuracy with component parts strictly selected
- High rigidity and large mounting weight



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

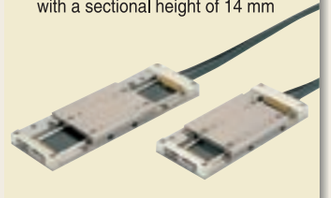
- Very compact positioning table that is 20mm high(sectional) and 17mm wide driven by a ground ball screw.
- +/-0.5micron repeatability is achieved with 60 mm stroke length.



TM

Nano Linear

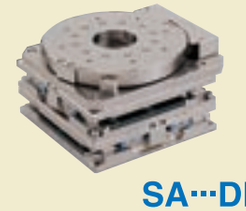
- Direct drive type with high speed and high response
- Maximum thrust of 25 N achieved with a sectional height of 14 mm



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

M

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

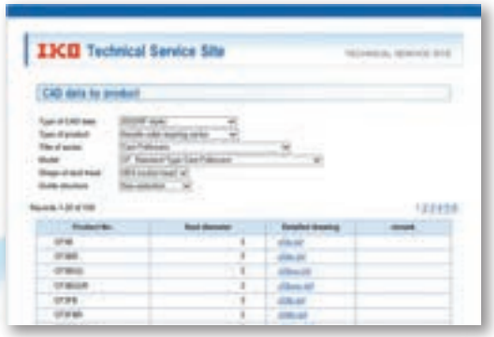
By selecting such specification as model code, dimensions, part code, material code, preload symbol, classification symbol, interchangeable code and supplemental code of Linear ways/Linear roller ways, you can easily specify the identification number used for ordering.
Also you can browse the CAD data 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

A

AR	L21	Cir-clips for Needle Roller Bearings
AS	F7	Thrust Bearings
AZ	F11	Thrust Bearings
AZK	F11	Thrust Bearings

B

BA···Z	B27	Shell Type Needle Roller Bearings
BAM	B27	Shell Type Needle Roller Bearings
BAMW	B45	Shell Type Needle Roller Bearings
BAW···Z	B45	Shell Type Needle Roller Bearings
BHA···Z	B27	Shell Type Needle Roller Bearings
BHAM	B27	Shell Type Needle Roller Bearings
BR	D47	Machined Type Needle Roller Bearings
BR···UU	D67	Machined Type Needle Roller Bearings
BRI	D51	Machined Type Needle Roller Bearings
BRI···UU	D71	Machined Type Needle Roller Bearings

C

CF···B	I25	Cam Followers
CF···BM	I25	Cam Followers
CF···BR	I25	Cam Followers
CF···BRM	I25	Cam Followers
CF···BUU	I25	Cam Followers
CF···BUUM	I25	Cam Followers
CF···BUUR	I25	Cam Followers
CF···BUURM	I25	Cam Followers
CF···FB	I29	Cam Followers
CF···FBR	I29	Cam Followers
CF···FBUU	I29	Cam Followers
CF···FBUUR	I29	Cam Followers
CF···FWBR	I47	Cam Followers
CF···FWBUUR	I47	Cam Followers
CF···G	I53	Cam Followers
CF···VB	I27	Cam Followers
CF···VBM	I27	Cam Followers
CF···VBR	I27	Cam Followers
CF···VBRM	I27	Cam Followers
CF···VBUU	I27	Cam Followers
CF···VBUUM	I27	Cam Followers
CF···VBUUR	I27	Cam Followers
CF···VBUURM	I27	Cam Followers
CF···WBR	I45	Cam Followers
CF···WBUUR	I45	Cam Followers
CF···WBUUR/SG	I55	C-Lube Cam Followers
CF−FU1	I49	Cam Followers
CF−RU1	I49	Cam Followers
CF−SFU···B	I51	Cam Followers
CFC···B	I57	Short Stud Type Cam Followers
CFE···B	I35	Cam Followers
CFE···BR	I35	Cam Followers
CFE···BUU	I35	Cam Followers
CFE···BUUR	I35	Cam Followers
CFE···VB	I37	Cam Followers
CFE···VBR	I37	Cam Followers
CFE···VBUU	I37	Cam Followers
CFE···VBUUR	I37	Cam Followers
CFES···B	I43	Cam Followers
CFES···BR	I43	Cam Followers
CFES···BUU	I43	Cam Followers
CFES···BUUR	I43	Cam Followers
CFKR	I31	Cam Followers
CFKR···R	I31	Cam Followers
CFKR···V	I33	Cam Followers
CFKR···VR	I33	Cam Followers
CFKR···VUU	I33	Cam Followers
CFKR···VUUR	I33	Cam Followers
CFKR···UU	I31	Cam Followers
CFKR···UUR	I31	Cam Followers
CFKRE	I39	Cam Followers
CFKRE···R	I39	Cam Followers
CFKRE···V	I41	Cam Followers
CFKRE···VR	I41	Cam Followers
CFKRE···VUU	I41	Cam Followers
CFKRE···VUUR	I41	Cam Followers
CFKRE···UU	I39	Cam Followers
CFKRE···UUR	I39	Cam Followers
CFS	I59	Miniature Type Cam Followers
CFS···F	I61	Miniature Type Cam Followers
CFS···FW	I65	Miniature Type Cam Followers
CFS···FV	I61	Miniature Type Cam Followers
CFS···V	I59	Miniature Type Cam Followers
CFS···W	I63	Miniature Type Cam Followers
CFS···WV	I63	Miniature Type Cam Followers
CL	I22	C-Lube Unit for Cam Followers
CR	I71	Cam Followers
CR···B	I69	Cam Followers
CR···BR	I69	Cam Followers
CR···BUU	I69	Cam Followers
CR···BUUR	I69	Cam Followers
CR···R	I71	Cam Followers
CR···UU	I71	Cam Followers
CR···UUR	I71	Cam Followers
CR···V	I77	Cam Followers
CR···VB	I73	Cam Followers
CR...VBS	I75	Cam Followers
CR...VBSR	I75	Cam Followers
CR···VBR	I73	Cam Followers
CR···VBUU	I73	Cam Followers
CR···VBUUR	I73	Cam Followers
CR···VR	I77	Cam Followers
CR···VUU	I77	Cam Followers
CR···VUUR	I77	Cam Followers
CRB	J19	Crossed Roller Bearings
CRB···UU	J19	Crossed Roller Bearings
CRBC	J19	Crossed Roller Bearings
CRBC···UU	J19	Crossed Roller Bearings
CRBFV	J17	Crossed Roller Bearings
CRBHV···A	J15	Crossed Roller Bearings
CRBHV···AUU	J15	Crossed Roller Bearings
CRBS	J27	Crossed Roller Bearings
CRBS···AUU	J27	Crossed Roller Bearings
CRBS···V	J27	Crossed Roller Bearings
CRBS···VUU	J27	Crossed Roller Bearings
CRBT···A	J23	Crossed Roller Bearings
CRBTF···A	J25	Crossed Roller Bearings
CRH···VB	I79	Cam Followers
CRH···VBR	I77	Cam Followers
CRH···VBUU	I79	Cam Followers
CRH···VBUUR	I77	Cam Followers
CRY···V	I105	Roller Followers
CRY···VR	I103	Roller Followers
CRY···VUU	I105	Roller Followers
CRY···VUUR	I103	Roller Followers

D

DS	L4	Seals for Needle Roller Bearings

G

GE···E	K15	Spherical Bushings
GE···EC	K27	Spherical Bushings
GE···EC−2RS	K27	Spherical Bushings
GE···ES	K15	Spherical Bushings
GE···ES−2RS	K15	Spherical Bushings
GE···G	K19	Spherical Bushings

IKO

Index of Model Codes

Index of Model Codes

GE···GS	K19	Spherical Bushings
GE···GS−2RS	K19	Spherical Bushings
GS	F7	Thrust Bearings
GTR	D9	Machined Type Needle Roller Bearings
GTRI	D31	Machined Type Needle Roller Bearings

I

IRB	H10	Inner Rings
IRT	H5	Inner Rings

K

KT	C5	Needle Roller Cages for General Usage
KT···EG	C21	Needle Roller Cages for Engine Connecting Rods
KTV···EG	C22	Needle Roller Cages for Engine Connecting Rods
KTW	C9	Needle Roller Cages for General Usage

L

LHS	K51	L-Balls
LHSA	K49	L-Balls
LRB	H25	Inner Rings
LRBZ···B	H25	Inner Rings
LRT	H13	Inner Rings
LRTZ	H13	Inner Rings

N

NA 48	D41	Machined Type Needle Roller Bearings
NA 49	D29	Machined Type Needle Roller Bearings
NA 49···UU	D61	Machined Type Needle Roller Bearings
NA 69	D29	Machined Type Needle Roller Bearings
NA 69···UU	D61	Machined Type Needle Roller Bearings
NAF	D89	Needle Roller Bearings with Separable Cage
NAFW	D89	Needle Roller Bearings with Separable Cage
NAG 49	E7	Roller Bearings
NAG 49···UU	E13	Roller Bearings
NART···FR	I99	Roller Followers
NART···FUUR	I99	Roller Followers
NART···R	I95	Roller Followers
NART···UUR	I95	Roller Followers
NART···UUR/SG	I101	C-Lube Roller Followers
NART···VR	I95	Roller Followers
NART···VUUR	I95	Roller Followers
NAS 50···UUNR	E19	Roller Bearings
NAS 50···ZZNR	E19	Roller Bearings
NAST	I92	Roller Followers
NAST···R	I92	Roller Followers
NAST···ZZ	I93	Roller Followers
NAST···ZZR	I93	Roller Followers
NAST···ZZUU	I93	Roller Followers
NAST···ZZUUR	I93	Roller Followers
NATA 59	G9	Combined Type Needle Roller Bearings
NATB 59	G9	Combined Type Needle Roller Bearings
NAU 49	E7	Roller Bearings
NAU 49···UU	E13	Roller Bearings
NAX	G5	Combined Type Needle Roller Bearings
NAX···Z	G5	Combined Type Needle Roller Bearings
NAXI	G7	Combined Type Needle Roller Bearings
NAXI···Z	G7	Combined Type Needle Roller Bearings
NBX	G5	Combined Type Needle Roller Bearings
NBX···Z	G5	Combined Type Needle Roller Bearings
NBXI	G7	Combined Type Needle Roller Bearings
NBXI···Z	G7	Combined Type Needle Roller Bearings
NTB	F7	Thrust Needle bearings
NUCF···BR	I67	Cam Followers
NURT	I103	Roller Followers
NURT···R	I103	Roller Followers

Index of Model Codes

O

OS	L3	Seals for Needle Roller Bearings

P

PB	K37	PILLOBALLs
PHS	K38	PILLOBALLs
PHS···EC	K43	PILLOBALLs
PHSA	K42	PILLOBALLs
PHSB	K40	PILLOBALLs
POS	K39	PILLOBALLs
POSB	K41	PILLOBALLs
POS···EC	K44	PILLOBALLs
PRC	K53	PILLOBALLs

R

RNA 48	D23	Machined Type Needle Roller Bearings
RNA 49	D7	Machined Type Needle Roller Bearings
RNA 49···UU	D55	Machined Type Needle Roller Bearings
RNA 69	D9	Machined Type Needle Roller Bearings
RNA 69···UU	D55	Machined Type Needle Roller Bearings
RNAF	D83	Needle Roller Bearings with Separable Cage
RNAFW	D83	Needle Roller Bearings with Separable Cage
RNAST	I91	Roller Followers
RNAST···R	I91	Roller Followers

S

SB	K11	Spherical Bushings
SB···A	K11	Spherical Bushings
SBB	K23	Spherical Bushings
SBB···−2RS	K23	Spherical Bushings
SNA	K58	Super Flexible Nozzle
SNM	K59	Super Flexible Nozzle
SNPT	K59	Super Flexible Nozzle

T

TA···Z	B7	Shell Type Needle Roller Bearings
TAF	D7	Machined Type Needle Roller Bearings
TAF···/SG	D77	C-Lube Machined Type Needle Roller Bearings
TAFI	D29	Machined Type Needle Roller Bearings
TAM	B7	Shell Type Needle Roller Bearings
TAMW	B21	Shell Type Needle Roller Bearings
TAW···Z	B21	Shell Type Needle Roller Bearings
TLA···UU	B49	Shell Type Needle Roller Bearings
TLA···Z	B7	Shell Type Needle Roller Bearings
TLAM	B7	Shell Type Needle Roller Bearings
TLAMW	B17	Shell Type Needle Roller Bearings
TLAW···Z	B17	Shell Type Needle Roller Bearings
TR	D9	Machined Type Needle Roller Bearings
TRI	D31	Machined Type Needle Roller Bearings
TRU	E7	Roller Bearings
TRU···UU	E13	Roller Bearings

W

WR	L19	Cir-clips for Needle Roller Bearings
WS	F7	Thrust Bearings

Y

YB	B27	Shell Type Needle Roller Bearings
YBH	B29	Shell Type Needle Roller Bearings
YT	B7	Shell Type Needle Roller Bearings
YTL	B7	Shell Type Needle Roller Bearings

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

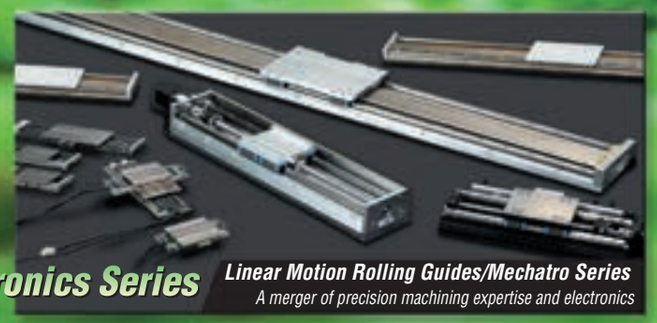
We have developed lubricating parts impregnated with a large amount of lubricant as C-Lube Series to save the customer's oiling management workload and built them into bearings and linear motion rolling guides.
The C-Lube Series not only keeps products maintenance-free for long by giving them an optimal 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

M

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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

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