KOYO

Ball & Roller Bearings — Popular Sizes

کاتالوگ سایزهای پرکاربرد بلبرینگ KOYO

استعلام قیمت و خرید بلبرینگ KOYO ←

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BALL & ROLLER BEARINGS

POPULAR SIZE

ISO 9001/QS-9000
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KOYO SEIKO CO., LTD.

CAT.NO.203E-1

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Koyo

- **Technical section**
  1. Structures and types
  2. Internal clearance
  3. Bearing numbers
  4. Handling of bearings
- **Bearing specification tables**
  - Deep groove ball bearings *d* 3 – 200 mm
  - Angular contact ball bearings *d* 10 – 200 mm
  - Self-aligning ball bearings *d* 10 – 100 mm
  - Cylindrical roller bearings *d* 20 – 200 mm
  - Tapered roller bearings *d* 15 – 200 mm
  - Spherical roller bearings *d* 25 – 300 mm
  - Thrust ball bearings *d* 10 – 200 mm
  - Spherical thrust roller bearings *d* 60 – 300 mm
  - Ball bearing units *d* 10 – 140 mm
  - Locknuts and lockwashers
- **Supplementary tables**
- **Products information**

Koyo®

BALL & ROLLER BEARINGS

POPULAR SIZE

CAT. NO. 203E-1

● VALUE & TECHNOLOGY

- Standard ball and roller bearings

- Ball bearing units

- Locknuts

- Lockwashers

Introduction

This catalogue is prepared to show most popular ball and roller bearings used in various applications. These bearings are generally available from stock.

As the technical information mentioned in this catalogue is limited, when more detailed information is required for new design of application, it is recommended that the KOYO General Catalogue is referred.

For trouble free operation of the application, it is recommended to keep the bearings in proper condition avoiding from extreme high or low temperature, wet, contamination, hitting, dropping, etc..
Also proper handling and maintenance are required at mounting, regular inspection, overhaul, and dismounting by the use of suitable tools, jigs and lubricant.

*For improvements, as well as other reasons, the contents of this catalogue are subject to change without prior notice.

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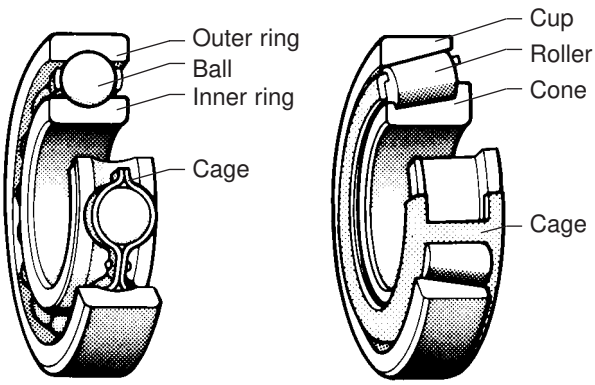
1. Rolling bearing structures and types

1-1 Structure

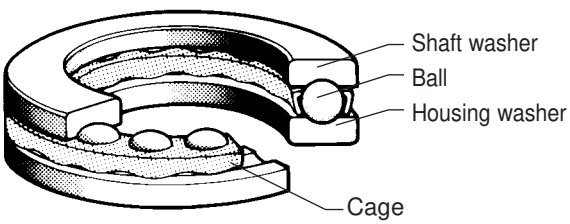
Rolling bearings (bearings hereinafter) normally comprise bearing rings, rolling elements and a cage (see Fig. 1-1).

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

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



Deep groove ball bearing Tapered roller bearing



Thrust ball bearing

Note) In thrust bearings inner and outer rings and also called "shaft washer" and "housing washer" respectively; in tapered roller bearings, the respective forms are "cone" and "cup."

Fig. 1-1 Bearing structure

1) Bearing rings

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

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

2) Rolling element

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

- Ball
- Cylindrical roller ($L_w \leq 3D_w$)[1)]
- Long cylindrical roller ($3D_w < L_w < 10D_w$, $D_w > 5$ mm)[1)]
- Needle roller ($3D_w < L_w < 10D_w$, $D_w \leq 5$ mm)[1)]
- Tapered roller (tapered trapezoid)
- Convex roller (barrel shape)

Note 1) L_w : roller length (mm)
D_w : roller diameter (mm)

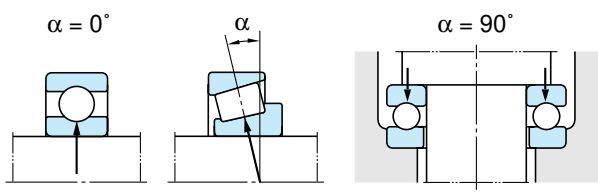
3) Cage

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

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

1-2 Type

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



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

- Radial bearings (0˚ ≤ α ≤ 45˚)
  ... designed to accommodate mainly radial load.
- Thrust bearings (45˚ < α ≤ 90˚)
  ... designed to accommodate mainly axial load.

Rolling bearings are classified in Fig. 1-2, and characteristics of each bearing type are described in Tables 1-1 to 1-8.

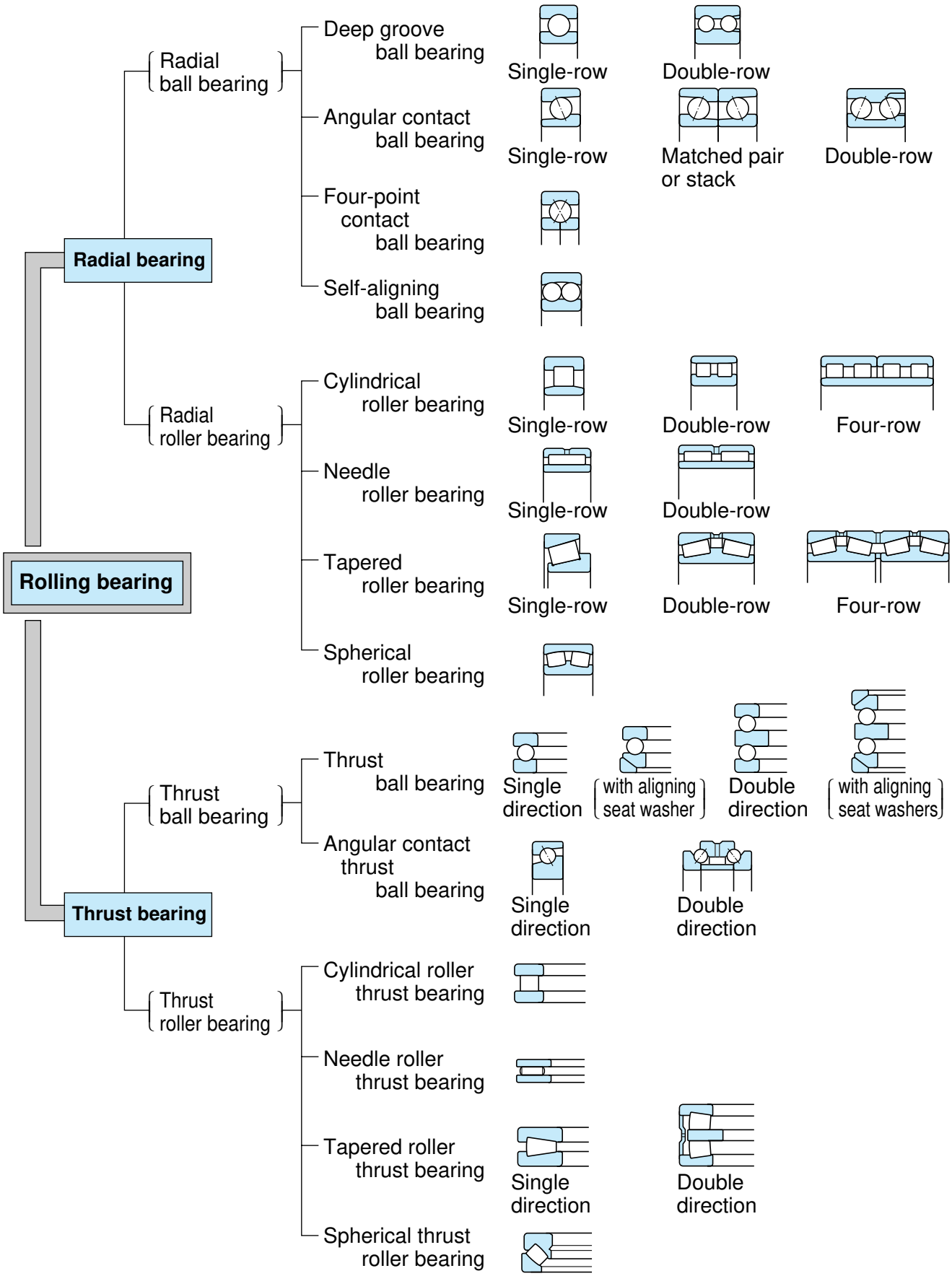
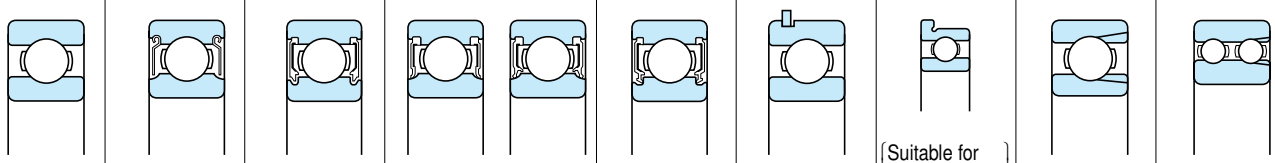


Fig. 1-2 Rolling bearings

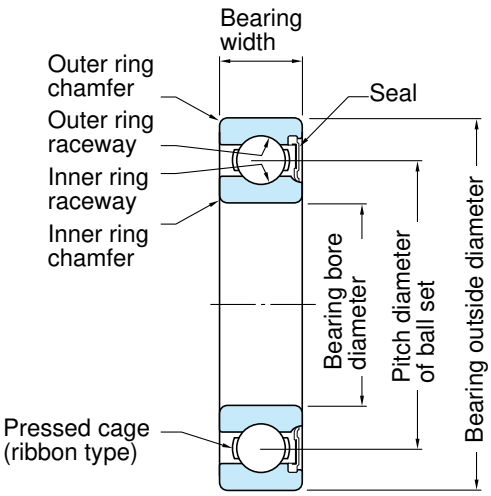
Table 1-1 Deep groove ball bearings

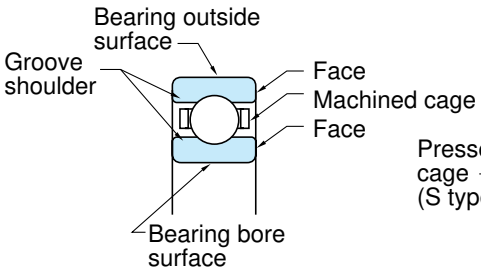
Single-row								Double-row
Open type	Shielded type	Non-contact sealed type	Contact sealed type	Extremely light contact sealed type	With locating snap ring	Flanged type	Maximum type	
								
	ZZ	2RU	2RS 2RK	2RD	NR	Suitable for extra-small or miniature bearing		
680, 690, 600, 620, 630, (ML), (OB) ... Extra-small, miniature bearing 6800, 6900, 16000, 6000, 6200, 6300, 6400							M6200 M6300	4200 4300

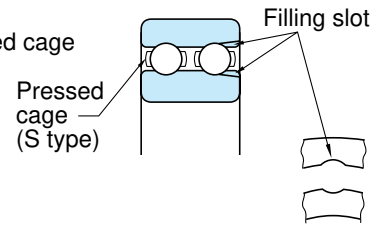
- The most popular types among rolling bearings, widely used in a variety of industries.
- Radial load and axial load in both directions can be accommodated.
- Suitable for operation at high speed, with low noise and low vibration.
- Sealed bearings employing steel shields or rubber seals are filled with the appropriate volume of grease when manufactured.
- Bearings with a flange or locating snap ring attached on the outer ring are easily mounted in housings for simple positioning of housing location.
- In spite of having the same boundary dimensions as standard bearings, maximum type bearings have a higher load rating because a filling slot on each of the inner and outer rings, allows a greater number of balls to be inserted than do standard bearings.

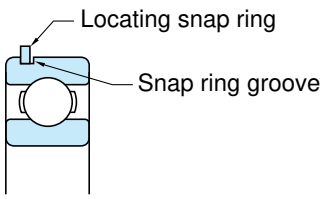
[Recommended cages] Pressed steel cage (ribbon types, snap type ...single-row, S type ...double-row), copper alloy or phenolic resin machined cage, synthetic resin molded cage

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





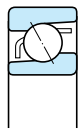
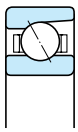
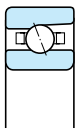
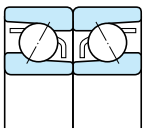
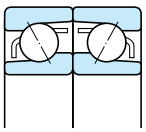
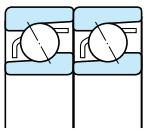
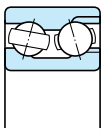
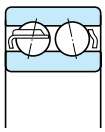




Bearing size (Reference) Unit mm

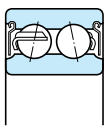
Connotation	Bore diameter	Outside diameter
Miniature	–	Under 9
Extra-small	Under 10	9 or more
Small size	10 or more	80 or less
Medium size	–	80 – 180
Large size	–	180 – 800
Extra-large size	–	Over 800

Table 1-2 Angular contact ball bearings

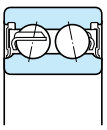
Single-row			Matched pair			Double-row	
		For high-speed use	Back-to-back arrangement	Face-to-Face arrangement	Tandem arrangement		
							
With pressed cage	With machined cage	ACH	DB	DF	DT	(With filling slot)	
7000 , 7200 , 7300 , 7400 ..... Contact angle 30˚ 7000B, 7200B, 7300B, 7400B ..... 40˚ 7900C, 7000C, 7200C, 7300C, ACH900C, ACH000C ..... 15˚						3200 3300 Contact angle 32˚	5200 5300 Contact angle 24˚

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

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



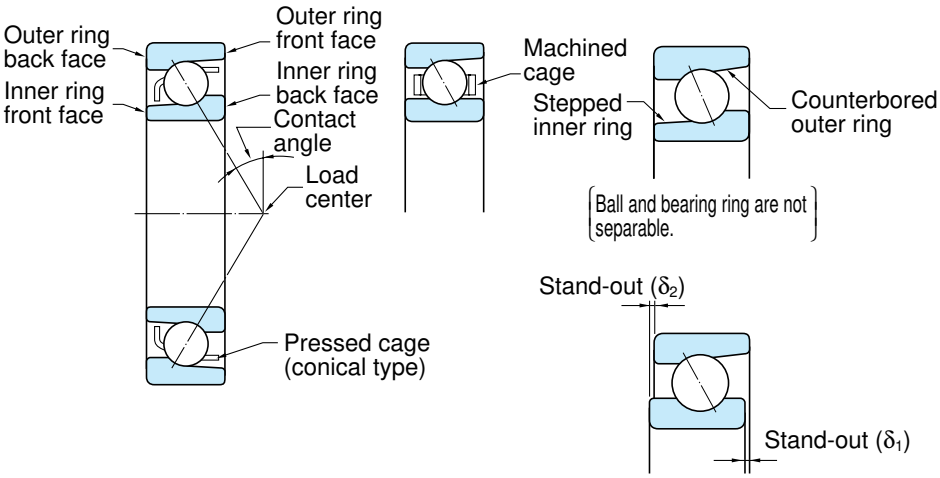
ZZ (Shielded)



2RS (Sealed)

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

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

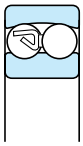
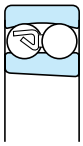


Contact angles of Koyo bearings (Reference)

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

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

Table 1-3 Self-aligning ball bearings

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

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

[Recommended cages]
Pressed steel cage
- staggered type .... 12, 13, 22...2RS, 23...2RS
- snap type 22, 23

[Main applications]
Power transmission shaft of wood working and spinning machines, plummer blocks

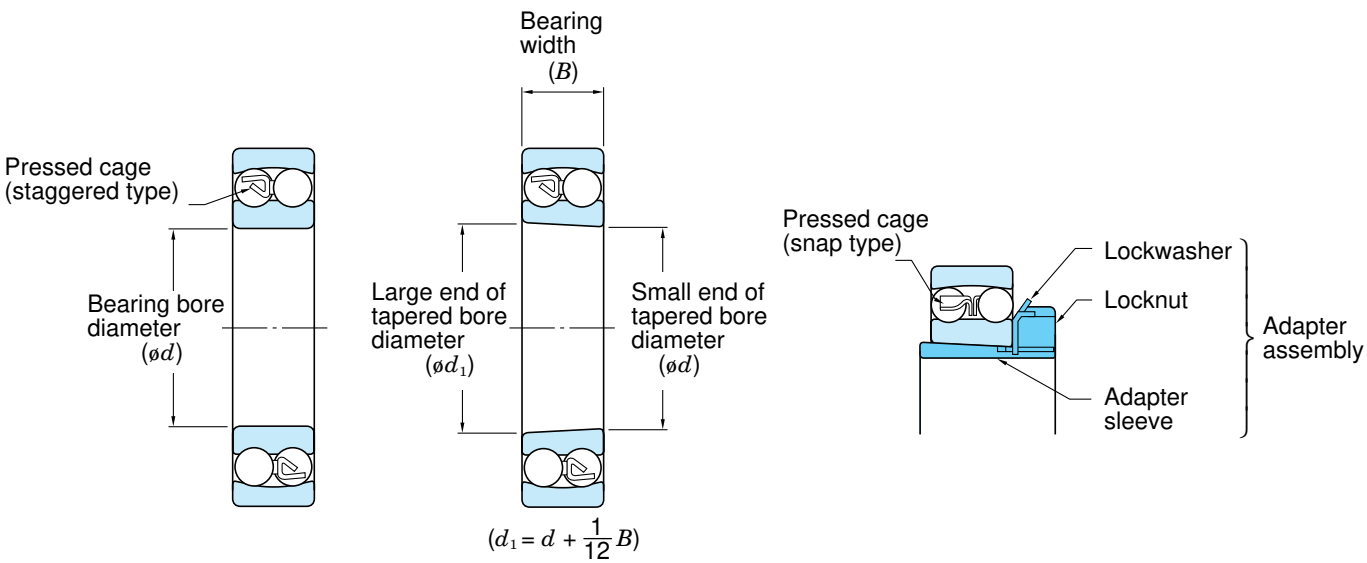
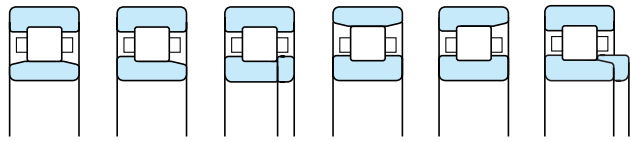
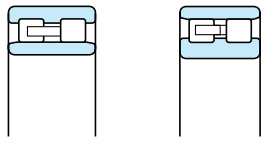
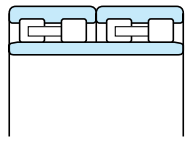


Table 1-4 Cylindrical roller bearings

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

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

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

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

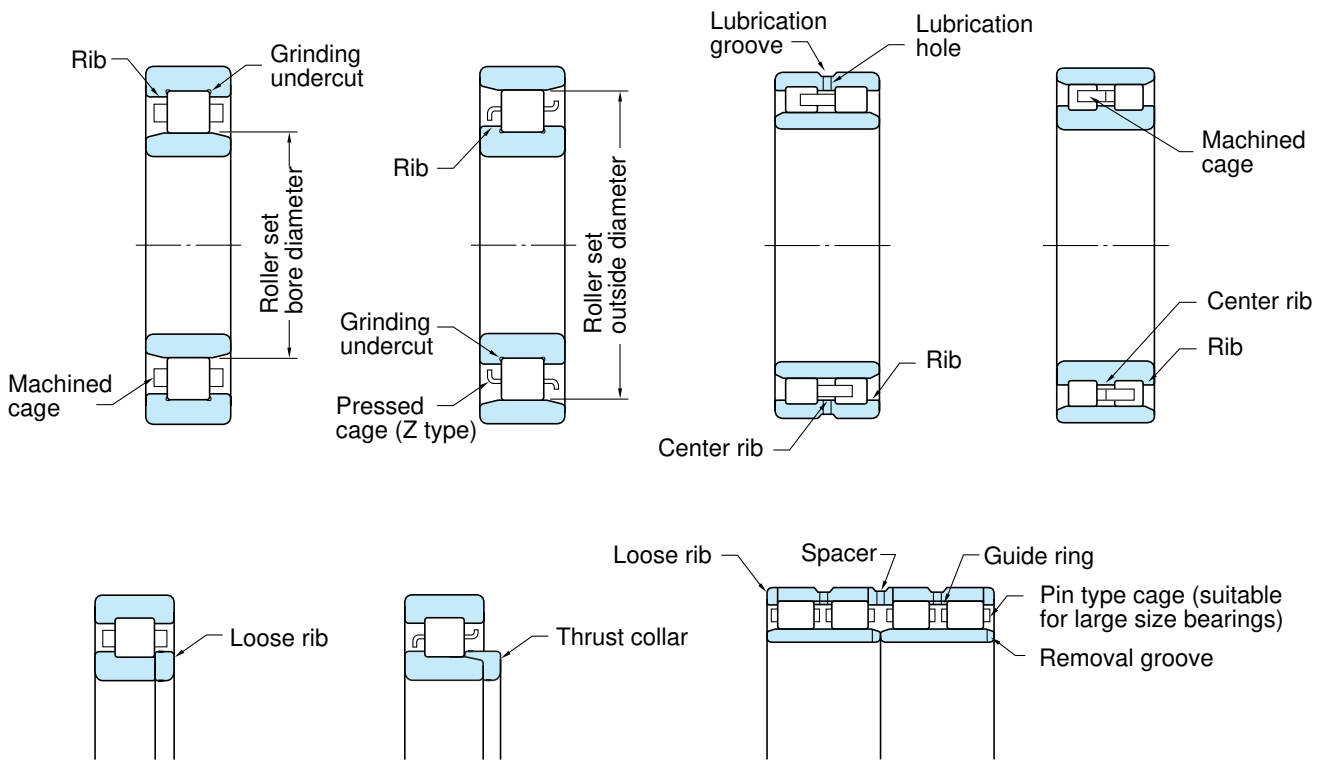
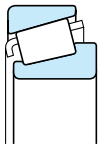
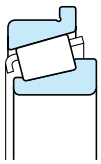
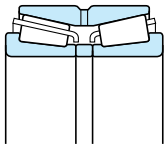
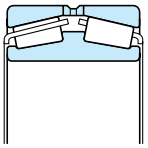
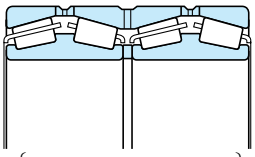


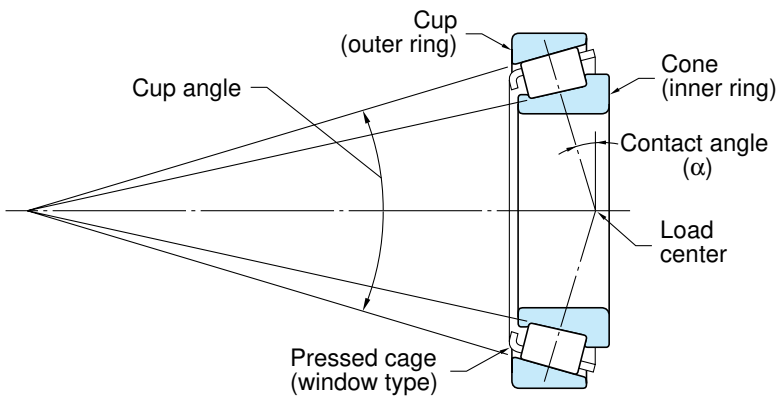
Table 1-5 Tapered roller bearings

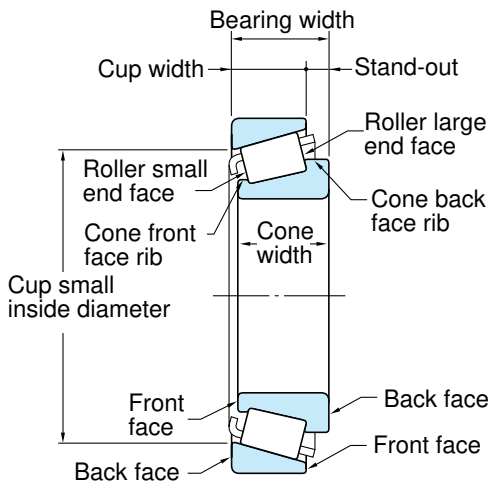
Single-row				Double-row		Four-row
		 Flanged type		 TDO type	 TDI type	 Mainly used on rolling mill roll neck
Standard contact angle		Intermediate contact angle	Steep contact angle			
32900JR	30200JR	30200CR	30300DJ	46200	45200	37200
32000JR	32200JR	32200CR	30300DJR	46200A	45300	47200
33000JR	33200JR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

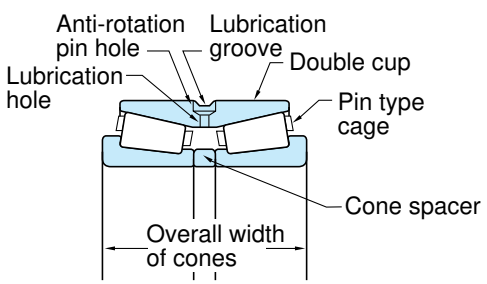
- Tapered rollers assembled in the bearings are guided by the cone back face rib.
- The raceway surfaces of cone and cup and the rolling contact surface of rollers are designed so that the respective apexes converge at a point on the bearing center line.
- Single-row bearings can accommodate radial load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

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

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







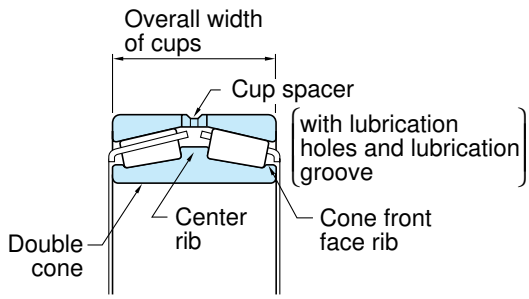
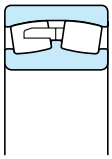
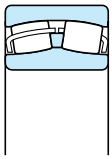
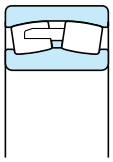
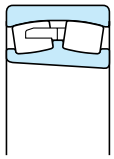


Table 1-6 Spherical roller bearings

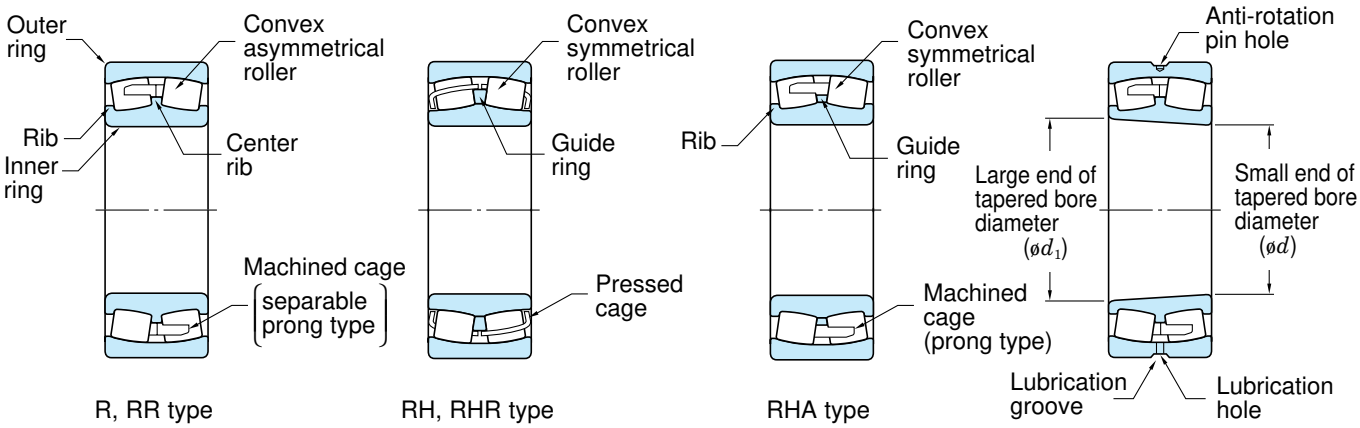
Cylindrical bore			Tapered bore
Convex asymmetrical roller type	Convex symmetrical roller type		
			
R, RR	RH, RHR	RHA	K or K30

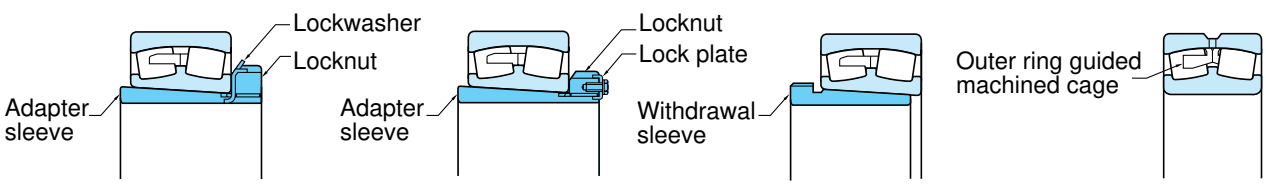
23900R, 23000R (RH, RHA), 23100R (RH, RHA), 22200R (RH, RHA), 21300R (RH)
24000R (RH, RHA), 24100R (RH, RHA), 23200R (RH, RHA), 22300R (RH, RHA)

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

[Recommended cages] Copper alloy machined cage, pressed steel cage, pin type cage, synthetic resin molded cage

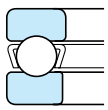
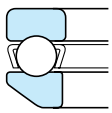
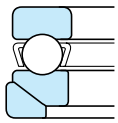
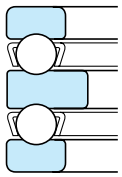
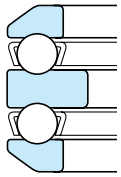
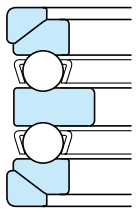
[Main applications] Paper manufacturing equipment, speed reducers, railway rolling stock axle journals, rolling mill pinion stands, table rollers, crushers, shaker screens, printing equipment, wood working equipment, speed reducers for various industrial uses, plummer blocks





(Bore diameter ≤ 180 mm) (Bore diameter ≥ 200 mm) (For shaker screen)

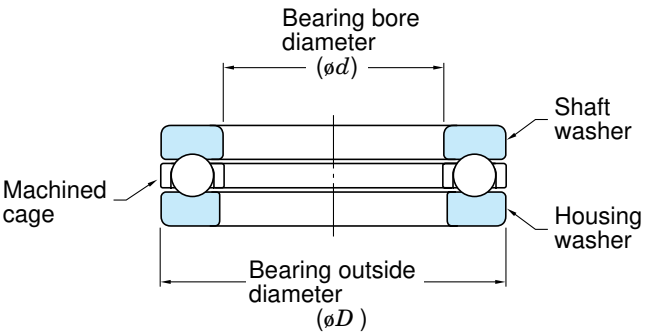
Table 1-7 Thrust ball bearings

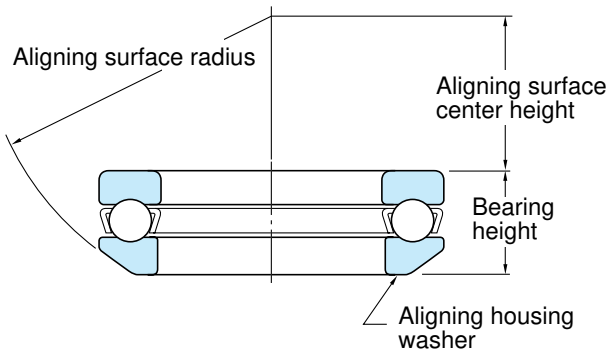
Single direction			Double direction		
With flat back faces	With spherical back face	With aligning seat washer	With flat back faces	With spherical back faces	With aligning seat washers
					
51100 51200 51300 51400	– 53200 53300 53400	– 53200U 53300U 53400U	– 52200 52300 52400	– 54200 54300 54400	– 54200U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

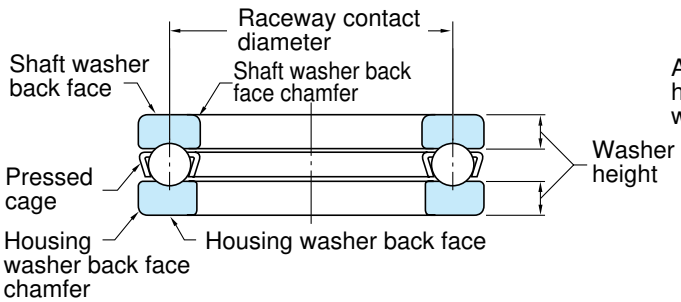
- This type of bearing comprises washer-shaped rings with raceway groove and ball and cage assembly.
- Washers to be mounted on shafts are called shaft washers (or inner rings); and, washers to be mounted into housings are housing washers (or outer rings).
  Central washers of double direction bearings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

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

[Main applications] Automobile king pins, machine tool spindles







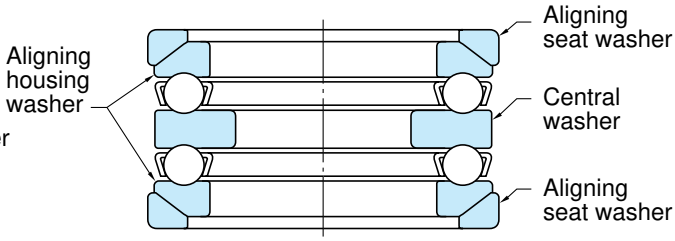
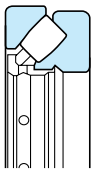


Table 1-8 Spherical thrust roller bearings

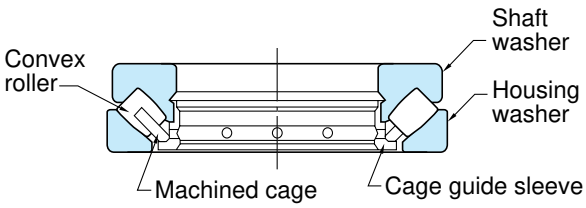


29200
29300
29400

- This type of bearing, comprising barrel-shaped convex rollers arranged at an angle with the axis, is self-aligning due to spherical housing washer raceway; therefore, shaft inclination can be compensated for to a certain degree.
- Great axial load resistance is provided.
  This type can accommodate a small amount of radial load as well as heavy axial load.
- Normally, oil lubrication is employed.

[Recommended cage]
Copper alloy machined cage

[Main applications]
Hydroelectric generators, vertical motors, propeller shafts for ships, screw down speed reducers, jib cranes, coal mills, pushing machines, molding machines



2. Bearing internal clearance

Table 2-1 Radial internal clearance of deep groove ball bearings (cylindrical bore)

Unit μm

Nominal bore diameter d, mm		Clearance									
		C2		CN		C3		C4		C5	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
2.5	**6**	0	7	2	13	8	23	*14*	*29*	*20*	*37*
6	**10**	0	7	2	13	8	23	14	29	20	37
10	**18**	0	9	3	18	11	25	18	33	25	45
18	**24**	0	10	5	20	13	28	20	36	28	48
24	**30**	1	11	5	20	13	28	23	41	30	53
30	**40**	1	11	6	20	15	33	28	46	40	64
40	**50**	1	11	6	23	18	36	30	51	45	73
50	**65**	1	15	8	28	23	43	38	61	55	90
65	**80**	1	15	10	30	25	51	46	71	65	105
80	**100**	1	18	12	36	30	58	53	84	75	120
100	**120**	2	20	15	41	36	66	61	97	90	140
120	**140**	2	23	18	48	41	81	71	114	105	160
140	**160**	2	23	18	53	46	91	81	130	120	180
160	**180**	2	25	20	61	53	102	91	147	135	200
180	**200**	2	30	25	71	63	117	107	163	150	230
200	**225**	2	35	25	85	75	140	125	195	175	265
225	**250**	2	40	30	95	85	160	145	225	205	300
250	**280**	2	45	35	105	90	170	155	245	225	340
280	**315**	2	55	40	115	100	190	175	270	245	370
315	**355**	3	60	45	125	110	210	195	300	275	410
355	**400**	3	70	55	145	130	240	225	340	315	460

Remarks) 1. For measured clearance, the increase of radial internal clearance caused by the measurement load should be added to the values in the above table for correction. Amounts for correction are as shown below.
Of the amounts for clearance correction in the C2 column, the smaller is applied to the minimum clearance, the larger to the maximum clearance.
2. Values typed in Italics are based on the Koyo standards.

Nominal bore diameter d, mm		Measurement load	Amounts of clearance correction, μm				
over	up to	N	C2	CN	C3	C4	C5
2.5	**18**	24.5	3 – 4	4	4	4	4
18	**50**	49	4 – 5	5	6	6	6
50	**280**	147	6 – 8	8	9	9	9

Table 2-2 Radial internal clearance of extra-small / miniature ball bearings

Unit μm

Clearance code	M1		M2		M3		M4		M5		M6	
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
Clearance	0	5	3	8	5	10	8	13	13	20	20	28

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

Measurement load	Amounts of clearance correction, μm					
N	M1	M2	M3	M4	M5	M6
2.3	1	1	1	1	1	1

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

Table 2-3 Axial internal clearance of matched pair angular contact ball bearings (measurement clearance) [1)]

Unit μm

Nominal bore diameter d, mm		Contact angle : 15°				Contact angle : 30°							
		C2		CN		C2		CN		C3		C4	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
–	10	13	33	33	53	3	14	10	30	30	50	50	70
10	18	15	35	35	55	3	16	10	30	30	50	50	70
18	24	20	40	45	65	3	20	20	40	40	60	60	80
24	30	20	40	45	65	3	20	20	40	40	60	60	80
30	40	20	40	45	65	3	20	25	45	45	65	70	90
40	50	20	40	50	70	3	20	30	50	50	70	75	95
50	65	30	55	65	90	9	27	35	60	60	85	90	115
65	80	30	55	70	95	10	28	40	65	70	95	110	135
80	100	35	60	85	110	10	30	50	75	80	105	130	155
100	120	40	65	100	125	12	37	65	90	100	125	150	175
120	140	45	75	110	140	15	40	75	105	120	150	180	210
140	160	45	75	125	155	15	40	80	110	130	160	210	240
160	180	50	80	140	170	15	45	95	125	140	170	235	265
180	200	50	80	160	190	20	50	110	140	170	200	275	305

Nominal bore diameter d, mm		Contact angle : 40°							
		C2		CN		C3		C4	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.
–	10	2	10	6	18	16	30	26	40
10	18	2	12	7	21	18	32	28	44
18	24	2	12	12	26	20	40	30	50
24	30	2	14	12	26	20	40	40	60
30	40	2	14	12	26	25	45	45	65
40	50	2	14	12	30	30	50	50	70
50	65	5	17	17	35	35	60	60	85
65	80	6	18	18	40	40	65	70	95
80	100	6	20	20	45	55	80	85	110
100	120	6	25	25	50	60	85	100	125
120	140	7	30	30	60	75	105	125	155
140	160	7	30	35	65	85	115	140	170
160	180	7	31	45	75	100	130	155	185
180	200	7	37	60	90	110	140	170	200

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

Table 2-4 Radial internal clearance of double-row angular contact ball bearings

Unit μm

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

Table 2-5 Radial internal clearance of self-aligning ball bearings

Unit μm

Nominal bore diameter d, mm		Cylindrical bore bearing clearance										Tapered bore bearing clearance									
		C2		CN		C3		C4		C5		C2		CN		C3		C4		C5	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
2.5	**6**	1	8	5	15	10	20	15	25	21	33	–	–	–	–	–	–	–	–	–	–
6	**10**	2	9	6	17	12	25	19	33	27	42	–	–	–	–	–	–	–	–	–	–
10	**14**	2	10	6	19	13	26	21	35	30	48	–	–	–	–	–	–	–	–	–	–
14	**18**	3	12	8	21	15	28	23	37	32	50	–	–	–	–	–	–	–	–	–	–
18	**24**	4	14	10	23	17	30	25	39	34	52	7	17	13	26	20	33	28	42	37	55
24	**30**	5	16	11	24	19	35	29	46	40	58	9	20	15	28	23	39	33	50	44	62
30	**40**	6	18	13	29	23	40	34	53	46	66	12	24	19	35	29	46	40	59	52	72
40	**50**	6	19	14	31	25	44	37	57	50	71	14	27	22	39	33	52	45	65	58	79
50	**65**	7	21	16	36	30	50	45	69	62	88	18	32	27	47	41	61	56	80	73	99
65	**80**	8	24	18	40	35	60	54	83	76	108	23	39	35	57	50	75	69	98	91	123
80	**100**	9	27	22	48	42	70	64	96	89	124	29	47	42	68	62	90	84	116	109	144
100	**120**	10	31	25	56	50	83	75	114	105	145	35	56	50	81	75	108	100	139	130	170
120	**140**	10	38	30	68	60	100	90	135	125	175	40	68	60	98	90	130	120	165	155	205
140	**160**	15	44	35	80	70	120	110	161	150	210	45	74	65	110	100	150	140	191	180	240

Table 2-6 Radial internal clearance of electric motor bearings

1) Deep groove ball bearing — Unit μm

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

Note 1) 10 mm is included.

Remark) To adjust for change of clearance due to measuring load, use correction values shown in Table 2-1.

2) Cylindrical roller bearing — Unit μm

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

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

Table 2-7 Radial internal clearance of cylindrical roller bearings and machined ring needle roller bearings

(1) Cylindrical bore bearing

Unit μm

Nominal bore diameter d, mm		Clearance									
		C2		CN		C3		C4		C5	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
–	10	0	25	20	45	35	60	50	75	–	–
10	24	0	25	20	45	35	60	50	75	65	90
24	30	0	25	20	45	35	60	50	75	70	95
30	40	5	30	25	50	45	70	60	85	80	105
40	50	5	35	30	60	50	80	70	100	95	125
50	65	10	40	40	70	60	90	80	110	110	140
65	80	10	45	40	75	65	100	90	125	130	165
80	100	15	50	50	85	75	110	105	140	155	190
100	120	15	55	50	90	85	125	125	165	180	220
120	140	15	60	60	105	100	145	145	190	200	245
140	160	20	70	70	120	115	165	165	215	225	275
160	180	25	75	75	125	120	170	170	220	250	300
180	200	35	90	90	145	140	195	195	250	275	330
200	225	45	105	105	165	160	220	220	280	305	365
225	250	45	110	110	175	170	235	235	300	330	395
250	280	55	125	125	195	190	260	260	330	370	440
280	315	55	130	130	205	200	275	275	350	410	485
315	355	65	145	145	225	225	305	305	385	455	535
355	400	100	190	190	280	280	370	370	460	510	600
400	450	110	210	210	310	310	410	410	510	565	665
450	500	110	220	220	330	330	440	440	550	625	735

(2) Tapered bore bearing

Unit μm

Nominal bore diameter d, mm		Non-interchangeable clearance													
		C9 NA [1]		C1 NA		C2 NA		CN NA		C3 NA		C4 NA		C5 NA	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
12	**14**	5	10	–	–	–	–	–	–	–	–	–	–	–	–
14	**24**	5	10	10	20	20	30	35	45	45	55	55	65	75	85
24	**30**	5	10	10	25	25	35	40	50	50	60	60	70	80	95
30	**40**	5	12	12	25	25	40	45	55	55	70	70	80	95	110
40	**50**	5	15	15	30	30	45	50	65	65	80	80	95	110	125
50	**65**	5	15	15	35	35	50	55	75	75	90	90	110	130	150
65	**80**	10	20	20	40	40	60	70	90	90	110	110	130	150	170
80	**100**	10	25	25	45	45	70	80	105	105	125	125	150	180	205
100	**120**	10	25	25	50	50	80	95	120	120	145	145	170	205	230
120	**140**	15	30	30	60	60	90	105	135	135	160	160	190	230	260
140	**160**	15	35	35	65	65	100	115	150	150	180	180	215	260	295
160	**180**	15	35	35	75	75	110	125	165	165	200	200	240	285	320
180	**200**	20	40	40	80	80	120	140	180	180	220	220	260	315	355
200	**225**	20	45	45	90	90	135	155	200	200	240	240	285	350	395
225	**250**	25	50	50	100	100	150	170	215	215	265	265	315	380	430
250	**280**	25	55	55	110	110	165	185	240	240	295	295	350	420	475
280	**315**	30	60	60	120	120	180	205	265	265	325	325	385	470	530
315	**355**	30	65	65	135	135	200	225	295	295	360	360	430	520	585
355	**400**	35	75	75	150	150	225	255	330	330	405	405	480	585	660
400	**450**	45	85	85	170	170	255	285	370	370	455	455	540	650	735
450	**500**	50	95	95	190	190	285	315	410	410	505	505	600	720	815

Note 1) Clearance C9NA is applied to tapered bore cylindrical roller bearings of JIS tolerance classes 5 and 4.

Table 2-8 Radial internal clearance of spherical roller bearings

(1) Cylindrical bore bearing

Unit μm

Nominal bore diameter d, mm		Clearance									
		C2		CN		C3		C4		C5	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
14	**18**	10	20	20	35	35	45	45	60	60	75
18	**24**	10	20	20	35	35	45	45	60	60	75
24	**30**	15	25	25	40	40	55	55	75	75	95
30	**40**	15	30	30	45	45	60	60	80	80	100
40	**50**	20	35	35	55	55	75	75	100	100	125
50	**65**	20	40	40	65	65	90	90	120	120	150
65	**80**	30	50	50	80	80	110	110	145	145	180
80	**100**	35	60	60	100	100	135	135	180	180	225
100	**120**	40	75	75	120	120	160	160	210	210	260
120	**140**	50	95	95	145	145	190	190	240	240	300
140	**160**	60	110	110	170	170	220	220	280	280	350
160	**180**	65	120	120	180	180	240	240	310	310	390
180	**200**	70	130	130	200	200	260	260	340	340	430
200	**225**	80	140	140	220	220	290	290	380	380	470
225	**250**	90	150	150	240	240	320	320	420	420	520
250	**280**	100	170	170	260	260	350	350	460	460	570
280	**315**	110	190	190	280	280	370	370	500	500	630
315	**355**	120	200	200	310	310	410	410	550	550	690
355	**400**	130	220	220	340	340	450	450	600	600	750
400	**450**	140	240	240	370	370	500	500	660	660	820
450	**500**	140	260	260	410	410	550	550	720	720	900
500	**560**	150	280	280	440	440	600	600	780	780	1 000
560	**630**	170	310	310	480	480	650	650	850	850	1 100
630	**710**	190	350	350	530	530	700	700	920	920	1 190
710	**800**	210	390	390	580	580	770	770	1 010	1 010	1 300
800	**900**	230	430	430	650	650	860	860	1 120	1 120	1 440
900	**1 000**	260	480	480	710	710	930	930	1 220	1 220	1 570

(2) Tapered bore bearing

Unit μm

Nominal bore diameter d, mm		Clearance									
		C2		CN		C3		C4		C5	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
18	**24**	15	25	25	35	35	45	45	60	60	75
24	**30**	20	30	30	40	40	55	55	75	75	95
30	**40**	25	35	35	50	50	65	65	85	85	105
40	**50**	30	45	45	60	60	80	80	100	100	130
50	**65**	40	55	55	75	75	95	95	120	120	160
65	**80**	50	70	70	95	95	120	120	150	150	200
80	**100**	55	80	80	110	110	140	140	180	180	230
100	**120**	65	100	100	135	135	170	170	220	220	280
120	**140**	80	120	120	160	160	200	200	260	260	330
140	**160**	90	130	130	180	180	230	230	300	300	380
160	**180**	100	140	140	200	200	260	260	340	340	430
180	**200**	110	160	160	220	220	290	290	370	370	470
200	**225**	120	180	180	250	250	320	320	410	410	520
225	**250**	140	200	200	270	270	350	350	450	450	570
250	**280**	150	220	220	300	300	390	390	490	490	620
280	**315**	170	240	240	330	330	430	430	540	540	680
315	**355**	190	270	270	360	360	470	470	590	590	740
355	**400**	210	300	300	400	400	520	520	650	650	820
400	**450**	230	330	330	440	440	570	570	720	720	910
450	**500**	260	370	370	490	490	630	630	790	790	1 000
500	**560**	290	410	410	540	540	680	680	870	870	1 100
560	**630**	320	460	460	600	600	760	760	980	980	1 230
630	**710**	350	510	510	670	670	850	850	1 090	1 090	1 360
710	**800**	390	570	570	750	750	960	960	1 220	1 220	1 500
800	**900**	440	640	640	840	840	1 070	1 070	1 370	1 370	1 690
900	**1 000**	490	710	710	930	930	1 190	1 190	1 520	1 520	1 860

Table 2-9 Radial internal clearance of double / four-row and matched pair tapered roller bearings (cylindrical bore)

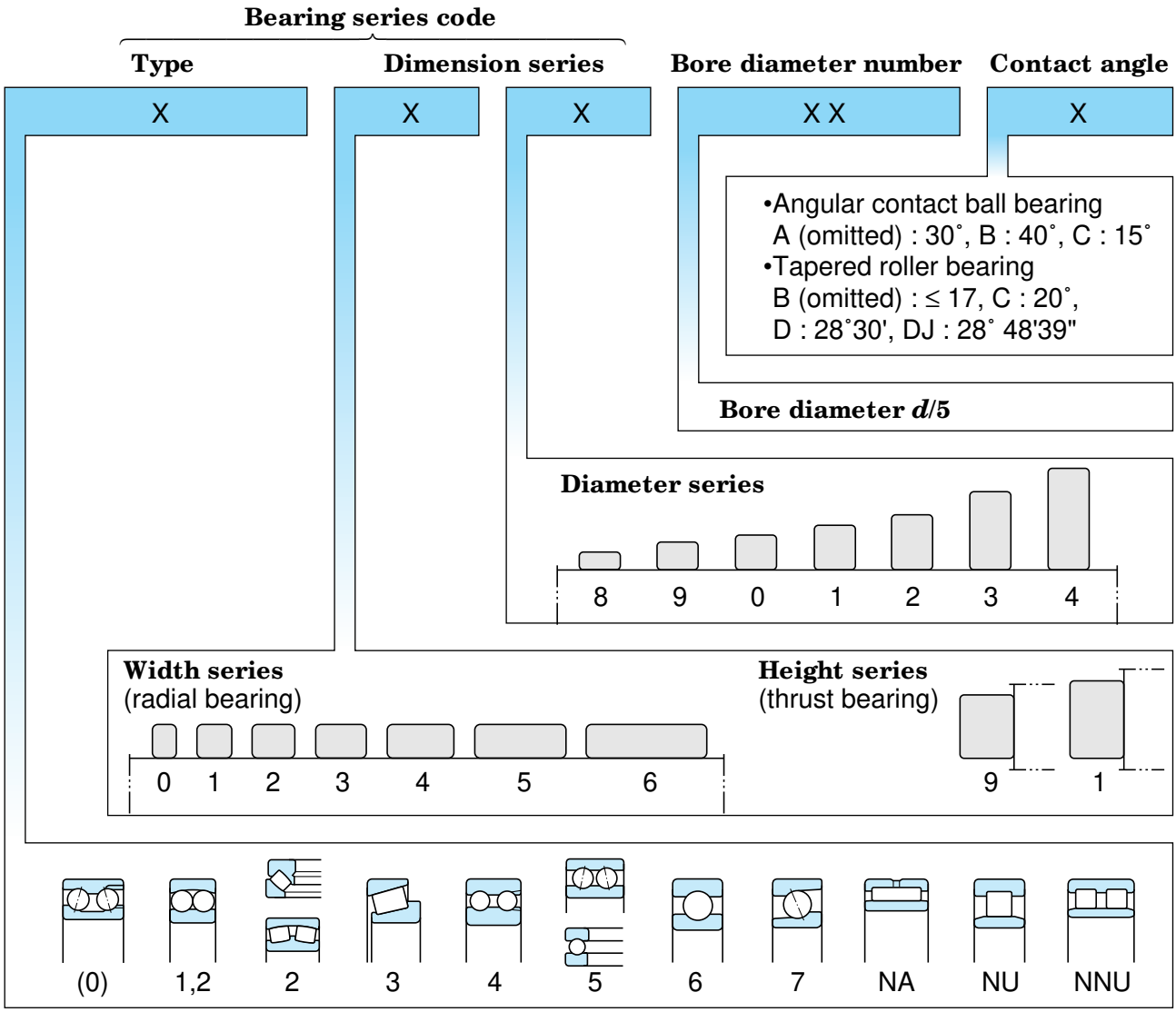
Unit μm

Nominal bore diameter d, mm		Clearance									
		C1		C2		CN		C3		C4	
over	up to	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
14	**18**	0	10	10	20	20	30	30	40	40	50
18	**24**	0	10	10	20	20	30	30	40	40	55
24	**30**	0	10	10	20	20	30	30	45	45	60
30	**40**	0	12	12	25	25	40	40	55	55	75
40	**50**	0	15	15	30	30	45	45	60	60	80
50	**65**	0	15	15	30	30	50	50	70	70	90
65	**80**	0	20	20	40	40	60	60	80	80	110
80	**100**	0	20	20	45	45	70	70	100	100	130
100	**120**	0	25	25	50	50	80	80	110	110	150
120	**140**	0	30	30	60	60	90	90	120	120	170
140	**160**	0	30	30	65	65	100	100	140	140	190
160	**180**	0	35	35	70	70	110	110	150	150	210
180	**200**	0	40	40	80	80	120	120	170	170	230
200	**225**	0	40	40	90	90	140	140	190	190	260
225	**250**	0	50	50	100	100	150	150	210	210	290
250	**280**	0	50	50	110	110	170	170	230	230	320
280	**315**	0	60	60	120	120	180	180	250	250	350
315	**355**	0	70	70	140	140	210	210	280	280	390
355	**400**	0	70	70	150	150	230	230	310	310	440
400	**450**	0	80	80	170	170	260	260	350	350	490
450	**500**	0	90	90	190	190	290	290	390	390	540
500	**560**	0	100	100	210	210	320	320	430	430	590
560	**630**	0	110	110	230	230	350	350	480	480	660
630	**710**	0	130	130	260	260	400	400	540	540	740
710	**800**	0	140	140	290	290	450	450	610	610	830
800	**900**	0	160	160	330	330	500	500	670	670	920

3. Bearing numbers

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

The figure below shows the general disignation system for metric ball and roller bearings in diagram.



Type code	Type
(0)	Angular contact ball bearing (double-row)
1	Self-aligning ball bearing
2	Self-aligning ball bearing, Spherical roller bearing and Spherical thrust roller bearing
3	Tapered roller bearing
4	Deep groove ball bearing (double-row)
5	Thrust ball bearing, Angular contact ball bearing (double-row)
6	Deep groove ball bearing (single-row)
7	Angular contact ball bearing (single-row)
NA	Needle roller bearing (single-row, double-row)
N, NU	Cylindrical roller bearing (single-row)
NN, NNU	Cylindrical roller bearing (double-low)

4. Handling of bearings

4-1 General instructions

Since rolling bearings are more precisely made than other machine parts, careful handling is absolutely necessary.

1) Keep bearings and the operating environment clean.
2) Handle carefully.
   Bearings can be cracked and brinelled easily by strong impact if handled roughly.
3) Handle using the proper tools.
4) Keep bearings well protected from rust.
   Do not handle bearings in high humidity.
   Operators should wear gloves in order not to soil bearings with perspiration from their hands.
5) Bearings should be handled by experienced or well trained operators.
6) Set bearing operation standards and follow them.
   - Storage of bearings
   - Cleaning of bearings and their adjoining parts
   - Inspection of dimensions of adjoining parts and finish conditions
   - Mounting
   - Inspection after mounting
   - Dismounting
   - Maintenance and inspection (periodical inspection)
   - Replenishment of lubricants

4-2 Storage of bearings

In shipping bearings, since they are covered with proper anti-corrosion oil and are wrapped in antitarnish paper, the quality of the bearings is guaranteed as long as the wrapping paper is not damaged.

If bearings are to be stored for a long time, it is advisable that the bearings be stored on shelves set higher than 30 cm from the floor, at a humidity less than 65%, and at a temperature around 20˚C.

Avoid storage in places exposed directly to the sun's rays or placing boxes of bearings against cold walls.

4-3 Bearing mounting

4-3-1 Recommended preparation prior to mounting

1) Preparation of bearings

Wait until just before mounting before removing the bearings from their packaging to prevent contamination and rust.

Since the anti-corrosion oil covering bearings is a highly capable lubricant, the oil should not be cleaned off if the bearings are pre-lubricated, or when the bearings are used for normal operation. However, if the bearings are used in measuring instruments or at high rotation speed, the anti-corrosion oil should be removed using a clean detergent oil. After removal of the anti-corrosion oil, bearings should not be left for a long time because they rust easily.

2) Inspection of shafts and housings

Clean up the shaft and housing to check whether it has flaws or burrs as a result of machining.

Be very careful to completely remove lapping agents (SiC, Al_2O_3, etc.), casting sands, and chips from inside the housing.

Next, check that the dimensions, forms, and finish conditions of the shaft and the housing are accurate to those specified on the drawing.

The shaft diameter and housing bore diameter should de measured at the several points as shown in Fig. 4-1 and 4-2.

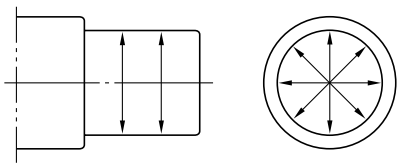


Fig. 4-1 Measuring points on shaft diameter

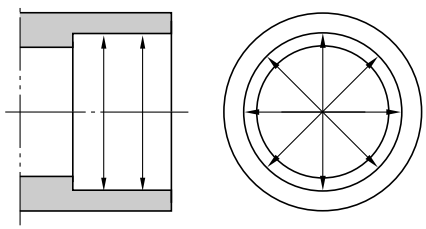


Fig. 4-2 Measuring points on housing bore diameter

Furthermore, fillet radius of shaft and housing, and the squareness of shoulders should be checked.

When using shaft and housing which have passed inspection, it is advisable to apply machine oil to each fitting surface just before mounting.

4-3-2 Bearing mounting

Mounting procedures depend on the type and fitting conditions of bearings.

For general bearings in which the shaft rotates, an interference fit is applied to inner rings, while a clearance fit is applied to outer rings.

For bearings in which the outer rings rotate, an interference fit is applied to the outer rings.

Interference fitting is roughly classified as shown here. The detailed mounting processes are described in Tables 4-1 to 4-3.

- Interference fit of inner rings
  - Bearings with cylindrical bore
    - Press fit ... Applied to small size bearings with restricted interference. (Table 4-1)
    - Shrink fit ... Applied to bearings which allow heavy interference or to large size bearings. (Table 4-2)
  - Bearings with tapered bore
    - Mounting on tapered shafts ..... (Table 4-3)
    - Mounting using sleeves ..... (Table 4-3)
- Interference fit of outer rings
  - Press fit ..... Most widely used method (Table 4-1)
  - Cooling fit ... Bearings are fit into housings by cooling them with dry ice, etc. In this method, proper rust-preventive treatment is required, since moisture in the atmosphere adheres to bearings.

Reference **Force is necessary to press fit or remove bearings**

The force necessary to press fit or remove inner rings of bearings differs depending on the finish of shafts and how much interference the bearings allow.

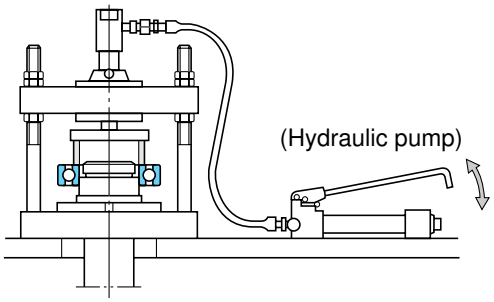
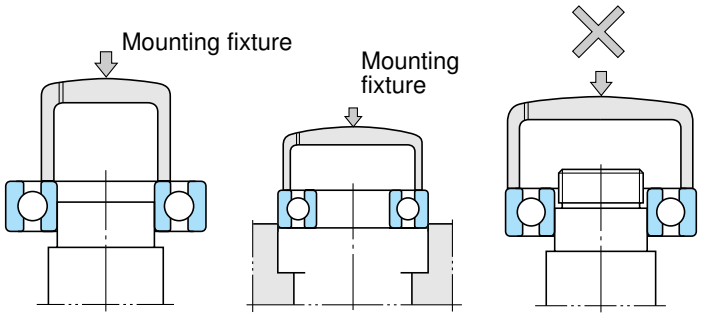
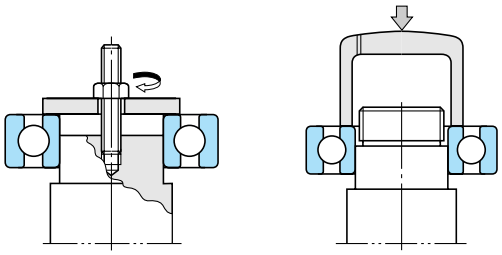
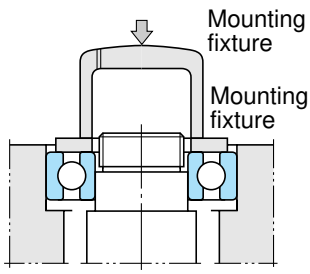
The standard values can be obtained by using the following equations.

(Solid shafts) $$K_a = 9.8 f_k \cdot \Delta d_{eff} \cdot B \left(1 - \frac{d^2}{D_i^2}\right) \times 10^3 \quad \text{(4-1)}$$

(Hollow shafts) $$K_a = 9.8 f_k \cdot \Delta d_{eff} \cdot B \frac{\left(1 - \frac{d^2}{D_i^2}\right)\left(1 - \frac{d_0^2}{d^2}\right)}{\left(1 - \frac{d_0^2}{D_i^2}\right)} \times 10^3 \quad \text{(4-2)}$$

Remark) For meaning of symbols, see page A 24.

Table 4-1 Press fit of bearings with cylindrical bores

Mounting methods	Descriptions
 (a) Using press fit (the most widely used method)	■ As shown in the Fig., a bearing should be mounted slowly with care, by using a fixture to apply force evenly to the bearing. When mounting the inner ring, apply pressure to the inner ring only. Similarly, in mounting the outer ring, press only the outer ring.  Inner ring press fit / Outer ring press fit / Inner ring press fit
 (b) Using bolts and nuts (screw hole should be provided at the shaft end) (c) Using hammers (only when there is no alternative measure)	■ If interference is required on both the inner and outer ring of nonseparable bearings, use two kinds of fixtures as shown in the Fig. and apply force carefully, as rolling elements are easily damaged. Be sure never to use a hammer in such cases.  Simultaneous press fit of inner ring and outer ring

In equations (4-1) and (4-2) in page A 23.

K_a : force necessary for press fit or removal — N

Δd_{eff} : effective interference — mm

f_k : resistance coefficient
(Coefficient taking into consideration friction between shafts and inner rings ... refer to the table on the right)

B : nominal inner ring width — mm

d : nominal inner ring bore diameter — mm

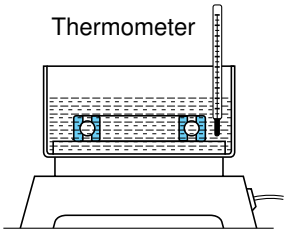
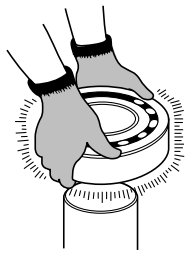
D_i : average outside diameter of inner ring — mm

d_0 : hollow shaft bore diameter — mm

Value of resistance coefficient f_k

Conditions	f_k
• Press fitting bearings on to cylindrical shafts	4
• Removing bearings from cylindrical shafts	6
• Press fitting bearings on to tapered shafts or tapered sleeves	5.5
• Removing bearings from tapered shafts or tapered sleeves	4.5
• Press fitting tapered sleeves between shafts and bearings	10
• Removing tapered sleeves from the space between shafts and bearings	11

Table 4-2 Shrink fit of cylindrical bore bearings

Shrink fit	Descriptions
 (a) Heating in an oil bath	■ This method, which expands bearings by heating them in oil, has the advantage of not applying too much force to bearings and taking only a short time. 
(b) Induction heater (This photograph shows a special machine for fitting the inner rings of cylindrical roller bearings.)	(Notes) • Oil temperature should not be higher than 100˚C, because bearings heated at higher than 120˚C lose hardness. • Heating temperature can be determined from the bore diameter of a bearing and the interference by referring to Fig. 4-3. • Use nets or a lifting device to prevent the bearing from resting directly on the bottom of the oil container. • Since bearings shrink in the radial direction as well as the axial direction while cooling down, fix the inner ring and shaft shoulder tightly with the shaft nut before shrinking, so that no space is left between them. ■ Shrink fit proves to be clean and effective since, by this method, the ring can be provided with even heat in a short time using neither fire nor oil. (When electricity is being conducted, the bearing itself generates heat by its electrical resistance, aided by the built-in exciting coil.) ■ For cylindrical roller bearings used in roll necks of rolling mills and railway rolling stock axle journals, where rings are frequently mounted and dismounted, it is advisable for Koyo special induction heaters (with automatic demagnetizers) to be used to fit inner rings.

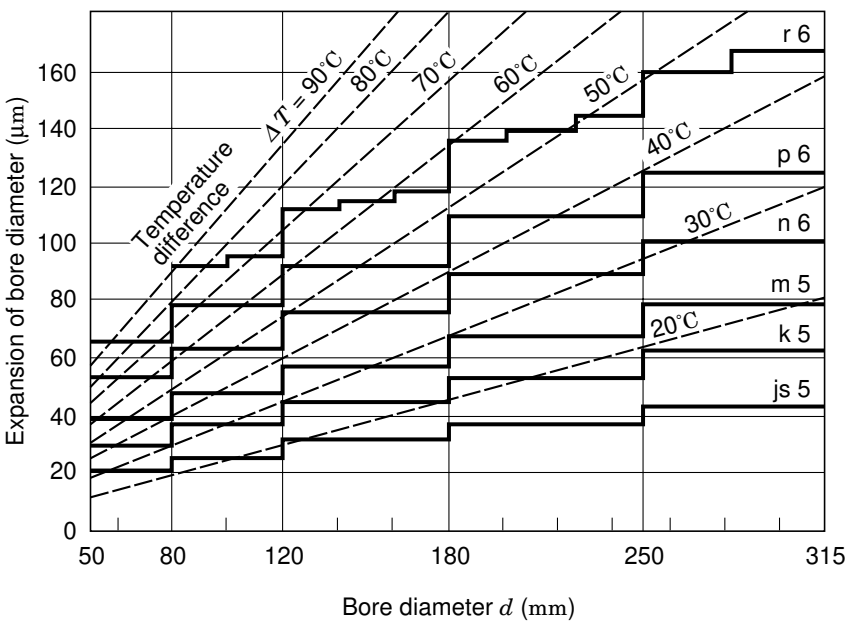


Fig. 4-3 Heating temperature and expansion of inner rings

Remarks)

1. Thick solid lines show the maximum interference value between bearings (class 0) and shafts (r6, p6, n6, m5, k5, js5) at normal temperature.

2. Therefore, the heating temperature should be selected to gain a larger "expansion of the bore diameter" than the maximum interference velues.
(When fitting class 0 bearings having a 90 mm bore diameter to m 5 shafts, this figure shows that heating temperature should be 40˚C higher than room temperature to produce expansion larger than the maximum interference value of 48 μm. However, taking cooling during mounting into consideration, the temperature should be set 20 to 30˚C higher than the temperature initially required.)

Table 4-3 Mounting bearings with tapered bores

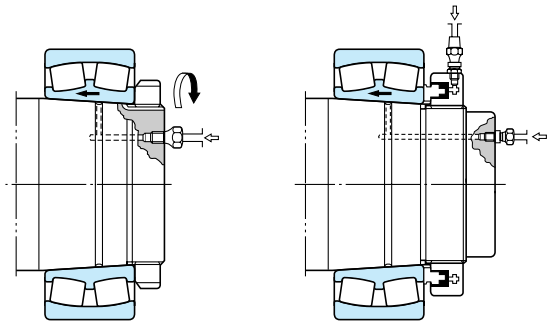
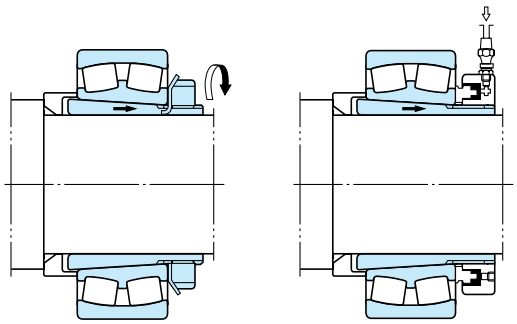
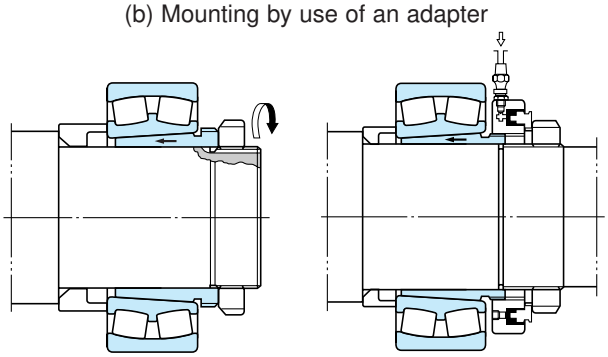
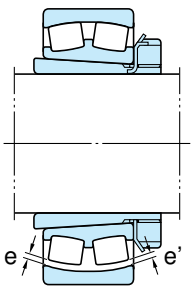
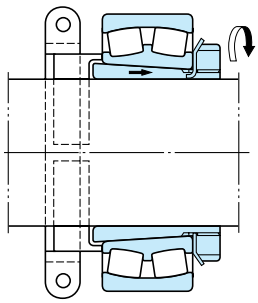
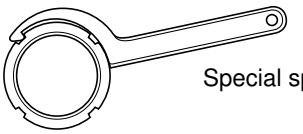
Mounting methods	Descriptions
 ① Locknut ② Hydraulic nut (a) Mounting on tapered shafts  ① Locknut ② Hydraulic nut (b) Mounting by use of an adapter  ① Locknut ② Hydraulic nut (c) Mounting by use of a withdrawal sleeve  (d) Measuring clearances	■ When mounting bearings directly on tapered shafts, provide oil holes and grooves on the shaft and inject high pressure oil into the space between the fitting surfaces (oil injection). Such oil injection can reduce tightening torque of locknut by lessening friction between the fitting surfaces. ■ When exact positioning is required in mounting a bearing on a shaft with no shoulder, use a clamp to help determine the position of the bearing.  Locating bearing by use of a clamp ■ When mounting bearings on shafts, locknuts are generally used. Special spanners are used to tighten them. Bearings can also be mounted using hydraulic nuts.  Special spanner ■ When mounting tapered bore spherical roller bearings, the reduction in the radial internal clearance which gradually occurs during operation should be taken into consideration as well as the push-in depth described in Table 4-4. Clearance reduction can be measured by a thickness gage. First, stabilize the roller in the proper position and then insert the gage into the space between the rollers and the outer ring. Be careful that the clearance between both roller rows and the outer rings is roughly the same (e ≒ e'). Since the clearance may differ at different measuring points, take measurements at several positions. ■ When mounting self-aligning ball bearings, leave enough clearance to allow easy aligning of the outer ring.

Table 4-4 Mounting tapered bore spherical roller bearings

Nominal bore diameter d mm		Reduction of radial internal clearance µm		Axial displacement, mm				Minimum required residual clearance, µm		
				1/12 taper		1/30 taper		CN clearance	C3 clearance	C4 clearance
over	up to	min.	max.	min.	max.	min.	max.			
24	**30**	15	20	0.27	0.35	–	–	10	20	35
30	**40**	20	25	0.32	0.4	–	–	15	25	40
40	**50**	25	35	0.4	0.5	–	–	20	30	45
50	**65**	30	40	0.45	0.6	–	–	25	35	55
65	**80**	35	50	0.55	0.75	–	–	35	40	70
80	**100**	40	55	0.65	0.85	–	–	40	50	85
100	**120**	55	70	0.85	1.05	2.15	2.65	45	65	100
120	**140**	65	90	1.0	1.2	2.5	3.0	55	80	110
140	**160**	75	100	1.1	1.35	2.75	3.4	55	90	130
160	**180**	80	110	1.2	1.5	3.0	3.8	60	100	150
180	**200**	90	120	1.4	1.7	3.5	4.3	70	110	170
200	**225**	100	130	1.55	1.85	3.85	4.6	80	120	190
225	**250**	110	140	1.7	2.05	4.25	5.1	90	130	210
250	**280**	120	160	1.8	2.3	4.5	5.75	100	140	230
280	**315**	130	180	2.0	2.5	5.0	6.25	110	150	250
315	**355**	150	200	2.3	2.8	5.75	7.0	120	170	270
355	**400**	170	220	2.5	3.1	6.25	7.75	130	190	300
400	**450**	190	240	2.8	3.4	7.0	8.5	140	210	330
450	**500**	210	270	3.1	3.8	7.75	9.5	160	230	360
500	**560**	240	310	3.5	4.3	8.75	10.8	170	260	370
560	**630**	260	350	3.9	4.8	9.75	12.0	200	300	410
630	**710**	300	390	4.3	5.3	10.8	13.3	210	320	460
710	**800**	340	430	4.8	6.0	12.0	15.0	230	370	530
800	**900**	370	500	5.3	6.7	13.3	16.8	270	410	570
900	**1 000**	410	550	5.9	7.4	14.8	18.5	300	450	640

Remark) The values for reduction of radial internal clearance listed above are values obtained when mounting bearings with CN clearance on solid shafts. In mounting bearings with C3 clearance, the maximum value listed above should be taken as the standard.

4-4 Test run

A trial operation is conducted to insure that the bearings are properly mounted.

In the case of compact machines, rotation may be checked by manual operation at first.

If no abnormalities, such as those described below, are observed, then further trial operation proceeds using a power source.

- Knocking ...
  due to flaws or insertion of foreign matter on rolling contact surfaces.
- Excessive torque (heavy) ...
  due to friction on sealing devices, too small clearances, and mounting errors.
- Uneven running torque ...
  due to improper mounting and mounting errors.

For machines too large to allow manual operation, idle running is performed by turning off the power source immediately after turning it on. Before starting power operation, it must be confirmed that bearings rotate smoothly without any abnormal vibration and noise.

Power operation should be started under no load and at low speed, then the speed is gradually increased until the designed speed is reached.

During power operation, check the noise, increase in temperature and vibration.

If any of the abnormalities listed in Tables 4-5 and 4-6 are found, oparation must be stopped, and inspection for defects immediately conducted.

The bearings should be dismounted if necessary.

Table 4-5 Bearing noises, causes, and countermeasures

Noise types		Causes	Countermeasures
Cyclic	Flaw noise (similar to noise when punching a rivet) Rust noise Brinelling noise (unclear siren-like noise)	Flaw on receway Rust on raceway Brinelling on raceway	Improve mounting procedure, cleaning method and rust preventive method. Replace bearing.
	Flaking noise [similar to a large hammering noise]	Flaking on receway	Replace bearing.
Not cyclic	Dirt noise (an irregular sandy noise)	Insertion of foreign matter	Improve cleaning method, sealing device. Use clean lubricant. Replace bearing.
	Fitting noise [drumming or hammering noise]	Improper fitting or excessive bearing clearance	Review fitting and clearance conditions. Provide preload. Improve mounting accuracy.
	Flaw noise, rust noise, flaking noise	Flaws, rust and flaking on rolling elements	Replace bearing.
	Squeak noise (often heard in cylindrical roller bearings with grease lubrication, especially in winter or at low temperatures)	If noise is caused by improper lubrication, a proper lubricant should be selected. In general, however, serious damage will not be caused by an improper lubricant if used continuously.	
Others	Abnormally large metallic sound	Abnormal load Incorrect mounting Insufficient amount of or improper lubricant	Review fitting, clearance. Adjust preload. Improve accuracy in processing and mounting shafts and housings. Improve sealing device. Refill lubricant. Select proper lubricant.

Table 4-6 Causes of and countermeasures for adnormal temperature rise

Causes	Countermeasures
Too much lubricant	Reduce lubricant amount. Use grease of lower consistency.
Insufficient lubricant	Refill lubricant.
Improper lubricant	Select proper lubricant.
Abnormal load	Review fitting and clearance conditions and adjust preload.
Improper mounting (excessive friction)	Improve accuracy on processing and mounting shaft and housing. Review fitting. Improve sealing device.

Normally, listening rods are employed for bearing noise inspections.

The Koyo Bearing Checker, which detects abnormalities through sound vibration, and the Koyo AE Diagnosis System of Bearings, which utilizes acoustic emission for abnormality detection, are useful for more precise inspection.

In general, bearing temperature can be estimated from housing temperature, but the most accurate method is to measure the temperature of outer rings directly via lubrication holes.

Normally, bearing temperature begins to rise gradually when operation is just starting; and, unless the bearing has some abnormality, the temperature stabilizes within one or two hours.

Therefore, a rapid rise in temperature or unusually high temperature indicates some abnormality.

4-5 Bearing dismounting

After dismounting bearings, handling of the bearings and the various methods available for this should be considered.

If the bearing is to be disposed of, any simple method such as torch cutting can be employed. If the bearing is to be reused or checked for the causes of its failure, the same amount of care as in mounting should be taken in dismounting so as not to damage the bearing and other parts.

Since bearings with interference fits are easily damaged during dismounting, measures to prevent damage during dismounting must be incorporated into the design.

It is recommended that dismounting devices be designed and manufactured, if necessary.

It is useful for discovering the causes of failures when the conditions of bearings, including mounting direction and location, are recorded prior to dismounting.

Dismounting method

Tables 4-7 to 4-9 describe dismounting methods for interference fit bearings intended for reuse or for failure analysis.

The force necessary to remove bearings can be calculated using the equations given on page A 23.

Table 4-7 Dismounting of cylindrical bore bearings

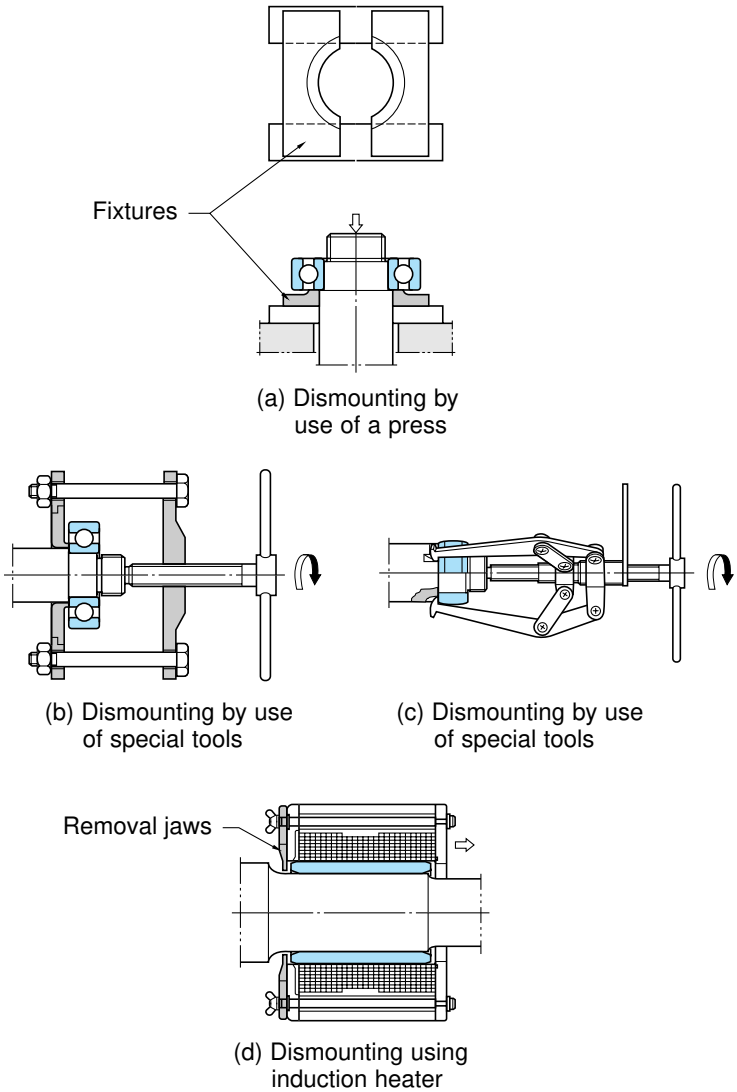
Inner ring dismounting methods	Descriptions
 (a) Dismounting by use of a press (b) Dismounting by use of special tools (c) Dismounting by use of special tools (d) Dismounting using induction heater	■ Non-separable bearings should be treated carefully during dismounting so as to minimize external force, which affects their rolling elements. ■ The easiest way to remove bearings is by using a press as shown in Fig.(a). It is recommended that the fixture be prepared so that the inner ring can receive the removal force. ■ Figs.(b) and (c) show a dismounting method in which special tools are employed. In both cases, the jaws of the tool should firmly hold the side of the inner ring. ■ Fig.(d) shows an example of removal by use of an induction heater: this method can be adapted to both mounting and dismounting of the inner rings of NU and NJ type cylindrical roller bearings. The heater can be used for heating and expanding inner rings in a short time.

Table 4-8 Dismounting tapered bore bearings

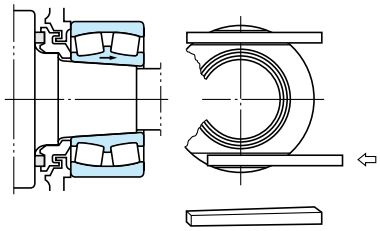
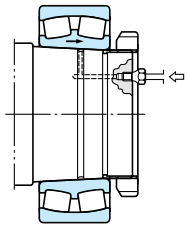
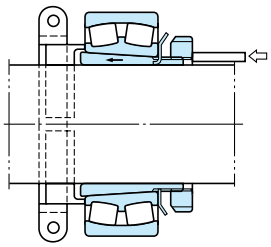
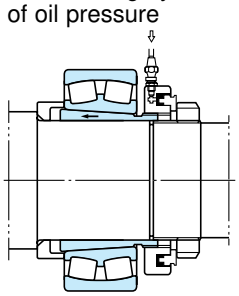
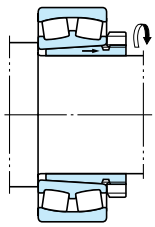
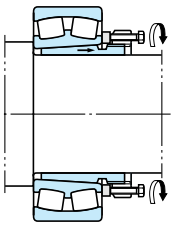
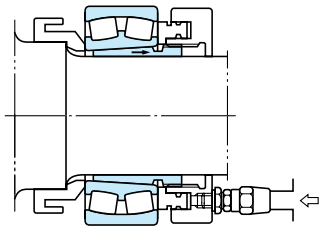
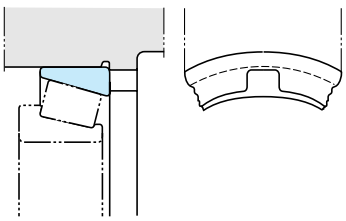
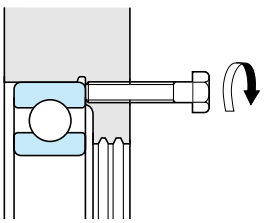
Inner ring dismounting methods	Descriptions
 (a) Dismounting by use of a wedge	■ Fig.(a) shows the dismounting of an inner ring by means of driving wedges into notches at the back of the labyrinth. Fig.(b) shows dismounting by means of feeding high pressure oil to the fitting surfaces. In both cases, it is recommended that a stopper (ex. shaft nuts) be provided to prevent bearings from suddenly dropping out.
 (b) Dismounting by use of oil pressure	
 (c) Dismounting by use of clamps	■ For bearings with an adapter sleeve, the following two methods are suitable. As shown in Fig.(c), fix bearings with clamps, loosen locknuts, then hammer off the adapter sleeve. This method is mainly used for small size bearings. Fig.(d) shows the method using hydraulic nuts.
 (d) Dismounting by use of hydraulic nuts	
 (e) Dismounting by use of locknuts	■ Small size bearings with withdrawal sleeves can be removed by tightening locknuts as shown in Fig.(e). For large size bearings, provide several bolt holes on locknuts as shown in Fig.(f), and tighten bolts. The bearings can then be removed as easily as small size bearings.
 (f) Dismounting by use of bolts	
 (g) Dismounting by use of hydraulic nuts	■ Fig.(g) shows the method using hydraulic nuts.

Table 4-9 Dismounting of outer rings

Outer ring dismounting methods	Description
 (a) Notches for dismounting	■ To dismount outer rings with interference fits, it is recommended that notches or bolt holes be provided on the shoulder of the housings.
 (b) Bolt holes and bolts for dismounting	

4-6 Maintenance and inspection of bearings

Periodic and thorough maintenance and inspection are indispensable to drawing full performance from bearings and lengthening their useful life.

Besides, prevention of accidents and down time by early detection of failures through maintenance and inspection greatly contributes to the enhancement of productivity and profitability.

4-6-1 Cleaning

Before dismounting a bearing for inspection, record the physical condition of the bearing, including taking photographs.

Cleaning should be done after checking the amount of remaining lubricant and collecting lubricant as a sample for examination.

- A dirty bearing should be cleaned using two cleaning processes, such as rough cleaning and finish cleaning.
  It is recommended that a net be set on the bottom of cleaning containers.
- In rough cleaning, use brushes to remove grease and dirt. Bearings should be handled carefully. Note that raceway surfaces may be damaged by foreign matter, if bearings are rotated in cleaning oil.
- During finish cleaning, clean bearings carefully by rotating them slowly in cleaning oil.

In general, neutral water-free light oil or kerosene is used to clean bearings, a warm alkali solution can also be used if necessary. In any case, it is essential to keep oil clean by filtering it prior to cleaning.

Apply anti-corrosion oil or rust preventive grease on bearings immediately after cleaning.

4-6-2 Inspection and analysis

Before determining that dismounted bearings will be reused, the accuracy of their dimensions and running, internal clearance, fitting surfaces, raceways, rolling contact surfaces, cages and seals must be carefully examined, so as to confirm that no abnormality is present.

It is desirable for skilled persons who have sufficient knowledge of bearings to make decisions on the reuse of bearings.

Criteria for reuse differs according to the performance and importance of machines and inspection frequency.

If the following defects are found, replace the bearing with a new one.

- Cracks and chips in bearing components
- Flaking on the raceway surfaces and the rolling contact surfaces
- Other failures of a serious degree

4-7 Methods of analyzing bearing failures

It is important for enhancing productivity and profitability, as well as for accident prevention that abnormalities in bearings are detected during operation.

Representative detection methods are described in the following section.

1) Noise checking

Since the detection of abnormalities in bearings from noises requires ample experience, sufficient training must be given to inspectors. Given this, it is recommended that specific persons be assigned to this work in order to gain this experience.

Attaching hearing aids or listening rods on housings is effective for detecting bearing noise.

2) Checking of operating temperature

Since this method utilizes change in operating temperature, its application is limited to relatively stable operations.

For detection, operating temperatures must be continuously recorded.

If abnormalities occur in bearings, operating temperature not only increase but also change irregularly.

It is recommended that this method be employed together with noise checking.

3) Lubricant checking

This method detects abnormalities from the foreign matter, including dirt and metallic powder, in lubricants collected as samples.

This method is recommended for inspection of bearings which cannot be checked by close visual inspection, and large size bearings.

Koyo

Bearing specification tables

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Deep groove ball bearings ..... B 2
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KOYO

Deep groove ball bearings

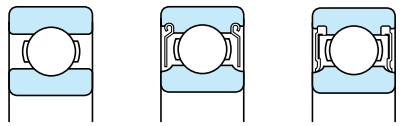
Deep groove ball bearings are available in a variety of sizes, and are the most popular of all rolling bearings. This type of bearing supports radial load and a certain degree of axial load in both directions simultaneously.

■ Shielded / sealed type
- Simplifies sealing structure of applications.
- Greasing is not necessary because bearings are pre-lubricated.
- Table 1 on the next page lists major shielded and sealed bearing types and compares their performance.

■ With locating snap ring
- Bearings with a locating snap ring can be fit to the housing easily, as the locating snap ring facilitates axial positioning.

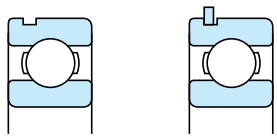
■ Extra-small ball bearings and miniature ball bearings
- The open type is widely used. Also available are the shielded / sealed type and the flanged type; the latter is easily positioned in the axial direction.

Single-row deep groove ball bearings



Open type | Shielded type | Sealed type

Bore diameter **10 – 200 mm**



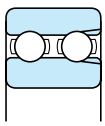
With snap ring groove | With locating snap ring

Bore diameter **10 – 130 mm**

Extra-small ball bearings and miniature ball bearings

Bore diameter **3 – 9 mm**

Double-row deep groove ball bearings

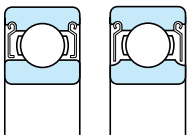
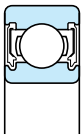
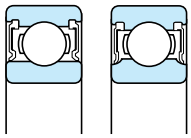
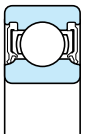
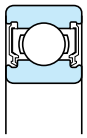


(with filling slot)

Bore diameter **15 – 75 mm**

Deep groove ball bearings

Table 1 Comparison of shielded and sealed bearing performance

Type / Characteristics	Shielded	Sealed			
	Non-contact type	Non-contact type	Contact type		Extremely light contact type
	ZZ	2RU	2RS	2RK	2RD
	 (a) [1] (b)	 (c)	 (d) [2] (e)	 (f)	 (g)
Friction torque	Small	Small	Large	Large	Small
High speed performance	Good	Good	Limited because of contact		Good
Grease sealing property	Good	Better than ZZ type	Better than 2RU type for low-speed applications	Excellent	Excellent
Dirt resistance	Good	Better than ZZ type	Better than 2RU type	Excellent	Excellent
Water resistance	Economical	Better than ZZ type but inferior to 2RS, 2RK and 2RD types	Good	Excellent	Better than ZZ and 2RU types
Operating temperature [3]	–30 to 110˚C		–30 to 100˚C		–30 to 110˚C

Notes)
1) Illustration (a) of the ZZ type shows the relatively small size bearing.
2) Illustration (d) of the 2RS type shows the relatively small size bearing.
3) The operating temperature range listed is for the standard type. It can be widened by using a different type of grease or sealing material. Consult Koyo for details.

Handling instructions

1) The shielded / sealed type deep groove ball bearing and the deep groove ball bearing with a locating snap ring are designed for use with the inner ring rotating.
   Consult koyo on use with the outer ring rotating.
2) When the axial load is large, make the shaft shoulder and housing shoulder larger than usual. (Referring to the specification table, make the mounting dimension d_a larger and make D_a smaller.)

Boundary dimensions	The dimensions of standard series are as specified in JIS B 1512. For extra-small and miniature ball bearings, special series (ML) are specified together with those described above.
Tolerances	As specified in JIS B 1514.
Radial internal clearance	■ Deep groove ball bearings (except extra-small ball bearings and miniature ball bearings) ..... as specified in JIS B 1520 (refer to Table 2-1 on p. A11.) ■ Extra-small ball bearings and miniature ball bearings ..... (refer to Table 2-2 on p. A11.) ■ Deep groove ball bearings for motors ..... (refer to Table 2-6 on p. A14.)
Standard cages	• Pressed steel cage (supplementary code : //) • Copper alloy machined cage (supplementary code : FY) Remark : For certain applications, stainless steel sheet pressed cages (YS) and polyamide molded cages (MG) may also be used.

Application of standard cages

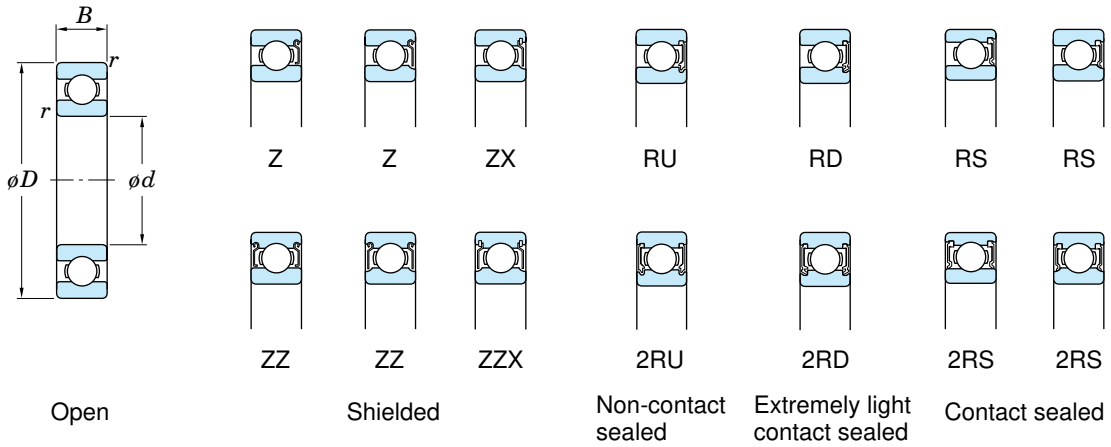
Bearing series	Pressed cage	Machined cage
68	683 – 689	–
69	693 – 699	–
60	603 – 609	–
62	623 – 629	–
63	633 – 639	–
68	6800 – 6838	6840 – 68/600
69	6900 – 6918	6920 – 6980
160	16001 – 16028	16030 – 16072
60	6000 – 6034	6036 – 6084
62	6200 – 6230	6232 – 6248
63	6300 – 6328	6330 – 6340
64	6403 – 6418	–
42	4200 – 4215	–
43	4302 – 4315	–

Allowable misalignment	0.002 3 – 0.003 4 rad (8' – 12')
Equivalent radial load (Single / double-row)	Dynamic equivalent radial load $P_r = XF_r + YF_a$ (refer to the table on the right for values X and Y.) Static equivalent radial load $P_{0r} = 0.6F_r + 0.5F_a$ (when the value of $P_{0r} < F_r$, $P_{0r} = F_r$)

$\frac{F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.014	0.19				2.30
0.028	0.22				1.99
0.056	0.26				1.71
0.084	0.28				1.55
0.11	0.30	1	0	0.56	1.45
0.17	0.34				1.31
0.28	0.38				1.15
0.42	0.42				1.04
0.56	0.44				1.00

Single-row deep groove ball bearings

d 10 – 20 mm



Boundary dimensions (mm)				Basic load ratings (kN)		Limiting speeds (min⁻¹) Grease lub.			Oil lub.	Bearing No.					(Refer.) Mass
d	D	B	r min.	C_r	C_{0r}	Open Z, ZZ RU, 2RU	(RD, 2RD)	(RS, 2RS)	Open Z	Open	Shielded ZZ	Sealed 2RU	2RD	2RS	Open type (kg)
10	19	5	0.3	1.70	0.84	37 000	–	–	43 000	**6800**	**ZZ**	**–**	**–**	**–**	0.005
	22	6	0.3	2.70	1.25	34 000	–	–	41 000	**6900**	**ZZ**	**–**	**–**	**–**	0.010
	26	8	0.3	4.55	1.95	31 000	–	19 000	36 000	**6000**	**ZZ**	**2RU**	**–**	**2RS**	0.019
	30	9	0.6	5.10	2.40	24 000	–	16 000	29 000	**6200**	**ZZ**	**2RU**	**–**	**2RS**	0.032
	35	11	0.6	8.10	3.45	22 000	–	16 000	27 000	**6300**	**ZZ**	**2RU**	**–**	**2RS**	0.053
12	21	5	0.3	1.90	1.05	33 000	–	–	39 000	**6801**	**ZZ**	**2RU**	**–**	**–**	0.006
	24	6	0.3	2.90	1.45	31 000	–	–	36 000	**6901**	**ZZ**	**2RU**	**–**	**–**	0.011
	28	7	0.3	5.10	2.40	27 000	–	–	32 000	**16001**	**–**	**–**	**–**	**–**	0.024
	28	8	0.3	5.10	2.40	27 000	–	17 000	32 000	**6001**	**ZZ**	**2RU**	**–**	**2RS**	0.022
	32	10	0.6	6.80	3.05	22 000	20 000	15 000	27 000	**6201**	**ZZ**	**2RU**	**2RD**	**2RS**	0.037
	37	12	1	9.70	4.20	20 000	18 000	15 000	25 000	**6301**	**ZZ**	**2RU**	**2RD**	**2RS**	0.060
15	24	5	0.3	2.10	1.25	28 000	–	–	33 000	**6802**	**ZZ**	**2RU**	**–**	**–**	0.007
	28	7	0.3	4.30	2.25	26 000	–	–	30 000	**6902**	**ZZ**	**2RU**	**–**	**–**	0.017
	32	8	0.3	5.60	2.85	23 000	–	–	28 000	**16002**	**–**	**–**	**–**	**–**	0.025
	32	9	0.3	5.60	2.85	23 000	–	14 000	27 000	**6002**	**ZZ**	**2RU**	**–**	**2RS**	0.030
	35	11	0.6	7.65	3.75	20 000	18 000	13 000	24 000	**6202**	**ZZ**	**2RU**	**2RD**	**2RS**	0.045
	42	13	1	11.4	5.45	17 000	15 000	12 000	20 000	**6302**	**ZZ**	**2RU**	**2RD**	**2RS**	0.082
17	26	5	0.3	2.60	1.55	26 000	–	–	30 000	**6803**	**ZZ**	**2RU**	**–**	**–**	0.008
	30	7	0.3	4.60	2.55	23 000	–	–	28 000	**6903**	**ZZ**	**2RU**	**–**	**–**	0.018
	35	8	0.3	6.00	3.25	21 000	–	–	25 000	**16003**	**–**	**–**	**–**	**–**	0.032
	35	10	0.3	6.00	3.25	21 000	–	12 000	25 000	**6003**	**ZZ**	**2RU**	**–**	**2RS**	0.039
	40	12	0.6	9.55	4.80	17 000	15 000	12 000	21 000	**6203**	**ZZ**	**2RU**	**2RD**	**2RS**	0.065
	47	14	1	13.6	6.65	15 000	14 000	10 000	18 000	**6303**	**ZZ**	**2RU**	**2RD**	**2RS**	0.115
	62	17	1.1	20.7	9.85	13 000	–	–	15 000	**6403**	**–**	**–**	**–**	**–**	0.270
20	32	7	0.3	4.00	2.45	21 000	–	–	25 000	**6804**	**ZZ**	**2RU**	**–**	**–**	0.018
	37	9	0.3	6.35	3.70	19 000	–	–	23 000	**6904**	**ZZ**	**2RU**	**–**	**–**	0.036
	42	8	0.3	7.95	4.50	17 000	–	–	21 000	**16004**	**–**	**–**	**–**	**–**	0.050
	42	12	0.6	9.40	5.05	17 000	–	10 000	21 000	**6004**	**ZZ**	**2RU**	**–**	**2RS**	0.069
	47	14	1	12.8	6.65	15 000	14 000	9 700	17 000	**6204**	**ZZ**	**2RU**	**2RD**	**2RS**	0.106
	52	15	1.1	15.9	7.85	14 000	13 000	9 500	17 000	**6304**	**ZZ**	**2RU**	**2RD**	**2RS**	0.144
	72	19	1.1	31.0	15.2	11 000	–	–	13 000	**6404**	**–**	**–**	**–**	**–**	0.400

Remark) Standard cage types used for the above bearings are described earlier in this section.

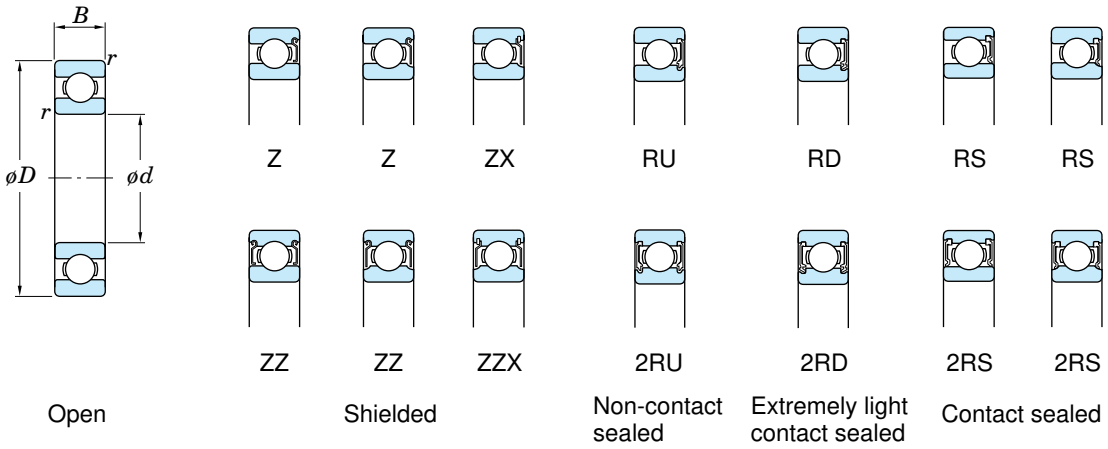
d 22 – 45 mm

Boundary dimensions (mm)				Basic load ratings (kN)		Limiting speeds (min⁻¹) Grease lub.			Oil lub.	Bearing No.					(Refer.) Mass
d	*D*	*B*	*r* min.	C_r	C_{0r}	Open Z, ZZ RU, 2RU	(RD, 2RD)	(RS, 2RS)	Open Z	Open	Shielded ZZ	Sealed 2RU	2RD	2RS	Open type (kg)
22	44	12	0.6	9.40	5.15	17 000	–	9 900	20 000	**60/22**	–	–	–	**2RS**	0.073
	50	14	1	12.8	6.65	15 000	–	9 700	17 000	**62/22**	–	–	–	**2RS**	0.118
	56	16	1.1	18.5	9.40	13 000	–	8 600	15 000	**63/22**	–	–	–	**2RS**	0.201
25	37	7	0.3	4.30	2.95	18 000	–	–	21 000	**6805**	**ZZ**	**2RU**	–	–	0.022
	42	9	0.3	7.00	4.55	16 000	–	–	19 000	**6905**	**ZZ**	**2RU**	–	–	0.041
	47	8	0.3	8.85	5.60	15 000	–	–	18 000	**16005**	–	–	–	–	0.060
	47	12	0.6	10.1	5.85	15 000	–	9 000	18 000	**6005**	**ZZ**	**2RU**	–	**2RS**	0.080
	52	15	1	14.0	7.85	13 000	12 000	8 400	15 000	**6205**	**ZZ**	**2RU**	**2RD**	**2RS**	0.128
	62	17	1.1	20.6	11.3	11 000	9 900	7 500	13 000	**6305**	**ZZ**	**2RU**	**2RD**	**2RS**	0.232
	80	21	1.5	36.1	19.4	9 100	–	–	11 000	**6405**	–	–	–	–	0.530
28	52	12	0.6	12.4	7.40	14 000	–	–	16 000	**60/28**	**ZZ**	–	–	–	0.097
	58	16	1	17.9	9.75	12 000	–	7 600	14 000	**62/28**	**ZZ**	–	–	**2RS**	0.173
	68	18	1.1	23.5	13.1	10 000	–	6 900	12 000	**63/28**	**ZZ**	–	–	**2RS**	0.328
30	42	7	0.3	4.55	3.40	15 000	–	–	18 000	**6806**	**ZZ**	**2RU**	–	–	0.026
	47	9	0.3	7.25	5.00	14 000	–	–	17 000	**6906**	**ZZ**	**2RU**	–	–	0.045
	55	9	0.3	11.2	7.35	13 000	–	–	15 000	**16006**	–	–	–	–	0.085
	55	13	1	13.2	8.25	13 000	–	7 500	15 000	**6006**	**ZZ**	**2RU**	–	**2RS**	0.116
	62	16	1	19.5	11.3	11 000	9 900	7 000	13 000	**6206**	**ZZ**	**2RU**	**2RD**	**2RS**	0.199
	72	19	1.1	26.7	15.0	9 600	8 600	6 400	12 000	**6306**	**ZZ**	**2RU**	**2RD**	**2RS**	0.346
	90	23	1.5	43.4	23.9	8 100	–	–	9 700	**6406**	–	–	–	–	0.735
32	58	13	1	15.0	9.15	12 000	–	7 200	14 000	**60/32**	**ZZ**	–	–	**2RS**	0.127
	65	17	1	23.5	13.1	10 000	–	6 900	12 000	**62/32**	**ZZ**	–	–	**2RS**	0.228
	75	20	1.1	30.1	16.2	9 300	–	6 400	11 000	**63/32**	**ZZ**	–	–	**2RS**	0.437
35	47	7	0.3	4.75	3.85	13 000	–	–	16 000	**6807**	**ZZ**	**2RU**	–	–	0.030
	55	10	0.6	10.9	7.75	12 000	–	–	14 000	**6907**	**ZZ**	**2RU**	–	–	0.073
	62	9	0.3	12.2	8.85	11 000	–	–	13 000	**16007**	–	–	–	–	0.110
	62	14	1	15.9	10.3	11 000	–	6 500	13 000	**6007**	**ZZ**	**2RU**	–	**2RS**	0.155
	72	17	1.1	25.7	15.4	9 200	8 300	6 000	11 000	**6207**	**ZZ**	**2RU**	**2RD**	**2RS**	0.288
	80	21	1.5	33.4	19.3	8 500	7 700	5 700	10 000	**6307**	**ZZ**	**2RU**	**2RD**	**2RS**	0.457
	100	25	1.5	55.0	31.0	7 200	–	–	8 600	**6407**	–	–	–	–	0.952
40	52	7	0.3	4.95	4.20	12 000	–	–	14 000	**6808**	**ZZ**	**2RU**	–	–	0.033
	62	12	0.6	13.7	9.95	11 000	–	–	13 000	**6908**	**ZZ**	**2RU**	–	–	0.112
	68	9	0.3	12.6	9.65	9 800	–	–	12 000	**16008**	–	–	–	–	0.125
	68	15	1	16.7	11.5	10 000	–	5 800	12 000	**6008**	**ZZ**	**2RU**	–	**2RS**	0.192
	80	18	1.1	29.1	17.8	8 300	7 500	5 400	10 000	**6208**	**ZZ**	**2RU**	**2RD**	**2RS**	0.366
	90	23	1.5	40.7	24.0	7 700	6 900	5 100	9 200	**6308**	**ZZ**	**2RU**	**2RD**	**2RS**	0.633
	110	27	2	63.7	36.6	6 600	–	–	7 900	**6408**	–	–	–	–	1.23
45	58	7	0.3	6.20	5.40	11 000	–	–	13 000	**6809**	**ZZ**	**2RU**	–	–	0.040
	68	12	0.6	14.1	10.9	9 700	–	–	11 000	**6909**	**ZZ**	**2RU**	–	–	0.132
	75	10	0.6	15.5	12.3	8 900	–	–	10 000	**16009**	–	–	–	–	0.170
	75	16	1	21.0	15.1	9 200	–	5 300	11 000	**6009**	**ZZ**	**2RU**	–	**2RS**	0.245
	85	19	1.1	32.7	20.3	7 700	6 900	5 100	9 200	**6209**	**ZZ**	**2RU**	**2RD**	**2RS**	0.407
	100	25	1.5	48.9	29.5	6 800	6 100	4 500	8 100	**6309**	**ZZ**	**2RU**	**2RD**	**2RS**	0.833
	120	29	2	77.2	45.1	6 000	–	–	7 200	**6409**	–	–	–	–	1.53

Remark) Standard cage types used for the above bearings are described earlier in this section.

Single-row deep groove ball bearings

d 50 – (70) mm



Boundary dimensions (mm)				Basic load ratings (kN)		Limiting speeds (min⁻¹) Grease lub.			Oil lub.	Bearing No.					(Refer.) Mass
d	D	B	r min.	C_r	C_{0r}	Open, Z, ZZ, RU, 2RU	(RD, 2RD)	(RS, 2RS)	Open, Z	Open	Shielded ZZ	Sealed 2RU	2RD	2RS	Open type (kg)
50	65	7	0.3	6.60	6.10	9 600	–	–	11 000	**6810**	**ZZ**	**2RU**	**–**	**–**	0.052
	72	12	0.6	14.5	11.7	9 000	–	–	11 000	**6910**	**ZZ**	**2RU**	**–**	**–**	0.133
	80	10	0.6	16.0	13.3	8 200	–	–	9 700	**16010**	**–**	**–**	**–**	**–**	0.180
	80	16	1	21.8	16.6	8 400	–	4 800	9 900	**6010**	**ZZ**	**2RU**	**–**	**2RS**	0.261
	90	20	1.1	35.1	23.3	7 100	6 400	4 600	8 500	**6210**	**ZZ**	**2RU**	**2RD**	**2RS**	0.463
	110	27	2	62.0	38.3	6 100	5 500	4 100	7 300	**6310**	**ZZ**	**2RU**	**2RD**	**2RS**	1.07
	130	31	2.1	83.0	49.5	5 500	–	–	6 600	**6410**	**–**	**–**	**–**	**–**	1.88
55	72	9	0.3	8.80	8.10	8 700	–	–	10 000	**6811**	**ZZ**	**2RU**	**–**	**–**	0.083
	80	13	1	16.6	14.1	8 100	–	–	9 600	**6911**	**ZZ**	**2RU**	**–**	**–**	0.185
	90	11	0.6	19.3	16.3	7 400	–	–	8 800	**16011**	**–**	**–**	**–**	**–**	0.260
	90	18	1.1	28.3	21.2	7 600	–	4 300	8 900	**6011**	**ZZ**	**2RU**	**–**	**2RS**	0.385
	100	21	1.5	43.4	29.4	6 300	–	4 100	7 600	**6211**	**ZZ**	**2RU**	**–**	**2RS**	0.607
	120	29	2	71.6	45.0	5 600	–	3 700	6 700	**6311**	**ZZ**	**2RU**	**–**	**2RS**	1.37
	140	33	2.1	100	62.3	5 000	–	–	6 000	**6411**	**–**	**–**	**–**	**–**	2.29
60	78	10	0.3	11.5	10.6	8 000	–	–	9 400	**6812**	**ZZ**	**2RU**	**–**	**–**	0.104
	85	13	1	20.2	17.3	7 500	–	–	8 900	**6912**	**ZZ**	**2RU**	**–**	**–**	0.192
	95	11	0.6	19.8	17.6	6 900	–	–	8 100	**16012**	**–**	**–**	**–**	**–**	0.280
	95	18	1.1	29.4	23.2	7 100	–	4 000	8 400	**6012**	**ZZ**	**2RU**	**–**	**2RS**	0.415
	110	22	1.5	52.4	36.2	5 700	–	3 700	6 900	**6212**	**ZZ**	**2RU**	**–**	**2RS**	0.783
	130	31	2.1	81.9	52.2	5 200	–	3 500	6 200	**6312**	**ZZ**	**2RU**	**–**	**2RS**	1.70
	150	35	2.1	110	70.8	4 600	–	–	5 500	**6412**	**–**	**–**	**–**	**–**	2.77
65	85	10	0.6	11.9	11.5	7 300	–	–	8 600	**6813**	**ZZ**	**2RU**	**–**	**–**	0.126
	90	13	1	17.4	16.1	7 100	–	–	8 400	**6913**	**ZZ**	**2RU**	**–**	**–**	0.211
	100	11	0.6	17.1	16.0	6 600	–	–	7 800	**16013**	**–**	**–**	**–**	**–**	0.300
	100	18	1.1	30.5	25.2	6 600	–	3 700	7 800	**6013**	**ZZ**	**2RU**	**–**	**2RS**	0.435
	120	23	1.5	57.2	40.1	5 400	–	3 500	6 400	**6213**	**ZZ**	**2RU**	**–**	**2RS**	0.990
	140	33	2.1	92.7	59.9	4 800	–	3 200	5 800	**6313**	**ZZ**	**2RU**	**–**	**2RS**	2.08
	160	37	2.1	118	79.2	4 300	–	–	5 200	**6413**	**–**	**–**	**–**	**–**	3.30
70	90	10	0.6	12.1	11.9	6 800	–	–	8 100	**6814**	**ZZ**	**2RU**	**–**	**–**	0.134
	100	16	1	23.7	21.2	6 400	–	–	7 600	**6914**	**ZZ**	**2RU**	**–**	**–**	0.342
	110	13	0.6	30.1	25.6	6 100	–	–	7 200	**16014**	**–**	**–**	**–**	**–**	0.433
	110	20	1.1	38.1	30.9	6 100	–	3 500	7 200	**6014**	**ZZ**	**2RU**	**–**	**2RS**	0.602

Remark) Standard cage types used for the above bearings are described earlier in this section.

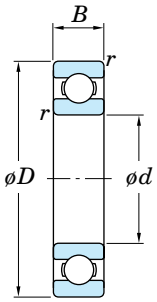
d (70) – 105 mm

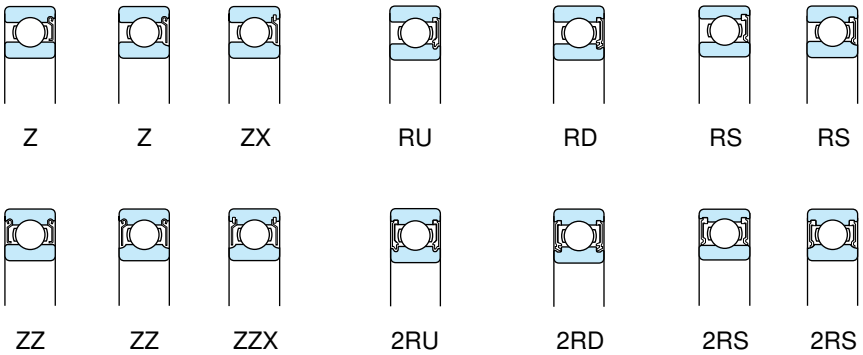
Boundary dimensions (mm)				Basic load ratings (kN)		Limiting speeds (min⁻¹) Grease lub.			Oil lub.	Bearing No.					(Refer.) Mass
d	*D*	*B*	*r* min.	C_r	C_{0r}	Open Z, ZZ RU, 2RU	(RD, 2RD)	(RS, 2RS)	Open Z	Open	Shielded ZZ	Sealed 2RU	2RD	2RS	Open type (kg)
70	125	24	1.5	62.2	44.1	5 100	–	3 300	6 100	**6214**	**ZZ**	**2RU**	**–**	**2RS**	1.07
	150	35	2.1	104	68.2	4 500	–	3 000	5 400	**6314**	**ZZ**	**2RU**	**–**	**2RS**	2.52
	180	42	3	144	104	3 900	–	–	4 600	**6414**	**–**	**–**	**–**	**–**	4.83
75	95	10	0.6	12.5	12.9	6 400	–	–	7 600	**6815**	**ZZ**	**2RU**	**–**	**–**	0.142
	105	16	1	24.4	22.6	6 100	–	–	7 200	**6915**	**ZZ**	**2RU**	**–**	**–**	0.363
	115	13	0.6	27.5	25.3	5 700	–	–	6 700	**16015**	**–**	**–**	**–**	**–**	0.457
	115	20	1.1	39.6	33.5	5 700	–	3 300	6 800	**6015**	**ZZ**	**2RU**	**–**	**2RS**	0.638
	130	25	1.5	67.4	48.3	4 800	–	3 100	5 800	**6215**	**ZZ**	**2RU**	**–**	**2RS**	1.18
	160	37	2.1	113	77.2	4 200	–	2 800	5 000	**6315**	**ZZ**	**2RU**	**–**	**2RS**	3.02
	190	45	3	154	115	3 600	–	–	4 400	**6415**	**–**	**–**	**–**	**–**	5.87
80	100	10	0.6	12.7	13.3	6 100	–	–	7 200	**6816**	**ZZ**	**2RU**	**–**	**–**	0.150
	110	16	1	25.0	24.0	5 700	–	–	6 800	**6916**	**ZZ**	**2RU**	**–**	**–**	0.382
	125	14	0.6	31.7	29.7	5 200	–	–	6 100	**16016**	**–**	**–**	**–**	**–**	0.597
	125	22	1.1	47.6	39.8	5 300	–	3 100	6 300	**6016**	**ZZ**	**–**	**–**	**2RS**	0.850
	140	26	2	72.7	53.0	4 500	–	2 900	5 400	**6216**	**ZZ**	**–**	**–**	**2RS**	1.40
	170	39	2.1	123	86.7	3 900	–	2 700	4 700	**6316**	**ZZ**	**–**	**–**	**2RS**	3.59
	200	48	3	164	125	3 400	–	–	4 100	**6416**	**–**	**–**	**–**	**–**	6.84
85	110	13	1	18.7	19.0	5 600	–	–	6 600	**6817**	**ZZ**	**2RU**	**–**	**–**	0.266
	120	18	1.1	31.9	29.6	5 300	–	–	6 300	**6917**	**ZZ**	**2RU**	**–**	**–**	0.535
	130	14	0.6	32.6	31.7	4 900	–	–	5 800	**16017**	**–**	**–**	**–**	**–**	0.626
	130	22	1.1	49.5	43.1	5 000	–	2 900	5 900	**6017**	**ZZ**	**–**	**–**	**2RS**	0.890
	150	28	2	84.0	61.9	4 200	–	2 700	5 000	**6217**	**ZZ**	**–**	**–**	**2RS**	1.79
	180	41	3	133	96.8	3 700	–	2 500	4 400	**6317**	**ZZX**	**–**	**–**	**2RS**	4.23
	210	52	4	173	136	3 300	–	–	3 900	**6417**	**–**	**–**	**–**	**–**	8.07
90	115	13	1	19.0	19.7	5 300	–	–	6 300	**6818**	**ZZ**	**2RU**	**–**	**–**	0.279
	125	18	1.1	32.8	31.6	5 100	–	–	6 000	**6918**	**ZZ**	**2RU**	**–**	**–**	0.565
	140	16	1	39.9	37.0	4 700	–	–	5 600	**16018**	**–**	**–**	**–**	**–**	0.848
	140	24	1.5	58.2	49.7	4 700	–	2 700	5 600	**6018**	**ZZ**	**–**	**–**	**2RS**	1.16
	160	30	2	96.1	71.5	3 900	–	2 600	4 700	**6218**	**ZZ**	**–**	**–**	**2RS**	2.15
	190	43	3	143	107	3 500	–	2 400	4 200	**6318**	**ZZX**	**–**	**–**	**2RS**	4.91
	225	54	4	184	149	3 100	–	–	3 700	**6418**	**–**	**–**	**–**	**–**	9.78
95	130	18	1.1	33.7	33.5	4 800	–	–	5 700	**6919**	**ZZ**	**2RU**	**–**	**–**	0.705
	145	16	1	41.2	39.6	4 500	–	–	5 300	**16019**	**–**	**–**	**–**	**–**	0.885
	145	24	1.5	60.4	53.9	4 400	–	2 500	5 200	**6019**	**ZZX**	**2RU**	**–**	**2RS**	1.21
	170	32	2.1	109	81.9	3 700	–	2 400	4 400	**6219**	**ZZX**	**–**	**–**	**2RS**	2.62
	200	45	3	153	119	3 300	–	2 200	4 000	**6319**	**ZZX**	**–**	**–**	**2RS**	5.67
100	125	13	1	19.6	21.2	4 800	–	–	5 700	**6820**	**ZZ**	**2RU**	**–**	**–**	0.309
	140	20	1.1	45.0	41.9	4 500	–	–	5 300	**6920**	**ZZ**	**2RU**	**–**	**–**	0.960
	150	16	1	42.4	42.1	4 300	–	–	5 100	**16020**	**–**	**–**	**–**	**–**	0.910
	150	24	1.5	60.2	54.2	4 300	–	2 500	5 100	**6020**	**ZZ**	**–**	**–**	**2RS**	1.25
	180	34	2.1	122	93.1	3 500	–	2 300	4 200	**6220**	**ZZX**	**–**	**–**	**2RS**	3.14
	215	47	3	173	141	3 000	–	2 100	3 600	**6320**	**ZZX**	**–**	**–**	**2RS**	7.00
105	145	20	1.1	46.5	44.8	4 300	–	–	5 100	**6921**	**ZZ**	**–**	**–**	**–**	1.00
	160	18	1	41.9	42.2	4 100	–	–	4 800	**16021**	**–**	**–**	**–**	**–**	1.20
	160	26	2	72.3	65.8	4 000	–	2 300	4 700	**6021**	**ZZX**	**–**	**–**	**2RS**	1.59
	190	36	2.1	133	105	3 300	–	2 200	3 900	**6221**	**ZZX**	**–**	**–**	**2RS**	3.70
	225	49	3	184	153	2 900	–	2 000	3 500	**6321**	**ZZX**	**–**	**–**	**2RS**	8.05

Remark) Standard cage types used for the above bearings are described earlier in this section.

Single-row deep groove ball bearings

d 110 – (160) mm





Open | Shielded | Non-contact sealed | Extremely light contact sealed | Contact sealed

Boundary dimensions (mm)				Basic load ratings (kN)		Limiting speeds (min⁻¹) Grease lub.			Oil lub.	Bearing No.					(Refer.) Mass
d	D	B	r min.	C_r	C_{0r}	Open Z, ZZ RU, 2RU	(RD, 2RD)	(RS, 2RS)	Open Z	Open	Shielded ZZ	Sealed 2RU	2RD	2RS	Open type (kg)
110	140	16	1	28.1	30.7	4 300	–	–	5 100	**6822**	**ZZ**	–	–	–	0.606
	150	20	1.1	47.9	47.8	4 100	–	–	4 900	**6922**	**ZZ**	–	–	–	1.04
	170	19	1	57.5	56.7	3 800	–	–	4 500	**16022**	–	–	–	–	1.46
	170	28	2	82.0	73.0	3 800	–	2 200	4 500	**6022**	**ZZX**	–	–	**2RS**	1.96
	200	38	2.1	144	117	3 100	–	2 000	3 700	**6222**	**ZZX**	–	–	**2RS**	4.36
	240	50	3	205	180	2 700	–	1 900	3 200	**6322**	**ZZX**	–	–	**2RS**	9.54
120	150	16	1	29.0	33.0	4 000	–	–	4 700	**6824**	**ZZ**	–	–	–	0.655
	165	22	1.1	57.2	56.9	3 800	–	–	4 400	**6924**	**ZZ**	–	–	–	1.41
	180	19	1	63.2	63.3	3 600	–	–	4 200	**16024**	–	–	–	–	1.80
	180	28	2	85.0	79.3	3 600	–	2 100	4 200	**6024**	**ZZX**	–	–	**2RS**	2.07
	215	40	2.1	155	131	2 900	–	1 900	3 400	**6224**	**ZZX**	–	–	**2RS**	5.15
	260	55	3	207	185	2 500	–	–	3 000	**6324**	**ZZX**	–	–	–	12.5
130	165	18	1.1	36.9	41.2	3 600	–	–	4 300	**6826**	–	–	–	–	0.939
	180	24	1.5	69.6	70.0	3 400	–	–	4 100	**6926**	–	–	–	–	1.86
	200	22	1.1	71.3	74.8	3 000	–	–	3 600	**16026**	–	–	–	–	2.69
	200	33	2	106	101	3 200	–	1 900	3 800	**6026**	**ZZX**	–	–	**2RS**	3.16
	230	40	3	167	146	2 700	–	1 800	3 200	**6226**	**ZZX**	–	–	**2RS**	5.82
	280	58	4	229	214	2 300	–	–	2 700	**6326**	**ZZX**	–	–	–	15.1
140	175	18	1.1	38.2	44.4	3 400	–	–	4 000	**6828**	–	–	–	–	1.00
	190	24	1.5	71.3	74.8	3 200	–	–	3 800	**6928**	–	–	–	–	1.98
	210	22	1.1	65.8	71.1	2 900	–	–	3 400	**16028**	–	–	–	–	2.86
	210	33	2	110	109	3 000	–	1 800	3 600	**6028**	**ZZX**	–	–	**2RS**	3.55
	250	42	3	166	150	2 400	–	1 600	2 900	**6228**	**ZZX**	–	–	**2RS**	7.45
	300	62	4	253	246	2 100	–	–	2 500	**6328**	**ZZX**	–	–	–	19.4
150	190	20	1.1	47.8	54.9	3 100	–	–	3 700	**6830**	–	–	–	–	1.40
	210	28	2	93.4	94.3	2 900	–	–	3 400	**6930**	–	–	–	–	3.05
	225	24	1.1	91.2	99.3	2 700	–	–	3 100	**16030**	–	–	–	–	3.58
	225	35	2.1	125	126	2 800	–	1 600	3 300	**6030**	**ZZX**	–	–	**2RS**	4.22
	270	45	3	176	168	2 200	–	–	2 700	**6230**	**ZZX**	–	–	–	9.41
	320	65	4	275	284	1 900	–	–	2 300	**6330**	–	–	–	–	26.2
160	200	20	1.1	48.4	56.9	2 900	–	–	3 400	**6832**	–	–	–	–	1.45
	220	28	2	96.1	101	2 700	–	–	3 200	**6932**	–	–	–	–	3.20
	240	25	1.5	98.8	108	2 600	–	–	3 100	**16032**	–	–	–	–	4.25

Remark) Standard cage types used for the above bearings are described earlier in this section.

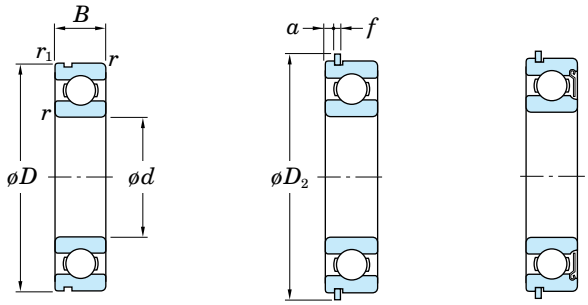
d (160) – 200 mm

Boundary dimensions (mm)				Basic load ratings (kN)		Limiting speeds (min⁻¹) Grease lub.			Oil lub.	Bearing No.					(Refer.) Mass
d	*D*	*B*	*r* min.	C_r	C_{0r}	Open Z, ZZ RU, 2RU	(RD, 2RD)	(RS, 2RS)	Open Z	Open	Shielded ZZ	Sealed 2RU	2RD	2RS	Open type (kg)
160	240	38	2.1	136	135	2 600	–	1 500	3 000	**6032**	**ZZX**	–	–	**2RS**	5.22
	290	48	3	185	186	2 100	–	–	2 500	**6232**	**ZZX**	–	–	–	14.3
	340	68	4	278	286	1 800	–	–	2 200	**6332**	–	–	–	–	29.0
170	215	22	1.1	59.8	70.5	2 700	–	–	3 200	**6834**	–	–	–	–	1.90
	230	28	2	98.8	108	2 600	–	–	3 100	**6934**	–	–	–	–	3.35
	260	28	1.5	114	127	2 300	–	–	2 700	**16034**	–	–	–	–	5.75
	260	42	2.1	161	161	2 400	–	–	2 800	**6034**	**ZZX**	–	–	–	6.80
	310	52	4	212	223	1 900	–	–	2 300	**6234**	**ZZX**	–	–	–	17.5
	360	72	4	326	355	1 700	–	–	2 000	**6334**	–	–	–	–	38.6
180	225	22	1.1	60.7	73.1	2 600	–	–	3 000	**6836**	–	–	–	–	2.00
	250	33	2	123	129	2 400	–	–	2 800	**6936**	–	–	–	–	4.90
	280	31	2	135	148	2 100	–	–	2 500	**16036**	–	–	–	–	7.55
	280	46	2.1	182	194	2 200	–	–	2 600	**6036**	**ZZX**	–	–	–	10.3
	320	52	4	227	241	1 800	–	–	2 200	**6236**	**ZZX**	–	–	–	18.3
	380	75	4	354	407	1 600	–	–	1 900	**6336**	–	–	–	–	44.7
190	240	24	1.5	73.1	88.1	2 400	–	–	2 800	**6838**	–	–	–	–	2.60
	260	33	2	126	138	2 300	–	–	2 700	**6938**	–	–	–	–	5.20
	290	31	2	139	158	2 000	–	–	2 400	**16038**	–	–	–	–	7.85
	290	46	2.1	188	201	2 100	–	–	2 500	**6038**	**ZZX**	–	–	–	10.8
	340	55	4	255	281	1 700	–	–	2 000	**6238**	–	–	–	–	23.0
	400	78	5	355	415	1 500	–	–	1 800	**6338**	–	–	–	–	51.5
200	250	24	1.5	78.0	93.6	2 300	–	–	2 700	**6840**	–	–	–	–	2.70
	280	38	2.1	157	168	2 100	–	–	2 500	**6940**	–	–	–	–	7.30
	310	34	2	161	180	1 900	–	–	2 300	**16040**	–	–	–	–	10.1
	310	51	2.1	217	243	1 900	–	–	2 300	**6040**	**ZZX**	–	–	–	14.0
	360	58	4	269	311	1 600	–	–	1 900	**6240**	**ZZX**	–	–	–	28.2
	420	80	5	411	506	1 300	–	–	1 600	**6340**	–	–	–	–	58.0

Remark) Standard cage types used for the above bearings are described earlier in this section.

Single-row deep groove ball bearings
snap ring groove type
locating snap ring type

d 10 – 35 mm



N
With snap ring groove

NR
With locating snap ring

With locating snap ring and one shield

Boundary dimensions (mm)					Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.		Dimensions of locating snap ring (mm)			(Refer.) Mass
d	*D*	*B*	*r* min.	r_1 min.	C_r	C_{0r}	Grease lub.	Oil lub.	With snap ring groove	With locating snap ring	D_2 max.	*a* max.	*f* ±0.05	(kg)
10	30	9	0.6	0.3	5.10	2.40	24 000	29 000	**6200N**	**6200NR**	34.7	2.06	1.07	0.032
	35	11	0.6	0.5	8.10	3.45	22 000	27 000	**6300N**	**6300NR**	39.7	2.06	1.07	0.053
12	32	10	0.6	0.3	6.80	3.05	22 000	27 000	**6201N**	**6201NR**	36.7	2.06	1.07	0.037
	37	12	1	0.5	9.70	4.20	20 000	25 000	**6301N**	**6301NR**	41.3	2.06	1.07	0.060
15	35	11	0.6	0.5	7.65	3.75	20 000	24 000	**6202N**	**6202NR**	39.7	2.06	1.07	0.045
	42	13	1	0.5	11.4	5.45	17 000	20 000	**6302N**	**6302NR**	46.3	2.06	1.07	0.082
17	40	12	0.6	0.5	9.55	4.80	17 000	21 000	**6203N**	**6203NR**	44.6	2.06	1.07	0.065
	47	14	1	0.5	13.6	6.65	15 000	18 000	**6303N**	**6303NR**	52.7	2.46	1.07	0.115
20	42	12	0.6	0.5	9.40	5.05	17 000	21 000	**6004N**	**6004NR**	46.3	2.06	1.07	0.069
	47	14	1	0.5	12.8	6.65	15 000	17 000	**6204N**	**6204NR**	52.7	2.46	1.07	0.106
	52	15	1.1	0.5	15.9	7.85	14 000	17 000	**6304N**	**6304NR**	57.9	2.46	1.07	0.144
22	44	12	0.6	0.5	9.40	5.15	17 000	20 000	**60/22N**	**60/22NR**	48.3	2.06	1.07	0.073
	50	14	1	0.5	12.8	6.65	15 000	17 000	**62/22N**	**62/22NR**	55.7	2.46	1.07	0.118
	56	16	1.1	0.5	18.5	9.40	13 000	15 000	**63/22N**	**63/22NR**	61.7	2.46	1.07	0.201
25	47	12	0.6	0.5	10.1	5.85	15 000	18 000	**6005N**	**6005NR**	52.7	2.06	1.07	0.080
	52	15	1	0.5	14.0	7.85	13 000	15 000	**6205N**	**6205NR**	57.9	2.46	1.07	0.128
	62	17	1.1	0.5	20.6	11.3	11 000	13 000	**6305N**	**6305NR**	67.7	3.28	1.65	0.232
28	52	12	0.6	0.5	12.4	7.40	14 000	16 000	**60/28N**	**60/28NR**	57.9	2.06	1.07	0.097
	58	16	1	0.5	17.9	9.75	12 000	14 000	**62/28N**	**62/28NR**	63.7	2.46	1.07	0.173
	68	18	1.1	0.5	23.5	13.1	10 000	12 000	**63/28N**	**63/28NR**	74.6	3.28	1.65	0.328
30	55	13	1	0.5	13.2	8.25	13 000	15 000	**6006N**	**6006NR**	60.7	2.08	1.07	0.116
	62	16	1	0.5	19.5	11.3	11 000	13 000	**6206N**	**6206NR**	67.7	3.28	1.65	0.199
	72	19	1.1	0.5	26.7	15.0	9 600	12 000	**6306N**	**6306NR**	78.6	3.28	1.65	0.346
32	58	13	1	0.5	15.0	9.15	12 000	14 000	**60/32N**	**60/32NR**	63.7	2.08	1.07	0.127
	65	17	1	0.5	23.5	13.1	10 000	12 000	**62/32N**	**62/32NR**	70.7	3.28	1.65	0.228
	75	20	1.1	0.5	30.1	16.2	9 300	11 000	**63/32N**	**63/32NR**	81.6	3.28	1.65	0.437
35	62	14	1	0.5	15.9	10.3	11 000	13 000	**6007N**	**6007NR**	67.7	2.08	1.65	0.155
	72	17	1.1	0.5	25.7	15.4	9 200	11 000	**6207N**	**6207NR**	78.6	3.28	1.65	0.288
	80	21	1.5	0.5	33.4	19.3	8 500	10 000	**6307N**	**6307NR**	86.6	3.28	1.65	0.457

Remark) Standard cage types used for the above bearings are described earlier in this section.

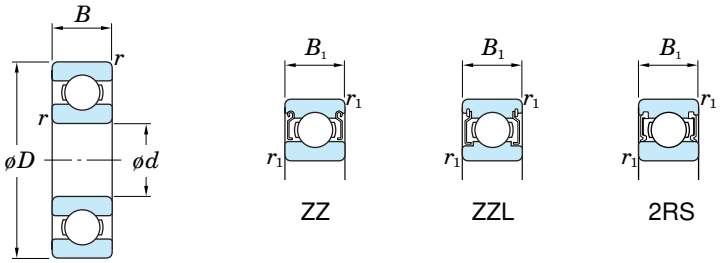
d 40 – 130 mm

Boundary dimensions (mm)					Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.		Dimensions of locating snap ring (mm)			(Refer.) Mass
d	D	B	r min.	r_1 min.	C_r	C_{0r}	Grease lub.	Oil lub.	With snap ring groove	With locating snap ring	D_2 max.	a max.	f ±0.05	(kg)
40	68	15	1	0.5	16.7	11.5	10 000	12 000	**6008N**	**6008NR**	74.6	2.49	1.65	0.192
	80	18	1.1	0.5	29.1	17.8	8 300	10 000	**6208N**	**6208NR**	86.6	3.28	1.65	0.366
	90	23	1.5	0.5	40.7	24.0	7 700	9 200	**6308N**	**6308NR**	96.5	3.28	2.41	0.633
45	75	16	1	0.5	21.0	15.1	9 200	11 000	**6009N**	**6009NR**	81.6	2.49	1.65	0.245
	85	19	1.1	0.5	32.7	20.3	7 700	9 200	**6209N**	**6209NR**	91.6	3.28	1.65	0.407
	100	25	1.5	0.5	48.9	29.5	6 800	8 100	**6309N**	**6309NR**	106.5	3.28	2.41	0.833
50	80	16	1	0.5	21.8	16.6	8 400	9 900	**6010N**	**6010NR**	86.6	2.49	1.65	0.261
	90	20	1.1	0.5	35.1	23.3	7 100	8 500	**6210N**	**6210NR**	96.5	3.28	2.41	0.463
	110	27	2	0.5	62.0	38.3	6 100	7 300	**6310N**	**6310NR**	116.6	3.28	2.41	1.07
55	90	18	1.1	0.5	28.3	21.2	7 600	8 900	**6011N**	**6011NR**	96.5	2.87	2.41	0.385
	100	21	1.5	0.5	43.4	29.4	6 300	7 600	**6211N**	**6211NR**	106.5	3.28	2.41	0.607
	120	29	2	0.5	71.6	45.0	5 600	6 700	**6311N**	**6311NR**	129.7	4.06	2.77	1.37
60	95	18	1.1	0.5	29.4	23.2	7 100	8 400	**6012N**	**6012NR**	101.6	2.87	2.41	0.415
	110	22	1.5	0.5	52.4	36.2	5 700	6 900	**6212N**	**6212NR**	116.6	3.28	2.41	0.783
	130	31	2.1	0.5	81.9	52.2	5 200	6 200	**6312N**	**6312NR**	139.7	4.06	2.77	1.70
65	100	18	1.1	0.5	30.5	25.2	6 600	7 800	**6013N**	**6013NR**	106.5	2.87	2.41	0.435
	120	23	1.5	0.5	57.2	40.1	5 400	6 400	**6213N**	**6213NR**	129.7	4.06	2.77	0.990
	140	33	2.1	0.5	92.7	59.9	4 800	5 800	**6313N**	**6313NR**	149.7	4.9	2.77	2.08
70	110	20	1.1	0.5	38.1	30.9	6 100	7 200	**6014N**	**6014NR**	116.6	2.87	2.41	0.602
	125	24	1.5	0.5	62.2	44.1	5 100	6 100	**6214N**	**6214NR**	134.7	4.06	2.77	1.07
	150	35	2.1	0.5	104	68.2	4 500	5 400	**6314N**	**6314NR**	159.7	4.9	2.77	2.52
75	115	20	1.1	0.5	39.6	33.5	5 700	6 800	**6015N**	**6015NR**	121.6	2.87	2.41	0.638
	130	25	1.5	0.5	67.4	48.3	4 800	5 800	**6215N**	**6215NR**	139.7	4.06	2.77	1.18
	160	37	2.1	0.5	113	77.2	4 200	5 000	**6315N**	**6315NR**	169.7	4.9	2.77	3.02
80	125	22	1.1	0.5	47.6	39.8	5 300	6 300	**6016N**	**6016NR**	134.7	2.87	2.77	0.850
	140	26	2	0.5	72.7	53.0	4 500	5 400	**6216N**	**6216NR**	149.7	4.9	2.77	1.40
	170	39	2.1	0.5	123	86.7	3 900	4 700	**6316N**	**6316NR**	182.9	5.69	3.05	3.59
85	130	22	1.1	0.5	49.5	43.1	5 000	5 900	**6017N**	**6017NR**	139.7	2.87	2.77	0.890
	150	28	2	0.5	84.0	61.9	4 200	5 000	**6217N**	**6217NR**	159.7	4.9	2.77	1.79
	180	41	3	0.5	133	96.8	3 700	4 400	**6317N**	**6317NR**	192.9	5.69	3.05	4.23
90	140	24	1.5	0.5	58.2	49.7	4 700	5 600	**6018N**	**6018NR**	149.7	3.71	2.77	1.16
	160	30	2	0.5	96.1	71.5	3 900	4 700	**6218N**	**6218NR**	169.7	4.9	2.77	2.15
	190	43	3	0.5	143	107	3 500	4 200	**6318N**	**6318NR**	202.9	5.69	3.05	4.91
95	145	24	1.5	0.5	60.4	53.9	4 400	5 200	**6019N**	**6019NR**	154.7	3.71	2.77	1.21
	170	32	2.1	0.5	109	81.9	3 700	4 400	**6219N**	**6219NR**	182.9	5.69	3.05	2.62
	200	45	3	0.5	153	119	3 300	4 000	**6319N**	**6319NR**	212.9	5.69	3.05	5.67
100	150	24	1.5	0.5	60.2	54.2	4 300	5 100	**6020N**	**6020NR**	159.7	3.71	2.77	1.25
	180	34	2.1	0.5	122	93.1	3 500	4 200	**6220N**	**6220NR**	192.9	5.69	3.05	3.14
105	160	26	2	0.5	72.3	65.8	4 000	4 700	**6021N**	**6021NR**	169.7	3.71	2.77	1.59
	190	36	2.1	0.5	133	105	3 300	3 900	**6221N**	**6221NR**	202.9	5.69	3.05	3.70
110	170	28	2	0.5	82.0	73.0	3 800	4 500	**6022N**	**6022NR**	182.9	3.71	3.05	1.96
	200	38	2.1	0.5	144	117	3 100	3 700	**6222N**	**6222NR**	212.9	5.69	3.05	4.36
120	180	28	2	0.5	85.0	79.3	3 600	4 200	**6024N**	**6024NR**	192.9	3.71	3.05	2.07
130	200	33	2	0.5	106	101	3 200	3 800	**6026N**	**6026NR**	212.9	5.69	3.05	3.16

Remark) Standard cage types used for the above bearings are described earlier in this section.

Extra-small ball bearings, miniature ball bearings

d 3 – 9 mm

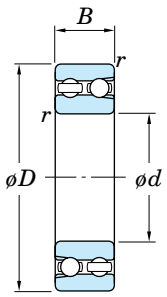


Open | Shielded | Contact sealed

Boundary dimensions (mm)						Basic load ratings (kN)		Limiting speeds (min⁻¹) Grease lub.		Oil lub.	Bearing No.			(Refer.) Mass
d	D	B	B_1	r min.	r_1 min.	C_r	C_{0r}	Open ZZ, ZZL	(2RS)	Open Z, ZL	Open	Shielded ZZ, ZZL	Sealed 2RS	(g)
3	8	3	4	0.15	0.15	0.55	0.17	64 000	–	76 000	**693**	**W693 ZZ**	–	0.6
	10	4	4	0.15	0.15	0.64	0.23	52 000	44 000	63 000	**623**	**623 ZZ**	**623 2RS**	1.6
4	11	4	4	0.15	0.15	0.96	0.35	54 000	44 000	65 000	**694**	**694 ZZ**	**694 2RS**	1.8
	12	4	4	0.2	0.2	0.97	0.36	53 000	–	63 000	**604**	**604 ZZ**	–	2.1
	13	5	5	0.2	0.2	1.30	0.49	44 000	39 000	54 000	**624**	**624 ZZ**	**624 2RS**	2.9
	16	5	5	0.3	0.3	1.75	0.67	40 000	–	49 000	**634**	**634 ZZ**	–	5.3
5	8	2	2.5	0.08	0.05	0.26	0.12	59 000	–	70 000	**ML5008**	**WML5008 ZZ**	–	0.3
	9	2.5	3	0.1	0.08	0.47	0.19	56 000	–	67 000	**ML5009**	**WML5009 ZZ**	–	0.5
	10	3	4	0.1	0.1	0.50	0.21	55 000	–	65 000	**ML5010**	**WML5010 ZZ**	–	0.9
	11	3	5	0.15	0.15	0.97	0.36	53 000	–	63 000	**685**	**W685 ZZ**	–	1.0
	13	4	4	0.2	0.2	1.10	0.43	50 000	42 000	60 000	**695**	**695 ZZ**	**695 2RS**	2.2
	16	5	5	0.3	0.3	1.75	0.67	40 000	33 000	49 000	**625**	**625 ZZ**	**625 2RS**	5.0
	19	6	6	0.3	0.3	2.60	1.05	35 000	27 000	43 000	**635**	**635 ZZ**	**635 2RS**	8.5
6	13	3.5	5	0.15	0.15	1.10	0.44	48 000	36 000	57 000	**686**	**W686 ZZ**	**W686 2RS**	1.8
	15	5	5	0.2	0.2	1.75	0.67	45 000	32 000	54 000	**696**	**696 ZZ**	**696 2RS**	3.9
	17	6	6	0.3	0.3	1.95	0.74	43 000	–	51 000	**606**	**606 ZZ**	–	5.8
	19	6	6	0.3	0.3	2.60	1.05	35 000	27 000	43 000	**626**	**626 ZZ**	**626 2RS**	8.1
7	14	3.5	5	0.15	0.15	1.15	0.51	45 000	–	54 000	**687**	**W687 ZZ**	–	2.0
	19	6	6	0.3	0.3	2.60	1.05	40 000	27 000	47 000	**607**	**607 ZZ**	**607 2RS**	7.6
	22	7	7	0.3	0.3	3.30	1.35	31 000	23 000	37 000	**627**	**627 ZZ**	**627 2RS**	13
8	16	4	5	0.2	0.2	1.60	0.71	42 000	28 000	50 000	**688**	**W688 ZZ**	**W688 2RS**	3.2
	19	6	6	0.3	0.3	2.25	0.91	39 000	27 000	46 000	**698**	**698 ZZ**	**698 2RS**	7.2
	22	7	7	0.3	0.3	3.30	1.35	34 000	23 000	41 000	**608**	**608 ZZ**	**608 2RS**	12
	24	8	8	0.3	0.3	3.35	1.40	28 000	22 000	35 000	**628**	**628 ZZ**	**628 2RS**	18
	28	9	9	0.3	0.3	4.55	1.95	26 000	–	32 000	**638**	**638 ZZ**	–	29
9	17	4	5	0.2	0.2	1.35	0.66	39 000	–	46 000	**689**	**W689 ZZ**	–	3.5
	20	6	6	0.3	0.3	2.45	1.05	35 000	25 000	42 000	**699**	**699 ZZ**	**699 2RS**	7.5
	24	7	7	0.3	0.3	3.35	1.40	33 000	22 000	40 000	**609**	**609 ZZ**	**609 2RS**	15
	26	8	8	0.6	0.6	4.55	1.95	27 000	19 000	33 000	**629**	**629 ZZ**	**629 2RS**	20

Double-row deep groove ball bearings

d 15 – 75 mm



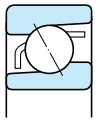
Boundary dimensions (mm)				Basic load ratings (kN)		Limiting speeds (min^{-1})		Bearing No.	(Refer.) Mass
d	*D*	*B*	*r* min.	C_r	C_{0r}	Grease lub.	Oil lub.		(kg)
15	35	14	0.6	9.75	9.00	12 000	16 000	**4202**	0.071
17	40	16	0.6	11.7	10.4	11 000	14 000	**4203**	0.106
20	47	18	1	16.4	16.0	9 000	12 000	**4204**	0.165
	52	21	1.1	19.5	17.0	8 300	11 000	**4304**	0.227
25	52	18	1	16.3	16.9	7 500	9 900	**4205**	0.189
	62	24	1.1	26.3	25.7	6 700	9 000	**4305**	0.365
30	62	20	1	22.0	24.7	6 400	8 500	**4206**	0.298
	72	27	1.1	35.5	35.9	5 700	7 600	**4306**	0.542
35	72	23	1.1	26.4	30.7	5 600	7 400	**4207**	0.460
	80	31	1.5	40.6	41.8	5 200	7 000	**4307**	0.752
40	80	23	1.1	33.7	42.4	4 700	6 300	**4208**	0.558
	90	33	1.5	46.0	48.8	4 600	6 100	**4308**	1.01
45	85	23	1.1	31.9	43.9	4 600	6 100	**4209**	0.605
	100	36	1.5	57.6	62.4	4 100	5 500	**4309**	1.35
50	90	23	1.1	31.4	44.6	4 200	5 600	**4210**	0.651
	110	40	2	70.4	77.7	3 700	5 000	**4310**	1.80
55	100	25	1.5	37.2	54.1	3 800	5 000	**4211**	0.882
	120	43	2	84.2	94.4	3 400	4 600	**4311**	2.29
60	110	28	1.5	47.9	67.6	3 500	4 700	**4212**	1.20
	130	46	2.1	99.2	113	3 100	4 200	**4312**	2.87
65	120	31	1.5	54.7	78.5	3 200	4 300	**4213**	1.59
	140	48	2.1	107	124	2 900	3 900	**4313**	3.46
70	125	31	1.5	62.1	89.8	3 100	4 100	**4214**	1.68
	150	51	2.1	115	136	2 700	3 600	**4314**	4.21
75	130	31	1.5	61.6	90.7	2 900	3 900	**4215**	1.77
	160	55	2.1	132	158	2 500	3 400	**4315**	5.15

KOYO

Angular contact ball bearings

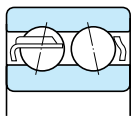
Angular contact ball bearings are suitable for applications which require high accuracy and good high-speed performance. This type of bearing is designed to carry a combined load.

Single-row angular contact ball bearings



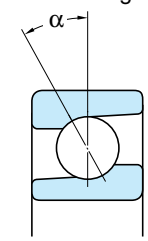
Bore diameter **10 – 200 mm**

Double-row angular contact ball bearings



Bore diameter **15 – 100 mm**

Single-row angular contact ball bearings and matched pair angular contact ball bearings



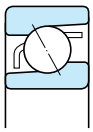
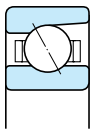
- The standard contact angles are 15˚, 30˚ and 40˚.
  They are identified, respectively, by the supplementary codes "C", "A" (omitted) and "B". Bearing with a smaller contact angle are more suitable for applications involving high-speed rotation.
  Those with a larger contact angle feature superior axial load resistance.
- Angular contact ball bearings are often preloaded to enhance their rigidity and rotating performance.
  For high-precision matched pair angular contact ball bearings of class 5 or higher, which are used in machine tools and other precision equipment, the standard preload is specified in three levels: light (L), medium (M) and heavy (H).
- When this type of bearing is loaded radially, an axial component of force is produced. In this case, two bearings are used together facing one another, or two or more bearings are matched and used.
- Tables 1 and 2 list the different types of single-row and matched pair/stack angular contact ball bearings and describe their characteristics.

Double-row angular contact ball bearings

Consist of two single-row angular contact ball bearings matched back-to-back, with inner and outer rings integrated.
Table 3 shows major types and their characteristics.

Angular contact ball bearings

Table 1 Single-row angular contact ball bearings

 (with pressed cage)  (with machined cage)	• Single-row angular contact ball bearings accommodate radial load and axial load in one direction. • Bearings with a machined cage are suitable for high-speed applications.

Reference **G-shaped bearing**

"G-shaped" bearings have a stand-out between the inner ring and outer ring on both sides that are equal in size. This arrangement is called "flush ground processing".
These bearings can be matched in a variety of ways.

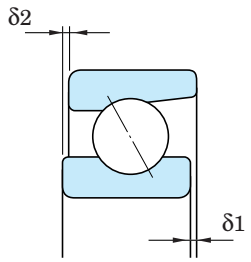
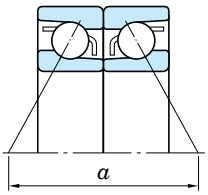
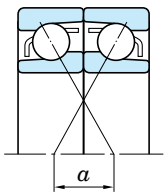
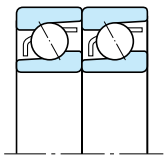
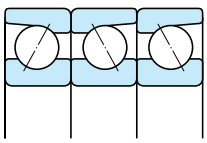
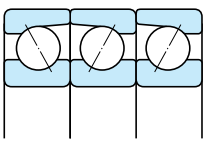


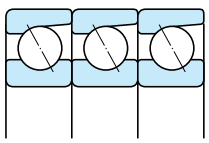
Table 2 Matched pair and stack angular contact ball bearings

Back-to-back arrangement (DB)		• Carries radial load and axial load in both directions. • Suitable for applications involving moment loading because the distance between the load centers (a) is long. • As for the preloaded type, the clearance is pre-adjusted so that bearings will be preloaded the proper amount when the inner ring is fixed with a nut.
Face-to-face arrangement (DF)		• Carries radial load and axial load in both directions. • Has a smaller moment load accommodating capacity than the back-to-back arrangement, because the distance between the load centers (a) is shorter. • As for the preloaded type, the clearance is pre-adjusted so that bearings will be preloaded the proper amount when the outer rings are pressed together.
Tandem arrangement (DT)		• Carries radial load and axial load in one direction. • Suitable for applications which involve a high degree of axial loading.

Matched stack


(DBD)


(DFD)


(DTD)

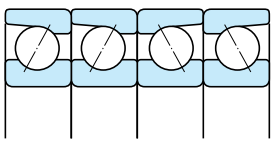
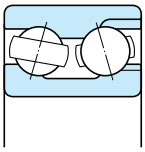
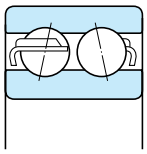

(DBB)

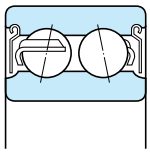
Table 3 Double-row angular contact ball bearings



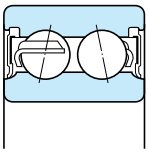
(with filling slot)
32, 33



(without filling slot)
52, 53



Shielded
52...ZZ, 53...ZZ



Shealed
52...2RS, 53...2RS

- Accommodates radial load and axial load in both directions. Also able to accommodate moment load.
- The 32 and 33 series are provided with a filling slot, while the 52 and 53 series are not.

  32 and 33 series : contact angle 32˚
  52 and 53 series : contact angle 24˚
- Inferior to single-row and matched pair angular contact ball bearings in terms of high-speed and high accuracy performance.
- Shielded or sealed 52 and 53 series bearings are also available.

Boundary dimensions	The dimensions of standard series are as specified in JIS B 1512.
Tolerances	• As specified in JIS B 1514. • Koyo has established "special tolerances" for bore diameter and outside diameter, as listed in the table to the right, to make it easy to produce highprecision matched stack bearings. Bearings which are produced based on these tolerances are identified by the supplementary code "K5."
Internal clearance	■ Matched pair bearing axial internal clearance ..... (refer to Table 2-3 on p. A 12.) ■ Double-row bearing radial internal clearance..... (refer to Table 2-4 on p. A 13.)
Recommended fits	■ Classes 5 and 4 bearings ..... as listed in the table below.

Special tolerances (K5) Unit μm

Nominal bore diameter d (mm)		Single plane mean bore diameter (Δd_{mp}) or single plane mean outside diameter deviation (ΔD_{mp})			
		Class 5		Class 4	
over	up to	upper	lower	upper	lower
–	50	–1	–4	–1	–3
50	80	–1	–5	–1	–4
80	120	–1	–5	–1	–4

Fit		Class 5	Class 4
		Tolerance class	
With shaft	Inner ring rotation	js 5	js 4
	Outer ring rotation	h 5	h 4
With housing	Fixed side	JS 6	JS 5
	Free side	H 6	H 5
	Outer ring rotation	M 5	M 4

Angular contact ball bearings

Standard cages

- Pressed steel cage (supplementary code : //)
- Copper alloy machined cage (supplementary code : FY)

Note) Machine tools are generally equipped with bearings that have a phenolic resin machined cage (FT). Bearings with a polyamide molded cage can also be used depending on the applications.

Application of standard cages

Bearing series	Pressed cage	Machined cage
70 70B 70C	– – –	7000 – 7040 7000 B – 7040 B 7000 C – 7040 C
72 72B 72C	7200 – 7220 7200 B – 7220 B 7200 C – 7220 C	7200 – 7240 7200 B – 7240 B 7200 C – 7240 C
73 73B 73C	7300 – 7320 7303 B – 7320 B 7303 C – 7320 C	7300 – 7340 7303 B – 7340 B 7303 C – 7334 C
74 74B	7405 – 7409 7405 B – 7409 B	7404 – 7418 7404 B – 7418 B
32 33	3200 – 3215 3302 – 3313	3216 – 3222 3314 – 3322
52 53	5203 – 5214 5304 – 5315	– –

Allowable misalignment

Single-row ... 0.000 6 rad (2'), double-row ... misalignment not allowed

Equivalent radial load

{ Single-row and matched pair angular contact ball bearings }

Dynamic equivalent radial load

$P_r = XF_r + YF_a$

Contact angle	$\frac{F_a}{C_{0r}}$	e	Single-row and tandem arrangement				Back-to-back and face-to-face arrangement			
			$F_a/F_r \le e$		$F_a/F_r > e$		$F_a/F_r \le e$		$F_a/F_r > e$	
			X	Y	X	Y	X	Y	X	Y
15°	0.015	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.029	0.40				1.40		1.57		2.28
	0.058	0.43				1.30		1.46		2.21
	0.087	0.46				1.23		1.38		2.00
	0.12	0.47				1.19		1.34		1.93
	0.17	0.50				1.12		1.26		1.82
	0.29	0.55				1.02		1.14		1.66
	0.44	0.56				1.00		1.12		1.63
	0.58	0.56				1.00		1.12		1.63
30°	–	0.80	1	0	0.39	0.76	1	0.78	0.63	1.24
40°	–	1.14	1	0	0.35	0.57	1	0.55	0.57	0.93

Note)
When two single-row angular contact ball bearings are used facing one another, an axial component of force is produced under radial load.

Static equivalent radial load

$P_{0r} = X_0F_r + Y_0F_a$

In reference to single-row and tandem arrangement bearings,

when $P_{0r} < F_r$,

$P_{0r} = F_r$

Contact angle	Single-row and tandem arrangement		Back-to-back and face-to-face arrangement	
	X_0	Y_0	X_0	Y_0
15°	0.5	0.46	1	0.92
30°	0.5	0.33	1	0.66
40°	0.5	0.26	1	0.52

Equivalent radial load
(Double-row angular contact ball bearings)

Dynamic equivalent radial load
$P_r = XF_r + YF_a$

Contact angle	e	$F_a / F_r \leq e$		$F_a / F_r > e$		(reference)
		X	Y	X	Y	
24°	0.66	1	0.95	0.68	1.45	52, 53 series
32°	0.86	1	0.73	0.62	1.17	32, 33 series

Static equivalent radial load
$P_{0r} = X_0 F_r + Y_0 F_a$

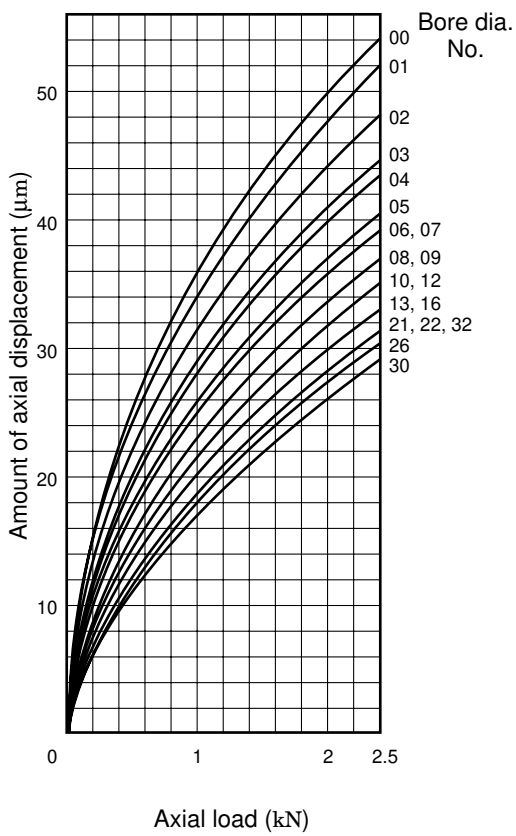
Contact angle	X_0	Y_0	(reference)
24°	1	0.78	52, 53 series
32°	1	0.63	32, 33 series

Remark) In angular contact ball bearings, slippage occurs between the balls and raceways under too small a load, causing smearing to develop.
Matched pair bearings may develop smearing when the ratio of the axial load to the radial load exceeds the value of e ($F_a / F_r > e$), as listed in the specification table.
Consult Koyo when these bearings are used under the above conditions.

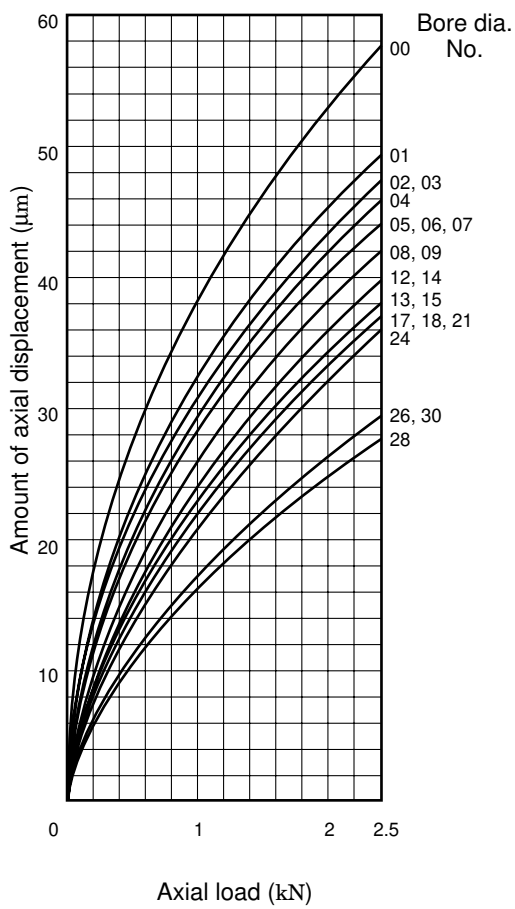
[Reference] Relationship between axial load and axial displacement

Diagrams (1) to (6) illustrate the relationship between axial load and axial displacement.

(1) 7000C (contact angle 15°)

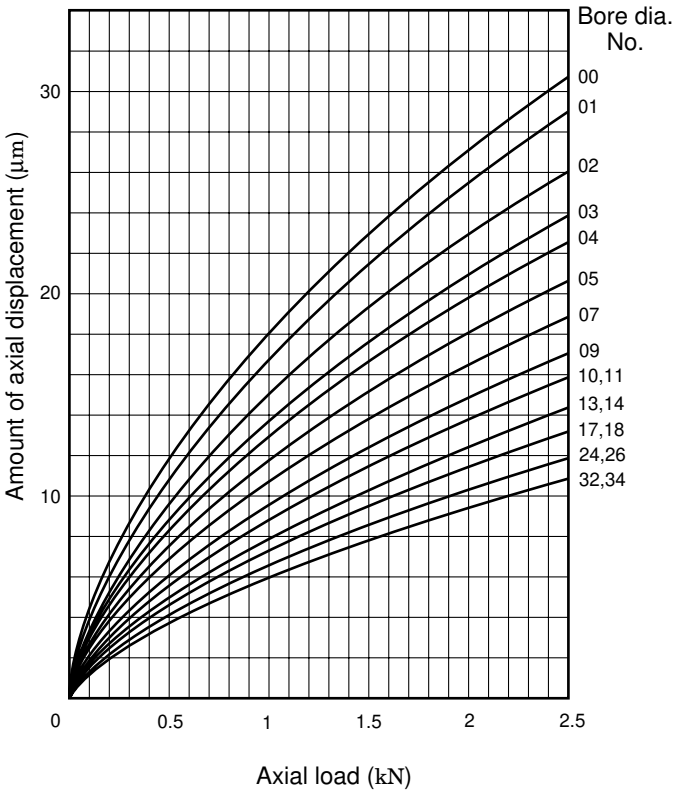


(2) 7200C (contact angle 15°)

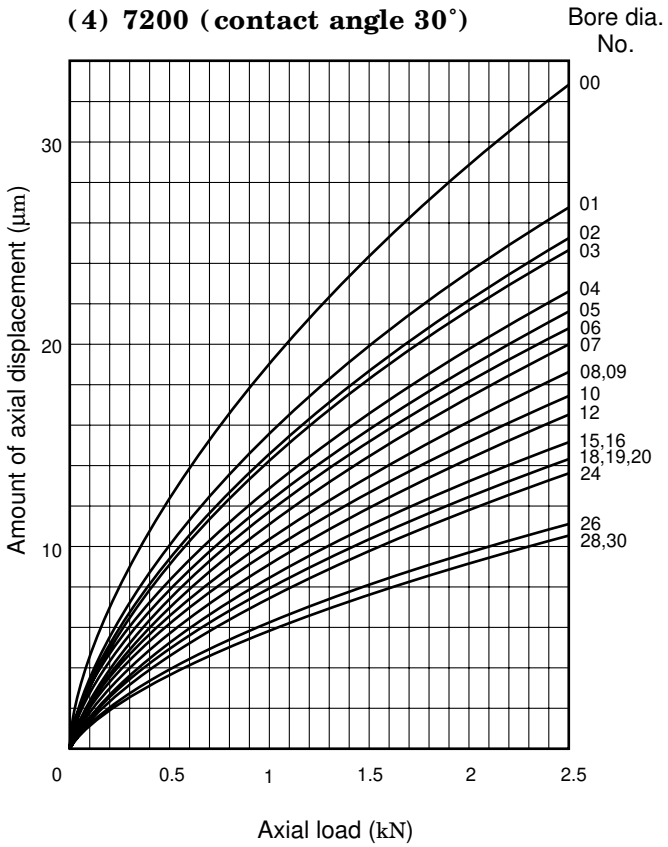


Angular contact ball bearings

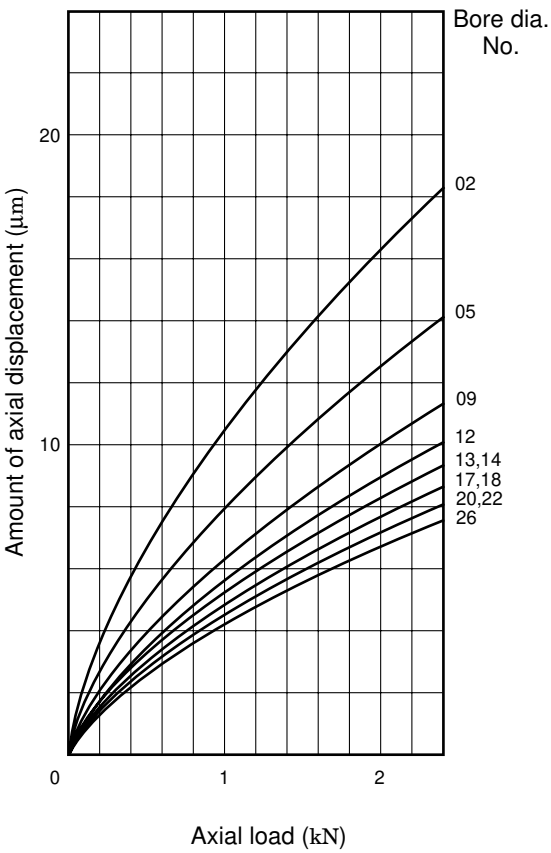
(3) 7000 (contact angle 30°)



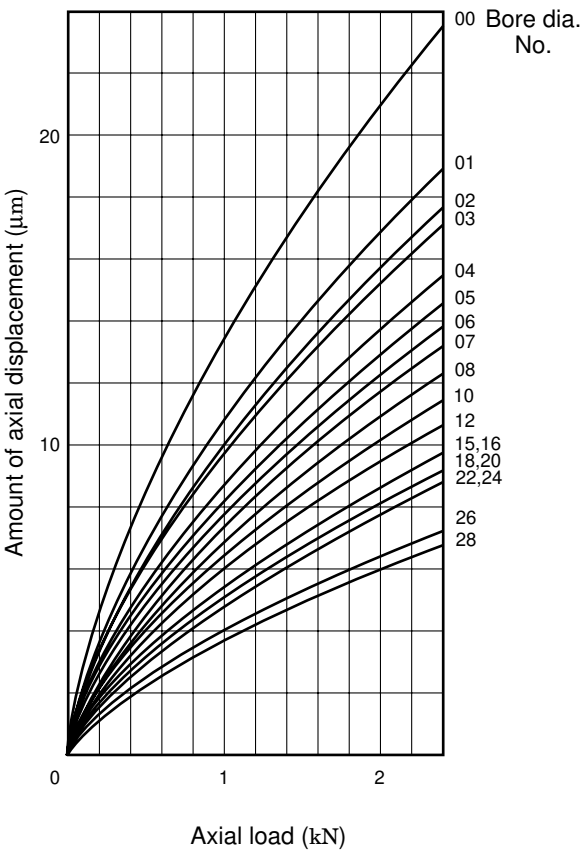
(4) 7200 (contact angle 30°)



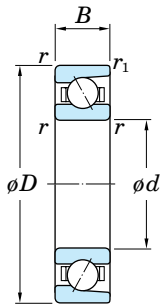
(5) 7000B (contact angle 40°)



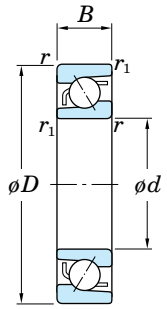
(6) 7200B (contact angle 40°)



d 10 – (25) mm



With machined cage



With pressed cage

Boundary dimensions (mm)					Basic load ratings (kN) With machined cage		Basic load ratings (kN) With pressed cage		Limiting speeds[1] (min⁻¹)		Bearing[2] No.	(Refer.) Mass
d	*D*	*B*	*r* min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	Grease lub.	Oil lub.		(kg)
10	26	8	0.3	0.15	5.00	2.35	–	–	34 000	42 000	**7000**	0.021
	30	9	0.6	0.3	4.30	2.00	4.95	2.50	22 000	29 000	**7200B**	0.031
12	28	8	0.3	0.15	5.40	2.75	–	–	29 000	37 000	**7001**	0.024
	32	10	0.6	0.3	7.45	3.65	8.00	4.05	27 000	34 000	**7201**	0.038
	32	10	0.6	0.3	6.95	3.40	7.40	3.75	20 000	27 000	**7201B**	0.038
	32	10	0.6	0.3	7.90	3.85	8.50	4.30	38 000	50 000	**7201C**	0.038
	37	12	1	0.6	10.2	4.60	11.2	5.25	24 000	31 000	**7301**	0.065
15	32	9	0.3	0.15	6.10	3.45	–	–	26 000	32 000	**7002**	0.035
	35	11	0.6	0.3	8.10	4.25	8.10	4.25	24 000	29 000	**7202**	0.048
	35	11	0.6	0.3	7.45	3.95	7.45	3.95	18 000	24 000	**7202B**	0.048
	35	11	0.6	0.3	8.65	4.55	8.65	4.55	33 000	43 000	**7202C**	0.048
	42	13	1	0.6	12.5	6.45	13.4	7.20	20 000	25 000	**7302**	0.088
17	35	10	0.3	0.15	6.75	4.15	–	–	23 000	28 000	**7003**	0.045
	40	12	0.6	0.3	10.2	5.50	10.2	5.50	21 000	26 000	**7203**	0.070
	40	12	0.6	0.3	9.35	5.05	9.35	5.05	16 000	21 000	**7203B**	0.070
	40	12	0.6	0.3	10.9	5.90	10.9	5.90	29 000	38 000	**7203C**	0.070
	47	14	1	0.6	14.9	7.90	16.0	8.75	18 000	23 000	**7303**	0.120
	47	14	1	0.6	13.8	7.30	14.8	8.10	14 000	18 000	**7303B**	0.120
20	42	12	0.6	0.3	10.3	6.10	–	–	19 000	24 000	**7004**	0.079
	47	14	1	0.6	14.5	8.40	15.4	9.15	17 000	22 000	**7204**	0.112
	47	14	1	0.6	13.3	7.70	14.1	8.40	13 000	17 000	**7204B**	0.112
	47	14	1	0.6	15.5	9.00	16.5	9.80	24 000	32 000	**7204C**	0.112
	52	15	1.1	0.6	17.4	9.40	18.7	10.4	17 000	21 000	**7304**	0.150
	52	15	1.1	0.6	16.2	8.70	17.3	9.65	13 000	17 000	**7304B**	0.150
	52	15	1.1	0.6	18.5	9.95	19.9	11.1	23 000	31 000	**7304C**	0.150
	72	19	1.1	0.6	35.6	19.1	–	–	9 600	13 000	**7404**	0.395
	72	19	1.1	0.6	33.5	17.9	–	–	8 500	12 000	**7404B**	0.395
25	47	12	0.6	0.3	11.3	7.40	–	–	17 000	21 000	**7005**	0.091
	47	12	0.6	0.3	12.3	8.00	–	–	23 000	30 000	**7005C**	0.091

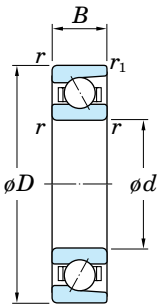
Notes 1) Rotation speed limits shown above are applicable to machined cage bearings.
Rotation speed limits of pressed cage bearings should be kept to under 80 % of this value.
For bearings with 15˚ contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.
2) B, C or no indication after the bearing number indicates nominal contact angle of 40˚, 15˚ and 30˚ respectively.
Remark) Standard cage types used for the above bearings are described earlier in this section.

d (25) – (45) mm

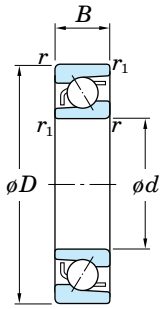
Boundary dimensions (mm)					Basic load ratings (kN) With machined cage		Basic load ratings (kN) With pressed cage		Limiting speeds[1] (min⁻¹)		Bearing[2] No.	(Refer.) Mass
d	*D*	*B*	*r* min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	Grease lub.	Oil lub.		(kg)
25	52	15	1	0.6	15.3	9.50	16.2	10.3	15 000	19 000	**7205**	0.135
	52	15	1	0.6	14.0	8.70	14.7	9.40	12 000	15 000	**7205B**	0.135
	52	15	1	0.6	16.6	10.2	17.5	11.1	21 000	28 000	**7205C**	0.135
	62	17	1.1	0.6	24.8	14.4	26.4	15.8	14 000	17 000	**7305**	0.243
	62	17	1.1	0.6	22.9	13.3	24.4	14.6	10 000	14 000	**7305B**	0.243
	62	17	1.1	0.6	26.4	15.3	28.1	16.8	19 000	25 000	**7305C**	0.243
	80	21	1.5	1	39.7	23.2	42.6	25.7	8 200	11 000	**7405**	0.527
	80	21	1.5	1	36.9	21.5	39.6	23.9	7 300	10 000	**7405B**	0.527
30	55	13	1	0.6	14.5	10.1	–	–	14 000	18 000	**7006**	0.133
	55	13	1	0.6	15.8	11.0	–	–	20 000	26 000	**7006C**	0.133
	62	16	1	0.6	21.3	13.7	22.5	14.8	13 000	16 000	**7206**	0.208
	62	16	1	0.6	19.4	12.5	20.5	13.6	9 600	13 000	**7206B**	0.208
	62	16	1	0.6	23.0	14.7	24.3	16.0	18 000	24 000	**7206C**	0.208
	72	19	1.1	0.6	30.1	18.9	31.9	20.6	12 000	14 000	**7306**	0.362
	72	19	1.1	0.6	27.6	17.4	29.3	19.0	8 700	12 000	**7306B**	0.362
	72	19	1.1	0.6	32.3	20.3	34.2	22.1	16 000	21 000	**7306C**	0.362
	90	23	1.5	1	47.6	28.4	51.0	31.6	7 300	9 700	**7406**	0.686
	90	23	1.5	1	44.2	26.4	47.4	29.3	6 500	8 900	**7406B**	0.686
35	62	14	1	0.6	17.5	12.6	–	–	12 000	15 000	**7007**	0.170
	62	14	1	0.6	19.1	13.7	–	–	17 000	22 000	**7007C**	0.170
	72	17	1.1	0.6	28.1	18.6	29.7	20.2	11 000	14 000	**7207**	0.295
	72	17	1.1	0.6	25.6	17.0	27.0	18.5	8 300	11 000	**7207B**	0.295
	72	17	1.1	0.6	30.4	20.1	32.1	21.7	15 000	20 000	**7207C**	0.295
	80	21	1.5	1	35.4	22.0	39.9	26.4	10 000	13 000	**7307**	0.475
	80	21	1.5	1	32.5	20.2	36.6	24.3	7 700	10 000	**7307B**	0.475
	80	21	1.5	1	37.9	23.6	42.8	28.3	14 000	19 000	**7307C**	0.475
	100	25	1.5	1	60.4	37.0	64.8	41.1	6 500	8 600	**7407**	0.950
	100	25	1.5	1	56.2	34.3	60.2	38.1	5 700	7 900	**7407B**	0.950
40	68	15	1	0.6	18.7	14.6	–	–	11 000	14 000	**7008**	0.210
	68	15	1	0.6	20.5	15.9	–	–	15 000	20 000	**7008C**	0.210
	80	18	1.1	0.6	33.6	23.3	35.3	25.1	10 000	12 000	**7208**	0.382
	80	18	1.1	0.6	30.6	21.3	32.1	23.0	7 500	10 000	**7208B**	0.382
	80	18	1.1	0.6	36.4	25.2	38.2	27.1	14 000	18 000	**7208C**	0.382
	90	23	1.5	1	43.2	27.4	48.8	32.9	9 200	12 000	**7308**	0.657
	90	23	1.5	1	39.7	25.2	44.8	30.3	6 900	9 200	**7308B**	0.657
	90	23	1.5	1	46.3	29.4	52.3	35.3	13 000	17 000	**7308C**	0.657
	110	27	2	1	69.9	43.5	75.0	48.4	5 900	7 900	**7408**	1.23
	110	27	2	1	64.9	40.4	69.6	44.9	5 200	7 200	**7408B**	1.23
45	75	16	1	0.6	22.2	17.7	–	–	10 000	12 000	**7009**	0.260
	75	16	1	0.6	24.4	19.3	–	–	14 000	18 000	**7009C**	0.260
	85	19	1.1	0.6	37.7	26.6	39.6	28.6	9 400	12 000	**7209**	0.430
	85	19	1.1	0.6	34.3	24.3	36.1	26.1	7 000	9 400	**7209B**	0.430
	85	19	1.1	0.6	40.8	28.7	42.9	30.9	13 000	17 000	**7209C**	0.430
	100	25	1.5	1	55.1	37.1	58.4	40.4	8 200	10 000	**7309**	0.875

Notes 1) Rotation speed limits shown above are applicable to machined cage bearings.
Rotation speed limits of pressed cage bearings should be kept to under 80 % of this value.
For bearings with 15˚ contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.
2) B, C or no indication after the bearing number indicates nominal contact angle of 40˚, 15˚ and 30˚ respectively.
Remark) Standard cage types used for the above bearings are described earlier in this section.

d (45) – (60) mm



With machined cage



With pressed cage

Boundary dimensions (mm)					Basic load ratings (kN) With machined cage		Basic load ratings (kN) With pressed cage		Limiting speeds[1] (min⁻¹)		Bearing[2] No.	(Refer.) Mass
d	*D*	*B*	*r* min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	Grease lub.	Oil lub.		(kg)
45	100	25	1.5	1	50.6	34.1	53.6	37.2	6 200	8 200	**7309B**	0.875
	100	25	1.5	1	59.2	39.7	62.7	43.4	11 000	15 000	**7309C**	0.875
	120	29	2	1	84.9	53.8	91.1	59.8	5 400	7 100	**7409**	1.55
	120	29	2	1	78.9	50.0	84.7	55.5	4 800	6 600	**7409B**	1.55
50	80	16	1	0.6	23.6	20.1	–	–	9 200	11 000	**7010**	0.290
	80	16	1	0.6	26.0	21.9	–	–	13 000	17 000	**7010C**	0.290
	90	20	1.1	0.6	39.4	29.4	41.3	31.5	8 500	11 000	**7210**	0.485
	90	20	1.1	0.6	35.7	26.7	37.4	28.6	6 400	8 500	**7210B**	0.485
	90	20	1.1	0.6	42.8	31.8	44.8	34.1	12 000	16 000	**7210C**	0.485
	110	27	2	1	70.1	48.1	74.3	52.5	7 300	9 100	**7310**	1.14
	110	27	2	1	64.4	44.3	68.2	48.3	5 500	7 300	**7310B**	1.14
	110	27	2	1	75.1	51.6	79.6	56.2	10 000	13 000	**7310C**	1.14
	130	31	2.1	1.1	97.4	65.3	–	–	4 900	6 600	**7410**	1.92
	130	31	2.1	1.1	90.2	60.4	–	–	4 400	6 000	**7410B**	1.92
55	90	18	1.1	0.6	31.1	26.3	–	–	8 300	10 000	**7011**	0.420
	90	18	1.1	0.6	34.1	28.6	–	–	11 000	15 000	**7011C**	0.420
	100	21	1.5	1	48.7	37.1	51.0	39.8	7 600	9 500	**7211**	0.635
	100	21	1.5	1	44.1	33.8	46.2	36.2	5 700	7 600	**7211B**	0.635
	100	21	1.5	1	52.9	40.2	55.4	43.1	11 000	14 000	**7211C**	0.635
	120	29	2	1	80.9	56.5	85.8	61.7	6 700	8 400	**7311**	1.45
	120	29	2	1	74.3	52.0	78.7	56.7	5 000	6 700	**7311B**	1.45
	140	33	2.1	1.1	118	82.4	–	–	4 500	6 000	**7411**	2.36
	140	33	2.1	1.1	110	76.5	–	–	4 000	5 500	**7411B**	2.36
60	95	18	1.1	0.6	31.9	28.1	–	–	7 700	9 700	**7012**	0.450
	95	18	1.1	0.6	35.0	30.6	–	–	11 000	14 000	**7012C**	0.450
	110	22	1.5	1	58.9	45.7	61.7	49.0	6 900	8 600	**7212**	0.820
	110	22	1.5	1	53.4	41.6	55.9	44.6	5 100	6 900	**7212B**	0.820
	110	22	1.5	1	64.0	49.5	67.0	53.0	9 500	13 000	**7212C**	0.820
	130	31	2.1	1.1	92.5	65.6	98.1	71.6	6 200	7 700	**7312**	1.81

Notes 1) Rotation speed limits shown above are applicable to machined cage bearings.
Rotation speed limits of pressed cage bearings should be kept to under 80 % of this value.
For bearings with 15˚ contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.
2) B, C or no indication after the bearing number indicates nominal contact angle of 40˚, 15˚ and 30˚ respectively.

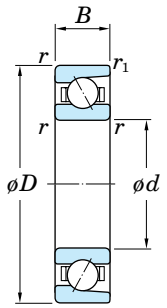
Remark) Standard cage types used for the above bearings are described earlier in this section.

d (60) – (85) mm

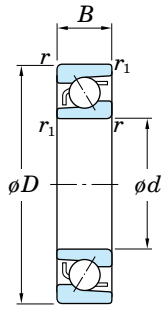
Boundary dimensions (mm)					Basic load ratings (kN) With machined cage		Basic load ratings (kN) With pressed cage		Limiting speeds[1] (min⁻¹)		Bearing[2] No.	(Refer.) Mass
d	*D*	*B*	*r* min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	Grease lub.	Oil lub.		(kg)
60	130	31	2.1	1.1	84.9	60.3	90.0	65.8	4 600	6 200	**7312B**	1.81
	150	35	2.1	1.1	129	93.6	–	–	4 100	5 500	**7412**	2.85
	150	35	2.1	1.1	119	86.7	–	–	3 700	5 100	**7412B**	2.85
65	100	18	1.1	0.6	33.7	31.4	–	–	7 200	9 000	**7013**	0.470
	100	18	1.1	0.6	37.1	34.3	–	–	10 000	13 000	**7013C**	0.470
	120	23	1.5	1	67.3	54.2	70.2	57.8	6 400	8 000	**7213**	1.02
	120	23	1.5	1	60.9	49.3	63.6	52.6	4 800	6 400	**7213B**	1.02
	120	23	1.5	1	73.1	58.7	76.3	62.6	8 900	12 000	**7213C**	1.02
	140	33	2.1	1.1	105	75.3	111	82.2	5 800	7 200	**7313**	2.22
	140	33	2.1	1.1	96.1	69.3	102	75.6	4 300	5 800	**7313B**	2.22
	160	37	2.1	1.1	139	104	–	–	3 900	5 200	**7413**	3.41
	160	37	2.1	1.1	129	96.8	–	–	3 500	4 800	**7413B**	3.41
70	110	20	1.1	0.6	42.7	39.4	–	–	6 600	8 300	**7014**	0.660
	110	20	1.1	0.6	46.9	43.0	–	–	9 200	12 000	**7014C**	0.660
	125	24	1.5	1	69.8	55.6	76.3	63.5	6 100	7 600	**7214**	1.12
	125	24	1.5	1	63.2	50.6	69.1	57.8	4 600	6 100	**7214B**	1.12
	125	24	1.5	1	75.9	60.2	83.0	68.8	8 400	11 000	**7214C**	1.12
	150	35	2.1	1.1	118	85.8	125	93.6	5 400	6 700	**7314**	2.70
	150	35	2.1	1.1	108	78.9	114	86.0	4 000	5 400	**7314B**	2.70
	180	42	3	1.1	149	115	–	–	3 500	4 600	**7414**	4.99
	180	42	3	1.1	148	119	–	–	3 100	4 300	**7414B**	4.99
75	115	20	1.1	0.6	43.6	41.7	–	–	6 300	7 800	**7015**	0.690
	130	25	1.5	1	79.2	65.2	82.7	69.5	5 800	7 200	**7215**	1.23
	130	25	1.5	1	71.7	59.3	74.9	63.3	4 300	5 800	**7215B**	1.23
	130	25	1.5	1	86.1	70.6	89.9	75.3	8 000	11 000	**7215C**	1.23
	160	37	2.1	1.1	128	97.0	136	106	5 000	6 300	**7315**	3.15
	160	37	2.1	1.1	118	89.2	125	97.3	3 800	5 000	**7315B**	3.15
	190	45	3	1.1	171	141	–	–	3 300	4 400	**7415**	5.90
	190	45	3	1.1	158	131	–	–	2 900	4 000	**7415B**	5.90
80	125	22	1.1	0.6	53.4	50.6	–	–	5 800	7 200	**7016**	0.930
	140	26	2	1	85.3	71.5	89.0	76.2	5 400	6 700	**7216**	1.50
	140	26	2	1	77.1	65.0	80.5	69.3	4 000	5 400	**7216B**	1.50
	140	26	2	1	92.8	77.5	96.9	82.7	7 500	9 900	**7216C**	1.50
	170	39	2.1	1.1	139	109	147	119	4 700	5 900	**7316**	3.85
	170	39	2.1	1.1	127	100	135	109	3 500	4 700	**7316B**	3.85
	200	48	3	1.1	193	166	–	–	3 100	4 100	**7416**	6.00
	200	48	3	1.1	179	154	–	–	2 700	3 800	**7416B**	6.00
85	130	22	1.1	0.6	54.6	53.7	–	–	5 500	6 800	**7017**	0.970
	130	22	1.1	0.6	60.1	58.7	–	–	7 600	10 000	**7017C**	0.970
	150	28	2	1	98.6	83.6	103	89.2	5 000	6 300	**7217**	1.87
	150	28	2	1	89.2	76.0	93.1	81.1	3 800	5 000	**7217B**	1.87
	150	28	2	1	107	90.6	112	96.6	7 000	9 200	**7217C**	1.87
	180	41	3	1.1	150	122	159	133	4 400	5 500	**7317**	4.53
	180	41	3	1.1	137	112	145	122	3 300	4 400	**7317B**	4.53

Notes 1) Rotation speed limits shown above are applicable to machined cage bearings.
Rotation speed limits of pressed cage bearings should be kept to under 80 % of this value.
For bearings with 15˚ contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.
2) B, C or no indication after the bearing number indicates nominal contact angle of 40˚, 15˚ and 30˚ respectively.
Remark) Standard cage types used for the above bearings are described earlier in this section.

d (85) – (105) mm



With machined cage



With pressed cage

Boundary dimensions (mm)					Basic load ratings (kN) With machined cage		Basic load ratings (kN) With pressed cage		Limiting speeds[1] (min⁻¹)		Bearing[2] No.	(Refer.) Mass
d	D	B	r min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	Grease lub.	Oil lub.		(kg)
85	210	52	4	1.5	204	180	–	–	3 000	3 900	**7417**	8.54
	210	52	4	1.5	189	167	–	–	2 600	3 600	**7417B**	8.54
90	140	24	1.5	1	65.2	63.3	–	–	5 100	6 400	**7018**	1.26
	140	24	1.5	1	71.7	69.1	–	–	7 100	9 400	**7018C**	1.26
	160	30	2	1	113	96.7	118	103	4 700	5 900	**7218**	2.30
	160	30	2	1	102	88.0	107	93.8	3 500	4 700	**7218B**	2.30
	160	30	2	1	123	105	128	112	6 500	8 600	**7218C**	2.30
	190	43	3	1.1	161	135	171	147	4 200	5 200	**7318**	5.30
	190	43	3	1.1	148	124	156	135	3 100	4 200	**7318B**	5.30
	225	54	4	1.5	216	196	–	–	2 800	3 700	**7418**	11.4
	225	54	4	1.5	200	182	–	–	2 500	3 400	**7418B**	11.4
95	145	24	1.5	1	66.6	67.1	–	–	4 800	6 000	**7019**	1.32
	145	24	1.5	1	73.4	73.4	–	–	6 700	8 900	**7019C**	1.32
	170	32	2.1	1.1	122	103	128	111	4 400	5 500	**7219**	2.78
	170	32	2.1	1.1	111	94.0	116	101	3 300	4 400	**7219B**	2.78
	170	32	2.1	1.1	133	112	139	120	6 100	8 100	**7219C**	2.78
	200	45	3	1.1	172	149	183	162	4 000	4 900	**7319**	6.12
	200	45	3	1.1	158	137	167	149	3 000	4 000	**7319B**	6.12
100	150	24	1.5	1	68.4	70.6	–	–	4 700	5 900	**7020**	1.37
	150	24	1.5	1	61.2	63.6	–	–	3 500	4 700	**7020B**	1.37
	150	24	1.5	1	75.3	77.2	–	–	6 500	8 600	**7020C**	1.37
	180	34	2.1	1.1	137	117	144	126	4 100	5 200	**7220**	3.32
	180	34	2.1	1.1	124	107	130	115	3 100	4 200	**7220B**	3.32
	180	34	2.1	1.1	149	127	156	136	5 700	7 600	**7220C**	3.32
	215	47	3	1.1	184	161	207	194	3 600	4 600	**7320**	7.53
	215	47	3	1.1	168	148	190	178	2 700	3 600	**7320B**	7.53
105	160	26	2	1	79.8	81.9	–	–	4 400	5 500	**7021**	1.73
	190	36	2.1	1.1	149	132	–	–	3 900	4 900	**7221**	3.95
	190	36	2.1	1.1	135	121	–	–	2 900	3 900	**7221B**	3.95

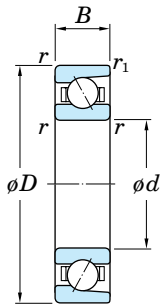
Notes 1) Rotation speed limits shown above are applicable to machined cage bearings.
Rotation speed limits of pressed cage bearings should be kept to under 80 % of this value.
For bearings with 15˚ contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.
2) B, C or no indication after the bearing number indicates nominal contact angle of 40˚, 15˚ and 30˚ respectively.
Remark) Standard cage types used for the above bearings are described earlier in this section.

d (105) – 180 mm

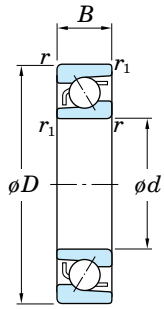
Boundary dimensions (mm)					Basic load ratings (kN)				Limiting speeds (min⁻¹)		Bearing[1] No.	(Refer.) Mass
					With machined cage		With pressed cage					
d	*D*	*B*	*r* min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	Grease lub.	Oil lub.		(kg)
105	225	49	3	1.1	208	193	–	–	3 500	4 400	**7321**	8.62
	225	49	3	1.1	191	177	–	–	2 600	3 500	**7321B**	8.62
110	170	28	2	1	91.9	92.8	–	–	4 200	5 200	**7022**	2.14
	200	38	2.1	1.1	162	148	–	–	3 700	4 600	**7222**	4.65
	200	38	2.1	1.1	147	135	–	–	2 800	3 700	**7222B**	4.65
	240	50	3	1.1	232	226	–	–	3 200	4 000	**7322**	10.1
	240	50	3	1.1	213	208	–	–	2 400	3 200	**7322B**	10.1
120	180	28	2	1	96.6	103	–	–	3 900	4 900	**7024**	2.27
	215	40	2.1	1.1	174	166	–	–	3 400	4 300	**7224**	5.49
	215	40	2.1	1.1	158	151	–	–	2 600	3 400	**7224B**	5.49
	260	55	3	1.1	246	252	–	–	3 000	3 700	**7324**	12.6
	260	55	3	1.1	225	231	–	–	2 200	3 000	**7324B**	12.6
130	200	33	2	1	117	125	–	–	3 500	4 400	**7026**	3.43
	200	33	2	1	105	113	–	–	2 600	3 500	**7026B**	3.43
	230	40	3	1.1	196	198	–	–	3 200	4 000	**7226**	6.21
	230	40	3	1.1	177	180	–	–	2 400	3 200	**7226B**	6.21
	280	58	4	1.5	301	329	–	–	2 700	3 400	**7326**	15.4
	280	58	4	1.5	250	268	–	–	2 100	2 700	**7326B**	15.4
140	210	33	2	1	120	133	–	–	3 300	4 100	**7028**	3.64
	210	33	2	1	107	119	–	–	2 500	3 300	**7028B**	3.64
	250	42	3	1.1	218	234	–	–	2 900	3 600	**7228**	7.76
	250	42	3	1.1	197	213	–	–	2 200	2 900	**7228B**	7.76
	300	62	4	1.5	329	374	–	–	2 500	3 200	**7328**	18.8
	300	62	4	1.5	302	344	–	–	1 900	2 500	**7328B**	18.8
150	225	35	2.1	1.1	137	154	–	–	3 000	3 800	**7030**	4.43
	225	35	2.1	1.1	122	138	–	–	2 300	3 000	**7030B**	4.43
	270	45	3	1.1	248	280	–	–	2 700	3 300	**7230**	9.75
	270	45	3	1.1	225	254	–	–	2 000	2 700	**7230B**	9.75
	320	65	4	1.5	348	414	–	–	2 300	2 900	**7330**	22.4
	320	65	4	1.5	318	380	–	–	1 800	2 300	**7330B**	22.4
160	240	38	2.1	1.1	155	176	–	–	2 800	3 500	**7032**	5.45
	240	38	2.1	1.1	139	158	–	–	2 100	2 800	**7032B**	5.45
	290	48	3	1.1	230	263	–	–	2 500	3 100	**7232**	12.1
	290	48	3	1.1	238	279	–	–	1 800	2 500	**7232B**	12.1
	340	68	4	1.5	332	416	–	–	1 600	2 200	**7332B**	26.4
170	260	42	2.1	1.1	186	214	–	–	2 600	3 200	**7034**	7.58
	260	42	2.1	1.1	166	193	–	–	1 900	2 600	**7034B**	7.77
	310	52	4	1.5	245	300	–	–	1 700	2 300	**7234B**	15.1
	360	72	4	1.5	355	444	–	–	1 500	2 000	**7334B**	31.2
180	280	46	2.1	1.1	212	253	–	–	2 400	3 000	**7036**	10.1
	280	46	2.1	1.1	190	228	–	–	1 800	2 400	**7036B**	10.2
	320	52	4	1.5	265	329	–	–	1 600	2 200	**7236B**	15.7
	380	75	4	1.5	373	488	–	–	1 400	1 900	**7336B**	40.0

Note 1) B, C or no indication after the bearing number indicates nominal contact angle of 40˚, 15˚ and 30˚ respectively.
Remark) Standard cage types used for the above bearings are described earlier in this section.

d 190 – 200 mm



With machined cage



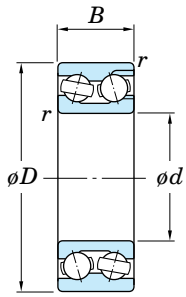
With pressed cage

Boundary dimensions (mm)					Basic load ratings (kN) With machined cage		With pressed cage		Limiting speeds (min⁻¹)		Bearing[1] No.	(Refer.) Mass
d	*D*	*B*	*r* min.	r_1 min.	C_r	C_{0r}	C_r	C_{0r}	Grease lub.	Oil lub.		(kg)
190	290	46	2.1	1.1	217	268	–	–	2 300	2 800	**7038**	10.8
	290	46	2.1	1.1	194	241	–	–	1 700	2 300	**7038B**	10.8
	340	55	4	1.5	273	353	–	–	1 500	2 000	**7238B**	18.8
	400	78	5	2	411	548	–	–	1 300	1 800	**7338B**	45.5
200	360	58	4	1.5	292	384	–	–	1 400	1 900	**7240B**	22.4
	420	80	5	2	432	602	–	–	1 200	1 700	**7340B**	52.0

Note 1) B, C or no indication after the bearing number indicates nominal contact angle of 40˚, 15˚ and 30˚ respectively.
Remark) Standard cage types used for the above bearings are described earlier in this section.

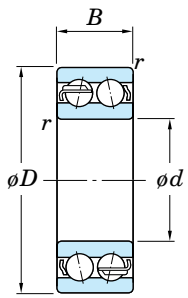
Double-row angular contact ball bearings

d 15 – 45 mm

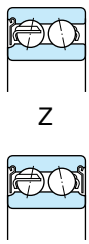


Open

32, 33 series
(With filling slot)

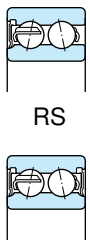


Open



Z

ZZ
Shielded



RS

2RS
Contact sealed

52, 53 series
(Without filling slot)

Boundary dimensions (mm)				Basic load ratings (kN) Open		Shielded-sealed		Limiting speeds (min⁻¹) Grease lub.		Oil lub.	Bearing No.			(Refer.) Mass
d	*D*	*B*	*r* min.	C_r	C_{0r}	C_r	C_{0r}	Open Z, ZZ	(RS, 2RS)	Open Z	Open	Shielded ZZ	Sealed 2RS	(kg)
15	35	15.9	0.6	9.70	7.45	–	–	12 000	–	16 000	**3202**	**–**	**–**	0.072
	42	19	1	15.2	11.9	–	–	10 000	–	14 000	**3302**	**–**	**–**	0.132
17	40	17.5	0.6	13.8	10.8	–	–	11 000	–	14 000	**3203**	**–**	**–**	0.100
	40	17.5	0.6	13.2	8.15	12.7	8.35	11 000	11 000	14 000	**5203**	**ZZ**	**2RS**	0.091
	47	22.2	1	21.7	17.1	–	–	9 400	–	13 000	**3303**	**–**	**–**	0.192
20	47	20.6	1	17.2	15.0	–	–	9 000	–	12 000	**3204**	**–**	**–**	0.170
	47	20.6	1	19.7	12.6	16.0	10.8	8 800	8 800	12 000	**5204**	**ZZ**	**2RS**	0.120
	52	22.2	1.1	20.8	18.4	–	–	8 200	–	11 000	**3304**	**–**	**–**	0.230
	52	22.2	1.1	24.7	15.0	19.8	12.8	8 300	8 300	11 000	**5304**	**ZZ**	**2RS**	0.230
25	52	20.6	1	18.9	18.2	–	–	7 800	–	10 000	**3205**	**–**	**–**	0.190
	52	20.6	1	21.4	14.8	18.9	13.8	7 700	7 700	10 000	**5205**	**ZZ**	**2RS**	0.190
	62	25.4	1.1	28.9	26.5	–	–	6 800	–	9 100	**3305**	**–**	**–**	0.369
	62	25.4	1.1	32.7	20.8	27.5	18.5	6 900	6 900	9 200	**5305**	**ZZ**	**2RS**	0.340
30	62	23.8	1	27.3	27.0	–	–	6 500	–	8 700	**3206**	**–**	**–**	0.320
	62	23.8	1	29.7	21.3	25.4	18.3	6 400	6 400	8 600	**5206**	**ZZ**	**2RS**	0.290
	72	30.2	1.1	38.1	36.1	–	–	5 800	–	7 800	**3306**	**–**	**–**	0.585
	72	30.2	1.1	41.0	28.5	34.3	25.2	5 800	5 800	7 700	**5306**	**ZZ**	**2RS**	0.510
35	72	27	1.1	36.8	37.5	–	–	5 600	–	7 500	**3207**	**–**	**–**	0.480
	72	27	1.1	39.2	29.0	31.7	24.6	5 500	5 500	7 300	**5207**	**ZZ**	**2RS**	0.430
	80	34.9	1.5	48.6	46.8	–	–	5 200	–	7 000	**3307**	**–**	**–**	0.816
	80	34.9	1.5	51.2	36.2	46.1	32.8	5 100	5 100	6 800	**5307**	**ZZ**	**2RS**	0.790
40	80	30.2	1.1	42.0	43.9	–	–	5 000	–	6 700	**3208**	**–**	**–**	0.650
	80	30.2	1.1	44.4	33.6	36.5	29.1	5 000	5 000	6 700	**5208**	**ZZ**	**2RS**	0.570
	90	36.5	1.5	54.1	53.8	–	–	4 600	–	6 100	**3308**	**–**	**–**	1.07
	90	36.5	1.5	62.7	45.4	51.4	37.8	4 600	4 600	6 100	**5308**	**ZZ**	**2RS**	1.05
45	85	30.2	1.1	45.4	51.4	–	–	4 600	–	6 100	**3209**	**–**	**–**	0.710
	85	30.2	1.1	49.9	38.4	41.7	33.9	4 600	4 600	6 100	**5209**	**ZZ**	**2RS**	0.620
	100	39.7	1.5	66.1	67.3	–	–	4 100	–	5 500	**3309**	**–**	**–**	1.42
	100	39.7	1.5	75.1	55.7	68.9	51.4	4 100	4 100	5 500	**5309**	**ZZ**	**2RS**	1.42

Remark) Standard cage types used for the above bearings are described earlier in this section.

d 50 – 100 mm

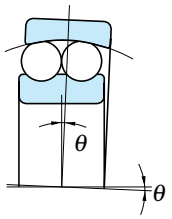
Boundary dimensions (mm)				Basic load ratings (kN)				Limiting speeds (min⁻¹)			Bearing No.			(Refer.) Mass
				Open		Shielded-sealed		Grease lub.		Oil lub.				
d	*D*	*B*	*r* min.	C_r	C_{0r}	C_r	C_{0r}	Open Z, ZZ	(RS, 2RS)	Open Z	Open	Shielded ZZ	Sealed 2RS	(kg)
50	90	30.2	1.1	45.1	52.1	–	–	4 300	–	5 700	**3210**	**–**	**–**	0.760
	90	30.2	1.1	53.3	43.6	44.1	37.9	4 300	4 300	5 600	**5210**	**ZZ**	**2RS**	0.670
	110	44.4	2	86.1	88.6	–	–	3 800	–	5 000	**3310**	**–**	**–**	1.95
	110	44.4	2	88.5	67.0	81.8	62.2	3 600	3 600	4 800	**5310**	**ZZ**	**2RS**	1.93
55	100	33.3	1.5	50.9	60.2	–	–	3 900	–	5 100	**3211**	**–**	**–**	1.05
	100	33.3	1.5	65.9	55.2	52.9	44.7	3 800	3 800	5 100	**5211**	**ZZ**	**2RS**	0.960
	120	49.2	2	101	106	–	–	3 400	–	4 500	**3311**	**–**	**–**	2.53
	120	49.2	2	110	85.1	95.7	74.3	3 300	3 300	4 500	**5311**	**ZZ**	**2RS**	2.30
60	110	36.5	1.5	64.0	76.8	–	–	3 500	–	4 700	**3212**	**–**	**–**	1.40
	110	36.5	1.5	74.4	60.8	62.6	55.9	3 500	3 500	4 700	**5212**	**ZZ**	**2RS**	1.36
	130	54	2.1	125	132	–	–	3 100	–	4 200	**3312**	**–**	**–**	3.24
	130	54	2.1	126	98.7	110	87.1	3 100	3 100	4 100	**5312**	**ZZ**	**2RS**	3.16
65	120	38.1	1.5	76.4	97.4	–	–	3 200	–	4 300	**3213**	**–**	**–**	1.75
	120	38.1	1.5	86.9	75.3	69.2	63.1	3 200	3 200	4 300	**5213**	**ZZ**	**2RS**	1.66
	140	58.7	2.1	142	153	–	–	2 900	–	3 900	**3313**	**–**	**–**	4.08
	140	58.7	2.1	142	113	142	113	2 900	2 900	3 900	**5313**	**ZZ**	**2RS**	3.91
70	125	39.7	1.5	77.9	96.4	–	–	3 100	–	4 100	**3214**	**–**	**–**	1.92
	125	39.7	1.5	94.5	82.6	76.3	70.3	3 100	3 100	4 100	**5214**	**ZZ**	**2RS**	1.81
	150	63.5	2.1	151	160	–	–	2 700	–	3 600	**3314**	**–**	**–**	5.04
	150	63.5	2.1	160	129	160	129	2 700	2 700	3 600	**5314**	**ZZ**	**2RS**	4.89
75	130	41.3	1.5	92.4	120	–	–	2 900	–	3 900	**3215**	**–**	**–**	2.10
	160	68.3	2.1	169	189	–	–	2 500	–	3 300	**3315**	**–**	**–**	6.16
	160	68.3	2.1	174	147	174	147	2 500	2 500	3 300	**5315**	**ZZ**	**2RS**	5.97
80	140	44.4	2	97.5	121	–	–	2 700	–	3 600	**3216**	**–**	**–**	2.64
	170	68.3	2.1	184	213	–	–	2 400	–	3 100	**3316**	**–**	**–**	6.93
85	150	49.2	2	114	143	–	–	2 500	–	3 400	**3217**	**–**	**–**	3.39
	180	73	3	188	219	–	–	2 200	–	3 000	**3317**	**–**	**–**	8.30
90	160	52.4	2	132	167	–	–	2 400	–	3 100	**3218**	**–**	**–**	4.14
	190	73	3	205	242	–	–	2 100	–	2 800	**3318**	**–**	**–**	9.23
95	170	55.6	2.1	152	193	–	–	2 200	–	3 000	**3219**	**–**	**–**	5.00
	200	77.8	3	218	270	–	–	2 000	–	2 600	**3319**	**–**	**–**	10.9
100	180	60.3	2.1	172	221	–	–	2 100	–	2 800	**3220**	**–**	**–**	6.10
	215	82.6	3	249	324	–	–	1 800	–	2 500	**3320**	**–**	**–**	13.5

Remark) Standard cage types used for the above bearings are described earlier in this section.

KOYO

Self-aligning ball bearings

Self-aligning ball bearings have a spherical outer ring raceway, the center of whose curvature meets that of the bearing itself, so that the inner ring, balls and cage continue to rotate, aligning themselves if they have become misaligned within design limits.

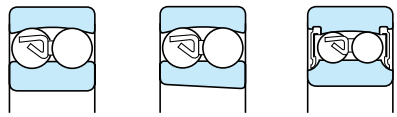


θ : Allowable aligning angle

This type of bearing is suitable when the displacement of the centers around which the shaft and housing rotate and shaft deflection are likely to occur.

Bearings with a tapered bore can easily be fit to the shaft with an adapter assembly.

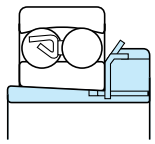
Self-aligning ball bearings



Cylindrical bore | Tapered bore | Sealed bore

Bore diameter **10 – 100 mm**

Adapter assemblies



Bore diameter **17 – 90 mm**

Boundary dimensions	The dimensions of standard series are as specified in JIS B 1512.
Tolerances	As specified in JIS B 1514, class 0.
Radial internal clearance	As specified in JIS B 1520. (refer to Table 2-5 on p. A 14.)
Standard cages	• Staggered type pressed steel cage (application : all dimensional range of 12, 13, 22...2RS and 23...2RS series) • Snap type pressed steel cage (application : all dimensional range of 22 series and those of No. 2300 thru 2316) • Copper alloy machined cage (application : bearings of No. 2317 thru 2320)
Allowable aligning angle	• 12 and 22 series ..... 0.044 rad (2.5˚) • 13 and 23 series ..... 0.052 rad (3˚) • 22...2RS and 23...2RS series.. 0.026 rad (1.5˚)

Dynamic equivalent radial load

$P_r = XF_r + YF_a$

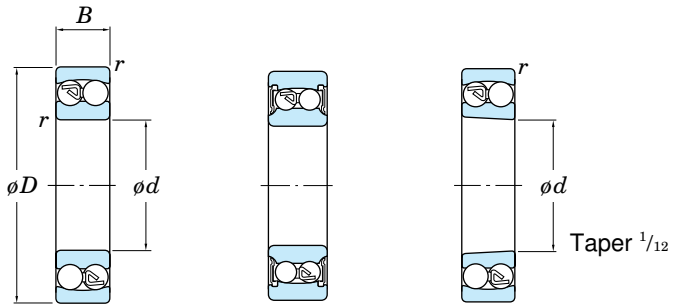
$F_a / F_r \leq e$		$F_a / F_r > e$	
X	Y	X	Y
1	Y_1	0.65	Y_2

Static equivalent radial load

$P_{0r} = F_r + Y_0 F_a$

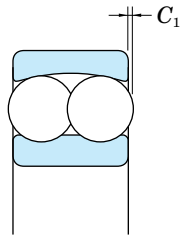
Self-aligning ball bearings

d 10 – 35 mm



Cylindrical bore　　Sealed　　Tapered bore

[Note] Protruding distance of balls



Balls of the following bearing protrude by C_1 from the bearing side.

Bearing No.	C_1 (mm)
2216	0.2 (approx.)

Boundary dimensions (mm)				Basic load ratings (kN)				Limiting speeds (min⁻¹)			Bearing No.			(Refer.) Mass (kg)	
				Open		Sealed type		Grease lub.		Oil lub.	Cylindrical bore	Sealed type	Tapered bore		
d	D	B	r min.	C_r	C_{0r}	C_r	C_{0r}	Open	2RS	Open	Open	2RS	Open	Cylindrical bore	Tapered bore
10	30	9	0.6	5.50	1.20	–	–	23 000	–	28 000	**1200**	**–**	**–**	0.034	–
	30	14	0.6	7.40	1.60	5.40	1.20	23 000	15 000	29 000	**2200**	**2RS**	**–**	0.047	–
12	32	10	0.6	5.60	1.25	–	–	21 000	–	26 000	**1201**	**–**	**–**	0.040	–
	32	14	0.6	7.65	1.75	5.60	1.25	21 000	14 000	26 000	**2201**	**2RS**	**–**	0.053	–
	37	12	1	9.40	2.15	–	–	18 000	–	22 000	**1301**	**–**	**–**	0.067	–
	37	17	1	9.70	2.30	–	–	16 000	–	22 000	**2301**	**–**	**–**	0.095	–
15	35	11	0.6	7.45	1.75	–	–	18 000	–	22 000	**1202**	**–**	**–**	0.049	–
	35	14	0.6	7.70	1.85	7.45	1.75	18 000	12 000	22 000	**2202**	**2RS**	**–**	0.060	–
	42	13	1	9.55	2.30	–	–	16 000	–	20 000	**1302**	**–**	**–**	0.094	–
	42	17	1	12.1	2.90	9.55	2.30	14 000	11 000	20 000	**2302**	**2RS**	**–**	0.114	–
17	40	12	0.6	7.90	2.00	–	–	16 000	–	20 000	**1203**	**–**	**–**	0.073	–
	40	16	0.6	9.80	2.40	7.90	2.00	16 000	11 000	20 000	**2203**	**2RS**	**–**	0.088	–
	47	14	1	12.5	3.20	–	–	14 000	–	17 000	**1303**	**–**	**–**	0.130	–
	47	19	1	14.5	3.60	12.5	3.20	13 000	9 400	18 000	**2303**	**2RS**	**–**	0.158	–
20	47	14	1	9.90	2.60	–	–	14 000	–	17 000	**1204**	**–**	**1204K**	0.120	0.118
	47	18	1	12.6	3.30	9.90	2.60	14 000	9 100	17 000	**2204**	**2RS**	**2204K**	0.140	0.136
	52	15	1.1	12.4	3.30	–	–	13 000	–	15 000	**1304**	**–**	**1304K**	0.163	0.161
	52	21	1.1	18.0	4.70	12.4	3.35	11 000	8 300	15 000	**2304**	**2RS**	**2304K**	0.209	0.205
25	52	15	1	12.1	3.30	–	–	12 000	–	14 000	**1205**	**–**	**1205K**	0.141	0.138
	52	18	1	12.6	3.50	12.1	3.30	12 000	7 900	15 000	**2205**	**2RS**	**2205K**	0.163	0.158
	62	17	1.1	18.0	5.00	–	–	9 900	–	12 000	**1305**	**–**	**1305K**	0.257	0.252
	62	24	1.1	24.4	6.60	17.6	4.95	9 400	6 600	13 000	**2305**	**2RS**	**2305K**	0.335	0.327
30	62	16	1	15.6	4.65	–	–	9 900	–	12 000	**1206**	**–**	**1206K**	0.220	0.216
	62	20	1	15.6	4.65	15.6	4.65	10 000	6 600	12 000	**2206**	**2RS**	**2206K**	0.260	0.254
	72	19	1.1	21.3	6.30	–	–	8 700	–	11 000	**1306**	**–**	**1306K**	0.387	0.381
	72	27	1.1	31.4	8.75	21.3	6.30	8 000	5 800	11 000	**2306**	**2RS**	**2306K**	0.500	0.489
35	72	17	1.1	15.8	5.10	–	–	8 500	–	10 000	**1207**	**–**	**1207K**	0.323	0.317
	72	23	1.1	21.6	6.60	15.8	5.10	8 500	5 700	10 000	**2207**	**2RS**	**2207K**	0.403	0.396
	80	21	1.5	25.1	7.85	–	–	7 600	–	9 300	**1307**	**–**	**1307K**	0.510	0.502
	80	31	1.5	39.4	11.3	25.1	7.85	7 100	5 100	9 800	**2307**	**2RS**	**2307K**	0.675	0.657

Remark) Standard cage types used for the above bearings are described earlier in this section.

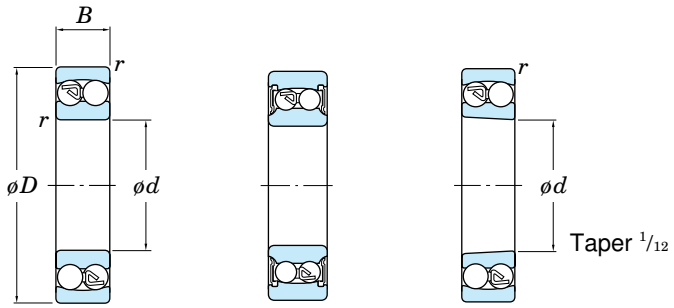
d 40 – 90 mm

Boundary dimensions (mm)				Basic load ratings (kN)				Limiting speeds (min⁻¹)			Bearing No.			(Refer.)Mass(kg)	
				Open		Sealed type		Grease lub.		Oil lub.	Cylindrical bore	Sealed type	Tapered bore		
d	*D*	*B*	*r* min.	C_r	C_{0r}	C_r	C_{0r}	Open	2RS	Open	Open	2RS	Open	Cylindrical bore	Tapered bore
40	80	18	1.1	19.2	6.50	–	–	7 500	–	9 200	**1208**	**–**	**1208K**	0.417	0.411
	80	23	1.1	22.4	7.40	19.2	6.50	7 600	5 000	9 300	**2208**	**2RS**	**2208K**	0.505	0.494
	90	23	1.5	29.5	9.70	–	–	6 900	–	8 400	**1308**	**–**	**1308K**	0.715	0.704
	90	33	1.5	44.9	13.5	29.5	9.70	6 200	4 600	8 600	**2308**	**2RS**	**2308K**	0.925	0.903
45	85	19	1.1	21.8	7.35	–	–	7 000	–	8 500	**1209**	**–**	**1209K**	0.465	0.459
	85	23	1.1	23.3	8.15	21.8	7.35	7 000	4 600	8 500	**2209**	**2RS**	**2209K**	0.545	0.533
	100	25	1.5	38.1	12.7	–	–	6 100	–	7 500	**1309**	**–**	**1309K**	0.957	0.942
	100	36	1.5	54.4	16.7	38.1	12.7	5 600	4 100	7 700	**2309**	**2RS**	**2309K**	1.23	1.20
50	90	20	1.1	22.7	8.10	–	–	6 500	–	7 900	**1210**	**–**	**1210K**	0.525	0.515
	90	23	1.1	23.3	8.50	22.7	8.10	6 500	4 300	7 900	**2210**	**2RS**	**2210K**	0.590	0.577
	110	27	2	43.4	14.1	–	–	5 600	–	6 800	**1310**	**–**	**1310K**	1.21	1.19
	110	40	2	64.6	20.3	43.4	14.1	5 100	3 700	7 000	**2310**	**2RS**	**2310K**	1.64	1.60
55	100	21	1.5	26.8	10.0	–	–	5 800	–	7 100	**1211**	**–**	**1211K**	0.705	0.693
	100	25	1.5	26.8	10.0	26.8	10.0	5 800	3 900	7 100	**2211**	**2RS**	**2211K**	0.810	0.792
	120	29	2	51.3	17.9	–	–	5 000	–	6 200	**1311**	**–**	**1311K**	1.58	1.56
	120	43	2	75.3	24.0	51.3	17.9	4 600	3 400	6 400	**2311**	**2RS**	**2311K**	2.10	2.05
60	110	22	1.5	30.2	11.5	–	–	5 200	–	6 400	**1212**	**–**	**1212K**	0.900	0.885
	110	28	1.5	34.1	12.6	30.2	11.5	5 300	3 500	6 500	**2212**	**2RS**	**2212K**	1.09	1.07
	130	31	2.1	57.2	20.8	–	–	4 500	–	5 500	**1312**	**–**	**1312K**	1.96	1.93
	130	46	2.1	87.2	28.3	57.1	20.8	4 200	3 000	5 800	**2312**	**2RS**	**2312K**	2.60	2.53
65	120	23	1.5	31.0	12.5	–	–	4 800	–	5 800	**1213**	**–**	**1213K**	1.15	1.13
	120	31	1.5	43.5	16.4	31.0	12.5	4 900	3 200	5 900	**2213**	**2RS**	**2213K**	1.46	1.43
	140	33	2.1	61.7	22.9	–	–	4 300	–	5 200	**1313**	**–**	**1313K**	2.45	2.41
	140	48	2.1	95.8	32.5	62.1	22.9	3 800	2 900	5 300	**2313**	**2RS**	**2313K**	3.23	3.15
70	125	24	1.5	34.6	13.8	–	–	4 600	–	5 700	**1214**	**–**	**–**	1.26	–
	125	31	1.5	43.9	17.1	34.6	13.8	4 600	3 100	5 600	**2214**	**2RS**	**–**	1.52	–
	150	35	2.1	74.0	27.7	–	–	4 000	–	4 900	**1314**	**–**	**–**	2.99	–
	150	51	2.1	89.6	31.7	74.1	27.7	3 600	2 600	4 900	**2314**	**2RS**	**–**	4.23	–
75	130	25	1.5	38.8	15.7	–	–	4 300	–	5 300	**1215**	**–**	**1215K**	1.36	1.34
	130	31	1.5	44.2	17.8	38.8	15.7	4 300	2 900	5 300	**2215**	**2RS**	**2215K**	1.62	1.58
	160	37	2.1	78.9	29.9	–	–	4 000	–	4 900	**1315**	**–**	**1315K**	3.56	3.51
	160	55	2.1	103	36.8	81.8	30.5	3 400	2 600	4 600	**2315**	**2RS**	**2315K**	5.13	5.01
80	140	26	2	39.8	17.0	–	–	4 000	–	4 900	**1216**	**–**	**1216K**	1.67	1.64
	140	33	2	49.0	19.9	39.8	17.0	4 100	2 700	5 000	**2216**	**2RS**	**2216K**	2.01	1.97
	170	39	2.1	88.1	33.1	–	–	3 500	–	4 300	**1316**	**–**	**1316K**	4.18	4.12
	170	58	2.1	129	45.7	88.4	33.1	3 100	2 300	4 300	**2316**	**2RS**	**2316K**	6.10	5.96
85	150	28	2	49.2	20.8	–	–	3 800	–	4 600	**1217**	**–**	**1217K**	2.07	2.04
	150	36	2	58.3	23.6	49.2	20.8	3 800	2 500	4 600	**2217**	**2RS**	**2217K**	2.52	2.46
	180	41	3	97.3	37.8	–	–	3 300	–	4 000	**1317**	**–**	**1317K**	4.98	4.91
	180	60	3	141	51.5	–	–	3 000	–	4 100	**2317**	**–**	**2317K**	7.05	6.89
90	160	30	2	56.8	23.4	–	–	3 500	–	4 300	**1218**	**–**	**1218K**	2.52	2.48
	160	40	2	67.7	27.2	54.1	23.1	3 500	2 400	4 300	**2218**	**2RS**	**2218K**	3.40	3.33
	190	43	3	116	44.4	–	–	3 100	–	3 800	**1318**	**–**	**1318K**	5.80	5.71
	190	64	3	153	57.9	–	–	2 800	–	3 900	**2318**	**–**	**2318K**	8.44	8.25

Remark) Standard cage types used for the above bearings are described earlier in this section.

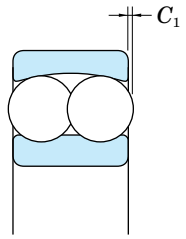
Self-aligning ball bearings

d 95 – 100 mm



Cylindrical bore　　Sealed　　Tapered bore

[Note] Protruding distance of balls



Balls of the following bearing protrude by C_1 from the bearing side.

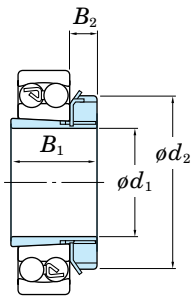
Bearing No.	C_1 (mm)
1319 1320	1.6 2.5 (approx.)

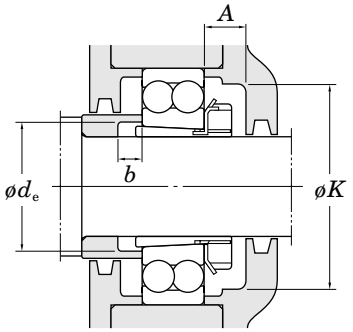
Boundary dimensions (mm)				Basic load ratings (kN)				Limiting speeds (min⁻¹)			Bearing No.			(Refer.)Mass (kg)	
				Open		Sealed type		Grease lub.		Oil lub.	Cylindrical bore	Sealed type	Tapered bore		
d	D	B	r min.	C_r	C_{0r}	C_r	C_{0r}	Open	2RS	Open	Open	2RS	Open	Cylindrical bore	Tapered bore
95	170	32	2.1	57.0	24.3	–	–	3 300	–	4 000	**1219**	**–**	**1219K**	3.10	3.05
	170	43	2.1	82.7	34.3	60.8	26.8	3 300	2 200	4 000	**2219**	**2RS**	**2219K**	4.10	4.00
	200	45	3	132	50.8	–	–	2 900	–	3 600	**1319**	**–**	**1319K**	6.69	6.59
	200	67	3	166	64.8	–	–	2 700	–	3 700	**2319**	**–**	**2319K**	9.79	9.57
100	180	34	2.1	69.0	29.7	–	–	3 100	–	3 800	**1220**	**–**	**1220K**	3.70	3.64
	180	46	2.1	80.9	34.0	69.0	29.7	3 100	2 100	3 800	**2220**	**2RS**	**2220K**	4.98	4.87
	215	47	3	143	57.3	–	–	2 800	–	3 400	**1320**	**–**	**1320K**	8.30	8.19
	215	73	3	183	73.4	–	–	2 400	–	3 400	**2320**	**–**	**2320K**	12.4	12.1

Remark) Standard cage types used for the above bearings are described earlier in this section.

Adapter assemblies for self-aligning ball bearings

d_1 17 – 45 mm





Boundary dimensions (mm) d_1	B_1	d_2	B_2	Brg. bore (mm) d	Designations Bearing + adapter ass'y	Mounting dimensions (mm) A min.	K min.	d_e min.	b min.	Mass Brg. + adapter ass'y (kg)	(Refer.) Adapter sleeve No.	Locknut No.
17	24	32	7	20	1204K+**H204X**	–	–	23	5	0.159	A204X	AN04
	28	32	7	20	2204K+**H304X**	–	–	24	5	0.181	A304X	AN04
	28	32	7	20	1304K+**H304X**	–	–	24	8	0.206	A304X	AN04
	31	32	7	20	2304K+**H2304X**	–	–	24	5	0.254	A2304X	AN04
20	26	38	8	25	1205K+**H205X**	15	45	28	5	0.208	A205X	AN05
	29	38	8	25	2205K+**H305X**	15	45	29	5	0.233	A305X	AN05
	29	38	8	25	1305K+**H305X**	15	45	29	6	0.327	A305X	AN05
	35	38	8	25	2305K+**H2305X**	15	45	29	5	0.414	A2305X	AN05
25	27	45	8	30	1206K+**H206X**	15	50	33	5	0.315	A206X	AN06
	31	45	8	30	2206K+**H306X**	15	50	34	5	0.363	A306X	AN06
	31	45	8	30	1306K+**H306X**	15	50	34	6	0.490	A306X	AN06
	38	45	8	30	2306K+**H2306X**	15	50	35	5	0.615	A2306X	AN06
30	29	52	9	35	1207K+**H207X**	17	58	38	5	0.442	A207X	AN07
	35	52	9	35	2207K+**H307X**	17	58	39	5	0.538	A307X	AN07
	35	52	9	35	1307K+**H307X**	17	58	39	7	0.644	A307X	AN07
	43	52	9	35	2307K+**H2307X**	17	58	40	5	0.822	A2307X	AN07
35	31	58	10	40	1208K+**H208X**	17	65	44	5	0.585	A208X	AN08
	36	58	10	40	2208K+**H308X**	17	65	44	5	0.683	A308X	AN08
	36	58	10	40	1308K+**H308X**	17	65	44	5	0.893	A308X	AN08
	46	58	10	40	2308K+**H2308X**	17	65	45	5	1.13	A2308X	AN08
40	33	65	11	45	1209K+**H209X**	17	72	49	5	0.686	A209X	AN09
	39	65	11	45	2209K+**H309X**	17	72	49	8	0.781	A309X	AN09
	39	65	11	45	1309K+**H309X**	17	72	49	5	1.19	A309X	AN09
	50	65	11	45	2309K+**H2309X**	17	72	50	5	1.48	A2309X	AN09
45	35	70	12	50	1210K+**H210X**	19	76	53	5	0.789	A210X	AN10
	42	70	12	50	2210K+**H310X**	19	76	54	10	0.880	A310X	AN10
	42	70	12	50	1310K+**H310X**	19	76	54	5	1.49	A310X	AN10
	55	70	12	50	2310K+**H2310X**	19	76	56	5	1.96	A2310X	AN10

d_1 50 – 90 mm

Boundary dimensions (mm) d_1	B_1	d_2	B_2	Brg. bore (mm) d	Designations Bearing + adapter ass'y	Mounting dimensions (mm) A min.	K min.	d_e min.	b min.	Mass Brg. + adapter ass'y (kg)	(Refer.) Adapter sleeve No.	Locknut No.
50	37	75	12	55	1211K+**H211X**	19	85	60	6	1.00	A211X	AN11
	45	75	12	55	2211K+**H311X**	19	85	60	11	1.14	A311X	AN11
	45	75	12	55	1311K+**H311X**	19	85	60	6	1.91	A311X	AN11
	59	75	12	55	2311K+**H2311X**	19	85	61	6	2.47	A2311X	AN11
55	38	80	13	60	1212K+**H212X**	20	90	61	5	1.23	A212X	AN12
	47	80	13	60	2212K+**H312X**	20	90	65	9	1.46	A312X	AN12
	47	80	13	60	1312K+**H312X**	20	90	65	5	2.32	A312X	AN12
	62	80	13	60	2312K+**H2312X**	20	90	66	5	3.01	A2312X	AN12
60	40	85	14	65	1213K+**H213X**	21	96	70	5	1.53	A213X	AN13
	50	85	14	65	2213K+**H313X**	21	96	70	8	1.89	A313X	AN13
	50	85	14	65	1313K+**H313X**	21	96	70	5	2.87	A313X	AN13
	65	85	14	65	2313K+**H2313X**	21	96	72	5	3.71	A2313X	AN13
65	43	98	15	75	1215K+**H215X**	23	110	80	5	2.05	A215X	AN15
	55	98	15	75	2215K+**H315X**	23	110	80	12	2.41	A315X	AN15
	55	98	15	75	1315K+**H315X**	23	110	80	5	4.34	A315X	AN15
	73	98	15	75	2315K+**H2315X**	23	110	82	5	6.06	A2315X	AN15
70	46	105	17	80	1216K+**H216X**	25	120	85	5	2.52	A216X	AN16
	59	105	17	80	2216K+**H316X**	25	120	86	12	3.00	A316X	AN16
	59	105	17	80	1316K+**H316X**	25	120	86	5	5.15	A316X	AN16
	78	105	17	80	2316K+**H2316X**	25	120	87	5	7.24	A2316X	AN16
75	50	110	18	85	1217K+**H217X**	27	128	90	6	3.06	A217X	AN17
	63	110	18	85	2217K+**H317X**	27	128	91	12	3.64	A317X	AN17
	63	110	18	85	1317K+**H317X**	27	128	91	6	6.09	A317X	AN17
	82	110	18	85	2317K+**H2317X**	27	128	94	6	8.34	A2317X	AN17
80	52	120	18	90	1218K+**H218X**	28	139	95	6	3.67	A218X	AN18
	65	120	18	90	2218K+**H318X**	28	139	96	10	4.70	A318X	AN18
	65	120	18	90	1318K+**H318X**	28	139	96	6	7.08	A318X	AN18
	86	120	18	90	2318K+**H2318X**	28	139	99	6	9.94	A2318X	AN18
85	55	125	19	95	1219K+**H219X**	29	145	101	7	4.42	A219X	AN19
	68	125	19	95	2219K+**H319X**	29	145	102	9	5.56	A319X	AN19
	68	125	19	95	1319K+**H319X**	29	145	102	7	8.15	A319X	AN19
	90	125	19	95	2319K+**H2319X**	29	145	105	7	11.5	A2319X	AN19
90	58	130	20	100	1220K+**H220X**	30	150	106	7	5.13	A220X	AN20
	71	130	20	100	2220K+**H320X**	30	150	107	8	6.56	A320X	AN20
	71	130	20	100	1320K+**H320X**	30	150	107	7	9.88	A320X	AN20
	97	130	20	100	2320K+**H2320X**	30	150	110	7	14.2	A2320X	AN20

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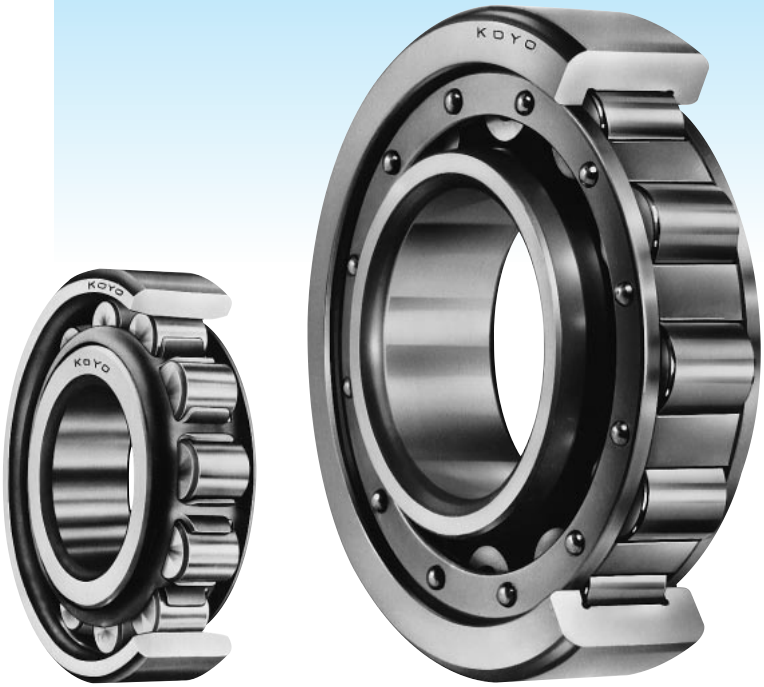
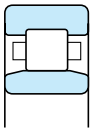


Cylindrical roller bearings

Cylindrical roller bearings



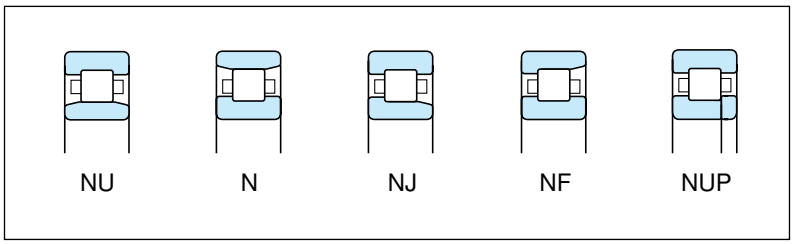
Bore diameter **20 – 200 mm**

Cylindrical roller bearings feature high radial load capacity because the rollers and raceway are in linear contact. These bearings are suitable for applications that involve heavy radial and impact loading.

They are also appropriate for high-speed applications in that they can be machined very accurately due to their structure.

Having a separable inner ring or outer ring, these bearings can be mounted and dismounted easily.

Cylindrical roller bearings



- The NU and N types exhibit their best performance when used as free side bearings since they adjust to the shaft's axial movement, to a certain extent, relative to the housing position.
- The NJ and NF types carry axial load in one direction, while the NUP type can carry a certain degree of axial load in both directions.

Cylindrical roller bearings

Boundary dimensions

The dimensions of standard series are as specified in JIS B 1512.

Tolerances

As specified in JIS B 1514.

Tolerances of roller set bore diameter F_w and roller set outside diameter E_w of interchangeable bearings are as follows :

Unit μm

Nominal bore diameter d (mm)		ΔF_W Roller set bore diameter deviation		ΔE_W Roller set outside diameter deviation	
over	up to	upper	lower	upper	lower
–	20	+10	0	0	–10
20	50	+15	0	0	–15
50	120	+20	0	0	–20
120	200	+25	0	0	–25
200	250	+30	0	0	–30
250	315	+35	0	0	–35
315	400	+40	0	0	–40
400	500	+45	0	–	–

Remark) Interchangeable bearings have an inner ring with rollers that can be matched with the outer ring, or an outer ring with rollers that can be matched with the inner ring, without affecting performance.

Radial internal clearance

- Cylindrical bore and tapered bore bearings ..... (refer to Table 2-7 on pp. A 16, 17.)
- Motor bearings ..... (refer to Table 2-6 on P. A 14.)

Standard cages

- Pressed steel cage (supplementary code : //)
- Copper alloy machined cage (supplementary code : FY)

For application range, refer to Table 1.

Copper alloy machined cages without rivets (LY) are also used for some special purposes.

Allowable misalignment

Allowable misalignment of single-row cylindrical roller bearings depends on bearing type and specification.
General values are as follows :

1) When P_r / C_r is approx. 10% under load of normal use
..... 0.000 6 – 0.000 9 rad (2' – 3')

2) When P_r / C_r is approx. 6% under load lighter than 1)
..... 0.001 2 rad (4')

When very large allowable misalignment is required, consult Koyo.

Equivalent radial load

Dynamic equivalent radial load $P_r = F_r$

Static equivalent radial load $P_{0r} = F_r$

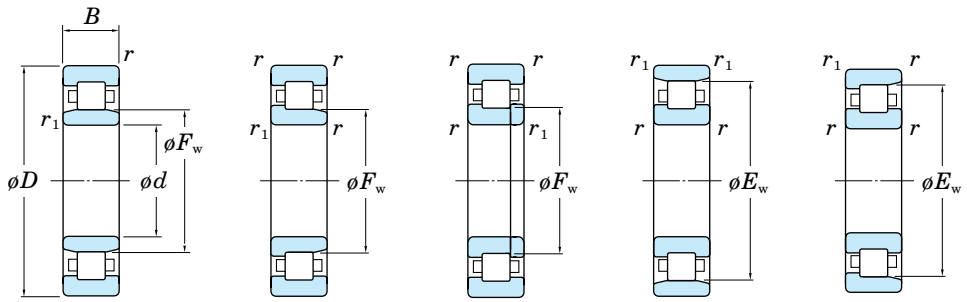
Allowable axial load

Cylindrical roller bearings with ribs, including loose rib and thrust coller, on both inner and outer rings accommodate axial load to a certain extent.
(NJ and NF types accommodate load applied in one direction :
NUP type in both directions.)

Table 1 Application of standard cages

Bearing series	Pressed cage	Machined cage
NU 10	–	1005 – 1092
NU, NJ, NUP, NF 2	204 – 220	204 – 264
NU, NJ, NUP 22	2204 – 2220	2204 – 2252
NU, NJ, NUP, NF 3	304 – 320	304 – 348
NU, NJ, NUP 23	2304 – 2320	2304 – 2340
NU, NJ, NUP, NF 4	406 – 420	406 – 430

d 20 – (45) mm



NU NJ NUP N NF

Boundary dimensions (mm)							Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.					(Refer.) Mass
d	D	B	r min.	r_1 min.	F_w	E_w	C_r	C_{0r}	Grease lub.	Oil lub.	NU	NJ	NUP	N	NF	NU (kg)
20	47	14	1	0.6	27	40	15.4	12.7	15 000	18 000	**NU204**	**NJ**	**NUP**	**N**	**NF**	0.108
	47	18	1	0.6	27	–	20.7	18.4	13 000	18 000	**NU2204**	**NJ**	–	–	–	0.146
	52	15	1.1	0.6	28.5	44.5	23.1	19.2	12 000	16 000	**NU304**	**NJ**	**NUP**	**N**	**NF**	0.147
	52	21	1.1	0.6	28.5	–	32.9	30.2	11 000	16 000	**NU2304**	–	–	–	–	0.212
25	47	12	0.6	0.3	30.5	–	14.3	13.1	15 000	18 000	**NU1005**	–	–	–	–	0.084
	52	15	1	0.6	32	45	17.7	15.7	13 000	16 000	**NU205**	**NJ**	**NUP**	**N**	**NF**	0.132
	52	18	1	0.6	32	–	23.7	22.8	12 000	16 000	**NU2205**	**NJ**	**NUP**	–	–	0.163
	62	17	1.1	1.1	35	53	29.3	25.2	10 000	14 000	**NU305**	**NJ**	**NUP**	**N**	**NF**	0.241
	62	24	1.1	1.1	35	–	42.7	40.9	9 100	14 000	**NU2305**	**NJ**	**NUP**	–	–	0.340
30	55	13	1	0.6	36.5	–	18.7	18.4	13 000	15 000	**NU1006**	–	–	–	–	0.121
	62	16	1	0.6	38.5	53.5	23.5	21.5	11 000	13 000	**NU206**	**NJ**	**NUP**	**N**	**NF**	0.200
	62	20	1	0.6	38.5	–	32.9	33.1	9 800	13 000	**NU2206**	**NJ**	**NUP**	–	–	0.262
	72	19	1.1	1.1	42	62	38.6	35.2	8 700	12 000	**NU306**	**NJ**	**NUP**	**N**	**NF**	0.358
	72	27	1.1	1.1	42	–	51.4	50.8	7 700	12 000	**NU2306**	**NJ**	**NUP**	–	–	0.500
	90	23	1.5	1.5	45	73	62.8	55.0	7 600	10 000	**NU406**	**NJ**	–	–	**NF**	0.753
35	62	14	1	0.6	42	–	22.6	23.2	11 000	13 000	**NU1007**	–	–	–	–	0.182
	72	17	1.1	0.6	43.8	61.8	33.6	31.5	9 500	11 000	**NU207**	**NJ**	**NUP**	**N**	**NF**	0.293
	72	23	1.1	0.6	43.8	–	49.0	51.2	8 500	11 000	**NU2207**	**NJ**	**NUP**	–	–	0.402
	80	21	1.5	1.1	46.2	68.2	49.6	46.9	7 900	10 000	**NU307**	**NJ**	**NUP**	**N**	**NF**	0.477
	80	31	1.5	1.1	46.2	–	64.4	65.7	7 000	10 000	**NU2307**	**NJ**	**NUP**	–	–	0.696
	100	25	1.5	1.5	53	83	75.2	68.9	6 600	8 800	**NU407**	**NJ**	–	–	**NF**	1.02
40	68	15	1	0.6	47	–	24.9	25.7	10 000	12 000	**NU1008**	–	–	–	–	0.223
	80	18	1.1	1.1	50	70	43.8	42.9	8 300	10 000	**NU208**	**NJ**	**NUP**	**N**	**NF**	0.366
	80	23	1.1	1.1	50	–	58.3	62.0	7 500	10 000	**NU2208**	**NJ**	**NUP**	–	–	0.490
	90	23	1.5	1.5	53.5	77.5	58.6	56.9	6 900	9 100	**NU308**	**NJ**	**NUP**	**N**	**NF**	0.657
	90	33	1.5	1.5	53.5	–	82.2	88.0	6 100	9 100	**NU2308**	**NJ**	**NUP**	–	–	0.956
	110	27	2	2	58	92	97.1	89.1	6 000	8 000	**NU408**	**NJ**	–	**N**	**NF**	1.30
45	75	16	1	0.6	52.5	–	31.0	33.8	9 200	11 000	**NU1009**	–	–	–	–	0.289
	85	19	1.1	1.1	55	75	46.1	46.9	7 700	9 200	**NU209**	**NJ**	**NUP**	**N**	**NF**	0.427
	85	23	1.1	1.1	55	–	61.4	67.8	6 900	9 200	**NU2209**	**NJ**	**NUP**	–	–	0.536
	100	25	1.5	1.5	58.5	86.5	78.8	77.5	6 200	8 300	**NU309**	**NJ**	**NUP**	**N**	**NF**	0.870

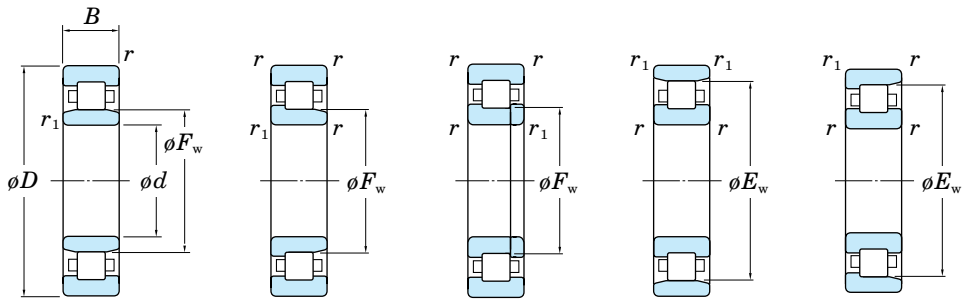
Remarks) Standard cage types used for the above bearings are shown in Table 1 earlier in this section. Please note that basic load ratings and rotation speed limits shown above indicate the value applicable to machined cage. When bearings with pressed cage are used, consult Koyo.

d (45) – 80 mm

Boundary dimensions (mm)							Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.					(Refer.) Mass
d	*D*	*B*	*r* min.	r_1 min.	F_W	E_W	C_r	C_{0r}	Grease lub.	Oil lub.	NU	NJ	NUP	N	NF	NU (kg)
45	100	36	1.5	1.5	58.5	–	106	113	5 500	8 300	**NU2309**	**NJ**	**NUP**	**–**	**–**	1.25
	120	29	2	2	64.5	100.5	115	112	5 400	7 200	**NU409**	**NJ**	**–**	**N**	**NF**	1.64
50	80	16	1	0.6	57.5	–	33.6	36.8	8 400	9 900	**NU1010**	**–**	**–**	**–**	**–**	0.306
	90	20	1.1	1.1	60.4	80.4	48.2	51.0	7 100	8 500	**NU210**	**NJ**	**NUP**	**N**	**NF**	0.479
	90	23	1.1	1.1	60.4	–	64.2	73.6	6 400	8 500	**NU2210**	**NJ**	**NUP**	**–**	**–**	0.580
	110	27	2	2	65	95	92.2	93.4	5 600	7 500	**NU310**	**NJ**	**NUP**	**N**	**NF**	1.15
	110	40	2	2	65	–	128	142	5 000	7 500	**NU2310**	**NJ**	**NUP**	**–**	**–**	1.69
	130	31	2.1	2.1	70.8	110.8	139	136	4 900	6 600	**NU410**	**NJ**	**–**	**–**	**NF**	2.01
55	90	18	1.1	1	64.5	–	37.4	43.8	7 600	8 900	**NU1011**	**–**	**–**	**–**	**–**	0.445
	100	21	1.5	1.1	66.5	88.5	58.0	62.3	6 400	7 700	**NU211**	**NJ**	**NUP**	**N**	**NF**	0.640
	100	25	1.5	1.1	66.5	–	75.3	87.2	5 800	7 700	**NU2211**	**NJ**	**NUP**	**–**	**–**	0.780
	120	29	2	2	70.5	104.5	111	111	5 100	6 800	**NU311**	**NJ**	**NUP**	**N**	**NF**	1.44
	120	43	2	2	70.5	–	148	162	4 500	6 800	**NU2311**	**NJ**	**NUP**	**–**	**–**	2.10
	140	33	2.1	2.1	77.2	117.2	142	138	4 600	6 100	**NU411**	**NJ**	**–**	**N**	**NF**	2.51
60	95	18	1.1	1	69.5	–	42.1	50.0	7 000	8 300	**NU1012**	**–**	**–**	**–**	**–**	0.477
	110	22	1.5	1.5	73.5	97.5	71.9	79.9	5 800	7 000	**NU212**	**NJ**	**NUP**	**N**	**NF**	0.823
	110	28	1.5	1.5	73.5	–	101	123	5 200	7 000	**NU2212**	**NJ**	**NUP**	**–**	**–**	1.07
	130	31	2.1	2.1	77	113	124	126	4 700	6 300	**NU312**	**NJ**	**NUP**	**N**	**NF**	1.83
	130	46	2.1	2.1	77	–	168	188	4 200	6 300	**NU2312**	**NJ**	**NUP**	**–**	**–**	2.69
	150	35	2.1	2.1	83	127	178	184	4 200	5 700	**NU412**	**NJ**	**NUP**	**N**	**NF**	3.02
65	100	18	1.1	1	74.5	–	43.3	52.9	6 600	7 800	**NU1013**	**–**	**–**	**–**	**–**	0.506
	120	23	1.5	1.5	79.6	105.6	83.8	94.4	5 400	6 400	**NU213**	**NJ**	**NUP**	**N**	**NF**	1.05
	120	31	1.5	1.5	79.6	–	120	149	4 800	6 400	**NU2213**	**NJ**	**NUP**	**–**	**–**	1.43
	120	38.1	1.5	1.5	79.6	–	148	197	4 300	6 400	**NU3213**	**–**	**–**	**–**	**–**	1.90
	140	33	2.1	2.1	83.5	121.5	137	139	4 300	5 800	**NU313**	**NJ**	**NUP**	**N**	**NF**	2.24
	140	48	2.1	2.1	83.5	–	190	212	3 900	5 800	**NU2313**	**NJ**	**NUP**	**–**	**–**	3.25
	160	37	2.1	2.1	89.3	135.3	198	203	4 000	5 300	**NU413**	**NJ**	**NUP**	**–**	**NF**	3.58
70	110	20	1.1	1	80	–	57.9	70.4	6 100	7 200	**NU1014**	**–**	**–**	**–**	**–**	0.702
	125	24	1.5	1.5	84.5	110.5	83.3	95.2	5 100	6 100	**NU214**	**NJ**	**NUP**	**N**	**NF**	1.15
	125	31	1.5	1.5	84.5	–	119	151	4 600	6 100	**NU2214**	**NJ**	**NUP**	**–**	**–**	1.52
	150	35	2.1	2.1	90	130	162	168	4 000	5 400	**NU314**	**NJ**	**NUP**	**N**	**NF**	2.73
	150	51	2.1	2.1	90	–	224	262	3 600	5 400	**NU2314**	**NJ**	**NUP**	**–**	**–**	3.97
	180	42	3	3	100	152	246	257	3 500	4 700	**NU414**	**NJ**	**NUP**	**N**	**NF**	5.26
75	115	20	1.1	1	85	–	63.6	78.1	5 700	6 800	**NU1015**	**–**	**–**	**–**	**–**	0.735
	130	25	1.5	1.5	88.5	116.5	101	118	4 800	5 800	**NU215**	**NJ**	**NUP**	**N**	**NF**	1.24
	130	31	1.5	1.5	88.5	–	135	172	4 300	5 800	**NU2215**	**NJ**	**NUP**	**–**	**–**	1.57
	160	37	2.1	2.1	95.5	139.5	194	205	3 800	5 000	**NU315**	**NJ**	**NUP**	**N**	**NF**	3.24
	160	55	2.1	2.1	95.5	–	275	327	3 400	5 000	**NU2315**	**NJ**	**NUP**	**–**	**–**	4.84
	190	45	3	3	104.5	160.5	265	274	3 300	4 400	**NU415**	**NJ**	**NUP**	**N**	**NF**	6.25
80	125	22	1.1	1	91.5	–	69.3	86.4	5 300	6 300	**NU1016**	**–**	**–**	**–**	**–**	0.994
	140	26	2	2	95.3	125.3	106	122	4 500	5 400	**NU216**	**NJ**	**NUP**	**N**	**NF**	1.51
	140	33	2	2	95.3	–	148	186	4 000	5 400	**NU2216**	**NJ**	**NUP**	**–**	**–**	1.96
	170	39	2.1	2.1	103	147	194	207	3 500	4 700	**NU316**	**NJ**	**NUP**	**N**	**NF**	3.92
	170	58	2.1	2.1	103	–	275	332	3 100	4 700	**NU2316**	**NJ**	**NUP**	**–**	**–**	5.83
	200	48	3	3	110	170	302	315	3 100	4 200	**NU416**	**NJ**	**NUP**	**N**	**NF**	7.28

Remarks) Standard cage types used for the above bearings are shown in Table 1 earlier in this section. Please note that basic load ratings and rotation speed limits shown above indicate the value applicable to machined cage. When bearings with pressed cage are used, consult Koyo.

d 85 – (120) mm



NU NJ NUP N NF

Boundary dimensions (mm)							Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.					(Refer.) Mass
d	*D*	*B*	*r* min.	r_1 min.	F_w	E_w	C_r	C_{0r}	Grease lub.	Oil lub.	NU	NJ	NUP	N	NF	NU (kg)
85	130	22	1.1	1	96.5	–	71.4	91.2	5 100	6 000	**NU1017**	–	–	–	–	1.04
	150	28	2	2	101.8	133.8	121	140	4 200	5 000	**NU217**	**NJ**	**NUP**	**N**	**NF**	1.90
	150	36	2	2	101.8	–	169	218	3 800	5 000	**NU2217**	**NJ**	**NUP**	–	–	2.50
	180	41	3	3	108	156	225	247	3 300	4 500	**NU317**	**NJ**	**NUP**	**N**	**NF**	4.52
	180	60	3	3	108	–	315	382	3 000	4 500	**NU2317**	**NJ**	**NUP**	–	–	6.62
	210	52	4	4	113	177	340	350	3 000	4 000	**NU417**	**NJ**	**NUP**	**N**	**NF**	8.68
90	160	30	2	2	107	143	152	178	3 900	4 700	**NU218**	**NJ**	**NUP**	**N**	**NF**	2.28
	160	40	2	2	107	–	207	265	3 500	4 700	**NU2218**	**NJ**	**NUP**	–	–	3.10
	190	43	3	3	115	165	243	265	3 100	4 200	**NU318**	**NJ**	**NUP**	**N**	**NF**	5.38
	190	64	3	3	115	–	329	395	2 800	4 200	**NU2318**	**NJ**	**NUP**	–	–	7.90
	225	54	4	4	123.5	191.5	374	400	2 800	3 700	**NU418**	**NJ**	**NUP**	**N**	**NF**	10.3
95	170	32	2.1	2.1	113.5	151.5	165	195	3 700	4 400	**NU219**	**NJ**	**NUP**	**N**	**NF**	2.80
	170	43	2.1	2.1	113.5	–	230	298	3 300	4 400	**NU2219**	**NJ**	**NUP**	–	–	3.85
	200	45	3	3	121.5	173.5	277	311	3 000	4 000	**NU319**	**NJ**	**NUP**	**N**	**NF**	6.20
	200	67	3	3	121.5	–	394	496	2 600	4 000	**NU2319**	**NJ**	**NUP**	–	–	9.39
	240	55	4	4	133.5	–	410	444	2 600	3 400	**NU419**	**NJ**	–	–	–	13.6
100	180	34	2.1	2.1	120	160	183	217	3 500	4 200	**NU220**	**NJ**	**NUP**	**N**	**NF**	3.38
	180	46	2.1	2.1	120	–	259	338	3 100	4 200	**NU2220**	**NJ**	**NUP**	–	–	4.67
	215	47	3	3	129.5	185.5	323	337	2 800	3 700	**NU320**	**NJ**	**NUP**	**N**	**NF**	7.70
	215	73	3	3	129.5	–	464	548	2 500	3 700	**NU2320**	**NJ**	**NUP**	–	–	11.9
	250	58	4	4	139	–	458	498	2 500	3 300	**NU420**	**NJ**	–	–	–	14.0
105	190	36	2.1	2.1	126.8	168.8	201	241	3 300	3 900	**NU221**	**NJ**	**NUP**	**N**	**NF**	4.00
	225	49	3	3	135	195	366	417	2 600	3 500	**NU321**	**NJ**	**NUP**	**N**	**NF**	8.76
110	200	38	2.1	2.1	132.5	178.5	241	290	3 100	3 700	**NU222**	**NJ**	**NUP**	**N**	**NF**	4.65
	200	53	2.1	2.1	132.5	–	334	442	2 800	3 700	**NU2222**	**NJ**	**NUP**	–	–	6.93
	240	50	3	3	143	207	411	467	2 500	3 300	**NU322**	**NJ**	**NUP**	**N**	**NF**	10.4
	240	80	3	3	143	–	604	789	2 200	3 300	**NU2322**	**NJ**	–	–	–	18.8
	280	65	4	4	155	–	550	621	2 200	2 900	**NU422**	**NJ**	–	–	–	19.9
120	215	40	2.1	2.1	143.5	191.5	260	318	2 900	3 400	**NU224**	**NJ**	**NUP**	**N**	**NF**	5.65
	215	58	2.1	2.1	143.5	–	367	492	2 600	3 400	**NU2224**	**NJ**	**NUP**	–	–	8.56

Remarks) Standard cage types used for the above bearings are shown in Table 1 earlier in this section. Please note that basic load ratings and rotation speed limits shown above indicate the value applicable to machined cage. When bearings with pressed cage are used, consult Koyo.

d (120) – 200 mm

Boundary dimensions (mm)							Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.					(Refer.) Mass
d	*D*	*B*	*r* min.	r_1 min.	F_W	E_W	C_r	C_{0r}	Grease lub.	Oil lub.	NU	NJ	NUP	N	NF	NU (kg)
120	260	55	3	3	154	226	485	551	2 200	3 000	**NU324**	**NJ**	**NUP**	**N**	**NF**	13.1
	260	86	3	3	154	–	708	918	2 000	3 000	**NU2324**	**NJ**	**NUP**	–	–	23.1
	310	72	5	5	170	–	690	770	1 900	2 600	**NU424**	**NJ**	–	–	–	28.0
130	200	33	2	1.1	148	–	171	238	3 200	3 800	**NU1026**	–	–	–	–	3.77
	230	40	3	3	156	204	282	362	2 700	3 200	**NU226**	**NJ**	**NUP**	**N**	**NF**	6.49
	230	64	3	3	156	–	395	560	2 400	3 200	**NU2226**	**NJ**	**NUP**	–	–	11.2
	280	58	4	4	167	243	564	667	2 100	2 700	**NU326**	**NJ**	**NUP**	**N**	**NF**	16.4
	280	93	4	4	167	–	838	1 130	1 800	2 700	**NU2326**	**NJ**	**NUP**	–	–	29.1
	340	78	5	5	185	–	771	876	1 800	2 300	**NU426**	**NJ**	–	–	–	36.1
140	210	33	2	1.1	158	–	175	250	3 000	3 600	**NU1028**	–	–	–	–	4.00
	250	42	3	3	169	221	324	421	2 400	2 900	**NU228**	**NJ**	**NUP**	**N**	–	8.27
	250	68	3	3	169	–	465	671	2 200	2 900	**NU2228**	**NJ**	**NUP**	–	–	14.3
	300	62	4	4	180	260	623	746	1 900	2 500	**NU328**	**NJ**	**NUP**	**N**	**NF**	20.1
	300	102	4	4	180	–	920	1 250	1 700	2 500	**NU2328**	**NJ**	**NUP**	–	–	36.8
	360	82	5	5	198	–	874	1 020	1 600	2 200	**NU428**	**NJ**	–	–	–	46.8
150	225	35	2.1	1.5	169.5	–	201	281	2 800	3 300	**NU1030**	–	–	–	–	4.83
	270	45	3	3	182	238	374	492	2 200	2 700	**NU230**	**NJ**	**NUP**	**N**	**NF**	10.3
	270	73	3	3	182	–	545	800	2 000	2 700	**NU2230**	**NJ**	**NUP**	–	–	18.7
	320	65	4	4	193	277	663	807	1 800	2 300	**NU330**	**NJ**	**NUP**	**N**	**NF**	26.4
	320	108	4	4	193	–	1 020	1 400	1 600	2 300	**NU2330**	**NJ**	**NUP**	–	–	44.7
	380	85	5	5	213	–	930	1 120	1 500	2 000	**NU430**	**NJ**	–	–	–	53.3
160	290	48	3	3	195	255	427	568	2 100	2 500	**NU232**	**NJ**	**NUP**	**N**	**NF**	14.4
	290	80	3	3	195	–	631	939	1 800	2 500	**NU2232**	**NJ**	**NUP**	–	–	23.6
	340	68	4	4	208	292	698	876	1 600	2 200	**NU332**	**NJ**	**NUP**	**N**	–	31.7
	340	114	4	4	208	–	1 070	1 520	1 400	2 200	**NU2332**	**NJ**	**NUP**	–	–	53.1
170	310	52	4	4	208	272	475	637	1 900	2 300	**NU234**	**NJ**	**NUP**	**N**	–	18.4
	310	86	4	4	208	–	715	1 080	1 700	2 300	**NU2234**	**NJ**	**NUP**	–	–	29.2
	360	72	4	4	220	310	809	1 010	1 500	2 000	**NU334**	**NJ**	**NUP**	**N**	–	38.6
	360	120	4	4	220	–	1 220	1 750	1 300	2 000	**NU2334**	**NJ**	**NUP**	–	–	62.6
180	320	52	4	4	218	282	492	677	1 800	2 200	**NU236**	**NJ**	**NUP**	**N**	–	19.3
	320	86	4	4	218	–	741	1 140	1 600	2 200	**NU2236**	**NJ**	**NUP**	–	–	30.4
	380	75	4	4	232	328	917	1 150	1 400	1 900	**NU336**	**NJ**	**NUP**	**N**	–	42.6
	380	126	4	4	232	–	1 350	1 940	1 300	1 900	**NU2336**	**NJ**	**NUP**	–	–	73.0
190	340	55	4	4	231	299	554	768	1 700	2 000	**NU238**	**NJ**	**NUP**	**N**	–	23.2
	340	92	4	4	231	–	828	1 290	1 500	2 000	**NU2238**	**NJ**	**NUP**	–	–	37.0
	400	78	5	5	245	345	987	1 260	1 300	1 800	**NU338**	**NJ**	**NUP**	**N**	–	49.9
	400	132	5	5	245	–	1 520	2 220	1 200	1 800	**NU2338**	**NJ**	**NUP**	–	–	84.7
200	360	58	4	4	244	316	618	865	1 600	1 900	**NU240**	**NJ**	**NUP**	**N**	–	26.8
	360	98	4	4	244	–	946	1 490	1 400	1 900	**NU2240**	**NJ**	**NUP**	–	–	44.4
	420	80	5	5	260	360	987	1 270	1 200	1 700	**NU340**	**NJ**	**NUP**	**N**	–	56.2
	420	138	5	5	260	–	1 520	2 240	1 100	1 700	**NU2340**	**NJ**	**NUP**	–	–	97.4

Remarks) Standard cage types used for the above bearings are shown in Table 1 earlier in this section. Please note that basic load ratings and rotation speed limits shown above indicate the value applicable to machined cage. When bearings with pressed cage are used, consult Koyo.

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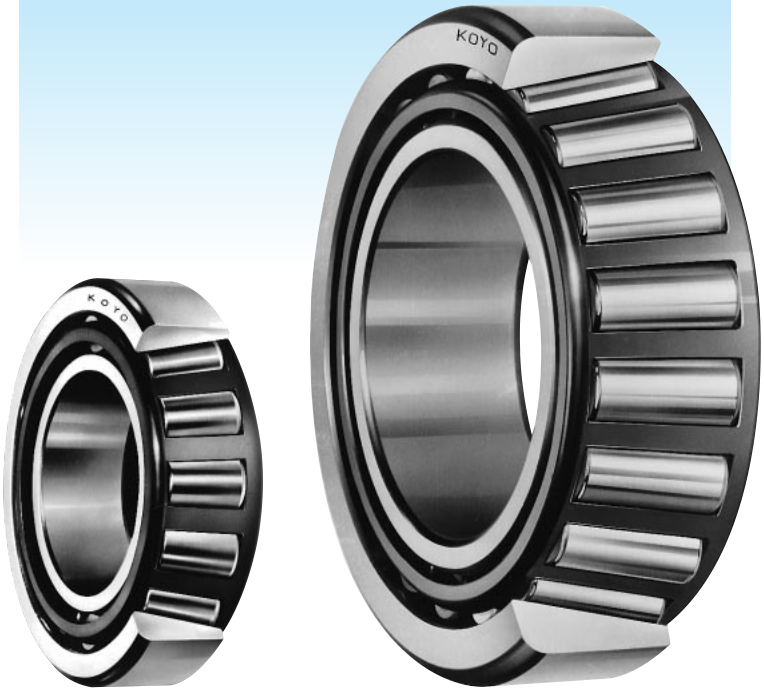


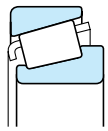
Tapered roller bearings

Tapered roller bearings are designed such that cup, cone and rollers have tapered surfaces whose apexes converge at a common point on the bearing axis.

Along with metric series bearings, inch series bearings are also available.

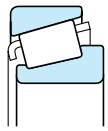
This type of bearing is suitable for applications that involve heavy or impact loading.

Tapered roller bearings



Matric series

Bore diameter **15 – 200 mm**

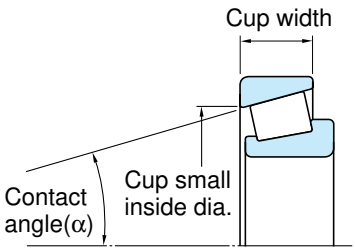


Inch series
(including J series matric bearing)

Bore diameter **15.875 – 200.000 mm**

Tapered roller bearings

- Able to carry radial and axial load in one direction simultaneously.
  Because an axial component of force is produced when this type of bearing is loaded radially, two bearings are used together facing one another, or two or more bearings are matched and used.
- There are the standard, medium and steep type which are different in contact angle size.
  Medium-tapered metric series bearings are identified by the supplementary code "C" which is added as a suffix to bearing numbers.
- Bearings whose cup width, cup small inside diameter and contact angle are determined in accordance with ISO 355 specifications are identified by the supplementary code "J" as a suffix.
  Cone assemblies and the cups of such bearings are inter-changeable with those of bearings produced abroad if the bearing numbers are the same.



ISO sub-unit specifications

Note : When supplementary code "J" is added as a prefix (not a suffix) to bearing numbers (e.g. JHM720249/JHM720210), the bearings are not designed according to ISO 355.
Such bearings are called "J series metric tapered roller bearings," and are produced according to special tolerances.

Tapered roller bearings

Boundary dimensions

Metric single-row tapered roller bearings : as specified in JIS B 1512.

Reference

JIS B 1512 specifies new dimension series which are based on ISO 355, as well as the conventional "3XX" dimension series.
These new dimension series are as follows :

New dimension series

(1) Angle series

Angle series	Contact angle α	
	over	up to
2	10°	13°52'
3	13°52'	15°59'
4	15°59'	18°55'
5	18°55'	23°
6	23°	27°
7	27°	30°

(2) Diameter series

Diameter series	$D/(d^{0.77})$	
	over	up to
B	3.40	3.80
C	3.80	4.40
D	4.40	4.70
E	4.70	5.00
F	5.00	5.60
G	5.60	7.00

(3) Width series

Width series	$T/\{(D-d)^{0.95}\}$	
	over	up to
B	0.50	0.68
C	0.68	0.80
D	0.80	0.88
E	0.88	1.00

Remarks :
1. Combine these series symbols in the listed order to make the dimension series numbers.
   (ex. 2BC)
2. Bearing numbers consist of a dimension series number and a bore diameter which is added as a suffix.
   (ex. 2BC080 : bearing bore diameter 80 mm)

Tolerances

- Metric series single-row tapered roller bearings as specified in JIS B 1514.
- Inch series tapered roller bearings as specified in ABMA Section 19.
- J series metric tapered roller bearings the tolerance is specified separately.

Standard cage

Pressed steel cage (supplementary code : //)
(Some large size bearings have a pin type cage (FP) instead.)

Allowable misalignment

Single-row tapered roller bearings : 0.000 9 rad (3')
(If the misalignment exceeds this angle size, Koyo is ready to design special bearings to order.)

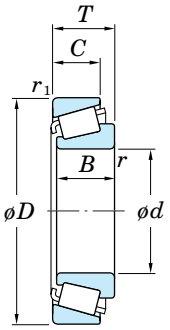
Equivalent radial load	■ Single-row tapered roller bearings Dynamic equivalent radial load $\left(\text{when } \frac{F_a}{F_r} \leq e\right)$ $P_r = F_r$ $\left(\text{when } \frac{F_a}{F_r} > e\right)$ $P_r = 0.4F_r + Y_1 F_a$ Static equivalent radial load $P_{0r} = 0.5F_r + Y_0 F_a$ when $P_{0r} < F_r$, $P_{0r} = F_r$ ■ Double-row or four-row tapered roller bearings Dynamic equivalent radial load $\left(\text{when } \frac{F_a}{F_r} \leq e\right)$ $P_r = F_r + Y_2 F_a$ $\left(\text{when } \frac{F_a}{F_r} > e\right)$ $P_r = 0.67F_r + Y_3 F_a$ Static equivalent radial load $P_{0r} = F_r + Y_0 F_a$

Remarks) 1. When two single-row tapered roller bearings are used together facing one another, an axial component of force is produced under radial load.

2. When the load is too small, slippage occurs between the rollers and raceways, causing smearing to develop. This also occurs to matched pair bearings when the ratio of axial load to radial load exceeds the value e shown in the specification table ($F_a / F_r > e$).
Consult Koyo on use of bearings under such conditions.

Tapered roller bearings metric series

d 15 – 30 mm



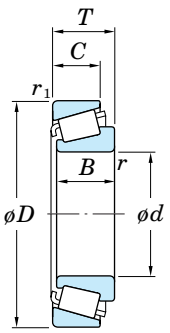
Boundary dimensions (mm)							Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.	(Refer.) Dimension series to ISO355	(Refer.) Mass (kg)
d	*D*	*T*	*B*	*C*	*r* min.	r_1 min.	C_r	C_{0r}	Grease lub.	Oil lub.			
15	35	11.75	11	10	0.6	0.6	15.8	14.5	12 000	16 000	**30202R**	–	0.054
	42	14.25	13	11	1	1	21.9	19.2	10 000	14 000	**30302JR**	2FB	0.098
17	40	13.25	12	11	1	1	20.8	20.7	10 000	14 000	**30203JR**	2DB	0.081
	40	17.25	16	14	1	1	27.4	27.5	10 000	14 000	**32203JR**	2DD	0.104
	47	15.25	14	12	1	1	27.4	24.5	9 200	12 000	**30303R**	–	0.127
	47	20.25	19	16	1	1	31.9	29.9	9 400	13 000	**32303**	–	0.170
20	42	15	15	12	0.6	0.6	27.3	31.5	9 700	13 000	**32004JR**	3CC	0.102
	47	15.25	14	12	1	1	25.8	25.5	9 000	12 000	**57008R**	–	0.125
	47	15.25	14	12	1	1	27.0	27.2	8 700	12 000	**30204JR**	2DB	0.127
	47	19.25	18	15	1	1	33.1	34.7	8 900	12 000	**32204JR**	2DD	0.159
	52	16.25	16	13	1.5	1.5	36.2	35.1	8 300	11 000	**30304AJR**	–	0.179
	52	22.25	21	18	1.5	1.5	45.1	46.7	8 400	11 000	**32304JR**	2FD	0.244
22	44	15	15	11.5	0.6	0.6	28.3	33.6	9 100	12 000	**320/22JR**	3CC	0.108
25	47	15	15	11.5	0.6	0.6	30.2	37.7	8 300	11 000	**32005JR**	4CC	0.118
	47	17	17	14	0.6	0.6	33.5	42.3	8 300	11 000	**33005JR**	2CE	0.131
	52	16.25	15	13	1	1	31.5	33.7	7 800	10 000	**30205JR**	3CC	0.156
	52	19.25	18	16	1	1	39.8	44.8	7 900	11 000	**32205JR**	2CD	0.188
	52	22	22	18	1	1	48.9	58.5	7 900	10 000	**33205JR**	2DE	0.225
	62	18.25	17	13	1.5	1.5	39.8	42.5	5 700	8 000	**30305DJR**	7FB	0.269
	62	18.25	17	14	1.5	1.5	45.0	45.8	6 700	9 000	**TR0506R**	–	0.275
	62	18.25	17	15	1.5	1.5	48.2	46.9	6 800	9 000	**30305JR**	2FB	0.273
	62	25.25	24	20	1.5	1.5	61.2	64.1	6 900	9 100	**32305JR**	2FD	0.386
28	52	16	16	12	1	1	35.2	44.0	7 500	10 000	**320/28JR**	4CC	0.150
30	55	17	17	13	1	1	38.2	48.0	7 000	9 400	**32006JR**	4CC	0.177
	55	20	20	16	1	1	43.2	55.2	7 000	9 400	**33006JR**	2CE	0.203
	62	17.25	16	14	1	1	41.5	44.8	6 500	8 700	**30206JR**	3DB	0.236
	62	21.25	20	17	1	1	50.7	57.9	6 500	8 700	**32206JR**	3DC	0.292
	62	25	25	19.5	1	1	66.4	79.4	6 500	8 700	**33206JR**	2DE	0.359
	72	20.75	19	14	1.5	1.5	50.9	54.9	4 900	6 800	**30306DJR**	7FB	0.400
	72	20.75	19	16	1.5	1.5	56.5	55.2	5 900	7 900	**TRA0607R**	–	0.405
	72	20.75	19	16	1.5	1.5	59.6	60.1	5 800	7 700	**30306JR**	2FB	0.411
	72	28.75	27	23	1.5	1.5	82.2	91.6	5 900	7 900	**32306JR**	2FD	0.588

d 32 – (55) mm

Boundary dimensions (mm)							Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.	(Refer.) Dimension series to ISO355	(Refer.) Mass (kg)
d	*D*	*T*	*B*	*C*	*r* min.	r_1 min.	C_r	C_{0r}	Grease lub.	Oil lub.			
32	58	17	17	13	1	1	39.2	50.6	6 700	8 900	**320/32JR**	4CC	0.196
	65	22.25	21	18	1	1	51.6	57.7	6 200	8 200	**322/32**	–	0.330
	75	29.75	28	23	1.5	1.5	75.1	87.1	5 600	7 400	**TR0608A**	5FD	0.649
35	62	18	18	14	1	1	45.5	59.4	6 200	8 200	**32007JR**	4CC	0.231
	62	21	21	17	1	1	51.3	68.0	6 200	8 200	**33007JR**	2CE	0.263
	72	18.25	17	15	1.5	1.5	55.1	60.9	5 600	7 400	**30207JR**	3DB	0.344
	72	24.25	23	19	1.5	1.5	69.6	82.4	5 600	7 500	**32207JR**	3DC	0.453
	72	28	28	22	1.5	1.5	87.6	107	5 700	7 500	**33207JR**	2DE	0.551
	80	22.75	21	15	2	1.5	63.1	69.1	4 300	6 000	**30307DJR**	7FB	0.536
	80	22.75	21	18	2	1.5	76.2	78.9	5 200	6 900	**30307JR-1**	2FB	0.527
	80	32.75	31	25	2	1.5	96.9	123	5 200	7 000	**TR0708-1R**	–	0.830
	80	32.75	31	25	2	1.5	101	114	5 300	7 000	**32307JR**	2FE	0.776
40	68	19	19	14.5	1	1	53.5	71.4	5 600	7 400	**32008JR**	3CD	0.282
	68	22	22	18	1	1	60.4	84.6	5 500	7 400	**33008JR**	2BE	0.326
	75	26	26	20.5	1.5	1.5	82.2	108	5 200	6 900	**33108JR**	2CE	0.508
	80	19.75	18	16	1.5	1.5	62.9	69.2	5 000	6 700	**30208JR**	3DB	0.434
	80	24.75	23	19	1.5	1.5	77.7	90.8	5 000	6 600	**32208JR**	3DC	0.554
	80	32	32	25	1.5	1.5	108	139	5 000	6 700	**33208JR**	2DE	0.758
	90	25.25	23	17	2	1.5	80.5	90.2	3 800	5 300	**30308DJR**	7FB	0.757
	90	25.25	23	20	2	1.5	90.6	101	4 500	6 100	**30308JR**	2FB	0.757
	90	35.25	33	26	2	1.5	112	138	4 700	6 200	**TR0809AR**	–	1.10
	90	35.25	33	27	2	1.5	116	139	4 600	6 200	**32308JR**	2FD	1.06
45	75	20	20	15.5	1	1	62.8	86.5	5 000	6 600	**32009JR**	3CC	0.354
	75	24	24	19	1	1	69.6	101	5 000	6 700	**33009JR**	2CE	0.416
	80	26	26	20.5	1.5	1.5	87.5	120	4 800	6 400	**33109JR**	3CE	0.563
	85	20.75	19	16	1.5	1.5	67.2	77.4	4 600	6 100	**30209JR**	3DB	0.502
	85	24.75	23	19	1.5	1.5	84.2	104	4 600	6 100	**32209JR-1**	3DC	0.597
	85	32	32	25	1.5	1.5	112	149	4 600	6 200	**33209JR**	3DE	0.818
	100	27.25	25	18	2	1.5	95.1	107	3 400	4 700	**30309DJR**	7FB	0.973
	100	27.25	25	22	2	1.5	113	128	4 100	5 400	**30309JR**	2FB	1.01
	100	38.25	36	30	2	1.5	146	180	4 100	5 500	**32309JR**	2FD	1.43
50	72	15	15	12	0.6	0.6	35.9	56.3	4 900	6 600	**32910JR**	2BC	0.195
	80	20	20	15.5	1	1	65.7	94.5	4 600	6 100	**32010JR**	3CC	0.389
	80	24	24	19	1	1	73.0	110	4 600	6 100	**33010JR**	2CE	0.451
	85	26	26	20	1.5	1.5	89.4	127	4 400	5 900	**33110JR**	3CE	0.594
	90	21.75	20	17	1.5	1.5	76.5	91.7	4 300	5 700	**30210JR**	3DB	0.566
	90	24.75	23	19	1.5	1.5	85.0	105	4 300	5 700	**32210JR**	3DC	0.643
	90	32	32	24.5	1.5	1.5	119	167	4 300	5 700	**33210JR**	3DE	0.887
	110	29.25	27	19	2.5	2	115	133	3 100	4 300	**30310DJR**	7FB	1.25
	110	29.25	27	23	2.5	2	137	152	3 700	4 900	**30310JR**	2FB	1.32
	110	42.25	40	33	2.5	2	176	220	3 700	5 000	**32310JR**	2FD	1.89
55	80	17	17	14	1	1	44.6	73.3	4 400	5 900	**32911JR**	2BC	0.285
	90	23	23	17.5	1.5	1.5	84.6	121	4 100	5 500	**32011JR**	3CC	0.569
	90	27	27	21	1.5	1.5	96.5	149	4 100	5 400	**33011JR**	2CE	0.672
	95	30	30	23	1.5	1.5	116	161	4 000	5 300	**33111JR**	3CE	0.868
	100	22.75	21	18	2	1.5	94.6	113	3 900	5 200	**30211JR**	3DB	0.732
	100	26.75	25	21	2	1.5	107	133	3 900	5 200	**32211JR-1**	3DC	0.863
	100	35	35	27	2	1.5	142	189	3 900	5 200	**33211JR**	3DE	1.18
	120	31.5	29	21	2.5	2	129	148	2 900	4 000	**30311DJR**	7FB	1.59

Tapered roller bearings metric series

d (55) – 70 mm



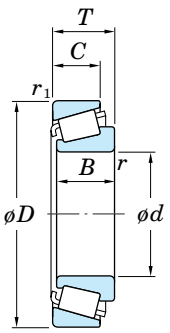
Boundary dimensions (mm)							Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.	(Refer.) Dimension series to ISO355	(Refer.) Mass (kg)
d	*D*	*T*	*B*	*C*	*r* min.	r_1 min.	C_r	C_{0r}	Grease lub.	Oil lub.			
55	120	31.5	29	25	2.5	2	149	170	3 300	4 500	**30311JR**	2FB	1.65
	120	45.5	43	35	2.5	2	200	250	3 400	4 500	**32311JR**	2FD	2.38
60	85	17	17	14	1	1	46.2	78.2	4 100	5 500	**32912JR**	2BC	0.306
	95	23	23	17.5	1.5	1.5	86.1	127	3 900	5 200	**32012JR**	4CC	0.621
	95	27	27	21	1.5	1.5	101	162	3 900	5 200	**33012JR**	2CE	0.719
	100	30	30	23	1.5	1.5	118	170	3 700	5 000	**33112JR**	3CE	0.923
	110	23.75	22	19	2	1.5	106	127	3 500	4 700	**30212JR**	3EB	0.945
	110	29.75	28	24	2	1.5	132	167	3 500	4 700	**32212JR**	3EC	1.19
	110	38	38	29	2	1.5	174	239	3 600	4 700	**33212JR**	3EE	1.57
	130	33.5	31	22	3	2.5	153	179	2 600	3 700	**30312DJR**	7FB	2.01
	130	33.5	31	26	3	2.5	173	201	3 100	4 100	**30312JR**	2FB	2.08
	130	48.5	46	37	3	2.5	244	315	3 100	4 200	**32312JR**	2FD	2.99
65	90	17	17	14	1	1	47.4	83.1	3 900	5 200	**32913JR**	2BC	0.327
	100	23	23	17.5	1.5	1.5	90.0	137	3 600	4 800	**32013JR**	4CC	0.664
	100	27	27	21	1.5	1.5	103	169	3 600	4 800	**33013JR**	2CE	0.762
	110	34	34	26.5	1.5	1.5	152	223	3 400	4 600	**33113JR**	3DE	1.33
	120	24.75	23	20	2	1.5	128	156	3 200	4 300	**30213JR**	3EB	1.18
	120	32.75	31	27	2	1.5	157	203	3 200	4 300	**32213JR**	3EC	1.58
	120	41	41	32	2	1.5	200	277	3 200	4 300	**33213JR**	3EE	2.02
	140	36	33	23	3	2.5	176	209	2 400	3 400	**30313DJR**	7GB	2.44
	140	36	33	28	3	2.5	204	239	2 800	3 800	**30313JR**	2GB	2.56
	140	51	48	39	3	2.5	276	357	2 900	3 900	**32313JR**	2GD	3.64
70	100	20	20	16	1	1	71.0	115	3 500	4 700	**32914JR**	2BC	0.496
	110	25	25	19	1.5	1.5	108	163	3 300	4 400	**32014JR**	4CC	0.884
	110	31	31	25.5	1.5	1.5	134	208	3 300	4 400	**33014JR**	2CE	1.09
	120	37	37	29	2	1.5	181	266	3 100	4 200	**33114JR**	3DE	1.71
	125	26.25	24	21	2	1.5	138	173	3 100	4 100	**30214JR**	3EB	1.32
	125	33.25	31	27	2	1.5	169	225	3 100	4 100	**32214JR**	3EC	1.71
	125	41	41	32	2	1.5	206	294	3 100	4 100	**33214JR**	3EE	2.16
	150	38	35	25	3	2.5	197	235	2 300	3 200	**30314DJR**	7GB	2.97
	150	38	35	30	3	2.5	230	273	2 600	3 500	**30314JR**	2GB	3.08
	150	54	51	42	3	2.5	317	414	2 700	3 600	**32314JR**	2GD	4.50

d 75 – 95 mm

Boundary dimensions (mm)							Basic load ratings (kN)		Limiting speeds (min^{-1})		Bearing No.	(Refer.) Dimension series to ISO355	(Refer.) Mass (kg)
d	*D*	*T*	*B*	*C*	*r* min.	r_1 min.	C_r	C_{0r}	Grease lub.	Oil lub.			
75	105	20	20	16	1	1	73.6	123	3 300	4 400	**32915JR**	2BC	0.526
	115	25	25	19	1.5	1.5	110	169	3 100	4 200	**32015JR**	4CC	0.930
	115	31	31	25.5	1.5	1.5	141	225	3 200	4 200	**33015JR**	2CE	1.16
	125	37	37	29	2	1.5	186	280	3 000	4 000	**33115JR**	3DE	1.84
	130	27.25	25	22	2	1.5	142	181	2 900	3 900	**30215JR**	4DB	1.42
	130	33.25	31	27	2	1.5	174	234	2 900	3 900	**32215JR**	4DC	1.77
	130	41	41	31	2	1.5	212	310	2 900	3 900	**33215JR**	3EE	2.26
	160	40	37	26	3	2.5	222	266	2 100	2 900	**30315DR**	–	3.48
	160	40	37	31	3	2.5	260	311	2 500	3 300	**30315JR**	2GB	3.65
	160	58	55	45	3	2.5	363	481	2 500	3 300	**32315JR**	2GD	5.41
80	110	20	20	16	1	1	76.1	131	3 100	4 200	**32916JR**	2BC	0.556
	125	29	29	22	1.5	1.5	147	225	2 900	3 900	**32016JR**	3CC	1.32
	125	36	36	29.5	1.5	1.5	173	288	2 900	3 900	**33016JR**	2CE	1.63
	130	37	37	29	2	1.5	191	294	2 800	3 800	**33116JR**	3DE	1.93
	140	28.25	26	22	2.5	2	161	202	2 700	3 600	**30216JR**	3EB	1.72
	140	35.25	33	28	2.5	2	203	271	2 700	3 600	**32216JR**	3EC	2.17
	140	46	46	35	2.5	2	250	371	2 700	3 600	**33216JR**	3EE	2.99
	170	42.5	39	27	3	2.5	236	282	2 000	2 800	**30316DJR**	7GB	4.12
	170	42.5	39	33	3	2.5	294	355	2 300	3 100	**30316JR**	2GB	4.46
	170	61.5	58	48	3	2.5	383	503	2 300	3 100	**32316JR**	2GD	6.31
85	120	23	23	18	1.5	1.5	97.1	165	2 900	3 900	**32917JR**	2BC	0.794
	130	29	29	22	1.5	1.5	150	234	2 800	3 700	**32017JR**	4CC	1.38
	130	36	36	29.5	1.5	1.5	177	300	2 800	3 700	**33017JR**	2CE	1.72
	140	41	41	32	2.5	2	224	346	2 600	3 500	**33117JR**	3DE	2.43
	150	30.5	28	24	2.5	2	182	231	2 500	3 400	**30217JR**	3EB	2.17
	150	38.5	36	30	2.5	2	232	315	2 500	3 400	**32217JR**	3EC	2.80
	150	49	49	37	2.5	2	294	439	2 500	3 400	**33217JR**	3EE	3.63
	180	44.5	41	28	4	3	263	317	1 900	2 600	**30317DJR**	7GB	4.81
	180	44.5	41	34	4	3	316	384	2 200	2 900	**30317JR**	2GB	5.15
	180	63.5	60	49	4	3	439	587	2 200	3 000	**32317JR**	2GD	7.42
90	125	23	23	18	1.5	1.5	101	175	2 800	3 700	**32918JR**	2BC	0.834
	140	32	32	24	2	1.5	178	276	2 600	3 500	**32018JR**	3CC	1.80
	140	39	39	32.5	2	1.5	221	367	2 600	3 400	**33018JR**	2CE	2.22
	150	45	45	35	2.5	2	258	413	2 500	3 300	**33118JR**	3DE	3.13
	160	32.5	30	26	2.5	2	204	261	2 400	3 200	**30218JR**	3FB	2.65
	160	42.5	40	34	2.5	2	263	362	2 400	3 200	**32218JR**	3FC	3.47
	190	46.5	43	30	4	3	282	336	1 700	2 400	**30318DR**	–	5.60
	190	46.5	43	36	4	3	345	420	2 100	2 700	**30318JR**	2GB	6.04
	190	67.5	64	53	4	3	461	614	2 100	2 800	**32318JR**	2GD	8.61
95	145	32	32	24	2	1.5	182	287	2 500	3 300	**32019JR**	4CC	1.88
	145	39	39	32.5	2	1.5	226	382	2 500	3 300	**33019JR**	2CE	2.31
	160	49	49	38	2.5	2	304	473	2 300	3 100	**33119JR**	3EE	3.89
	170	34.5	32	27	3	2.5	231	299	2 200	3 000	**30219JR**	3FB	3.20
	170	45.5	43	37	3	2.5	311	439	2 200	3 000	**32219JR**	3FC	4.34
	170	58	58	44	3	2.5	374	582	2 200	2 900	**33219JR**	3FE	5.66
	200	49.5	45	32	4	3	319	391	1 700	2 300	**30319DJR**	7GB	6.68
	200	49.5	45	38	4	3	372	455	2 000	2 600	**30319JR**	2GB	6.96
	200	71.5	67	55	4	3	517	695	2 000	2 600	**32319JR**	2GD	10.1

Tapered roller bearings metric series

d 100 – (120) mm

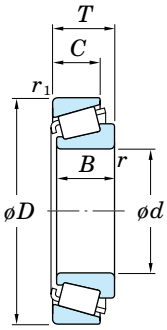


	Boundary dimensions (mm)						Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.	(Refer.) Dimension series to ISO355	(Refer.) Mass (kg)
d	*D*	*T*	*B*	*C*	*r* min.	r_1 min.	C_r	C_{0r}	Grease lub.	Oil lub.			
100	140	25	25	20	1.5	1.5	126	217	2 400	3 300	**32920JR**	2CC	1.19
	150	32	32	24	2	1.5	185	298	2 400	3 200	**32020JR**	4CC	1.95
	150	39	39	32.5	2	1.5	231	397	2 400	3 200	**33020JR**	2CE	2.40
	165	52	52	40	2.5	2	325	523	2 200	3 000	**33120JR**	3EE	4.29
	180	37	34	29	3	2.5	258	338	2 100	2 800	**30220JR**	3FB	3.83
	180	49	46	39	3	2.5	347	495	2 100	2 800	**32220JR**	3FC	5.21
	180	63	63	48	3	2.5	431	680	2 100	2 800	**33220JR**	3FE	6.92
	215	51.5	47	34	4	3	318	374	1 500	2 100	**30320D**	–	8.02
	215	51.5	47	39	4	3	344	400	1 800	2 400	**30320**	–	7.76
	215	51.5	47	39	4	3	422	521	1 800	2 400	**30320JR**	2GB	8.49
	215	56.5	51	35	4	3	373	459	1 500	2 200	**31320JR**	7GB	8.72
	215	77.5	73	60	4	3	579	783	1 800	2 400	**32320JR**	2GD	13.0
105	145	25	25	20	1.5	1.5	128	224	2 400	3 100	**32921JR**	2CC	1.23
	160	35	35	26	2.5	2	215	344	2 200	3 000	**32021JR**	4DC	2.45
	160	43	43	34	2.5	2	267	461	2 200	3 000	**33021JR**	2DE	3.08
	175	56	56	44	2.5	2	360	607	2 100	2 800	**33121JR**	3EE	5.33
	190	39	36	30	3	2.5	288	380	2 000	2 600	**30221JR**	3FB	4.49
	190	53	50	43	3	2.5	392	567	2 000	2 700	**32221JR**	3FC	6.37
	190	68	68	52	3	2.5	497	790	2 000	2 600	**33221JR**	3FE	8.43
	225	53.5	49	41	4	3	464	578	1 700	2 300	**30321JR**	2GB	9.73
	225	58	53	36	4	3	397	489	1 500	2 100	**31321JR**	7GB	9.72
	225	81.5	77	63	4	3	635	866	1 800	2 300	**32321JR**	2GD	14.9
110	170	38	38	29	2.5	2	248	395	2 100	2 800	**32022JR**	4DC	3.12
	170	47	47	37	2.5	2	287	502	2 100	2 800	**33022JR**	2DE	3.81
	180	56	56	43	2.5	2	369	634	2 000	2 700	**33122JR**	3EE	5.52
	200	41	38	32	3	2.5	324	434	1 900	2 500	**30222JR**	3FB	5.33
	200	56	53	46	3	2.5	438	640	1 900	2 500	**32222JR**	3FC	7.45
	240	54.5	50	42	4	3	481	590	1 600	2 100	**30322JR**	2GB	11.4
	240	63	57	38	4	3	452	563	1 400	1 900	**31322JR**	7GB	12.2
	240	84.5	80	65	4	3	691	943	1 600	2 200	**32322JR**	2GD	17.8
120	165	29	29	23	1.5	1.5	172	298	2 100	2 700	**32924JR**	2CC	1.77
	180	38	38	29	2.5	2	258	427	2 000	2 600	**32024JR**	4DC	3.34
	180	48	48	38	2.5	2	299	540	2 000	2 600	**33024JR**	2DE	4.16
	200	62	62	48	2.5	2	462	785	1 800	2 400	**33124JR**	3FE	7.73
	215	43.5	40	34	3	2.5	347	473	1 700	2 300	**30224JR**	4FB	6.36

d (120) – 200 mm

Boundary dimensions (mm)							Basic load ratings (kN)		Limiting speeds (min^{-1})		Bearing No.	(Refer.) Dimension series to ISO355	(Refer.) Mass (kg)
d	*D*	*T*	*B*	*C*	*r* min.	r_1 min.	C_r	C_{0r}	Grease lub.	Oil lub.			
120	215	61.5	58	50	3	2.5	470	691	1 700	2 300	**32224JR**	4FD	9.04
	260	59.5	55	46	4	3	569	714	1 500	2 000	**30324JR**	2GB	14.5
	260	68	62	42	4	3	526	665	1 300	1 800	**31324JR**	7GB	15.4
	260	90.5	86	69	4	3	800	1 110	1 500	2 000	**32324JR**	2GD	22.2
130	180	32	32	25	2	1.5	200	368	1 900	2 500	**32926JR**	2CC	2.42
	200	45	45	34	2.5	2	340	563	1 800	2 300	**32026JR**	4EC	5.04
	200	55	55	43	2.5	2	390	705	1 700	2 300	**33026JR**	2EE	6.19
	230	43.75	40	34	4	3	377	511	1 600	2 100	**30226JR**	4FB	7.24
	230	67.75	64	54	4	3	554	830	1 600	2 200	**32226JR**	4FD	11.5
	280	63.75	58	49	5	4	657	834	1 400	1 800	**30326JR**	2GB	18.1
	280	72	66	44	5	4	589	748	1 200	1 600	**31326JR**	7GB	18.9
140	190	32	32	25	2	1.5	206	390	1 800	2 300	**32928JR**	2CC	2.57
	210	45	45	34	2.5	2	346	585	1 700	2 200	**32028JR**	4DC	5.28
	210	56	56	44	2.5	2	406	758	1 600	2 200	**33028JR**	2DE	6.61
	250	45.75	42	36	4	3	420	570	1 500	1 900	**30228JR**	4FB	8.97
	250	71.75	68	58	4	3	636	961	1 500	2 000	**32228JR**	4FD	14.7
	300	67.75	62	53	5	4	749	962	1 300	1 700	**30328JR**	2GB	22.6
	300	77	70	47	5	4	674	865	1 100	1 500	**31328JR**	7GB	23.3
150	210	38	38	30	2.5	2	286	536	1 600	2 100	**32930JR**	2DC	3.96
	225	48	48	36	3	2.5	391	668	1 500	2 000	**32030JR**	4EC	6.41
	225	59	59	46	3	2.5	459	869	1 500	2 000	**33030JR**	2EE	8.09
	270	49	45	38	4	3	483	664	1 300	1 800	**30230JR**	4GB	11.6
	270	77	73	60	4	3	704	1 070	1 300	1 800	**32230JR**	4GD	18.2
	320	72	65	55	5	4	837	1 080	1 200	1 500	**30330JR**	2GB	26.6
	320	82	75	50	5	4	763	989	980	1 400	**31330JR**	7GB	28.0
160	220	38	38	30	2.5	2	295	568	1 500	2 000	**32932JR**	2DC	4.19
	240	51	51	38	3	2.5	440	758	1 400	1 900	**32032JR**	4EC	7.75
	290	52	48	40	4	3	542	750	1 200	1 600	**30232JR**	4GB	14.1
	290	84	80	67	4	3	795	1 210	1 200	1 700	**32232JR**	4GD	23.2
	340	75	68	58	5	4	938	1 220	1 100	1 400	**30332JR**	2GB	31.8
170	230	38	38	30	2.5	2	296	606	1 400	1 900	**32934JR**	3DC	4.49
	260	57	57	43	3	2.5	526	905	1 300	1 700	**32034JR**	4EC	10.5
	310	57	52	43	5	4	620	867	1 100	1 500	**30234JR**	4GB	17.8
	310	91	86	71	5	4	898	1 380	1 100	1 500	**32234JR**	4GD	28.9
	360	80	72	62	5	4	1 040	1 370	1 000	1 300	**30334JR**	2GB	37.5
180	250	45	45	34	2.5	2	357	735	1 300	1 700	**32936JR**	4DC	6.64
	280	64	64	48	3	2.5	644	1 100	1 200	1 600	**32036JR**	3FD	14.1
	320	57	52	43	5	4	615	870	1 100	1 400	**30236JR**	4GB	18.3
	320	91	86	71	5	4	957	1 520	1 100	1 500	**32236JR**	4GD	29.9
190	260	45	45	34	2.5	2	366	789	1 200	1 600	**32938JR**	4DC	6.89
	290	64	64	48	3	2.5	654	1 170	1 100	1 500	**32038JR**	4FD	14.7
	340	60	55	46	5	4	729	1 030	1 000	1 300	**30238JR**	4GB	21.9
	340	97	92	75	5	4	1 090	1 740	1 000	1 300	**32238JR**	4GD	36.6
200	280	51	51	39	3	2.5	486	958	1 100	1 500	**32940JR**	3EC	9.44
	310	70	70	53	3	2.5	755	1 340	1 100	1 400	**32040JR**	4FD	19.1
	360	64	58	48	5	4	792	1 120	940	1 200	**30240JR**	4GB	26.4
	360	104	98	82	5	4	1 240	1 880	960	1 300	**32240JR**	3GD	44.2

Tapered roller bearings
inch series
d 15.875 – (28.575) mm



Boundary dimensions (mm)							Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.		(Refer.) Mass (kg)	
d	*D*	*T*	*B*	*C*	*r* min.	r_1 min.	C_r	C_{0r}	Grease lub.	Oil lub.	Cone	Cup	Cone	Cup
15.875	42.862	14.288	14.288	9.525	1.6	1.6	17.8	17.7	10 000	14 000	**11590**	**11520**	0.060	0.040
17.462	39.878	13.843	14.605	10.668	1.2	1.2	25.4	26.0	11 000	14 000	**LM11749R**	**LM11710**	0.058	0.028
19.050	45.237	15.494	16.637	12.065	1.2	1.2	29.4	30.1	9 400	13 000	**LM11949**	**LM11910**	0.081	0.044
	49.225	19.845	21.539	14.288	1.2	1.2	37.7	37.7	8 900	12 000	**09078**	**09195**	0.124	0.065
	49.225	21.209	19.050	17.462	1.2	1.6	37.7	37.7	8 900	12 000	**09067**	**09196**	0.114	0.084
21.430	50.005	17.526	18.288	13.970	1.2	1.2	39.1	40.7	8 500	11 000	**M12649**	**M12610**	0.119	0.058
21.987	45.974	15.494	16.637	12.065	1.2	1.2	30.1	34.6	8 900	12 000	**LM12749**	**LM12711**	0.078	0.043
22.225	50.005	17.526	18.288	13.970	1.2	1.2	39.1	40.7	8 500	11 000	**M12648**	**M12610**	0.115	0.058
	56.896	19.368	19.837	15.875	1.2	1.2	40.0	43.1	7 600	10 000	**1755**	**1729**	0.150	0.100
	57.150	22.225	22.225	17.462	0.8	1.6	52.6	55.7	7 600	10 000	**1280**	**1220**	0.189	0.105
22.606	47.000	15.500	15.500	12.000	1.6	1.0	28.0	32.8	8 700	12 000	**LM72849**	**LM72810**	0.076	0.047
23.812	50.292	14.224	14.732	10.668	1.6	1.2	31.2	37.0	7 800	10 000	**L44640R**	**L44610**	0.099	0.039
	56.896	19.368	19.837	15.875	0.8	1.2	40.0	43.1	7 600	10 000	**1779**	**1729**	0.141	0.100
25.400	50.005	13.495	14.260	9.525	1.0	1.0	26.7	28.8	7 900	11 000	**07100**	**07196**	0.084	0.035
	50.005	13.495	14.260	9.525	1.6	1.0	26.7	28.8	7 900	11 000	**07100S**	**07196**	0.082	0.035
	50.292	14.224	14.732	10.668	1.2	1.2	31.2	37.0	7 800	10 000	**L44643R**	**L44610**	0.092	0.039
	61.912	19.050	20.638	14.288	0.8	2.0	44.6	50.7	6 400	8 600	**15101**	**15243**	0.215	0.080
	62.000	19.050	20.638	14.288	3.6	1.2	44.6	50.7	6 400	8 600	**15100**	**15245**	0.215	0.081
	63.500	19.050	20.638	14.288	0.8	1.2	44.6	50.7	6 400	8 600	**15101**	**15250R**	0.215	0.097
	64.292	21.432	21.432	16.670	1.6	1.6	55.2	70.7	6 400	8 500	**M86643R**	**M86610**	0.248	0.127
	65.088	22.225	21.463	15.875	1.6	1.6	47.8	51.7	5 600	7 900	**23100**	**23256**	0.231	0.140
	72.233	25.400	25.400	19.842	0.8	2.4	66.9	87.4	5 700	7 600	**HM88630**	**HM88610**	0.391	0.185
26.988	50.292	14.224	14.732	10.668	3.6	1.2	31.2	37.0	7 800	10 000	**L44649R**	**L44610**	0.083	0.039
	60.325	19.842	17.462	15.875	3.6	1.6	37.8	42.7	7 000	9 400	**15580**	**15523**	0.140	0.122
	62.000	19.050	20.638	14.288	0.8	1.2	44.6	50.7	6 400	8 600	**15106**	**15245**	0.206	0.081
28.575	57.150	19.845	19.355	15.875	3.6	1.6	48.8	57.1	7 000	9 300	**1988R**	**1922**	0.151	0.076
	62.000	19.050	20.638	14.288	3.6	1.2	44.6	50.7	6 400	8 600	**15112**	**15245**	0.193	0.081

Remark) Inch series tapered roller bearings with bore diameter larger than 200 mm are shown in catalogue "large size ball & roller bearings," CAT. NO. 211E.

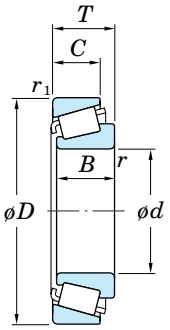
d (28.575) – 38.000 mm

Boundary dimensions (mm)							Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.[1]		(Refer.) Mass (kg)	
d	*D*	*T*	*B*	*C*	r [2] min.	r_1 min.	C_r	C_{0r}	Grease lub.	Oil lub.	Cone	Cup	Cone	Cup
28.575	64.292	21.432	21.432	16.670	1.6	1.6	55.2	70.7	6 400	8 500	**M86647R**	**M86610**	0.225	0.127
	66.421	23.812	25.433	19.050	1.2	1.2	67.0	75.2	6 500	8 700	**2689**	**2631**	0.249	0.165
	68.262	22.225	22.225	17.462	0.8	1.6	51.0	61.1	6 000	8 000	**02474**	**02420**	0.252	0.150
	73.025	22.225	22.225	17.462	0.8	3.2	55.0	65.7	5 500	7 400	**02872**	**02820**	0.319	0.158
29.000	50.292	14.224	14.732	10.668	3.6	1.2	28.9	37.2	7 600	10 000	**L45449**	**L45410**	0.079	0.036
29.367	66.421	23.812	25.433	19.050	3.6	1.2	67.0	75.2	6 500	8 700	**2690**	**2631**	0.242	0.165
30.162	64.292	21.432	21.432	16.670	1.6	1.6	55.2	70.7	6 400	8 500	**M86649R**	**M86610**	0.213	0.127
	68.262	22.225	22.225	17.462	2.4	1.6	56.1	71.1	6 000	7 900	**M88043**	**M88010**	0.258	0.144
30.213	62.000	19.050	20.638	14.288	3.6	1.2	44.6	50.7	6 400	8 600	**15118**	**15245**	0.181	0.081
	62.000	19.050	20.638	14.288	1.6	1.2	44.6	50.7	6 400	8 600	**15119**	**15245**	0.183	0.081
	62.000	19.050	20.638	14.288	0.8	1.2	44.6	50.7	6 400	8 600	**15120**	**15245**	0.183	0.081
30.226	69.012	19.845	19.583	15.875	0.8	3.2	46.1	55.0	5 900	7 800	**14116**	**14274**	0.226	0.131
31.750	59.131	15.875	16.764	11.811	sp	1.2	35.8	43.1	6 600	8 800	**LM67048**	**LM67010**	0.120	0.062
	62.000	18.161	19.050	14.288	sp	1.2	44.6	50.7	6 400	8 600	**15123**	**15245**	0.157	0.081
	62.000	19.050	20.638	14.288	3.6	1.2	44.6	50.7	6 400	8 600	**15125**	**15245**	0.169	0.081
	62.000	19.050	20.638	14.288	0.8	1.2	44.6	50.7	6 400	8 600	**15126**	**15245**	0.171	0.081
	66.421	25.400	25.357	20.638	0.8	3.2	71.4	85.1	6 000	8 000	**2580**	**2520**	0.281	0.123
	68.262	22.225	22.225	17.462	1.6	1.6	56.1	71.1	6 000	7 900	**M88046**	**M88010**	0.245	0.144
	68.262	22.225	22.225	17.462	3.6	1.6	51.0	61.1	6 000	8 000	**02475**	**02420**	0.224	0.150
	73.025	22.225	22.225	17.462	3.6	3.2	55.0	65.7	5 600	7 400	**02875**	**02820**	0.293	0.158
	73.025	29.370	27.783	23.020	1.2	3.2	74.3	101	5 600	7 500	**HM88542**	**HM88510**	0.377	0.238
	73.812	29.370	27.783	23.020	1.2	3.2	74.3	101	5 600	7 500	**HM88542**	**HM88512**	0.377	0.254
33.338	68.262	22.225	22.225	17.462	0.8	1.6	56.1	71.1	6 000	7 900	**M88048**	**M88010**	0.231	0.144
	73.025	29.370	27.783	23.020	0.8	3.2	74.3	101	5 600	7 500	**HM88547**	**HM88510**	0.360	0.238
	76.200	29.370	28.575	23.020	0.8	3.2	79.5	107	5 400	7 200	**HM89443**	**HM89410**	0.415	0.254
34.925	65.088	18.034	18.288	13.970	sp	1.2	48.0	58.5	6 000	8 000	**LM48548**	**LM48510**	0.164	0.086
	69.012	26.982	26.721	15.875	0.8	1.2	46.1	55.0	5 900	7 800	**14136A**	**14276**	0.254	0.133
	72.233	25.400	25.400	19.842	2.4	2.4	66.9	87.4	5 700	7 600	**HM88649**	**HM88610**	0.301	0.185
	73.025	23.812	24.608	19.050	1.6	0.8	72.2	87.3	5 600	7 400	**25877R**	**25821**	0.310	0.165
	76.200	29.370	28.575	23.812	1.6	3.2	80.9	97.4	5 400	7 200	**31594**	**31520**	0.388	0.232
34.980	59.131	15.875	16.764	11.938	sp	1.2	35.7	48.5	6 400	8 500	**L68149**	**L68110**	0.112	0.056
	59.975	15.875	16.764	11.938	sp	1.2	35.7	48.5	6 400	8 500	**L68149**	**L68111**	0.112	0.063
35.000	79.375	23.812	25.400	19.050	0.8	0.8	81.1	105	5 000	6 700	**26883R**	**26822**	0.414	0.186
35.717	72.233	25.400	25.400	19.842	3.6	2.4	66.9	87.4	5 700	7 600	**HM88648**	**HM88610**	0.291	0.185
36.487	73.025	23.812	24.608	19.050	1.6	0.8	72.2	87.3	5 600	7 400	**25880R**	**25821**	0.294	0.165
36.512	76.200	29.370	28.575	23.020	3.6	0.8	79.5	107	5 400	7 200	**HM89449**	**HM89411**	0.386	0.258
	79.375	23.812	25.400	19.050	0.8	0.8	81.1	105	5 000	6 700	**26877R**	**26822**	0.404	0.186
38.000	63.000	17.000	17.000	13.500	sp	sp	43.5	58.2	6 000	8 000	**JL69349**	**JL69310**	0.128	0.070

Notes 1) Bearings identified by prefix J feature special designed accuracy.
2) 'sp' means special chamfer shape.

Remark) Inch series tapered roller bearings with bore diameter larger than 200 mm are shown in catalogue "large size ball & roller bearings," CAT. NO. 211E.

Tapered roller bearings
inch series
d 38.100 – 41.275 mm



Boundary dimensions (mm)							Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.		(Refer.) Mass (kg)	
d	D	T	B	C	r 1) min.	r_1 min.	C_r	C_{0r}	Grease lub.	Oil lub.	Cone	Cup	Cone	Cup
38.100	65.088	18.034	18.288	13.970	sp	1.2	42.9	56.5	5 800	7 800	**LM29748**	**LM29710**	0.154	0.079
	65.088	19.812	18.288	15.748	2.4	1.2	42.9	56.5	5 800	7 800	**LM29749**	**LM29711**	0.159	0.092
	71.438	15.875	16.520	11.908	1.6	1.0	46.1	53.8	5 700	7 600	**19150R**	**19281**	0.167	0.105
	71.996	17.018	16.520	14.288	1.6	1.6	46.1	53.8	5 700	7 600	**19150R**	**19283**	0.167	0.133
	71.996	19.000	20.638	14.237	3.6	1.6	49.7	61.3	5 600	7 400	**16150**	**16282**	0.207	0.121
	72.238	20.638	20.638	15.875	3.6	1.2	49.7	61.3	5 600	7 400	**16150**	**16284**	0.207	0.144
	72.238	23.812	20.638	19.050	3.6	2.4	49.7	61.3	5 600	7 400	**16150**	**16283**	0.207	0.183
	76.200	23.812	25.654	19.050	3.6	0.8	74.1	92.2	5 400	7 200	**2788R**	**2729**	0.308	0.189
	79.375	29.370	29.771	23.812	3.6	3.2	87.4	105	5 200	6 900	**3490**	**3420**	0.419	0.256
	82.550	29.370	28.575	23.020	0.8	3.2	87.3	117	4 900	6 600	**HM801346**	**HM801310**	0.483	0.282
	82.550	29.370	28.575	23.020	2.4	3.2	87.3	117	4 900	6 600	**HM801346X**	**HM801310**	0.483	0.282
	88.501	26.988	29.083	22.225	3.6	1.6	98.2	112	4 900	6 500	**418**	**414**	0.523	0.325
39.688	73.025	23.812	25.654	19.050	3.6	0.8	74.1	92.2	5 400	7 200	**2789R**	**2735X**	0.288	0.134
40.000	76.200	20.638	20.940	15.507	1.6	1.2	57.3	65.9	5 300	7 000	**28158**	**28300**	0.266	0.137
	80.000	21.000	22.403	17.826	3.6	1.2	68.0	74.8	4 900	6 600	**344**	**332**	0.334	0.144
	80.000	21.000	22.403	17.826	0.8	1.2	68.0	74.8	4 900	6 600	**344A**	**332**	0.334	0.144
40.483	82.550	29.370	28.575	23.020	3.6	3.2	87.3	117	4 900	6 600	**HM801349**	**HM801310**	0.450	0.282
41.275	73.025	16.667	17.462	12.700	3.6	1.6	45.9	55.8	5 200	6 900	**18590**	**18520**	0.199	0.085
	73.431	19.558	19.812	14.732	3.6	0.8	57.8	73.0	5 200	7 000	**LM501349**	**LM501310**	0.227	0.107
	73.431	21.430	19.812	16.604	3.6	0.8	57.8	73.0	5 200	7 000	**LM501349**	**LM501314**	0.227	0.126
	73.431	23.012	19.812	18.186	3.6	2.4	57.8	73.0	5 200	7 000	**LM501349**	**LM501311**	0.227	0.140
	76.200	18.009	17.384	14.288	1.6	1.6	51.6	63.3	5 200	6 900	**11162R**	**11300**	0.221	0.127
	76.200	22.225	23.020	17.462	3.6	0.8	66.3	83.3	5 200	6 900	**24780R**	**24720**	0.275	0.148
	80.000	21.000	22.403	17.826	3.6	1.2	68.0	74.8	4 900	6 600	**342**	**332**	0.317	0.144
	85.725	30.162	30.162	23.812	3.6	1.2	108	136	4 800	6 400	**3877**	**3821**	0.506	0.324
	88.900	20.638	22.225	16.513	3.6	1.2	74.3	87.3	4 400	5 800	**365A**	**362A**	0.458	0.164
	88.900	30.162	29.370	23.020	0.8	3.2	99.6	125	4 600	6 100	**HM803145**	**HM803110**	0.577	0.318
	88.900	30.162	29.370	23.020	3.6	3.2	99.6	125	4 600	6 100	**HM803146**	**HM803110**	0.574	0.318
	90.488	39.688	40.386	33.338	3.6	3.2	132	169	4 500	6 000	**4388**	**4335**	0.775	0.454
	95.250	30.162	29.370	23.020	3.6	3.2	104	140	3 300	4 400	**HM804840**	**HM804810**	0.719	0.351
	104.775	36.512	36.512	28.575	1.6	3.2	141	195	3 800	5 100	**HM807035**	**HM807010**	1.19	0.497

Note 1) 'sp' means special chamfer shape.

Remark) Inch series tapered roller bearings with bore diameter larger than 200 mm are shown in catalogue "large size ball & roller bearings," CAT. NO. 211E.

d 42.875 – 50.000 mm

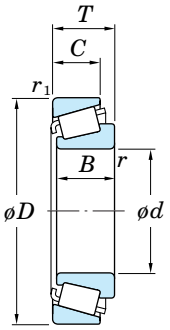
Boundary dimensions (mm)							Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.[1]		(Refer.) Mass (kg)	
d	*D*	*T*	*B*	*C*	*r* min.	r_1 min.	C_r	C_{0r}	Grease lub.	Oil lub.	Cone	Cup	Cone	Cup
42.875	82.931	23.812	25.400	19.050	3.6	0.8	77.2	100	4 800	6 300	**25577**	**25520**	0.382	0.200
44.450	82.931	23.812	25.400	19.050	5.2	0.8	77.2	100	4 800	6 300	**25582**	**25520**	0.361	0.200
	84.138	30.162	30.886	23.812	3.6	3.2	95.8	120	4 600	6 200	**3578R**	**3520**	0.479	0.221
	85.000	20.638	21.692	17.462	2.4	1.2	71.8	81.7	4 600	6 200	**355**	**354A**	0.344	0.160
	85.000	20.638	21.692	17.462	0.8	1.2	71.8	81.7	4 600	6 200	**355A**	**354A**	0.344	0.160
	88.900	30.162	29.370	23.020	3.6	3.2	99.6	125	4 600	6 100	**HM803149**	**HM803110**	0.525	0.318
	95.250	27.783	28.575	22.225	0.8	2.4	108	141	4 100	5 400	**33885**	**33821**	0.714	0.264
	95.250	30.162	29.370	23.020	0.8	2.4	104	140	3 300	4 400	**HM804842**	**HM804810**	0.673	0.351
	95.250	30.162	29.370	23.020	3.6	2.4	104	140	3 300	4 400	**HM804843**	**HM804810**	0.670	0.351
	95.250	30.958	28.301	20.638	3.6	0.8	88.7	98.4	3 700	5 200	**53177**	**53375**	0.558	0.363
	95.250	30.958	28.575	22.225	3.6	0.8	99.7	120	3 700	5 100	**HM903249**	**HM903210**	0.614	0.383
	104.775	36.512	36.512	28.575	3.6	3.2	141	195	3 800	5 100	**HM807040**	**HM807010**	1.13	0.497
	111.125	30.162	26.909	20.638	3.6	3.2	111	150	3 100	4 300	**55175CR**	**55437**	0.939	0.507
	111.125	30.162	26.909	20.638	0.8	3.2	111	150	3 100	4 300	**55176CR**	**55437**	0.939	0.507
44.983	93.264	30.162	30.302	23.812	3.6	3.2	103	137	4 200	5 500	**3776**	**3720**	0.650	0.288
44.988	95.250	30.958	28.575	22.225	3.6	0.8	99.7	120	3 700	5 100	**HM903248**	**HM903210**	0.606	0.383
45.242	73.431	19.558	19.812	15.748	3.6	0.8	55.6	78.1	5 100	6 700	**LM102949**	**LM102910**	0.209	0.100
	77.788	19.842	19.842	15.080	3.6	0.8	57.1	73.5	4 900	6 500	**LM603049**	**LM603011**	0.243	0.120
	77.788	21.430	19.842	16.667	3.6	0.8	57.1	73.5	4 900	6 500	**LM603049**	**LM603012**	0.243	0.138
	79.974	19.842	19.842	15.080	3.6	0.8	57.1	73.5	4 900	6 500	**LM603049**	**LM603014**	0.243	0.152
45.618	85.000	23.812	25.400	19.050	3.6	2.4	77.2	100	4 800	6 300	**25590**	**25526**	0.344	0.241
45.987	74.976	18.000	18.000	14.000	2.4	1.6	52.6	74.6	5 000	6 600	**LM503349R**	**LM503310**	0.207	0.095
46.038	79.375	17.462	17.462	13.495	2.8	1.6	47.1	59.1	4 800	6 400	**18690**	**18620**	0.208	0.123
	85.000	20.638	21.692	17.462	3.6	1.2	71.8	81.7	4 600	6 200	**359A**	**354A**	0.323	0.160
	85.000	20.638	21.692	17.462	2.4	1.2	71.8	81.7	4 600	6 200	**359S**	**354A**	0.323	0.160
47.625	88.900	20.638	22.225	16.513	3.6	1.2	74.3	87.3	4 400	5 800	**369A**	**362A**	0.373	0.164
	88.900	25.400	25.400	19.050	3.6	3.2	87.1	112	4 400	5 900	**M804049**	**M804010**	0.450	0.216
	95.250	30.162	29.370	23.020	3.6	3.2	104	140	3 300	4 400	**HM804846**	**HM804810**	0.617	0.351
	96.838	21.000	21.946	15.875	0.8	0.8	80.4	101	3 900	5 200	**386A**	**382A**	0.563	0.177
	101.600	34.925	36.068	26.988	3.6	3.2	131	159	4 000	5 300	**528**	**522**	0.871	0.411
	104.775	30.162	29.317	24.605	4.8	3.2	109	144	3 700	4 900	**463**	**453X**	0.838	0.372
	111.125	30.162	26.909	20.638	3.6	3.2	97.7	119	3 200	4 400	**55187**	**55437**	0.817	0.507
48.412	95.250	30.162	29.370	23.020	2.4	3.2	104	140	3 300	4 400	**HM804848**	**HM804810**	0.606	0.351
49.212	88.900	20.638	22.225	16.513	0.8	1.2	74.3	87.3	4 400	5 800	**365S**	**362A**	0.366	0.164
	104.775	36.512	36.512	28.575	3.6	3.2	141	195	3 800	5 100	**HM807044**	**HM807010**	1.03	0.497
	114.300	44.450	44.450	34.925	3.6	3.2	189	230	3 800	5 000	**65390**	**65320**	1.28	0.894
50.000	82.000	21.501	21.501	17.000	3.0	0.5	71.7	97.9	4 500	6 000	**JLM104948**	**JLM104910**	0.304	0.128
	88.900	20.638	22.225	16.513	2.0	1.2	74.3	87.3	4 400	5 800	**365**	**362A**	0.346	0.164
	90.000	28.000	28.000	23.000	3.0	2.5	105	138	4 300	5 800	**JM205149**	**JM205110**	0.508	0.243
	105.000	37.000	36.000	29.000	3.0	2.8	149	205	3 800	5 100	**JHM807045**	**JHM807012**	1.01	0.523
	110.000	22.000	21.996	18.824	0.8	1.2	86.4	116	3 400	4 500	**396**	**394A**	0.777	0.263

Note 1) Bearings identified by prefix J feature special designed accuracy.

Remark) Inch series tapered roller bearings with bore diameter larger than 200 mm are shown in catalogue "large size ball & roller bearings," CAT. NO. 211E.

Tapered roller bearings
inch series

d 50.800 – 54.991 mm



Boundary dimensions (mm)							Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.		(Refer.) Mass (kg)	
d	*D*	*T*	*B*	*C*	*r* min.	r_1 min.	C_r	C_{0r}	Grease lub.	Oil lub.	Cone	Cup	Cone	Cup
50.800	82.550	21.590	22.225	16.510	3.6	1.2	61.2	84.3	4 500	6 000	**LM104949**	**LM104911**	0.287	0.131
	88.900	17.462	17.462	13.495	3.6	1.2	49.7	65.5	4 400	5 900	**18790**	**18724**	0.226	0.190
	88.900	20.638	22.225	16.513	1.6	1.2	74.3	87.3	4 400	5 800	**368**	**362A**	0.333	0.164
	88.900	20.638	22.225	16.513	3.6	1.2	74.3	87.3	4 400	5 800	**368A**	**362A**	0.331	0.164
	92.075	24.608	25.400	19.845	3.6	0.8	84.8	119	4 200	5 600	**28580R**	**28521**	0.453	0.247
	93.264	30.162	30.302	23.812	3.6	3.2	103	137	4 200	5 500	**3780**	**3720**	0.547	0.288
	95.250	27.783	28.575	22.225	3.6	0.8	108	141	4 100	5 400	**33889**	**33822**	0.604	0.267
	96.838	21.000	21.946	15.875	0.8	0.8	80.4	101	3 900	5 200	**385AX**	**382A**	0.521	0.177
	97.630	24.608	24.608	19.446	3.6	0.8	89.6	131	3 900	5 200	**28678**	**28622**	0.569	0.267
	101.600	31.750	31.750	25.400	3.6	3.2	114	143	3 900	5 200	**49585**	**49520**	0.736	0.384
	101.600	34.925	36.068	26.988	0.8	3.2	131	159	4 000	5 300	**529**	**522**	0.806	0.411
	104.775	30.162	30.958	23.812	6.4	3.2	126	165	3 700	4 900	**45284**	**45220**	0.873	0.345
	104.775	36.512	36.512	28.575	3.6	3.2	141	195	3 800	5 100	**HM807046**	**HM807010**	0.995	0.497
	107.950	36.512	36.957	28.575	3.6	3.2	138	172	3 800	5 100	**537**	**532X**	0.969	0.569
	111.125	30.162	26.909	20.638	3.6	3.2	111	150	3 100	4 300	**55200CR**	**55437**	0.840	0.507
	112.712	30.162	30.162	23.812	3.6	3.2	147	207	3 300	4 500	**39575**	**39520**	1.13	0.359
	123.825	36.512	32.791	25.400	3.6	3.2	156	190	2 900	4 000	**72200C**	**72487**	1.32	0.782
51.592	88.900	20.638	22.225	16.513	2.0	1.2	74.3	87.3	4 400	5 800	**368S**	**362A**	0.321	0.164
52.388	92.075	24.608	25.400	19.845	3.6	0.8	84.8	119	4 200	5 600	**28584R**	**28521**	0.435	0.247
	104.775	30.162	29.317	24.605	1.6	3.2	109	144	3 700	4 900	**468**	**453X**	0.748	0.372
53.975	88.900	19.050	19.050	13.492	2.4	2.0	62.9	86.8	4 200	5 600	**LM806649**	**LM806610**	0.312	0.135
	95.250	27.783	28.575	22.225	1.6	0.8	108	141	4 100	5 400	**33895**	**33822**	0.550	0.267
	104.775	36.512	36.512	28.575	3.6	3.2	141	195	3 800	5 100	**HM807049**	**HM807010**	0.921	0.497
	120.650	41.275	41.275	31.750	3.6	3.2	174	217	3 500	4 600	**621**	**612**	1.36	0.853
	123.825	36.512	32.791	25.400	3.6	3.2	156	190	2 900	4 000	**72212C**	**72487**	1.26	0.782
	123.825	38.100	36.678	30.162	3.6	3.2	162	223	3 200	4 200	**557S**	**552A**	1.47	0.756
54.991	135.755	53.975	56.007	44.450	3.6	3.2	266	357	3 000	4 000	**6381**	**6320**	2.75	1.37

Remark) Inch series tapered roller bearings with bore diameter larger than 200 mm are shown in catalogue "large size ball & roller bearings," CAT. NO. 211E.

d 55.000 – 66.675 mm

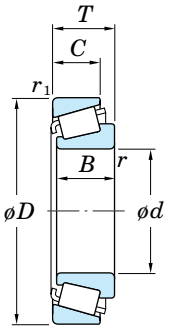
Boundary dimensions (mm)							Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.[1]		(Refer.) Mass (kg)	
d	*D*	*T*	*B*	*C*	*r* min.	r_1 min.	C_r	C_{0r}	Grease lub.	Oil lub.	Cone	Cup	Cone	Cup
55.000	90.000	23.000	23.000	18.500	1.6	0.5	81.4	115	4 200	5 500	**JLM506849**	**JLM506810**	0.370	0.183
	95.000	29.000	29.000	23.500	1.6	2.8	110	150	4 000	5 300	**JM207049**	**JM207010**	0.567	0.256
	96.838	21.000	21.946	15.875	2.4	0.8	80.4	101	3 900	5 200	**385**	**382A**	0.461	0.177
	110.000	39.000	39.000	32.000	3.0	2.5	176	224	3 600	4 900	**JH307749**	**JH307710**	1.16	0.560
55.562	97.630	24.608	24.608	19.446	3.6	0.8	89.6	131	3 900	5 200	**28680**	**28622**	0.492	0.267
55.575	96.838	21.000	21.946	15.875	2.4	0.8	80.4	101	3 900	5 200	**389**	**382A**	0.452	0.177
57.150	96.838	21.000	21.946	15.875	2.4	0.8	80.4	101	3 900	5 200	**387**	**382A**	0.428	0.177
	96.838	21.000	21.946	15.875	3.6	0.8	80.4	101	3 900	5 200	**387A**	**382A**	0.426	0.177
	96.838	21.000	21.946	15.875	5.2	0.8	80.4	101	3 900	5 200	**387AS**	**382A**	0.422	0.177
	96.838	21.000	21.946	15.875	0.8	0.8	80.4	101	3 900	5 200	**387S**	**382A**	0.431	0.177
	98.425	21.000	21.946	17.826	2.4	0.8	80.4	101	3 900	5 200	**387**	**382**	0.428	0.233
	104.775	30.162	29.317	24.605	2.4	3.2	109	144	3 700	4 900	**462**	**453X**	0.685	0.372
	104.775	30.162	29.317	24.605	3.6	3.2	109	144	3 700	4 900	**469**	**453X**	0.682	0.372
	104.775	30.162	30.958	23.812	6.4	0.8	126	165	3 700	4 900	**45291**	**45221**	0.742	0.350
	112.712	30.162	30.162	23.812	3.6	3.2	147	207	3 300	4 500	**39580**	**39520**	1.05	0.355
	112.712	30.162	30.162	23.812	7.9	3.2	147	207	3 300	4 500	**39581**	**39520**	1.03	0.355
	123.825	36.512	32.791	25.400	3.6	3.2	156	190	2 900	4 000	**72225C**	**72487**	1.19	0.782
	140.030	36.512	33.236	23.520	3.6	2.4	150	177	2 500	3 500	**78225**	**78551**	1.70	0.915
57.531	96.838	21.000	21.946	15.875	3.6	0.8	80.4	101	3 900	5 200	**388A**	**382A**	0.420	0.177
60.325	100.000	25.400	25.400	19.845	3.6	3.2	91.4	137	3 700	4 900	**28985**	**28921**	0.533	0.230
	101.600	25.400	25.400	19.845	3.6	3.2	91.4	137	3 700	4 900	**28985**	**28920**	0.533	0.269
	127.000	44.450	44.450	34.925	3.6	3.2	208	269	3 300	4 400	**65237**	**65500**	1.59	1.02
	136.525	46.038	46.038	36.512	3.6	3.2	231	369	2 800	3 700	**H715332**	**H715311**	2.56	0.950
61.912	110.000	22.000	21.996	18.824	0.8	1.2	86.4	116	3 400	4 500	**392**	**394A**	0.606	0.259
	146.050	41.275	39.688	25.400	3.6	3.2	199	232	2 300	3 300	**H913842R**	**H913810**	2.20	0.898
63.500	107.950	25.400	25.400	19.050	1.6	3.2	92.8	143	3 400	4 500	**29586**	**29520**	0.649	0.277
	110.000	22.000	21.996	18.824	3.6	1.2	86.4	116	3 400	4 500	**395**	**394A**	0.575	0.259
	110.000	25.400	25.400	19.050	3.6	1.2	92.8	143	3 400	4 500	**29585**	**29521**	0.644	0.333
	112.712	30.162	30.162	23.812	3.6	3.2	147	207	3 300	4 500	**39585**	**39520**	0.908	0.355
65.000	105.000	24.000	23.000	18.500	3.0	1.0	95.3	129	3 500	4 700	**JLM710949**	**JLM710910**	0.513	0.234
	110.000	28.000	28.000	22.500	3.0	2.8	136	191	3 400	4 600	**JM511946**	**JM511910**	0.733	0.338
	120.000	39.000	38.500	32.000	3.0	2.8	189	255	3 200	4 300	**JH211749**	**JH211710**	1.27	0.618
65.088	135.755	53.975	56.007	44.450	3.6	3.2	266	357	3 000	4 000	**6379**	**6320**	2.34	1.37
66.675	110.000	22.000	21.996	18.824	0.8	1.2	86.4	116	3 400	4 500	**395A**	**394A**	0.524	0.259
	110.000	22.000	21.996	18.824	3.6	1.2	86.4	116	3 400	4 500	**395S**	**394A**	0.519	0.259
	112.712	30.162	30.048	23.812	3.6	0.8	111	164	3 400	4 500	**3984**	**3925**	0.700	0.454
	112.712	30.162	30.162	23.812	3.6	3.2	147	207	3 300	4 500	**39590**	**39520**	0.832	0.355
	112.712	30.162	30.162	23.812	3.6	0.8	147	207	3 300	4 500	**39590**	**39521**	0.832	0.360
	117.475	30.162	30.162	23.812	3.6	3.2	118	179	3 200	4 200	**33262**	**33462**	0.910	0.436
	122.238	38.100	38.354	29.718	3.6	1.6	191	249	3 200	4 300	**HM212049**	**HM212010**	1.26	0.596
	135.755	53.975	56.007	44.450	4.3	3.2	266	357	3 000	4 000	**6386**	**6320**	2.27	1.37
	177.800	57.150	53.975	37.308	3.6	3.2	334	372	2 100	2 900	**HH914449**	**HH914412**	4.26	2.51

Note 1) Bearings identified by prefix J feature special designed accuracy.

Remark) Inch series tapered roller bearings with bore diameter larger than 200 mm are shown in catalogue "large size ball & roller bearings," CAT. NO. 211E.

Tapered roller bearings
inch series

d 68.262 – (76.200) mm



Boundary dimensions (mm)							Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.[1]		(Refer.) Mass (kg)	
d	*D*	*T*	*B*	*C*	*r* min.	r_1 min.	C_r	C_{0r}	Grease lub.	Oil lub.	Cone	Cup	Cone	Cup
68.262	110.000	22.000	21.996	18.824	2.4	1.2	86.4	116	3 400	4 500	**399A**	**394A**	0.493	0.259
	110.000	22.000	21.996	18.824	5.2	1.2	86.4	116	3 400	4 500	**399AS**	**394A**	0.485	0.259
	136.525	41.275	41.275	31.750	3.6	3.2	241	308	2 900	3 800	**H414245**	**H414210**	1.92	0.788
	136.525	46.038	46.038	36.512	3.6	3.2	231	369	2 800	3 700	**H715343**	**H715311**	2.27	0.950
69.850	112.712	25.400	25.400	19.050	1.6	3.2	97.0	155	3 200	4 300	**29675**	**29620**	0.676	0.270
	117.475	30.162	30.162	23.812	3.6	3.2	118	179	3 200	4 200	**33275**	**33462**	0.830	0.436
	120.000	29.794	29.007	24.237	3.6	2.0	118	161	3 200	4 200	**482**	**472**	0.791	0.487
	120.000	32.545	32.545	26.195	3.6	3.2	150	218	3 100	4 200	**47487R**	**47420**	1.01	0.476
	123.825	30.162	29.007	24.605	3.6	3.2	118	161	3 200	4 200	**482**	**472X**	0.791	0.625
	127.000	36.512	36.170	28.575	3.6	3.2	156	226	3 000	4 000	**566**	**563**	1.24	0.648
	146.050	41.275	39.688	25.400	3.6	3.2	202	237	2 300	3 300	**H913849R**	**H913810**	1.95	0.898
70.000	110.000	26.000	25.000	20.500	1.0	2.5	103	158	3 300	4 400	**JLM813049**	**JLM813010**	0.590	0.300
	115.000	29.000	29.000	23.000	3.0	2.5	123	173	3 200	4 300	**JM612949**	**JM612910**	0.776	0.358
71.438	117.475	30.162	30.162	23.812	3.6	3.2	118	179	3 200	4 200	**33281**	**33462**	0.789	0.436
	120.000	32.545	32.545	26.195	3.6	3.2	150	218	3 100	4 200	**47490R**	**47420**	0.964	0.476
	127.000	36.512	36.170	28.575	3.6	3.2	156	226	3 000	4 000	**567A**	**563**	1.19	0.648
	136.525	41.275	41.275	31.750	3.6	3.2	241	308	2 900	3 800	**H414249**	**H414210**	1.80	0.788
	136.525	46.038	46.038	36.512	3.6	3.2	231	369	2 800	3 700	**H715345**	**H715311**	2.15	0.950
73.025	112.712	25.400	25.400	19.050	3.6	3.2	97.0	155	3 200	4 300	**29685**	**29620**	0.602	0.270
	117.475	30.162	30.162	23.812	3.6	3.2	118	179	3 200	4 200	**33287**	**33462**	0.747	0.436
	127.000	36.512	36.170	28.575	3.6	3.2	156	226	3 000	4 000	**567**	**563**	1.14	0.648
	149.225	53.975	54.229	44.450	3.6	3.2	285	404	2 700	3 500	**6460**	**6420**	2.79	1.61
75.000	115.000	25.000	25.000	19.000	3.0	2.8	101	151	3 100	4 200	**JLM714149**	**JLM714110**	0.612	0.269
	120.000	31.000	29.500	25.000	3.0	2.8	145	216	3 100	4 100	**JM714249**	**JM714210**	0.846	0.430
76.200	121.442	24.608	23.012	17.462	3.6	2.0	90.0	127	3 000	4 000	**34301**	**34478**	0.617	0.313
	127.000	30.162	31.000	22.225	6.4	3.2	143	225	2 400	3 200	**42688**	**42620**	1.04	0.434
	133.350	30.162	29.769	22.225	6.4	3.2	133	198	2 700	3 600	**495AX**	**492A**	1.20	0.430
	133.350	33.338	33.338	26.195	6.4	3.2	154	245	2 700	3 700	**47678R**	**47620**	1.29	0.577
	135.733	44.450	46.101	34.925	3.6	3.2	213	337	2 800	3 700	**5760**	**5735**	1.85	0.877
	136.525	30.162	29.769	22.225	3.6	3.2	133	198	2 700	3 600	**495A**	**493**	1.26	0.544
	139.992	36.512	36.098	28.575	3.6	3.2	175	262	2 700	3 600	**575R**	**572**	1.64	0.779

Note 1) Bearings identified by prefix J feature special designed accuracy.

Remark) Inch series tapered roller bearings with bore diameter larger than 200 mm are shown in catalogue "large size ball & roller bearings," CAT. NO. 211E.

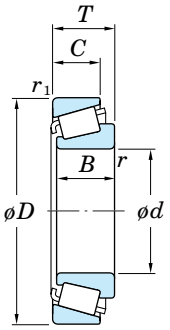
d (76.200) – (101.600) mm

Boundary dimensions (mm)							Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.[1]		(Refer.) Mass (kg)	
d	*D*	*T*	*B*	*C*	*r* min.	r_1 min.	C_r	C_{0r}	Grease lub.	Oil lub.	Cone	Cup	Cone	Cup
76.200	150.089	44.450	46.672	36.512	3.6	3.2	264	368	2 500	3 400	**748SR**	**742**	2.51	1.06
	161.925	49.212	46.038	31.750	3.6	3.2	246	286	2 100	2 900	**9285R**	**9220**	3.00	1.38
77.788	117.475	25.400	25.400	19.050	3.6	3.2	101	166	3 100	4 100	**LM814849**	**LM814810**	0.619	0.295
	121.442	24.608	23.012	17.462	3.6	2.0	90.0	127	3 000	4 000	**34306**	**34478**	0.583	0.313
	127.000	30.162	31.000	22.225	3.6	3.2	143	225	2 400	3 200	**42690**	**42620**	1.00	0.434
79.375	190.500	57.150	57.531	46.038	3.6	3.2	440	602	2 000	2 700	**HH221431**	**HH221410**	6.16	2.21
80.000	130.000	35.000	34.000	28.500	3.2	2.5	168	256	2 800	3 800	**JM515649**	**JM515610**	1.19	0.575
80.962	133.350	30.162	29.769	22.225	3.6	3.2	133	198	2 700	3 600	**496**	**492A**	1.12	0.429
82.550	125.412	25.400	25.400	19.845	3.6	1.6	101	162	2 900	3 800	**27687**	**27620**	0.710	0.344
	133.350	30.162	29.769	22.225	3.6	3.2	133	198	2 700	3 600	**495**	**492A**	1.08	0.429
	133.350	33.338	33.338	26.195	3.6	0.8	154	245	2 700	3 700	**47686R**	**47620A**	1.13	0.577
	133.350	39.688	39.688	32.545	6.7	3.2	177	306	2 800	3 700	**HM516448**	**HM516410**	1.33	0.763
	139.700	36.512	36.098	28.575	3.6	3.2	175	262	2 700	3 600	**580R**	**572X**	1.41	0.765
	139.992	36.512	36.098	28.575	3.6	3.2	175	262	2 700	3 600	**580R**	**572**	1.41	0.779
	139.992	36.512	36.098	28.575	6.7	3.2	175	262	2 700	3 600	**582R**	**572**	1.40	0.779
	146.050	41.275	41.275	31.750	3.6	3.2	208	301	2 600	3 400	**663**	**653**	1.91	0.880
	150.089	44.450	46.672	36.512	3.6	3.2	264	368	2 500	3 400	**749AR**	**742**	2.23	1.06
83.345	125.412	25.400	25.400	19.845	3.6	1.6	101	162	2 900	3 800	**27690**	**27620**	0.689	0.344
85.000	130.000	30.000	29.000	24.000	3.0	2.5	142	228	2 800	3 700	**JM716649**	**JM716610**	0.937	0.456
	140.000	39.000	38.000	31.500	3.0	2.5	203	308	2 700	3 500	**JHM516849**	**JHM516810**	1.54	0.759
85.026	150.089	44.450	46.672	36.512	3.6	3.2	264	368	2 500	3 400	**749R**	**742**	2.12	1.06
85.725	133.350	30.162	29.769	22.225	3.6	3.2	133	198	2 700	3 600	**497**	**492A**	0.978	0.429
	142.138	42.862	42.862	34.133	4.8	3.2	219	351	2 600	3 500	**HM617049**	**HM617010**	1.72	0.902
	146.050	41.275	41.275	31.750	3.6	3.2	208	301	2 600	3 400	**665**	**653**	1.77	0.880
	146.050	41.275	41.275	31.750	6.4	3.2	208	301	2 600	3 400	**665A**	**653**	1.76	0.880
	152.400	39.688	36.322	30.162	3.6	3.2	183	287	2 400	3 300	**596**	**592A**	1.83	1.04
	161.925	47.625	48.260	38.100	3.6	3.2	273	391	2 400	3 200	**758**	**752**	2.67	1.59
88.900	152.400	39.688	39.688	30.162	6.4	3.2	248	359	2 400	3 200	**HM518445**	**HM518410**	2.10	0.768
	161.925	47.625	48.260	38.100	3.6	3.2	273	391	2 400	3 200	**759**	**752**	2.50	1.59
	161.925	53.975	55.100	42.862	3.6	3.2	316	471	2 400	3 200	**6580R**	**6535**	3.09	1.65
89.974	146.975	40.000	40.000	32.500	7.1	3.6	206	310	2 500	3 300	**HM218248**	**HM218210**	1.66	0.784
95.000	150.000	35.000	34.000	27.000	3.0	2.5	187	294	2 400	3 300	**JM719149**	**JM719113**	1.43	0.766
95.250	128.588	15.875	15.083	11.908	1.6	1.6	58.0	93.0	2 600	3 500	**LL319349**	**LL319310**	0.393	0.147
	147.638	35.717	36.322	26.192	5.2	0.8	183	287	2 400	3 300	**594A**	**592XE**	1.45	0.62
100.000	155.000	36.000	35.000	28.000	3.0	2.5	204	328	2 300	3 100	**JM720249**	**JM720210**	1.64	0.763
	160.000	41.000	40.000	32.000	3.0	2.5	237	378	2 300	3 000	**JHM720249**	**JHM720210**	2.11	0.964
100.012	157.162	36.512	36.116	26.195	3.6	3.2	180	288	2 300	3 000	**52393**	**52618**	1.74	0.694
101.600	157.162	36.512	36.116	26.195	3.6	3.2	180	288	2 300	3 000	**52400**	**52618**	1.67	0.694
	157.162	36.512	36.116	26.195	7.9	3.2	180	288	2 300	3 000	**52401**	**52618**	1.64	0.694
	168.275	41.275	41.275	30.162	3.6	3.2	224	349	2 200	3 000	**687**	**672**	2.15	1.22

Note 1) Bearings identified by prefix J feature special designed accuracy.

Remark) Inch series tapered roller bearings with bore diameter larger than 200 mm are shown in catalogue "large size ball & roller bearings," CAT. NO. 211E.

Tapered roller bearings
inch series
d (101.600) – 200.000 mm

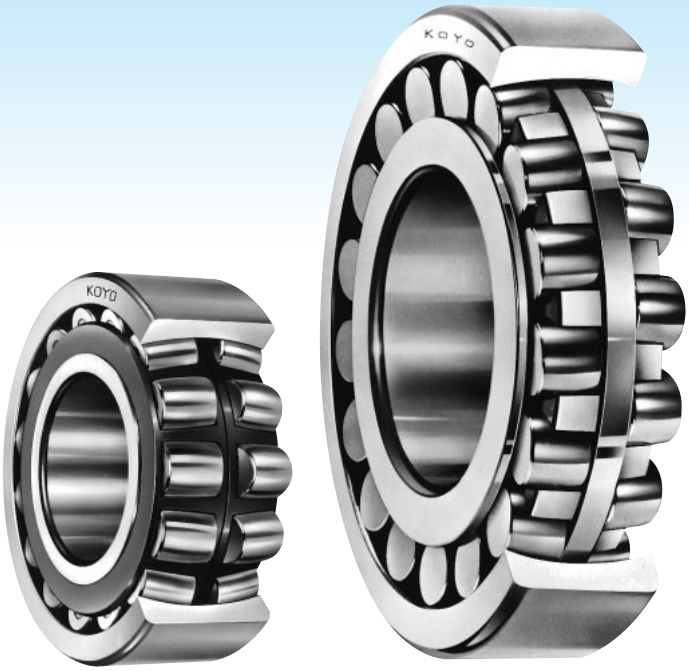


Boundary dimensions (mm)							Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.[1]		(Refer.) Mass (kg)	
d	D	T	B	C	r min.	r_1 min.	C_r	C_{0r}	Grease lub.	Oil lub.	Cone	Cup	Cone	Cup
101.600	180.975	47.625	48.006	38.100	3.6	3.2	288	438	2 100	2 800	**780**	**772**	3.09	1.92
	190.500	57.150	57.531	44.450	7.9	3.2	385	565	2 100	2 700	**861R**	**854**	4.20	2.66
	190.500	57.150	57.531	46.038	7.9	3.2	440	602	2 000	2 700	**HH221449**	**HH221410**	4.72	2.21
104.775	180.975	47.625	48.006	38.100	3.6	3.2	288	438	2 100	2 800	**782**	**772**	2.90	1.92
106.362	165.100	36.512	36.512	26.988	3.6	3.2	195	325	2 200	2 900	**56418R**	**56650**	1.84	0.852
107.950	146.050	21.432	21.432	16.670	1.6	1.6	86.4	167	2 300	3 100	**L521949R**	**L521910**	0.665	0.325
	158.750	23.020	21.438	15.875	3.6	3.2	104	169	2 200	3 000	**37425**	**37625**	0.893	0.484
	165.100	36.512	36.512	26.988	3.6	3.2	195	325	2 200	2 900	**56425R**	**56650**	1.76	0.852
109.538	158.750	23.020	21.438	15.875	6.4	6.4	104	169	2 200	3 000	**37431**	**37625**	0.848	0.484
109.987	159.987	34.925	34.925	26.988	3.6	3.2	184	319	2 200	2 900	**LM522549**	**LM522510**	1.55	0.784
110.000	165.000	35.000	35.000	26.500	3.0	2.5	195	325	2 200	2 900	**JM822049**	**JM822010**	1.64	0.826
114.300	177.800	41.275	41.275	30.162	3.6	3.2	234	380	2 000	2 700	**64450R**	**64700**	2.45	1.10
	190.500	47.625	49.212	34.925	3.6	3.2	303	483	1 900	2 600	**71450**	**71750**	3.33	1.72
	212.725	66.675	66.675	53.975	7.1	3.2	513	699	1 800	2 400	**HH224346**	**HH224310**	6.64	3.03
	212.725	66.675	66.675	53.975	7.1	3.2	450	674	1 800	2 400	**938**	**932**	5.96	4.07
	228.600	53.975	49.428	38.100	3.6	3.2	430	651	1 300	1 900	**HM926740**	**HM926710**	7.26	2.78
114.976	212.725	66.675	66.675	53.975	7.1	3.2	513	699	1 800	2 400	**HH224349**	**HH224310**	6.58	3.03
115.087	190.500	47.625	49.212	34.925	3.6	3.2	303	483	1 900	2 600	**71453**	**71750**	3.28	1.72
117.475	180.975	34.925	31.750	25.400	3.6	3.2	171	247	2 000	2 700	**68462**	**68712**	1.75	1.04
170.000	230.000	39.000	38.000	31.000	3.0	2.5	291	558	1 400	1 900	**JHM534149**	**JHM534110**	3.17	1.29
180.000	250.000	47.000	45.000	37.000	3.0	2.5	365	705	1 300	1 700	**JM736149**	**JM736110**	4.47	2.10
190.000	260.000	46.000	44.000	36.500	3.0	2.5	369	723	1 200	1 700	**JM738249**	**JM738210**	4.71	2.18
196.850	254.000	28.575	27.783	21.433	1.6	1.6	188	387	1 200	1 600	**L540049**	**L540010**	2.34	1.02
200.000	300.000	65.000	62.000	51.000	3.6	2.5	617	1 140	1 100	1 500	**JHM840449**	**JHM840410**	9.97	5.13

Note 1) Bearings identified by prefix J feature special designed accuracy.

Remark) Inch series tapered roller bearings with bore diameter larger than 200 mm are shown in catalogue "large size ball & roller bearings," CAT. NO. 211E.

KOYO

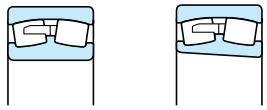


Spherical roller bearings

Spherical roller bearings feature a large load rating capacity and self-aligning capability.
This type of bearing is suitable for low-or medium-speed applications which involve heavy or impact loading.

- These bearings are divided into R, RR, RH, RHR and RHA types, which differ in internal structure. (refer ro Table 1.)
- Each type can be produced with a cylindrical bore or tapered bore.
  Bearing with a tapered bore can be fit and removed easily using an adapter assembly or withdrawal sleeve. The rate of taper is equivalent among all bearing series.
  240 and 241 series ...1 : 30 (supplementary code "K30")
  Others ...1 : 12 (supplementary code "K")

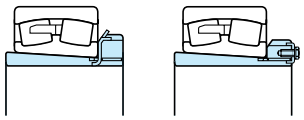
Spherical roller bearings



Cylindrical bore Tapered bore

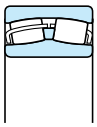
Bore diameter **25 – 300 mm**

Adapter assemblies



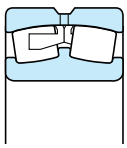
Bore diameter **20 – 280 mm**

Table 1 Spherical roller bearings : types and structures

Structure	R, RR type*	 RH, RHR type	RHA type
Roller	Convex asymmetrical roller	Convex symmetrical roller	Convex symmetrical roller
Cage	Copper alloy prong type machined cage *(excl. 240 and 241 series)	Pressed steel cage	Copper alloy integral type machined cage
Inner ring (with or without rib)	With center rib	Without center rib (guide ring)	Without center rib (guide ring)
	With ribs on both sides (to prevent rollers from falling) *(excl. 240 and 241 series)	Without ribs on both sides	With ribs on both sides (to prevent rollers from falling)
Characteristics	Superior to RH and RHA types in high-speed performance.	The load rating capacity is larger than that of R type. (There are some exceptional cases due to different interior specifications.)	

* Some 240 or 241 series R type bearings have a pressed cage. Some of them are provided with an inner ring which does not have ribs.

Spherical roller bearings for shaker screens



- These bearings consist of convex asymmetric rollers and a prong type, copper alloy, outer ring guided, machined cage. This cage possesses optimum characteristics for use with shaker screens.
- The bearings most commonly used with shaker screens are 223 series spherical roller bearings. They are identified by the supplementary code “ROVSW502.” The outer ring outside diameter tolerance of these bearings is held to a small allowable variation.

Spherical roller bearings

Bearings with lubrication holes and a lubrication groove

- Outer rings can be provided with lubrication holes, a lubrication groove and an anti-rotation pin hole. (Specifications are given in Table 4.)
- Inner rings can also be provided with lubrication holes and a lubrication groove.

Table 2 Supplementary codes for identification of bearings with lubrication holes, lubrication groove and anti-rotation pin hole (outer ring)

Supplementary code		Number of lubrication holes	Hole layout
With lubrication holes and lubrication groove	With lubrication holes, lubrication groove and anti-rotation pin hole		
W33	W3N	3	3 equally spaced positions [1]
W33A	W3NA	4	4 equally spaced positions
–	W3NB	5	6 equally spaced positions [2]
W33C	W3NC	6	6 equally spaced positions
–	W3ND	7	8 equally spaced positions [2]
W33T	–	8	8 equally spaced positions

Notes 1) 4 or 6 holes are provided in smaller size bearings. Consult Koyo.
2) One hole is used for the anti-rotation pin.

Table 3 Supplementary codes for identification of bearings with lubrication holes and / or lubrication groove

Supplementary code	Inner ring		Outer ring	
	Number of lubrication holes	Lubrication groove	Number of lubricaiton holes	Lubrication groove
W513	3	–	3	○
W518	3	–	3	–
W26	3	–	–	–

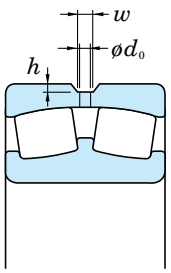


Table 4 Lubrication hole and lubrication groove dimensions Unit mm

Bore diameter number	Nominal bore diameter d	239			230			240			231			241			222			232			213			223		
		d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h	d_0	w	h
20	100	–	–	–	3.5	5	1	–	–	–	4	6	1.2	–	–	–	5	7	1.5	6	8	1.5	4	6	1.5	6	8	1.5
22	110	–	–	–	5	7	1.2	–	–	–	4	6	1.2	4	6	1.2	5	7	1.5	6	8	1.5	4	6	1.5	8	10	2
24	120	–	–	–	5	7	1.2	4	6	1.2	4	6	1.2	4	6	1.2	5	7	1.5	8	10	2	4	6	1.5	10	12	2.5
26	130	–	–	–	5	7	1.2	4	6	1.2	4	6	1.5	4	6	1.5	6	8	1.5	8	10	2	–	–	–	12	14	3
28	140				5	7	1.2	5	7	1.2	6	8	1.5	6	8	1.5	8	10	2	8	10	2	–	–	–	12	14	3
30	150	5	7	1.2	6	8	1.5	6	8	1.5	8	10	2	8	10	2	10	12	2.5	8	10	2	–	–	–	12	14	3
32	160	5	7	1.2	6	8	1.5	6	8	1.5	10	12	2.5	10	12	2	10	12	2.5	10	12	2.5	–	–	–	12	14	3
34	170	5	7	1.2	8	10	2	8	10	2	10	12	2.5	10	12	2	12	14	3	10	12	2.5	–	–	–	12	14	3
36	180	5	7	1.2	10	12	2.5	10	12	2.5	10	12	2.5	10	12	2	12	14	3	10	12	2.5	–	–	–	14	16.5	4
38	190	5	7	1.2	10	12	2.5	–	–	–	10	12	2.5	10	12	2	12	14	3	12	14	3	–	–	–	14	16.5	4
40	200	6	8	1.5	10	12	2.5	10	12	2.5	12	14	3	12	14	3	12	14	3	12	14	3	–	–	–	14	16.5	4
44	220	6	8	1.5	10	12	2.5	10	12	2.5	12	14	3	12	14	3	12	14	3	12	14	3	–	–	–	14	16.5	4
48	240	6	8	1.5	10	12	2.5	10	12	2.5	12	14	3	12	14	3	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
52	260	10	12	2.5	12	14	3	12	14	3	12	14	3	12	14	3	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
56	280	10	12	2.5	12	14	3	12	14	3	12	14	3	12	14	3	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
60	300	10	12	2.5	12	14	3	12	14	3	12	14	3	12	14	3	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
64	320	10	12	2.5	12	14	3	12	14	3	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
68	340	12	14	3	14	16.5	4	14	16.5	3	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
72	360	12	14	3	14	16.5	4	14	16.5	3	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
76	380	12	14	3	14	16.5	4	14	16.5	3	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
80	400	12	14	3	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
84	420	12	14	3	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
88	440	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4
92	460	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4	–	–	–	14	16.5	4
96	480	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	–	–	–	14	16.5	4	–	–	–	14	16.5	4
/500	500	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	4	14	16.5	5	–	–	–	14	16.5	4	–	–	–	–	–	–

Boundary dimensions	As specified in JIS B 1512.
Tolerances	As specified in JIS B 1514, class 0.
Radial internal clearance	As specified in JIS B 1520. (refer to Table 2-8 on pp. A 18, 19.)
Standard cages	Refer to Table 5.
Allowable aligning angle	Refer to Table 5. (veries depending on bearing series.)
Equivalent radial load	Dynamic equivalent radial load $\left(\text{when } \frac{F_a}{F_r} \leq e\right) \quad P_r = F_r + Y_1 F_a$ $\left(\text{when } \frac{F_a}{F_r} > e\right) \quad P_r = 0.67F_r + Y_2 F_a$ Static equivalent radial load $P_{0r} = F_r + Y_0 F_a$

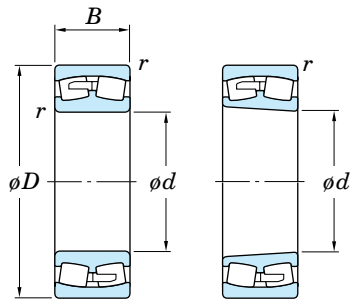
Remark) If the ratio of axial load to radial load exceeds the value e given in the specification table ($F_a / F_r > e$), slippage occurs between rollers in rows that are not axial-loaded and the raceway.
This may cause smearing, especially when the bearing is large.
Consult Koyo on the use of bearings under such conditions.

Table 5 Application of standard cages and allowable aligning angle

Bearing series	Standard cages		Allowable aligning angle
	Pressed cage	Machined cage	
239 R	——	23930R – 239/500R	0.026 rad (1.5˚)
230 R	——	23038R – 230/500R	0.026 rad (1.5˚)
RH	23022RH – 23036RH	——	
RHA	——	23038RHA – 23096RHA	
240 R	——	24038R – 240/500R	0.035 rad (2˚)
RH	24024RH – 24036RH	——	
RHA	——	24038RHA – 24096RHA	
231 R	——	23136R – 231/500R	0.026 rad (1.5˚)
RH	23122RH – 23134RH	——	
RHA	——	23136RHA – 23196RHA	
241 R	——	24136R – 241/500R	0.044 rad (2.5˚)
RH	24122RH – 24134RH	——	
RHA	——	24136RHA – 24196RHA	
222 R(RR)	——	22232RR – 22272R	0.026 rad (1.5˚)
RH(RHR)	22205RHR – 22230RH	——	
RHA	——	22232RHA – 22260RHA	
232 R	——	23232R – 232/500R	0.044 rad (2.5˚)
RH	23218RH – 23230RH	——	
RHA	——	23232RHA – 23296RHA	
213 R	——	21328R – 21322R	0.017 rad (1˚)
RH	21311RH – 21322RH	——	
223 R(RR)	——	22328R – 22360R	0.035 rad (2˚)
RH(RHR)	22308RHR – 22326RH	——	
RHA	——	22328RHA – 22356RHA	

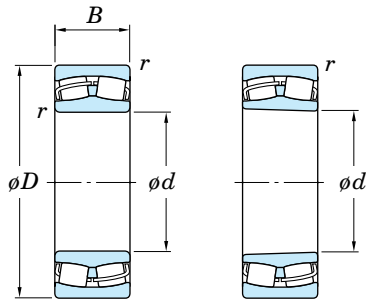
d 25 – 80 mm

R, RR



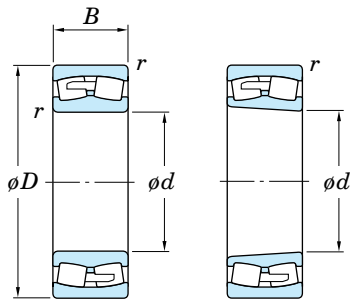
Cylindrical bore Tapered bore

RH, RHR



Cylindrical bore Tapered bore

RHA



Cylindrical bore Tapered bore

Boundary dimensions (mm)				Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.		(Refer.) Mass (kg)	
d	*D*	*B*	*r* min.	C_r	C_{0r}	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	Cylindrical bore	Tapered bore
25	52	18	1	45.4	48.1	7 000	9 300	**22205RHR**	**22205RHRK**	0.220	0.215
30	62	20	1	61.2	65.9	5 900	7 900	**22206RHR**	**22206RHRK**	0.360	0.350
	72	19	1.1	59.3	62.7	5 200	7 000	**21306RH**	**21306RHK**	0.380	0.370
35	72	23	1.1	80.3	88.7	5 000	6 700	**22207RHR**	**22207RHRK**	0.550	0.540
	80	21	1.5	69.6	75.3	4 500	6 000	**21307RH**	**21307RHK**	0.510	0.500
40	80	23	1.1	90.9	102	4 500	6 000	**22208RHR**	**22208RHRK**	0.660	0.650
	90	23	1.5	85.7	95.5	4 100	5 500	**21308RH**	**21308RHK**	0.710	0.700
	90	33	1.5	136	152	4 100	5 500	**22308RHR**	**22308RHRK**	1.25	1.23
45	85	23	1.1	95.6	110	4 200	5 600	**22209RHR**	**22209RHRK**	0.720	0.710
	100	25	1.5	108	124	3 600	4 900	**21309RH**	**21309RHK**	0.950	0.940
	100	36	1.5	166	183	3 700	4 900	**22309RHR**	**22309RHRK**	1.62	1.59
50	90	23	1.1	103	122	3 900	5 200	**22210RHR**	**22210RHRK**	0.780	0.770
	110	27	2	128	151	3 300	4 400	**21310RH**	**21310RHK**	1.20	1.18
	110	40	2	204	237	3 300	4 500	**22310RHR**	**22310RHRK**	2.21	2.18
55	100	25	1.5	124	144	3 400	4 600	**22211RHR**	**22211RHRK**	1.05	1.04
	120	29	2	144	165	3 000	4 100	**21311RH**	**21311RHK**	1.60	1.58
	120	43	2	236	264	3 000	4 000	**22311RHR**	**22311RHRK**	2.72	2.67
60	110	28	1.5	153	181	3 100	4 200	**22212RHR**	**22212RHRK**	1.45	1.43
	130	31	2.1	168	193	2 800	3 700	**21312RH**	**21312RHK**	1.95	1.92
	130	46	2.1	283	334	2 800	3 700	**22312RHR**	**22312RHRK**	3.43	3.37
65	120	31	1.5	178	211	2 900	3 800	**22213RHR**	**22213RHRK**	1.84	1.81
	140	33	2.1	194	232	2 600	3 400	**21313RH**	**21313RHK**	2.45	2.41
	140	48	2.1	305	360	2 600	3 400	**22313RHR**	**22313RHRK**	4.15	4.07
70	125	31	1.5	187	222	2 700	3 600	**22214RHR**	**22214RHRK**	1.94	1.91
	150	35	2.1	215	260	2 400	3 200	**21314RH**	**21314RHK**	3.00	2.95
	150	51	2.1	348	413	2 400	3 200	**22314RHR**	**22314RHRK**	5.01	4.92
75	130	31	1.5	193	236	2 600	3 400	**22215RHR**	**22215RHRK**	2.05	2.01
	160	37	2.1	246	298	2 200	3 000	**21315RH**	**21315RHK**	3.55	3.50
	160	55	2.1	393	473	2 200	3 000	**22315RHR**	**22315RHRK**	6.13	6.02
80	140	33	2	217	271	2 400	3 200	**22216RHR**	**22216RHRK**	2.61	2.57
	170	39	2.1	275	339	2 100	2 800	**21316RH**	**21316RHK**	4.20	4.14
	170	58	2.1	431	521	2 100	2 800	**22316RHR**	**22316RHRK**	7.18	7.04

Remark) Standard cage types used for the above bearings are shown in Table 5 earlier in this section.

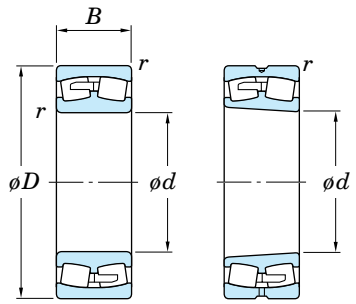
d 85 – (150) mm

Boundary dimensions (mm)				Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.		(Refer.) Mass (kg)	
d	*D*	*B*	*r* min.	C_r	C_{0r}	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	Cylindrical bore	Tapered bore
85	150	36	2	258	324	2 200	3 000	**22217RHR**	**22217RHRK**	3.23	3.16
	180	41	3	300	372	2 000	2 600	**21317RH**	**21317RHK**	5.00	4.93
	180	60	3	481	586	2 000	2 600	**22317RHR**	**22317RHRK**	8.41	8.26
90	160	40	2	298	381	2 100	2 800	**22218RHR**	**22218RHRK**	4.01	3.94
	160	52.4	2	336	482	2 100	2 800	**23218RH**	**23218RHK**	4.60	4.47
	190	43	3	330	416	1 900	2 500	**21318RH**	**21318RHK**	5.80	5.71
	190	64	3	538	662	1 900	2 500	**22318RHR**	**22318RHRK**	9.87	9.68
95	170	43	2.1	334	422	2 000	2 600	**22219RHR**	**22219RHRK**	4.90	4.80
	200	45	3	362	461	1 800	2 300	**21319RH**	**21319RHK**	7.15	7.05
	200	67	3	586	726	1 800	2 300	**22319RHR**	**22319RHRK**	11.6	11.38
100	150	37	1.5	208	332	2 100	2 800	**23020RH**	————	2.80	——
	180	46	2.1	377	481	1 900	2 500	**22220RHR**	**22220RHRK**	5.82	5.72
	180	60.3	2.1	425	629	1 900	2 500	**23220RH**	**23220RHK**	6.70	6.51
	215	47	3	416	524	1 600	2 200	**21320RH**	**21320RHK**	8.80	8.68
	215	73	3	700	877	1 600	2 200	**22320RHR**	**22320RHRK**	14.7	14.4
110	170	45	2	300	486	1 900	2 500	**23022RH**	**23022RHK**	4.50	4.38
	180	56	2	385	605	1 800	2 400	**23122RH**	**23122RHK**	5.55	5.37
	180	69	2	469	778	1 800	2 400	**24122RH**	**24122RHK30**	6.53	6.44
	200	53	2.1	491	642	1 700	2 200	**22222RHR**	**22222RHRK**	8.37	8.22
	200	69.8	2.1	537	792	1 700	2 200	**23222RH**	**23222RHK**	9.70	9.40
	240	50	3	484	616	1 400	1 900	**21322RH**	**21322RHK**	12.0	11.8
	240	80	3	828	1 040	1 400	1 900	**22322RHR**	**22322RHRK**	20.2	19.8
120	180	46	2	314	524	1 700	2 300	**23024RH**	**23024RHK**	4.90	4.77
	180	60	2	397	709	1 700	2 300	**24024RH**	**24024RHK30**	5.04	4.96
	200	62	2	454	714	1 600	2 200	**23124RH**	**23124RHK**	7.80	7.56
	200	80	2	605	1 020	1 600	2 200	**24124RH**	**24124RHK30**	9.64	9.54
	215	58	2.1	565	764	1 500	2 000	**22224RHR**	**22224RHRK**	10.6	10.4
	215	76	2.1	616	956	1 500	2 100	**23224RH**	**23224RHK**	12.0	11.6
	260	86	3	896	1 130	1 300	1 800	**22324RHR**	**22324RHRK**	24.1	23.6
130	200	52	2	404	674	1 600	2 100	**23026RH**	**23026RHK**	7.30	7.12
	200	69	2	512	914	1 600	2 100	**24026RH**	**24026RHK30**	7.43	7.33
	210	64	2	494	799	1 500	2 000	**23126RH**	**23126RHK**	8.55	8.27
	210	80	2	620	1 080	1 500	2 000	**24126RH**	**24126RHK30**	10.3	10.1
	230	64	3	658	914	1 400	1 900	**22226RHR**	**22226RHRK**	13.3	13.0
	230	80	3	702	1 090	1 400	1 900	**23226RH**	**23226RHK**	14.0	13.5
	280	93	4	1 040	1 340	1 200	1 600	**22326RHR**	**22326RHRK**	30.3	29.7
140	210	53	2	422	723	1 500	2 000	**23028RH**	**23028RHK**	7.80	7.60
	210	69	2	524	957	1 500	2 000	**24028RH**	**24028RHK30**	7.88	7.74
	225	68	2.1	565	940	1 400	1 900	**23128RH**	**23128RHK**	10.5	10.2
	225	85	2.1	702	1 220	1 400	1 900	**24128RH**	**24128RHK30**	12.3	12.1
	250	68	3	759	1 030	1 300	1 700	**22228RHR**	**22228RHRK**	16.4	16.1
	250	88	3	811	1 290	1 300	1 700	**23228RH**	**23228RHK**	18.5	17.9
	300	102	4	1 100	1 410	1 300	1 700	**22328R**	**22328RK**	36.2	35.5
	300	102	4	1 170	1 570	1 100	1 500	**22328RH**	**22328RHK**	35.7	34.9
150	210	45	2	334	622	1 600	2 100	**23930R**	**23930RK**	4.97	4.81

Remark) Standard cage types used for the above bearings are shown in Table 5 earlier in this section.

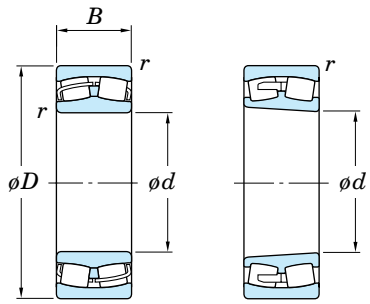
d (150) – (180) mm

R, RR



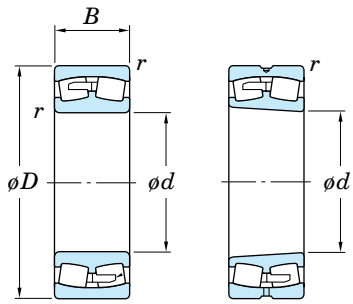
Cylindrical bore Tapered bore

RH, RHR



Cylindrical bore Tapered bore

RHA



Cylindrical bore Tapered bore

Boundary dimensions (mm)				Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.		(Refer.) Mass (kg)	
d	*D*	*B*	*r* min.	C_r	C_{0r}	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	Cylindrical bore	Tapered bore
150	225	56	2.1	461	797	1 400	1 800	**23030RH**	**23030RHK**	9.50	9.26
	225	75	2.1	593	1 100	1 400	1 800	**24030RH**	**24030RHK30**	9.81	9.64
	250	80	2.1	717	1 230	1 300	1 700	**23130RH**	**23130RHK**	16.0	15.5
	250	100	2.1	915	1 590	1 300	1 700	**24130RH**	**24130RHK30**	18.4	18.1
	270	73	3	865	1 200	1 200	1 600	**22230RHR**	**22230RHRK**	20.6	20.2
	270	96	3	959	1 540	1 200	1 600	**23230RH**	**23230RHK**	24.0	23.3
	320	108	4	1 230	1 600	1 200	1 500	**22330R**	**22330RK**	43.6	42.7
	320	108	4	1 290	1 740	1 200	1 500	**22330RHA**	**22330RHAK**	40.3	39.4
160	220	45	2	341	649	1 500	2 000	**23932R**	**23932RK**	5.25	5.08
	240	60	2.1	531	924	1 300	1 700	**23032RH**	**23032RHK**	11.3	11.0
	240	80	2.1	679	1 270	1 300	1 700	**24032RH**	**24032RHK30**	12.0	11.8
	270	86	2.1	848	1 430	1 200	1 600	**23132RH**	**23132RHK**	20.5	19.9
	270	109	2.1	1 070	1 890	1 200	1 600	**24132RH**	**24132RHK30**	24.0	23.7
	290	80	3	885	1 270	1 200	1 600	**22232R**	**22232RK**	23.4	22.9
	290	80	3	897	1 320	1 200	1 600	**22232RHA**	**22232RHAK**	21.9	21.4
	290	104	3	1 030	1 650	1 200	1 600	**23232R**	**23232RK**	31.0	30.1
	290	104	3	1 100	1 780	1 200	1 600	**23232RHA**	**23232RHAK**	29.4	28.5
	340	114	4	1 380	1 790	1 100	1 400	**22332R**	**22332RK**	51.9	51.0
	340	114	4	1 420	1 940	1 100	1 400	**22332RHA**	**22332RHAK**	48.0	47.1
170	230	45	2	353	691	1 400	1 900	**23934R**	**23934RK**	5.53	5.35
	260	67	2.1	632	1 090	1 200	1 600	**23034RH**	**23034RHK**	15.9	15.5
	260	90	2.1	828	1 540	1 200	1 600	**24034RH**	**24034RHK30**	16.3	16.0
	280	88	2.1	916	1 550	1 100	1 500	**23134RH**	**23134RHK**	21.5	20.8
	280	109	2.1	1 090	1 940	1 100	1 500	**24134RH**	**24134RHK30**	25.4	25.0
	310	86	4	952	1 390	1 100	1 500	**22234R**	**22234RK**	29.0	28.4
	310	86	4	1 010	1 490	1 100	1 500	**22234RHA**	**22234RHAK**	27.1	26.5
	310	110	4	1 150	1 870	1 100	1 500	**23234R**	**23234RK**	37.5	36.5
	310	110	4	1 210	1 940	1 100	1 500	**23234RHA**	**23234RHAK**	35.6	34.6
	360	120	4	1 460	1 920	1 000	1 300	**22334R**	**22334RK**	62.0	60.8
	360	120	4	1 590	2 200	1 000	1 300	**22334RHA**	**22334RHAK**	57.3	56.1
180	250	52	2	479	939	1 300	1 700	**23936R**	**23936RK**	8.00	7.80
	280	74	2.1	768	1 330	1 100	1 400	**23036RH**	**23036RHK**	20.2	19.7
	280	100	2.1	984	1 830	1 100	1 400	**24036RH**	**24036RHK30**	21.4	21.0

Remark) Standard cage types used for the above bearings are shown in Table 5 earlier in this section.

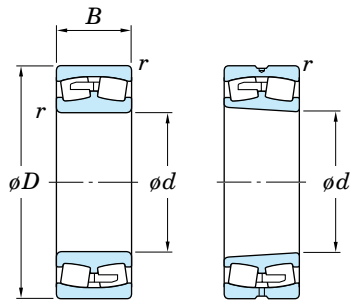
d (180) – (220) mm

Boundary dimensions (mm)				Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.		(Refer.) Mass (kg)	
d	*D*	*B*	*r* min.	C_r	C_{0r}	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	Cylindrical bore	Tapered bore
180	300	96	3	1 000	1 800	1 100	1 500	**23136R**	**23136RK**	28.4	27.5
	300	96	3	1 060	1 790	1 100	1 500	**23136RHA**	**23136RHAK**	26.5	25.6
	300	118	3	1 160	2 010	1 000	1 400	**24136R**	**24136RK30**	33.3	32.7
	300	118	3	1 250	2 240	1 100	1 500	**24136RHA**	**24136RHAK30**	31.8	31.2
	320	86	4	978	1 450	1 100	1 400	**22236R**	**22236RK**	30.5	29.8
	320	86	4	1 060	1 610	1 100	1 400	**22236RHA**	**22236RHAK**	28.5	27.8
	320	112	4	1 190	1 980	1 100	1 400	**23236R**	**23236RK**	39.8	38.6
	320	112	4	1 320	2 170	1 100	1 400	**23236RHA**	**23236RHAK**	37.7	36.5
	380	126	4	1 740	2 360	920	1 200	**22336R**	**22336RK**	71.4	69.9
	380	126	4	1 740	2 410	930	1 200	**22336RHA**	**22336RHAK**	66.0	64.5
190	260	52	2	486	969	1 200	1 600	**23938R**	**23938RK**	8.40	8.10
	290	75	2.1	736	1 370	1 100	1 500	**23038R**	**23038RK**	18.8	18.2
	290	75	2.1	789	1 430	1 100	1 500	**23038RHA**	**23038RHAK**	17.2	16.6
	290	100	2.1	906	1 640	1 000	1 400	**24038R**	**24038RK30**	24.0	23.6
	290	100	2.1	1 010	1 920	1 100	1 500	**24038RHA**	**24038RHAK30**	22.4	22.0
	320	104	3	1 090	2 000	1 000	1 400	**23138R**	**23138RK**	35.5	34.4
	320	104	3	1 210	2 080	1 000	1 400	**23138RHA**	**23138RHAK**	33.2	32.1
	320	128	3	1 340	2 320	950	1 300	**24138R**	**24138RK30**	42.0	41.4
	320	128	3	1 460	2 630	1 000	1 400	**24138RHA**	**24138RHAK30**	40.1	39.5
	340	92	4	1 110	1 730	1 000	1 300	**22238R**	**22238RK**	37.4	36.6
	340	92	4	1 150	1 770	1 000	1 300	**22238RHA**	**22238RHAK**	34.9	34.1
	340	120	4	1 410	2 210	1 000	1 300	**23238R**	**23238RK**	47.4	46.0
	340	120	4	1 490	2 470	990	1 300	**23238RHA**	**23238RHAK**	44.9	43.5
	400	132	5	1 900	2 610	880	1 200	**22338R**	**22338RK**	84.1	82.4
	400	132	5	1 940	2 810	870	1 200	**22338RHA**	**22338RHAK**	77.7	76.0
200	280	60	2.1	601	1 190	1 100	1 500	**23940R**	**23940RK**	12.0	11.6
	310	82	2.1	890	1 670	1 000	1 400	**23040R**	**23040RK**	24.1	23.4
	310	82	2.1	940	1 680	1 100	1 400	**23040RHA**	**23040RHAK**	22.0	21.3
	310	109	2.1	1 030	1 900	950	1 300	**24040R**	**24040RK30**	30.5	30.0
	310	109	2.1	1 180	2 230	1 100	1 400	**24040RHA**	**24040RHAK30**	28.5	28.0
	340	112	3	1 240	2 250	980	1 300	**23140R**	**23140RK**	43.7	42.4
	340	112	3	1 380	2 340	970	1 300	**23140RHA**	**23140RHAK**	40.8	39.5
	340	140	3	1 450	2 490	890	1 200	**24140R**	**24140RK30**	51.9	51.1
	340	140	3	1 660	2 970	990	1 300	**24140RHA**	**24140RHAK30**	49.5	48.7
	360	98	4	1 230	1 930	930	1 200	**22240R**	**22240RK**	45.0	44.0
	360	98	4	1 310	2 030	940	1 300	**22240RHA**	**22240RHAK**	42.0	41.0
	360	128	4	1 550	2 610	940	1 300	**23240R**	**23240RK**	58.1	56.4
	360	128	4	1 660	2 780	930	1 200	**23240RHA**	**23240RHAK**	55.1	53.4
	420	138	5	2 010	2 750	830	1 100	**22340R**	**22340RK**	95.4	93.5
	420	138	5	2 060	2 920	820	1 100	**22340RHA**	**22340RHAK**	88.1	86.2
220	300	60	2.1	634	1 300	1 000	1 400	**23944R**	**23944RK**	13.0	12.6
	340	90	3	984	1 890	940	1 300	**23044R**	**23044RK**	31.5	30.6
	340	90	3	1 090	1 950	940	1 200	**23044RHA**	**23044RHAK**	28.8	27.9
	340	118	3	1 240	2 300	850	1 100	**24044R**	**24044RK30**	39.6	39.0
	340	118	3	1 380	2 630	950	1 300	**24044RHA**	**24044RHAK30**	37.0	36.4
	370	120	4	1 440	2 700	880	1 200	**23144R**	**23144RK**	54.8	53.2
	370	120	4	1 590	2 790	870	1 200	**23144RHA**	**23144RHAK**	51.2	49.6
	370	150	4	1 680	2 900	800	1 100	**24144R**	**24144RK30**	65.0	64.0

Remark) Standard cage types used for the above bearings are shown in Table 5 earlier in this section.

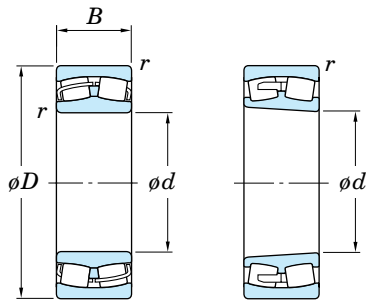
d (220) – (260) mm

R, RR



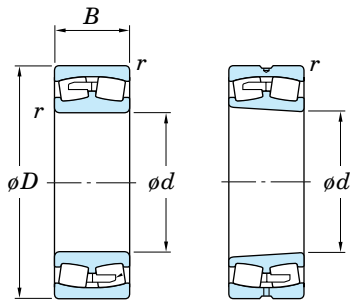
Cylindrical bore Tapered bore

RH, RHR



Cylindrical bore Tapered bore

RHA



Cylindrical bore Tapered bore

Boundary dimensions (mm)				Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.		(Refer.) Mass (kg)	
d	*D*	*B*	*r* min.	C_r	C_{0r}	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	Cylindrical bore	Tapered bore
220	370	150	4	1 920	3 550	880	1 200	**24144RHA**	**24144RHAK30**	62.0	61.0
	400	108	4	1 560	2 400	820	1 100	**22244R**	**22244RK**	63.0	61.7
	400	108	4	1 590	2 440	820	1 100	**22244RHA**	**22244RHAK**	58.8	57.5
	400	144	4	1 880	3 200	830	1 100	**23244R**	**23244RK**	81.6	79.2
	400	144	4	2 020	3 350	810	1 100	**23244RHA**	**23244RHAK**	77.4	75.0
	460	145	5	2 380	3 380	720	960	**22344R**	**22344RK**	124	122
	460	145	5	2 370	3 470	730	970	**22344RHA**	**22344RHAK**	115	113
240	320	60	2.1	651	1 380	940	1 300	**23948R**	**23948RK**	14.0	13.5
	360	92	3	1 100	2 170	860	1 100	**23048R**	**23048RK**	34.9	33.8
	360	92	3	1 170	2 180	860	1 100	**23048RHA**	**23048RHAK**	31.9	30.9
	360	118	3	1 310	2 530	780	1 000	**24048R**	**24048RK30**	42.4	41.8
	360	118	3	1 430	2 840	870	1 200	**24048RHA**	**24048RHAK30**	39.6	39.0
	400	128	4	1 630	3 080	790	1 100	**23148R**	**23148RK**	67.6	65.6
	400	128	4	1 810	3 200	790	1 000	**23148RHA**	**23148RHAK**	63.1	61.1
	400	160	4	1 970	3 500	720	960	**24148R**	**24148RK30**	80.3	79.0
	400	160	4	2 200	4 130	800	1 100	**24148RHA**	**24148RHAK30**	76.6	75.3
	440	120	4	1 920	2 940	730	970	**22248R**	**22248RK**	85.0	83.2
	440	120	4	1 920	2 990	730	970	**22248RHA**	**22248RHAK**	79.4	77.6
	440	160	4	2 340	3 990	730	970	**23248R**	**23248RK**	110	107
	440	160	4	2 460	4 130	730	970	**23248RHA**	**23248RHAK**	104	101
	500	155	5	2 610	4 020	650	870	**22348R**	**22348RK**	157	154
	500	155	5	2 720	3 990	650	870	**22348RHA**	**22348RHAK**	145	142
260	360	75	2.1	914	1 880	820	1 100	**23952R**	**23952RK**	24.0	23.3
	400	104	4	1 330	2 570	760	1 000	**23052R**	**23052RK**	50.7	49.3
	400	104	4	1 470	2 720	760	1 000	**23052RHA**	**23052RHAK**	46.3	44.9
	400	140	4	1 690	3 240	690	920	**24052R**	**24052RK30**	64.6	63.7
	400	140	4	1 860	3 670	770	1 000	**24052RHA**	**24052RHAK30**	60.3	59.4
	440	144	4	2 100	3 860	710	940	**23152R**	**23152RK**	93.6	90.8
	440	144	4	2 220	4 000	700	930	**23152RHA**	**23152RHAK**	87.4	84.6
	440	180	4	2 360	4 170	640	860	**24152R**	**24152RK30**	111	110
	440	180	4	2 650	4 950	720	950	**24152RHA**	**24152RHAK30**	106	105
	480	130	5	2 240	3 460	650	870	**22252R**	**22252RK**	110	108
	480	130	5	2 230	3 430	650	870	**22252RHA**	**22252RHAK**	103	101
	480	174	5	2 750	4 640	640	860	**23252R**	**23252RK**	144	140

Remark) Standard cage types used for the above bearings are shown in Table 5 earlier in this section.

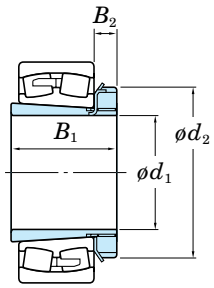
d (260) – 300 mm

Boundary dimensions (mm)				Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.		(Refer.) Mass (kg)	
d	*D*	*B*	*r* min.	C_r	C_{0r}	Grease lub.	Oil lub.	Cylindrical bore	Tapered bore	Cylindrical bore	Tapered bore
260	480	174	5	2 870	4 900	650	860	**23252RHA**	**23252RHAK**	137	133
	540	165	6	2 830	4 380	590	780	**22352R**	**22352RK**	196	192
	540	165	6	3 120	4 620	580	780	**22352RHA**	**22352RHAK**	181	177
280	380	75	2.1	928	1 960	760	1 000	**23956R**	**23956RK**	26.0	25.2
	420	106	4	1 430	2 860	710	950	**23056R**	**23056RK**	54.5	52.9
	420	106	4	1 550	2 950	700	940	**23056RHA**	**23056RHAK**	49.8	48.2
	420	140	4	1 740	3 420	640	850	**24056R**	**24056RK30**	68.5	67.4
	420	140	4	1 960	4 000	710	950	**24056RHA**	**24056RHAK30**	64.0	62.9
	460	146	5	2 140	4 280	660	880	**23156R**	**23156RK**	100	96.9
	460	146	5	2 340	4 290	650	870	**23156RHA**	**23156RHAK**	93.4	90.3
	460	180	5	2 440	4 440	600	790	**24156R**	**24156RK30**	118	116
	460	180	5	2 740	5 240	660	880	**24156RHA**	**24156RHAK30**	113	112
	500	130	5	2 100	3 380	610	810	**22256R**	**22256RK**	114	112
	500	130	5	2 320	3 670	610	810	**22256RHA**	**22256RHAK**	106	104
	500	176	5	2 690	4 910	610	820	**23256R**	**23256RK**	153	149
	500	176	5	3 010	5 300	600	800	**23256RHA**	**23256RHAK**	145	141
	580	175	6	3 150	4 910	530	710	**22356R**	**22356RK**	229	225
	580	175	6	3 510	5 260	530	700	**22356RHA**	**22356RHAK**	212	208
300	420	90	3	1 280	2 610	680	910	**23960R**	**23960RK**	40.0	38.8
	460	118	4	1 750	3 480	630	840	**23060R**	**23060RK**	75.8	73.7
	460	118	4	1 940	3 700	630	840	**23060RHA**	**23060RHAK**	68.9	66.8
	460	160	4	2 240	4 370	570	760	**24060R**	**24060RK30**	97.1	95.5
	460	160	4	2 420	4 910	640	850	**24060RHA**	**24060RHAK30**	90.7	89.1
	500	160	5	2 490	4 850	590	790	**23160R**	**23160RK**	132	128
	500	160	5	2 730	4 970	580	780	**23160RHA**	**23160RHAK**	123	119
	500	200	5	2 990	5 520	530	710	**24160R**	**24160RK30**	157	155
	500	200	5	3 320	6 420	590	790	**24160RHA**	**24160RHAK30**	150	148
	540	140	5	2 690	4 330	550	740	**22260R**	**22260RK**	145	142
	540	140	5	2 650	4 360	550	740	**22260RHA**	**22260RHAK**	135	132
	540	192	5	3 430	5 910	540	720	**23260R**	**23260RK**	197	192
	540	192	5	3 530	6 280	540	720	**23260RHA**	**23260RHAK**	187	182
	620	185	7.5	3 910	5 430	470	630	**22360R**	**22360RK**	289	284

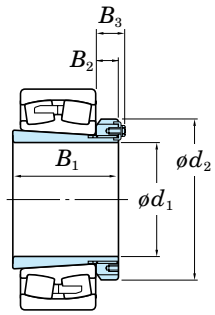
Remark) Standard cage types used for the above bearings are shown in Table 5 earlier in this section.

Adapter assemblies for spherical roller bearings

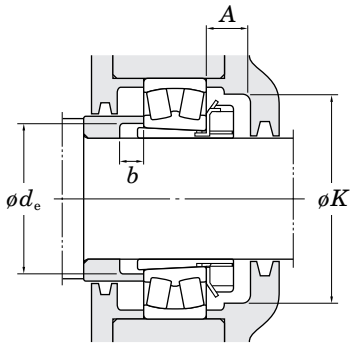
d_1 20 – (80) mm



$d_1 \leq 180$ mm



$d_1 \geq 200$ mm

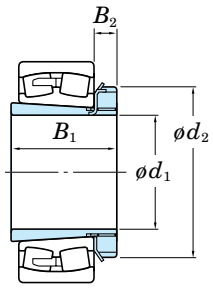


Boundary dimensions (mm) d_1	B_1	d_2	B_2	B_3	Brg. bore (mm) d	Designations Bearing + adapter ass'y	Mounting dimensions (mm) A min.	K min.	d_e min.	b min.	Mass Brg. + adapter ass'y (kg)	(Refer.) Adapter sleeve No.	Locknut No.
20	29	38	8	–	25	22205RHRK + **H305X**	15	45	29	5	0.290	A305X	AN05
25	31	45	8	–	30	22206RHRK + **H306X**	15	50	34	5	0.459	A306X	AN06
	31	45	8	–	30	21306RHK + **H306X**	15	50	34	6	0.479	A306X	AN06
30	35	52	9	–	35	22207RHRK + **H307X**	17	58	39	5	0.682	A307X	AN07
	35	52	9	–	35	21307RHK + **H307X**	17	58	39	7	0.642	A307X	AN07
35	36	58	10	–	40	22208RHRK + **H308X**	17	65	44	5	0.839	A308X	AN08
	36	58	10	–	40	21308RHK + **H308X**	17	65	44	5	0.888	A308X	AN08
	46	58	10	–	40	22308RHRK + **H2308X**	17	65	45	5	1.46	A2308X	AN08
40	39	65	11	–	45	22209RHRK + **H309X**	17	72	49	8	0.958	A309X	AN09
	39	65	11	–	45	21309RHK + **H309X**	17	72	49	5	1.19	A309X	AN09
	50	65	11	–	45	22309RHRK + **H2309X**	17	72	50	5	1.87	A2309X	AN09
45	42	70	12	–	50	22210RHRK + **H310X**	19	76	54	10	1.07	A310X	AN10
	42	70	12	–	50	21310RHK + **H310X**	19	76	54	5	1.48	A310X	AN10
	55	70	12	–	50	22310RHRK + **H2310X**	19	76	56	5	2.54	A2310X	AN10
50	45	75	12	–	55	22211RHRK + **H311X**	19	85	60	11	1.39	A311X	AN11
	45	75	12	–	55	21311RHK + **H311X**	19	85	60	6	1.93	A311X	AN11
	59	75	12	–	55	22311RHRK + **H2311X**	19	85	61	6	3.09	A2311X	AN11
55	47	80	13	–	60	22212RHRK + **H312X**	20	90	65	9	1.82	A312X	AN12
	47	80	13	–	60	21312RHK + **H312X**	20	90	65	5	2.31	A312X	AN12
	62	80	13	–	60	22312RHRK + **H2312X**	20	90	66	5	3.82	A2312X	AN12
60	50	85	14	–	65	22213RHRK + **H313X**	21	96	70	8	2.27	A313X	AN13
	50	85	14	–	65	21313RHK + **H313X**	21	96	70	5	2.87	A313X	AN13
	65	85	14	–	65	22313RHRK + **H2313X**	21	96	72	5	4.63	A2313X	AN13
65	55	98	15	–	75	22215RHRK + **H315X**	23	110	80	12	2.84	A315X	AN15
	55	98	15	–	75	21315RHK + **H315X**	23	110	80	5	4.33	A315X	AN15
	73	98	15	–	75	22315RHRK + **H2315X**	23	110	82	5	7.07	A2315X	AN15
70	59	105	17	–	80	22216RHRK + **H316X**	25	120	86	12	3.60	A316X	AN16
	59	105	17	–	80	21316RHK + **H316X**	25	120	86	5	5.17	A316X	AN16
	78	105	17	–	80	22316RHRK + **H2316X**	25	120	87	5	8.32	A2316X	AN16
75	63	110	18	–	85	22217RHRK + **H317X**	27	128	91	12	4.34	A317X	AN17
	63	110	18	–	85	21317RHK + **H317X**	27	128	91	6	6.11	A317X	AN17
	82	110	18	–	85	22317RHRK + **H2317X**	27	128	94	6	9.71	A2317X	AN17
80	65	120	18	–	90	22218RHRK + **H318X**	28	139	96	10	5.31	A318X	AN18

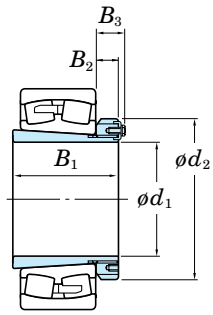
d_1 (80) – (150) mm

Boundary dimensions (mm) d_1	B_1	d_2	B_2	B_3	Brg. bore (mm) d	Designations Bearing + adapter ass'y	Mounting dimensions (mm) A min.	K min.	d_e min.	b min.	Mass Brg. + adapter ass'y (kg)	(Refer.) Adapter sleeve No.	Locknut No.
80	86	120	18	–	90	23218RHK + **H2318X**	28	139	99	18	6.16	A2318X	AN18
	65	120	18	–	90	21318RHK + **H318X**	28	139	96	6	7.08	A318X	AN18
	86	120	18	–	90	22318RHRK + **H2318X**	28	139	99	6	11.37	A2318X	AN18
85	68	125	19	–	95	22219RHRK + **H319X**	29	145	102	9	6.36	A319X	AN19
	68	125	19	–	95	21319RHK + **H319X**	29	145	102	7	8.61	A319X	AN19
	90	125	19	–	95	22319RHRK + **H2319X**	29	145	105	7	13.3	A2319X	AN19
90	71	130	20	–	100	22220RHRK + **H320X**	30	150	107	8	7.41	A320X	AN20
	97	130	20	–	100	23220RHK + **H2320X**	30	150	110	19	8.66	A2320X	AN20
	71	130	20	–	100	21320RHK + **H320X**	30	150	107	7	10.4	A320X	AN20
	97	130	20	–	100	22320RHRK + **H2320X**	30	150	110	7	16.6	A2320X	AN20
100	81	145	21	–	110	23122RHK + **H3122X**	32	170	117	7	7.62	A3122X	AN22
	77	145	21	–	110	22222RHRK + **H322X**	32	170	117	6	10.4	A322X	AN22
	105	145	21	–	110	23222RHK + **H2322X**	32	170	121	17	12.1	A2322X	AN22
	77	145	21	–	110	21322RHK + **H322X**	32	170	117	9	14.0	A322X	AN22
	105	145	21	–	110	22322RHRK + **H2322X**	32	170	121	7	22.5	A2322X	AN22
110	72	145	22	–	120	23024RHK + **H3024**	33	180	127	7	6.70	A3024	ANL24
	88	155	22	–	120	23124RHK + **H3124**	33	180	128	7	10.2	A3124	AN24
	88	155	22	–	120	22224RHRK + **H3124**	33	180	128	11	13.0	A3124	AN24
	112	155	22	–	120	23224RHK + **H2324**	33	180	131	17	14.8	A2324	AN24
	112	155	22	–	120	22324RHRK + **H2324**	33	180	131	7	26.8	A2324	AN24
115	80	155	23	–	130	23026RHK + **H3026**	34	190	137	8	9.97	A3026	ANL26
	92	165	23	–	130	23126RHK + **H3126**	34	190	138	8	11.9	A3126	AN26
	92	165	23	–	130	22226RHRK + **H3126**	34	190	138	8	16.7	A3126	AN26
	121	165	23	–	130	23226RHK + **H2326**	34	190	142	21	18.1	A2326	AN26
	121	165	23	–	130	22326RHRK + **H2326**	34	190	142	8	34.3	A2326	AN26
125	82	165	24	–	140	23028RHK + **H3028**	36	205	147	8	10.76	A3028	ANL28
	97	180	24	–	140	23128RHK + **H3128**	36	205	149	8	14.5	A3128	AN28
	97	180	24	–	140	22228RHRK + **H3128**	36	205	149	8	20.4	A3128	AN28
	131	180	24	–	140	23228RHK + **H2328**	36	205	152	22	23.5	A2328	AN28
	131	180	24	–	140	22328RK + **H2328**	36	205	152	8	41.1	A2328	AN28
	131	180	24	–	140	22328RHK + **H2328**	36	205	152	8	38.3	A2328	AN28
135	87	180	26	–	150	23030RHK + **H3030**	37	220	158	8	13.15	A3030	ANL30
	111	195	26	–	150	23130RHK + **H3130**	37	220	160	8	21.0	A3130	AN30
	111	195	26	–	150	22230RHRK + **H3130**	37	220	160	15	25.7	A3130	AN30
	139	195	26	–	150	23230RHK + **H2330**	37	220	163	20	29.9	A2330	AN30
	139	195	26	–	150	22330RK + **H2330**	37	220	163	8	49.3	A2330	AN30
	139	195	26	–	150	22330RHAK + **H2330**	37	220	163	8	46.0	A2330	AN30
140	93	190	28	–	160	23032RHK + **H3032**	39	230	168	8	16.2	A3032	ANL32
	119	210	28	–	160	23132RHK + **H3132**	39	230	170	8	27.6	A3132	AN32
	119	210	28	–	160	22232RK + **H3132**	39	230	170	14	30.5	A3132	AN32
	119	210	28	–	160	22232RHAK + **H3132**	39	230	170	14	29.1	A3132	AN32
	147	210	28	–	160	23232RK + **H2332**	39	230	174	18	39.2	A2332	AN32
	147	210	28	–	160	23232RHAK + **H2332**	39	230	174	18	37.6	A2332	AN32
	147	210	28	–	160	22332RK + **H2332**	39	230	174	8	60.1	A2332	AN32
	147	210	28	–	160	22332RHAK + **H2332**	39	230	174	8	56.2	A2332	AN32
150	101	200	29	–	170	23034RHK + **H3034**	40	250	179	8	21.5	A3034	ANL34
	122	220	29	–	170	23134RHK + **H3134**	40	250	180	8	29.2	A3134	AN34
	122	220	29	–	170	22234RK + **H3134**	40	250	180	10	36.8	A3134	AN34

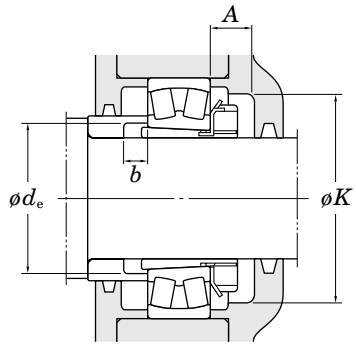
d_1 (150) – 180 mm



$d_1 \leq 180$ mm



$d_1 \geq 200$ mm



Boundary dimensions (mm) d_1	B_1	d_2	B_2	B_3	Brg. bore (mm) d	Designations Bearing + adapter ass'y	Mounting dimensions (mm) A min.	K min.	d_e min.	b min.	Mass Brg. + adapter ass'y (kg)	(Refer.) Adapter sleeve No.	Locknut No.
150	122	220	29	–	170	22234RHAK + **H3134**	40	250	180	10	34.9	A3134	AN34
	154	220	29	–	170	23234RK + **H2334**	40	250	185	18	46.7	A2334	AN34
	154	220	29	–	170	23234RHAK + **H2334**	40	250	185	18	44.8	A2334	AN34
	154	220	29	–	170	22334RK + **H2334**	40	250	185	8	71.0	A2334	AN34
	154	220	29	–	170	22334RHAK + **H2334**	40	250	185	8	66.3	A2334	AN34
160	109	210	30	–	180	23036RHK + **H3036**	41	260	189	8	26.5	A3036	ANL36
	131	230	30	–	180	23136RK + **H3136**	41	260	191	8	37.0	A3136	AN36
	131	230	30	–	180	23136RHAK + **H3136**	41	260	191	8	35.1	A3136	AN36
	131	230	30	–	180	22236RK + **H3136**	41	260	191	18	39.3	A3136	AN36
	131	230	30	–	180	22236RHAK + **H3136**	41	260	191	18	37.3	A3136	AN36
	161	230	30	–	180	23236RK + **H2336**	41	260	195	22	49.9	A2336	AN36
	161	230	30	–	180	23236RHAK + **H2336**	41	260	195	22	47.8	A2336	AN36
	161	230	30	–	180	22336RK + **H2336**	41	260	195	8	81.2	A2336	AN36
	161	230	30	–	180	22336RHAK + **H2336**	41	260	195	8	75.8	A2336	AN36
170	112	220	31	–	190	23038RK + **H3038**	43	270	199	9	25.7	A3038	ANL38
	112	220	31	–	190	23038RHAK + **H3038**	43	270	199	9	24.1	A3038	ANL38
	141	240	31	–	190	23138RK + **H3138**	43	270	202	9	45.2	A3138	AN38
	141	240	31	–	190	23138RHAK + **H3138**	43	270	202	9	42.9	A3138	AN38
	141	240	31	–	190	22238RK + **H3138**	43	270	202	21	47.4	A3138	AN38
	141	240	31	–	190	22238RHAK + **H3138**	43	270	202	21	44.9	A3138	AN38
	169	240	31	–	190	23238RK + **H2338**	43	270	206	21	58.6	A2338	AN38
	169	240	31	–	190	23238RHAK + **H2338**	43	270	206	21	56.1	A2338	AN38
	169	240	31	–	190	22338RK + **H2338**	43	270	206	9	95.0	A2338	AN38
	169	240	31	–	190	22338RHAK + **H2338**	43	270	206	9	88.6	A2338	AN38
180	120	240	32	–	200	23040RK + **H3040**	46	280	210	10	32.6	A3040	ANL40
	120	240	32	–	200	23040RHAK + **H3040**	46	280	210	10	30.5	A3040	ANL40
	150	250	32	–	200	23140RK + **H3140**	46	280	212	10	54.5	A3140	AN40
	150	250	32	–	200	23140RHAK + **H3140**	46	280	212	10	51.6	A3140	AN40
	150	250	32	–	200	22240RK + **H3140**	46	280	212	24	56.1	A3140	AN40
	150	250	32	–	200	22240RHAK + **H3140**	46	280	212	24	53.1	A3140	AN40
	176	250	32	–	200	23240RK + **H2340**	46	280	216	20	70.3	A2340	AN40
	176	250	32	–	200	23240RHAK + **H2340**	46	280	216	20	67.3	A2340	AN40
	176	250	32	–	200	22340RK + **H2340**	46	280	216	10	107	A2340	AN40
	176	250	32	–	200	22340RHAK + **H2340**	46	280	216	10	100	A2340	AN40

d_1 200 – 280 mm

Boundary dimensions (mm) d_1	B_1	d_2	B_2	B_3	Brg. bore (mm) d	Designations Bearing + adapter ass'y	Mounting dimensions (mm) A min.	K min.	d_e min.	b min.	Mass Brg. + adapter ass'y (kg)	(Refer.) Adapter sleeve No.	Locknut No.
200	128	260	30	41	220	23044RK + **H3044**	–	–	231	12	40.9	A3044	ANL44
	128	260	30	41	220	23044RHAK + **H3044**	–	–	231	12	38.2	A3044	ANL44
	158	280	32	44	220	23144RK + **H3144**	–	–	233	10	67.9	A3144	AN44
	158	280	32	44	220	23144RHAK + **H3144**	–	–	233	10	64.3	A3144	AN44
	158	280	32	44	220	22244RK + **H3144**	–	–	233	22	76.4	A3144	AN44
	158	280	32	44	220	22244RHAK + **H3144**	–	–	233	22	72.2	A3144	AN44
	183	280	32	44	220	23244RK + **H2344**	–	–	236	11	95.9	A2344	AN44
	183	280	32	44	220	23244RHAK + **H2344**	–	–	236	11	91.7	A2344	AN44
	183	280	32	44	220	22344RK + **H2344**	–	–	236	10	139	A2344	AN44
	183	280	32	44	220	22344RHAK + **H2344**	–	–	236	10	130	A2344	AN44
220	133	290	34	46	240	23048RK + **H3048**	–	–	251	11	47.0	A3048	ANL48
	133	290	34	46	240	23048RHAK + **H3048**	–	–	251	11	44.1	A3048	ANL48
	169	300	34	46	240	23148RK + **H3148**	–	–	254	11	82.9	A3148	AN48
	169	300	34	46	240	23148RHAK + **H3148**	–	–	254	11	78.4	A3148	AN48
	169	300	34	46	240	22248RK + **H3148**	–	–	254	19	101	A3148	AN48
	169	300	34	46	240	22248RHAK + **H3148**	–	–	254	19	94.9	A3148	AN48
	196	300	34	46	240	23248RK + **H2348**	–	–	257	6	127	A2348	AN48
	196	300	34	46	240	23248RHAK + **H2348**	–	–	257	6	121	A2348	AN48
	196	300	34	46	240	22348RK + **H2348**	–	–	257	11	174	A2348	AN48
	196	300	34	46	240	22348RHAK + **H2348**	–	–	257	11	162	A2348	AN48
240	147	310	34	46	260	23052RK + **H3052**	–	–	272	13	64.6	A3052	ANL52
	147	310	34	46	260	23052RHAK + **H3052**	–	–	272	13	60.2	A3052	ANL52
	187	330	36	49	260	23152RK + **H3152**	–	–	276	11	113	A3152	AN52
	187	330	36	49	260	23152RHAK + **H3152**	–	–	276	11	107	A3152	AN52
	187	330	36	49	260	22252RK + **H3152**	–	–	276	25	130	A3152	AN52
	187	330	36	49	260	22252RHAK + **H3152**	–	–	276	25	123	A3152	AN52
	208	330	36	49	260	23252RK + **H2352**	–	–	278	2	164	A2352	AN52
	208	330	36	49	260	23252RHAK + **H2352**	–	–	278	2	157	A2352	AN52
	208	330	36	49	260	22352RK + **H2352**	–	–	278	11	216	A2352	AN52
	208	330	36	49	260	22352RHAK + **H2352**	–	–	278	11	201	A2352	AN52
260	152	330	38	50	280	23056RK + **H3056**	–	–	292	12	70.6	A3056	ANL56
	152	330	38	50	280	23056RHAK + **H3056**	–	–	292	12	65.9	A3056	ANL56
	192	350	38	51	280	23156RK + **H3156**	–	–	296	12	121	A3156	AN56
	192	350	38	51	280	23156RHAK + **H3156**	–	–	296	12	115	A3156	AN56
	192	350	38	51	280	22256RK + **H3156**	–	–	296	28	137	A3156	AN56
	192	350	38	51	280	22256RHAK + **H3156**	–	–	296	28	129	A3156	AN56
	221	350	38	51	280	23256RK + **H2356**	–	–	299	11	177	A2356	AN56
	221	350	38	51	280	23256RHAK + **H2356**	–	–	299	11	169	A2356	AN56
	221	350	38	51	280	22356RK + **H2356**	–	–	299	12	253	A2356	AN56
	221	350	38	51	280	22356RHAK + **H2356**	–	–	299	12	236	A2356	AN56
280	168	360	42	54	300	23060RK + **H3060**	–	–	313	12	96.5	A3060	ANL60
	168	360	42	54	300	23060RHAK + **H3060**	–	–	313	12	89.6	A3060	ANL60
	208	380	40	53	300	23160RK + **H3160**	–	–	317	12	158	A3160	AN60
	208	380	40	53	300	23160RHAK + **H3160**	–	–	317	12	149	A3160	AN60
	208	380	40	53	300	22260RK + **H3160**	–	–	317	32	172	A3160	AN60
	208	380	40	53	300	22260RHAK + **H3160**	–	–	317	32	162	A3160	AN60
	240	380	40	53	300	23260RK + **H3260**	–	–	321	12	226	A3260	AN60
	240	380	40	53	300	23260RHAK + **H3260**	–	–	321	12	216	A3260	AN60

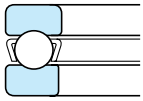
KOYO

Thrust ball bearings

Thrust ball bearings are divided into single and double direction types. The former is able to accommodate axial load in one direction, while the latter is able to accommodate it in both directions.

Neither is suitable for applications that involve radial load or high-speed rotation.

Thrust ball bearings



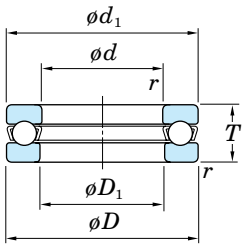
Bore diameter **10 – 200 mm**

Boundary dimensions	As specified in JIS B 1512.
Tolerances	As specified in JIS B 1514.
Standard cages	• Pressed steel cage (supplementary code : //) • Copper alloy or carbon steel machined cage (supplementary code : FY or FC) • Polyamide resin molded cage (supplementary code : MG)
Required minimum axial load	A certain degree of load is necessary in order for bearings to operate satisfactorily.
Allowable misalignment	Misalignment not allowed. (for flat back face type)
Equivalent axial load	Dynamic equivalent axial load $P_a = F_a$ Static equivalent axial load $P_{0a} = F_a$

Application of standard cages

Bearing series	Molded cage	Pressed cage	Machined cage
511	51100 - 51107	51108 - 51132	51134 - 51172
512	51200 - 51207	51208 - 51224	51226 - 51272
513	–	51305 - 51313	51314 - 51340
514	–	51405 - 51414	–

d 10 – 45 mm



Boundary dimensions (mm)				Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.	Dimensions (mm)		(Refer.) Mass
d	D	T	r min.	C_a	C_{0a}	Grease lub.	Oil lub.		d_1 max.	D_1 min.	(kg)
10	24	9	0.3	10.0	14.0	6 500	10 000	**51100**	24	11	0.020
	26	11	0.6	12.7	17.1	5 700	8 800	**51200**	26	12	0.030
12	26	9	0.3	9.65	14.0	6 500	10 000	**51101**	26	13	0.022
	28	11	0.6	13.2	19.0	5 400	8 300	**51201**	28	14	0.034
15	28	9	0.3	9.95	15.4	6 100	9 400	**51102**	28	16	0.024
	32	12	0.6	16.6	24.8	4 900	7 500	**51202**	32	17	0.046
17	30	9	0.3	10.8	18.2	6 100	9 400	**51103**	30	18	0.028
	35	12	0.6	17.2	27.3	4 900	7 500	**51203**	35	19	0.053
20	35	10	0.3	14.2	24.7	5 100	7 900	**51104**	35	21	0.040
	40	14	0.6	22.3	37.7	3 900	6 000	**51204**	40	22	0.082
25	42	11	0.6	19.5	37.2	4 400	6 800	**51105**	42	26	0.059
	47	15	0.6	27.8	50.4	3 600	5 500	**51205**	47	27	0.120
	52	18	1	35.7	61.4	3 100	4 800	**51305**	52	27	0.180
	60	24	1	55.6	89.4	2 600	4 000	**51405**	60	27	0.340
30	47	11	0.6	20.4	42.2	4 300	6 600	**51106**	47	32	0.068
	52	16	0.6	29.4	58.2	3 400	5 200	**51206**	52	32	0.150
	60	21	1	42.8	78.7	2 700	4 200	**51306**	60	32	0.270
	70	28	1	72.8	126	2 200	3 400	**51406**	70	32	0.530
35	52	12	0.6	21.2	47.2	3 900	6 000	**51107**	52	37	0.090
	62	18	1	39.2	78.2	2 900	4 500	**51207**	62	37	0.220
	68	24	1	55.5	105	2 400	3 700	**51307**	68	37	0.390
	80	32	1.1	87.1	155	1 900	2 900	**51407**	80	37	0.790
40	60	13	0.6	26.9	62.8	3 400	5 300	**51108**	60	42	0.120
	68	19	1	47.0	98.3	2 700	4 200	**51208**	68	42	0.270
	78	26	1	69.3	135	2 100	3 300	**51308**	78	42	0.550
	90	36	1.1	113	205	1 700	2 600	**51408**	90	42	1.14
45	65	14	0.6	27.8	69.1	3 200	5 000	**51109**	65	47	0.150
	73	20	1	47.7	105	2 600	4 000	**51209**	73	47	0.320
	85	28	1	80.0	163	1 900	3 000	**51309**	85	47	0.690
	100	39	1.1	130	242	1 500	2 300	**51409**	100	47	1.47

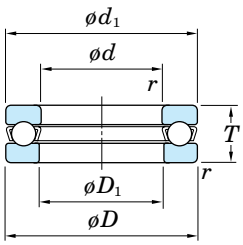
Remark) Standard cage types used for the above bearings are described earlier in this section.

d 50 – 120 mm

Boundary dimensions (mm)				Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.	Dimensions (mm)		(Refer.) Mass
d	D	T	r min.	C_a	C_{0a}	Grease lub.	Oil lub.		d_1 max.	D_1 min.	(kg)
50	70	14	0.6	28.8	75.4	3 100	4 800	**51110**	70	52	0.160
	78	22	1	48.5	111	2 300	3 600	**51210**	78	52	0.390
	95	31	1.1	96.6	202	1 800	2 700	**51310**	95	52	1.00
	110	43	1.5	148	283	1 400	2 100	**51410**	110	52	1.99
55	78	16	0.6	34.8	93.1	2 800	4 300	**51111**	78	57	0.240
	90	25	1	69.4	159	2 100	3 200	**51211**	90	57	0.610
	105	35	1.1	119	246	1 600	2 400	**51311**	105	57	1.34
	120	48	1.5	180	349	1 200	1 900	**51411**	120	57	2.64
60	85	17	1	41.4	113	2 600	4 000	**51112**	85	62	0.290
	95	26	1	73.6	179	1 900	3 000	**51212**	95	62	0.690
	110	35	1.1	124	267	1 500	2 300	**51312**	110	62	1.43
	130	51	1.5	214	437	1 100	1 700	**51412**	130	62	3.51
65	90	18	1	41.7	117	2 400	3 700	**51113**	90	67	0.340
	100	27	1	74.9	189	1 900	2 900	**51213**	100	67	0.770
	115	36	1.1	128	287	1 400	2 200	**51313**	115	67	1.57
	140	56	2	232	493	1 000	1 600	**51413**	140	68	4.47
70	95	18	1	43.1	127	2 300	3 600	**51114**	95	72	0.360
	105	27	1	76.1	199	1 800	2 800	**51214**	105	72	0.810
	125	40	1.1	134	291	1 300	2 000	**51314**	125	72	2.06
	150	60	2	250	553	940	1 450	**51414**	150	73	5.48
75	100	19	1	44.4	136	2 200	3 400	**51115**	100	77	0.420
	110	27	1	77.4	209	1 800	2 700	**51215**	110	77	0.860
	135	44	1.5	154	339	1 200	1 900	**51315**	135	77	2.68
80	105	19	1	44.7	141	2 100	3 300	**51116**	105	82	0.430
	115	28	1	78.5	218	1 700	2 600	**51216**	115	82	0.950
	140	44	1.5	160	368	1 200	1 800	**51316**	140	82	2.82
85	110	19	1	45.9	150	2 100	3 200	**51117**	110	87	0.460
	125	31	1	95.4	264	1 500	2 300	**51217**	125	88	1.29
	150	49	1.5	186	419	1 100	1 700	**51317**	150	88	3.66
90	120	22	1	59.7	190	1 900	2 900	**51118**	120	92	0.680
	135	35	1.1	117	326	1 400	2 100	**51218**	135	93	1.77
	155	50	1.5	193	454	1 000	1 600	**51318**	155	93	3.88
100	135	25	1	85.0	268	1 600	2 500	**51120**	135	102	0.990
	150	38	1.1	147	410	1 200	1 900	**51220**	150	103	2.36
	170	55	1.5	226	556	940	1 450	**51320**	170	103	5.11
110	145	25	1	87.1	288	1 600	2 400	**51122**	145	112	1.08
	160	38	1.1	153	451	1 200	1 800	**51222**	160	113	2.57
	190	63	2	267	704	810	1 250	**51322**	187	113	7.72
120	155	25	1	89.0	308	1 500	2 300	**51124**	155	122	1.16
	170	39	1.1	154	472	1 100	1 700	**51224**	170	123	2.86
	210	70	2.1	311	869	710	1 100	**51324**	205	123	10.6

Remark) Standard cage types used for the above bearings are described earlier in this section.

d 130 – 200 mm



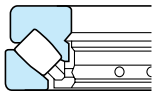
Boundary dimensions (mm)				Basic load ratings (kN)		Limiting speeds (min⁻¹)		Bearing No.	Dimensions (mm)		(Refer.) Mass
d	D	T	r min.	C_a	C_{0a}	Grease lub.	Oil lub.		d_1 max.	D_1 min.	(kg)
130	170	30	1	104	352	1 300	2 000	**51126**	170	132	1.87
	190	45	1.5	191	566	970	1 500	**51226**	187	133	4.09
	225	75	2.1	330	958	650	1 000	**51326**	220	134	13.0
140	180	31	1	107	377	1 200	1 900	**51128**	178	142	2.02
	200	46	1.5	187	566	940	1 450	**51228**	197	143	4.46
	240	80	2.1	350	1 050	620	950	**51328**	235	144	15.5
150	190	31	1	109	402	1 200	1 900	**51130**	188	152	2.15
	215	50	1.5	213	652	840	1 300	**51230**	212	153	5.64
	250	80	2.1	361	1 130	580	900	**51330**	245	154	16.3
160	200	31	1	112	427	1 200	1 800	**51132**	198	162	2.28
	225	51	1.5	223	718	810	1 250	**51232**	222	163	6.53
	270	87	3	410	1 340	550	850	**51332**	265	164	21.0
170	215	34	1.1	131	496	1 100	1 700	**51134**	213	172	3.25
	240	55	1.5	261	834	750	1 150	**51234**	237	173	8.12
	280	87	3	463	1 570	520	800	**51334**	275	174	22.0
180	225	34	1.1	129	496	1 000	1 600	**51136**	222	183	3.39
	250	56	1.5	265	874	710	1 100	**51236**	247	183	8.68
	300	95	3	463	1 580	490	750	**51336**	295	184	28.1
190	240	37	1.1	163	616	970	1 500	**51138**	237	193	3.95
	270	62	2	308	1 060	650	1 000	**51238**	267	194	11.7
	320	105	4	543	1 950	440	680	**51338**	315	195	36.0
200	250	37	1.1	168	657	940	1 450	**51140**	247	203	4.13
	280	62	2	314	1 110	620	950	**51240**	277	204	12.2
	340	110	4	596	2 220	420	650	**51340**	335	205	42.9

Remark) Standard cage types used for the above bearings are described earlier in this section.

KOYO

Spherical thrust roller bearings

Spherical thrust roller bearings



Bore diameter **60 – 300 mm**

Spherical thrust roller bearings are designed to carry high axial loads. They can also support radial load if magnitude is no more than 55% of the axial load being carried.

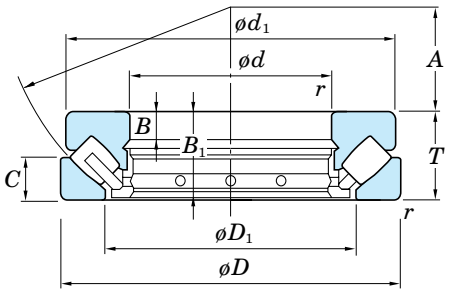
These bearings are not suitable for high-speed rotation.

Having a spherical housing washer raceway surface, these bearings are self-alignings, adjusting to axial inclination.

They are usually used with oil lubrication.

Boudary dimensions	As specified in JIS B 1512.
Tolerances	As specified in JIS B 1514, class 0.
Required minimum axial load	A certain degree of load is necessary in order for bearings to operate satisfactorily.
Standard cage	Copper alloy machined cage (supplementary code : FY)
Allowable aligning angle	0.035 – 0.052 rad (2˚ – 3˚) in general, depending on bearing series.
Equivalent axial load	Dynamic equivalent axial load $P_a = 1.2F_r + F_a$ Static equivalent axial load $P_{0a} \fallingdotseq 2.7F_r + F_a$ (Note : $F_r / F_a \leq 0.55$)

d 60 – 180 mm



Boundary dimensions (mm)				Basic load ratings (kN)		Limiting speeds (min⁻¹)	Bearing No.	Dimensions (mm)						(Refer.) Mass
d	D	T	r min.	C_a	C_{0a}	Oil lub.		d_1	D_1	B	B_1	C	A	(kg)
60	130	42	1.5	319	884	2 700	**29412R**	123	89	15	39.5	20	38	2.61
65	140	45	2	360	1 020	2 500	**29413R**	133	96	16	42.5	21	42	3.34
70	150	48	2	387	1 100	2 300	**29414R**	142	103	17	45.5	23	44	4.06
75	160	51	2	468	1 360	2 100	**29415R**	152	109	18	48	24	47	4.76
80	170	54	2.1	505	1 480	2 000	**29416R**	162	117	19	51	26	50	5.91
85	150	39	1.5	321	1 000	2 600	**29317R**	143.5	114	13	37	19	50	2.82
	180	58	2.1	572	1 700	1 900	**29417R**	170	125	21	55	28	54	7.04
90	155	39	1.5	330	1 050	2 500	**29318R**	148.5	117	13	37	19	52	3.06
	190	60	2.1	658	2 010	1 800	**29418R**	180	132	22	57	29	56	8.18
100	170	42	1.5	385	1 270	2 300	**29320R**	163	129	14	40	20.8	58	3.81
	210	67	3	730	2 220	1 650	**29420R**	200	146	24	64	32	62	11.2
110	190	48	2	502	1 690	2 000	**29322R**	182	143	16	45.5	23	64	5.56
	230	73	3	896	2 810	1 500	**29422R**	220	162	26	69	35	69	14.7
120	210	54	2.1	608	2 050	1 800	**29324R**	200	159	18	51	26	70	7.63
	250	78	4	1 090	3 450	1 350	**29424R**	236	174	29	74	37	74	18.2
130	225	58	2.1	715	2 440	1 700	**29326R**	215	171	19	55	28	76	9.43
	270	85	4	1 200	3 850	1 250	**29426R**	255	189	31	81	41	81	22.8
140	240	60	2.1	744	2 590	1 600	**29328R**	230	183	20	57	29	82	11.1
	280	85	4	1 250	4 060	1 250	**29428R**	268	199	31	81	41	86	24.6
150	250	60	2.1	798	2 880	1 550	**29330R**	240	194	20	57	29	87	11.6
	300	90	4	1 390	4 640	1 100	**29430R**	285	214	32	86	44	92	29.9
160	270	67	3	956	3 430	1 400	**29332R**	260	208	23	64	32	92	15.4
	320	95	5	1 590	5 340	1 050	**29432R**	306	229	34	91	45	99	36.2
170	280	67	3	981	3 590	1 350	**29334R**	270	216	23	64	32	96	16.2
	340	103	5	1 750	5 900	950	**29434R**	324	243	37	99	50	104	44.3
180	300	73	3	1 100	4 000	1 250	**29336R**	290	232	25	69	35	103	20.7
	360	109	5	2 060	7 000	900	**29436R**	342	255	39	105	52	110	52.6

d 190 – 300 mm

Boundary dimensions (mm)				Basic load ratings (kN)		Limiting speeds (min^{-1})	Bearing No.	Dimensions (mm)						(Refer.) Mass
d	D	T	r min.	C_a	C_{0a}	Oil lub.		d_1	D_1	B	B_1	C	A	(kg)
190	320	78	4	1 250	4 610	1 150	**29338R**	308	246	27	74	38	110	25.1
	380	115	5	2 240	7 720	850	**29438R**	360	271	41	111	55	117	60.7
200	340	85	4	1 440	5 340	1 050	**29340R**	325	261	29	81	41	116	31.2
	400	122	5	2 460	8 470	800	**29440R**	380	286	43	117	59	122	72.2
220	360	85	4	1 510	5 830	1 000	**29344R**	345	280	29	81	41	125	33.3
	420	122	6	2 540	8 990	750	**29444R**	400	308	43	117	58	132	74.9
240	380	85	4	1 520	5 990	950	**29348R**	365	300	29	81	41	135	35.5
	440	122	6	2 610	9 510	700	**29448R**	420	326	43	117	59	142	80.0
260	420	95	5	1 930	7 610	850	**29352R**	405	329	32	91	45	148	49.1
	480	132	6	3 120	11 700	650	**29452R**	460	357	48	127	64	154	104
280	440	95	5	2 000	8 110	800	**29356R**	423	348	32	91	46	158	53.2
	520	145	6	3 650	13 600	550	**29456R**	495	387	52	140	68	166	134
300	480	109	5	2 490	10 200	700	**29360R**	460	379	37	105	50	168	74.9
	540	145	6	3 880	14 900	550	**29460R**	515	402	52	140	70	175	142

KOYO

Ball bearing units

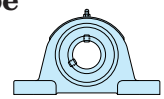
Ball bearing units consist of pre-lubricated sealed ball bearings and a housing which varies in shape.

They are capable of aligning themselves efficiently using the spherical fitting surface between the bearing and housing, effectively preventing overloads due to misalignment.

Koyo ball bearing units are highly accurate and feature excellent load resistance. They are completely sealed, and provided with a relubrication feature.

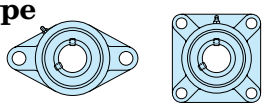
Ball bearing units without a relubrication feature are also available.

Pillow block type



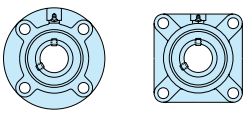
Bore diameter **12 –140 mm**

Flanged type



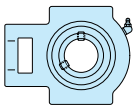
Bore diameter **12 – 140 mm**

Flanged type with spigot joint



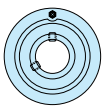
Bore diameter **12 – 140 mm**

Take-up type



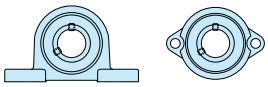
Bore diameter **12 – 140 mm**

Cartridge type



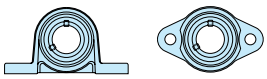
Bore diameter **12 – 65 mm**

Light duty units



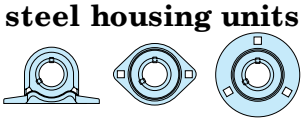
Bore diameter **12 – 40 mm**

"Clean" series (made from light alloy)



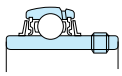
Bore diameter **10 – 30 mm**

Pressed steel housing units



Bore diameter **12 – 35 mm**

Ball bearings for units



Bore diameter **10 – 140 mm**

Ball bearing units

Major ball bearing unit types

(1) Cast iron units

	Pillow block type ● UCP 2·X·3 ▲ UKP 2·X·3
	Rhombic-flanged type ● UCFL 2·X·3 ▲ UKFL 2·X·3
	Square-flanged type ● UCF 2·X·3 ▲ UKF 2·X·3
	Round-flanged type with spigot joint ● UCFC 2·X ▲ UKFC 2·X
	Square-flanged type with spigot joint ● UCFS 3 ▲ UKFS 3
	Take-up type ● UCT 2·X·3 ▲ UKT 2·X·3
	Cartridge type ● UCC 2 ▲ UKC 2

Special pillow block type

● UCPH 2

● UCPA 2

Thick section pillow block type

● UCIP 2·3
▲ UKIP 2·3

Flanged type variations

● UCFA 2

● UCFB 2

Hanger type

● UCHA 2

(2) Light duty units (cast iron)

Pillow block type	Rhombic-flanged type
● BLP 2	● BLF 2

(3) "Clean" series units (special light alloy)

Pillow block type	Rhombic-flanged type
● UP 0	● UFL 0

(4) Pressed steel housing units

● SBPP 2	● SBPFL 2	● SBPF 2

(5) Take-up units with frame

● UCTH 2	● UCTL 2 ● UCTU 2·3

(6) Ball bearings for units

	Cylindrical bore type (set screw locking) ● UC 2·X·3 ● SU 0 ● SB 2
	Tapered bore type (adapter locking) ● UK 2·X·3

Notes) This catalogue includes the specifications of major units and bearings which are boxed in the table.
Marks ● : set screw locking, ▲ : adapter locking

Tolerances	• Ball bearings ..... as specified in JIS B 1558 (Tables 1 and 2). • Housings ..... as specified in JIS B 1559. (the internal spherical diameter tolerance is given in Table 3.)
Bearing radial internal clearance	As specified in JIS B 1520 (Table 2-1 on p. A 11). Koyo provides cylindrical bore bearings with normal radial internal clearance. Tapered bore bearings are provided with a C3 radial internal clearance in consideration of possible inner ring expansion caused by tightening of an adapter.
Recommended fits of inner ring and shaft (indicated by the tolerance class)	• Cylindrical bore bearings ..... h6, h7, h8, j6 (k6, k7 and m6 when heavy or impact load is to be supported.) • Tapered bore bearings ..... h8, h9 • High-speed blower bearings (S5) h5, j5
Rotation speed limits	See Table 4.
Allowable aligning angle	• 0.052 rad (3˚)

Ball bearing units

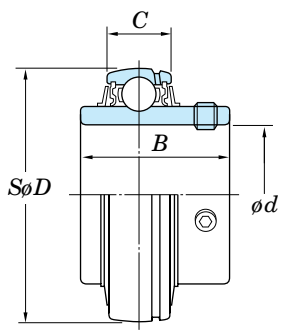
Table 1 Ball bearings for units : inner ring tolerance Unit μm

Nominal bore diameter d (mm)		Bore diameter: UC, SU and SB types: Single plane mean bore diameter deviation Δd_{mp}		Bore diameter: UC, SU and SB types: Single radial plane bore diameter variation Vd_p	Bore diameter: Bearings for blower (S5): Single plane mean bore diameter deviation Δd_{mp}		Bore diameter: Bearings for blower (S5): Single radial plane bore diameter variation Vd_p	Single inner (outer) ring width deviation ΔB_s (ΔC_s)		Radial runout of assembled bearing inner ring K_{ia}
over	up to	upper	lower	max.	upper	lower	max.	upper	lower	max.
10 more	18	+15	0	10	+13	0	6	0	–120	15
18	31.75	+18	0	12	+13	0	6	0	–120	18
31.75	50.8	+21	0	14	+13	0	10	0	–120	20
50.8	80	+24	0	16	+15	0	10	0	–150	25
80	120	+28	0	19	+18	0	14	0	–200	30
120	180	+33	0	22	+23	0	14	0	–250	35

Table 2 Ball bearings for units : outer ring tolerance Unit μm

Nominal outside diameter D (mm)		Mean outside diameter deviation ΔD_m		Radial runout of assembled bearing outer ring K_{ea}
over	up to	upper	lower	max.
18	30	0	–9	15
30	50	0	–11	20
50	80	0	–13	25
80	120	0	–15	35
120	150	0	–18	40
150	180	0	–25	45
180	250	0	–30	50
250	315	0	–35	60

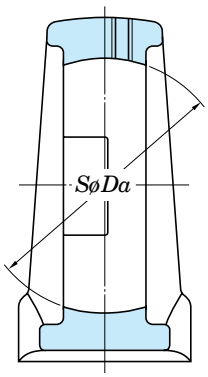
Note) The lower value of mean outside diameter deviation does not apply to the sides of outer rings up to the extent of a quater of the outer ring width from the side faces.



UC type

Table 3 Housing spherical bore diameter tolerance Unit μm

Nominal spherical bore diameter D_a (mm)		Tolerance class H7: Single plane mean spherical bore diameter deviation ΔD_{amp}		Tolerance class J7: Single plane mean spherical bore diameter deviation ΔD_{amp}		Tolerance class K7: Single plane mean spherical bore diameter deviation ΔD_{amp}		All tolerance classes: Single radial plane spherical bore diameter variation Vd_p
over	up to	upper	lower	upper	lower	upper	lower	max.
18	30	+21	0	+12	–9	+6	–15	8
30	50	+25	0	+14	–11	+7	–18	10
50	80	+30	0	+18	–12	+9	–21	12
80	120	+35	0	+22	–13	+10	–25	14
120	180	+40	0	+26	–14	+12	–28	16
180	250	+46	0	+30	–16	+13	–33	18
250	315	+52	0	+36	–16	+16	–36	20



Remark) Koyo generally applies class J to housing designs.
Class H and class K and also be applied depending on the application.

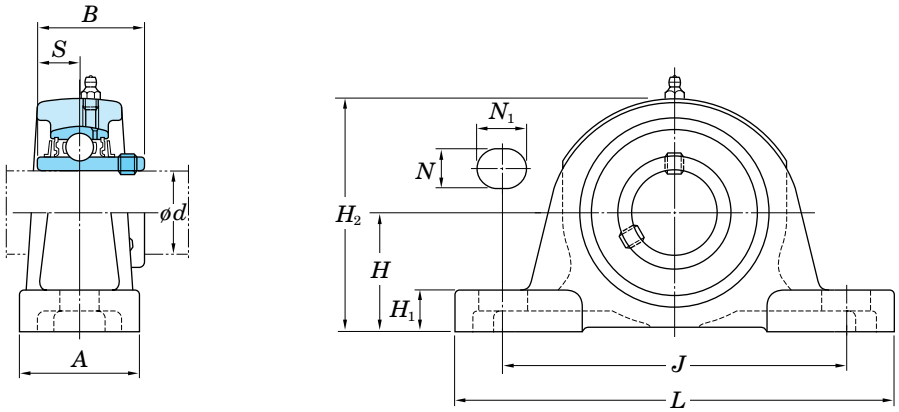
Table 4 Rotation speed limits of ball bearing units Unit μm

Bore diameter No.	Standard			Triple lip sealed (L3)			For high speed rotation (K3 and S5)			Heat resistant type B (DIK2)
	Diameter series			Diameter series			Diameter series			Diameter series
	2	X	3	2	X	3	2	X	3	2, X, 3
01	5 800			2 300			8 700			3 800
02	5 800			2 300			8 700			3 800
03	5 800			2 300			8 700			3 800
04	5 800			2 300			8 700			3 800
05	5 100	4 300	4 600	2 100	960		7 700	6 400	6 700	3 000
06	4 300	3 700	3 900	960	830		6 400	5 500	5 800	2 500
07	3 700	3 300	3 400	830	750	770	5 500	5 000	5 100	2 100
08	3 300	3 100	3 100	750	690	690	5 000	4 600	4 600	1 900
09	3 100	2 800	2 700	690	640	620	4 600	4 300	4 100	1 700
10	2 800	2 500	2 400	640	570	550	4 300	3 800	3 700	1 500
11	2 500	2 300	2 300	570	520	510	3 800	3 500	3 400	1 400
12	2 300	2 200	2 100	520	490	470	3 500	3 200	3 100	1 300
13	2 200	2 100	1 900	490	460	440	3 200	3 100	2 900	1 200
14	2 100	2 000	1 800	460	440	410	3 100	2 900	2 700	1 100
15	2 000	1 800	1 700	440	410	380	2 900	2 700	2 600	1 000
16	1 800	1 700	1 600	410	380	360	2 700	2 600	2 400	940
17	1 700	1 600	1 500	380	360	340	2 600	2 400	2 300	880
18	1 600	1 500	1 400	360	340	320	2 400	2 300	2 100	830
19		–	1 400		–	310		–	2 000	790
20		1 300	1 300		300	280		2 000	1 900	750
21			1 200			–			1 800	710
22			1 100			250			1 700	680
24			1 100			240			1 600	630
26			1 000			220			1 500	580
28			910			200			1 400	540

Remarks) 1. Cold-resistant types (D2K2) and heat-resistant types A (D3K2) feature the same level of rotation speed limits as the standard type.
2. Refer to a separate catalog for details of triple lip sealed bearings, high-speed bearings (K3 and S5) and heat-resistant bearings (D1K2 and D3K2).
3. When bearings are fit loosely, rotation speed limits should be compensated for by the fitting coefficient given below.

Bearing type		Fitting coefficient					
		Shaft tolerance class					
		h 5, js 5	h 6	h 7	h 8	h 9	j 6
Standard		–	1	0.8	0.5	0.2	1
Triple lip sealed	(L3)	–	–	1	1	0.9	–
For high speed rotation	(K3)	–	0.8	0.6	–	–	1
For blower	(S5)	1	0.8	0.6	–	–	–
Heat-resistant type B	(D1K2)	–	–	1	1	0.7	–

Ball bearing units
pillow block type
UCP (set screw locking)
d 12 – 55 mm



Shaft dia. (mm)	Dimensions (mm)										Bolt size	Unit No.	Housing No.	Applicable bearing			(Refer.) Unit Mass
														No.	Basic load ratings (kN)		
d	*H*	*J*	*L*	*A*	H_1	H_2	*N*	N_1	*B*	*S*					C_r	C_{0r}	(kg)
12	30.2	95	127	38	12	60	13	18	31	12.7	M10	**UCP201**	P203	UC201	12.8	6.65	0.63
15	30.2	95	127	38	12	60	13	18	31	12.7	M10	**UCP202**	P203	UC202	12.8	6.65	0.61
17	30.2	95	127	38	12	60	13	18	31	12.7	M10	**UCP203**	P203	UC203	12.8	6.65	0.60
20	33.3	95	127	38	13	64	13	18	31	12.7	M10	**UCP204**	P204	UC204	12.8	6.65	0.66
25	36.5	105	140	38	13	71	13	18	34.1	14.3	M10	**UCP205**	P205	UC205	14.0	7.85	0.80
	44.4	119	159	51	16	86	17	25	38.1	15.9	M14	**UCPX05**	PX05	UCX05	19.5	11.3	1.5
	45	132	175	45	16	85	17	20	38	15	M14	**UCP305**	P305	UC305	20.6	11.3	1.7
30	42.9	121	165	48	15	84	17	21	38.1	15.9	M14	**UCP206**	P206	UC206	19.5	11.3	1.3
	47.6	127	175	57	17	93	17	25	42.9	17.5	M14	**UCPX06**	PX06	UCX06	25.7	15.4	2.1
	50	140	180	50	17	95	17	20	43	17	M14	**UCP306**	P306	UC306	26.7	15.0	2.2
35	47.6	127	167	48	16	93	17	21	42.9	17.5	M14	**UCP207**	P207	UC207	25.7	15.4	1.6
	54	144	203	57	19	105	17	30	49.2	19	M14	**UCPX07**	PX07	UCX07	29.1	17.8	2.7
	56	160	210	56	19	107	17	25	48	19	M14	**UCP307**	P307	UC307	33.4	19.3	3.0
40	49.2	137	184	54	17	98	17	21	49.2	19	M14	**UCP208**	P208	UC208	29.1	17.8	2.0
	58.7	156	222	67	21	114	20	32	49.2	19	M16	**UCPX08**	PX08	UCX08	32.7	20.3	3.5
	60	170	220	60	19	118	17	27	52	19	M14	**UCP308**	P308	UC308	40.7	24.0	3.8
45	54	146	190	54	17	106	17	21	49.2	19	M14	**UCP209**	P209	UC209	32.7	20.3	2.2
	58.7	156	222	67	21	116	20	33	51.6	19	M16	**UCPX09**	PX09	UCX09	35.1	23.3	3.7
	67	190	245	67	21	132	20	30	57	22	M16	**UCP309**	P309	UC309	48.9	29.5	4.9
50	57.2	159	206	60	19	113	20	22	51.6	19	M16	**UCP210**	P210	UC210	35.1	23.3	2.9
	63.5	171	241	73	22	126	20	36	55.6	22.2	M16	**UCPX10**	PX10	UCX10	43.4	29.4	4.6
	75	212	275	75	24	148	20	35	61	22	M16	**UCP310**	P310	UC310	62.0	38.3	6.6
55	63.5	171	219	60	19	125	20	22	55.6	22.2	M16	**UCP211**	P211	UC211	43.4	29.4	3.6
	69.8	184	260	79	28	139	25	36	65.1	25.4	M20	**UCPX11**	PX11	UCX11	52.4	36.2	6.5
	80	236	310	80	27	158	20	38	66	25	M16	**UCP311**	P311	UC311	71.6	45.0	7.9

Remarks 1) Applicable sizes of grease nipples are shown below.
1/4-28UNF ..... 201 – 210, X05 – X09, 305 – 308
PT 1/8 ..... 211 – 218, X10 – X20, 309 – 328

2) For bearings with double- or triple-lip seals, unit and bearing number are suffixed by L2 or L3.
(For more detailed information, refer to ball bearing for unit specification tables.)

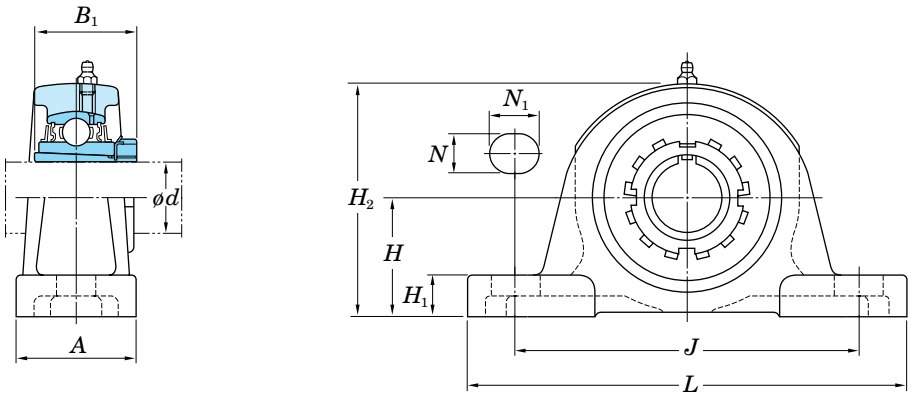
d 60 – 140 mm

Shaft dia. (mm)	Dimensions (mm)										Bolt size	Unit No.	Housing No.	Applicable bearing			(Refer.) Unit Mass
														No.	Basic load ratings (kN)		
d	*H*	*J*	*L*	*A*	H_1	H_2	*N*	N_1	*B*	*S*					C_r	C_{0r}	(kg)
60	69.8	184	241	70	22	138	20	25	65.1	25.4	M16	**UCP212**	P212	UC212	52.4	36.2	4.9
	76.2	203	286	83	28	152	25	40	65.1	25.4	M20	**UCPX12**	PX12	UCX12	57.2	40.1	7.7
	85	250	330	85	29	167	25	38	71	26	M20	**UCP312**	P312	UC312	81.9	52.2	9.5
65	76.2	203	265	70	25	150	25	30	65.1	25.4	M20	**UCP213**	P213	UC213	57.2	40.1	5.9
	76.2	203	286	83	28	155	25	40	74.6	30.2	M20	**UCPX13**	PX13	UCX13	62.2	44.1	8.1
	90	260	340	90	32	176	25	38	75	30	M20	**UCP313**	P313	UC313	92.7	59.9	10.7
70	79.4	210	266	72	28	156	25	30	74.6	30.2	M20	**UCP214**	P214	UC214	62.2	44.1	6.8
	88.9	229	330	89	32	171	27	50	77.8	33.3	M22	**UCPX14**	PX14	UCX14	67.4	48.3	10.2
	95	280	360	90	35	186	27	40	78	33	M22	**UCP314**	P314	UC314	104	68.2	12.4
75	82.6	217	275	74	28	162	25	30	77.8	33.3	M20	**UCP215**	P215	UC215	67.4	48.3	7.4
	88.9	229	330	89	32	175	27	50	82.6	33.3	M22	**UCPX15**	PX15	UCX15	72.7	53.0	10.8
	100	290	380	100	35	198	27	40	82	32	M22	**UCP315**	P315	UC315	113	77.2	14.8
80	88.9	232	292	78	32	174	25	35	82.6	33.3	M20	**UCP216**	P216	UC216	72.7	53.0	9.0
	101.6	283	381	102	34	195	27	58	85.7	34.1	M22	**UCPX16**	PX16	UCX16	84.0	61.9	15.3
	106	300	400	110	35	209	27	40	86	34	M22	**UCP316**	P316	UC316	123	86.7	18.5
85	95.2	247	310	83	32	185	25	40	85.7	34.1	M20	**UCP217**	P217	UC217	84.0	61.9	10.8
	101.6	283	381	102	34	200	27	60	96	39.7	M22	**UCPX17**	PX17	UCX17	96.1	71.5	16.1
	112	320	420	110	40	220	33	45	96	40	M27	**UCP317**	P317	UC317	133	96.8	20.3
90	101.6	262	327	88	34	198	27	45	96	39.7	M22	**UCP218**	P218	UC218	96.1	71.5	13.9
	101.6	283	381	111	38	204	27	60	104	42.9	M22	**UCPX18**	PX18	UCX18	109	81.9	19.1
	118	330	430	110	40	234	33	45	96	40	M27	**UCP318**	P318	UC318	143	107	22.8
95	125	360	470	120	46	248	36	50	103	41	M30	**UCP319**	P319	UC319	153	119	29.0
100	127	337	432	121	45	245	33	65	117.5	49.2	M27	**UCPX20**	PX20	UCX20	133	105	30.4
	140	380	490	120	46	273	36	50	108	42	M30	**UCP320**	P320	UC320	173	141	35.1
105	140	380	490	120	46	278	36	50	112	44	M30	**UCP321**	P321	UC321	184	153	37.6
110	150	400	520	140	50	296	40	55	117	46	M33	**UCP322**	P322	UC322	205	180	44.0
120	160	450	570	140	50	316	40	55	126	51	M33	**UCP324**	P324	UC324	207	185	55.4
130	180	480	600	140	50	355	40	55	135	54	M33	**UCP326**	P326	UC326	229	214	72.1
140	200	500	620	140	60	393	40	55	145	59	M33	**UCP328**	P328	UC328	253	246	92.5

Remarks 1) Applicable sizes of grease nipples are shown below.
{ 1/4-28UNF ..... 201 – 210, X05 – X09, 305 – 308
PT 1/8 ..... 211 – 218, X10 – X20, 309 – 328 }

2) For bearings with double- or triple-lip seals, unit and bearing number are suffixed by L2 or L3.
(For more detailed information, refer to ball bearing for unit specification tables.)

Ball bearing units
pillow block type
UKP (adapter locking)
d 20 – 60 mm



Shaft dia. (mm)	Dimensions (mm)									Bolt size	Unit No.	Housing No.	Applicable bearing			(Refer.) Unit Mass
													No.	Basic load ratings (kN)		
d	*H*	*J*	*L*	*A*	H_1	H_2	*N*	N_1	B_1					C_r	C_{0r}	(kg)
20	36.5	105	140	38	13	71	13	18	29	M10	**UKP205**	P205	UK205	14.0	7.85	0.84
	44.4	119	159	51	16	86	17	25	35	M14	**UKPX05**	PX05	UKX05	19.5	11.3	1.5
	45	132	175	45	16	85	17	20	35	M14	**UKP305**	P305	UK305	20.6	11.3	1.7
25	42.9	121	165	48	15	84	17	21	31	M14	**UKP206**	P206	UK206	19.5	11.3	1.4
	47.6	127	175	57	17	93	17	25	38	M14	**UKPX06**	PX06	UKX06	25.7	15.4	2.1
	50	140	180	50	17	95	17	20	38	M14	**UKP306**	P306	UK306	26.7	15.0	2.3
30	47.6	127	167	48	16	93	17	21	35	M14	**UKP207**	P207	UK207	25.7	15.4	1.7
	54	144	203	57	19	105	17	30	43	M14	**UKPX07**	PX07	UKX07	29.1	17.8	2.7
	56	160	210	56	19	107	17	25	43	M14	**UKP307**	P307	UK307	33.4	19.3	3.0
35	49.2	137	184	54	17	98	17	21	36	M14	**UKP208**	P208	UK208	29.1	17.8	2.0
	58.7	156	222	67	21	114	20	32	46	M16	**UKPX08**	PX08	UKX08	32.7	20.3	3.5
	60	170	220	60	19	118	17	27	46	M14	**UKP308**	P308	UK308	40.7	24.0	3.8
40	54	146	190	54	17	106	17	21	39	M14	**UKP209**	P209	UK209	32.7	20.3	2.3
	58.7	156	222	67	21	116	20	33	50	M16	**UKPX09**	PX09	UKX09	35.1	23.3	3.7
	67	190	245	67	21	132	20	30	50	M16	**UKP309**	P309	UK309	48.9	29.5	5.0
45	57.2	159	206	60	19	113	20	22	42	M16	**UKP210**	P210	UK210	35.1	23.3	3.0
	63.5	171	241	73	22	126	20	36	55	M16	**UKPX10**	PX10	UKX10	43.4	29.4	4.6
	75	212	275	75	24	148	20	35	55	M16	**UKP310**	P310	UK310	62.0	38.3	6.7
50	63.5	171	219	60	19	125	20	22	45	M16	**UKP211**	P211	UK211	43.4	29.4	3.7
	69.8	184	260	79	28	139	25	36	59	M20	**UKPX11**	PX11	UKX11	52.4	36.2	6.2
	80	236	310	80	27	158	20	38	59	M16	**UKP311**	P311	UK311	71.6	45.0	8.1
55	69.8	184	241	70	22	138	20	25	47	M16	**UKP212**	P212	UK212	52.4	36.2	4.8
	76.2	203	286	83	28	152	25	40	62	M20	**UKPX12**	PX12	UKX12	57.2	40.1	7.5
	85	250	330	85	29	167	25	38	62	M20	**UKP312**	P312	UK312	81.9	52.2	9.4
60	76.2	203	265	70	25	150	25	30	50	M20	**UKP213**	P213	UK213	57.2	40.1	5.8
	76.2	203	286	83	28	155	25	40	65	M20	**UKPX13**	PX13	UKX13	62.2	44.1	7.8
	90	260	340	90	32	176	25	38	65	M20	**UKP313**	P313	UK313	92.7	59.9	10.8

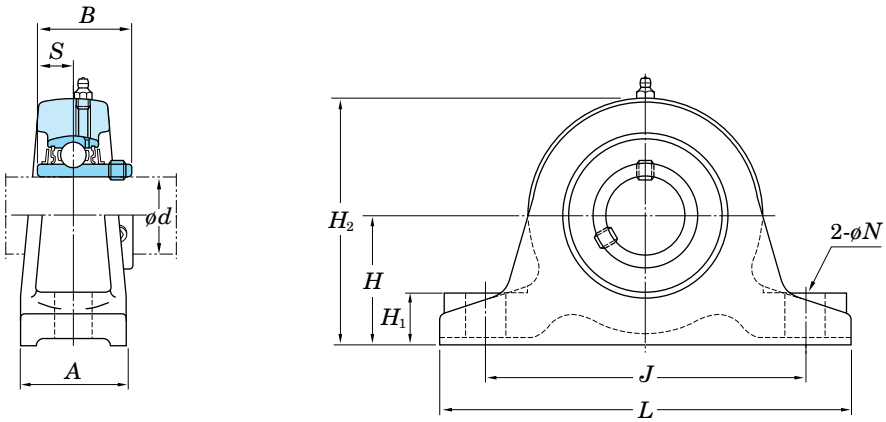
Remark) Applicable sizes of grease nipples are shown below.
1/4-28UNF ..... 205 – 210, X05 – X09, 305 – 308
PT 1/8 ..... 211 – 218, X10 – X20, 309 – 328

d 65 – 125 mm

Shaft dia. (mm)	Dimensions (mm)									Bolt size	Unit No.	Housing No.	Applicable bearing			(Refer.) Unit Mass
													No.	Basic load ratings (kN)		
d	*H*	*J*	*L*	*A*	H_1	H_2	*N*	N_1	B_1					C_r	C_{0r}	(kg)
65	82.6	217	275	74	28	162	25	30	55	M20	**UKP215**	P215	UK215	67.4	48.3	7.5
	88.9	229	330	89	32	175	27	50	73	M22	**UKPX15**	PX15	UKX15	72.7	53.0	10.5
	100	290	380	100	35	198	27	40	73	M22	**UKP315**	P315	UK315	113	77.2	14.9
70	88.9	232	292	78	32	174	25	35	59	M20	**UKP216**	P216	UK216	72.7	53.0	9.2
	101.6	283	381	102	34	195	27	58	78	M22	**UKPX16**	PX16	UKX16	84.0	61.9	15.4
	106	300	400	110	35	209	27	40	78	M22	**UKP316**	P316	UK316	123	86.7	18.6
75	95.2	247	310	83	32	185	25	40	63	M20	**UKP217**	P217	UK217	84.0	61.9	11.0
	101.6	283	381	102	34	200	27	60	82	M22	**UKPX17**	PX17	UKX17	96.1	71.5	15.8
	112	320	420	110	40	220	33	45	82	M27	**UKP317**	P317	UK317	133	96.8	20.2
80	101.6	262	327	88	34	198	27	45	65	M22	**UKP218**	P218	UK218	96.1	71.5	13.8
	101.6	283	381	111	38	204	27	60	86	M22	**UKPX18**	PX18	UKX18	109	81.9	18.6
	118	330	430	110	40	234	33	45	86	M27	**UKP318**	P318	UK318	143	107	22.8
85	125	360	470	120	46	248	36	50	90	M30	**UKP319**	P319	UK319	153	119	29.3
90	127	337	432	121	45	245	33	65	97	M27	**UKPX20**	PX20	UKX20	133	105	29.3
	140	380	490	120	46	273	36	50	97	M30	**UKP320**	P320	UK320	173	141	34.8
100	150	400	520	140	50	296	40	55	105	M33	**UKP322**	P322	UK322	205	180	43.9
110	160	450	570	140	50	316	40	55	112	M33	**UKP324**	P324	UK324	207	185	55.7
115	180	480	600	140	50	355	40	55	121	M33	**UKP326**	P326	UK326	229	214	71.9
125	200	500	620	140	60	393	40	55	131	M33	**UKP328**	P328	UK328	253	246	92.5

Remark) Applicable sizes of grease nipples are shown below.
(1/4-28UNF ..... 205 – 210, X05 – X09, 305 – 308
PT 1/8 ..... 211 – 218, X10 – X20, 309 – 328)

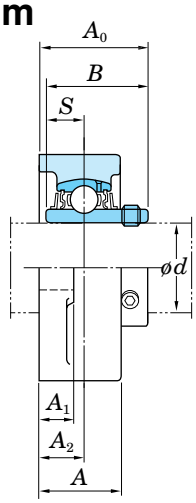
Ball bearing units
thick section pillow block type
UCIP (set screw locking)
d 40 – 140 mm

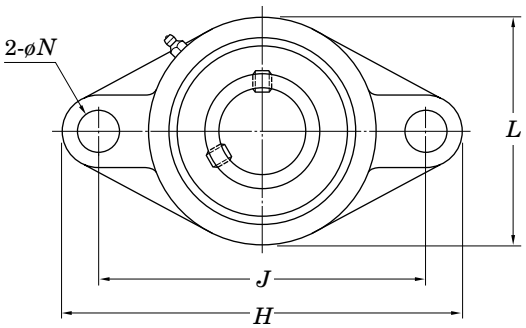


Shaft dia. (mm)	Dimensions (mm)									Bolt size	Unit No.	Housing No.	Applicable bearing			(Refer.) Unit Mass
													No.	Basic load ratings (kN)		
d	*H*	*J*	*L*	*A*	H_1	H_2	*N*	*B*	*S*					C_r	C_{0r}	(kg)
40	60	150	200	60	25	115	19	49.2	19	M16	**UCIP208**	IP208	UC208	29.1	17.8	3.4
45	70	160	210	60	25	128	19	49.2	19	M16	**UCIP209**	IP209	UC209	32.7	20.3	3.9
50	70	170	220	60	28	132	19	51.6	19	M16	**UCIP210**	IP210	UC210	35.1	23.3	4.8
55	80	180	230	60	28	148	19	55.6	22.2	M16	**UCIP211**	IP211	UC211	43.4	29.4	5.3
60	80	200	260	70	30	155	22	65.1	25.4	M20	**UCIP212**	IP212	UC212	52.4	36.2	7.2
65	90	220	280	70	30	172	22	65.1	25.4	M20	**UCIP213**	IP213	UC213	57.2	40.1	8.8
	110	250	310	70	30	208	22	75	30	M20	**UCIP313**	IP313	UC313	92.7	59.9	13.4
70	110	270	330	75	35	215	25	78	33	M22	**UCIP314**	IP314	UC314	104	68.2	15.3
75	120	280	340	75	35	230	25	82	32	M22	**UCIP315**	IP315	UC315	113	77.2	17.6
80	120	290	350	85	40	235	25	86	34	M22	**UCIP316**	IP316	UC316	123	86.7	20.3
85	130	310	370	85	40	255	25	96	40	M22	**UCIP317**	IP317	UC317	133	96.8	25.9
90	130	330	400	85	45	260	29	96	40	M27	**UCIP318**	IP318	UC318	143	107	28.6
95	150	340	410	85	45	285	29	103	41	M27	**UCIP319**	IP319	UC319	153	119	31.7
100	150	360	430	85	45	295	29	108	42	M27	**UCIP320**	IP320	UC320	173	141	36.9
110	170	410	490	100	50	335	32	117	46	M30	**UCIP322**	IP322	UC322	205	180	52.4
120	170	430	510	100	50	345	32	126	51	M30	**UCIP324**	IP324	UC324	207	185	58.7
130	200	470	550	110	50	390	32	135	54	M30	**UCIP326**	IP326	UC326	229	214	76.2
140	200	500	590	110	55	400	35	145	59	M33	**UCIP328**	IP328	UC328	253	246	87.0

Remarks 1) Applicable sizes of grease nipples are shown below.
{1/4-28UNF ..... 208 – 210
PT 1/8 ..... 211 – 213, 313 – 328}
2) Bearings with triple-lip seals are indicated by L3 after the bearing and unit number.
(For more detailed information, refer to ball bearing for unit specification tables.)

Ball bearing units
rhombic-flanged type
UCFL (set screw locking)
d 12 – 60 mm





Shaft dia. (mm)	Dimensions (mm)										Bolt size	Unit No.	Housing No.	Applicable bearing			(Refer.) Unit Mass
														No.	Basic load ratings (kN)		
d	*H*	*J*	*L*	*A*	A_1	A_2	A_0	*N*	*B*	*S*					C_r	C_{0r}	(kg)
12	113	90	60	25.5	11	15	33.3	12	31	12.7	M10	**UCFL201**	FL204	UC201	12.8	6.65	0.50
15	113	90	60	25.5	11	15	33.3	12	31	12.7	M10	**UCFL202**	FL204	UC202	12.8	6.65	0.48
17	113	90	60	25.5	11	15	33.3	12	31	12.7	M10	**UCFL203**	FL204	UC203	12.8	6.65	0.47
20	113	90	60	25.5	11	15	33.3	12	31	12.7	M10	**UCFL204**	FL204	UC204	12.8	6.65	0.45
25	130	99	68	27	13	16	35.8	16	34.1	14.3	M14	**UCFL205**	FL205	UC205	14.0	7.85	0.64
	141	117	83	30	13	18	40.2	12	38.1	15.9	M10	**UCFLX05**	FLX05	UCX05	19.5	11.3	1.1
	150	113	80	29	13	16	39	19	38	15	M16	**UCFL305**	FL305	UC305	20.6	11.3	1.1
30	148	117	80	31	13	18	40.2	16	38.1	15.9	M14	**UCFL206**	FL206	UC206	19.5	11.3	0.93
	156	130	95	34	14	19	44.4	16	42.9	17.5	M14	**UCFLX06**	FLX06	UCX06	25.7	15.4	1.5
	180	134	90	32	15	18	44	23	43	17	M20	**UCFL306**	FL306	UC306	26.7	15.0	1.5
35	161	130	90	34	14	19	44.4	16	42.9	17.5	M14	**UCFL207**	FL207	UC207	25.7	15.4	1.2
	171	144	105	38	14	21	51.2	16	49.2	19	M14	**UCFLX07**	FLX07	UCX07	29.1	17.8	1.9
	185	141	100	36	16	20	49	23	48	19	M20	**UCFL307**	FL307	UC307	33.4	19.3	1.8
40	175	144	100	36	14	21	51.2	16	49.2	19	M14	**UCFL208**	FL208	UC208	29.1	17.8	1.6
	179	148	111	40	14	22	52.2	16	49.2	19	M14	**UCFLX08**	FLX08	UCX08	32.7	20.3	2.1
	200	158	112	40	17	23	56	23	52	19	M20	**UCFL308**	FL308	UC308	40.7	24.0	2.5
45	188	148	108	38	15	22	52.2	19	49.2	19	M16	**UCFL209**	FL209	UC209	32.7	20.3	1.9
	189	157	116	40	14	23	55.6	16	51.6	19	M14	**UCFLX09**	FLX09	UCX09	35.1	23.3	2.4
	230	177	125	44	18	25	60	25	57	22	M22	**UCFL309**	FL309	UC309	48.9	29.5	3.5
50	197	157	115	40	15	22	54.6	19	51.6	19	M16	**UCFL210**	FL210	UC210	35.1	23.3	2.2
	216	184	133	44	20	26	59.4	19	55.6	22.2	M16	**UCFLX10**	FLX10	UCX10	43.4	29.4	3.8
	240	187	140	48	19	28	67	25	61	22	M22	**UCFL310**	FL310	UC310	62.0	38.3	4.4
55	224	184	130	43	18	25	58.4	19	55.6	22.2	M16	**UCFL211**	FL211	UC211	43.4	29.4	3.3
	250	198	150	52	20	30	71	25	66	25	M22	**UCFL311**	FL311	UC311	71.6	45.0	5.3
60	250	202	140	48	18	29	68.7	23	65.1	25.4	M20	**UCFL212**	FL212	UC212	52.4	36.2	4.2
	270	212	160	56	22	33	78	31	71	26	M27	**UCFL312**	FL312	UC312	81.9	52.2	6.5

Remarks 1) Applicable sizes of grease nipples are shown below.
1/4-28UNF ..... 201 – 210, X05 – X09, 305 – 308
PT 1/8 ..... 211 – 218, X10, 309 – 318

2) For bearings with double- or triple-lip seals, unit and bearing number are suffixed by L2 or L3.
(For more detailed information, refer to ball bearing for unit specification tables.)

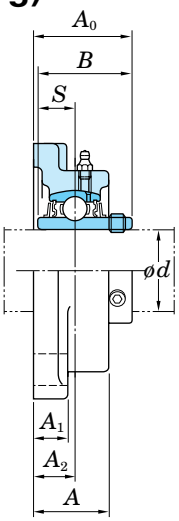
d 65 – 90 mm

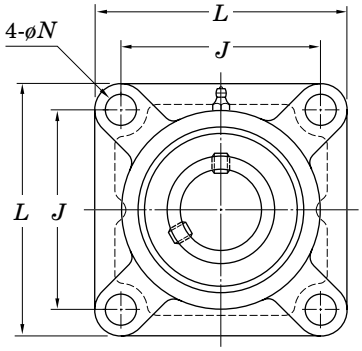
Shaft dia. (mm)	Dimensions (mm)										Bolt size	Unit No.	Housing No.	Applicable bearing			(Refer.) Unit Mass
														No.	Basic load ratings (kN)		
d	H	J	L	A	A_1	A_2	A_0	N	B	S					C_r	C_{0r}	(kg)
65	258	210	155	50	20	30	69.7	23	65.1	25.4	M20	**UCFL213**	FL213	UC213	57.2	40.1	5.1
	295	240	175	58	25	33	78	31	75	30	M27	**UCFL313**	FL313	UC313	92.7	59.9	8.5
70	265	216	160	54	20	31	75.4	23	74.6	30.2	M20	**UCFL214**	FL214	UC214	62.2	44.1	5.7
	315	250	185	61	28	36	81	35	78	33	M30	**UCFL314**	FL314	UC314	104	68.2	9.7
75	275	225	165	56	20	34	78.5	23	77.8	33.3	M20	**UCFL215**	FL215	UC215	67.4	48.3	6.4
	320	260	195	66	30	39	89	35	82	32	M30	**UCFL315**	FL315	UC315	113	77.2	11.3
80	290	233	180	58	20	34	83.3	25	82.6	33.3	M22	**UCFL216**	FL216	UC216	72.7	53.0	7.8
	355	285	210	68	32	38	90	38	86	34	M33	**UCFL316**	FL316	UC316	123	86.7	14.4
85	305	248	190	63	22	36	87.6	25	85.7	34.1	M22	**UCFL217**	FL217	UC217	84.0	61.9	9.8
	370	300	220	74	32	44	100	38	96	40	M33	**UCFL317**	FL317	UC317	133	96.8	16.0
90	320	265	205	68	23	40	96.3	25	96	39.7	M22	**UCFL218**	FL218	UC218	96.1	71.5	12.3
	385	315	235	76	36	44	100	38	96	40	M33	**UCFL318**	FL318	UC318	143	107	19.0

Remarks 1) Applicable sizes of grease nipples are shown below.
{ 1/4-28UNF ..... 201 – 210, X05 – X09, 305 – 308
PT 1/8 ..... 211 – 218, X10, 309 – 318 }

2) For bearings with double- or triple-lip seals, unit and bearing number are suffixed by L2 or L3.
(For more detailed information, refer to ball bearing for unit specification tables.)

Ball bearing units
square-flanged type
UCF (set screw locking)
d 12 – 55 mm





Shaft dia. (mm) d	Dimensions (mm) J	L	A	A_1	A_2	A_0	N	B	S	Bolt size	Unit No.	Housing No.	Applicable bearing No.	Basic load ratings (kN) C_r	C_{0r}	(Refer.) Unit Mass (kg)
12	64	86	25.5	11	15	33.3	12	31	12.7	M10	**UCF201**	F204	UC201	12.8	6.65	0.64
15	64	86	25.5	11	15	33.3	12	31	12.7	M10	**UCF202**	F204	UC202	12.8	6.65	0.62
17	64	86	25.5	11	15	33.3	12	31	12.7	M10	**UCF203**	F204	UC203	12.8	6.65	0.61
20	64	86	25.5	11	15	33.3	12	31	12.7	M10	**UCF204**	F204	UC204	12.8	6.65	0.59
25	70	95	27	13	16	35.8	12	34.1	14.3	M10	**UCF205**	F205	UC205	14.0	7.85	0.83
	83	108	30	13	18	40.2	12	38.1	15.9	M10	**UCFX05**	FX05	UCX05	19.5	11.3	1.2
	80	110	29	13	16	39	16	38	15	M14	**UCF305**	F305	UC305	20.6	11.3	1.3
30	83	108	31	13	18	40.2	12	38.1	15.9	M10	**UCF206**	F206	UC206	19.5	11.3	1.1
	92	117	34	14	19	44.4	16	42.9	17.5	M14	**UCFX06**	FX06	UCX06	25.7	15.4	1.6
	95	125	32	15	18	44	16	43	17	M14	**UCF306**	F306	UC306	26.7	15.0	1.9
35	92	117	34	15	19	44.4	14	42.9	17.5	M12	**UCF207**	F207	UC207	25.7	15.4	1.5
	102	130	38	14	21	51.2	16	49.2	19	M14	**UCFX07**	FX07	UCX07	29.1	17.8	2.0
	100	135	36	16	20	49	19	48	19	M16	**UCF307**	F307	UC307	33.4	19.3	2.3
40	102	130	36	15	21	51.2	16	49.2	19	M14	**UCF208**	F208	UC208	29.1	17.8	1.9
	105	137	40	14	22	52.2	19	49.2	19	M16	**UCFX08**	FX08	UCX08	32.7	20.3	2.4
	112	150	40	17	23	56	19	52	19	M16	**UCF308**	F308	UC308	40.7	24.0	3.1
45	105	137	38	16	22	52.2	16	49.2	19	M14	**UCF209**	F209	UC209	32.7	20.3	2.2
	111	143	40	14	23	55.6	19	51.6	19	M16	**UCFX09**	FX09	UCX09	35.1	23.3	2.7
	125	160	44	18	25	60	19	57	22	M16	**UCF309**	F309	UC309	48.9	29.5	4.0
50	111	143	40	16	22	54.6	16	51.6	19	M14	**UCF210**	F210	UC210	35.1	23.3	2.5
	130	162	44	20	26	59.4	19	55.6	22.2	M16	**UCFX10**	FX10	UCX10	43.4	29.4	3.7
	132	175	48	19	28	67	23	61	22	M20	**UCF310**	F310	UC310	62.0	38.3	5.1
55	130	162	43	18	25	58.4	19	55.6	22.2	M16	**UCF211**	F211	UC211	43.4	29.4	3.4
	143	175	49	20	29	68.7	19	65.1	25.4	M16	**UCFX11**	FX11	UCX11	52.4	36.2	4.9
	140	185	52	20	30	71	23	66	25	M20	**UCF311**	F311	UC311	71.6	45.0	5.6

Remarks 1) Applicable sizes of grease nipples are shown below.
1/4-28UNF ..... 201 – 210, X05 – X09, 305 – 308
PT 1/8 ..... 211 – 218, X10 – X20, 309 – 328

2) For bearings with double- or triple-lip seals, unit and bearing number are suffixed by L2 or L3.
(For more detailed information, refer to ball bearing for unit specification tables.)

d 60 – 140 mm

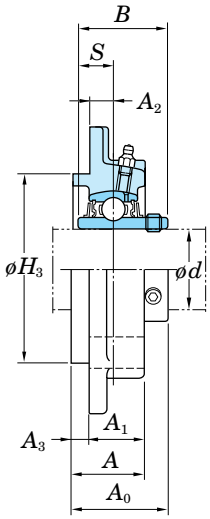
Shaft dia. (mm) *d*	Dimensions (mm) *J*	*L*	*A*	A_1	A_2	A_0	*N*	*B*	*S*	Bolt size	Unit No.	Housing No.	Applicable bearing No.	Basic load ratings (kN) C_r	C_{0r}	(Refer.) Unit Mass (kg)
60	143	175	48	18	29	68.7	19	65.1	25.4	M16	**UCF212**	F212	UC212	52.4	36.2	4.2
	149	187	59	21	34	73.7	19	65.1	25.4	M16	**UCFX12**	FX12	UCX12	57.2	40.1	5.7
	150	195	56	22	33	78	23	71	26	M20	**UCF312**	F312	UC312	81.9	52.2	6.9
65	149	187	50	22	30	69.7	19	65.1	25.4	M16	**UCF213**	F213	UC213	57.2	40.1	5.2
	149	187	59	21	34	78.4	19	74.6	30.2	M16	**UCFX13**	FX13	UCX13	62.2	44.1	6.3
	166	208	58	22	33	78	23	75	30	M20	**UCF313**	F313	UC313	92.7	59.9	7.8
70	152	193	54	22	31	75.4	19	74.6	30.2	M16	**UCF214**	F214	UC214	62.2	44.1	5.9
	152	197	60	22	37	81.5	23	77.8	33.3	M20	**UCFX14**	FX14	UCX14	67.4	48.3	7.0
	178	226	61	25	36	81	25	78	33	M22	**UCF314**	F314	UC314	104	68.2	10.1
75	159	200	56	22	34	78.5	19	77.8	33.3	M16	**UCF215**	F215	UC215	67.4	48.3	6.4
	152	197	68	24	40	89.3	23	82.6	33.3	M20	**UCFX15**	FX15	UCX15	72.7	53.0	8.4
	184	236	66	25	39	89	25	82	32	M22	**UCF315**	F315	UC315	113	77.2	11.6
80	165	208	58	22	34	83.3	23	82.6	33.3	M20	**UCF216**	F216	UC216	72.7	53.0	7.3
	171	214	70	24	40	91.6	23	85.7	34.1	M20	**UCFX16**	FX16	UCX16	84.0	61.9	9.4
	196	250	68	27	38	90	31	86	34	M27	**UCF316**	F316	UC316	123	86.7	12.8
85	175	220	63	24	36	87.6	23	85.7	34.1	M20	**UCF217**	F217	UC217	84.0	61.9	8.9
	171	214	70	24	40	96.3	23	96	39.7	M20	**UCFX17**	FX17	UCX17	96.1	71.5	10.8
	204	260	74	27	44	100	31	96	40	M27	**UCF317**	F317	UC317	133	96.8	15.3
90	187	235	68	25	40	96.3	23	96	39.7	M20	**UCF218**	F218	UC218	96.1	71.5	11.4
	171	214	76	24	45	106.1	23	104	42.9	M20	**UCFX18**	FX18	UCX18	109	81.9	11.9
	216	280	76	30	44	100	35	96	40	M30	**UCF318**	F318	UC318	143	107	18.9
95	228	290	94	30	59	121	35	103	41	M30	**UCF319**	F319	UC319	153	119	21.6
100	211	268	97	28	59	127.3	31	117.5	49.2	M27	**UCFX20**	FX20	UCX20	133	105	19.4
	242	310	94	32	59	125	38	108	42	M33	**UCF320**	F320	UC320	173	141	25.8
105	242	310	94	32	59	127	38	112	44	M33	**UCF321**	F321	UC321	184	153	30.2
110	266	340	96	35	60	131	41	117	46	M36	**UCF322**	F322	UC322	205	180	35.3
120	290	370	110	40	65	140	41	126	51	M36	**UCF324**	F324	UC324	207	185	47.3
130	320	410	115	45	65	146	41	135	54	M36	**UCF326**	F326	UC326	229	214	65.5
140	350	450	125	55	75	161	41	145	59	M36	**UCF328**	F328	UC328	253	246	93.4

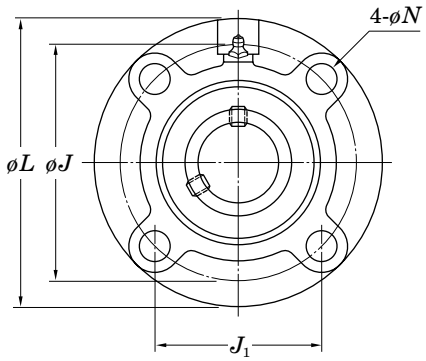
Remarks 1) Applicable sizes of grease nipples are shown below.
1/4-28UNF ..... 201 – 210, X05 – X09, 305 – 308
PT 1/8 ..... 211 – 218, X10 – X20, 309 – 328

2) For bearings with double- or triple-lip seals, unit and bearing number are suffixed by L2 or L3.
(For more detailed information, refer to ball bearing for unit specification tables.)

Ball bearing units
round-falnged type with spigot joint
UCFC (set screw locking)

d 12 – 70 mm





Shaft dia. (mm) d	Dimensions (mm) L	J	J_1	H_3	A	A_1	A_2	A_3	A_0	N	B	S	Bolt size	Unit No.	Housing No.	Applicable bearing No.	Basic load ratings (kN) C_r	C_{0r}	(Refer.) Unit Mass (kg)
12	100	78	55.1	62	25.5	20.5	10	5	33.3	12	31	12.7	M10	**UCFC201**	FC204	UC201	12.8	6.65	0.78
15	100	78	55.1	62	25.5	20.5	10	5	33.3	12	31	12.7	M10	**UCFC202**	FC204	UC202	12.8	6.65	0.76
17	100	78	55.1	62	25.5	20.5	10	5	33.3	12	31	12.7	M10	**UCFC203**	FC204	UC203	12.8	6.65	0.75
20	100	78	55.1	62	25.5	20.5	10	5	33.3	12	31	12.7	M10	**UCFC204**	FC204	UC204	12.8	6.65	0.73
25	115	90	63.6	70	27	21	10	6	35.8	12	34.1	14.3	M10	**UCFC205**	FC205	UC205	14.0	7.85	0.95
	111	92	65	76	30	24	10	6	38.2	9.5	38.1	15.9	M8	**UCFCX05**	FCX05	UCX05	19.5	11.3	1.2
30	125	100	70.7	80	31	23	10	8	40.2	12	38.1	15.9	M10	**UCFC206**	FC206	UC206	19.5	11.3	1.3
	127	105	74.2	85	32	22.5	8	9.5	42.9	12	42.9	17.5	M10	**UCFCX06**	FCX06	UCX06	25.7	15.4	1.5
35	135	110	77.8	90	34	26	11	8	44.4	14	42.9	17.5	M12	**UCFC207**	FC207	UC207	25.7	15.4	1.7
	133	111	78.5	92	37	26	9	11	50.2	12	49.2	19	M10	**UCFCX07**	FCX07	UCX07	29.1	17.8	1.9
40	145	120	84.8	100	36	26	11	10	51.2	14	49.2	19	M12	**UCFC208**	FC208	UC208	29.1	17.8	2.0
	133	111	78.5	92	37	26	9	11	50.2	12	49.2	19	M10	**UCFCX08**	FCX08	UCX08	32.7	20.3	2.0
45	160	132	93.3	105	38	26	10	12	52.2	16	49.2	19	M14	**UCFC209**	FC209	UC209	32.7	20.3	2.6
	155	130	91.9	108	37	25	8	12	52.6	14	51.6	19	M12	**UCFCX09**	FCX09	UCX09	35.1	23.3	2.6
50	165	138	97.6	110	40	28	10	12	54.6	16	51.6	19	M14	**UCFC210**	FC210	UC210	35.1	23.3	2.9
	162	136	96.2	118	41	25	7	16	56.4	14	55.6	22.2	M12	**UCFCX10**	FCX10	UCX10	43.4	29.4	3.2
55	185	150	106.1	125	43	31	13	12	58.4	19	55.6	22.2	M16	**UCFC211**	FC211	UC211	43.4	29.4	4.2
	180	152	107.5	127	48	26	4	22	65.7	16	65.1	25.4	M14	**UCFCX11**	FCX11	UCX11	52.4	36.2	4.3
60	195	160	113.1	135	48	36	17	12	68.7	19	65.1	25.4	M16	**UCFC212**	FC212	UC212	52.4	36.2	5.0
	194	165	116.7	140	53	33	11	20	70.7	16	65.1	25.4	M14	**UCFCX12**	FCX12	UCX12	57.2	40.1	5.3
65	205	170	120.2	145	50	36	16	14	69.7	19	65.1	25.4	M16	**UCFC213**	FC213	UC213	57.2	40.1	5.6
	194	165	116.7	140	53	33	11	20	75.4	16	74.6	30.2	M14	**UCFCX13**	FCX13	UCX13	62.2	44.1	5.7
70	215	177	125.1	150	54	40	17	14	75.4	19	74.6	30.2	M16	**UCFC214**	FC214	UC214	62.2	44.1	6.8
	222	190	134.3	164	56	36	14	20	78.5	19	77.8	33.3	M16	**UCFCX14**	FCX14	UCX14	67.4	48.3	7.3

Remarks 1) Applicable sizes of grease nipples are shown below.
1/4-28UNF ..... 201 – 210, X05 – X09
PT 1/8 ..... 211 – 218, X10 – X20

2) For bearings with double- or triple-lip seals, unit and bearing number are suffixed by L2 or L3.
(For more detailed information, refer to ball bearing for unit specification tables.)

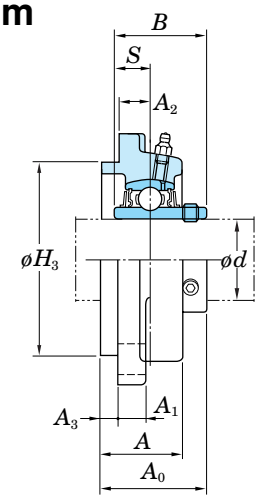
d 75 – 100 mm

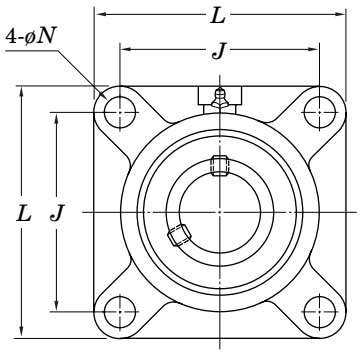
Shaft dia. (mm)	Dimensions (mm)												Bolt size	Unit No.	Housing No.	Applicable bearing			(Refer.) Unit Mass
																No.	Basic load ratings (kN)		
d	L	J	J_1	H_3	A	A_1	A_2	A_3	A_0	N	B	S					C_r	C_{0r}	(kg)
75	220	184	130.1	160	56	40	18	16	78.5	19	77.8	33.3	M16	**UCFC215**	FC215	UC215	67.4	48.3	7.2
	222	190	134.3	164	57	35	12	22	83.3	19	82.6	33.3	M16	**UCFCX15**	FCX15	UCX15	72.7	53.0	8.0
80	240	200	141.4	170	58	42	18	16	83.3	23	82.6	33.3	M20	**UCFC216**	FC216	UC216	72.7	53.0	8.7
	260	219	154.8	186	61	36	10	25	86.6	23	85.7	34.1	M20	**UCFCX16**	FCX16	UCX16	84.0	61.9	11.3
85	250	208	147.1	180	63	45	18	18	87.6	23	85.7	34.1	M20	**UCFC217**	FC217	UC217	84.0	61.9	10.3
	260	219	154.8	186	61	36	10	25	91.3	23	96	39.7	M20	**UCFCX17**	FCX17	UCX17	96.1	71.5	12.9
90	265	220	155.5	190	68	50	22	18	96.3	23	96	39.7	M20	**UCFC218**	FC218	UC218	96.1	71.5	13.3
	260	219	154.8	186	71	43	12	28	101.1	23	104	42.9	M20	**UCFCX18**	FCX18	UCX18	109	81.9	13.5
100	276	238	168.3	206	94	66	22	28	118.3	23	117.5	49.2	M20	**UCFCX20**	FCX20	UCX20	133	105	18.2

Remarks 1) Applicable sizes of grease nipples are shown below.
1/4-28UNF ..... 201 – 210, X05 – X09
PT 1/8 ..... 211 – 218, X10 – X20

2) For bearings with double- or triple-lip seals, unit and bearing number are suffixed by L2 or L3.
(For more detailed information, refer to ball bearing for unit specification tables.)

Ball bearing units
square-flanged type with spigot joint
UCFS (set screw locking)
d 25 – 140 mm





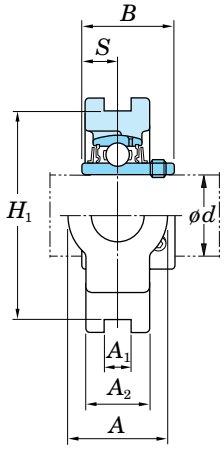
Shaft dia. (mm)	Dimensions (mm)											Bolt size	Unit No.	Housing No.	Applicable bearing			(Refer.) Unit Mass
															No.	Basic load ratings (kN)		
d	*J*	*L*	H_3	*A*	A_1	A_2	A_3	A_0	*N*	*B*	*S*					C_r	C_{0r}	(kg)
25	80	110	80	29	13	9	7	39	16	38	15	M14	**UCFS305**	FS305	UC305	20.6	11.3	1.4
30	95	125	90	32	15	10	8	44	16	43	17	M14	**UCFS306**	FS306	UC306	26.7	15.0	1.9
35	100	135	100	36	16	11	9	49	19	48	19	M16	**UCFS307**	FS307	UC307	33.4	19.3	2.3
40	112	150	115	40	17	13	10	56	19	52	19	M16	**UCFS308**	FS308	UC308	40.7	24.0	3.4
45	125	160	125	44	18	14	11	60	19	57	22	M16	**UCFS309**	FS309	UC309	48.9	29.5	4.4
50	132	175	140	48	19	16	12	67	23	61	22	M20	**UCFS310**	FS310	UC310	62.0	38.3	5.3
55	140	185	150	52	20	17	13	71	23	66	25	M20	**UCFS311**	FS311	UC311	71.6	45.0	6.1
60	150	195	160	56	22	19	14	78	23	71	26	M20	**UCFS312**	FS312	UC312	81.9	52.2	7.4
65	166	208	175	58	22	15	18	78	23	75	30	M20	**UCFS313**	FS313	UC313	92.7	59.9	8.8
70	178	226	185	61	25	18	18	81	25	78	33	M22	**UCFS314**	FS314	UC314	104	68.2	11.2
75	184	236	200	66	25	21	18	89	25	82	32	M22	**UCFS315**	FS315	UC315	113	77.2	13.7
80	196	250	210	68	27	18	20	90	31	86	34	M27	**UCFS316**	FS316	UC316	123	86.7	15.1
85	204	260	220	74	27	24	20	100	31	96	40	M27	**UCFS317**	FS317	UC317	133	96.8	17.3
90	216	280	240	76	30	24	20	100	35	96	40	M30	**UCFS318**	FS318	UC318	143	107	21.3
95	228	290	250	94	30	39	20	121	35	103	41	M30	**UCFS319**	FS319	UC319	153	119	24.5
100	242	310	260	94	32	39	20	125	38	108	42	M33	**UCFS320**	FS320	UC320	173	141	29.5
105	242	310	260	94	32	39	20	127	38	112	44	M33	**UCFS321**	FS321	UC321	184	153	32.7
110	266	340	300	96	35	35	25	131	41	117	46	M36	**UCFS322**	FS322	UC322	205	180	39.0
120	290	370	330	110	40	35	30	140	41	126	51	M36	**UCFS324**	FS324	UC324	207	185	50.6
130	320	410	360	115	45	35	30	146	41	135	54	M36	**UCFS326**	FS326	UC326	229	214	67.7
140	350	450	400	125	55	45	30	161	41	145	59	M36	**UCFS328**	FS328	UC328	253	246	94.0

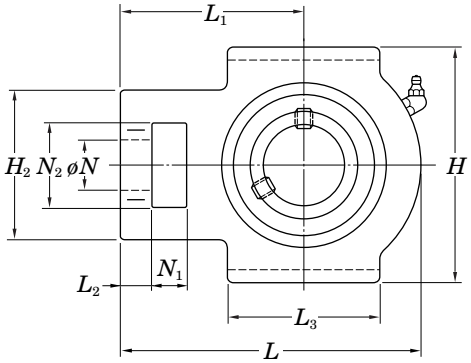
Remarks 1) Applicable sizes of grease nipples are shown below.
1/4-28UNF ..... 305 – 308
PT 1/8 ..... 309 – 328

2) Bearings with triple-lip seals are indicated by L3 after the bearing and unit number.
(For more detailed information, refer to ball bearing for unit specification tables.)

Ball bearing units take-up type UCT (set screw locking)

d 12 – 55 mm





Shaft dia. (mm) d	Dimensions (mm) A	A_1	A_2	H	H_1	H_2	L	L_1	L_2	L_3	N	N_1	N_2	B	S	Unit No.	Housing No.	Applicable bearing No.	Basic load ratings (kN) C_r	C_{0r}	(Refer.) Unit Mass (kg)
12	32	12	21	89	76	51	94	61	10	51	19	16	32	31	12.7	**UCT201**	T204	UC201	12.8	6.65	0.81
15	32	12	21	89	76	51	94	61	10	51	19	16	32	31	12.7	**UCT202**	T204	UC202	12.8	6.65	0.79
17	32	12	21	89	76	51	94	61	10	51	19	16	32	31	12.7	**UCT203**	T204	UC203	12.8	6.65	0.78
20	32	12	21	89	76	51	94	61	10	51	19	16	32	31	12.7	**UCT204**	T204	UC204	12.8	6.65	0.76
25	32	12	24	89	76	51	97	62	10	51	19	16	32	34.1	14.3	**UCT205**	T205	UC205	14.0	7.85	0.84
	37	12	28	102	89	56	113	70	10	57	22	16	37	38.1	15.9	**UCTX05**	TX05	UCX05	19.5	11.3	1.4
	36	12	26	89	80	62	122	76	12	65	26	16	36	38	15	**UCT305**	T305	UC305	20.6	11.3	1.4
30	37	12	28	102	89	56	113	70	10	57	22	16	37	38.1	15.9	**UCT206**	T206	UC206	19.5	11.3	1.3
	37	12	30	102	89	64	129	78	13	64	22	16	37	42.9	17.5	**UCTX06**	TX06	UCX06	25.7	15.4	1.7
	41	16	28	100	90	70	137	85	14	74	28	18	41	43	17	**UCT306**	T306	UC306	26.7	15.0	1.8
35	37	12	30	102	89	64	129	78	13	64	22	16	37	42.9	17.5	**UCT207**	T207	UC207	25.7	15.4	1.6
	49	16	36	114	102	83	144	88	15	83	29	19	49	49.2	19	**UCTX07**	TX07	UCX07	29.1	17.8	2.7
	45	16	32	111	100	75	150	94	15	80	30	20	45	48	19	**UCT307**	T307	UC307	33.4	19.3	2.3
40	49	16	33	114	102	83	144	88	16	83	29	19	49	49.2	19	**UCT208**	T208	UC208	29.1	17.8	2.5
	49	16	36	117	102	83	144	87	15	83	29	19	49	49.2	19	**UCTX08**	TX08	UCX08	32.7	20.3	2.6
	50	18	34	124	112	83	162	100	17	89	32	22	50	52	19	**UCT308**	T308	UC308	40.7	24.0	3.0
45	49	16	35	117	102	83	144	87	16	83	29	19	49	49.2	19	**UCT209**	T209	UC209	32.7	20.3	2.4
	49	16	38	117	102	83	149	90	16	86	29	19	49	51.6	19	**UCTX09**	TX09	UCX09	35.1	23.3	2.9
	55	18	38	138	125	90	178	110	18	97	34	24	55	57	22	**UCT309**	T309	UC309	48.9	29.5	4.1
50	49	16	37	117	102	83	149	90	16	86	29	19	49	51.6	19	**UCT210**	T210	UC210	35.1	23.3	2.6
	64	22	42	146	130	102	171	106	19	95	35	25	64	55.6	22.2	**UCTX10**	TX10	UCX10	43.4	29.4	4.4
	61	20	40	151	140	98	191	117	20	106	37	27	61	61	22	**UCT310**	T310	UC310	62.0	38.3	4.9
55	64	22	38	146	130	102	171	106	19	95	35	25	64	55.6	22.2	**UCT211**	T211	UC211	43.4	29.4	4.0
	64	22	44	146	130	102	194	119	19	102	35	32	64	65.1	25.4	**UCTX11**	TX11	UCX11	52.4	36.2	5.3
	66	22	44	163	150	105	207	127	21	115	39	29	66	66	25	**UCT311**	T311	UC311	71.6	45.0	6.1

Remarks 1) Applicable sizes of grease nipples are shown below.
{ 1/4-28UNF ..... 201 – 210, X05 – X09, 305 – 308
PT 1/8 ..... 211 – 217, X10 – X17, 309 – 328 }

2) For bearings with double- or triple-lip seals, unit and bearing number are suffixed by L2 or L3.
(For more detailed information, refer to ball bearing for unit specification tables.)

d 60 – 140 mm

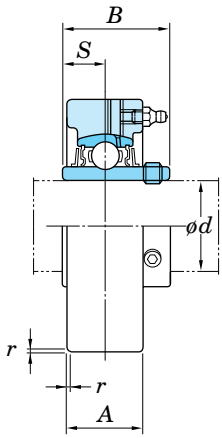
Shaft dia. (mm)	Dimensions (mm)															Unit No.	Housing No.	Applicable bearing			(Refer.) Unit Mass
																		No.	Basic load ratings (kN)		
d	A	A_1	A_2	H	H_1	H_2	L	L_1	L_2	L_3	N	N_1	N_2	B	S				C_r	C_{0r}	(kg)
60	64	22	42	146	130	102	194	119	19	102	35	32	64	65.1	25.4	**UCT212**	T212	UC212	52.4	36.2	4.9
	70	26	48	167	151	111	224	137	21	121	41	32	70	65.1	25.4	**UCTX12**	TX12	UCX12	57.2	40.1	7.4
	71	22	46	178	160	113	220	135	23	123	41	31	71	71	26	**UCT312**	T312	UC312	81.9	52.2	7.6
65	70	26	44	167	151	111	224	137	21	121	41	32	70	65.1	25.4	**UCT213**	T213	UC213	57.2	40.1	6.9
	70	26	48	167	151	111	224	137	21	121	41	32	70	74.6	30.2	**UCTX13**	TX13	UCX13	62.2	44.1	7.6
	80	26	50	190	170	116	238	146	25	134	43	32	70	75	30	**UCT313**	T313	UC313	92.7	59.9	9.3
70	70	26	46	167	151	111	224	137	21	121	41	32	70	74.6	30.2	**UCT214**	T214	UC214	62.2	44.1	7.0
	70	26	48	167	151	111	232	140	21	121	41	32	70	77.8	33.3	**UCTX14**	TX14	UCX14	67.4	48.3	7.9
	90	26	52	202	180	130	252	155	25	140	46	36	85	78	33	**UCT314**	T314	UC314	104	68.2	11.1
75	70	26	48	167	151	111	232	140	21	121	41	32	70	77.8	33.3	**UCT215**	T215	UC215	67.4	48.3	7.3
	70	28	48	184	165	111	235	140	21	121	41	32	70	82.6	33.3	**UCTX15**	TX15	UCX15	72.7	53.0	8.7
	90	26	55	216	192	132	262	160	25	150	46	36	85	82	32	**UCT315**	T315	UC315	113	77.2	13.0
80	70	26	51	184	165	111	235	140	21	121	41	32	70	82.6	33.3	**UCT216**	T216	UC216	72.7	53.0	8.2
	73	28	54	198	173	124	260	162	28	157	48	38	73	85.7	34.1	**UCTX16**	TX16	UCX16	84.0	61.9	11.7
	102	30	60	230	204	150	282	174	28	160	53	42	98	86	34	**UCT316**	T316	UC316	123	86.7	16.2
85	73	30	54	198	173	124	260	162	29	157	48	38	73	85.7	34.1	**UCT217**	T217	UC217	84.0	61.9	11.0
	73	28	54	198	173	124	260	162	28	157	48	38	73	96	39.7	**UCTX17**	TX17	UCX17	96.1	71.5	11.7
	102	32	64	240	214	152	298	183	30	170	53	42	98	96	40	**UCT317**	T317	UC317	133	96.8	19.0
90	110	32	66	255	228	160	312	192	30	175	57	46	106	96	40	**UCT318**	T318	UC318	143	107	21.6
95	110	35	72	270	240	165	322	197	31	180	57	46	106	103	41	**UCT319**	T319	UC319	153	119	24.9
100	120	35	75	290	260	175	345	210	32	200	59	48	115	108	42	**UCT320**	T320	UC320	173	141	30.7
105	120	35	75	290	260	175	345	210	32	200	59	48	115	112	44	**UCT321**	T321	UC321	184	153	36.7
110	130	38	80	320	285	185	385	235	38	215	65	52	125	117	46	**UCT322**	T322	UC322	205	180	39.7
120	140	45	90	355	320	210	432	267	42	230	70	60	140	126	51	**UCT324**	T324	UC324	207	185	54.4
130	150	50	100	385	350	220	465	285	45	240	75	65	150	135	54	**UCT326**	T326	UC326	229	214	69.3
140	155	50	100	415	380	230	515	315	50	255	80	70	160	145	59	**UCT328**	T328	UC328	253	246	85.1

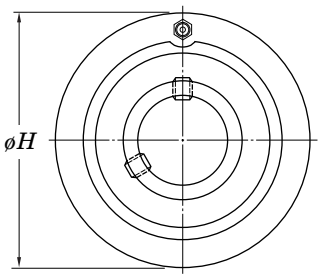
Remarks 1) Applicable sizes of grease nipples are shown below.
{ 1/4-28UNF ..... 201 – 210, X05 – X09, 305 – 308
PT 1/8 ..... 211 – 217, X10 – X17, 309 – 328 }

2) For bearings with double- or triple-lip seals, unit and bearing number are suffixed by L2 or L3.
(For more detailed information, refer to ball bearing for unit specification tables.)

Ball bearing units cartridge type UCC (set screw locking)

d 12 – 65 mm

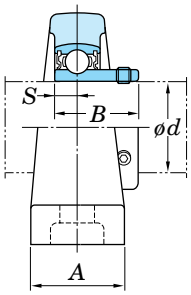


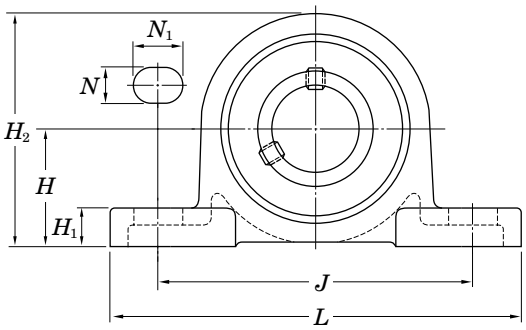


Shaft dia. (mm) *d*	Dimensions (mm) *H*	*A*	*r*	*B*	*S*	Unit No.	Housing No.	Applicable bearing No.	Basic load ratings (kN) C_r	C_{0r}	(Refer.) Unit Mass (kg)
12	72	20	1.5	31	12.7	**UCC201**	C204	UC201	12.8	6.65	0.52
15	72	20	1.5	31	12.7	**UCC202**	C204	UC202	12.8	6.65	0.50
17	72	20	1.5	31	12.7	**UCC203**	C204	UC203	12.8	6.65	0.49
20	72	20	1.5	31	12.7	**UCC204**	C204	UC204	12.8	6.65	0.47
25	80	22	1.5	34.1	14.3	**UCC205**	C205	UC205	14.0	7.85	0.64
30	85	27	1.5	38.1	15.9	**UCC206**	C206	UC206	19.5	11.3	0.81
35	90	28	2	42.9	17.5	**UCC207**	C207	UC207	25.7	15.4	0.93
40	100	30	2	49.2	19	**UCC208**	C208	UC208	29.1	17.8	1.2
45	110	31	2	49.2	19	**UCC209**	C209	UC209	32.7	20.3	1.5
50	120	33	2	51.6	19	**UCC210**	C210	UC210	35.1	23.3	2.0
55	125	35	2.5	55.6	22.2	**UCC211**	C211	UC211	43.4	29.4	2.2
60	130	38	2.5	65.1	25.4	**UCC212**	C212	UC212	52.4	36.2	2.6
65	140	40	2.5	65.1	25.4	**UCC213**	C213	UC213	57.2	40.1	3.0

Remarks 1) Applicable sizes of grease nipples are shown below.
(1/4-28UNF ..... 201 – 213)
2) For bearings with double- or triple-lip seals, unit and bearing number are suffixed by L2 or L3.
(For more detailed information, refer to ball bearing for unit specification tables.)

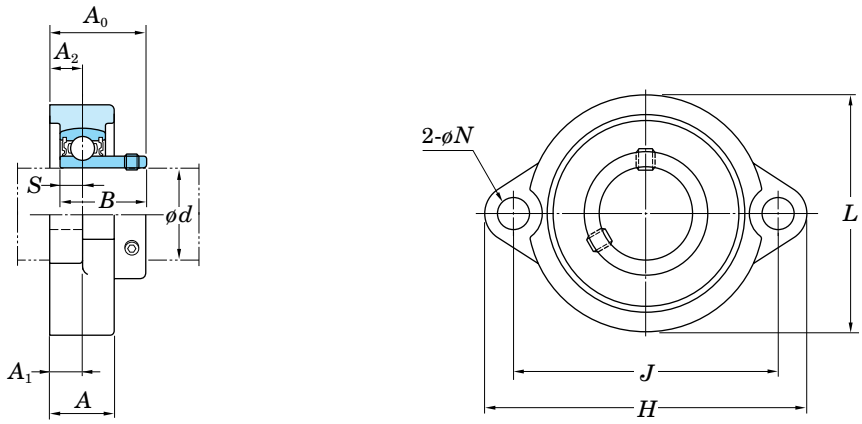
Ball bearing units
light duty pillow block type
BLP (set screw locking)
d 12 – 40 mm





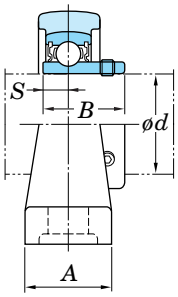
Shaft dia. (mm)	Dimensions (mm)										Bolt size	Unit No.	Housing No.	Applicable bearing			(Refer.) Unit Mass
														No.	Basic load ratings (kN)		
d	*H*	*J*	*L*	*A*	H_1	H_2	*N*	N_1	*B*	*S*					C_r	C_{0r}	(kg)
12	30.2	87	114	25	12	57	11	16	22	6	M10	**BLP201**	LP203	SB201	9.55	4.80	0.36
15	30.2	87	114	25	12	57	11	16	22	6	M10	**BLP202**	LP203	SB202	9.55	4.80	0.36
17	30.2	87	114	25	12	57	11	16	22	6	M10	**BLP203**	LP203	SB203	9.55	4.80	0.36
20	33.3	97	125	27	13	65	11	16	25	7	M10	**BLP204**	LP204	SB204	12.8	6.65	0.51
25	36.5	100	130	29	13	71	11	16	27	7.5	M10	**BLP205**	LP205	SB205	14.0	7.85	0.57
30	42.9	120	156	33	14	83	14	21	30	8	M12	**BLP206**	LP206	SB206	19.5	11.3	0.69
35	47.6	127	165	35	16	93	14	21	32	8.5	M12	**BLP207**	LP207	SB207	25.7	15.4	0.94
40	50.8	140	184	37	18	102	14	22	34	9	M12	**BLP208**	LP208	SB208	29.1	17.8	1.8

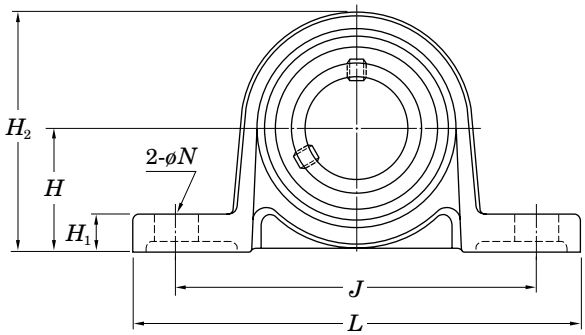
Ball bearing units
light duty rhombic-flanged type
BLF (set screw locking)
d 12 – 35 mm



Shaft dia. (mm)	Dimensions (mm)										Bolt size	Unit No.	Housing No.	Applicable bearing			(Refer.) Unit Mass
														No.	Basic load ratings (kN)		
d	*H*	*J*	*L*	*A*	A_1	A_2	A_0	*N*	*B*	*S*					C_r	C_{0r}	(kg)
12	81	63.5	52	18	9.5	9.5	25.5	8	22	6	M6	**BLF201**	LF203	SB201	9.55	4.80	0.25
15	81	63.5	52	18	9.5	9.5	25.5	8	22	6	M6	**BLF202**	LF203	SB202	9.55	4.80	0.25
17	81	63.5	52	18	9.5	9.5	25.5	8	22	6	M6	**BLF203**	LF203	SB203	9.55	4.80	0.25
20	90	71.5	60	20	11	11	29	10	25	7	M8	**BLF204**	LF204	SB204	12.8	6.65	0.33
25	95	76	64	20	11	11	30.5	10	27	7.5	M8	**BLF205**	LF205	SB205	14.0	7.85	0.38
30	113	90.5	76	22.5	12	12	34	12	30	8	M10	**BLF206**	LF206	SB206	19.5	11.3	0.57
35	122	100	89	24	13	13	36.5	12	32	8.5	M10	**BLF207**	LF207	SB207	25.7	15.4	0.77

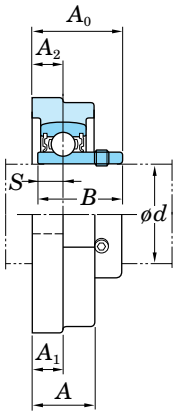
Ball bearing units
"clean" series pillow block type
UP (set screw locking)
d 10 – 30 mm

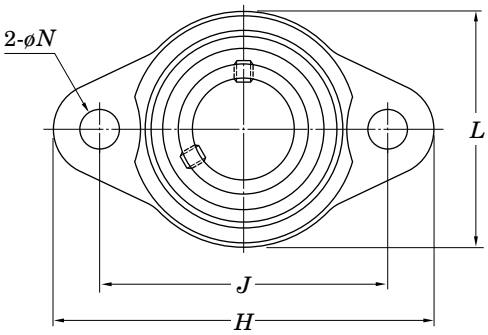




Shaft dia. (mm)	Dimensions (mm)									Bolt size	Unit No.	Housing No.	Applicable bearing			(Refer.) Unit Mass
													No.	Basic load ratings (kN)		
d	*H*	*J*	*L*	*A*	H_1	H_2	*N*	*B*	*S*					C_r	C_{0r}	(kg)
10	18	53	67	16	6	35	7	15	5	M6	**UP000**	P000	SU000	4.55	1.95	0.070
12	19	56	71	16	6	38	7	15	5	M6	**UP001**	P001	SU001	5.10	2.40	0.090
15	22	63	80	16	7	43	7	16.5	5.5	M6	**UP002**	P002	SU002	5.60	2.85	0.110
17	24	67	85	18	7	47	7	17.5	6	M6	**UP003**	P003	SU003	6.00	3.25	0.150
20	28	80	100	20	9	55	10	21	7	M8	**UP004**	P004	SU004	9.40	5.05	0.230
25	32	90	112	20	10	62	10	22	7	M8	**UP005**	P005	SU005	10.1	5.85	0.280
30	36	106	132	26	11	70	13	24.5	7.5	M10	**UP006**	P006	SU006	13.2	8.25	0.420

Ball bearing units
"clean" series rhombic-flanged type
UFL (set screw locking)
d 10 – 30 mm

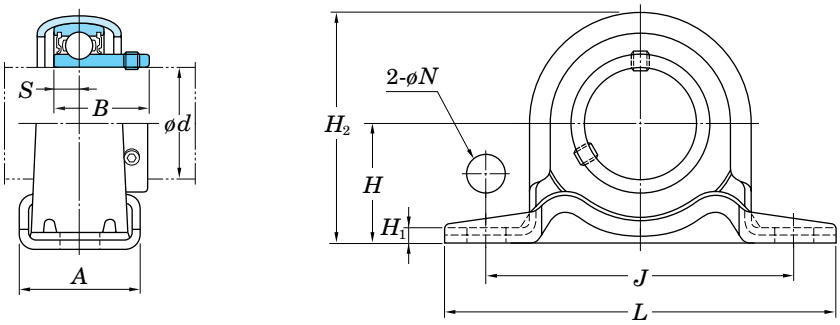




Shaft dia. (mm)	Dimensions (mm)										Bolt size	Unit No.	Housing No.	Applicable bearing			(Refer.) Unit Mass
														No.	Basic load ratings (kN)		
d	*H*	*J*	*L*	*A*	A_1	A_2	A_0	*N*	*B*	*S*					C_r	C_{0r}	(kg)
10	60	45	36	12	6	6	16	7	15	5	M6	**UFL000**	FL000	SU000	4.55	1.95	0.050
12	63	48	38	12	6	6	16	7	15	5	M6	**UFL001**	FL001	SU001	5.10	2.40	0.065
15	67	53	42	13	6.5	6.5	17.5	7	16.5	5.5	M6	**UFL002**	FL002	SU002	5.60	2.85	0.085
17	71	56	46	14	7	7	18.5	7	17.5	6	M6	**UFL003**	FL003	SU003	6.00	3.25	0.110
20	90	71	55	16	8	8	22	10	21	7	M8	**UFL004**	FL004	SU004	9.40	5.05	0.180
25	95	75	60	16	8	8	23	10	22	7	M8	**UFL005**	FL005	SU005	10.1	5.85	0.230
30	112	85	70	18	9	9	26	13	24.5	7.5	M10	**UFL006**	FL006	SU006	13.2	8.25	0.310

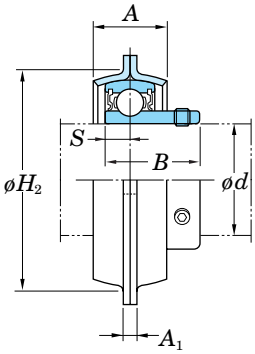
Ball bearing units pressed steel pillow block type SBPP (set screw locking)

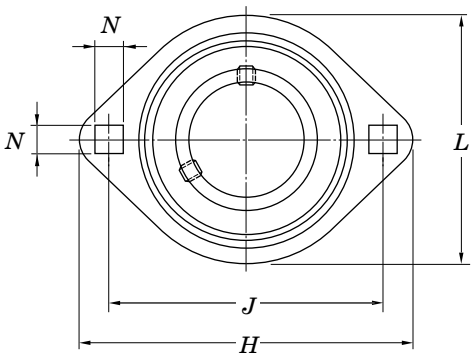
d 12 – 35 mm



Shaft dia. (mm) *d*	Dimensions (mm) *H*	*J*	*L*	*A*	H_1	H_2	*N*	*B*	*S*	Bolt size	Unit No.	Housing No.	Applicable bearing No.	Basic load ratings (kN) C_r	C_{0r}	(Refer.) Unit Mass (kg)
12	22.2	68	86	25	3.2	43.8	9.5	22	6	M8	**SBPP201F**	PP203F	SB201	9.55	4.80	0.16
15	22.2	68	86	25	3.2	43.8	9.5	22	6	M8	**SBPP202F**	PP203F	SB202	9.55	4.80	0.16
17	22.2	68	86	25	3.2	43.8	9.5	22	6	M8	**SBPP203F**	PP203F	SB203	9.55	4.80	0.16
20	25.4	76	98	32	3.2	50.5	9.5	25	7	M8	**SBPP204F**	PP204F	SB204	12.8	6.65	0.23
25	28.6	86	108	32	4	56.6	11.5	27	7.5	M10	**SBPP205F**	PP205F	SB205	14.0	7.85	0.28
30	33.3	95	117	38	4	66.3	11.5	30	8	M10	**SBPP206F**	PP206F	SB206	19.5	11.3	0.47
35	39.7	106	129	41	4.6	78	11.5	32	8.5	M10	**SBPP207F**	PP207F	SB207	25.7	15.4	0.67

Ball bearing units
pressed steel rhombic-flanged type
SBPFL (set screw locking)
d 12 – 35 mm



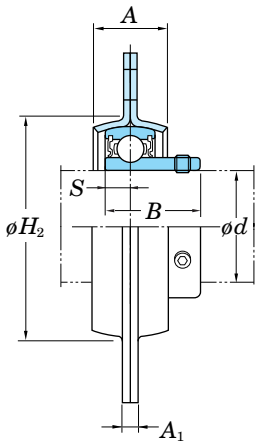


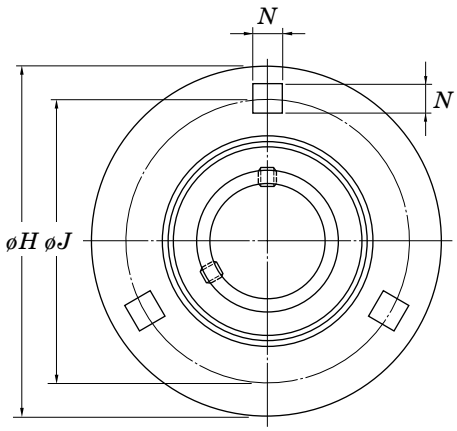
Shaft dia. (mm)	Dimensions (mm)									Bolt size	Unit No.	Housing No.	Applicable bearing			(Refer.) Unit Mass
													No.	Basic load ratings (kN)		
d	*H*	*J*	*L*	*A*	A_1	*N*	H_2 1)	*B*	*S*					C_r	C_{0r}	(kg)
12	81	63.5	59	14	4	7.1	49	22	6	M6	**SBPFL201**	PFL203	SB201	9.55	4.80	0.19
15	81	63.5	59	14	4	7.1	49	22	6	M6	**SBPFL202**	PFL203	SB202	9.55	4.80	0.19
17	81	63.5	59	14	4	7.1	49	22	6	M6	**SBPFL203**	PFL203	SB203	9.55	4.80	0.19
20	90	71.5	67	16	4	9	55	25	7	M8	**SBPFL204**	PFL204	SB204	12.8	6.65	0.24
25	95	76	71	18	4	9	60	27	7.5	M8	**SBPFL205**	PFL205	SB205	14.0	7.85	0.28
30	113	90.5	84	19	5.2	11	71	30	8	M10	**SBPFL206**	PFL206	SB206	19.5	11.3	0.38
35	122	100	94	22	5.2	11	81	32	8.5	M10	**SBPFL207**	PFL207	SB207	25.7	15.4	0.66

Note 1) H_2 shows minimum dimension of mounting hole.

Ball bearing units pressed steel round-flanged type SBPF (set screw locking)

d 12 – 35 mm

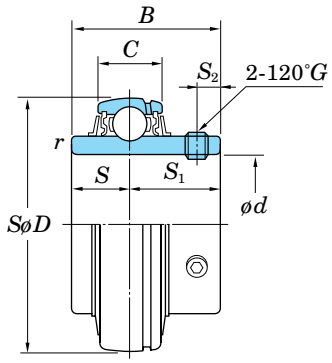




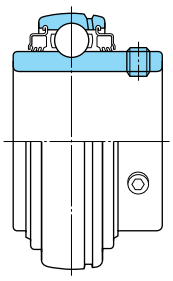
Shaft dia. (mm)	Dimensions (mm)								Bolt size	Unit No.	Housing No.	Applicable bearing			(Refer.) Unit Mass
												No.	Basic load ratings (kN)		
d	*H*	*J*	*A*	A_1	*N*	H_2 1)	*B*	*S*					C_r	C_{0r}	(kg)
12	81	63.5	14	4	7.1	49	22	6	M6	**SBPF201**	PF203	SB201	9.55	4.80	0.27
15	81	63.5	14	4	7.1	49	22	6	M6	**SBPF202**	PF203	SB202	9.55	4.80	0.27
17	81	63.5	14	4	7.1	49	22	6	M6	**SBPF203**	PF203	SB203	9.55	4.80	0.27
20	90	71.5	16	4	9	55	25	7	M8	**SBPF204**	PF204	SB204	12.8	6.65	0.33
25	95	76	18	4	9	60	27	7.5	M8	**SBPF205**	PF205	SB205	14.0	7.85	0.38
30	113	90.5	19	5.2	11	71	30	8	M10	**SBPF206**	PF206	SB206	19.5	11.3	0.62
35	122	100	22	5.2	11	81	32	8.5	M10	**SBPF207**	PF207	SB207	25.7	15.4	0.82

Note 1) H_2 shows minimum dimension of mounting hole.

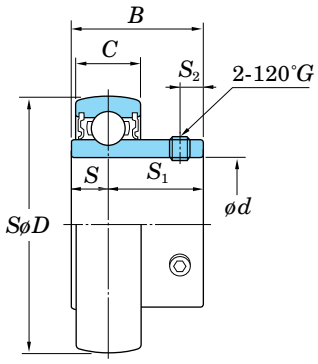
Ball bearings for units
cylindrical bore type (set screw locking)
d 10 – 40 mm



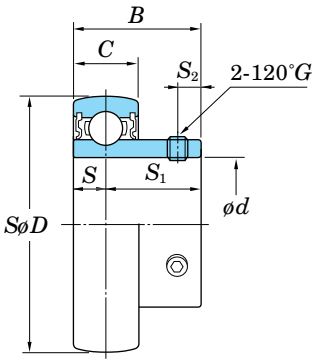
UC



UC...L3
(with triple-lip seals)



SU



SB

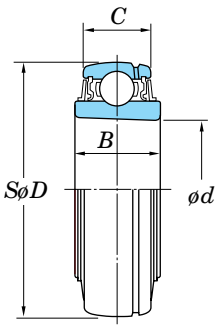
Shaft dia. (mm)	Boundary dimensions (mm)				Basic load ratings (kN)		Bearing No.		Dimensions (mm)			Set screw size	(Refer.) Mass
d	D	B	C	r min.	C_r	C_{0r}	With standard seals	With triple-lip seals	S	S_1	S_2	G	(kg)
10	26	15	8	–	4.55	1.95	**SU000**	**–**	5	10	3	M3×0.35	0.024
12	28	15	8	–	5.10	2.40	**SU001**	**–**	5	10	3	M3×0.35	0.026
	40	22	12	–	9.55	4.80	**SB201**	**–**	6	16	4	M5×0.5	0.10
	47	31	16	0.6	12.8	6.65	**UC201**	**UC201L2**	12.7	18.3	5	M6×0.75	0.21
15	32	16.5	9	–	5.60	2.85	**SU002**	**–**	5.5	11	3.3	M4×0.5	0.038
	40	22	12	–	9.55	4.80	**SB202**	**–**	6	16	4	M5×0.5	0.10
	47	31	16	0.6	12.8	6.65	**UC202**	**UC202L2**	12.7	18.3	5	M6×0.75	0.19
17	35	17.5	10	–	6.00	3.25	**SU003**	**–**	6	11.5	3.3	M4×0.5	0.050
	40	22	12	–	9.55	4.80	**SB203**	**–**	6	16	4	M5×0.5	0.10
	47	31	16	0.6	12.8	6.65	**UC203**	**UC203L2**	12.7	18.3	5	M6×0.75	0.18
20	42	21	12	–	9.40	5.05	**SU004**	**–**	7	14	4	M5×0.5	0.080
	47	25	14	–	12.8	6.65	**SB204**	**–**	7	18	5	M6×0.75	0.15
	47	31	16	1	12.8	6.65	**UC204**	**UC204L2**	12.7	18.3	5	M6×0.75	0.16
25	47	22	12	–	10.1	5.85	**SU005**	**–**	7	15	4.5	M5×0.5	0.10
	52	27	15	–	14.0	7.85	**SB205**	**–**	7.5	19.5	5.5	M6×0.75	0.18
	52	34.1	17	1	14.0	7.85	**UC205**	**UC205L2**	14.3	19.8	5.5	M6×0.75	0.20
	62	38	22	1.1	20.6	11.3	**UC305**	**–**	15	23	6	M6×0.75	0.45
	62	38.1	19	1	19.5	11.3	**UCX05**	**UCX05L3**	15.9	22.2	6	M6×0.75	0.39
30	55	24.5	13	–	13.2	8.25	**SU006**	**–**	7.5	17	5.5	M5×0.5	0.15
	62	30	16	–	19.5	11.3	**SB206**	**–**	8	22	6	M6×0.75	0.27
	62	38.1	19	1	19.5	11.3	**UC206**	**UC206L3**	15.9	22.2	6	M6×0.75	0.32
	72	42.9	20	1	25.7	15.4	**UCX06**	**UCX06L3**	17.5	25.4	6.5	M8×1	0.58
	72	43	24	1.1	26.7	15.0	**UC306**	**–**	17	26	6	M6×0.75	0.56
35	72	32	17	–	25.7	15.4	**SB207**	**–**	8.5	23.5	6	M6×0.75	0.42
	72	42.9	20	1.1	25.7	15.4	**UC207**	**UC207L3**	17.5	25.4	6.5	M8×1	0.48
	80	48	26	1.5	33.4	19.3	**UC307**	**UC307L3**	19	29	8	M8×1	0.71
	80	49.2	21	1.1	29.1	17.8	**UCX07**	**UCX07L3**	19	30.2	8	M8×1	0.75
40	80	34	18	–	29.1	17.8	**SB208**	**–**	9	25	8	M8×1	0.60
	80	49.2	21	1.1	29.1	17.8	**UC208**	**UC208L3**	19	30.2	8	M8×1	0.64
	85	49.2	22	1.1	32.7	20.3	**UCX08**	**UCX08L3**	19	30.2	8	M8×1	0.83
	90	52	28	1.5	40.7	24.0	**UC308**	**UC308L3**	19	33	10	M10×1.25	1.00

Remark) Bearing in number range from UC201L2 to UC205L2 are double-lip sealed (L2) due to dimensional restriction.

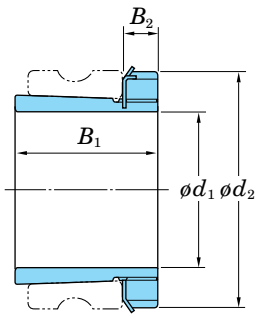
d 45 – 140 mm

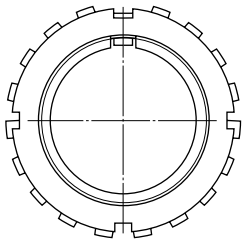
Shaft dia. (mm)	Boundary dimensions (mm)				Basic load ratings (kN)		Bearing No.		Dimensions (mm)			Set screw size	(Refer.) Mass
d	D	B	C	r min.	C_r	C_{0r}	With standard seals	With triple-lip seals	S	S_1	S_2	G	(kg)
45	85	49.2	22	1.1	32.7	20.3	**UC209**	**UC209L3**	19	30.2	8	M8×1	0.68
	90	51.6	24	1.1	35.1	23.3	**UCX09**	**UCX09L3**	19	32.6	9	M10×1.25	0.95
	100	57	30	1.5	48.9	29.5	**UC309**	**UC309L3**	22	35	10	M10×1.25	1.33
50	90	51.6	24	1.1	35.1	23.3	**UC210**	**UC210L3**	19	32.6	9	M10×1.25	0.80
	100	55.6	25	1.1	43.4	29.4	**UCX10**	**UCX10L3**	22.2	33.4	9	M10×1.25	1.29
	110	61	32	2	62.0	38.3	**UC310**	**UC310L3**	22	39	12	M12×1.5	1.69
55	100	55.6	25	1.5	43.4	29.4	**UC211**	**UC211L3**	22.2	33.4	9	M10×1.25	1.11
	110	65.1	27	1.5	52.4	36.2	**UCX11**	**UCX11L3**	25.4	39.7	10.5	M10×1.25	1.80
	120	66	34	2	71.6	45.0	**UC311**	**UC311L3**	25	41	12	M12×1.5	1.90
60	110	65.1	27	1.5	52.4	36.2	**UC212**	**UC212L3**	25.4	39.7	10.5	M10×1.25	1.54
	120	65.1	28	1.5	57.2	40.1	**UCX12**	**UCX12L3**	25.4	39.7	12	M12×1.5	2.05
	130	71	36	2.1	81.9	52.2	**UC312**	**UC312L3**	26	45	12	M12×1.5	2.60
65	120	65.1	28	1.5	57.2	40.1	**UC213**	**UC213L3**	25.4	39.7	12	M12×1.5	1.86
	125	74.6	30	1.5	62.2	44.1	**UCX13**	**UCX13L3**	30.2	44.4	12	M12×1.5	2.52
	140	75	38	2.1	92.7	59.9	**UC313**	**UC313L3**	30	45	12	M12×1.5	3.16
70	125	74.6	30	1.5	62.2	44.1	**UC214**	**UC214L3**	30.2	44.4	12	M12×1.5	2.05
	130	77.8	32	1.5	67.4	48.3	**UCX14**	**UCX14L3**	33.3	44.5	12	M12×1.5	2.74
	150	78	40	2.1	104	68.2	**UC314**	**UC314L3**	33	45	12	M12×1.5	3.90
75	130	77.8	32	1.5	67.4	48.3	**UC215**	**UC215L3**	33.3	44.5	12	M12×1.5	2.21
	140	82.6	33	1.5	72.7	53.0	**UCX15**	**UCX15L3**	33.3	49.3	14	M12×1.5	3.41
	160	82	42	2.1	113	77.2	**UC315**	**UC315L3**	32	50	14	M14×1.5	4.70
80	140	82.6	33	2	72.7	53.0	**UC216**	**UC216L3**	33.3	49.3	14	M12×1.5	2.79
	150	85.7	35	2	84.0	61.9	**UCX16**	**UCX16L3**	34.1	51.6	14	M12×1.5	3.87
	170	86	44	2.1	123	86.7	**UC316**	**UC316L3**	34	52	14	M14×1.5	5.60
85	150	85.7	35	2	84.0	61.9	**UC217**	**UC217L3**	34.1	51.6	14	M12×1.5	3.45
	160	96	38	2	96.1	71.5	**UCX17**	**UCX17L3**	39.7	56.3	15	M12×1.5	5.05
	180	96	46	3	133	96.8	**UC317**	**UC317L3**	40	56	16	M16×1.5	6.90
90	160	96	38	2	96.1	71.5	**UC218**	**UC218L3**	39.7	56.3	15	M12×1.5	4.35
	170	104	40	2	109	81.9	**UCX18**	–	42.9	61.1	16	M14×1.5	6.00
	190	96	48	3	143	107	**UC318**	**UC318L3**	40	56	16	M16×1.5	7.87
95	200	103	50	3	153	119	**UC319**	**UC319L3**	41	62	18	M16×1.5	8.91
100	190	117.5	43	2.1	133	105	**UCX20**	–	49.2	68.3	18	M16×1.5	8.56
	215	108	54	3	173	141	**UC320**	**UC320L3**	42	66	20	M18×1.5	11.2
105	225	112	56	3	184	153	**UC321**	–	44	68	20	M18×1.5	12.7
110	240	117	60	3	205	180	**UC322**	**UC322L3**	46	71	20	M18×1.5	15.1
120	260	126	64	3	207	185	**UC324**	**UC324L3**	51	75	20	M18×1.5	19.0
130	280	135	68	4	229	214	**UC326**	**UC326L3**	54	81	20	M20×1.5	23.6
140	300	145	72	4	253	246	**UC328**	**UC328L3**	59	86	20	M20×1.5	29.4

Ball bearings for units
tapered bore type (adapter locking)
d_1 20 – 65 mm



UK





Adapter assembly

Shaft dia. (mm)	Boundary dimensions (mm)				Basic load ratings (kN)		Bearing No.	(Refer.) Mass	Applicable adapter assembly					
										Dimensions (mm)			Mass	Sleeve No.
d_1	d	D	B	C	C_r	C_{0r}		(kg)	No.	B_1	B_2	d_2	(kg)	
20	25	52	21	17	14.0	7.85	**UK205**	0.16	H305X	29	8	38	0.075	A305X
	25	62	23	19	19.5	11.3	**UKX05**	0.27	H2305X	35	8	38	0.095	A2305X
	25	62	27	22	20.6	11.3	**UK305**	0.40	H2305X	35	8	38	0.095	A2305X
25	30	62	23	19	19.5	11.3	**UK206**	0.25	H306X	31	8	45	0.11	A306X
	30	72	26	20	25.7	15.4	**UKX06**	0.43	H2306X	38	8	45	0.13	A2306X
	30	72	30	24	26.7	15.0	**UK306**	0.47	H2306X	38	8	45	0.13	A2306X
30	35	72	26	20	25.7	15.4	**UK207**	0.37	H307X	35	9	52	0.14	A307X
	35	80	27	21	29.1	17.8	**UKX07**	0.53	H2307X	43	9	52	0.17	A2307X
	35	80	33	26	33.4	19.3	**UK307**	0.60	H2307X	43	9	52	0.17	A2307X
35	40	80	27	21	29.1	17.8	**UK208**	0.47	H308X	36	10	58	0.19	A308X
	40	85	29	22	32.7	20.3	**UKX08**	0.58	H2308X	46	10	58	0.22	A2308X
	40	90	35	28	40.7	24.0	**UK308**	0.80	H2308X	46	10	58	0.22	A2308X
40	45	85	29	22	32.7	20.3	**UK209**	0.52	H309X	39	11	65	0.25	A309X
	45	90	29	24	35.1	23.3	**UKX09**	0.67	H2309X	50	11	65	0.28	A2309X
	45	100	38	30	48.9	29.5	**UK309**	1.08	H2309X	50	11	65	0.28	A2309X
45	50	90	29	24	35.1	23.3	**UK210**	0.59	H310X	42	12	70	0.30	A310X
	50	100	31	25	43.4	29.4	**UKX10**	0.89	H2310X	55	12	70	0.36	A2310X
	50	110	40	32	62.0	38.3	**UK310**	1.38	H2310X	55	12	70	0.36	A2310X
50	55	100	31	25	43.4	29.4	**UK211**	0.80	H311X	45	12	75	0.35	A311X
	55	110	33	27	52.4	36.2	**UKX11**	1.15	H2311X	59	12	75	0.42	A2311X
	55	120	43	34	71.6	45.0	**UK311**	1.78	H2311X	59	12	75	0.42	A2311X
55	60	110	33	27	52.4	36.2	**UK212**	1.02	H312X	47	13	80	0.43	A312X
	60	120	36	28	57.2	40.1	**UKX12**	1.45	H2312X	62	13	80	0.48	A2312X
	60	130	47	36	81.9	52.2	**UK312**	2.06	H2312X	62	13	80	0.48	A2312X
60	65	120	36	28	57.2	40.1	**UK213**	1.34	H313X	50	14	85	0.46	A313X
	65	125	40	30	62.2	44.1	**UKX13**	1.62	H2313X	65	14	85	0.56	A2313X
	65	140	49	38	92.7	59.9	**UK313**	2.71	H2313X	65	14	85	0.56	A2313X
65	75	130	40	32	67.4	48.3	**UK215**	1.50	H315X	55	15	98	0.83	A315X
	75	140	42	33	72.7	53.0	**UKX15**	2.10	H2315X	73	15	98	1.05	A2315X
	75	160	55	42	113	77.2	**UK315**	3.80	H2315X	73	15	98	1.05	A2315X

d_1 70 – 125 mm

Shaft dia. (mm)	Boundary dimensions (mm)				Basic load ratings (kN)		Bearing No.	(Refer.) Mass	Applicable adapter assembly					Sleeve No.
										Dimensions (mm)			Mass	
d_1	d	D	B	C	C_r	C_{0r}		(kg)	No.	B_1	B_2	d_2	(kg)	
70	80	140	42	33	72.7	53.0	**UK216**	1.96	H316X	59	17	105	1.05	A316X
	80	150	44	35	84.0	61.9	**UKX16**	2.64	H2316X	78	17	105	1.3	A2316X
	80	170	55	44	123	86.7	**UK316**	4.39	H2316X	78	17	105	1.3	A2316X
75	85	150	44	35	84.0	61.9	**UK217**	2.42	H317X	63	18	110	1.2	A317X
	85	160	48	38	96.1	71.5	**UKX17**	3.25	H2317X	82	18	110	1.45	A2317X
	85	180	60	46	133	96.8	**UK317**	5.30	H2317X	82	18	110	1.45	A2317X
80	90	160	48	38	96.1	71.5	**UK218**	2.90	H318X	65	18	120	1.4	A318X
	90	170	50	40	109	81.9	**UKX18**	3.80	H2318X	86	18	120	1.7	A2318X
	90	190	60	48	143	107	**UK318**	6.20	H2318X	86	18	120	1.7	A2318X
85	95	200	66	50	153	119	**UK319**	7.31	H2319X	90	19	125	1.95	A2319X
90	100	190	54	43	133	105	**UKX20**	5.36	H2320X	97	20	130	2.2	A2320X
	100	215	68	54	173	141	**UK320**	8.70	H2320X	97	20	130	2.2	A2320X
100	110	240	78	60	205	180	**UK322**	12.2	H2322X	105	21	145	2.75	A2322X
110	120	260	87	64	207	185	**UK324**	16.1	H2324	112	22	155	3.2	A2324
115	130	280	87	68	229	214	**UK326**	18.8	H2326	121	23	165	4.6	A2326
125	140	300	97	72	253	246	**UK328**	23.9	H2328	131	24	180	5.5	A2328

KOYO

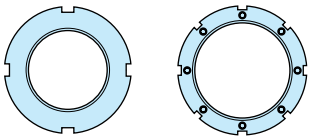
Locknuts and lockwashers

Bearings are often fit to a shaft with an adapter sleeve, locknut, lockwasher or lock plate.
These accessories make it easy to attach and remove bearings.
They are standardized in JIS.

- Locknuts are standardized such that they can be used with either adapter sleeves, withdrawal sleeves or shafts.
- Lockwashers and lock plates are used as locks on locknuts.

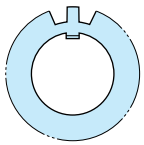
Lockwashers are used with bearings of bore diameter number 40 or lower. Lock plates are used with those of bore diameter 44 or higher.

Locknuts



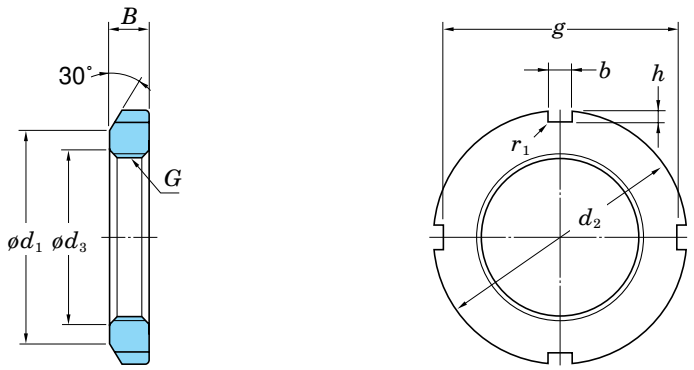
AN **02 – 100**

Lockwashers



AW **00 - 40 (X)**

Locknuts
for adapter sleeves and shafts
AN02 – 25



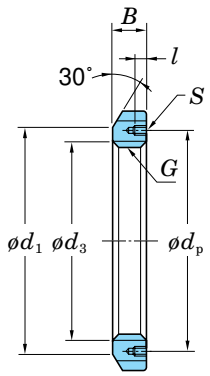
Locknut No.	Thread size G [1]	Standard dimensions (mm) d_2	d_1	g	d_3	b	h	B	r max.	(Refer.) Mass (kg)	Applicable [2] adapter sleeve (bore No.)	Applicable [3] lockwasher No.
AN02	M 15×1	25	21	21	15.5	4	2	5	0.4	0.010	–	AW02
03	M 17×1	28	24	24	17.5	4	2	5	0.4	0.013	–	03
04	M 20×1	32	26	28	20.5	4	2	6	0.4	0.019	04	04
AN05	M 25×1.5	38	32	34	25.8	5	2	7	0.4	0.025	05	AW05
06	M 30×1.5	45	38	41	30.8	5	2	7	0.4	0.043	06	06
07	M 35×1.5	52	44	48	35.8	5	2	8	0.4	0.053	07	07
AN08	M 40×1.5	58	50	53	40.8	6	2.5	9	0.5	0.085	08	AW08
09	M 45×1.5	65	56	60	45.8	6	2.5	10	0.5	0.119	09	09
10	M 50×1.5	70	61	65	50.8	6	2.5	11	0.5	0.148	10	10
AN11	M 55×2	75	67	69	56	7	3	11	0.5	0.158	11	AW11
12	M 60×2	80	73	74	61	7	3	11	0.5	0.174	12	12
13	M 65×2	85	79	79	66	7	3	12	0.5	0.203	13	13
AN14	M 70×2	92	85	85	71	8	3.5	12	0.5	0.242	14	AW14
15	M 75×2	98	90	91	76	8	3.5	13	0.5	0.287	15	15
16	M 80×2	105	95	98	81	8	3.5	15	0.6	0.397	16	16
AN17	M 85×2	110	105	103	86	8	3.5	16	0.6	0.451	17	AW17
18	M 90×2	120	108	112	91	10	4	16	0.6	0.556	18	18
19	M 95×2	125	113	117	96	10	4	17	0.6	0.658	19	19
AN20	M100×2	130	120	122	101	10	4	18	0.6	0.698	20	AW20
21	M105×2	140	126	130	106	12	5	18	0.7	0.845	21	21
22	M110×2	145	133	135	111	12	5	19	0.7	0.965	22	22
AN23	M115×2	150	137	140	116	12	5	19	0.7	1.01	–	AW23
24	M120×2	155	138	145	121	12	5	20	0.7	1.08	24	24
25	M125×2	160	148	150	126	12	5	21	0.7	1.19	–	25

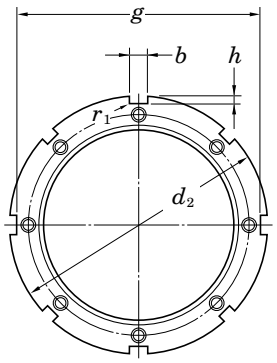
Notes 1) Basic profile and dimension of screw thread are in accordance with JIS B 0207 (metric fine screw threads).
2) Applicable to adapter sleeve series A31, A2, A3 and A23.
3) Applicable to lockwashers with flat inner tongue.

AN26 – 40

Locknut No.	Thread size	Standard dimensions (mm)								(Refer.) Mass	Applicable [2] adapter sleeve (bore No.)	Applicable [3] lockwasher No.
	G [1]	d_2	d_1	g	d_3	b	h	B	r max.	(kg)		
AN26	M130×2	165	149	155	131	12	5	21	0.7	1.25	26	AW26
27	M135×2	175	160	163	136	14	6	22	0.7	1.55	–	27
28	M140×2	180	160	168	141	14	6	22	0.7	1.56	28	28
AN29	M145×2	190	172	178	146	14	6	24	0.7	1.80	–	AW29
30	M150×2	195	171	183	151	14	6	24	0.7	2.03	30	30
31	M155×3	200	182	186	156.5	16	7	25	0.7	2.30	–	–
AN32	M160×3	210	182	196	161.5	16	7	25	0.7	2.59	32	AW32
33	M165×3	210	193	196	166.5	16	7	26	0.7	2.70	–	–
34	M170×3	220	193	206	171.5	16	7	26	0.7	2.80	34	34
AN36	M180×3	230	203	214	181.5	18	8	27	0.7	3.07	36	AW36
38	M190×3	240	214	224	191.5	18	8	28	0.7	3.39	38	38
40	M200×3	250	226	234	201.5	18	8	29	0.7	3.69	40	40

Locknuts
for adapter sleeves and shafts
AN44 – 100

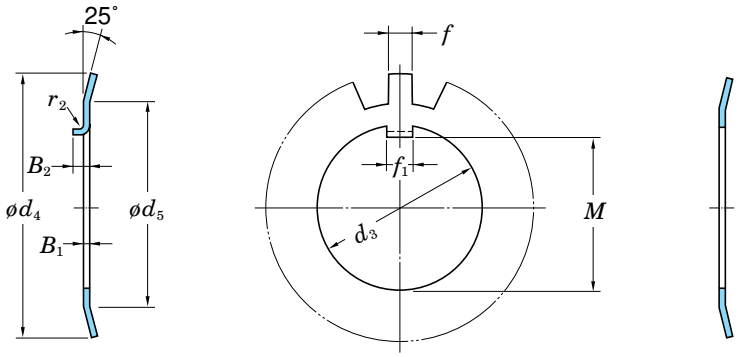




Locknut No.	Thread size G [1]	Standard dimensions (mm) d_2	d_1	g	d_3	b	h	B	r max.	Tapped hole (mm) l	S [2] Thread size	d_p	(Refer.) Mass (kg)	Applicable [3] adapter sleeve (bore No.)	Applicable lock plate No.
AN44	Tr220×4	280	250	260	222	20	10	32	0.8	15	M 8×1.25	238	5.16	44	AL44
48	Tr240×4	300	270	280	242	20	10	34	0.8	15	M 8×1.25	258	5.91	48	44
52	Tr260×4	330	300	306	262	24	12	36	0.8	18	M10×1.5	281	7.99	52	52
AN56	Tr280×4	350	320	326	282	24	12	38	0.8	18	M10×1.5	301	8.99	56	AL52
60	Tr300×4	380	340	356	302	24	12	40	0.8	18	M10×1.5	326	11.7	60	60
64	Tr320×5	400	360	376	322.5	24	12	42	0.8	18	M10×1.5	345	13.0	64	64
AN68	Tr340×5	440	400	410	342.5	28	15	55	1	21	M12×1.75	372	23.0	68	AL68
72	Tr360×5	460	420	430	362.5	28	15	58	1	21	M12×1.75	392	25.0	72	68
76	Tr380×5	490	450	454	382.5	32	18	60	1	21	M12×1.75	414	30.8	76	76
AN80	Tr400×5	520	470	484	402.5	32	18	62	1	27	M16×2	439	36.7	80	AL80
84	Tr420×5	540	490	504	422.5	32	18	70	1	27	M16×2	459	43.3	84	80
88	Tr440×5	560	510	520	442.5	36	20	70	1	27	M16×2	477	45.1	88	88
AN92	Tr460×5	580	540	540	462.5	36	20	75	1	27	M16×2	497	50.2	92	AL88
96	Tr480×5	620	560	580	482.5	36	20	75	1	27	M16×2	527	62.0	96	96
100	Tr500×5	630	580	584	502.5	40	23	80	1	27	M16×2	539	63.1	/500	100

Notes 1) Basic profile and dimension of screw thread are in accordance with JIS B 0216.
2) Basic profile and dimension of bore with internal thread are in accordance with JIS B 0205 (metric coarse screw threads).
3) Applicable to adapter sleeve series A31, A32, A23 and A30.

Lockwashers
AW00 – 40(X)



With bent inner tongue

With flat inner tongue

Lockwasher No. With bent inner tongue	Lockwasher No. With flat inner tongue	Standard dimensions (mm) d_3	M	f_1	B_1	f	d_4	d_5	r	B_2	No. of tooth	(Refer.) Mass (kg/100pcs.)	Applicable adapter sleeve (bore No.)	Applicable locknut No.
AW00	**AW00X**	10	8.5	3	1	3	13	21	0.5	2	9	0.131	–	AN00
01	**01X**	12	10.5	3	1	3	17	25	0.5	2	9	0.192	–	01
02	**02X**	15	13.5	4	1	4	21	28	1	2.5	13	0.253	–	02
AW03	**AW03X**	17	15.5	4	1	4	24	32	1	2.5	13	0.313	–	AN03
04	**04X**	20	18.5	4	1	4	26	36	1	2.5	13	0.350	04	04
05	**05X**	25	23	5	1.2	5	32	42	1	2.5	13	0.640	05	05
AW06	**AW06X**	30	27.5	5	1.2	5	38	49	1	2.5	13	0.780	06	AN06
07	**07X**	35	32.5	6	1.2	5	44	57	1	2.5	15	1.04	07	07
08	**08X**	40	37.5	6	1.2	6	50	62	1	2.5	15	1.23	08	08
AW09	**AW09X**	45	42.5	6	1.2	6	56	69	1	2.5	17	1.52	09	AN09
10	**10X**	50	47.5	6	1.2	6	61	74	1	2.5	17	1.60	10	10
11	**11X**	55	52.5	8	1.2	7	67	81	1	4	17	1.96	11	11
AW12	**AW12X**	60	57.5	8	1.5	7	73	86	1.2	4	17	2.53	12	AN12
13	**13X**	65	62.5	8	1.5	7	79	92	1.2	4	19	2.90	13	13
14	**14X**	70	66.5	8	1.5	8	85	98	1.2	4	19	3.34	14	14
AW15	**AW15X**	75	71.5	8	1.5	8	90	104	1.2	4	19	3.56	15	AN15
16	**16X**	80	76.5	10	1.8	8	95	112	1.2	4	19	4.64	16	16
17	**17X**	85	81.5	10	1.8	8	102	119	1.2	4	19	5.24	17	17
AW18	**AW18X**	90	86.5	10	1.8	10	108	126	1.2	4	19	6.23	18	AN18
19	**19X**	95	91.5	10	1.8	10	113	133	1.2	4	19	6.70	19	19
20	**20X**	100	96.5	12	1.8	10	120	142	1.2	6	19	7.65	20	20
AW21	**AW21X**	105	100.5	12	1.8	12	126	145	1.2	6	19	8.26	21	AN21
22	**22X**	110	105.5	12	1.8	12	133	154	1.2	6	19	9.40	22	22
23	**23X**	115	110.5	12	2	12	137	159	1.5	6	19	10.8	–	23
AW24	**AW24X**	120	115	14	2	12	138	164	1.5	6	19	10.5	24	AN24
25	**25X**	125	120	14	2	12	148	170	1.5	6	19	11.8	–	25
26	**26X**	130	125	14	2	12	149	175	1.5	6	19	11.3	26	26
AW27	**AW27X**	135	130	14	2	14	160	185	1.5	6	19	14.4	–	AN27
28	**28X**	140	135	16	2	14	160	192	1.5	8	19	14.2	28	28
29	**29X**	145	140	16	2	14	172	202	1.5	8	19	16.8	–	29
AW30	**AW30X**	150	145	16	2	14	171	205	1.5	8	19	15.5	30	AN30
31	**31X**	155	147.5	16	2.5	16	182	212	1.5	8	19	20.9	–	31
32	**32X**	160	154	18	2.5	16	182	217	1.5	8	19	22.2	32	32
AW33	**AW33X**	165	157.5	18	2.5	16	193	222	1.5	8	19	24.1	–	AN33
34	**34X**	170	164	18	2.5	16	193	232	1.5	8	19	24.7	34	34
36	**36X**	180	174	20	2.5	18	203	242	1.5	8	19	26.8	36	36
AW38	**AW38X**	190	184	20	2.5	18	214	252	1.5	8	19	27.8	38	AN38
40	**40X**	200	194	20	2.5	18	226	262	1.5	8	19	29.3	40	40

Remarks 1) AW00–AW40, AW00X–AW40X are applicable to adapter assembly series H31, H2, H3 and H23.
2) For adapter sleeves with narrow slits, lockwashers with flat inner tongue should be used. Either type of lockwasher can be used for adapter sleeves with wide slits.

Supplementary tables

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Supplementary table 1 Shaft tolerances (deviation from nominal dimensions)

Nominal shaft diameter (mm)		Deviation classes of shaft diameter															
over	up to	d6	e6	f6	g5	g6	h5	h6	h7	h8	h9	h10	js5	js6	js7	j5	j6
3	6	−30 −38	−20 −28	−10 −18	−4 −9	−4 −12	0 −5	0 −8	0 −12	0 −18	0 −30	0 −48	± 2.5	± 4	± 6	+3 −2	+6 −2
6	10	−40 −49	−25 −34	−13 −22	−5 − 11	−5 −14	0 −6	0 −9	0 −15	0 −22	0 −36	0 −58	± 3	± 4.5	± 7	+4 −2	+7 −2
10	18	−50 −61	−32 −43	−16 −27	−6 −14	−6 −17	0 −8	0 −11	0 −18	0 −27	0 −43	0 −70	± 4	± 5.5	± 9	+5 −3	+8 −3
18	30	−65 −78	−40 −53	−20 −33	−7 −16	−7 −20	0 −9	0 −13	0 −21	0 −33	0 −52	0 −84	± 4.5	± 6.5	±10	+5 −4	+9 −4
30	50	−80 −96	−50 −66	−25 −41	−9 −20	−9 −25	0 −11	0 −16	0 −25	0 −39	0 −62	0 −100	± 5.5	± 8	±12	+6 −5	+11 −5
50	80	−100 −119	−60 −79	−30 −49	−10 −23	−10 −29	0 −13	0 −19	0 −30	0 −46	0 −74	0 −120	± 6.5	± 9.5	±15	+6 −7	+12 −7
80	120	−120 −142	−72 −94	−36 −58	−12 −27	−12 −34	0 −15	0 −22	0 −35	0 −54	0 −87	0 −140	± 7.5	±11	±17	+6 −9	+13 − 9
120	180	−145 −170	−85 −110	−43 −68	−14 −32	−14 −39	0 −18	0 −25	0 −40	0 −63	0 −100	0 −160	± 9	±12.5	±20	+7 −11	+14 −11
180	250	−170 −199	−100 −129	−50 −79	−15 −35	−15 −44	0 −20	0 −29	0 −46	0 −72	0 −115	0 −185	±10	±14.5	±23	+7 −13	+16 −13
250	315	−190 −222	−110 −142	−56 −88	−17 −40	−17 −49	0 −23	0 −32	0 −52	0 −81	0 −130	0 −210	±11.5	±16	±26	+7 −16	±16
315	400	−210 −246	−125 −161	−62 −98	−18 −43	−18 −54	0 −25	0 −36	0 −57	0 −89	0 −140	0 −230	±12.5	±18	±28	+7 −18	±18
400	500	−230 −270	−135 −175	−68 −108	−20 −47	−20 −60	0 −27	0 −40	0 −63	0 −97	0 −155	0 −250	±13.5	±20	±31	+7 −20	±20
500	630	−260 −304	−145 −189	−76 −120	–	−22 −66	–	0 −44	0 −70	0 −110	0 −175	0 −280	–	±22	±35	–	–
630	800	−290 −340	−160 −210	−80 −130	–	−24 −74	–	0 −50	0 −80	0 −125	0 −200	0 −320	–	±25	±40	–	–
800	1 000	−320 −376	−170 −226	−86 −142	–	−26 −82	–	0 −56	0 −90	0 −140	0 −230	0 −360	–	±28	±45	–	–

Note 1) Δ_{dmp} : single plane mean bore diameter deviation

Unit μm

k5	k6	k7	m5	m6	m7	n5	n6	p6	r6	r7	Nominal shaft diameter (mm) over	up to	(Refer.) Δd_{mp} [1] of bearing (class 0)
+6 +1	+9 +1	+13 +1	+9 +4	+12 +4	+16 +4	+13 +8	+16 +8	+20 +12	+23 +15	+27 +15	3	6	0 – 8
+7 +1	+10 +1	+16 +1	+12 +6	+15 +6	+21 +6	+16 +10	+19 +10	+24 +15	+28 +19	+34 +19	6	10	0 – 8
+9 +1	+12 +1	+19 +1	+15 +7	+18 +7	+25 +7	+20 +12	+23 +12	+29 +18	+34 +23	+41 +23	10	18	0 – 8
+11 +2	+15 +2	+23 +2	+17 +8	+21 +8	+29 +8	+24 +15	+28 +15	+35 +22	+41 +28	+49 +28	18	30	0 – 10
+13 +2	+18 +2	+27 +2	+20 +9	+25 +9	+34 +9	+28 +17	+33 +17	+42 +26	+50 +34	+59 +34	30	50	0 – 12
+15 +2	+21 +2	+32 +2	+24 +11	+30 +11	+41 +11	+33 +20	+39 +20	+51 +32	+60 +41	+71 +41	50	65	0 – 15
									+62 +43	+73 +43	65	80	
+18 +3	+25 +3	+38 +3	+28 +13	+35 +13	+48 +13	+38 +23	+45 +23	+59 +37	+73 +51	+86 +51	80	100	0 – 20
									+76 +54	+89 +54	100	120	
+21 +3	+28 +3	+43 +3	+33 +15	+40 +15	+55 +15	+45 +27	+52 +27	+68 +43	+88 +63	+103 +63	120	140	0 – 25
									+90 +65	+105 +65	140	160	
									+93 +68	+108 + 68	160	180	
+24 +4	+33 +4	+50 +4	+37 +17	+46 +17	+63 +17	+51 +31	+60 +31	+79 +50	+106 +77	+123 +77	180	200	0 – 30
									+109 +80	+126 +80	200	225	
									+113 +84	+130 +84	225	250	
+27 +4	+36 +4	+56 +4	+43 +20	+52 +20	+72 +20	+57 +34	+66 +34	+88 +56	+126 +94	+146 +94	250	280	0 – 35
									+130 +98	+150 +98	280	315	
+29 +4	+40 +4	+61 +4	+46 +21	+57 +21	+78 +21	+62 +37	+73 +37	+98 +62	+144 +108	+165 +108	315	355	0 – 40
									+150 +114	+171 +114	355	400	
+32 +5	+45 +5	+68 +5	+50 +23	+63 +23	+86 +23	+67 +40	+80 +40	+108 +68	+166 +126	+189 +126	400	450	0 – 45
									+172 +132	+195 +132	450	500	
–	+44 0	+70 0	–	+70 +26	+96 +26	–	+88 +44	+122 +78	+194 +150	+220 +150	500	560	0 – 50
									+199 +155	+225 +155	560	630	
–	+50 0	+80 0	–	+80 +30	+110 +30	–	+100 +50	+138 +88	+225 +175	+255 +175	630	710	0 – 75
									+235 +185	+265 +185	710	800	
–	+56 0	+90 0	–	+90 +34	+124 +34	–	+112 +56	+156 +100	+266 +210	+300 +210	800	900	0 – 100
									+276 +220	+310 +220	900	1 000	

Supplementary table 2 Housing bore tolerances (deviation from nominal dimensions)

Nominal bore diameter (mm)		Deviation classes of housing bore diameter														
over	up to	E6	F6	F7	G6	G7	H6	H7	H8	H9	H10	J6	J7	JS5	JS6	JS7
10	18	+43 +32	+27 +16	+34 +16	+17 +6	+24 +6	+11 0	+18 0	+27 0	+43 0	+70 0	+ 6 − 5	+10 −8	± 4	± 5.5	± 9
18	30	+53 +40	+33 +20	+41 +20	+20 +7	+28 +7	+13 0	+21 0	+33 0	+52 0	+84 0	+ 8 − 5	+12 −9	± 4.5	± 6.5	±10
30	50	+66 +50	+41 +25	+50 +25	+25 +9	+34 +9	+16 0	+25 0	+39 0	+62 0	+100 0	+10 −6	+14 −11	± 5.5	± 8	±12
50	80	+79 +60	+49 +30	+60 +30	+29 +10	+40 +10	+19 0	+30 0	+46 0	+74 0	+120 0	+13 −6	+18 −12	± 6.5	± 9.5	±15
80	120	+94 +72	+58 +36	+71 +36	+34 +12	+47 +12	+22 0	+35 0	+54 0	+87 0	+140 0	+16 −6	+22 −13	± 7.5	±11	±17
120	180	+110 +85	+68 +43	+83 +43	+39 +14	+54 +14	+25 0	+40 0	+63 0	+100 0	+160 0	+18 −7	+26 −14	± 9	±12.5	±20
180	250	+129 +100	+79 +50	+96 +50	+44 +15	+61 +15	+29 0	+46 0	+72 0	+115 0	+185 0	+22 −7	+30 −16	±10	±14.5	±23
250	315	+142 +110	+88 +56	+108 +56	+49 +17	+69 +17	+32 0	+52 0	+81 0	+130 0	+210 0	+25 −7	+36 −16	±11.5	±16	±26
315	400	+161 +125	+98 +62	+119 +62	+54 +18	+75 +18	+36 0	+57 0	+89 0	+140 0	+230 0	+29 −7	+39 −18	±12.5	±18	±28
400	500	+175 +135	+108 +68	+131 +68	+60 +20	+83 +20	+40 0	+63 0	+97 0	+155 0	+250 0	+33 −7	+43 −20	±13.5	±20	±31
500	630	+189 +145	+120 +76	+146 +76	+66 +22	+92 +22	+44 0	+70 0	+110 0	+175 0	+280 0	–	–	–	±22	±35
630	800	+210 +160	+130 +80	+160 +80	+74 +24	+104 +24	+50 0	+80 0	+125 0	+200 0	+320 0	–	–	–	±25	±40
800	1 000	+226 +170	+142 +86	+176 +86	+82 +26	+116 +26	+56 0	+90 0	+140 0	+230 0	+360 0	–	–	–	±28	±45
1 000	1 250	+261 +195	+164 +98	+203 +98	+94 +28	+133 +28	+66 0	+105 0	+165 0	+260 0	+420 0	–	–	–	±33	±52

Note 1) ΔD_{mp} : single plane mean outside diameter deviation

Unit μm

K5	K6	K7	M5	M6	M7	N5	N6	N7	P6	P7	R7	Nominal bore diameter (mm) over	up to	(Refer.) ΔD_{mp} [1] of bearing (class 0)
+2 −6	+2 −9	+6 −12	−4 −12	−4 −15	0 −18	−9 −17	−9 −20	−5 −23	−15 −26	−11 −29	−16 −34	10	18	0 − 8
+1 −8	+2 −11	+6 −15	−5 −14	−4 −17	0 −21	−12 −21	−11 −24	−7 −28	−18 −31	−14 −35	−20 −41	18	30	0 − 9
+2 −9	+3 −13	+7 −18	−5 −16	−4 −20	0 −25	−13 −24	−12 −28	−8 −33	−21 −37	−17 −42	−25 −50	30	50	0 − 11
+3 −10	+4 −15	+9 −21	−6 −19	−5 −24	0 −30	−15 −28	−14 −33	−9 −39	−26 −45	−21 −51	−30 −60	50	65	0 − 13
											−32 −62	65	80	
+2 −13	+4 −18	+10 −25	−8 −23	−6 −28	0 −35	−18 −33	−16 −38	−10 −45	−30 −52	−24 −59	−38 −73	80	100	0 − 15
											−41 −76	100	120	
+3 −15	+4 −21	+12 −28	−9 −27	−8 −33	0 −40	−21 −39	−20 −45	−12 −52	−36 −61	−28 −68	−48 −88	120	140	(up to150) 0 − 18 (over 150) 0 − 25
											−50 −90	140	160	
											−53 −93	160	180	
+2 −18	+5 −24	+13 −33	−11 −31	−8 −37	0 −46	−25 −45	−22 −51	−14 −60	−41 −70	−33 −79	−60 −106	180	200	0 − 30
											−63 −109	200	225	
											−67 −113	225	250	
+3 −20	+5 −27	+16 −36	−13 −36	−9 −41	0 −52	−27 −50	−25 −57	−14 −66	−47 −79	−36 −88	−74 −126	250	280	0 − 35
											−78 −130	280	315	
+3 −22	+7 −29	+17 −40	−14 −39	−10 −46	0 −57	−30 −55	−26 −62	−16 −73	−51 −87	−41 −98	−87 −144	315	355	0 − 40
											−93 −150	355	400	
+2 −25	+8 −32	+18 −45	−16 −43	−10 −50	0 −63	−33 −60	−27 −67	−17 −80	−55 −95	−45 −108	−103 −166	400	450	0 − 45
											−109 −172	450	500	
−	0 −44	0 −70	−	−26 −70	−26 −96	−	−44 −88	−44 −114	−78 −122	−78 −148	−150 −220	500	560	0 − 50
											−155 −225	560	630	
−	0 −50	0 −80	−	−30 −80	−30 −110	−	−50 −100	−50 −130	−88 −138	−88 −168	−175 −255	630	710	0 − 75
											−185 −265	710	800	
−	0 −56	0 −90	−	−34 −90	−34 −124	−	−56 −112	−56 −146	−100 −156	−100 −190	−210 −300	800	900	0 −100
											−220 −310	900	1 000	
−	0 −66	0 −105	−	−40 −106	−40 −145	−	−66 −132	−66 −171	−120 −186	−120 −225	−250 −355	1 000	1 120	0 −125
											−260 −365	1 120	1 250	

Supplementary table 3 Numerical values for standard tolerance grades IT

Basic size (mm)		Standard tolerance grades (IT)																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14 1)	15 1)	16 1)	17 1)	18 1)
over	up to	Tolerances (μm)											Tolerances (mm)						
–	3	0.8	1.2	2	3	4	6	10	14	25	40	60	0.10	0.14	0.26	0.40	0.60	1.00	1.40
3	6	1	1.5	2.5	4	5	8	12	18	30	48	75	0.12	0.18	0.30	0.48	0.75	1.20	1.80
6	10	1	1.5	2.5	4	6	9	15	22	36	58	90	0.15	0.22	0.36	0.58	0.90	1.50	2.20
10	18	1.2	2	3	5	8	11	18	27	43	70	110	0.18	0.27	0.43	0.70	1.10	1.80	2.70
18	30	1.5	2.5	4	6	9	13	21	33	52	84	130	0.21	0.33	0.52	0.84	1.30	2.10	3.30
30	50	1.5	2.5	4	7	11	16	25	39	62	100	160	0.25	0.39	0.62	1.00	1.60	2.50	3.90
50	80	2	3	5	8	13	19	30	46	74	120	190	0.30	0.46	0.74	1.20	1.90	3.00	4.60
80	120	2.5	4	6	10	15	22	35	54	87	140	220	0.35	0.54	0.87	1.40	2.20	3.50	5.40
120	180	3.5	5	8	12	18	25	40	63	100	160	250	0.40	0.63	1.00	1.60	2.50	4.00	6.30
180	250	4.5	7	10	14	20	29	46	72	115	185	290	0.46	0.72	1.15	1.85	2.90	4.60	7.20
250	315	6	8	12	16	23	32	52	81	130	210	320	0.52	0.81	1.30	2.10	3.20	5.20	8.10
315	400	7	9	13	18	25	36	57	89	140	230	360	0.57	0.89	1.40	2.30	3.60	5.70	8.90
400	500	8	10	15	20	27	40	63	97	155	250	400	0.63	0.97	1.55	2.50	4.00	6.30	9.70
500	630	–	–	–	–	–	44	70	110	175	280	440	0.70	1.10	1.75	2.80	4.40	7.00	11.00
630	800	–	–	–	–	–	50	80	125	200	320	500	0.80	1.25	2.00	3.20	5.00	8.00	12.50
800	1 000	–	–	–	–	–	56	90	140	230	360	560	0.90	1.40	2.30	3.60	5.60	9.00	14.00
1 000	1 250	–	–	–	–	–	66	105	165	260	420	660	1.05	1.65	2.60	4.20	6.60	10.50	16.50
1 250	1 600	–	–	–	–	–	78	125	195	310	500	780	1.25	1.95	3.10	5.00	7.80	12.50	19.50
1 600	2 000	–	–	–	–	–	92	150	230	370	600	920	1.50	2.30	3.70	6.00	9.20	15.00	23.00
2 000	2 500	–	–	–	–	–	110	175	280	440	700	1 100	1.75	2.80	4.40	7.00	11.00	17.50	28.00
2 500	3 150	–	–	–	–	–	135	210	330	540	860	1 350	2.10	3.30	5.40	8.60	13.50	21.00	33.00

Note 1) Standard tolerance grades IT 14 to IT 18 (incl.) shall not be used for basic sizes less than or equal to 1 mm.

Supplementary table 4 Greek alphabet list

Name	Roman type	Italic type		Name	Roman type	Italic type	
	Capital	Capital	Lowercase		Capital	Capital	Lowercase
alpha	Α	A	α	nu	Ν	N	ν
beta	Β	B	β	xi	Ξ	Ξ	ξ
gamma	Γ	Γ	γ	omicron	Ο	O	o
delta	Δ	Δ	δ	pi	Π	Π	π
epsilon	Ε	E	ε, ϵ	rho	Ρ	P	ρ
zeta	Ζ	Z	ζ	sigma	Σ	Σ	σ
eta	Η	H	η	tau	Τ	T	τ
theta	Θ	Θ	ϑ, θ	upsilon	Υ	Υ	υ
iota	Ι	I	ι	phi	Φ	Φ	φ, ϕ
kappa	Κ	K	χ, κ	chi	Χ	X	χ
lambda	Λ	Λ	λ	psi	Ψ	Ψ	ψ
mu	Μ	M	μ	omega	Ω	Ω	ω

Supplementary table 5 Prefixes used with SI units

Factor	Prefix		Factor	Prefix	
	Name	Symbol		Name	Symbol
10^{18}	exa	E	10^{-1}	deci	d
10^{15}	peta	P	10^{-2}	centi	c
10^{12}	tera	T	10^{-3}	milli	m
10^{9}	giga	G	10^{-6}	micro	
10^{6}	mega	M	10^{-9}	nano	n
10^{3}	kilo	k	10^{-12}	pico	p
10^{2}	hecto	h	10^{-15}	femto	f
10	deka	da	10^{-18}	atto	a

Supplementary table 6 (1) SI units and conversion factors

Mass	SI units	Other Units[1)]	Conversion into SI units	Conversion from SI units
Angle	rad [radian(s)]	° [degree(s)] ✻ ' [minute(s)] ✻ " [second(s)] ✻	1° = π / 180 rad 1' = π / 10 800 rad 1" = π / 648 000 rad	1 rad = 57.295 78°
Length	m [meter(s)]	Å [Angstrom unit] ✻✻ μ [micron(s)] in [inch(es)] ft [foot(feet)] yd [yard(s)] mile [mile(s)]	1Å = 10^{-10} m = 0.1 nm = 100 pm 1μ = 1μm 1 in = 25.4 mm 1 ft = 12 in = 0.304 8 m 1 yd = 3 ft = 0.914 4 m 1 mile = 5 280 ft = 1 609.344 m	1 m = 10^{10}Å 1 m = 39.37 in 1 m = 3.280 8 ft 1 m = 1.093 6 yd 1 km = 0.621 4 mile
Area	m^2	a [are(s)] ✻✻ ha [hectare(s)] ✻✻ acre [acre(s)]	1 a = 100 m^2 1 ha = 10^4 m^2 1 acre = 4 840 yd^2 = 4 046.86 m^2	 1 km^2 = 247.1 acre
Volume	m^3	ℓ , L [liter(s)] ✻ cc [cubic centimeters] gal (US) [gallon(s)] floz (US) [fluid ounce(s)] barrel (US) [barrels(US)]	1 ℓ = 1 dm^3 = 10^{-3} m^3 1 cc = 1 cm^3 = 10^{-6} m^3 1 gal (US) = 231 in^3 = 3.785 41 dm^3 1 floz (US) = 29.573 5 cm^3 1 barrel (US) = 158.987 dm^3	1 m^3 = 10^3 ℓ 1 m^3 = 10^6 cc 1 m^3 = 264.17 gal 1 m^3 = 33 814 floz 1 m^3 = 6.289 8 barrel
Time	s [second(s)]	min [minute(s)] ✻ h [hour(s)] ✻ d [day(s)] ✻		
Angular velocity	rad/s			
Velocity	m/s	kn [knot(s)] ✻✻ m/h ✻	1 kn = 1 852 m/h	1 km/h = 0.539 96 kn
Acceleration	m/s^2	G	1 G = 9.806 65 m/s^2	1 m/s^2 = 0.101 97 G
Frequency	Hz [hertz]	c/s [cycle(s)/second]	1 c/s = 1 s^{-1} = 1 Hz	
Rotational frequency	s^{-1}	rpm [revolutions per minute] min^{-1} ✻ r/min ✻✻	1 rpm = 1/60 s^{-1}	1 s^{-1} = 60 rpm
Mass	kg [kilogram(s)]	t [ton(s)] ✻ lb [pound(s)] gr [grain(s)] oz [ounce(s)] ton (UK) [ton(s) (UK)] ton (US) [ton(s) (US)] car [carat(s)]	1 t = 10^3 kg 1 lb = 0.453 592 37 kg 1 gr = 64.798 91 mg 1 oz = 1/16 lb = 28.349 5 g 1 ton (UK) = 1 016.05 kg 1 ton (US) = 907.185 kg 1 car = 200 mg	 1 kg = 2.204 6 lb 1 g = 15.432 4 gr 1 kg = 35.274 0 oz 1 t = 0.984 2 ton (UK) 1 t = 1.102 3 ton (US) 1 g = 5 car

Note 1) ✻ : Unit can be used as an SI unit.
✻✻ : Unit can be used as an SI unit for the time being.
No asterisk : Unit cannot be used.

Supplementary table 6 (2) SI units and conversion factors

Mass	SI units	Other Units[1)]	Conversion into SI units	Conversion from SI units
Density	kg/m^3			
Linear density	kg/m			
Momentum	kg・m/s			
Moment of momentum Angular momentum	kg・m^2/s			
Moment of inertia	kg・m^2			
Force	N [newton(s)]	dyn [dyne(s)] kgf [kilogram-force] gf [gram-force] tf [ton-force] lbf [pound-force]	1 dyn = 10^{-5} N 1 kgf = 9.806 65 N 1 gf = 9.806 65 × 10^{-3} N 1 tf = 9.806 65 × 10^{3} N 1 lbf = 4.448 22 N	1 N = 10^{5} dyn 1 N = 0.101 97 kgf 1 N = 0.224 809 lbf
Moment of force	N・m [newton meter(s)]	gf・cm kgf・cm kgf・m tf・m tf・lbf	1 gf・cm = 9.806 65 × 10^{-5} N・m 1 kgf・cm = 9.806 65 × 10^{-2} N・m 1 kgf・m = 9.806 65 N・m 1 tf・m = 9.806 65 × 10^{3} N・m 1 ft・lbf = 1.355 82 N・m	 1 N・m = 0.101 97 kgf・m 1 N・m = 0.737 56 ft・lbf
Pressure Normal stress	Pa [pascal(s)] {1 Pa = 1 N/m^2}	gf/ cm^2 kgf/mm^2 kgf/m^2 lbf/in^2 bar [bar(s)] ❊❊ at [engineering air pressure] mH_2O, mAq [meter water column] atm [atmosphere] mHg [meter mercury column] Torr [torr]	1 gf/ cm^2 = 9.806 65 × 10 Pa 1 kgf/mm^2 = 9.806 65 × 10^{6} Pa 1 kgf/m^2 = 9.806 65 Pa 1 lbf/in^2 = 6 894.76 Pa 1 bar = 10^{5} Pa 1 at = 1kgf/cm^2 = 9.806 65 × 10^{4} Pa 1 mH_2O = 9.806 65 × 10^{3} Pa 1 atm = 101 325 Pa 1 mHg = $\frac{101\,325}{0.76}$ Pa 1 Torr = 1mmHg = 133.322 Pa	 1 MPa = 0.101 97 kgf/mm^2 1 Pa = 0.101 97 kgf/m^2 1 Pa = 0.145 × 10^{-3} lbf/in^2 1 Pa = 10^{-2} mbar 1 Pa = 7.500 6 × 10^{-3} Torr
Viscosity	Pa・s [pascal second]	P [poise] kgf・s/m^2	10^{-2} P = 1 cP = 1 mPa・s 1 kgf・s/m^2 = 9.806 65 Pa・s	 1 Pa・s = 0.101 97 kgf・s/m^2
Kinematic viscosity	m^2/s	St [stokes]	10^{-2} St = 1 cSt = 1 mm^2/s	
Surface tension	N/m			

Note 1) ❊ : Unit can be used as an SI unit.
❊❊ : Unit can be used as an SI unit for the time being.
No asterisk : Unit cannot be used.

Supplementary table 6 (3) SI units and conversion factors

Mass	SI units	Other Units[1)]	Conversion into SI units	Conversion from SI units
Work Energy	J [joule(s)] W • s [watt(s) second] {1 J = 1 N • m 1 W • s = 1 J}	eV [electron volt(s)] ❊ erg [erg(s)] kgf • m ft • lbf	1 eV = (1.602 189 2±0.000 004 6)×10^{-19} J 1 erg = 10^{-7} J 1 kgf • m = 9.806 65 J 1 ft • lbf = 1.355 82 J	 1 J = 10^{7} erg 1 J = 0.101 97 kgf • m 1 J = 0.737 56 ft • lbf
Power	W [watt(s)] {1 W = 1 J/s}	erg/s [ergs per second] kgf • m/s PS [French horse-power] HP [horse-power (British)] ft • lbf/s	1 erg/s = 10^{-7} W 1 kgf • m/s = 9.806 65 W 1 PS = 75 kgf • m/s = 735.5 W 1 HP = 550 ft • lbf/s = 745.7 W 1 ft • lbf/s = 1.355 82 W	 1 W = 0.101 97 kgf • m/s 1 W = 0.001 36 PS 1 W = 0.001 34 HP
Thermo-dynamic temperature	K^{-1} [kelvin(s)] {t K = (t − 273.15)˚C}			
Celsius temperature	˚C [celsius(s)] {t˚C = (t+273.15) K}	˚F [degree(s) Fahrenheit]	t˚F = $\frac{5}{9}$(t − 32)˚C	t˚C = ($\frac{9}{5}$t+32)˚F
Linear expansion coefficient	K^{-1}	$˚C^{-1}$ [per degree]		
Heat	J [joule(s)]	erg [erg(s)] kgf • m cal [calories] cal_{15} [15 degree calories] cal_{IT} [I. T. calories]	1 erg = 10^{-7} J 1 cal = 4.186 05 J (when temperature is not specified) 1 cal_{15} = 4.185 5 J 1 cal_{IT} = 4.186 J 1 $Mcal_{IT}$ = 1.163 kW • h	1 J = 10^{7} erg 1 J = 0.238 89 cal 1 kW • h = 0.86 × 10^{6} cal
Thermal conductivity	W/ (m • K)	W/ (m • ˚C) cal/ (s • m • ˚C)	1 W/ (m • ˚C) = 1 W/ (m • K) 1 cal/ (s • m • ˚C) = 4.186 05 W/ (m • K)	
Coeffcient of heat transfer	W/ (m^2 • K)	W/ (m^2 • ˚C) cal/ (s • m^2 • ˚C)	1 W/ (m^2 • ˚C) = 1 W/ (m^2 • K) 1 cal/ (s • m^2 • ˚C) = 4.186 05 W/ (m^2 • K)	
Heat capacity	J/K	J/˚C	1 J/˚C = 1 J/K	
Massic heat capacity	J/ (kg • K)	J/ (kg • ˚C)		

Note 1) ❊ : Unit can be used as an SI unit.
❊❊ : Unit can be used as an SI unit for the time being.
No asterisk : Unit cannot be used.

Supplementary table 6 (4) SI units and conversion factors

Mass	SI units	Other Units[1)]	Conversion into SI units	Conversion from SI units
Electric current	A [ampere(s)]			
Electric charge Quantity of electricity	C [coulomb(s)] {1 C = 1 A • s}	A • h ❊	1 A • h = 3.6 kC	
Tension Electric potential	V [volt(s)] {1 V = 1 W/A}			
Capacitance	F [farad(s)] {1 F = 1 C/V}			
Magnetic field strength	A/m	Oe [oersted(s)]	1 Oe = $\frac{10^3}{4\pi}$ A/m	1 A/m = $4\pi \times 10^{-3}$ Oe
Magnetic flux density	T [tesla(s)] {1 T = 1 N/(A • m) = 1 Wb/m^2 = 1 V • s/m^2}	Gs [gauss(es)] γ [gamma(s)]	1 Gs = 10^{-4} T 1 γ = 10^{-9} T	1 T = 10^4 Gs 1 T = 10^9 γ
Magnetic flux	Wb [weber(s)] {1 Wb = 1 V • s}	Mx [maxwell(s)]	1 Mx = 10^{-8} Wb	1 Wb = 10^8 Mx
Self inductance	H [henry (– ries)] {1 H = 1 Wb/A}			
Resistance (to direct current)	Ω [ohm(s)] {1 Ω = 1 V/A}			
Conductance (to direct current)	S [siemens] {1 S = 1 A/V}			
Active power	W {1 W = 1 J/s = 1 A • V}			

Note 1) ❊ : Unit can be used as an SI unit.
❊❊ : Unit can be used as an SI unit for the time being.
No asterisk : Unit cannot be used.

Supplementary table 7 Inch/millimeter conversion

Inch		Inches										
		0	1	2	3	4	5	6	7	8	9	10
		mm										
0	0	**0**	**25.4000**	**50.8000**	**76.2000**	**101.6000**	**127.0000**	**152.4000**	**177.8000**	**203.2000**	**228.6000**	**254.0000**
1/64	0.015625	0.3969	25.7969	51.1969	76.5969	101.9969	127.3969	152.7969	178.1969	203.5969	228.9969	254.3969
1/32	0.03125	0.7938	26.1938	51.5938	76.9938	102.3938	127.7938	153.1938	178.5938	203.9938	229.3938	254.7938
3/64	0.046875	1.1906	26.5906	51.9906	77.3906	102.7906	128.1906	153.5906	178.9906	204.3906	229.7906	255.1906
1/16	0.0625	1.5875	26.9875	52.3875	77.7875	103.1875	128.5875	153.9875	179.3875	204.7875	230.1875	255.5875
5/64	0.078125	1.9844	27.3844	52.7844	78.1844	103.5844	128.9844	154.3844	179.7844	205.1844	230.5844	255.9844
3/32	0.09375	2.3812	27.7812	53.1812	78.5812	103.9812	129.3812	154.7812	180.1812	205.5812	230.9812	256.3812
7/64	0.109375	2.7781	28.1781	53.5781	78.9781	104.3781	129.7781	155.1781	180.5781	205.9781	231.3781	256.7781
1/8	0.125	**3.1750**	**28.5750**	**53.9750**	**79.3750**	**104.7750**	**130.1750**	**155.5750**	**180.9750**	**206.3750**	**231.7750**	**257.1750**
9/64	0.140625	3.5719	28.9719	54.3719	79.7719	105.1719	130.5719	155.9719	181.3719	206.7719	232.1719	257.5719
5/32	0.15625	3.9688	29.3688	54.7688	80.1688	105.5688	130.9688	156.3688	181.7688	207.1688	232.5688	257.9688
11/64	0.171875	4.3656	29.7656	55.1656	80.5656	105.9656	131.3656	156.7656	182.1656	207.5656	232.9656	258.3656
3/16	0.1875	4.7625	30.1625	55.5625	80.9625	106.3625	131.7625	157.1625	182.5625	207.9625	233.3625	258.7625
13/64	0.203125	5.1594	30.5594	55.9594	81.3594	106.7594	132.1594	157.5594	182.9594	208.3594	233.7594	259.1594
7/32	0.21875	5.5562	30.9562	56.3562	81.7562	107.1562	132.5562	157.9562	183.3562	208.7562	234.1562	259.5562
15/64	0.234375	5.9531	31.3531	56.7531	82.1531	107.5531	132.9531	158.3531	183.7531	209.1531	234.5531	259.9531
1/4	0.25	**6.3500**	**31.7500**	**57.1500**	**82.5500**	**107.9500**	**133.3500**	**158.7500**	**184.1500**	**209.5500**	**234.9500**	**260.3500**
17/64	0.265625	6.7469	32.1469	57.5469	82.9469	108.3469	133.7469	159.1469	184.5469	209.9469	235.3469	260.7469
9/32	0.28125	7.1438	32.5438	57.9438	83.3438	108.7438	134.1438	159.5438	184.9438	210.3438	235.7438	261.1438
19/64	0.296875	7.5406	32.9406	58.3406	83.7406	109.1406	134.5406	159.9406	185.3406	210.7406	236.1406	261.5406
5/16	0.3125	7.9375	33.3375	58.7375	84.1375	109.5375	134.9375	160.3375	185.7375	211.1375	236.5375	261.9375
21/64	0.328125	8.3344	33.7344	59.1344	84.5344	109.9344	135.3344	160.7344	186.1344	211.5344	236.9344	262.3344
11/32	0.34375	8.7312	34.1312	59.5312	84.9312	110.3312	135.7312	161.1312	186.5312	211.9312	237.3312	262.7312
23/64	0.359375	9.1281	34.5281	59.9281	85.3281	110.7281	136.1281	161.5281	186.9281	212.3281	237.7281	263.1281
3/8	0.375	**9.5250**	**34.9250**	**60.3250**	**85.7250**	**111.1250**	**136.5250**	**161.9250**	**187.3250**	**212.7250**	**238.1250**	**263.5250**
25/64	0.390625	9.9219	35.3219	60.7219	86.1219	111.5219	136.9219	162.3219	187.7219	213.1219	238.5219	263.9219
13/32	0.40625	10.3188	35.7188	61.1188	86.5188	111.9188	137.3188	162.7188	188.1188	213.5188	238.9188	264.3188
27/64	0.421875	10.7156	36.1156	61.5156	86.9156	112.3156	137.7156	163.1156	188.5156	213.9156	239.3156	264.7156
7/16	0.4375	11.1125	36.5125	61.9125	87.3125	112.7125	138.1125	163.5125	188.9125	214.3125	239.7125	265.1125
29/64	0.453125	11.5094	36.9094	62.3094	87.7094	113.1094	138.5094	163.9094	189.3094	214.7094	240.1094	265.5094
15/32	0.46875	11.9062	37.3062	62.7062	88.1062	113.5062	138.9062	164.3062	189.7062	215.1062	240.5062	265.9062
31/64	0.484375	12.3031	37.7031	63.1031	88.5031	113.9031	139.3031	164.7031	190.1031	215.5031	240.9031	266.3031
1/2	0.5	**12.7000**	**38.1000**	**63.5000**	**88.9000**	**114.3000**	**139.7000**	**165.1000**	**190.5000**	**215.9000**	**241.3000**	**266.7000**
33/64	0.515625	13.0969	38.4969	63.8969	89.2969	114.6969	140.0969	165.4969	190.8969	216.2969	241.6969	267.0969
17/32	0.53125	13.4938	38.8938	64.2938	89.6938	115.0938	140.4938	165.8938	191.2938	216.6938	242.0938	267.4938
35/64	0.546875	13.8906	39.2906	64.6906	90.0906	115.4906	140.8906	166.2906	191.6906	217.0906	242.4906	267.8906
9/16	0.5625	14.2875	39.6875	65.0875	90.4875	115.8875	141.2875	166.6875	192.0875	217.4875	242.8875	268.2875
37/64	0.578125	14.6844	40.0844	65.4844	90.8844	116.2844	141.6844	167.0844	192.4844	217.8844	243.2844	268.6844
19/32	0.59375	15.0812	40.4812	65.8812	91.2812	116.6812	142.0812	167.4812	192.8812	218.2812	243.6812	269.0812
39/64	0.609375	15.4781	40.8781	66.2781	91.6781	117.0781	142.4781	167.8781	193.2781	218.6781	244.0781	269.4781
5/8	0.625	**15.8750**	**41.2750**	**66.6750**	**92.0750**	**117.4750**	**142.8750**	**168.2750**	**193.6750**	**219.0750**	**244.4750**	**269.8750**
41/64	0.640625	16.2719	41.6719	67.0719	92.4719	117.8719	143.2719	168.6719	194.0719	219.4719	244.8719	270.2719
21/32	0.65625	16.6688	42.0688	67.4688	92.8688	118.2688	143.6688	169.0688	194.4688	219.8688	245.2688	270.6688
43/64	0.671875	17.0656	42.4656	67.8656	93.2656	118.6656	144.0656	169.4656	194.8656	220.2656	245.6656	271.0656
11/16	0.6875	17.4625	42.8625	68.2625	93.6625	119.0625	144.4625	169.8625	195.2625	220.6625	246.0625	271.4625
45/64	0.703125	17.8594	43.2594	68.6594	94.0594	119.4594	144.8594	170.2594	195.6594	221.0594	246.4594	271.8594
23/32	0.71875	18.2562	43.6562	69.0562	94.4562	119.8562	145.2562	170.6562	196.0562	221.4562	246.8562	272.2562
47/64	0.734375	18.6531	44.0531	69.4531	94.8531	120.2531	145.6531	171.0531	196.4531	221.8531	247.2531	272.6531
3/4	0.75	**19.0500**	**44.4500**	**69.8500**	**95.2500**	**120.6500**	**146.0500**	**171.4500**	**196.8500**	**222.2500**	**247.6500**	**273.0500**
49/64	0.765625	19.4469	44.8469	70.2469	95.6469	121.0469	146.4469	171.8469	197.2469	222.6469	248.0469	273.4469
25/32	0.78125	19.8438	45.2438	70.6438	96.0438	121.4438	146.8438	172.2438	197.6438	223.0438	248.4438	273.8438
51/64	0.796875	20.2406	45.6406	71.0406	96.4406	121.8406	147.2406	172.6406	198.0406	223.4406	248.8406	274.2406
13/16	0.8125	20.6375	46.0375	71.4375	96.8375	122.2375	147.6375	173.0375	198.4375	223.8375	249.2375	274.6375
53/64	0.828125	21.0344	46.4344	71.8344	97.2344	122.6344	148.0344	173.4344	198.8344	224.2344	249.6344	275.0344
27/32	0.84375	21.4312	46.8312	72.2312	97.6312	123.0312	148.4312	173.8312	199.2312	224.6312	250.0312	275.4312
55/64	0.859375	21.8281	47.2281	72.6281	98.0281	123.4281	148.8281	174.2281	199.6281	225.0281	250.4281	275.8281
7/8	0.875	**22.2250**	**47.6250**	**73.0250**	**98.4250**	**123.8250**	**149.2250**	**174.6250**	**200.0250**	**225.4250**	**250.8250**	**276.2250**
57/64	0.890625	22.6219	48.0219	73.4219	98.8219	124.2219	149.6219	175.0219	200.4219	225.8219	251.2219	276.6219
29/32	0.90625	23.0188	48.4188	73.8188	99.2188	124.6188	150.0188	175.4188	200.8188	226.2188	251.6188	277.0188
59/64	0.921875	23.4156	48.8156	74.2156	99.6156	125.0156	150.4156	175.8156	201.2156	226.6156	252.0156	277.4156
15/16	0.9375	23.8125	49.2125	74.6125	100.0125	125.4125	150.8125	176.2125	201.6125	227.0125	252.4125	277.8125
61/64	0.953125	24.2094	49.6094	75.0094	100.4094	125.8094	151.2094	176.6094	202.0094	227.4094	252.8094	278.2094
31/32	0.96875	24.6062	50.0062	75.4062	100.8062	126.2062	151.6062	177.0062	202.4062	227.8062	253.2062	278.6062
63/64	0.984375	25.0031	50.4031	75.8031	101.2031	126.6031	152.0031	177.4031	202.8031	228.2031	253.6031	279.0031

Supplementaty table 8 Steel hardness conversion

Rockwell	Vicker's	Brinell		Rockwell		Shore
C-scale 1471.0 N {150 kgf}		Standard ball	Tungsten carbide ball	A-scale 588.4 N {60 kgf}	B-scale 980.7 N {100 kgf}	
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		73.1		60
44	434	409		72.5		58
43	423	400		72.0		57
42	412	390		71.5		56
41	402	381		70.9		55
40	392	371		70.4	–	54
39	382	362		69.9	–	52
38	372	353		69.4	–	51
37	363	344		68.9	–	50
36	354	336		68.4	(109.0)	49
35	345	327		67.9	(108.5)	48
34	336	319		67.4	(108.0)	47
33	327	311		66.8	(107.5)	46
32	318	301		66.3	(107.0)	44
31	310	294		65.8	(106.0)	43
30	302	286		65.3	(105.5)	42
29	294	279		64.7	(104.5)	41
28	286	271		64.3	(104.0)	41
27	279	264		63.8	(103.0)	40
26	272	258		63.3	(102.5)	38
25	266	253		62.8	(101.5)	38
24	260	247		62.4	(101.0)	37
23	254	243		62.0	100.0	36
22	248	237		61.5	99.0	35
21	243	231		61.0	98.5	35
20	238	226		60.5	97.8	34
(18)	230	219		–	96.7	33
(16)	222	212		–	95.5	32
(14)	213	203		–	93.9	31
(12)	204	194		–	92.3	29
(10)	196	187			90.7	28
(8)	188	179			89.5	27
(6)	180	171			87.1	26
(4)	173	165			85.5	25
(2)	166	158			83.5	24
(0)	160	152			81.7	24

Supplementary table 9 Surface roughness comparison

Arithmetical mean deviation of the profile R_a	Maximum height of the profile R_{max}	Ten-point height of irregularities R_z	Roughness grade numbers N	Symbol
0.013 a	0.05 S	0.05 Z		
0.025 a	0.1 S	0.1 Z	N 1	
0.05 a	0.2 S	0.2 Z	N 2	▽▽▽▽
0.10 a	0.4 S	0.4 Z	N 3	
0.20 a	0.8 S	0.8 Z	N 4	
0.40 a	1.6 S	1.6 Z	N 5	
0.80 a	3.2 S	3.2 Z	N 6	▽▽▽
1.6 a	6.3 S	6.3 Z	N 7	
3.2 a	12.5 S	12.5 Z	N 8	▽▽
6.3 a	25 S	25 Z	N 9	
12.5 a	50 S	50 Z	N10	▽
25 a	100 S	100 Z	N11	
50 a	200 S	200 Z	N12	
100 a	400 S	400 Z		

Notes) Above table is applicable only when processed surface peaks are of equal height.
Above table is roughly applicable to processed surfaces for general use.
Numbers are combined only for convenience in deciding surface roughness.

Supplementary table 10 Viscosity conversion

Kinematic viscosity mm^2/s	Saybolt SUS (second)		Redwood R (second)		Engler E (degree)
	100 °F	210 °F	50 °C	100 °C	
2	32.6	32.8	30.8	31.2	1.14
3	36.0	36.3	33.3	33.7	1.22
4	39.1	39.4	35.9	36.5	1.31
5	42.3	42.6	38.5	39.1	1.40
6	45.5	45.8	41.1	41.7	1.48
7	48.7	49.0	43.7	44.3	1.56
8	52.0	52.4	46.3	47.0	1.65
9	55.4	55.8	49.1	50.0	1.75
10	58.8	59.2	52.1	52.9	1.84
11	62.3	62.7	55.1	56.0	1.93
12	65.9	66.4	58.2	59.1	2.02
13	69.6	70.1	61.4	62.3	2.12
14	73.4	73.9	64.7	65.6	2.22
15	77.2	77.7	68.0	69.1	2.32
16	81.1	81.7	71.5	72.6	2.43
17	85.1	85.7	75.0	76.1	2.54
18	89.2	89.8	78.6	79.7	2.64
19	93.3	94.0	82.1	83.6	2.76
20	97.5	98.2	85.8	87.4	2.87
21	102	102	89.5	91.3	2.98
22	106	107	93.3	95.1	3.10
23	110	111	97.1	98.9	3.22
24	115	115	101	103	3.34
25	119	120	105	107	3.46
26	123	124	109	111	3.58
27	128	129	112	115	3.70
28	132	133	116	119	3.82
29	137	138	120	123	3.95
30	141	142	124	127	4.07
31	145	146	128	131	4.20
32	150	150	132	135	4.32
33	154	155	136	139	4.45
34	159	160	140	143	4.57

Kinematic viscosity mm^2/s	Saybolt SUS (second)		Redwood R (second)		Engler E (degree)
	100 °F	210 °F	50 °C	100 °C	
35	163	164	144	147	4.70
36	168	170	148	151	4.83
37	172	173	153	155	4.96
38	177	178	156	159	5.08
39	181	183	160	164	5.21
40	186	187	164	168	5.34
41	190	192	168	172	5.47
42	195	196	172	176	5.59
43	199	201	176	180	5.72
44	204	205	180	185	5.85
45	208	210	184	189	5.98
46	213	215	188	193	6.11
47	218	219	193	197	6.24
48	222	224	197	202	6.37
49	227	228	201	206	6.50
50	231	233	205	210	6.63
55	254	256	225	231	7.24
60	277	279	245	252	7.90
65	300	302	266	273	8.55
70	323	326	286	294	9.21
75	346	349	306	315	9.89
80	371	373	326	336	10.5
85	394	397	347	357	11.2
90	417	420	367	378	11.8
95	440	443	387	399	12.5
100	464	467	408	420	13.2
120	556	560	490	504	15.8
140	649	653	571	588	18.4
160	742	747	653	672	21.1
180	834	840	734	757	23.7
200	927	933	816	841	26.3
250	1 159	1 167	1 020	1 051	32.9
300	1 391	1 400	1 224	1 241	39.5

Remark) 1 mm^2/s=1 cSt (centi stokes)

Koyo products information

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Automobiles

■ Hub units built-in ABS sensor

■ DAC type double-row angular contact ball bearings for wheel

■ DU type double-row tapered roller bearings for wheel

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■ Clutch release bearings (CAT. NO. 283E)

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■ Pressed rocker arm rollers

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■ Steering joints

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■ Bearings for motorcycle wheel

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■ Space and aircraft bearings

■ Space and aircraft bearings

■ Space and aircraft bearings

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■ Integral type bearings

■ Spindle units
for rotary encoders

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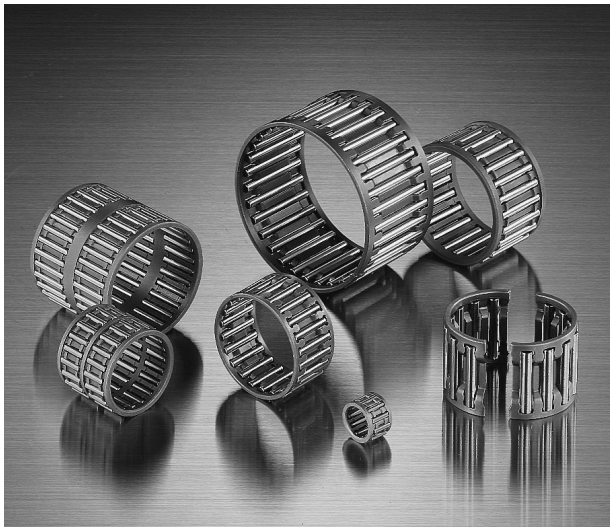
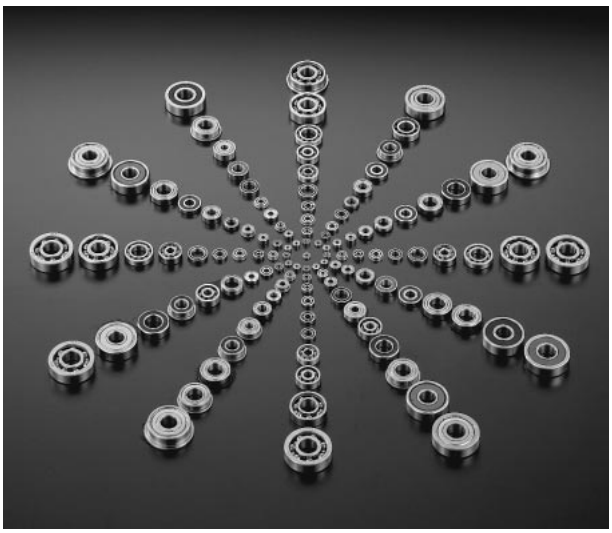


■ Cage and rollers (CAT. NO. 201E)



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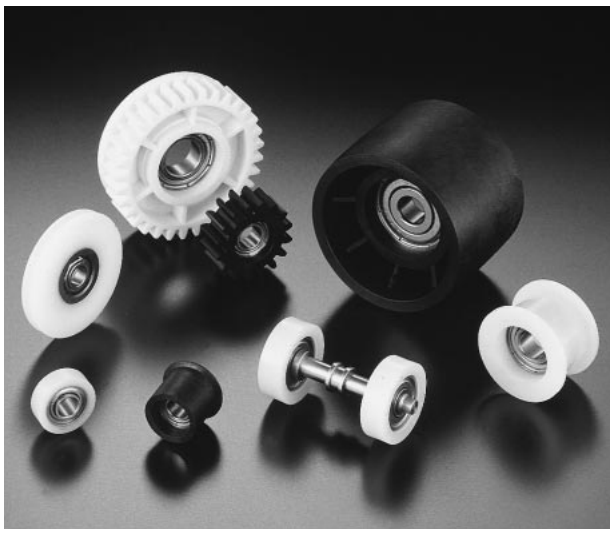

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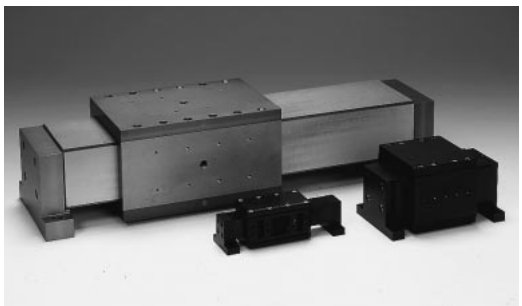

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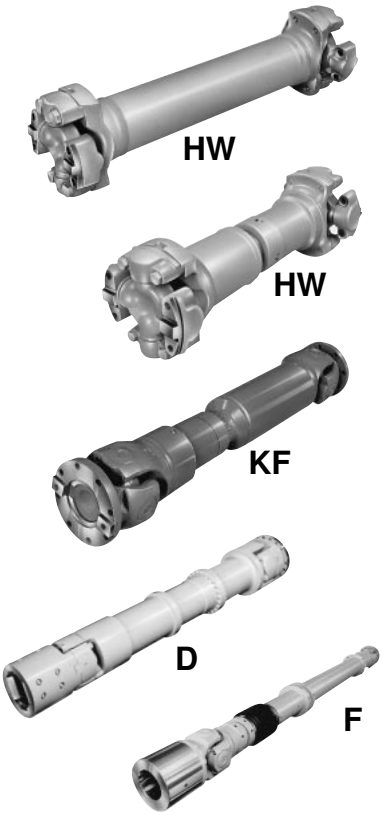

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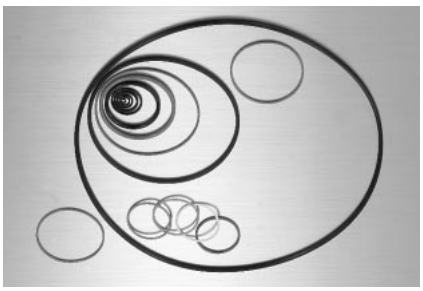

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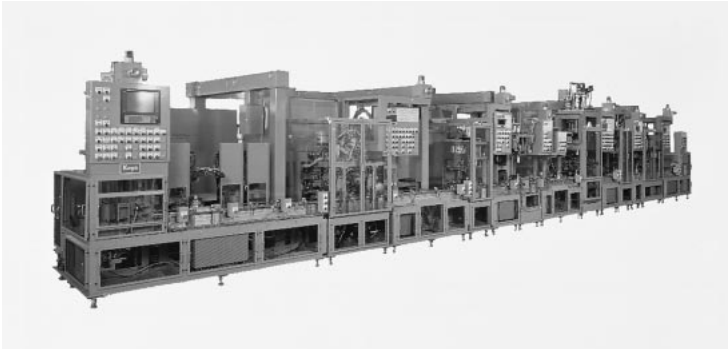

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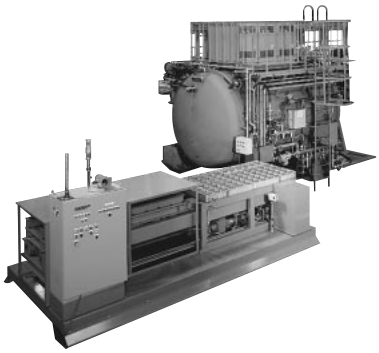

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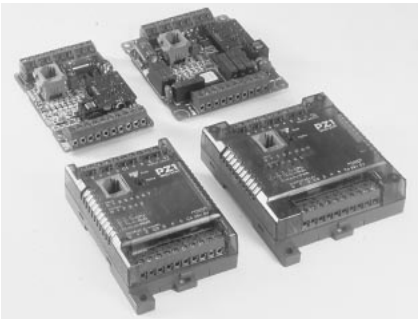

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