

MOTION & CONTROL™

NSK



1. TYPES AND FEATURES OF ROLLING BEARINGS

1.1 Design and Classification

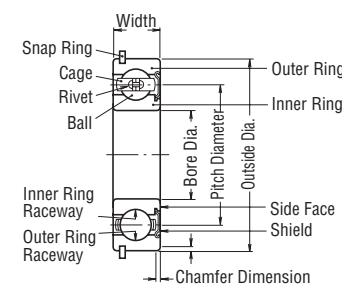
Rolling bearings generally consist of rolling elements, two rings, and a cage. They are classified into radial bearings or thrust bearings depending on the direction of the main load. In addition, depending on the type of rolling elements, they are classified into ball bearings or roller bearings and further divided by differences in their design or specific purpose. The most common bearing types and part names are shown in Fig. 1.1, and a general classification of rolling bearings is shown in Fig. 1.2.

1.2 Characteristics of Rolling Bearings

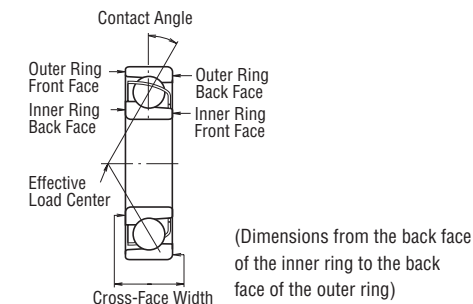
Compared with plain bearings, rolling bearings have the following major advantages:

- (1) Their starting torque or friction is low and the difference between the starting torque and running torque is small.
- (2) With the advancement of worldwide standardization, rolling bearings are internationally available and interchangeable.
- (3) Maintenance, replacement, and inspection are easy because of the simple structure surrounding rolling bearings.
- (4) Many rolling bearings are capable of taking both radial and axial loads simultaneously or independently.
- (5) Rolling bearings can be used under a wide range of temperatures.
- (6) Rolling bearings can be preloaded to produce a negative clearance and achieve greater rigidity.

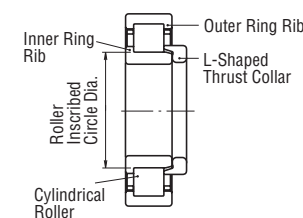
Furthermore, different types of rolling bearings have their own individual advantages. The features of the most common rolling bearings are described on Pages A010 to A013 and in Table 1.1 (Pages A014 and A015).



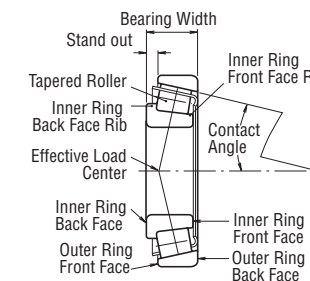
Single-Row Deep Groove Ball Bearing



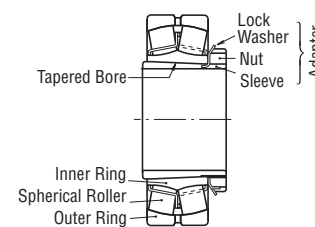
Single-Row Angular Contact Ball Bearing



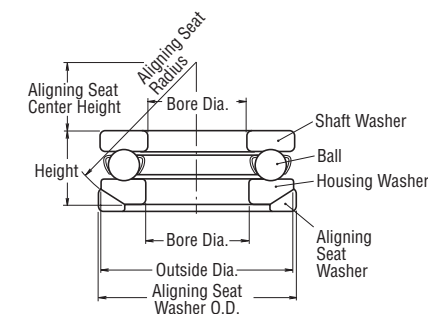
Cylindrical Roller Bearing



Tapered Roller Bearing



Spherical Roller Bearing



Single-Direction Thrust Ball Bearing

Fig. 1.1 Names of Bearing Parts

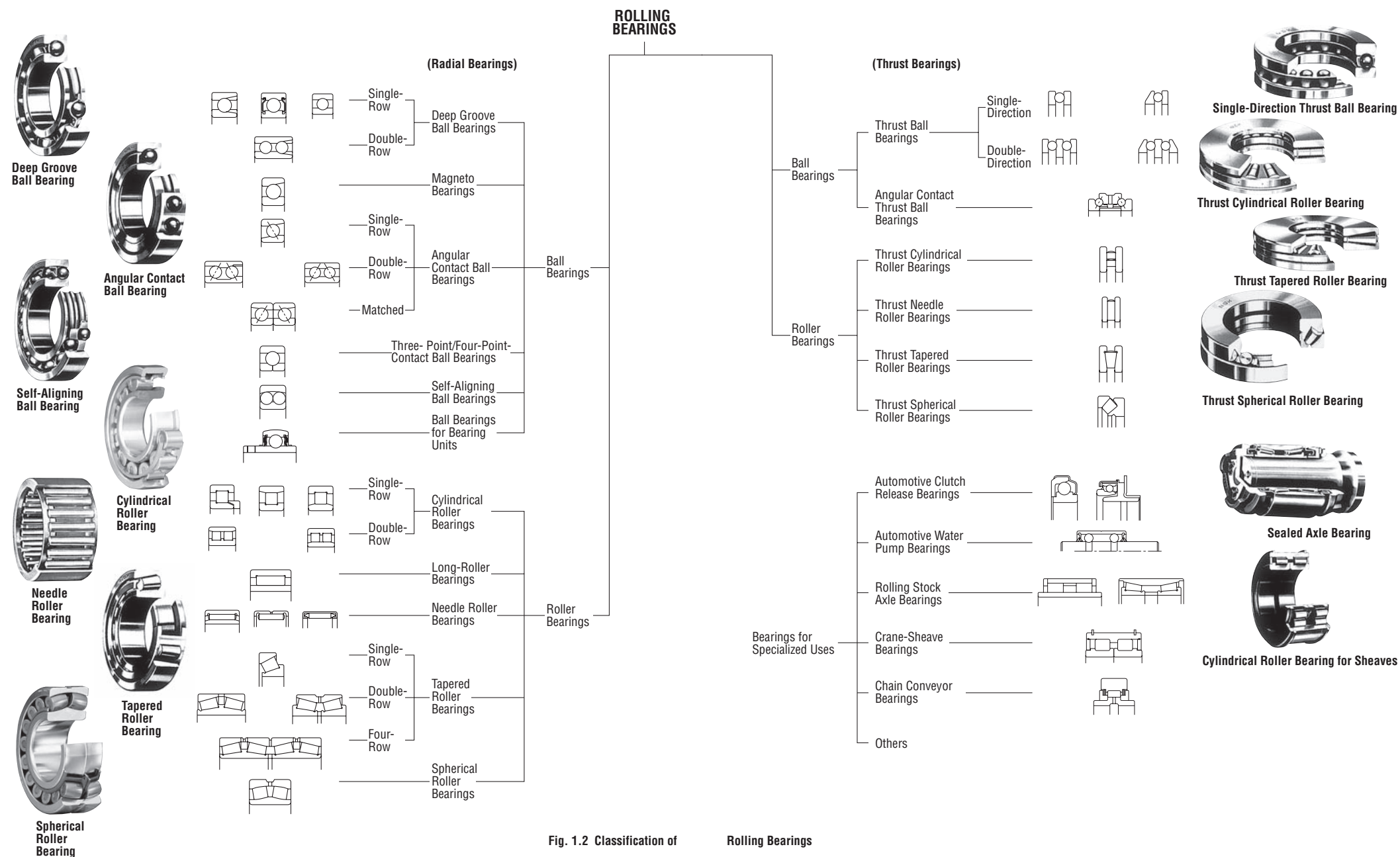
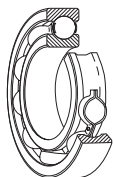


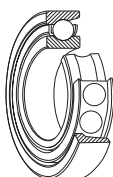
Fig. 1.2 Classification of Rolling Bearings

Single-Row Deep Groove Ball Bearings



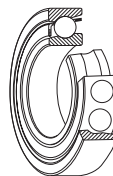
Single-row deep groove ball bearings are the most common type of rolling bearing and are in widespread use. The raceway grooves on both the inner and outer rings have circular arcs of slightly larger radii than those of the balls. They are capable of taking radial loads. In addition, axial loads can be applied in either direction. Because of their low torque, they are highly suitable for applications where high speeds and low power loss are required. While they can be used as open bearings, single-row deep groove bearings often have steel shields or rubber seals installed on one or both sides and are prelubricated with grease. In addition, snap rings are sometimes used on the periphery. Pressed-steel cages are most commonly used.

Magneto Bearings



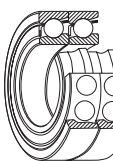
The inner groove of magneto bearings is slightly more shallow than that of deep groove bearings. Since the outer ring has a shoulder on only one side, the outer ring may be removed, which is often advantageous for mounting. In general, two such bearings are used in a paired mounting. Magneto bearings are small bearings with a bore diameter of 4 to 20 mm and are mainly used for small magnetos, gyroscopes, instruments, etc. Pressed-brass cages are generally used.

Single-Row Angular Contact Ball Bearings



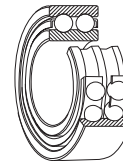
Individual bearings of this type are capable of taking axial loads in one direction and radial loads. Four contact angles of 15°, 25°, 30°, and 40° are available. The larger the contact angle, the higher the axial load capacity. For high-speed operation however, smaller contact angles are preferred. Usually, two bearings are used in a paired mounting, and the clearance between them must be adjusted properly. Pressed-steel and machined-brass cages are commonly used; however, for high precision bearings with a contact angle less than 30°, polyamide resin cages are often used.

Paired Mounting



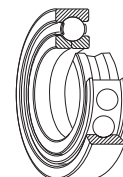
A combination of two radial bearings is called a paired mounting. Usually, they are formed using angular contact ball bearings or tapered roller bearings. Possible arrangements include: face-to-face (type DF), in which the outer ring faces are oriented towards each other; back-to-back (type DB); or same-direction (type DT), in which both front faces are oriented in the same direction. DF and DB arrangements are capable of taking radial loads and axial loads in both directions. Type DT is used when there is a strong axial load in one direction and it is necessary to divide the load equally across each bearing.

Double-Row Angular Contact Ball Bearings



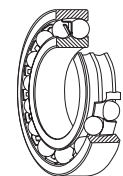
Double-row angular contact ball bearings are like two single-row angular contact ball bearings mounted back-to-back, except that they have only one inner ring and one outer ring. They have a narrower width than two single bearings, and can take thrust loads in both directions.

Four-Point-Contact Ball Bearings



The inner and outer rings of four-point-contact ball bearings are separable because the inner ring is split in a radial plane. They can take axial loads from either direction, and the balls have a contact angle of 35° with each ring. Radial loads are not recommended. Just one bearing of this type can replace a combination of face-to-face or back-to-back angular contact bearings. Machined-brass cages are generally used.

Self-Aligning Ball Bearings



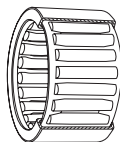
The inner ring of this type of bearing has two raceways, and the outer ring has a single spherical raceway with its center of curvature coincident with the bearing axis. Therefore, the axis of the inner ring, balls, and cage can deflect to some extent around the bearing center. Consequently, minor angular misalignment of the shaft and housing caused by machining or mounting error is automatically corrected. This type of bearing often has a tapered bore for mounting using an adapter sleeve.

Cylindrical Roller Bearings



In bearings of this type, the cylindrical rollers are in linear contact with the raceways. They have a high radial load capacity and are suitable for high speeds. NU, NJ, NUP, N, and NF are single-row bearing types, while NNU and NN are double-row bearing types, with designations depending on the design or absence of side ribs. The outer and inner rings of all types are separable. Some cylindrical roller bearings have no ribs on either the inner or outer ring, so that the rings can move axially relative to each other. These can be used as free-end bearings. Cylindrical roller bearings, in which either the inner or outer ring has two ribs and the other ring has one, are capable of taking some axial load in one direction. Double-row cylindrical roller bearings have high radial rigidity and are used primarily for precision machine tools. Pressed steel or machined brass cages are generally used, but sometimes molded polyamide cages are employed.

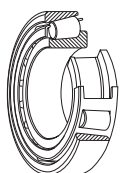
Needle Roller Bearings



Needle roller bearings contain many slender rollers with a length 3 to 10 times their diameter. As a result, the ratio of the bearing outside diameter to the inscribed circle diameter is small, and they have a rather high radial load capacity.

There are numerous types available, and many have no inner ring. The drawn-cup type has a pressed-steel outer ring and the solid type has a machined outer ring. There are also cage and roller assemblies without rings. Most bearings have pressed-steel cages, but some do not use cages.

Tapered Roller Bearings

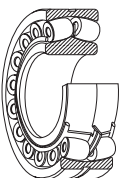


Bearings of this type use conical rollers guided by a back-face rib on the inner ring. These bearings are capable of taking high radial loads and also axial loads in one direction. The HR Series features a greater quantity of larger rollers, allowing for even higher load capacity.

They are generally mounted in pairs in a manner similar to single-row angular contact ball bearings. In this case, the proper internal clearance can be obtained by adjusting the axial distance between the inner or outer rings of the two opposed bearings. Since they are separable, the inner ring assemblies and outer rings can be mounted independently.

Tapered roller bearings are divided into three types depending on contact angle; these are normal angle, medium angle, and steep angle. Double-row and four-row tapered roller bearings are also available. Pressed-steel cages are generally used.

Spherical Roller Bearings



These bearings have barrel-shaped rollers between the inner ring, which has two raceways, and the outer ring, which has one spherical raceway. Since the center of curvature of the outer ring raceway surface coincides with the bearing axis, they are self-aligning in a manner similar to that of self-aligning ball bearings. Therefore, if there is deflection of the shaft or housing or misalignment of their axes, it is automatically corrected so that excessive force is not applied to the bearings.

Spherical roller bearings can take not only heavy radial loads, but also some axial loads in either direction. They have excellent radial load-carrying capacity and are suitable for use where there are heavy or impact loads.

Some bearings have tapered bores and may be mounted directly on tapered shafts or cylindrical shafts using adapters or withdrawal sleeves.

Pressed-steel and machined-brass cages are used.

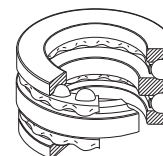
Single-Direction Thrust Ball Bearings



Single-direction thrust ball bearings are composed of washer-like bearing rings with raceway grooves. The ring attached to the shaft is called the shaft washer (or inner ring) while the ring attached to the housing is called the housing washer (or outer ring).

Double-direction thrust ball bearings have three rings with the middle ring (center ring) fixed to the shaft.

Double-Direction Thrust Ball Bearings



As their names imply, single-direction thrust bearings can take axial loads in one direction, while double-direction thrust bearings can take axial loads in both directions.

There are also thrust ball bearings with an aligning seat washer beneath the housing washer in order to compensate for shaft misalignment or mounting error.

Pressed-steel cages are usually used in smaller bearings and machined cages in larger bearings.

Spherical Thrust Roller Bearings



These bearings have a spherical raceway in the housing washer and barrel-shaped rollers obliquely arranged around it. Since the raceway in the housing washer is spherical, these bearings are self-aligning. They have a very high axial load capacity and are capable of taking moderate radial loads when an axial load is applied.

Pressed-steel cages or machined-brass cages are usually used.

Table 1. 1 Types and Characteristics

Bearing Type		Deep Groove Ball Bearings	Magneto Bearings	Angular Contact Ball Bearings	Double-Row Angular Contact Ball Bearings	Duplex Angular Contact Ball Bearings	Four-Point-Contact Ball Bearings	Self-Aligning Ball Bearings	Cylindrical Roller Bearings	Double-Row Cylindrical Roller Bearings	Cylindrical Roller Bearings with Single Rib
Features											
Load Capacity	Radial Loads										
	Axial Loads										
	Combined Loads										
High Speeds											
High Accuracy											
Low Noise and Torque											
Rigidity											
Angular Misalignment											
Self-Aligning Capability											
Ring Separability											
Fixed-End Bearing											
Free-End Bearing											
Inner Ring Tapered Bore											
Remarks		Two bearings are usually mounted in opposition. Contact angles of 15°, 25°, 30° and 40°. Two bearings are usually mounted in opposition. Clearance adjustment is necessary. Combination of DF and DT pairs is possible, but not for use on free-end. Contact angle of 35° Including N type Including MNU type Including NF type									
Page No.		C005 C053	C005 C050	C072	C072 C106	C072	C072 C108	C114	C124	C124 C158	C124

Excellent
 Good
 Fair
 Poor
 Unsuitable
 One direction only
 Two directions

☆ Applicable
 ★ Applicable, allow for shaft contraction/elongation at bearing fitting surfaces.

of Rolling Bearings

Cylindrical Roller Bearings with Thrust Collars	Needle Roller Bearings	Tapered Roller Bearings	Double- and Multi-Row Tapered Roller Bearings	Spherical Roller Bearings	Thrust Ball Bearings	Thrust Ball Bearings with Aligning Seat	Double-Direction Angular Contact Thrust Ball Bearings	Thrust Cylindrical Roller Bearings	Thrust Tapered Roller Bearings	Thrust Spherical Roller Bearings	Page No.
											—
											—
											—
											—
											A022 A098
											A023 A126 A151
											A023
											A023 A192
											A022 Blue pages of each brg. type
											A022
											A023 A024
											A026 to A029
											A026 to A029
											A150 B008 B012
Including NUP type		Two bearings are usually mounted in opposition. Clearance adjustment is necessary.	KH and KV types are also available but not for use on free-end.					Including needle roller thrust bearings		To be used with oil lubrication	
C124	C341	C182	C182 C246	C258	C296	C296	—	C314	C322	C332	

1.3 Contact Angle and Bearing Types

The contact angle (α) refers to the angle between a vertical plane of the rotation axis of the bearing and a straight line between the points where the rolling element comes in contact with the inner ring raceway and outer ring raceway.

Radial bearings and thrust bearings are classified depending on the size of the contact angle.

Figure 1.3 shows the relation between contact angle and loading direction on the bearing.

Radial bearing α : Less than 45°
(A primarily radial load is applied.)

Thrust bearing α : Over 45°
(A primarily axial load is applied.)

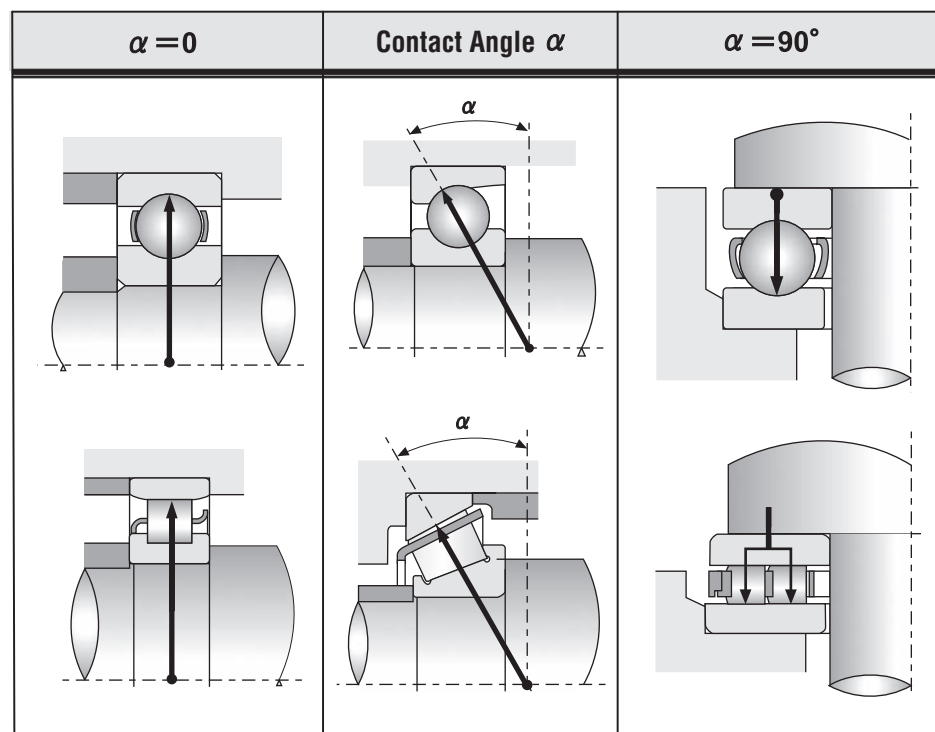


Fig. 1.3 Contact Angle α

1.4 Types of Load on Bearings

An example deep groove ball bearing is shown below in Figure 1.4 along with the types of load applied to a rolling bearing. These are:

- (a) Radial load
- (b) Axial load
- (c) Combined radial and axial load
- (d) Moment load

It is important to select the optimum bearing type according to the type and magnitude of the load.

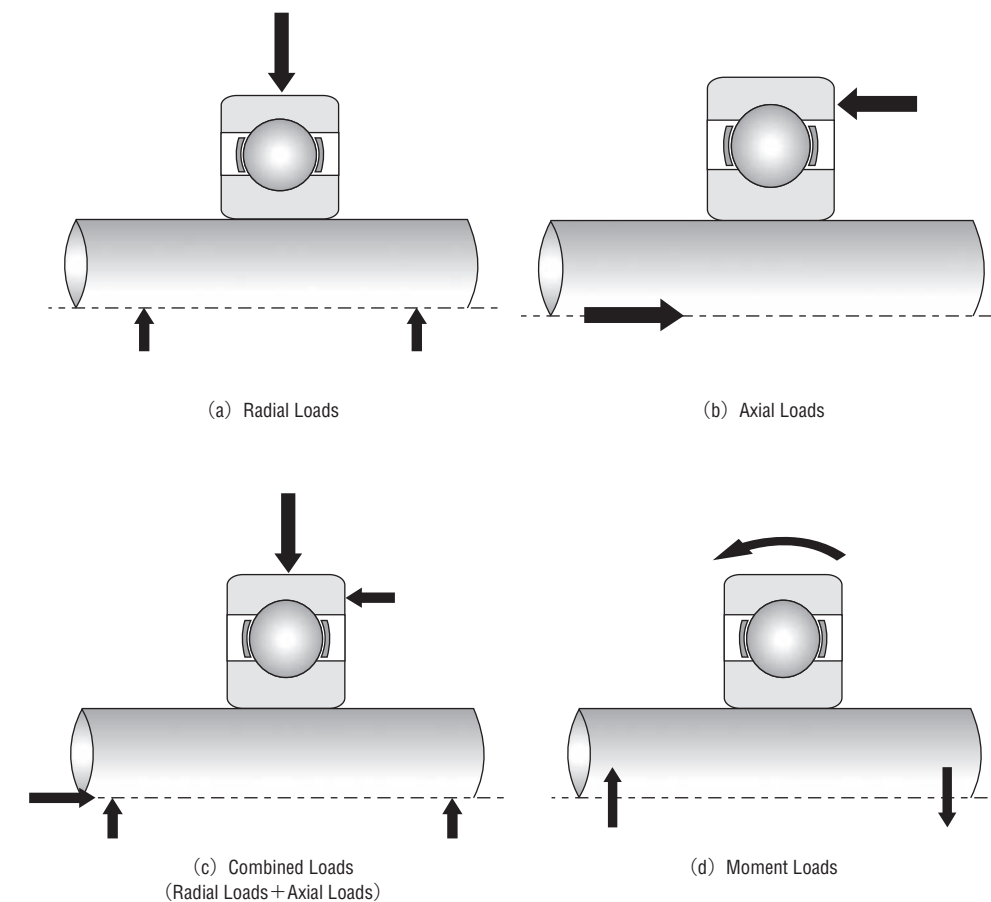


Fig. 1.4 Types of Load

DESIGN, TYPES, AND FEATURES

THRUST BALL BEARINGS

Thrust ball bearings are classified into those with flat seats or aligning seats, depending on the shape of the outer ring seat (housing washer). They can sustain axial loads but no radial loads.

Available Series of thrust ball bearings available are shown in Table 1.

For single-direction thrust ball bearings, pressed-steel cages and machined-brass cages are usually used as shown in Table 2. The cages in double-direction thrust ball bearings are the same as those in single-direction thrust ball bearings of the same Diameter Series.

The basic load ratings listed in the bearing tables are based on the standard cage type shown in Table 2. If the type of cage is different for bearings with the same number, the number of balls may vary; in such cases, the load rating will differ from that listed in the bearing tables.

MINIMUM AXIAL LOAD

Be sure to apply some axial load to thrust bearings to prevent slippage between the rolling elements and raceways. For more details, please refer to Page A198.

Table1 Series of Thrust Ball Bearings				Table 2 Standard Cages for Thrust Ball Bearings	
	W/Flat Seat	W/Aligning Seat	W/Aligning Seat Washer	Pressed Steel	Machined Brass
Single-Direction	511	—	—	51100 – 51152X	51156X – 51172X
	512	532	532U	51200 – 51236X	51238X – 51272X
	513	533	533U	51305 – 51336X	51338X – 51340X
	514	534	534U		
Double-Direction	522	542	542U	51405 – 51418X	51420X – 51436X
	523	543	543U	53200 – 53236X	53238X – 53272X
	524	544	544U	53305 – 53336X	53338X – 53340X
				53405 – 53418X	53420X – 53436X

TOLERANCES AND RUNNING ACCURACY

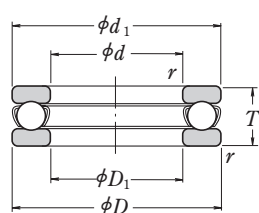
THRUST BALL BEARINGS Table 7.6 (Pages A140 to A142)

RECOMMENDED FITS

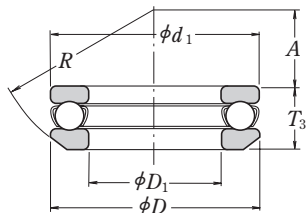
THRUST BALL BEARINGSTable 8.4 (Pages A164)
Table 8.6 (Pages A165)

SINGLE-DIRECTION THRUST BALL BEARINGS

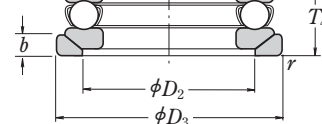
Bore Diameter 10 – 50 mm



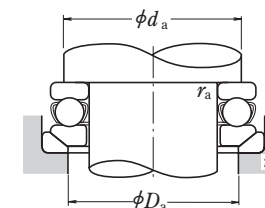
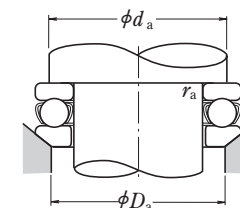
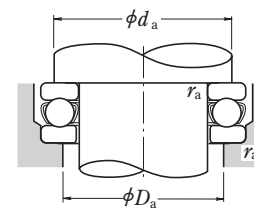
With Flat Seat



With Aligning Seat



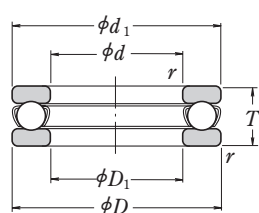
With Aligning Seat Washer



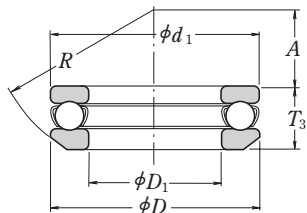
Boundary Dimensions (mm)						Basic Load Ratings (N)		Limiting Speeds (min ⁻¹)		Bearing	Designations		Dimensions (mm)							Abutment and Fillet Dimensions (mm)			Mass(kg) approx.		
<i>d</i>	<i>D</i>	<i>T</i>	<i>T</i> ₃	<i>T</i> ₄	<i>r</i> _{min.}	<i>C</i> _a	<i>C</i> _{0a}	Grease	Oil	With Flat Seat	With Aligning Seat	With Aligning Seat Washer	<i>d</i> ₁	<i>D</i> ₁	<i>D</i> ₂	<i>D</i> ₃	<i>b</i>	<i>A</i>	<i>R</i>	<i>d</i> _a min.	<i>D</i> _a max.	<i>r</i> _a max.	With Flat Seat	With Aligning Seat	With Aligning Seat Washer
10	24	9	—	—	0.3	10 100	14 000	6 700	10 000	51100	—	—	24	11	—	—	—	—	—	18	16	0.3	0.019	—	—
	26	11	11.6	13	0.6	12 800	17 100	6 000	9 000	51200	53200	53200 U	26	12	18	28	3.5	8.5	22	20	16	0.6	0.028	0.029	0.036
12	26	9	—	—	0.3	10 400	15 400	6 700	10 000	51101	—	—	26	13	—	—	—	—	—	20	18	0.3	0.021	—	—
	28	11	11.4	13	0.6	13 300	19 000	5 600	8 500	51201	53201	53201 U	28	14	20	30	3.5	11.5	25	22	18	0.6	0.031	0.031	0.039
15	28	9	—	—	0.3	10 600	16 800	6 300	9 500	51102	—	—	28	16	—	—	—	—	—	23	20	0.3	0.023	—	—
	32	12	13.3	15	0.6	16 700	24 800	5 000	7 500	51202	53202	53202 U	32	17	24	35	4	12	28	25	22	0.6	0.043	0.048	0.059
17	30	9	—	—	0.3	11 400	19 500	6 000	9 000	51103	—	—	30	18	—	—	—	—	—	25	22	0.3	0.025	—	—
	35	12	13.2	15	0.6	17 300	27 300	4 800	7 500	51203	53203	53203 U	35	19	26	38	4	16	32	28	24	0.6	0.050	0.055	0.069
20	35	10	—	—	0.3	15 100	26 600	5 300	8 000	51104	—	—	35	21	—	—	—	—	—	29	26	0.3	0.037	—	—
	40	14	14.7	17	0.6	22 500	37 500	4 300	6 300	51204	53204	53204 U	40	22	30	42	5	18	36	32	28	0.6	0.077	0.080	0.096
25	42	11	—	—	0.6	19 700	37 000	4 800	7 100	51105	—	—	42	26	—	—	—	—	—	35	32	0.6	0.056	—	—
	47	15	16.7	19	0.6	28 000	50 500	3 800	5 600	51205	53205	53205 U	47	27	36	50	5.5	19	40	38	34	0.6	0.111	0.123	0.151
	52	18	19.8	22	1	36 000	61 500	3 200	5 000	51305	53305	53305 U	52	27	38	55	6	21	45	41	36	1	0.169	0.182	0.224
	60	24	26.4	29	1	56 000	89 500	2 600	4 000	51405	53405	53405 U	60	27	42	62	8	19	50	46	39	1	0.334	0.353	0.426
30	47	11	—	—	0.6	20 600	42 000	4 300	6 700	51106	—	—	47	32	—	—	—	—	—	40	37	0.6	0.064	—	—
	52	16	17.8	20	0.6	29 500	58 000	3 400	5 300	51206	53206	53206 U	52	32	42	55	5.5	22	45	43	39	0.6	0.137	0.154	0.183
	60	21	22.6	25	1	43 000	78 500	2 800	4 300	51306	53306	53306 U	60	32	45	62	7	22	50	48	42	1	0.267	0.28	0.336
	70	28	30.1	33	1	73 000	126 000	2 200	3 400	51406	53406	53406 U	70	32	50	75	9	20	56	54	46	1	0.519	0.535	0.666
35	52	12	—	—	0.6	22 100	49 500	4 000	6 000	51107	—	—	52	37	—	—	—	—	—	45	42	0.6	0.081	—	—
	62	18	19.9	22	1	39 500	78 000	3 000	4 500	51207	53207	53207 U	62	37	48	65	7	24	50	51	46	1	0.21	0.231	0.292
	68	24	25.6	28	1	56 000	105 000	2 400	3 800	51307	53307	53307 U	68	37	52	72	7.5	24	56	55	48	1	0.386	0.403	0.488
	80	32	34	37	1.1	87 500	155 000	2 000	3 000	51407	53407	53407 U	80	37	58	85	10	23	64	62	53	1	0.769	0.785	0.967
40	60	13	—	—	0.6	27 100	63 000	3 600	5 300	51108	—	—	60	42	—	—	—	—	—	52	48	0.6	0.12	—	—
	68	19	20.3	23	1	47 500	98 500	2 800	4 300	51208	53208	53208 U	68	42	55	72	7	28.5	56	57	51	1	0.27	0.289	0.355
	78	26	28.5	31	1	70 000	135 000	2 200	3 400	51308	53308	53308 U	78	42	60	82	8.5	28	64	63	55	1	0.536	0.581	0.704
	90	36	38.2	42	1.1	103 000	188 000	1 700	2 600	51408	53408	53408 U	90	42	65	95	12	26	72	70	60	1	1.1	1.12	1.38
45	65	14	—	—	0.6	28 100	69 000	3 400	5 000	51109	—	—	65	47	—	—	—	—	—	57	53	0.6	0.143	—	—
	73	20	21.3	24	1	48 000	105 000	2 600	4 000	51209	53209	53209 U	73	47	60	78	7.5	26	56	62	56	1	0.31	0.333	0.419
	85	28	30.1	33	1	80 500	163 000	2 000	3 000	51309	53309	53309 U	85	47	65	90	10	25	64	69	61	1	0.672	0.702	0.888
	100	39	42.4	46	1.1	128 000	246 000	1 600	2 400	51409	53409	53409 U	100	47	72	105	12.5	29	80	78	67	1	1.46	1.53	1.87
50	70	14	—	—	0.6	29 000	75 500	3 200	4 800	51110	—	—	70	52	—	—	—	—	—	62	58	0.6	0.153	—	—
	78	22	23.5	26	1	49 000	111 000	2 400	3 600	51210	53210	53210 U	78	52	62	82	7.5	32.5	64	67	61	1	0.378	0.404	0.504
	95	31	34.3	37	1.1	97 500	202 000	1 800	2 800	51310	53310	53310 U	95	52	72	100	11	28	72	77	68	1	0.931	1.01	1.27
	110	43	45.6	50	1.5	147 000	288 000	1 400	2 200	51410	53410	53410 U	110	52	80	115	14	35	90	86	74	1.5	1.94	1.98	2.41

SINGLE-DIRECTION THRUST BALL BEARINGS

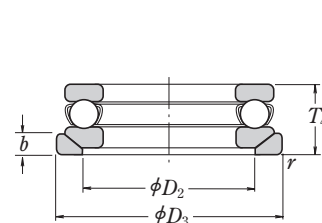
Bore Diameter 55 – 100 mm



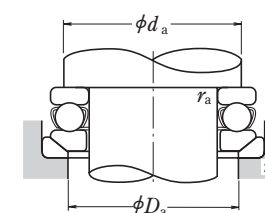
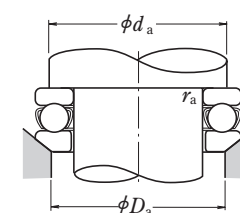
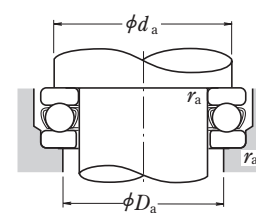
With Flat Seat



With Aligning Seat



With Aligning Seat Washer

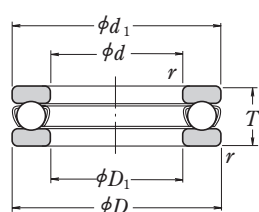


Boundary Dimensions (mm)						Basic Load Ratings (N)		Limiting Speeds (min ⁻¹)		Bearing	Designations ⁽¹⁾			Dimensions (mm)						Abutment and Fillet Dimensions (mm)			Mass(kg) approx.		
<i>d</i>	<i>D</i>	<i>T</i>	<i>T</i> ₃	<i>T</i> ₄	<i>r</i> min.	<i>C</i> _a	<i>C</i> _{0a}	Grease	Oil	With Flat Seat	With Aligning Seat	With Aligning Seat Washer	<i>d</i> ₁	<i>D</i> ₁	<i>D</i> ₂	<i>D</i> ₃	<i>b</i>	<i>A</i>	<i>R</i>	<i>d</i> _a min.	<i>D</i> _a max.	<i>r</i> _a max.	With Flat Seat	With Aligning Seat	With Aligning Seat Washer
55	78	16	—	—	0.6	35 000	93 000	2 800	4 300	51111	—	—	78	57	—	—	—	—	—	69	64	0.6	0.227	—	—
	90	25	27.3	30	1	70 000	159 000	2 200	3 200	51211	53211	53211 U	90	57	72	95	9	35	72	76	69	1	0.599	0.656	0.819
	105	35	39.3	42	1.1	115 000	244 000	1 600	2 400	51311	53311	53311 U	105	57	80	110	11.5	30	80	85	75	1	1.31	1.45	1.78
	120	48	50.5	55	1.5	181 000	350 000	1 300	1 900	51411	53411	53411 U	120	57	88	125	15.5	28	90	94	81	1.5	2.58	2.59	3.16
60	85	17	—	—	1	41 500	113 000	2 600	4 000	51112	—	—	85	62	—	—	—	—	—	75	70	1	0.281	—	—
	95	26	28	31	1	71 500	169 000	2 000	3 000	51212	53212	53212 U	95	62	78	100	9	32.5	72	81	74	1	0.673	0.731	0.897
	110	35	38.3	42	1.1	119 000	263 000	1 600	2 400	51312	53312	53312 U	110	62	85	115	11.5	41	90	90	80	1	1.4	1.51	1.83
	130	51	54	58	1.5	202 000	395 000	1 200	1 800	51412	53412	53412 U	130	62	95	135	16	34	100	102	88	1.5	3.16	3.2	3.91
65	90	18	—	—	1	42 000	117 000	2 400	3 800	51113	—	—	90	67	—	—	—	—	—	80	75	1	0.324	—	—
	100	27	28.7	32	1	75 500	189 000	1 900	2 800	51213	53213	53213 U	100	67	82	105	9	40	80	86	79	1	0.756	0.812	0.989
	115	36	39.4	43	1.1	123 000	282 000	1 500	2 400	51313	53313	53313 U	115	67	90	120	12.5	38.5	90	95	85	1	1.54	1.67	2.04
	140	56	60.2	65	2	234 000	495 000	1 100	1 700	51413	53413	53413 U	140	68	100	145	17.5	40	112	110	95	2	4.1	4.22	5.13
70	95	18	—	—	1	43 500	127 000	2 400	3 600	51114	—	—	95	72	—	—	—	—	—	85	80	1	0.346	—	—
	105	27	28.8	32	1	74 000	189 000	1 900	2 800	51214	53214	53214 U	105	72	88	110	9	38	80	91	84	1	0.793	0.866	1.05
	125	40	44.2	48	1.1	137 000	315 000	1 400	2 000	51314	53314	53314 U	125	72	98	130	13	43	100	103	92	1	2.0	2.2	2.64
	150	60	63.6	69	2	252 000	555 000	1 000	1 500	51414	53414	53414 U	150	73	110	155	19.5	34	112	118	102	2	5.05	5.12	6.21
75	100	19	—	—	1	43 500	131 000	2 200	3 400	51115	—	—	100	77	—	—	—	—	—	90	85	1	0.389	—	—
	110	27	28.3	32	1	78 000	209 000	1 800	2 800	51215	53215	53215 U	110	77	92	115	9.5	49	90	96	89	1	0.845	1.27	1.11
	135	44	48.1	52	1.5	159 000	365 000	1 300	1 900	51315	53315	53315 U	135	77	105	140	15	37	100	111	99	1.5	2.6	2.8	3.42
	160	65	69	75	2	254 000	560 000	950	1 400	51415	53415	53415 U	160	78	115	165	21	42	125	125	110	2	6.15	6.23	7.58
80	105	19	—	—	1	45 000	141 000	2 200	3 400	51116	—	—	105	82	—	—	—	—	—	95	90	1	0.417	—	—
	115	28	29.5	33	1	79 000	218 000	1 800	2 600	51216	53216	53216 U	115	82	98	120	10	46	90	101	94	1	0.931	1.01	1.23
	140	44	47.6	52	1.5	164 000	395 000	1 300	1 900	51316	53316	53316 U	140	82	110	145	15	50	112	116	104	1.5	2.74	2.94	3.55
	170	68	72.2	78	2.1	272 000	620 000	900	1 300	51416	53416	53416 U	170	83	125	175	22	36	125	133	117	2	7.21	7.33	8.9
85	110	19	—	—	1	46 500	150 000	2 200	3 200	51117	—	—	110	87	—	—	—	—	—	100	95	1	0.44	—	—
	125	31	33.1	37	1	96 000	264 000	1 600	2 400	51217	53217	53217 U	125	88	105	130	11	52	100	109	101	1	1.22	1.35	1.63
	150	49	53.1	58	1.5	207 000	490 000	1 100	1 700	51317	53317	53317 U	150	88	115	155	17.5	43	112	124	111	1.5	3.57	3.78	4.67
	180	72	77	83	2.1	310 000	755 000	850	1 300	51417 X	53417 X	53417 XU	177	88	130	185	23	47	140	141	124	2	8.51	8.72	10.4
90	120	22	—	—	1	60 000	190 000	1 900	3 000	51118	—	—	120	92	—	—	—	—	—	108	102	1	0.646	—	—
	135	35	38.5	42	1.1	114 000	310 000	1 400	2 200	51218	53218	53218 U	135	93	110	140	13.5	45	100	117	108	1	1.69	1.89	2.38
	155	50	54.6	59	1.5	214 000	525 000	1 100	1 700	51318	53318	53318 U	155	93	120	160	18	40	112	129	116	1.5	3.83	4.11	5.09
	190	77	81.2	88	2.1	330 000	825 000	800	1 200	51418 X	53418 X	53418 XU	187	93	140	195	25.5	40	140	149	131	2	10.2	10.3	12.4
100	135	25	—	—	1	86 000	268 000	1 700	2 600	51120	—	—	135	102	—	—	—	—	—	121	114	1	0.96	—	—
	150	38	40.9	45	1.1	135 000	375 000	1 300	2 000	51220	53220	53220 U	150	103	125	155	14	52	112	130	120	1	2.25	2.49	3.03
	170	55	59.2	64	1.5	239 000	595 000	1 000	1 500	51320	53320	53320 U	170	103	135	175	18	46	125	142	128	1.5	4.98	5.31	6.37
	210	85	90	98	3	370 000	985 000	710	1 100	51420 X	53420 X	53420 XU	205	103	155	220	27	50	160	165	145	2.5	14.8	15	18.1

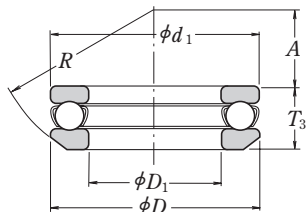
Note ⁽¹⁾ The outside diameter d_1 of shaft washers for bearing designations with an X is smaller than the outside diameter D of the housing washers.

SINGLE-DIRECTION THRUST BALL BEARINGS

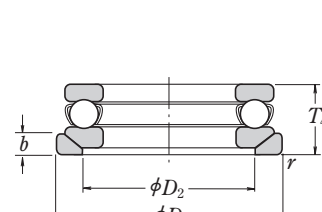
Bore Diameter 110 – 190 mm



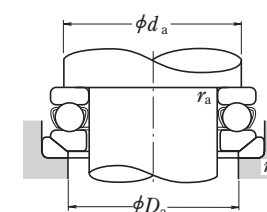
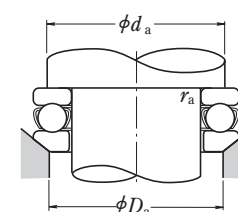
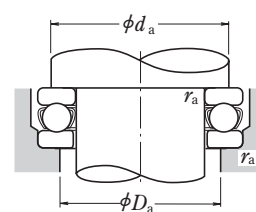
With Flat Seat



With Aligning Seat



With Aligning Seat Washer

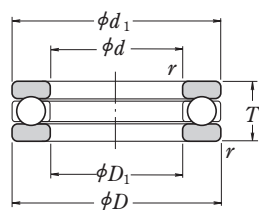


Boundary Dimensions (mm)						Basic Load Ratings (N)		Limiting Speeds (min ⁻¹)		Bearing	Designations ⁽¹⁾		Dimensions (mm)						Abutment and Fillet Dimensions (mm)			Mass(kg) approx.			
<i>d</i>	<i>D</i>	<i>T</i>	<i>T</i> ₃	<i>T</i> ₄	<i>r</i> min.	<i>C</i> _a	<i>C</i> _{0a}	Grease	Oil	With Flat Seat	With Aligning Seat	With Aligning Seat Washer	<i>d</i> ₁	<i>D</i> ₁	<i>D</i> ₂	<i>D</i> ₃	<i>b</i>	<i>A</i>	<i>R</i>	<i>d</i> _a min.	<i>D</i> _a max.	<i>r</i> _a max.	With Flat Seat	With Aligning Seat	With Aligning Seat Washer
110	145	25	—	—	1	88 000	288 000	1 700	2 400	51122	—	—	145	112	—	—	—	—	—	131	124	1	1.04	—	—
	160	38	40.2	45	1.1	136 000	395 000	1 300	1 900	51222	53222	53222 U	160	113	135	165	14	65	125	140	130	1	2.42	2.65	3.2
	190	63	67.2	72	2	282 000	755 000	900	1 300	51322 X	53322 X	53322 XU	187	113	150	195	20.5	51	140	158	142	2	7.19	7.55	9.1
	230	95	99.7	109	3	415 000	1 150 000	630	950	51422 X	53422 X	53422 XU	225	113	170	240	29	59	180	181	159	2.5	20	20.5	24.3
120	155	25	—	—	1	90 000	310 000	1 600	2 400	51124	—	—	155	122	—	—	—	—	—	141	134	1	1.12	—	—
	170	39	40.8	46	1.1	141 000	430 000	1 200	1 800	51224	53224	53224 U	170	123	145	175	15	61	125	150	140	1	2.7	2.94	3.58
	210	70	74.1	80	2.1	330 000	930 000	800	1 200	51324 X	53324 X	53324 XU	205	123	165	220	22	63	160	173	157	2	9.7	10.1	12.4
	250	102	107.3	118	4	480 000	1 400 000	600	900	51424 X	53424 X	53424 XU	245	123	185	260	32	70	200	196	174	3	26.2	26.5	31.3
130	170	30	—	—	1	105 000	350 000	1 400	2 000	51126	—	—	170	132	—	—	—	—	—	154	146	1	1.68	—	—
	190	45	47.9	53	1.5	183 000	550 000	1 100	1 600	51226 X	53226 X	53226 XU	187	133	160	195	17	67	140	166	154	1.5	3.95	4.35	5.33
	225	75	80.3	86	2.1	350 000	1 030 000	750	1 100	51326 X	53326 X	53326 XU	220	134	177	235	26	53	160	186	169	2	12.1	12.7	15.8
	270	110	115.2	128	4	525 000	1 590 000	530	800	51426 X	53426 X	53426 XU	265	134	200	280	38	58	200	212	188	3	32.3	32.4	38.8
140	180	31	—	—	1	107 000	375 000	1 300	2 000	51128 X	—	—	178	142	—	—	—	—	—	164	156	1	1.83	—	—
	200	46	48.6	55	1.5	186 000	575 000	1 000	1 500	51228 X	53228 X	53228 XU	197	143	170	210	17	87	160	176	164	1.5	4.3	4.74	5.89
	240	80	84.9	92	2.1	370 000	1 130 000	670	1 000	51328 X	53328 X	53328 XU	235	144	190	250	26	68	180	199	181	2	14.2	16.3	19.5
	280	112	117	131	4	550 000	1 750 000	530	800	51428 X	53428 X	53428 XU	275	144	206	290	38	83	225	222	198	3	34.7	34.8	41.4
150	190	31	—	—	1	110 000	400 000	1 300	1 900	51130 X	—	—	188	152	—	—	—	—	—	174	166	1	1.95	—	—
	215	50	53.3	60	1.5	238 000	735 000	950	1 400	51230 X	53230 X	53230 XU	212	153	180	225	20.5	79	160	189	176	1.5	5.52	6.09	7.82
	250	80	83.7	92	2.1	380 000	1 200 000	670	1 000	51330 X	53330 X	53330 XU	245	154	200	260	26	89.5	200	209	191	2	15	17.3	20.5
	300	120	125.9	140	4	620 000	2 010 000	480	710	51430 X	53430 X	53430 XU	295	154	225	310	41	69	225	238	212	3	43.5	43.8	51.9
160	200	31	—	—	1	113 000	425 000	1 200	1 900	51132 X	—	—	198	162	—	—	—	—	—	184	176	1	2.07	—	—
	225	51	54.7	61	1.5	249 000	805 000	900	1 400	51232 X	53232 X	53232 XU	222	163	190	235	21	74	160	199	186	1.5	6.04	6.78	8.7
	270	87	91.7	100	3	475 000	1 570 000	600	900	51332 X	53332 X	53332 XU	265	164	215	280	29	77	200	225	205	2.5	19.6	22.3	26.7
	320	130	135.3	150	5	650 000	2 210 000	450	670	51432 X	53432 X	53432 XU	315	164	240	330	41.5	84	250	254	226	4	52.7	52.9	62
170	215	34	—	—	1.1	135 000	510 000	1 100	1 700	51134 X	—	—	213	172	—	—	—	—	—	197	188	1	2.72	—	—
	240	55	58.7	65	1.5	280 000	915 000	850	1 300	51234 X	53234 X	53234 XU	237	173	200	250	21.5	91	180	212	198	1.5	7.41	8.21	10.5
	280	87	91.3	100	3	465 000	1 570 000	600	900	51334 X	53334 X	53334 XU	275	174	220	290	29	105	225	235	215	2.5	20.3	23.2	28
	340	135	141	156	5	715 000	2 480 000	430	630	51434 X	53434 X	53434 XU	335	174	255	350	46	74	250	269	241	4	61.2	61.3	73
180	225	34	—	—	1.1	136 000	530 000	1 100	1 700	51136 X	—	—	222	183	—	—	—	—	—	207	198	1	2.79	—	—
	250	56	58.2	66	1.5	284 000	955 000	800	1 200	51236 X	53236 X	53236 XU	247	183	210	260	21.5	112	200	222	208	1.5	7.94	8.57	10.8
	300	95	99.3	109	3	480 000	1 680 000	560	850	51336 X	53336 X	53336 XU	295	184	240	310	32	91	225	251	229	2.5	25.9	29.2	34.9
	360	140	148.3	164	5	750 000	2 730 000	400	600	51436 X	53436 X	53436 XU	355	184	270	370	46.5	97	280	285	255	4	70.5	72.1	84.9
190	240	37	—	—	1.1	172 000	655 000	1 000	1 600	51138 X	—	—	237	193	—	—	—	—	—	220	210	1	3.6	—	—
	270	62	65.7	73	2	320 000	1 110 000	750	1 100	51238 X	53238 X	53238 XU	267	194	230	280	23	98	200	238	222	2	11.8	12.9	15.7
	320	105	111	121	4	550 000	1 960 000	500	750	51338 X	53338 X	53338 XU	315	195	255	330	33	104	250	266	244	3	36.5	38.1	44.7

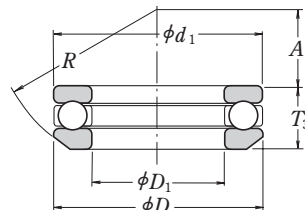
Note ⁽¹⁾ The outside diameter d_1 of shaft washers for bearing designations with an X is smaller than the outside diameter D of the housing washers.

SINGLE-DIRECTION THRUST BALL BEARINGS

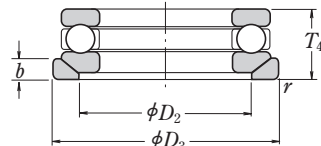
Bore Diameter 200 – 360 mm



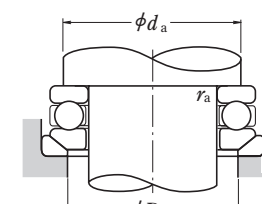
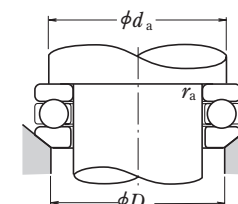
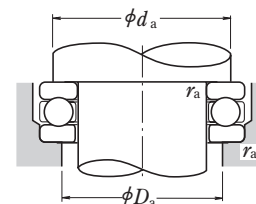
With Flat Seat



With Aligning Seat



With Aligning Seat Washer

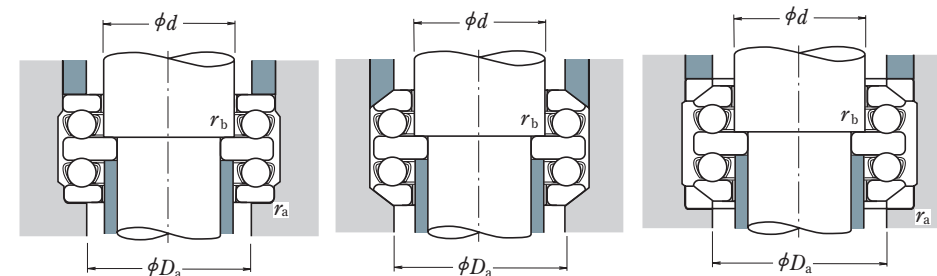
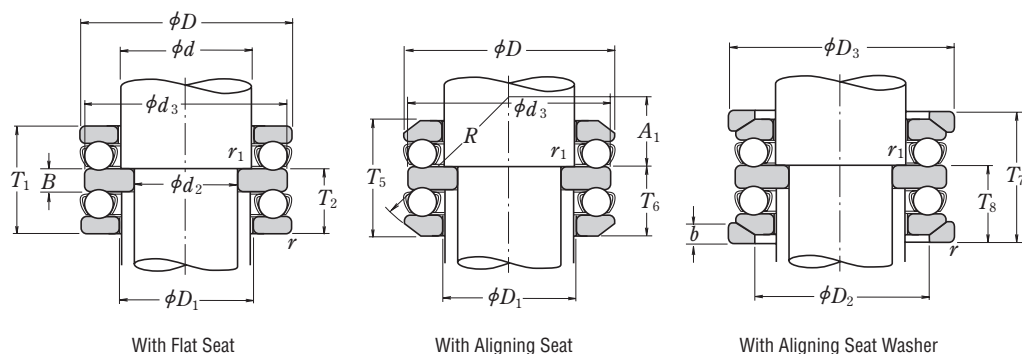


Boundary Dimensions (mm)						Basic Load Ratings (N)		Limiting Speeds (min ⁻¹)		Bearing	Designations ⁽¹⁾		Dimensions (mm)						Abutment and Fillet Dimensions (mm)			Mass(kg) approx.			
<i>d</i>	<i>D</i>	<i>T</i>	<i>T</i> ₃	<i>T</i> ₄	<i>r</i> min.	<i>C</i> _a	<i>C</i> _{0a}	Grease	Oil	With Flat Seat	With Aligning Seat	With Aligning Seat Washer	<i>d</i> ₁	<i>D</i> ₁	<i>D</i> ₂	<i>D</i> ₃	<i>b</i>	<i>A</i>	<i>R</i>	<i>d</i> _a min.	<i>D</i> _a max.	<i>r</i> _a max.	With Flat Seat	With Aligning Seat	With Aligning Seat Washer
200	250	37	—	—	1.1	173 000	675 000	1 000	1 500	51140 X	—	—	247	203	—	—	—	—	—	230	220	1	3.75	—	—
	280	62	65.3	74	2	315 000	1 110 000	710	1 100	51240 X	53240 X	53240 XU	277	204	240	290	23	125	225	248	232	2	12.3	13.4	16.1
	340	110	118.4	130	4	600 000	2 220 000	480	710	51340 X	53340 X	53340 XU	335	205	270	350	38	92	250	282	258	3	43.6	46.2	54.8
220	270	37	—	—	1.1	179 000	740 000	950	1 500	51144 X	—	—	267	223	—	—	—	—	—	250	240	1	4.09	—	—
	300	63	65.6	75	2	325 000	1 210 000	670	1 000	51244 X	53244 X	53244 XU	297	224	260	310	25	118	225	268	252	2	13.6	14.9	18
240	300	45	—	—	1.5	229 000	935 000	850	1 200	51148 X	—	—	297	243	—	—	—	—	—	276	264	1.5	6.55	—	—
	340	78	81.6	92	2.1	420 000	1 650 000	560	850	51248 X	53248 X	53248 XU	335	244	290	350	30	122	250	299	281	2	23.7	25.6	30.7
260	320	45	—	—	1.5	233 000	990 000	800	1 200	51152 X	—	—	317	263	—	—	—	—	—	296	284	1.5	7.01	—	—
	360	79	82.8	93	2.1	435 000	1 800 000	560	850	51252 X	53252 X	53252 XU	355	264	305	370	30	152	280	319	301	2	25.1	27.3	33.2
280	350	53	—	—	1.5	315 000	1 310 000	710	1 000	51156 X	—	—	347	283	—	—	—	—	—	322	308	1.5	12	—	—
	380	80	85	94	2.1	450 000	1 950 000	530	800	51256 X	53256 X	53256 XU	375	284	325	390	31	143	280	339	321	2	27.1	30.3	37
300	380	62	—	—	2	360 000	1 560 000	600	900	51160 X	—	—	376	304	—	—	—	—	—	348	332	2	17.2	—	—
	420	95	100.5	112	3	540 000	2 410 000	450	670	51260 X	53260 X	53260 XU	415	304	360	430	34	164	320	371	349	2.5	43.5	47.7	56.1
320	400	63	—	—	2	365 000	1 660 000	600	900	51164 X	—	—	396	324	—	—	—	—	—	368	352	2	18.6	—	—
	440	95	100.5	112	3	585 000	2 680 000	450	670	51264 X	53264 X	53264 XU	435	325	380	450	36	157	320	391	369	2.5	45	49.9	59.4
340	420	64	—	—	2	375 000	1 760 000	560	850	51168 X	—	—	416	344	—	—	—	—	—	388	372	2	19.9	—	—
	460	96	100.3	113	3	595 000	2 800 000	430	630	51268 X	53268 X	53268 XU	455	345	400	470	36	199	360	411	389	2.5	47.9	52.7	62
360	440	65	—	—	2	385 000	1 860 000	560	800	51172 X	—	—	436	364	—	—	—	—	—	408	392	2	21.5	—	—
	500	110	116.7	130	4	705 000	3 500 000	380	560	51272 X	53272 X	53272 XU	495	365	430	510	43	172	360	442	418	3	68.8	76.3	90.9

Note ⁽¹⁾ The outside diameter *d*₁ of shaft washers for bearing designations with an X is smaller than the outside diameter *D* of the housing washers.

DOUBLE-DIRECTION THRUST BALL BEARINGS

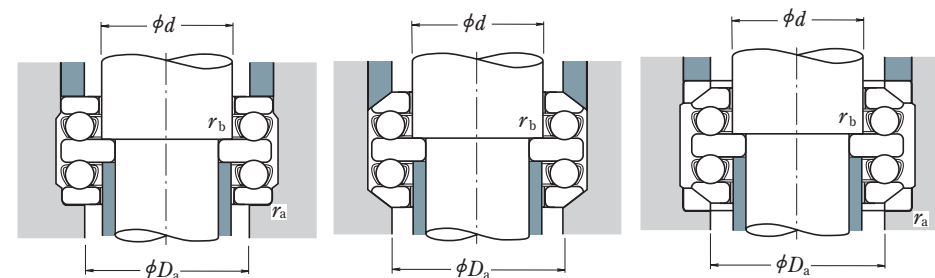
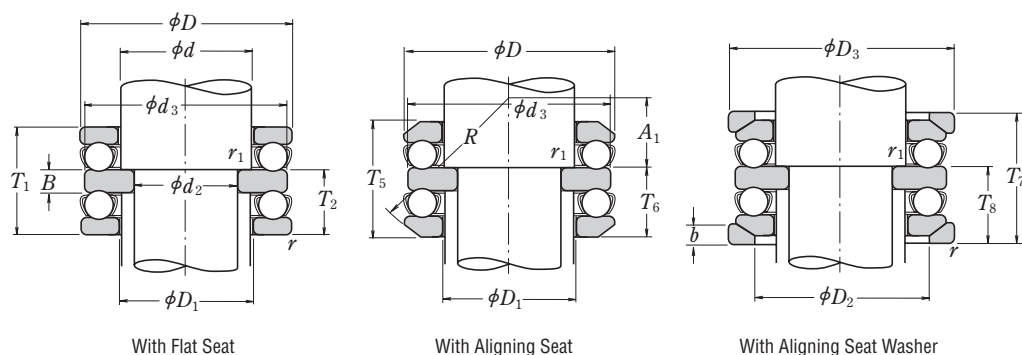
Bore Diameter 10 – 55 mm



Boundary Dimensions (mm)								Basic Load Ratings (N)		Limiting Speeds (min ⁻¹)		Bearing		Designations	Dimensions (mm)											Abutment and Fillet Dimensions (mm)			Mass (kg) approx.		
d_2	d	D	T_1	T_5	T_7	$r_{\min}$	$r_{1\min}$	C_a	C_{0a}	Grease	Oil	With Flat Seat	With Aligning Seat	With Aligning Seat Washer	d_3	D_1	D_2	D_3	T_2	T_6	T_8	B	b	A_1	R	D_a max.	r_a max.	r_b max.	With Flat Seat	With Aligning Seat	With Aligning Seat Washer
10	15	32	22	24.6	28	0.6	0.3	16 700	24 800	4 800	7 100	52202	54202	54202 U	32	17	24	35	13.5	14.8	16.5	5	4	10.5	28	24	0.6	0.3	0.081	0.090	0.113
15	20	40	26	27.4	32	0.6	0.3	22 500	37 500	4 000	6 000	52204	54204	54204 U	40	22	30	42	16	16.7	19	6	5	16	36	30	0.6	0.3	0.148	0.151	0.185
	25	60	45	49.8	55	1	0.6	56 000	89 500	2 400	3 600	52405	54405	54405 U	60	27	42	62	28	30.4	33	11	8	15	50	42	1	0.6	0.641	0.68	0.825
	30	70	52	56.2	62	1	0.6	73 000	126 000	2 200	3 200	52406	54406	54406 U	70	32	50	75	32	34.1	37	12	9	16	56	50	1	0.6	0.978	1.01	1.27
20	25	47	28	31.4	36	0.6	0.3	28 000	50 500	3 400	5 300	52205	54205	54205 U	47	27	36	50	17.5	19.2	21.5	7	5.5	16.5	40	36	0.6	0.3	0.213	0.236	0.293
	25	52	34	37.6	42	1	0.3	36 000	61 500	3 000	4 500	52305	54305	54305 U	52	27	38	55	21	22.8	25	8	6	18	45	38	1	0.3	0.324	0.35	0.434
	30	70	52	56.2	62	1	0.6	73 000	126 000	2 200	3 200	52406	54406	54406 U	70	32	50	75	32	34.1	37	12	9	16	56	50	1	0.6	0.978	1.01	1.27
25	30	52	29	32.6	37	0.6	0.3	29 500	58 000	3 200	5 000	52206	54206	54206 U	52	32	42	55	18	19.8	22	7	5.5	20	45	42	0.6	0.3	0.254	0.288	0.345
	30	60	38	41.2	46	1	0.3	43 000	78 500	2 600	4 000	52306	54306	54306 U	60	32	45	62	23.5	25.1	27.5	9	7	19.5	50	45	1	0.3	0.483	0.511	0.621
	35	80	59	63	69	1.1	0.6	87 500	155 000	1 800	2 800	52407	54407	54407 U	80	37	58	85	36.5	38.5	41.5	14	10	18.5	64	58	1	0.6	1.43	1.47	1.83
30	35	62	34	37.8	42	1	0.3	39 500	78 000	2 800	4 300	52207	54207	54207 U	62	37	48	65	21	22.9	25	8	7	21	50	48	1	0.3	0.406	0.447	0.57
	35	68	44	47.2	52	1	0.3	56 000	105 000	2 400	3 600	52307	54307	54307 U	68	37	52	72	27	28.6	31	10	7.5	21	56	52	1	0.3	0.71	0.744	0.915
	40	68	36	38.6	44	1	0.6	47 500	98 500	2 600	3 800	52208	54208	54208 U	68	42	55	72	22.5	23.8	26.5	9	7	25	56	55	1	0.6	0.543	0.581	0.713
40	40	78	49	54	59	1	0.6	70 000	135 000	2 000	3 000	52308	54308	54308 U	78	42	60	82	30.5	33	35.5	12	8.5	23.5	64	60	1	0.6	1.04	1.13	1.38
	40	90	65	69.4	77	1.1	0.6	103 000	188 000	1 700	2 400	52408	54408	54408 U	90	42	65	95	40	42.2	46	15	12	22	72	65	1	0.6	1.98	2.02	2.54
	45	73	37	39.6	45	1	0.6	48 000	105 000	2 400	3 600	52209	54209	54209 U	73	47	60	78	23	24.3	27	9	7.5	23	56	60	1	0.6	0.606	0.652	0.823
35	45	85	52	56.2	62	1	0.6	80 500	163 000	1 900	2 800	52309	54309	54309 U	85	47	65	90	32	34.1	37	12	10	21	64	65	1	0.6	1.28	1.34	1.71
	45	100	72	78.8	86	1.1	0.6	128 000	246 000	1 500	2 200	52409	54409	54409 U	100	47	72	105	44.5	47.9	51.5	17	12.5	23.5	80	72	1	0.6	2.71	2.85	3.53
40	50	78	39	42	47	1	0.6	49 000	111 000	2 400	3 400	52210	54210	54210 U	78	52	62	82	24	25.5	28	9	7.5	30.5	64	62	1	0.6	0.697	0.75	0.949
	50	95	58	64.6	70	1.1	0.6	97 500	202 000	1 700	2 600	52310	54310	54310 U	95	52	72	100	36	39.3	42	14	11	23	72	72	1	0.6	1.78	1.94	2.46
	50	110	78	83.2	92	1.5	0.6	147 000	288 000	1 400	2 000	52410	54410	54410 U	110	52	80	115	48	50.6	55	18	14	30	90	80	1.5	0.6	3.51	3.59	4.45
45	55	90	45	49.6	55	1	0.6	70 000	159 000	2 000	3 000	52211	54211	54211 U	90	57	72	95	27.5	29.8	32.5	10	9	32.5	72	72	1	0.6	1.11	1.22	1.55
	55	105	64	72.6	78	1.1	0.6	115 000	244 000	1 500	2 400	52311	54311	54311 U	105	57	80	110	39.5	43.8	46.5	15	11.5	25.5	80	80	1	0.6	2.43	2.7	3.35
	55	120	87	92	101	1.5	0.6	181 000	350 000	1 200	1 800	52411	54411	54411 U	120	57	88	125	53.5	56	60.5	20	15.5	22.5	90	88	1.5	0.6	4.66	4.68	5.82
50	60	95	46	50	56	1	0.6	71 500	169 000	1 900	3 000	52212	54212	54212 U	95	62	78	100	28	30	33	10	9	30.5	72	78	1	0.6	1.22	1.33	1.66
	60	110	64	70.6	78	1.1	0.6	119 000	263 000	1 500	2 200	52312	54312	54312 U	110	62	85	115	39.5	42.8	46.5	15	11.5	25.5	80	85	1	0.6	2.59	2.82	3.45
	60	130	93	99	107	1.5	0.6	202 000	395 000	1 100	1 700	52412	54412	54412 U	130	62	95	135	57	60	64	21	16	28	100	95	1.5	0.6	5.74	5.82	7.24
55	65	140	101	109.4	119	2	1	234 000	495 000	1 000	1 600	52413	54413	54413 U	140	68	100	145	62	66.2	71	23	17.5	34	112	100	2	1	7.41	7.66	9.47
	65	100	47	50.4	57	1	0.6	75 500	189 000	1 900	2 800	52213	54213	54213 U	100	67	82	105	28.5	30.2	33.5	10	9	38.5	80	82	1	0.6	1.34	1.45	1.81
	65	115	65	71.8	79	1.1	0.6	123 000	282 000	1 500	2 200	52313	54313	54313 U	115	67	90	120	40	43.4	47	15	12.5	34.5	90	90	1	0.6	2.8	3.06	3.8
70	70	105	47	50.6	57	1	1	74 000	189 000	1 800	2 800	52214	54214	54214 U	105	72	88	110	28.5	30.3	33.5	10	9	36.5	80	88	1	1	1.44	1.59	1.95
	70	125	72	80.4	88	1.1	1	137 000	315 000	1 300	2 000	52314	54314	54314 U	125	72	98	130	44	48.2	52	16	13	39	100	98	1	1	3.67	4.07	4.95
	70	150	107	114.2	125	2	1	252 000	555 000	1 000	1 500	52414	54414	54414 U	150	73	110	155	65.5	69.1	74.5	24	19.5	28.5	112	110	2	1	8.99	9.12	11.3

DOUBLE-DIRECTION THRUST BALL BEARINGS

Bore Diameter 60 – 130 mm

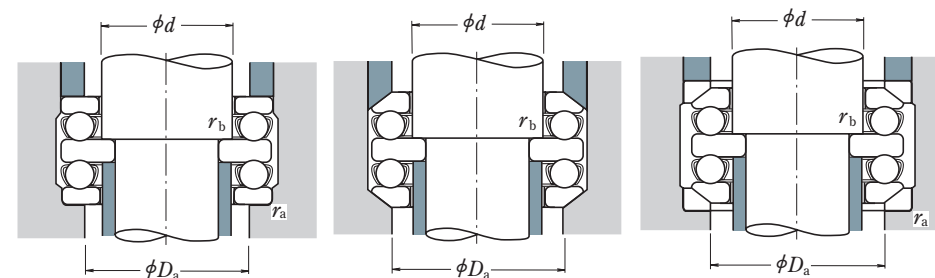
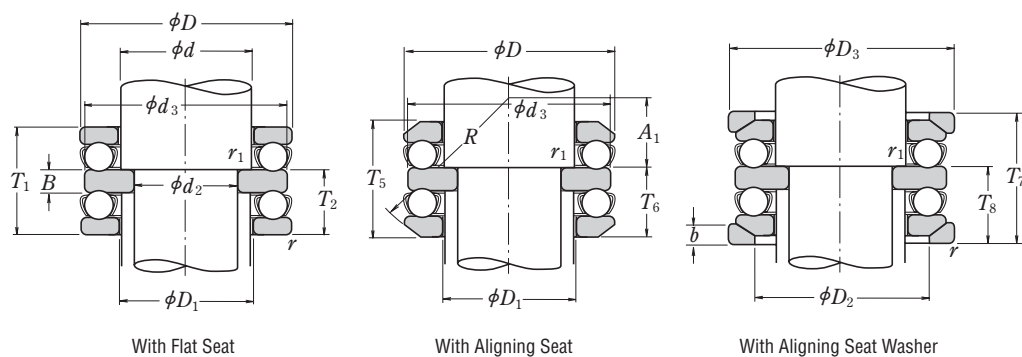


Boundary Dimensions (mm)								Basic Load Ratings (N)		Limiting Speeds (min ⁻¹)		Bearing Designations ⁽¹⁾			Dimensions (mm)										Abutment and Fillet Dimensions (mm)			Mass(kg) approx.			
<i>d</i> ₂	<i>d</i>	<i>D</i>	<i>T</i> ₁	<i>T</i> ₅	<i>T</i> ₇	<i>r</i> min.	<i>r</i> ₁ min.	<i>C</i> _a	<i>C</i> _{0a}	Grease	Oil	With Flat Seat	With Aligning Seat	With Aligning Seat Washer	<i>d</i> ₃	<i>D</i> ₁	<i>D</i> ₂	<i>D</i> ₃	<i>T</i> ₂	<i>T</i> ₆	<i>T</i> ₈	<i>B</i>	<i>b</i>	<i>A</i> ₁	<i>R</i>	<i>D</i> _a max.	<i>r</i> _a max.	<i>r</i> _b max.	With Flat Seat	With Aligning Seat	With Aligning Seat Washer
60	75	110	47	49.6	57	1	1	78 000	209 000	1 800	2 600	52215	54215	54215 U	110	77	92	115	28.5	29.8	33.5	10	9.5	47.5	90	92	1	1	1.54	1.66	2.06
	75	135	79	87.2	95	1.5	1	159 000	365 000	1 200	1 800	52315	54315	54315 U	135	77	105	140	48.5	52.6	56.5	18	15	32.5	100	105	1.5	1	4.74	5.14	6.38
	75	160	115	123	135	2	1	254 000	560 000	900	1 400	52415	54415	54415 U	160	78	115	165	70.5	74.5	80.5	26	21	36.5	125	115	2	1	10.8	11	13.7
65	80	115	48	51	58	1	1	79 000	218 000	1 700	2 600	52216	54216	54216 U	115	82	98	120	29	30.5	34	10	10	45	90	98	1	1	1.66	1.78	2.21
	80	140	79	86.2	95	1.5	1	164 000	395 000	1 200	1 800	52316	54316	54316 U	140	82	110	145	48.5	52.1	56.5	18	15	45.5	112	110	1.5	1	4.99	5.39	6.61
	80	170	120	128.4	140	2.1	1	272 000	620 000	850	1 300	52416	54416	54416 U	170	83	125	175	73.5	77.7	83.5	27	22	30.5	125	125	2	1	12.6	12.8	16
	85	180	128	138	150	2.1	1.1	310 000	755 000	800	1 200	52417 X	54417 X	54417 XU	179.5	88	130	185	78.5	83.5	89.5	29	23	40.5	140	130	2	1	15.4	15.8	19.5
70	85	125	55	59.2	67	1	1	96 000	264 000	1 500	2 200	52217	54217	54217 U	125	88	105	130	33.5	35.6	39.5	12	11	49.5	100	105	1	1	2.26	2.45	3.02
	85	150	87	95.2	105	1.5	1	207 000	490 000	1 100	1 600	52317	54317	54317 U	150	88	115	155	53	57.1	62	19	17.5	39	112	115	1.5	1	6.38	6.8	10.5
	90	190	135	143.4	157	2.1	1.1	330 000	825 000	750	1 100	52418 X	54418 X	54418 XU	189.5	93	140	195	82.5	86.7	93.5	30	25.5	34.5	140	140	2	1	17.5	18.1	22.5
75	90	135	62	69	76	1.1	1	114 000	310 000	1 400	2 000	52218	54218	54218 U	135	93	110	140	38	41.5	45	14	13.5	42	100	110	1	1	3.09	3.42	4.39
80	90	155	88	97.2	106	1.5	1	214 000	525 000	1 100	1 600	52318	54318	54318 U	155	93	120	160	53.5	58.1	62.5	19	18	36.5	112	120	1.5	1	6.79	7.33	9.29
	100	210	150	160	176	3	1.1	370 000	985 000	670	1 000	52420 X	54420 X	54420 XU	209.5	103	155	220	91.5	96.5	104.5	33	27	43.5	160	155	2.5	1	26.8	27.2	33.4
85	100	150	67	72.8	81	1.1	1	135 000	375 000	1 300	1 900	52220	54220	54220 U	150	103	125	155	41	43.9	48	15	14	49	112	125	1	1	4.08	4.54	5.64
	100	170	97	105.4	115	1.5	1	239 000	595 000	950	1 500	52320	54320	54320 U	170	103	135	175	59	63.2	68	21	18	42	125	135	1.5	1	8.82	9.47	11.6
90	110	230	166	—	—	3	1.1	415 000	1 150 000	600	900	52422 X	—	—	229	113	—	—	101.5	—	—	37	—	—	—	159	2.5	1	35.6	—	—
	95	110	160	67	71.4	81	1.1	1	136 000	395 000	1 200	1 800	52222	54222	54222 U	160	113	135	165	41	43.2	48	15	14	62	125	135	1	1	4.39	4.83
110		190	110	118.4	128	2	1	282 000	755 000	850	1 300	52322 X	54322 X	54322 XU	189.5	113	150	195	67	71.2	76	24	20.5	47	140	150	2	1	12.7	13.5	16.6
120		250	177	—	—	4	1.5	515 000	1 540 000	560	850	52424 X	—	—	249	123	—	—	108.5	—	—	40	—	—	—	174	3	1.5	47.6	—	—
100	120	170	68	71.6	82	1.1	1.1	141 000	430 000	1 200	1 800	52224	54224	54224 U	170	123	145	175	41.5	43.3	48.5	15	15	58.5	125	145	1	1	4.92	5.4	6.68
	120	210	123	131.2	143	2.1	1.1	330 000	930 000	750	1 100	52324 X	54324 X	54324 XU	209.5	123	165	220	75	79.1	85	27	22	58	160	165	2	1	17.6	16.4	22.9
	130	270	192	—	—	4	1.5	525 000	1 590 000	530	800	52426 X	—	—	269	134	—	—	117	—	—	42	—	—	—	188	3	1.5	57.8	—	—
110	130	190	80	85.8	96	1.5	1.1	183 000	550 000	1 000	1 500	52226 X	54226 X	54226 XU	189.5	133	160	195	49	51.9	57	18	17	63	140	160	1.5	1	7.43	8.24	10.2
	130	225	130	—	—	2.1	1.1	350 000	1 030 000	710	1 100	52326 X	—	—	224	134	—	—	80	—	—	30	—	—	—	169	2	1	21.5	—	—
	140	280	196	—	—	4	1.5	550 000	1 750 000	500	750	52428 X	—	—	279	144	—	—	120	—	—	44	—	—	—	198	3	1.5	62.4	—	—
120	140	200	81	86.2	99	1.5	1.1	186 000	575 000	1 000	1 500	52228 X	54228 X	54228 XU	199.5	143	170	210	49.5	52.1	58.5	18	17	83.5	160	170	1.5	1	8.01	8.87	11.2
	140	240	140	—	—	2.1	1.1	370 000	1 130 000	670	1 000	52328 X	—	—	239	144	—	—	85.5	—	—	31	—	—	—	181	2	1	24.8	—	—
	150	300	209	—	—	4	2	620 000	2 010 000	480	710	52430 X	—	—	299	153	—	—	127.5	—	—	46	—	—	—	212	3	2	77.8	—	—
130	150	215	89	95.6	109	1.5	1.1	238 000	735 000	900	1 300	52230 X	54230 X	54230 XU	214.5	153	180	225	54.5	57.8	64.5	20	20.5	74.5	160	180	1.5	1	10.4	11.5	15
	150	250	140	—	—	2.1	1.1	380 000	1 200 000	630	950	52330 X	—	—	249	154	—	—	85.5	—	—	31	—	—	—	191	2	1	30.3	—	—
	160	320	226	—	—	5	2	650 000	2 210 000	430	630	52432 X	—	—	319	164	—	—	138	—	—	50	—	—	—	226	4	2	93.6	—	—

Note ⁽¹⁾ The outside diameter d_3 of central washers for bearing designations with an X is smaller than the outside diameter D of the housing washers.

DOUBLE-DIRECTION THRUST BALL BEARINGS

Bore Diameter 135 – 190 mm



Boundary Dimensions (mm)								Basic Load Ratings (N)		Limiting Speeds (min ⁻¹)		Bearing Designations ⁽¹⁾			With Aligning Seat Washer	Dimensions (mm)										Abutment and Fillet Dimensions (mm)			Mass(kg) approx.		
<i>d</i> ₂	<i>d</i>	<i>D</i>	<i>T</i> ₁	<i>T</i> ₅	<i>T</i> ₇	<i>r</i> min.	<i>r</i> ₁ min.	<i>C</i> _a	<i>C</i> _{0a}	Grease	Oil	With Flat Seat	With Aligning Seat	<i>d</i> ₃		<i>D</i> ₁	<i>D</i> ₂	<i>D</i> ₃	<i>T</i> ₂	<i>T</i> ₆	<i>T</i> ₈	<i>B</i>	<i>b</i>	<i>A</i> ₁	<i>R</i>	<i>D</i> _a max.	<i>r</i> _a max.	<i>r</i> _b max.	With Flat Seat	With Aligning Seat	With Aligning Seat Washer
135	170	340	236	—	—	5	2.1	715 000	2 480 000	400	600	52434 X	—	—	339	174	—	—	143	—	—	50	—	—	—	240	4	2	110	—	—
140	160	225	90	97.4	110	1.5	1.1	249 000	805 000	850	1 300	52232 X	54232 X	54232 XU	224.5	163	190	235	55	58.7	65	20	21	70	160	190	1.5	1	11.2	12.7	16.5
	160	270	153	—	—	3	1.1	475 000	1 570 000	600	900	52332 X	—	—	269	164	—	—	93	—	—	33	—	—	—	205	2.5	1	35.1	—	—
	180	360	245	—	—	5	3	750 000	2 730 000	380	560	52436 X	—	—	359	184	—	—	148.5	—	—	52	—	—	—	254	4	2.5	126	—	—
150	170	240	97	104.4	117	1.5	1.1	280 000	915 000	800	1 200	52234 X	54234 X	54234 XU	239.5	173	200	250	59	62.7	69	21	21.5	87	180	200	1.5	1	13.6	15.2	19.8
	170	280	153	—	—	3	1.1	465 000	1 570 000	560	850	52334 X	—	—	279	174	—	—	93	—	—	33	—	—	—	215	2.5	1	40.8	—	—
	180	250	98	102.4	118	1.5	2	284 000	955 000	800	1 200	52236 X	54236 X	54236 XU	249	183	210	260	59.5	61.7	69.5	21	21.5	108.5	200	210	1.5	2	14.8	16.1	20.6
	180	300	165	—	—	3	2	480 000	1 680 000	530	800	52336 X	—	—	299	184	—	—	101	—	—	37	—	—	—	229	2.5	2.5	46.3	—	—
160	190	270	109	116.4	131	2	2	320 000	1 110 000	710	1 100	52238 X	54238 X	54238 XU	269	194	230	280	66.5	70.2	77.5	24	23	93.5	200	230	2	2	22.1	22.2	29.8
	190	320	183	—	—	4	2	550 000	1 960 000	480	710	52338 X	—	—	319	195	—	—	111.5	—	—	40	—	—	—	244	3	2	113	—	—
170	200	280	109	115.6	133	2	2	315 000	1 110 000	710	1 000	52240 X	54240 X	54240 XU	279	204	240	290	66.5	69.8	78.5	24	23	120.5	225	240	2	2	23.1	23.2	30.6
	200	340	192	—	—	4	2	600 000	2 220 000	450	670	52340 X	—	—	339	205	—	—	117	—	—	42	—	—	—	258	3	2	78.4	—	—
190	220	300	110	115.2	134	2	2	325 000	1 210 000	670	1 000	52244 X	54244 X	54244 XU	299	224	260	310	67	69.6	79	24	25	114	225	260	2	2	25.2	27.8	34.1

Note ⁽¹⁾ The outside diameter d_3 of central washers for bearing designations with an X is smaller than the outside diameter D of the housing washers.