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SINGLE-ROW DEEP GROOVE BALL BEARINGS

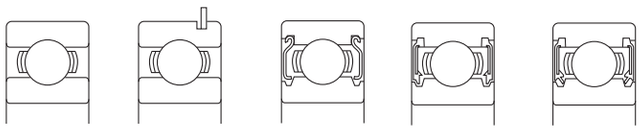
Single-row deep groove ball bearings are classified into the types shown below.

The proper amount of good quality grease is packed in shielded and sealed ball bearings. A comparison of the features of each type is shown in Table 1.

Table 1 Features of Sealed Ball Bearings

	Shielded (ZZ Type)	Rubber Non-Contact Seal (VV Type)	Rubber Contact Seal (DDU Type)
Torque	Low	Low	Higher than ZZ and VV types due to contact seal
Speed capability	Good	Good	Limited by contact seals
Grease-sealing effectiveness	Good	Better than ZZ type	Slightly better than VV type
Dust resistance	Good	Better than ZZ type (usable in moderately dusty environments)	Best (usable even in very dusty environments)
Water resistance	Not suitable	Not suitable	Good (usable even if fluid is splashed on bearing)
Operating temperature (1)	–10 to +110 °C	–10 to +110 °C	–10 to +100 °C

Note (1) The above temperature range applies to standard bearings. By using cold- or heat-resistant grease or changing the type of rubber, the operating temperature range can be extended. Please contact NSK for such applications.



Open | **With Snap Ring** | **Shielded (ZZ Type)** | **Rubber Non-Contact Sealed (VV Type)** | **Rubber Contact Sealed (DDU Type)**

Pressed cages are usually used for deep groove ball bearings. For large bearings, machined brass cages are used (refer to Table 2).

Machined cages are also used for high-speed applications.

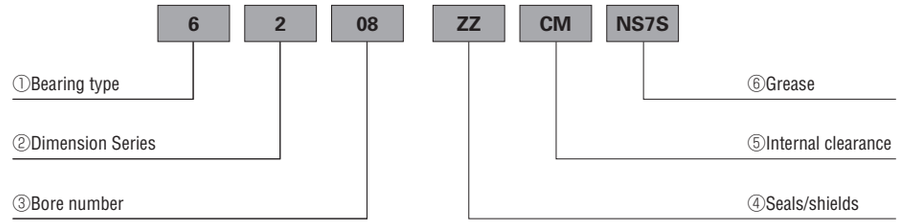
Table 2 Standard Cages for Deep Groove Ball Bearings

Series	Pressed Steel Cages	Machined Brass Cages
68	6800 – 6838	6840 – 68/800
69	6900 – 6936	6938 – 69/800
160	16001 – 16026	16028 – 16064
60	6000 – 6040	6044 – 60/670
62	6200 – 6240	6244 – 6272
63	6300 – 6332	6334 – 6356

☐ Formulation of Bearing Designations

Single-row deep groove ball bearings

Example:



①Bearing type	6: Single-row deep groove ball bearings
②Dimension Series	2: 02 Series, 3: 03 Series, 9: 19 Series, 0: 10 Series
③Bore number	Bore diameter for 03 and under—00: 10 mm, 01: 12 mm, 02: 15 mm, 03: 17 mm 04 and over—Bore diameter = Bore number × 5 (mm)
④Seals/shields	ZZ: Shield on both sides, DDU: Rubber contact seal on both sides, VV: Rubber non-contact seal on both sides, Z: Shield on one side, DU: Rubber contact seal on one side, V: Rubber non-contact seal on one side
⑤Internal clearance	Omitted: CN clearance*1, C3: Clearance greater than CN, C4: Clearance greater than C3, CM: For electric motors*1
⑥Grease designation*2	NS7: NS HI-LUBE

*1 CM clearance may be used instead of CN clearance (the reverse is not possible).

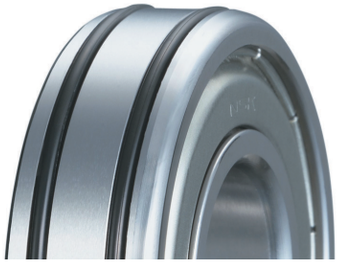
*2 The grease designation is required when seals/shields are used on both sides.

Creep-Free Bearings™

Creep-Free bearings, which come with two O-rings mounted in the outer ring, help to prevent creep by restricting the amount of clearance between the outer ring and housing.

No special machining is required; therefore bearings can be used with the same housing as standard bearings.

In creep limit load tests, the more housing clearance is reduced, the greater the improvements in creep prevention due to the tension of the O-ring mounted in the outer ring.



Features

■Prevents creep

O-rings help prevent creep.

■Easy to assemble

Assembly is easy since bearings can be fitted with a loose tolerance.

■Reusable housing

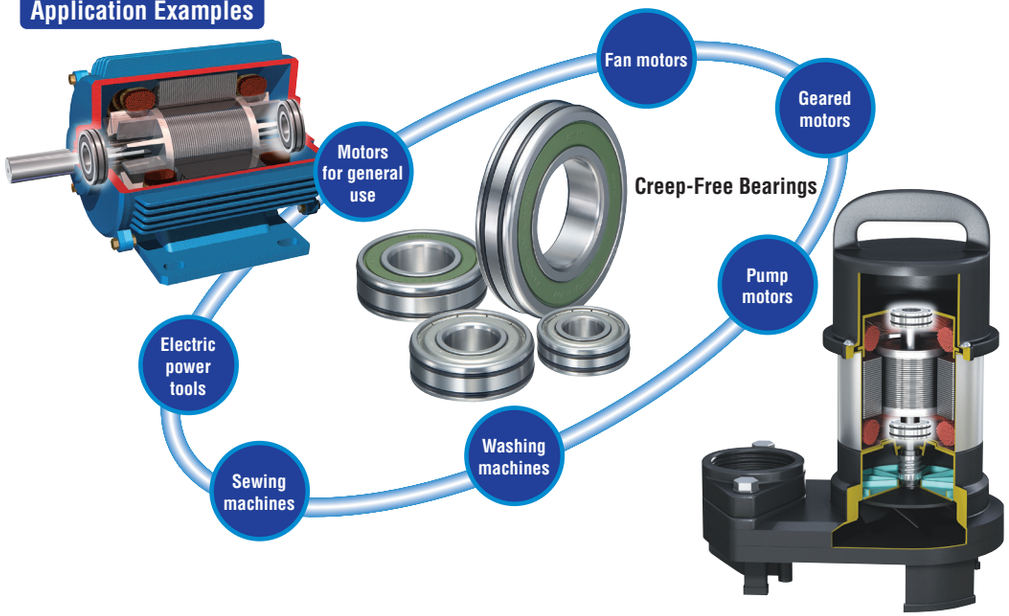
Very little abrasion occurs on the bore surface of the housing, making reuse possible.

■No special machining of the housing required

Bearings can be easily replaced since boundary dimensions are identical to standard bearings.

No reworking of the housing is required.

Application Examples



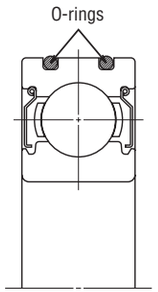


Fig. 1 Structure of Creep-Free Bearings

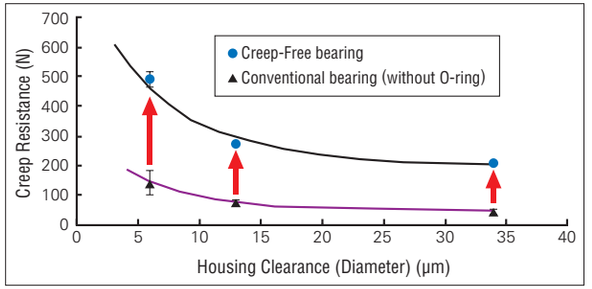


Fig. 2 Creep Limit Load Test (Example Bearing 6204)

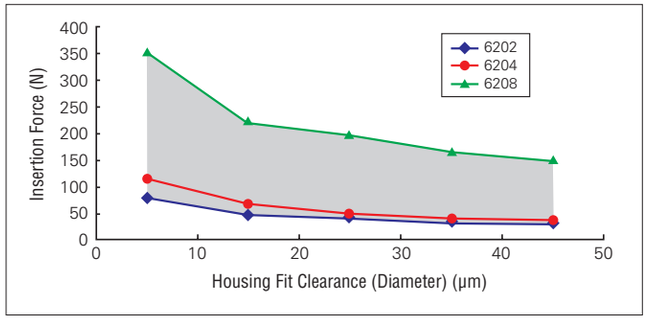


Fig. 3 Fit and Insertion Force

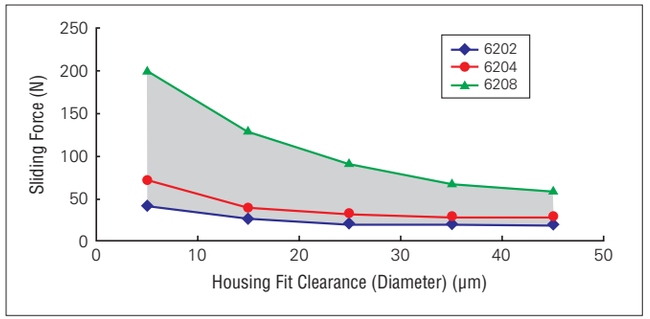


Fig. 4 Fit and Sliding Force

Note on Mounting Creep-Free Bearings

- When oil or grease is applied to the outer diameter of the bearing, use a mineral oil or a synthetic hydrocarbon oil (NSK's EA2, etc.).
- Nitrile rubber is used as the standard specification O-ring material (operating temperature range: –30 to 120 °C). Please contact NSK for use under special environments such as high temperatures.

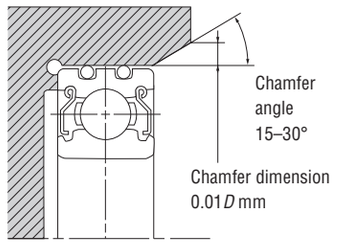
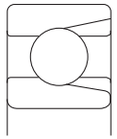


Fig. 5 Housing Shape and Dimension

Note that "free" in the product name "Creep-Free" bearings should not be understood as meaning that creep is nonexistent.



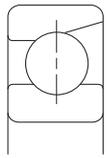
MAXIMUM BALL BEARINGS

Maximum ball bearings contain a larger number of balls than normal deep groove ball bearings thanks to filling slots provided in the inner and outer rings. Because of their filling slots, they are not suitable for applications with high axial loads.

BL2 and BL3 have boundary dimensions equal to those of Series 62 and 63 deep groove ball bearings respectively. Besides the open type, ZZ type shielded bearings are also available.

When using these bearings, it is important for the filling slot in the outer ring to be outside of the loaded zone as much as possible.

Maximum ball bearings use cages made of pressed steel.



MAGNETO BEARINGS

The groove in the inner ring is slightly shallower than that of deep groove ball bearings and one side of the outer ring is relieved. Consequently, the outer ring is separable, which is convenient for mounting.

Pressed cages are standard, but for high-speed applications, machined synthetic resin cages are used.

PRECAUTIONS FOR USE OF DEEP GROOVE BALL BEARINGS

If the bearing load is too small during operation, slippage may occur between the balls and raceways, which may result in smearing. The higher the weight of the balls and cage, the more likely this will occur, especially for large bearings. If very small bearing loads are expected, please contact NSK for selection of an appropriate bearing.

TOLERANCES AND RUNNING ACCURACY

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MAXIMUM BALL BEARINGS ..... Table 7.2 (Pages A128 to A131)
MAGNETO BEARINGS ..... Table 7.5 (Pages A138 and A139)

RECOMMENDED FITS

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Table 8.5 (Page A165)
MAXIMUM BALL BEARINGS ..... Table 8.3 (Page A164)
Table 8.5 (Page A165)
MAGNETO BEARINGS ..... Table 8.3 (Page A164)
Table 8.5 (Page A165)

INTERNAL CLEARANCES

SINGLE-ROW DEEP GROOVE BALL BEARINGS ..... Table 8.10 (Page A169)
MAXIMUM BALL BEARINGS ..... Table 8.10 (Page A169)
MAGNETO BEARINGS ..... Table 8.12 (Page A169)

LIMITING SPEEDS (GREASE/OIL)

The limiting speeds for grease and oil lubrication listed in the bearing tables should be adjusted depending on bearing load. Furthermore, higher speeds are attainable by changing the lubrication method, cage design, etc. Refer to Page A098 for detailed information.

TECHNICAL DATA

Radial and Axial Internal Clearances and Contact Angles for Single-Row Deep Groove Ball Bearings

(1) *Radial and Axial Internal Clearances*

The internal clearance in single-row bearings is specified as the radial internal clearance. The bearing internal clearance is the amount of relative displacement possible between the bearing rings when one ring is fixed and the other ring does not bear a load. The amount of movement along the bearing radius is called the radial clearance, and the amount along the axis is called the axial clearance.

The geometric relation between radial and axial clearance is shown in Fig. 1.

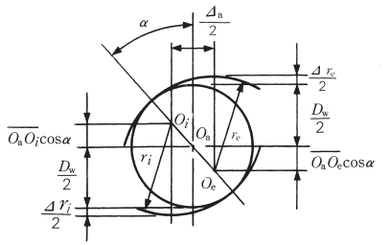


Fig. 1 Relationship Between Δ_r and Δ_a

Symbols used in Fig. 1
- O_a: Ball center
- O_e: Center of groove curvature, outer ring
- O_i: Center of groove curvature, inner ring
- D_w: Ball diameter (mm)
- r_e: Radius of outer ring groove (mm)
- r_i: Radius of inner ring groove (mm)
- α: Contact angle (°)
- Δ_r: Radial clearance (mm)
- Δ_a: Axial clearance (mm)

It is apparent from Fig. 1 that $\Delta_r=\Delta r_e+\Delta r_i$.

Various equations for clearance, contact angle, etc. can be derived from geometric relationships:

$$\Delta_r=2\,(1-\cos\alpha)\,(r_e+r_i-D_w) \quad \cdots\cdots (1)$$

$$\Delta_a=2\sin\alpha\,(r_e+r_i-D_w) \quad \cdots\cdots (2)$$

$$\frac{\Delta_a}{\Delta_r}=\cot\frac{\alpha}{2} \quad \cdots\cdots (3)$$

$$\Delta_a\fallingdotseq 2\,(r_e+r_i-D_w)^{1/2}\Delta_r^{1/2} \quad \cdots\cdots (4)$$

$$\alpha=\cos^{-1}\left(\frac{r_e+r_i-D_w-\frac{\Delta_r}{2}}{r_e+r_i-D_w}\right) \quad \cdots\cdots (5)$$

$$=\sin^{-1}\left(\frac{\Delta_a/2}{r_e+r_i-D_w}\right) \quad \cdots\cdots (6)$$

Because $(r_e+r_i-D_w)$ is a constant, fixed relationships between Δ_r, Δ_a, and α exist for all the various bearing types.

As previously mentioned, the clearances for deep groove ball bearings are given as radial clearances, but there are specific applications where an axial clearance is desirable as well. The relationship between deep groove ball bearing radial clearance Δ_r and axial clearance Δ_a is given in Equation (4). To simplify,

$$\Delta_a\fallingdotseq K\,\Delta_r^{1/2} \quad \cdots\cdots (7)$$

where K : Constant depending on bearing design
$K=2\,(r_e+r_i-D_w)^{1/2}$

Fig. 2 shows one example. The various values for K are presented by bearing size in Table 1 below.

Example

Assume bearing 6312 has a radial clearance of 0.017 mm. From Table 1, K=2.09. Therefore, the axial clearance Δ_a is:
$\Delta=2.09\times\sqrt{0.017}=2.09\times0.13=0.27$ (mm)

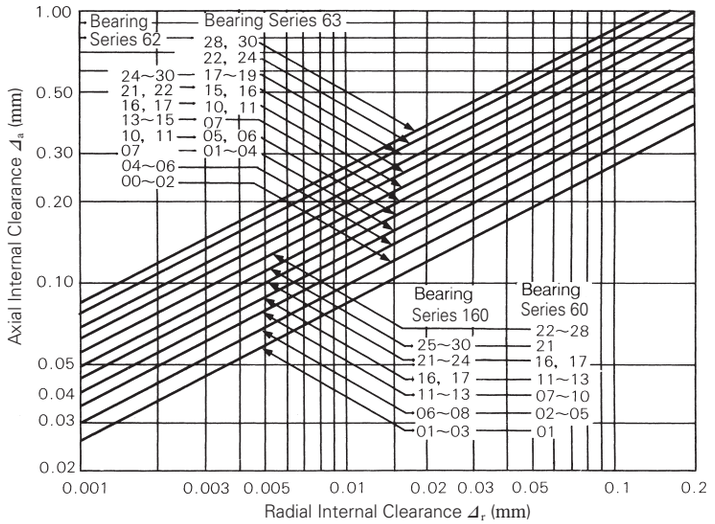


Fig. 2 Radial Clearance Δ_r and Axial Clearance Δ_a of Deep Groove Ball Bearings

Table 1 Constant Values of K for Radial and Axial Clearance Conversion

Bearing Bore No.	K			
	Series 160	Series 60	Series 62	Series 63
00	—	—	0.93	1.14
01	0.80	0.80	0.93	1.06
02	0.80	0.93	0.93	1.06
03	0.80	0.93	0.99	1.11
04	0.90	0.96	1.06	1.07
05	0.90	0.96	1.06	1.20
06	0.96	1.01	1.07	1.19
07	0.96	1.06	1.25	1.37
08	0.96	1.06	1.29	1.45
09	1.01	1.11	1.29	1.57
10	1.01	1.11	1.33	1.64
11	1.06	1.20	1.40	1.70
12	1.06	1.20	1.50	2.09
13	1.06	1.20	1.54	1.82
14	1.16	1.29	1.57	1.88
15	1.16	1.29	1.57	1.95
16	1.20	1.37	1.64	2.01
17	1.20	1.37	1.70	2.06
18	1.29	1.44	1.76	2.11
19	1.29	1.44	1.82	2.16
20	1.29	1.44	1.88	2.25
21	1.37	1.54	1.95	2.32
22	1.40	1.64	2.01	2.40
24	1.40	1.64	2.06	2.40
26	1.54	1.70	2.11	2.49
28	1.54	1.70	2.11	2.59
30	1.57	1.76	2.11	2.59

(2) *Relation Between Radial Clearance and Contact Angle*

Single-row deep groove ball bearings are sometimes used as thrust bearings. In such applications, the contact angle should be as large as possible.

The contact angle for ball bearings is determined by the geometric relationship between the radial clearance and radii of the inner and outer grooves. Using Equations (1) to (6), Fig. 3 shows the particular relationship between the radial clearance and contact angle of bearings in Series 62 and 63 bearings. The initial contact angle, α_0, refers to the initial contact angle when axial load is zero. Application of any load to the bearing will change this contact angle.

If the initial contact angle α_0 exceeds 20°, check whether or not the contact area of the ball and raceway touch the edge of the raceway shoulder (refer to Section 8.1.2).

For applications where an axial load alone is applied, the radial clearance for deep groove ball bearings is normally greater than the normal clearance in order to ensure that the contact angle is relatively large. The initial contact angles for C3 and C4 clearances are given for selected bearing sizes in Table 2 below.

Table 2 Initial Contact Angle α_0, With C3 and C4 Clearances

Bearing Designation	α_0 with C3	α_0 with C4
6205	12.5° to 18°	16.5° to 22°
6210	11.5° to 16.5°	13.5° to 19.5°
6215	11.5° to 16°	15.5° to 19.5°
6220	10.5° to 14.5°	14° to 17.5°
6305	11° to 16°	14.5° to 19.5°
6310	9.5° to 13.5°	12° to 16°
6315	9.5° to 13.5°	12.5° to 15.5°
6320	9° to 12.5°	12° to 15°

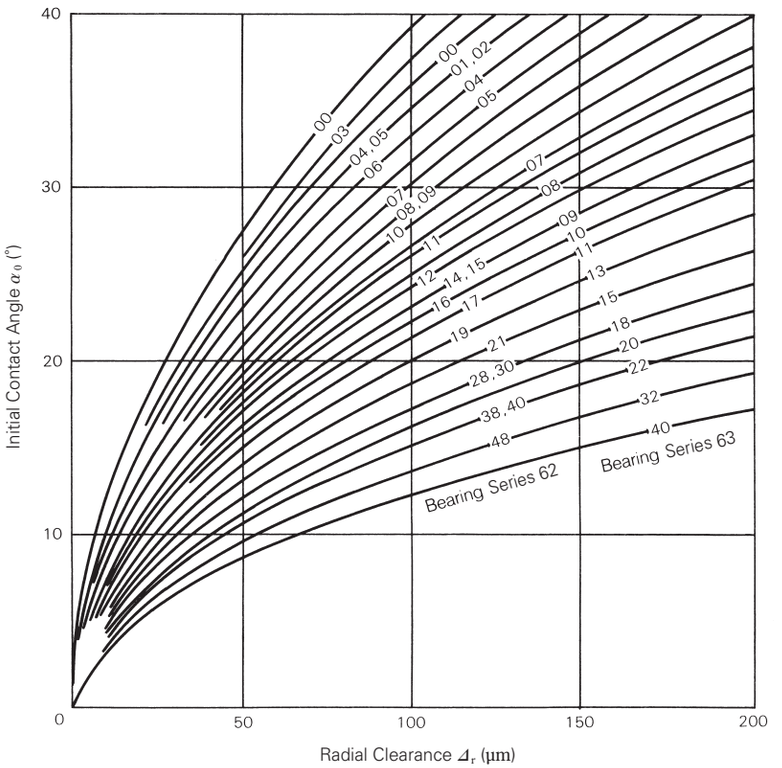


Fig. 3 Radial Clearance and Contact Angle

Features and Operating Temperature Range of Ball Bearing Seal Material

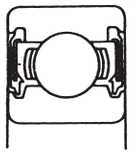
Sealed ball bearings are shown in Figs. 1 and 2. There are two seal types: non-contact seals and contact seals. Nitrile rubber is used for general-purpose applications, while polyacrylic, silicon, and fluoric rubbers are used based on operating temperature requirements. All rubbers have their own unique characteristics and must be selected while considering the application environment and operating conditions.

Table 1 shows principal features of each rubber material and the operating temperature range of the bearing seal. The operating temperature range of Table 1 is a guideline for continuous operation. Thermal aging of rubber is related to temperature and time. Rubber may be used in a much wider range of operating temperatures depending on the operating time and frequency.

Heat generation due to friction on the lip can be ignored in non-contact seals. Thermal factors, which cause aging of the rubber, refer to physical changes due to atmospheric and bearing temperatures. Accordingly, increased hardness or loss of elasticity due to thermal aging exerts only a negligible effect on seal performance. A rubber non-contact seal can thus be used in a greater range of operating temperatures than contact seals.

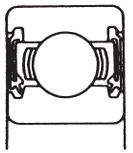
However, there are some disadvantages. Problems with friction-generated wear at the seal lip, thermal plastic deformation, and hardening may occur, causing the contact pressure between the lip and slide surface to decrease and result in a clearance. This clearance is low and does not degrade sealing performance (it does not cause dust entry or grease leakage). In most cases, this minor plastic deformation or increased hardness presents no practical problems.

However, in external environments with large amounts of dust and water, the bearing seal is used as an auxiliary seal and a main seal should be provided separately. As mentioned, the operating temperature range of rubber material is only a guideline for selection. Since heat resistant rubber is expensive, strive to understand temperature conditions so that an economical selection can be made. Pay attention not only to heat resistance, but also to the distinctive features of each rubber.



Rubber non-contact seal (VV)

Fig. 1



Rubber contact seal (DDU)

Fig. 2

Table 1 Features and Operating Temperature Range of Rubber Materials

Material		Nitrile Rubber	Polyacrylic Rubber	Silicon Rubber	Fluorine Rubber
Key features		○Most popular seal material ○Superior mechanical properties and resistance to oil and wear ○Readily ages under direct sunlight ○Less expensive than other rubbers	○Superior heat and oil resistances ○Large compression causes permanent deformation ○Inferior cold resistance ○One of the less expensive high-temperature materials ○Swells in contact with ester oil based grease	○High heat and cold resistances ○Inferior mechanical properties besides resistance to permanent deformation by compression. Note the tear strength ○Swells in contact with low-anilinepoint mineral oil, silicone grease, and silicone oil	○High heat resistance ○Superior oil and chemical resistances ○Cold resistance similar to nitrile rubber ○Deteriorates in contact with urea grease
Operating Temperature Range (1) (°C)	Non-Contact Seal	−50 to +130	−30 to +170	−100 to +250	−50 to +220
	Contact Seal	−30 to +110	−15 to +150	−70 to +200	−30 to +200

Note (1) This operating temperature refers to the temperature of rubber seal materials.

Free Space and Grease Filling Amount for Deep Groove Ball Bearings

Grease lubrication can simplify the bearing's peripheral construction. Thanks to enhanced grease quality, grease lubrication is now employed in place of oil lubrication in many fields. Be sure to select a grease appropriate for operating conditions. Take care with the filling amount, since too much or too little grease greatly affects the temperature rise and torque. The amount of grease needed depends on such factors as housing construction, free space, grease brand, and environment.

As a general guideline, the bearing is first filled with an appropriate amount of grease. Apply grease onto the cage guide surface, then, fill the free space, whic excludes the spindle and bearing inside the housing, with the following amount of grease:

When bearing speed is 50% or less of the specified limiting speed, fill 1/2 to 2/3 of the free space.
When bearing speed is 50% or more of the specified limiting speed, fill 1/3 to 1/2 of the free space.

In general, low speeds require more grease while high speeds require less grease. Depending on the particular application, the filling amount may have to be reduced further to reduce the torque and prevent heat generation. When bearing speed is extremely low on the other hand, grease may be packed almost full to prevent dust and water entry. Accordingly, one must know the extent of the housing's free space for the specific bearing to determine the correct filling amount. The volume of free space is shown in Table 1 for an open deep groove ball bearing for reference.

Note that the free space of the open type deep groove ball bearing is the volume obtained by subtracting the volume of the balls and cage from the space formed between inner and outer rings.

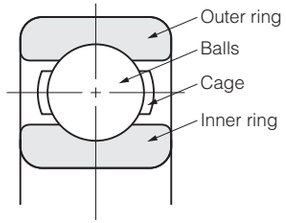


Table 1 Free Space of Open Deep Groove Ball Bearings

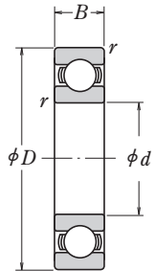
Units : cm^3

Bearing Bore No.	Bearing Free Space			Bearing Bore No.	Bearing Free Space		
	Bearing Series				Bearing Series		
	60	62	63		60	62	63
00	1.2	1.5	2.9	14	34	61	148
01	1.2	2.1	3.5	15	35	67	180
02	1.6	2.7	4.8	16	47	84	213
03	2.0	3.7	6.4	17	48	104	253
04	4.0	6.0	7.9	18	63	127	297
05	4.6	7.7	12	19	66	155	345
06	6.5	11	19	20	68	184	425
07	9.2	15	25	21	88	216	475
08	11	20	35	22	114	224	555
09	14	23	49	24	122	310	675
10	15	28	64	26	172	355	830
11	22	34	79	28	180	415	1 030
12	23	45	98	30	220	485	1 140
13	24	54	122	32	285	545	1 410

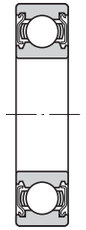
Remark The table above shows the free space of bearings using pressed-steel cages. The free space of a bearing using a high-tension machined-brass cage is about 50 to 60% of the value in this table.

■SINGLE-ROW DEEP GROOVE BALL BEARINGS

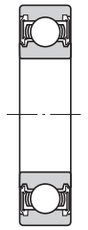
Bore Diameter 10 – 17 mm



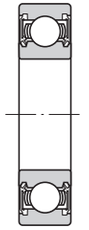
Open



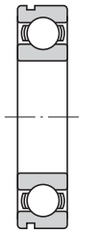
Shielded
ZZ



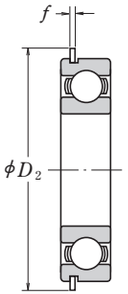
Non-Contact
Sealed
VV



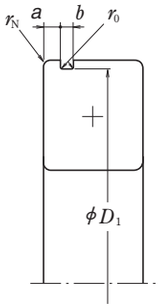
Contact
Sealed
DD · DDU

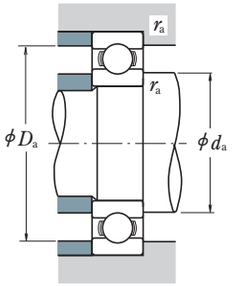


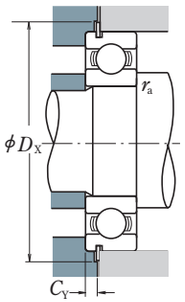
With Snap
Ring Groove
N



With
Snap Ring
NR







Dynamic Equivalent Load

$P = XF_r + YF_a$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22	1	0	0.56	1.99
0.689	0.26	1	0	0.56	1.71
1.03	0.28	1	0	0.56	1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34	1	0	0.56	1.31
3.45	0.38	1	0	0.56	1.15
5.17	0.42	1	0	0.56	1.04
6.89	0.44	1	0	0.56	1.00

Static Equivalent Load

$\frac{F_a}{F_r} > 0.8,\ P_0 = 0.6F_r + 0.5F_a$

$\frac{F_a}{F_r} \leqq 0.8,\ P_0 = F_r$

Boundary Dimensions (mm)				Basic Load Ratings (N)		Factor	Limiting Speeds (min⁻¹)			Bearing Designations			With Snap Ring Groove	With Snap Ring	Snap Ring Groove Dimensions (1) (mm)					Snap Ring (1) Dimensions (mm)		Abutment and Fillet Dimensions (mm)						Mass (kg)
							Grease		Oil																			
d	D	B	r min.	C_r	C_{0r}	f_0	Open Z · ZZ V · VV	DU DDU	Open Z	Open	Shielded	Sealed			a max.	b min.	D_1 max.	r_0 max.	r_N min.	D_2 max.	f max.	d_a(2) min.	d_a(2) max.	D_a(2) max.	r_a max.	D_x min.	C_Y max.	approx.
10	19	5	0.3	1 890	840	14.8	34 000	24 000	40 000	**6800**	**ZZ**	**VV**	**DD**	—	—	—	—	—	—	—	—	—	12	12	17	0.3	—	—	0.005
	22	6	0.3	2 970	1 270	14.0	32 000	22 000	38 000	**6900**	**ZZ**	**VV**	**DD**	**N**(3)	**NR**(3)	1.05	0.8	20.8	0.2	0.2	24.8	0.7	12	12.5	20	0.3	25.5	1.5	0.009
	26	8	0.3	5 050	1 970	12.4	30 000	22 000	36 000	**6000**	**ZZ**	**VV**	**DDU**	**N**(4)	**NR**(4)	1.35	0.87	24.5	0.2	0.3	28.7	0.84	12	13	24	0.3	29.4	1.9	0.018
	30	9	0.6	5 600	2 390	13.2	28 000	18 000	34 000	**6200**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.06	1.35	28.17	0.4	0.5	34.7	1.12	14	16	26	0.6	35.5	2.9	0.032
	35	11	0.6	8 900	3 450	11.2	26 000	17 000	30 000	**6300**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.06	1.35	33.17	0.4	0.5	39.7	1.12	14	16.5	31	0.6	40.5	2.9	0.052
12	21	5	0.3	2 110	1 040	15.3	32 000	20 000	38 000	**6801**	**ZZ**	**VV**	**DD**	—	—	—	—	—	—	—	—	—	14	14	19	0.3	—	—	0.006
	24	6	0.3	3 200	1 460	14.5	30 000	20 000	36 000	**6901**	**ZZ**	**VV**	**DD**	**N**(3)	**NR**(3)	1.05	0.8	22.8	0.2	0.2	26.8	0.7	14	14.5	22	0.3	27.5	1.5	0.010
	28	7	0.3	5 600	2 370	13.0	28 000	—	32 000	**16001**	—	—	—	—	—	—	—	—	—	—	—	—	14	—	26	0.3	—	—	0.019
	28	8	0.3	5 600	2 370	13.0	32 000	18 000	38 000	**6001**	**ZZ**	**VV**	**DDU**	**N**(4)	**NR**(4)	1.35	0.87	26.5	0.2	0.3	30.7	0.84	14	15.5	26	0.3	31.4	1.9	0.022
	32	10	0.6	7 500	3 050	12.3	26 000	17 000	32 000	**6201**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.06	1.35	30.15	0.4	0.5	36.7	1.12	16	17	28	0.6	37.5	2.9	0.037
	37	12	1	10 700	4 200	11.1	24 000	16 000	28 000	**6301**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.06	1.35	34.77	0.4	0.5	41.3	1.12	17	18	32	1	42	2.9	0.060
15	24	5	0.3	2 280	1 260	15.8	28 000	17 000	34 000	**6802**	**ZZ**	**VV**	**DD**	—	—	—	—	—	—	—	—	—	17	17	22	0.3	—	—	0.007
	28	7	0.3	4 750	2 260	14.3	26 000	17 000	30 000	**6902**	**ZZ**	**VV**	**DD**	**N**(3)	**NR**(3)	1.30	0.95	26.7	0.25	0.3	30.8	0.85	17	17	26	0.3	31.5	1.8	0.015
	32	8	0.3	6 150	2 840	13.9	24 000	—	28 000	**16002**	—	—	—	—	—	—	—	—	—	—	—	—	17	—	30	0.3	—	—	0.027
	32	9	0.3	6 150	2 840	13.9	26 000	15 000	32 000	**6002**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.06	1.35	30.15	0.4	0.3	36.7	1.12	17	19	30	0.3	37.5	2.9	0.031
	35	11	0.6	8 400	3 750	13.2	22 000	14 000	28 000	**6202**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.06	1.35	33.17	0.4	0.5	39.7	1.12	19	20.5	31	0.6	40.5	2.9	0.045
	42	13	1	12 600	5 450	12.3	19 000	13 000	24 000	**6302**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.06	1.35	39.75	0.4	0.5	46.3	1.12	20	22.5	37	1	47	2.9	0.083
17	26	5	0.3	2 890	1 570	15.7	26 000	15 000	30 000	**6803**	**ZZ**	**VV**	**DD**	—	—	—	—	—	—	—	—	—	19	19	24	0.3	—	—	0.007
	30	7	0.3	5 050	2 550	14.7	24 000	15 000	28 000	**6903**	**ZZ**	**VV**	**DDU**	**N**(3)	**NR**(3)	1.30	0.95	28.7	0.25	0.3	32.8	0.85	19	19.5	28	0.3	33.5	1.8	0.017
	35	8	0.3	6 600	3 250	14.4	22 000	—	26 000	**16003**	—	—	—	—	—	—	—	—	—	—	—	—	19	—	33	0.3	—	—	0.033
	35	10	0.3	6 600	3 250	14.4	24 000	13 000	28 000	**6003**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.06	1.35	33.17	0.4	0.3	39.7	1.12	19	21.5	33	0.3	40.5	2.9	0.041
	40	12	0.6	10 500	4 800	13.2	20 000	12 000	24 000	**6203**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.06	1.35	38.1	0.4	0.5	44.6	1.12	21	23.5	36	0.6	45.5	2.9	0.067
	47	14	1	15 000	6 650	12.4	17 000	11 000	20 000	**6303**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.46	1.35	44.6	0.4	0.5	52.7	1.12	22	25.5	42	1	53.5	3.3	0.113

Notes (1) For tolerances of snap ring grooves and snap ring dimensions, refer to Pages A116 to A119.

(2) When heavy axial loads are applied, d_a and D_a can be adjusted up to the shoulder diameter of the races. Please consult NSK for details.

(3) Ring types N and NR are applicable only to open bearings. Please consult NSK about the snap ring groove dimensions of sealed or shielded bearings.

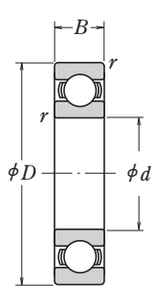
(4) Snap ring groove dimensions and snap ring dimensions do not conform to ISO464.

Remarks 1. Diameter Series 7 (extra-thin wall) bearings are also available; please contact NSK for details.

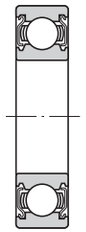
2. When using bearings with rotating outer rings, contact NSK if they are sealed, shielded, or have snap rings.

■SINGLE-ROW DEEP GROOVE BALL BEARINGS

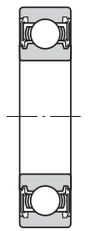
Bore Diameter 20 – 30 mm



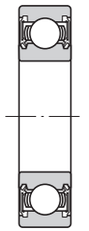
Open



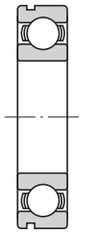
Shielded
ZZ



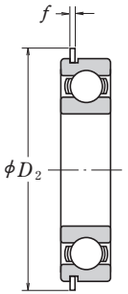
Non-Contact
Sealed
VV



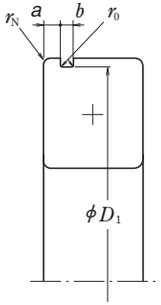
Contact
Sealed
DD · DDU

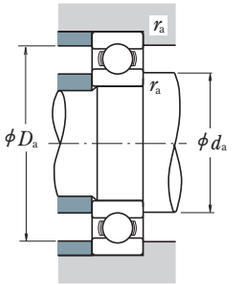


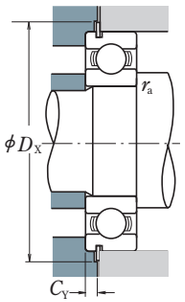
With Snap
Ring Groove
N



With
Snap Ring
NR







Dynamic Equivalent Load

$P = XF_r + YF_a$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22	1	0	0.56	1.99
0.689	0.26	1	0	0.56	1.71
1.03	0.28	1	0	0.56	1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34	1	0	0.56	1.31
3.45	0.38	1	0	0.56	1.15
5.17	0.42	1	0	0.56	1.04
6.89	0.44	1	0	0.56	1.00

Static Equivalent Load

$\frac{F_a}{F_r} > 0.8,\ P_0 = 0.6F_r + 0.5F_a$

$\frac{F_a}{F_r} \leqq 0.8,\ P_0 = F_r$

Boundary Dimensions (mm)				Basic Load Ratings (N)		Factor	Limiting Speeds (min⁻¹)			Bearing Designations				With Snap Ring Groove	With Snap Ring	Snap Ring Groove Dimensions (1) (mm)					Snap Ring (1) Dimensions (mm)		Abutment and Fillet Dimensions (mm)						Mass (kg)
							Grease		Oil																				
d	D	B	r min.	C_r	C_{0r}	f_0	Open Z · ZZ V · VV	DU DDU	Open Z	Open	Shielded	Sealed				a max.	b min.	D_1 max.	r_0 max.	r_N min.	D_2 max.	f max.	d_a(2) min.	d_a(2) max.	D_a(2) max.	r_a max.	D_x min.	C_Y max.	approx.
20	32	7	0.3	4 400	2 470	15.5	22 000	13 000	26 000	**6804**	**ZZ**	**VV**	**DD**	**N**	**NR**	1.30	0.95	30.7	0.25	0.3	34.8	0.85	22	22	30	0.3	35.5	1.8	0.017
	37	9	0.3	7 000	3 700	14.7	19 000	12 000	22 000	**6904**	**ZZ**	**VV**	**DDU**	**N**	**NR**	1.70	0.95	35.7	0.25	0.3	39.8	0.85	22	24	35	0.3	40.5	2.3	0.037
	42	8	0.3	8 700	4 450	14.5	18 000	—	20 000	**16004**	—	—	—	—	—	—	—	—	—	—	—	—	22	—	40	0.3	—	—	0.048
	42	12	0.6	10 300	5 000	13.8	20 000	11 000	24 000	**6004**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.06	1.35	39.75	0.4	0.5	46.3	1.12	24	25.5	38	0.6	47	2.9	0.068
	47	14	1	14 100	6 600	13.1	17 000	11 000	20 000	**6204**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.46	1.35	44.6	0.4	0.5	52.7	1.12	25	26.5	42	1	53.5	3.3	0.107
	52	15	1.1	17 500	7 900	12.4	16 000	10 000	19 000	**6304**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.46	1.35	49.73	0.4	0.5	57.9	1.12	26.5	28	45.5	1	58.5	3.3	0.145
22	44	12	0.6	10 300	5 050	14.0	17 000	11 000	20 000	**60/22**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.06	1.35	41.75	0.4	0.5	48.3	1.12	26	26.5	40	0.6	49	2.9	0.074
	50	14	1	14 200	6 800	13.5	14 000	9 500	16 000	**62/22**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.46	1.35	47.6	0.4	0.5	55.7	1.12	27	29.5	45	1	56.5	3.3	0.119
	56	16	1.1	20 200	9 250	12.4	13 000	9 500	16 000	**63/22**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.46	1.35	53.6	0.4	0.5	61.7	1.12	28.5	30.5	49.5	1	62.5	3.3	0.179
25	37	7	0.3	4 950	3 150	16.1	18 000	10 000	22 000	**6805**	**ZZ**	**VV**	**DD**	**N**	**NR**	1.30	0.95	35.7	0.25	0.3	39.8	0.85	27	27	35	0.3	40.5	1.8	0.021
	42	9	0.3	7 750	4 550	15.4	16 000	10 000	19 000	**6905**	**ZZ**	**VV**	**DDU**	**N**(3)	**NR**(3)	1.70	0.95	40.7	0.25	0.3	44.8	0.85	27	28.5	40	0.3	45.5	2.3	0.042
	47	8	0.3	9 750	5 600	15.1	15 000	—	18 000	**16005**	—	—	—	—	—	—	—	—	—	—	—	—	27	—	45	0.3	—	—	0.059
	47	12	0.6	11 100	5 850	14.5	18 000	9 500	22 000	**6005**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.06	1.35	44.6	0.4	0.5	52.7	1.12	29	30	43	0.6	53.5	2.9	0.079
	52	15	1	15 400	7 850	13.9	15 000	9 000	18 000	**6205**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.46	1.35	49.73	0.4	0.5	57.9	1.12	30	32	47	1	58.5	3.3	0.129
	62	17	1.1	22 600	11 200	13.2	13 000	8 000	16 000	**6305**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.28	1.9	59.61	0.6	0.5	67.7	1.7	31.5	36	55.5	1	68.5	4.6	0.235
28	52	12	0.6	13 700	7 400	14.5	14 000	8 500	16 000	**60/28**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.06	1.35	49.73	0.4	0.5	57.9	1.12	32	34	48	0.6	58.5	2.9	0.096
	58	16	1	18 300	9 500	13.9	12 000	8 000	14 000	**62/28**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.46	1.35	55.6	0.4	0.5	63.7	1.12	33	35.5	53	1	64.5	3.3	0.175
	68	18	1.1	29 400	14 000	12.4	10 000	7 500	13 000	**63/28**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.28	1.9	64.82	0.6	0.5	74.6	1.7	34.5	38	61.5	1	76	4.6	0.287
30	42	7	0.3	5 200	3 650	16.4	15 000	9 000	18 000	**6806**	**ZZ**	**VV**	**DD**	**N**	**NR**	1.30	0.95	40.7	0.25	0.3	44.8	0.85	32	32	40	0.3	45.5	1.8	0.024
	47	9	0.3	7 950	5 000	15.8	14 000	8 500	17 000	**6906**	**ZZ**	**VV**	**DDU**	**N**	**NR**	1.70	0.95	45.7	0.25	0.3	49.8	0.85	32	34	45	0.3	50.5	2.3	0.052
	55	9	0.3	12 400	7 350	15.2	13 000	—	15 000	**16006**	—	—	—	—	—	—	—	—	—	—	—	—	32	—	53	0.3	—	—	0.087
	55	13	1	14 600	8 300	14.7	15 000	8 000	18 000	**6006**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.08	1.35	52.6	0.4	0.5	60.7	1.12	35	36.5	50	1	61.5	2.9	0.116
	62	16	1	21 400	11 300	13.8	12 000	7 500	15 000	**6206**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.28	1.9	59.61	0.6	0.5	67.7	1.7	35	38.5	57	1	68.5	4.6	0.199
	72	19	1.1	29 300	15 000	13.3	11 000	6 700	13 000	**6306**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.28	1.9	68.81	0.6	0.5	78.6	1.7	36.5	42.5	65.5	1	80	4.6	0.345

Notes (1) For tolerances of snap ring grooves and snap ring dimensions, refer to Pages A116 to A119.

(2) When heavy axial loads are applied, d_a and D_a can be adjusted up to the shoulder diameter of the races. Please consult NSK for details.

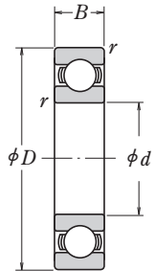
(3) Ring types N and NR are applicable only to open bearings. Please consult NSK about the snap ring groove dimensions of sealed or shielded bearings.

Remarks 1. Diameter Series 7 (extra-thin wall) bearings are also available; please contact NSK for details.

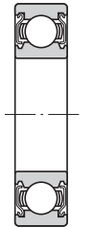
2. When using bearings with rotating outer rings, contact NSK if they are sealed, shielded, or have snap rings.

■SINGLE-ROW DEEP GROOVE BALL BEARINGS

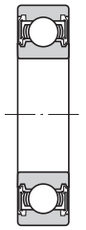
Bore Diameter 32 – 45 mm



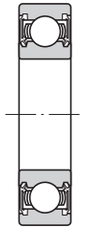
Open



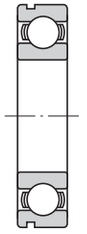
Shielded
ZZ



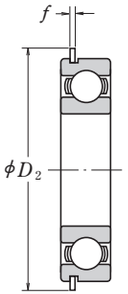
Non-Contact
Sealed
VV



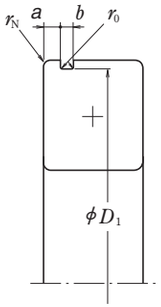
Contact
Sealed
DD · DDU

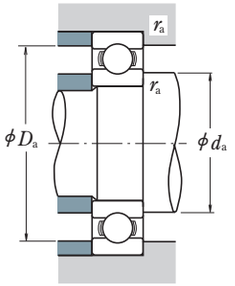


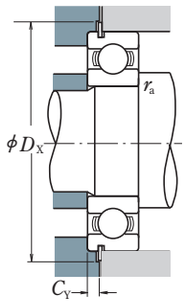
With Snap
Ring Groove
N



With
Snap Ring
NR







Dynamic Equivalent Load

$P = XF_r + YF_a$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22	1	0	0.56	1.99
0.689	0.26	1	0	0.56	1.71
1.03	0.28	1	0	0.56	1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34	1	0	0.56	1.31
3.45	0.38	1	0	0.56	1.15
5.17	0.42	1	0	0.56	1.04
6.89	0.44	1	0	0.56	1.00

Static Equivalent Load

$\frac{F_a}{F_r} > 0.8,\ P_0 = 0.6F_r + 0.5F_a$

$\frac{F_a}{F_r} \leqq 0.8,\ P_0 = F_r$

Boundary Dimensions (mm)				Basic Load Ratings (N)		Factor	Limiting Speeds (min⁻¹)			Bearing Designations				With Snap Ring Groove	With Snap Ring	Snap Ring Groove Dimensions (1) (mm)					Snap Ring (1) Dimensions (mm)		Abutment and Fillet Dimensions (mm)						Mass (kg)
							Grease		Oil																				
d	D	B	r min.	C_r	C_{0r}	f_0	Open Z · ZZ V · VV	DU DDU	Open Z	Open	Shielded	Sealed				a max.	b min.	D_1 max.	r_0 max.	r_N min.	D_2 max.	f max.	d_a(2) min.	d_a(2) max.	D_a(2) max.	r_a max.	D_x min.	C_Y max.	approx.
32	58	13	1	16 600	9 150	14.5	12 000	7 500	14 000	**60/32**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.08	1.35	55.6	0.4	0.5	63.7	1.12	37	38.5	53	1	64.5	2.9	0.122
	65	17	1	22 800	11 600	13.6	10 000	7 100	12 000	**62/32**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.28	1.9	62.6	0.6	0.5	70.7	1.7	37	40	60	1	71.5	4.6	0.225
	75	20	1.1	33 000	17 000	13.2	9 000	6 300	11 000	**63/32**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.28	1.9	71.83	0.6	0.5	81.6	1.7	38.5	44.5	68.5	1	83	4.6	0.389
35	47	7	0.3	5 400	4 100	16.7	14 000	7 500	16 000	**6807**	**ZZ**	**VV**	**DD**	**N**	**NR**	1.30	0.95	45.7	0.25	0.3	49.8	0.85	37	37	45	0.3	50.5	1.8	0.027
	55	10	0.6	11 600	7 250	15.5	12 000	7 500	15 000	**6907**	**ZZ**	**VV**	**DDU**	**N**	**NR**	1.70	0.95	53.7	0.25	0.5	57.8	0.85	39	39	51	0.6	58.5	2.3	0.075
	62	9	0.3	12 800	8 200	15.6	11 000	—	13 000	**16007**	—	—	—	—	—	—	—	—	—	—	—	—	37	—	60	0.3	—	—	0.107
	62	14	1	17 600	10 300	14.8	13 000	6 700	15 000	**6007**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.08	1.9	59.61	0.6	0.5	67.7	1.7	40	41.5	57	1	68.5	3.4	0.151
	72	17	1.1	28 200	15 300	13.8	11 000	6 300	13 000	**6207**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.28	1.9	68.81	0.6	0.5	78.6	1.7	41.5	44.5	65.5	1	80	4.6	0.284
	80	21	1.5	36 500	19 200	13.2	10 000	6 000	12 000	**6307**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.28	1.9	76.81	0.6	0.5	86.6	1.7	43	47	72	1.5	88	4.6	0.464
40	52	7	0.3	7 000	5 550	17.0	12 000	6 700	14 000	**6808**	**ZZ**	**VV**	**DD**	**N**	**NR**	1.30	0.95	50.7	0.25	0.3	54.8	0.85	42	42	50	0.3	55.5	1.8	0.031
	62	12	0.6	15 000	10 000	15.7	11 000	6 300	13 000	**6908**	**ZZ**	**VV**	**DDU**	**N**	**NR**	1.70	0.95	60.7	0.25	0.5	64.8	0.85	44	46	58	0.6	65.5	2.3	0.112
	68	9	0.3	13 900	9 650	16.0	10 000	—	12 000	**16008**	—	—	—	—	—	—	—	—	—	—	—	—	42	—	66	0.3	—	—	0.13
	68	15	1	18 400	11 500	15.3	12 000	6 000	14 000	**6008**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.49	1.9	64.82	0.6	0.5	74.6	1.7	45	47.5	63	1	76	3.8	0.19
	80	18	1.1	32 000	17 900	14.0	9 500	5 600	12 000	**6208**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.28	1.9	76.81	0.6	0.5	86.6	1.7	46.5	50.5	73.5	1	88	4.6	0.366
	90	23	1.5	45 000	24 000	13.2	9 000	5 300	11 000	**6308**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.28	2.7	86.79	0.6	0.5	96.5	2.46	48	53	82	1.5	98	5.4	0.636
45	58	7	0.3	7 250	6 150	17.2	11 000	6 000	13 000	**6809**	**ZZ**	**VV**	**DD**	**N**	**NR**	1.30	0.95	56.7	0.25	0.3	60.8	0.85	47	47.5	56	0.3	61.5	1.8	0.038
	68	12	0.6	15 500	10 900	15.9	9 500	5 600	12 000	**6909**	**ZZ**	**VV**	**DDU**	**N**	**NR**	1.70	0.95	66.7	0.25	0.3(3)	70.8	0.85	49	50	64	0.6	72	2.3	0.126
	75	10	0.6	16 400	11 400	15.9	9 000	—	11 000	**16009**	—	—	—	—	—	—	—	—	—	—	—	—	49	—	71	0.6	—	—	0.167
	75	16	1	23 000	15 200	15.3	10 000	5 300	12 000	**6009**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.49	1.9	71.83	0.6	0.5	81.6	1.7	50	53.5	70	1	83	3.8	0.241
	85	19	1.1	34 500	20 400	14.4	9 000	5 300	11 000	**6209**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.28	1.9	81.81	0.6	0.5	91.6	1.7	51.5	55.5	78.5	1	93	4.6	0.42
	100	25	1.5	58 500	32 000	13.1	7 500	4 800	9 500	**6309**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.28	2.7	96.8	0.6	0.5	106.5	2.46	53	61.5	92	1.5	108	5.4	0.829

Notes (1) For tolerances of snap ring grooves and snap ring dimensions, refer to Pages A116 to A119.

(2) When heavy axial loads are applied, d_a and D_a can be adjusted up to the shoulder diameter of the races. Please consult NSK for details.

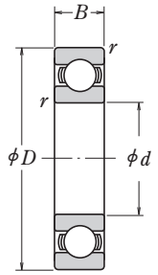
(3) Does not conform to ISO464.

Remarks 1. Diameter Series 7 (extra-thin wall) bearings are also available; please contact NSK for details.

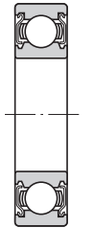
2. When using bearings with rotating outer rings, contact NSK if they are sealed, shielded, or have snap rings.

SINGLE-ROW DEEP GROOVE BALL BEARINGS

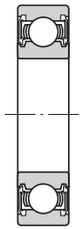
Bore Diameter 50 – 60 mm



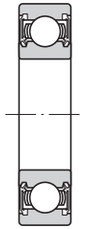
Open



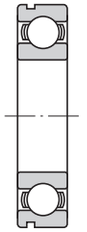
Shielded
ZZ



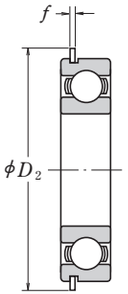
Non-Contact
Sealed
VV



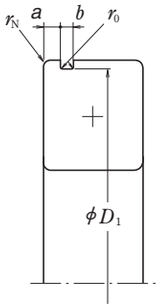
Contact
Sealed
DD · DDU

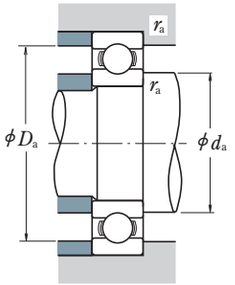


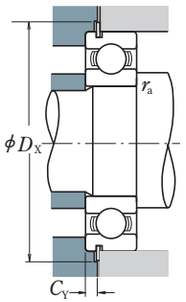
With Snap
Ring Groove
N



With
Snap Ring
NR







Dynamic Equivalent Load

$P = XF_r + YF_a$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22	1	0	0.56	1.99
0.689	0.26	1	0	0.56	1.71
1.03	0.28	1	0	0.56	1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34	1	0	0.56	1.31
3.45	0.38	1	0	0.56	1.15
5.17	0.42	1	0	0.56	1.04
6.89	0.44	1	0	0.56	1.00

Static Equivalent Load

$\frac{F_a}{F_r} > 0.8,\ P_0 = 0.6F_r + 0.5F_a$

$\frac{F_a}{F_r} \leqq 0.8,\ P_0 = F_r$

Boundary Dimensions (mm)				Basic Load Ratings (N)		Factor	Limiting Speeds (min⁻¹)			Bearing Designations				With Snap Ring Groove	With Snap Ring	Snap Ring Groove Dimensions (1) (mm)					Snap Ring (1) Dimensions (mm)		Abutment and Fillet Dimensions (mm)						Mass (kg)
							Grease		Oil																				
d	D	B	r min.	C_r	C_{0r}	f_0	Open Z · ZZ V · VV	DU DDU	Open Z	Open	Shielded	Sealed				a max.	b min.	D_1 max.	r_0 max.	r_N min.	D_2 max.	f max.	d_a(2) min.	d_a(2) max.	D_a(2) max.	r_a max.	D_x min.	C_Y max.	approx.
50	65	7	0.3	7 050	6 200	17.2	9 500	5 300	11 000	**6810**	**ZZ**	**VV**	**DDU**	**N**	**NR**	1.30	0.95	63.7	0.25	0.3	67.8	0.85	52	52.5	63	0.3	68.5	1.8	0.050
	72	12	0.6	16 000	11 700	16.1	9 000	5 300	11 000	**6910**	**ZZ**	**VV**	**DDU**	**N**	**NR**	1.70	0.95	70.7	0.25	0.5	74.8	0.85	54	55	68	0.6	76	2.3	0.135
	80	10	0.6	17 000	12 400	16.1	8 500	—	10 000	**16010**	—	—	—	—	—	—	—	—	—	—	—	—	54	—	76	0.6	—	—	0.175
	80	16	1	24 000	16 600	15.6	9 500	4 800	11 000	**6010**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.49	1.9	76.81	0.6	0.5	86.6	1.7	55	58.5	75	1	88	3.8	0.261
	90	20	1.1	38 500	23 200	14.4	8 000	4 800	10 000	**6210**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.28	2.7	86.79	0.6	0.5	96.5	2.46	56.5	60	83.5	1	98	5.4	0.459
	110	27	2	68 000	38 500	13.2	7 100	4 300	8 500	**6310**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.28	2.7	106.81	0.6	0.5	116.6	2.46	59	68	101	2	118	5.4	1.06
55	72	9	0.3	9 700	8 500	17.0	8 500	4 800	10 000	**6811**	**ZZ**	**VV**	**DDU**	**N**	**NR**	1.70	0.95	70.7	0.25	0.3	74.8	0.85	57	59	70	0.3	76	2.3	0.081
	80	13	1	17 600	13 300	16.2	8 000	4 500	9 500	**6911**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.10	1.3	77.9	0.4	0.5	84.4	1.12	60	61.5	75	1	86	2.9	0.189
	90	11	0.6	21 400	16 300	16.2	7 500	—	9 000	**16011**	—	—	—	—	—	—	—	—	—	—	—	—	59	—	86	0.6	—	—	0.257
	90	18	1.1	31 000	21 200	15.3	8 500	4 500	10 000	**6011**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.87	2.7	86.79	0.6	0.5	96.5	2.46	61.5	64	83.5	1	98	5	0.381
	100	21	1.5	47 500	29 300	14.3	7 500	4 300	9 000	**6211**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.28	2.7	96.8	0.6	0.5	106.5	2.46	63	66.5	92	1.5	108	5.4	0.619
	120	29	2	78 500	44 500	13.1	6 700	4 000	8 000	**6311**	**ZZ**	**VV**	**DDU**	**N**	**NR**	4.06	3.1	115.21	0.6	0.5	129.7	2.82	64	72.5	111	2	131.5	6.5	1.37
60	78	10	0.3	12 600	10 900	16.9	8 000	4 500	9 500	**6812**	**ZZ**	**VV**	**DD**	**N**	**NR**	1.70	1.3	76.2	0.4	0.3	82.7	1.12	62	64	76	0.3	84	2.5	0.103
	85	13	1	21 400	16 300	16.2	7 500	4 300	9 000	**6912**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.10	1.3	82.9	0.4	0.5	89.4	1.12	65	66	80	1	91	2.9	0.192
	95	11	0.6	22 000	17 500	16.3	7 100	—	8 500	**16012**	—	—	—	—	—	—	—	—	—	—	—	—	64	—	91	0.6	—	—	0.281
	95	18	1.1	32 500	23 200	15.6	8 000	4 000	9 500	**6012**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.87	2.7	91.82	0.6	0.5	101.6	2.46	66.5	69	88.5	1	103	5	0.412
	110	22	1.5	57 500	36 000	14.3	6 700	3 800	8 000	**6212**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.28	2.7	106.81	0.6	0.5	116.6	2.46	68	74.5	102	1.5	118	5.4	0.783
	130	31	2.1	90 000	52 000	13.1	6 000	3 600	7 100	**6312**	**ZZ**	**VV**	**DDU**	**N**	**NR**	4.06	3.1	125.22	0.6	0.5	139.7	2.82	71	79	119	2	141.5	6.5	1.72

Notes (1) For tolerances of snap ring grooves and snap ring dimensions, refer to Pages A116 to A119.

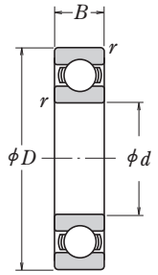
(2) When heavy axial loads are applied, d_a and D_a can be adjusted up to the shoulder diameter of the races. Please consult NSK for details.

Remarks

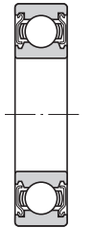
1. Diameter Series 7 (extra-thin wall) bearings are also available; please contact NSK for details.
2. When using bearings with rotating outer rings, contact NSK if they are sealed, shielded, or have snap rings.
3. Please consult NSK about the snap ring groove dimensions of Dimension Series 18 and 19 sealed and shielded bearings when the diameter is 50 mm or more.

SINGLE-ROW DEEP GROOVE BALL BEARINGS

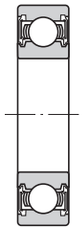
Bore Diameter 65 – 75 mm



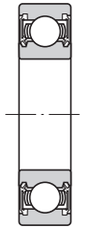
Open



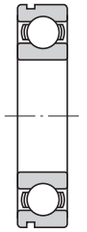
Shielded
ZZ



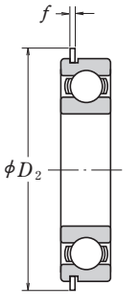
Non-Contact
Sealed
VV



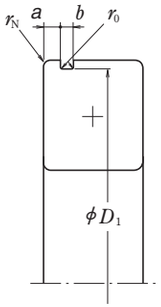
Contact
Sealed
DD · DDU

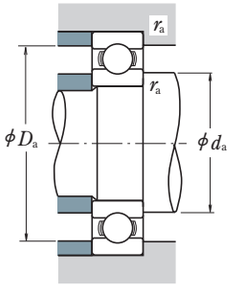


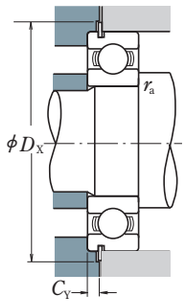
With Snap
Ring Groove
N



With
Snap Ring
NR







Dynamic Equivalent Load

$P = XF_r + YF_a$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22	1	0	0.56	1.99
0.689	0.26	1	0	0.56	1.71
1.03	0.28	1	0	0.56	1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34	1	0	0.56	1.31
3.45	0.38	1	0	0.56	1.15
5.17	0.42	1	0	0.56	1.04
6.89	0.44	1	0	0.56	1.00

Static Equivalent Load

$\frac{F_a}{F_r} > 0.8,\ P_0 = 0.6F_r + 0.5F_a$

$\frac{F_a}{F_r} \leqq 0.8,\ P_0 = F_r$

Boundary Dimensions (mm)				Basic Load Ratings (N)		Factor	Limiting Speeds (min⁻¹)			Bearing Designations				With Snap Ring Groove	With Snap Ring	Snap Ring Groove Dimensions (1) (mm)					Snap Ring (1) Dimensions (mm)		Abutment and Fillet Dimensions (mm)						Mass (kg)
							Grease		Oil																				
d	D	B	r min.	C_r	C_{0r}	f_0	Open Z · ZZ V · VV	DU DDU	Open Z	Open	Shielded	Sealed				a max.	b min.	D_1 max.	r_0 max.	r_N min.	D_2 max.	f max.	d_a(2) min.	d_a(2) max.	D_a(2) max.	r_a max.	D_X min.	C_Y max.	approx.
65	85	10	0.6	13 100	12 100	17.0	7 500	4 000	8 500	**6813**	**ZZ**	**VV**	**DD**	**N**	**NR**	1.70	1.3	82.9	0.4	0.5	89.4	1.12	69	69	81	0.6	91	2.5	0.128
	90	13	1	19 100	16 100	16.6	7 100	4 000	8 500	**6913**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.10	1.3	87.9	0.4	0.5	94.4	1.12	70	71.5	85	1	96	2.9	0.218
	100	11	0.6	22 500	18 700	16.5	6 700	—	8 000	**16013**	—	—	—	—	—	—	—	—	—	—	—	—	69	—	96	0.6	—	—	0.30
	100	18	1.1	33 500	25 200	15.8	7 500	4 000	9 000	**6013**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.87	2.7	96.8	0.6	0.5	106.5	2.46	71.5	73	93.5	1	108	5	0.439
	120	23	1.5	63 000	40 000	14.4	6 300	3 600	7 500	**6213**	**ZZ**	**VV**	**DDU**	**N**	**NR**	4.06	3.1	115.21	0.6	0.5	129.7	2.82	73	80	112	1.5	131.5	6.5	1.0
	140	33	2.1	102 000	60 000	13.2	5 600	3 400	6 700	**6313**	**ZZ**	**VV**	**DDU**	**N**	**NR**	4.90	3.1	135.23	0.6	0.5	149.7	2.82	76	85.5	129	2	152	7.3	2.11
70	90	10	0.6	13 300	12 700	17.2	6 700	3 800	8 000	**6814**	**ZZ**	**VV**	**DD**	**N**	**NR**	1.70	1.3	87.9	0.4	0.5	94.4	1.12	74	74.5	86	0.6	96	2.5	0.134
	100	16	1	26 100	21 200	16.3	6 300	3 600	7 500	**6914**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.50	1.3	97.9	0.4	0.5	104.4	1.12	75	77.5	95	1	106	3.3	0.349
	110	13	0.6	29 500	23 600	16.3	6 000	—	7 100	**16014**	—	—	—	—	—	—	—	—	—	—	—	—	74	—	106	0.6	—	—	0.441
	110	20	1.1	42 000	31 000	15.6	7 100	3 600	8 500	**6014**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.87	2.7	106.81	0.6	0.5	116.6	2.46	76.5	80.5	103.5	1	118	5	0.608
	125	24	1.5	68 500	44 000	14.5	6 000	3 400	7 100	**6214**	**ZZ**	**VV**	**DDU**	**N**	**NR**	4.06	3.1	120.22	0.6	0.5	134.7	2.82	78	84	117	1.5	136.5	6.5	1.09
	150	35	2.1	115 000	68 000	13.2	5 300	3 200	6 300	**6314**	**ZZ**	**VV**	**DDU**	**N**	**NR**	4.90	3.1	145.24	0.6	0.5	159.7	2.82	81	92	139	2	162	7.3	2.57
75	95	10	0.6	13 800	13 900	17.3	6 300	3 600	7 500	**6815**	**ZZ**	**VV**	**DDU**	**N**	**NR**	1.70	1.3	92.9	0.4	0.5	99.4	1.12	79	79.5	91	0.6	101	2.5	0.149
	105	16	1	26 800	22 600	16.5	6 000	3 400	7 100	**6915**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.50	1.3	102.6	0.4	0.5	110.7	1.12	80	82	100	1	112	3.3	0.364
	115	13	0.6	30 500	25 300	16.4	5 600	—	6 700	**16015**	—	—	—	—	—	—	—	—	—	—	—	—	79	—	111	0.6	—	—	0.463
	115	20	1.1	43 500	33 500	15.8	6 700	3 400	8 000	**6015**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.87	2.7	111.81	0.6	0.5	121.6	2.46	81.5	85.5	108.5	1	123	5	0.649
	130	25	1.5	73 000	49 500	14.7	5 600	3 200	6 700	**6215**	**ZZ**	**VV**	**DDU**	**N**	**NR**	4.06	3.1	125.22	0.6	0.5	139.7	2.82	83	90	122	1.5	141.5	6.5	1.19
	160	37	2.1	125 000	77 000	13.2	4 800	2 800	6 000	**6315**	**ZZ**	**VV**	**DDU**	**N**	**NR**	4.90	3.1	155.22	0.6	0.5	169.7	2.82	86	98.5	149	2	172	7.3	3.08

Notes (1) For tolerances of snap ring grooves and snap ring dimensions, refer to Pages A116 to A119.

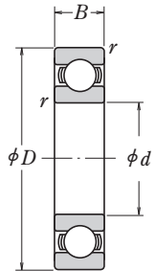
(2) When heavy axial loads are applied, d_a and D_a can be adjusted up to the shoulder diameter of the races. Please consult NSK for details.

Remarks

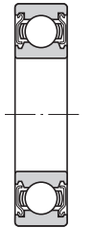
1. Diameter Series 7 (extra-thin wall) bearings are also available; please contact NSK for details.
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3. Please consult NSK about the snap ring groove dimensions of Dimension Series 18 and 19 sealed and shielded bearings when the diameter is 50 mm or more.

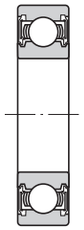
SINGLE-ROW DEEP GROOVE BALL BEARINGS

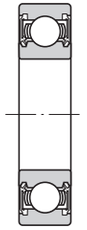
Bore Diameter 80 – 90 mm

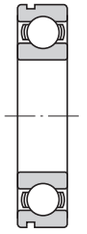


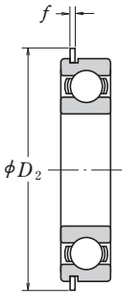
Open


Shielded ZZ

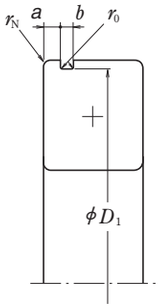

Non-Contact Sealed VV

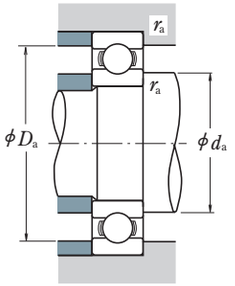

Contact Sealed DD · DDU

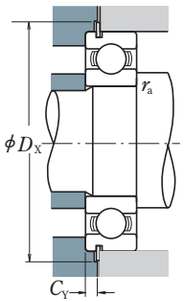

With Snap Ring Groove N



With Snap Ring NR







Dynamic Equivalent Load

$P = XF_r + YF_a$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22	1	0	0.56	1.99
0.689	0.26	1	0	0.56	1.71
1.03	0.28	1	0	0.56	1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34	1	0	0.56	1.31
3.45	0.38	1	0	0.56	1.15
5.17	0.42	1	0	0.56	1.04
6.89	0.44	1	0	0.56	1.00

Static Equivalent Load

$\frac{F_a}{F_r} > 0.8,\ P_0 = 0.6F_r + 0.5F_a$

$\frac{F_a}{F_r} \leqq 0.8,\ P_0 = F_r$

Boundary Dimensions (mm)				Basic Load Ratings (N)		Factor	Limiting Speeds (min⁻¹)			Bearing Designations				With Snap Ring Groove	With Snap Ring	Snap Ring Groove Dimensions (1) (mm)					Snap Ring (1) Dimensions (mm)		Abutment and Fillet Dimensions (mm)						Mass (kg)
							Grease		Oil																				
d	D	B	r min.	C_r	C_{0r}	f_0	Open Z · ZZ V · VV	DU DDU	Open Z	Open	Shielded	Sealed				a max.	b min.	D_1 max.	r_0 max.	r_N min.	D_2 max.	f max.	d_a(2) min.	d_a(2) max.	D_a(2) max.	r_a max.	D_x min.	C_Y max.	approx.
80	100	10	0.6	13 900	14 500	17.4	6 000	3 400	7 100	**6816**	**ZZ**	**VV**	**DDU**	**N**	**NR**	1.7	1.3	97.9	0.4	0.5	104.4	1.12	84	84.5	96	0.6	106	2.5	0.151
	110	16	1	27 400	24 000	16.6	5 600	3 200	6 700	**6916**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.5	1.3	107.6	0.4	0.5	115.7	1.12	85	87.5	105	1	117	3.3	0.391
	125	14	0.6	35 000	29 600	16.4	5 300	—	6 300	**16016**	—	—	—	—	—	—	—	—	—	—	—	—	84	—	121	0.6	—	—	0.621
	125	22	1.1	52 500	40 000	15.6	6 300	3 200	7 100	**6016**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.87	3.1	120.22	0.6	0.5	134.7	2.82	86.5	91	118.5	1	136.5	5.3	0.872
	140	26	2	80 000	53 000	14.6	5 300	3 000	6 300	**6216**	**ZZ**	**VV**	**DDU**	**N**	**NR**	4.90	3.1	135.23	0.6	0.5	149.7	2.82	89	95.5	131	2	152	7.3	1.42
	170	39	2.1	135 000	86 500	13.3	4 500	2 800	5 600	**6316**	**ZZ**	**VV**	**DDU**	**N**	**NR**	5.69	3.5	163.65	0.6	0.5	182.9	3.1	91	104.5	159	2	185	8.4	3.67
85	110	13	1	20 600	20 000	17.1	5 600	3 200	6 700	**6817**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.10	1.3	107.6	0.4	0.5	115.7	1.12	90	90.5	105	1	117	2.9	0.263
	120	18	1.1	35 000	29 600	16.4	5 300	3 000	6 300	**6917**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.30	1.3	117.6	0.4	0.5	125.7	1.12	91.5	94.5	113.5	1	127	4.1	0.55
	130	14	0.6	36 000	31 500	16.5	5 000	—	6 000	**16017**	—	—	—	—	—	—	—	—	—	—	—	—	89	—	126	0.6	—	—	0.652
	130	22	1.1	54 500	43 000	15.8	6 000	3 000	7 100	**6017**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.87	3.1	125.22	0.6	0.5	139.7	2.82	91.5	96	123.5	1	141.5	5.3	0.918
	150	28	2	92 500	62 000	14.5	4 800	2 800	6 000	**6217**	**ZZ**	**VV**	**DDU**	**N**	**NR**	4.90	3.1	145.24	0.6	0.5	159.7	2.82	94	102	141	2	162	7.3	1.76
	180	41	3	146 000	97 000	13.3	4 300	2 600	5 000	**6317**	**ZZ**	**VV**	**DDU**	**N**	**NR**	5.69	3.5	173.66	0.6	0.5	192.9	3.1	98	110.5	167	2.5	195	8.4	4.28
90	115	13	1	20 900	21 000	17.2	5 300	3 000	6 300	**6818**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.10	1.3	112.6	0.4	0.5	120.7	1.12	95	95.5	110	1	122	2.9	0.276
	125	18	1.1	36 000	31 500	16.5	5 000	2 800	6 000	**6918**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.30	1.3	122.6	0.4	0.5	130.7	1.12	96.5	98.5	118.5	1	132	4.1	0.585
	140	16	1	45 500	39 500	16.3	4 800	—	5 600	**16018**	—	—	—	—	—	—	—	—	—	—	—	—	95	—	135	1	—	—	0.873
	140	24	1.5	64 000	50 000	15.6	5 600	2 800	6 300	**6018**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.71	3.1	135.23	0.6	0.5	149.7	2.82	98	103	132	1.5	152	6.1	1.19
	160	30	2	106 000	71 500	14.5	4 500	2 600	5 600	**6218**	**ZZ**	**VV**	**DDU**	**N**	**NR**	4.90	3.1	155.22	0.6	0.5	169.7	2.82	99	107.5	151	2	172	7.3	2.18
	190	43	3	157 000	107 000	13.3	4 000	2 400	4 800	**6318**	**ZZ**	**VV**	**DDU**	**N**	**NR**	5.69	3.5	183.64	0.6	0.5	202.9	3.1	103	117	177	2.5	205	8.4	4.98

Notes (1) For tolerances of snap ring grooves and snap ring dimensions, refer to Pages A116 to A119.

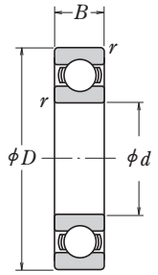
(2) When heavy axial loads are applied, d_a and D_a can be adjusted up to the shoulder diameter of the races. Please consult NSK for details.

Remarks

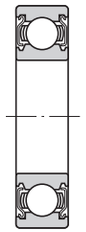
1. Diameter Series 7 (extra-thin wall) bearings are also available; please contact NSK for details.
2. When using bearings with rotating outer rings, contact NSK if they are sealed, shielded, or have snap rings.
3. Please consult NSK about the snap ring groove dimensions of Dimension Series 18 and 19 sealed and shielded bearings when the diameter is 50 mm or more.

■SINGLE-ROW DEEP GROOVE BALL BEARINGS

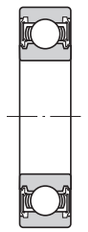
Bore Diameter 95 – 105 mm



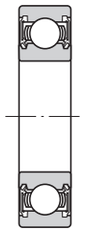
Open



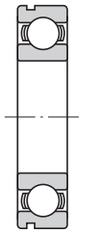
Shielded
ZZ



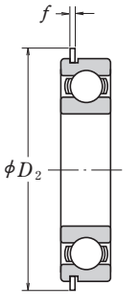
Non-Contact
Sealed
VV



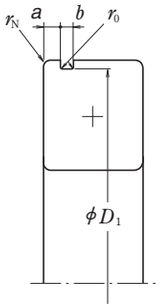
Contact
Sealed
DD · DDU

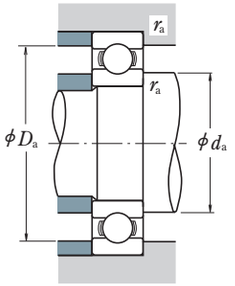


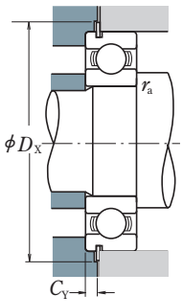
With Snap
Ring Groove
N



With
Snap Ring
NR







Dynamic Equivalent Load

$P = XF_r + YF_a$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22	1	0	0.56	1.99
0.689	0.26	1	0	0.56	1.71
1.03	0.28	1	0	0.56	1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34	1	0	0.56	1.31
3.45	0.38	1	0	0.56	1.15
5.17	0.42	1	0	0.56	1.04
6.89	0.44	1	0	0.56	1.00

Static Equivalent Load

$\frac{F_a}{F_r} > 0.8,\ P_0 = 0.6F_r + 0.5F_a$

$\frac{F_a}{F_r} \leqq 0.8,\ P_0 = F_r$

Boundary Dimensions (mm)				Basic Load Ratings (N)		Factor	Limiting Speeds (min⁻¹)			Bearing Designations				With Snap Ring Groove	With Snap Ring	Snap Ring Groove Dimensions (1) (mm)					Snap Ring (1) Dimensions (mm)		Abutment and Fillet Dimensions (mm)						Mass (kg)
							Grease		Oil																				
d	D	B	r min.	C_r	C_{0r}	f_0	Open Z · ZZ V · VV	DU DDU	Open Z	Open	Shielded	Sealed				a max.	b min.	D_1 max.	r_0 max.	r_N min.	D_2 max.	f max.	d_a(2) min.	d_a(2) max.	D_a(2) max.	r_a max.	D_x min.	C_Y max.	approx.
95	120	13	1	21 200	22 000	17.2	5 000	2 800	6 000	**6819**	**ZZ**	**VV**	**DD**	**N**	**NR**	2.10	1.3	117.6	0.4	0.5	125.7	1.12	100	101.5	115	1	127	2.9	0.297
	130	18	1.1	37 000	33 500	16.6	4 800	2 800	5 600	**6919**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.30	1.3	127.6	0.4	0.5	135.7	1.12	101.5	103.5	123.5	1	137	4.1	0.601
	145	16	1	47 000	42 000	16.4	4 500	—	5 300	**16019**	—	—	—	—	—	—	—	—	—	—	—	—	100	—	140	1	—	—	0.904
	145	24	1.5	66 500	54 000	15.8	5 300	2 600	6 000	**6019**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.71	3.1	140.23	0.6	0.5	154.7	2.82	103	108.5	137	1.5	157	6.1	1.23
	170	32	2.1	120 000	82 000	14.4	4 300	2 600	5 000	**6219**	**ZZ**	**VV**	**DDU**	**N**	**NR**	5.69	3.5	163.65	0.6	0.5	182.9	3.1	106	114	159	2	185	8.4	2.64
	200	45	3	168 000	119 000	13.3	3 400	2 400	4 300	**6319**	**ZZ**	**VV**	**DDU**	**N**	**NR**	5.69	3.5	193.65	0.6	0.5	212.9	3.1	108	123.5	187	2.5	215	8.4	5.76
100	125	13	1	21 500	23 000	17.3	4 800	2 800	5 600	**6820**	**ZZ**	**VV**	**DD**	**N**	**NR**	2.10	1.3	122.6	0.4	0.5	130.7	1.12	105	105.5	120	1	132	2.9	0.31
	140	20	1.1	47 000	42 000	16.4	4 500	2 600	5 300	**6920**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.30	1.9	137.6	0.6	0.5	145.7	1.7	106.5	111	133.5	1	147	4.7	0.828
	150	16	1	46 500	42 000	16.5	4 300	—	5 300	**16020**	—	—	—	—	—	—	—	—	—	—	—	—	105	—	145	1	—	—	0.945
	150	24	1.5	66 000	54 000	15.9	5 000	2 600	6 000	**6020**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.71	3.1	145.24	0.6	0.5	159.7	2.82	108	112.5	142	1.5	162	6.1	1.29
	180	34	2.1	134 000	93 000	14.4	4 000	2 400	4 800	**6220**	**ZZ**	**VV**	**DDU**	**N**	**NR**	5.69	3.5	173.66	0.6	0.5	192.9	3.1	111	121.5	169	2	195	8.4	3.17
	215	47	3	191 000	141 000	13.2	2 800	2 200	3 400	**6320**	**ZZ**	**VV**	**DDU**	—	—	—	—	—	—	—	—	—	113	133	202	2.5	—	—	7.04
105	130	13	1	21 800	23 900	17.4	4 800	2 600	5 600	**6821**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.10	1.3	127.6	0.4	0.5	135.7	1.12	110	110.5	125	1	137	2.9	0.324
	145	20	1.1	46 500	42 000	16.5	4 300	—	5 300	**6921**	**ZZ**	**VV**	—	**N**	**NR**	3.30	1.9	142.6	0.6	0.5	150.7	1.7	111.5	116	138.5	1	152	4.7	0.856
	160	18	1	57 000	50 500	16.3	4 000	—	4 800	**16021**	—	—	—	—	—	—	—	—	—	—	—	—	110	—	155	1	—	—	1.24
	160	26	2	79 500	66 000	15.8	4 500	2 400	5 600	**6021**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.71	3.1	155.22	0.6	0.5	169.7	2.82	114	120	151	2	172	6.1	1.58
	190	36	2.1	146 000	105 000	14.4	3 800	2 200	4 500	**6221**	**ZZ**	**VV**	**DDU**	**N**	**NR**	5.69	3.5	183.64	0.6	0.5	202.9	3.1	116	127.5	179	2	205	8.4	3.79
	225	49	3	202 000	154 000	13.2	2 600	2 000	3 200	**6321**	**ZZ**	—	**DDU**	—	—	—	—	—	—	—	—	—	118	138	212	2.5	—	—	8.09

Notes (1) For tolerances of snap ring grooves and snap ring dimensions, refer to Pages A116 to A119.

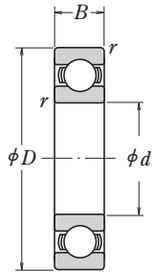
(2) When heavy axial loads are applied, d_a and D_a can be adjusted up to the shoulder diameter of the races. Please consult NSK for details.

Remarks

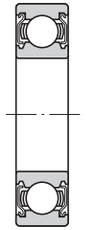
1. Diameter Series 7 (extra-thin wall) bearings are also available; please contact NSK for details.
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3. Please consult NSK about the snap ring groove dimensions of Dimension Series 18 and 19 sealed and shielded bearings when the diameter is 50 mm or more.

■SINGLE-ROW DEEP GROOVE BALL BEARINGS

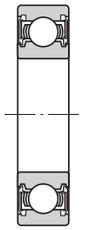
Bore Diameter 110 – 150 mm



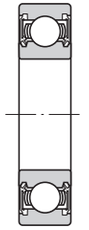
Open



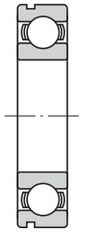
Shielded
ZZ · ZZS



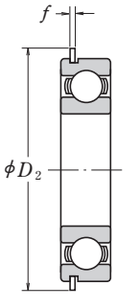
Non-Contact
Sealed
VV



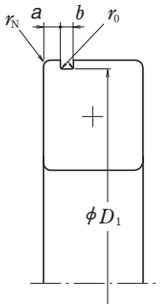
Contact
Sealed
DD · DDU

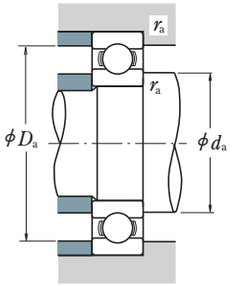


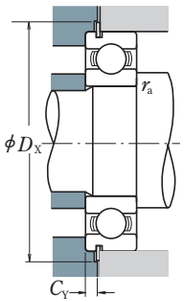
With Snap
Ring Groove
N



With
Snap Ring
NR







Dynamic Equivalent Load

$P = XF_r + YF_a$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22	1	0	0.56	1.99
0.689	0.26	1	0	0.56	1.71
1.03	0.28	1	0	0.56	1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34	1	0	0.56	1.31
3.45	0.38	1	0	0.56	1.15
5.17	0.42	1	0	0.56	1.04
6.89	0.44	1	0	0.56	1.00

Static Equivalent Load

$\frac{F_a}{F_r} > 0.8,\ P_0 = 0.6F_r + 0.5F_a$

$\frac{F_a}{F_r} \leqq 0.8,\ P_0 = F_r$

Boundary Dimensions (mm)				Basic Load Ratings (N)		Factor	Limiting Speeds (min⁻¹) Grease		Oil	Bearing Designations				With Snap Ring Groove	With Snap Ring	Snap Ring Groove Dimensions (1) (mm)					Snap Ring (1) Dimensions (mm)		Abutment and Fillet Dimensions (mm)						Mass (kg)
d	D	B	r min.	C_r	C_{0r}	f_0	Open Z · ZZ V · VV	DU DDU	Open Z	Open	Shielded	Sealed				a max.	b min.	D_1 max.	r_0 max.	r_N min.	D_2 max.	f max.	d_a(2) min.	d_a(2) max.	D_a(2) max.	r_a max.	D_X min.	C_Y max.	approx.
110	140	16	1	31 000	32 500	17.1	4 300	2 400	5 300	**6822**	**ZZ**	**VV**	**DDU**	**N**	**NR**	2.50	1.9	137.6	0.6	0.5	145.7	1.7	115	117	135	1	147	3.9	0.497
	150	20	1.1	48 000	44 500	16.6	4 300	2 400	5 000	**6922**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.30	1.9	147.6	0.6	0.5	155.7	1.7	116.5	121	143.5	1	157	4.7	0.893
	170	19	1	63 000	56 500	16.3	3 800	—	4 500	**16022**	—	—	—	—	—	—	—	—	—	—	—	—	115	—	165	1	—	—	1.51
	170	28	2	93 000	73 000	15.5	4 500	2 200	5 300	**6022**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.71	3.5	163.65	0.6	0.5	182.9	3.1	119	124.5	161	2	185	6.4	1.94
	200	38	2.1	159 000	117 000	14.3	2 800	2 200	3 400	**6222**	**ZZ**	**VV**	**DDU**	**N**	**NR**	5.69	3.5	193.65	0.6	0.5	212.9	3.1	121	134	189	2	215	8.4	4.45
	240	50	3	226 000	179 000	13.2	2 400	—	3 000	**6322**	**ZZ**	—	—	—	—	—	—	—	—	—	—	—	123	147	227	2.5	—	—	9.51
120	150	16	1	32 000	35 500	17.3	4 000	2 200	4 800	**6824**	**ZZ**	**VV**	**DD**	**N**	**NR**	2.50	1.9	147.6	0.6	0.5	155.7	1.7	125	127	145	1	157	3.9	0.537
	165	22	1.1	58 500	54 000	16.5	3 800	—	4 500	**6924**	**ZZ**	—	—	**N**	**NR**	3.70	1.9	161.8	0.6	0.5	171.5	1.7	126.5	132	158.5	1	173	5.1	1.21
	180	19	1	62 500	57 500	16.5	3 600	—	4 300	**16024**	—	—	—	—	—	—	—	—	—	—	—	—	125	—	175	1	—	—	1.6
	180	28	2	97 000	80 000	15.7	4 000	2 200	4 800	**6024**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.71	3.5	173.66	0.6	0.5	192.9	3.1	129	134.5	171	2	195	6.4	2.08
	215	40	2.1	171 000	131 000	14.4	2 600	2 000	3 200	**6224**	**ZZ**	**VV**	**DDU**	—	—	—	—	—	—	—	—	—	131	146	204	2	—	—	5.29
	260	55	3	227 000	185 000	13.5	2 200	1 800	2 800	**6324**	**ZZS**	—	**DDU**	—	—	—	—	—	—	—	—	—	133	161	247	2.5	—	—	12.5
130	165	18	1.1	40 500	44 000	17.1	3 600	2 000	4 300	**6826**	**ZZS**	**VV**	**DD**	**N**	**NR**	3.30	1.9	161.8	0.6	0.5	171.5	1.7	136.5	138	158.5	1	173	4.7	0.758
	180	24	1.5	71 500	67 500	16.5	3 400	—	4 000	**6926**	**ZZ**	—	—	**N**	**NR**	3.70	1.9	176.8	0.6	0.5	186.5	1.7	138	144	172	1.5	188	5.1	1.57
	200	22	1.1	83 500	77 500	16.4	3 000	—	3 600	**16026**	—	—	—	—	—	—	—	—	—	—	—	—	136.5	—	193.5	1	—	—	2.4
	200	33	2	117 000	101 000	15.8	3 000	1 900	3 600	**6026**	**ZZ**	—	**DDU**	**N**	**NR**	5.69	3.5	193.65	0.6	0.5	212.9	3.1	139	148.5	191	2	215	8.4	3.26
	230	40	3	184 000	146 000	14.5	2 400	—	3 000	**6226**	**ZZ**	—	—	—	—	—	—	—	—	—	—	—	143	157	217	2.5	—	—	5.96
	280	58	4	252 000	214 000	13.6	2 200	—	2 600	**6326**	**ZZS**	—	—	—	—	—	—	—	—	—	—	—	146	175	264	3	—	—	15.2
140	175	18	1.1	42 000	48 000	17.3	3 400	1 900	4 000	**6828**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.30	1.9	171.8	0.6	0.5	181.5	1.7	146.5	148.5	168.5	1	183	4.7	0.832
	190	24	1.5	73 500	72 000	16.6	3 200	—	3 800	**6928**	**ZZS**	**VV**	—	**N**	**NR**	3.70	1.9	186.8	0.6	0.5	196.5	1.7	148	153.5	182	1.5	198	5.1	1.67
	210	22	1.1	85 500	82 500	16.5	2 800	—	3 400	**16028**	—	—	—	—	—	—	—	—	—	—	—	—	146.5	—	203.5	1	—	—	2.84
	210	33	2	121 000	109 000	16.0	2 800	1 800	3 400	**6028**	**ZZ**	—	**DDU**	—	—	—	—	—	—	—	—	—	149	158.5	201	2	—	—	3.48
	250	42	3	183 000	150 000	14.9	2 200	1 700	2 800	**6228**	**ZZS**	—	**DDU**	—	—	—	—	—	—	—	—	—	153	171.5	237	2.5	—	—	7.68
	300	62	4	278 000	246 000	13.6	2 000	—	2 400	**6328**	**ZZS**	—	—	—	—	—	—	—	—	—	—	—	156	187	284	3	—	—	18.5
150	190	20	1.1	52 500	58 500	17.1	3 200	1 800	3 800	**6830**	**ZZ**	**VV**	**DDU**	**N**	**NR**	3.30	1.9	186.8	0.6	0.5	196.5	1.7	156.5	160	183.5	1	198	4.7	1.15
	210	28	2	93 500	90 500	16.5	2 600	1 700	3 200	**6930**	**ZZS**	—	**DDU**	—	—	—	—	—	—	—	—	—	159	166	201	2	—	—	3.01
	225	24	1.1	92 500	91 000	16.6	2 600	—	3 000	**16030**	—	—	—	—	—	—	—	—	—	—	—	—	156.5	—	218.5	1	—	—	3.62
	225	35	2.1	138 000	126 000	15.9	2 600	1 700	3 000	**6030**	**ZZ**	**VV**	**DDU**	—	—	—	—	—	—	—	—	—	161	170	214	2	—	—	4.24
	270	45	3	194 000	168 000	15.1	2 000	—	2 600	**6230**	**ZZS**	—	—	—	—	—	—	—	—	—	—	—	163	186	257	2.5	—	—	10
	320	65	4	300 000	284 000	13.9	1 800	—	2 200	**6330**	**ZZS**	—	—	—	—	—	—	—	—	—	—	—	166	203	304	3	—	—	22.7

Notes (1) For tolerances of snap ring grooves and snap ring dimensions, refer to Pages A116 to A119.

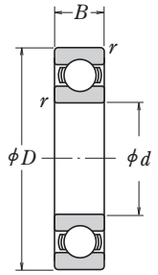
(2) When heavy axial loads are applied, d_a and D_a can be adjusted up to the shoulder diameter of the races. Please consult NSK for details.

Remarks

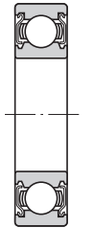
1. When using bearings with rotating outer rings, contact NSK if they are sealed, shielded, or have snap rings.
2. Please consult NSK about the snap ring groove dimensions of Dimension Series 18 and 19 sealed and shielded bearings when the diameter is 50 mm or more.

■SINGLE-ROW DEEP GROOVE BALL BEARINGS

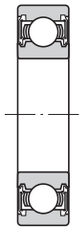
Bore Diameter 160 mm



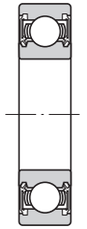
Open



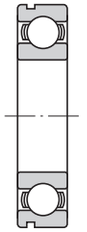
Shielded
ZZ · ZZS



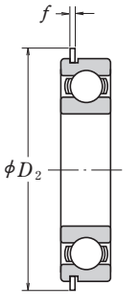
Non-Contact
Sealed
VV



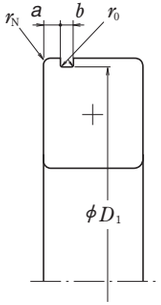
Contact
Sealed
DD · DDU

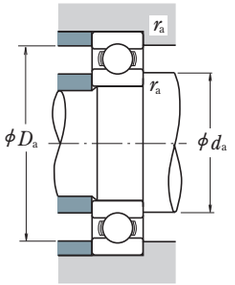


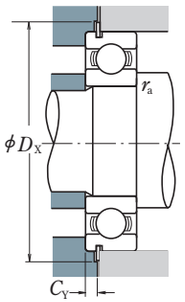
With Snap
Ring Groove
N



With
Snap Ring
NR







Dynamic Equivalent Load

$P = XF_r + YF_a$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22	1	0	0.56	1.99
0.689	0.26	1	0	0.56	1.71
1.03	0.28	1	0	0.56	1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34	1	0	0.56	1.31
3.45	0.38	1	0	0.56	1.15
5.17	0.42	1	0	0.56	1.04
6.89	0.44	1	0	0.56	1.00

Static Equivalent Load

$\frac{F_a}{F_r} > 0.8,\ P_0 = 0.6F_r + 0.5F_a$

$\frac{F_a}{F_r} \leqq 0.8,\ P_0 = F_r$

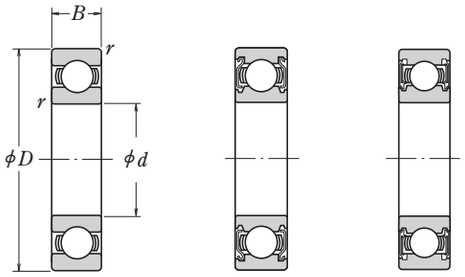
Boundary Dimensions (mm)				Basic Load Ratings (N)		Factor	Limiting Speeds (min⁻¹)			Bearing Designations				With Snap Ring Groove	With Snap Ring	Snap Ring Groove Dimensions (1) (mm)					Snap Ring (1) Dimensions (mm)		Abutment and Fillet Dimensions (mm)						Mass (kg)
							Grease		Oil																				
d	D	B	r min.	C_r	C_{0r}	f_0	Open Z · ZZ V · VV	DU DDU	Open Z	Open	Shielded	Sealed				a max.	b min.	D_1 max.	r_0 max.	r_N min.	D_2 max.	f max.	d_a(2) min.	d_a(2) max.	D_a(2) max.	r_a max.	D_x min.	C_Y max.	approx.
160	200	20	1.1	53 000	61 000	17.2	2 600	1 700	3 200	**6832**	**ZZS**	**VV**	**DDU**	**N**	**NR**	3.30	1.9	196.8	0.6	0.5	206.5	1.7	166.5	170.5	193.5	1	208	4.7	1.23
	220	28	2	95 500	96 000	16.6	2 600	1 600	3 000	**6932**	**ZZS**	—	**DDU**	—	—	—	—	—	—	—	—	—	169	176	211	2	—	—	2.71
	240	25	1.5	109 000	108 000	16.5	2 400	—	2 800	**16032**	—	—	—	—	—	—	—	—	—	—	—	—	168	—	232	1.5	—	—	4.2
	240	38	2.1	150 000	135 000	15.9	2 400	1 600	2 800	**6032**	**ZZ**	—	**DDU**	—	—	—	—	—	—	—	—	—	171	181.5	229	2	—	—	5.15
	290	48	3	204 000	186 000	15.4	1 900	—	2 400	**6232**	**ZZS**	—	—	—	—	—	—	—	—	—	—	—	173	202	277	2.5	—	—	12.8
	340	68	4	305 000	287 000	13.9	1 700	—	2 000	**6332**	**ZZS**	—	—	—	—	—	—	—	—	—	—	—	176	215.5	324	3	—	—	26.2

Notes (1) For tolerances of snap ring grooves and snap ring dimensions, refer to Pages A116 to A119.
(2) When heavy axial loads are applied, d_a and D_a can be adjusted up to the shoulder diameter of the races. Please consult NSK for details.

Remarks
1. When using bearings with rotating outer rings, contact NSK if they are sealed, shielded, or have snap rings.
2. Please consult NSK about the snap ring groove dimensions of Dimension Series 18 and 19 sealed and shielded bearings when the diameter is 50 mm or more.

SINGLE-ROW DEEP GROOVE BALL BEARINGS

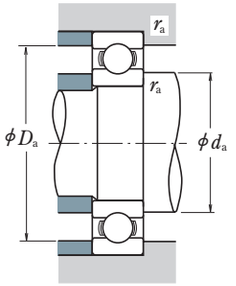
Bore Diameter 170 – 240 mm



Open

Shielded
ZZS

Non-Contact
Sealed
VV



Boundary Dimensions (mm)				Basic Load Ratings (N)		Factor	Limiting Speeds (min⁻¹)			Bearing Designations				Abutment and Fillet Dimensions (mm)				Mass (kg)
							Grease		Oil									
d	D	B	r min.	C_r	C_{0r}	f_0	Open Z · ZZ V · VV	DU DDU	Open Z	Open	Shielded	Sealed		d_a(1) min.	d_a(1) max.	D_a(1) max.	r_a max.	approx.
170	215	22	1.1	66 000	75 000	17.1	2 600	1 600	3 000	**6834**	**ZZS**	**VV**	**DDU**	176.5	182	208.5	1	1.86
	230	28	2	94 500	97 000	16.7	2 400	—	2 800	**6934**	**ZZS**	—	—	179	186	221	2	3.34
	260	28	1.5	126 000	126 000	16.5	2 200	—	2 600	**16034**	—	—	—	178	—	252	1.5	5.71
	260	42	2.1	177 000	161 000	15.8	2 200	—	2 600	**6034**	**ZZS**	**VV**	—	181	194.5	249	2	6.89
	310	52	4	234 000	224 000	15.3	1 800	—	2 200	**6234**	**ZZS**	—	—	186	215	294	3	15.8
	360	72	4	360 000	355 000	13.6	1 600	—	2 000	**6334**	—	—	—	186	—	344	3	36.6
180	225	22	1.1	66 500	78 500	17.2	2 400	—	2 800	**6836**	—	**VV**	—	186.5	192	218.5	1	1.98
	250	33	2	131 000	128 000	16.4	2 200	—	2 600	**6936**	**ZZS**	—	—	189	198.5	241	2	4.16
	280	31	2	159 000	157 000	16.3	2 000	—	2 400	**16036**	—	—	—	189	—	271	2	7.5
	280	46	2.1	198 000	185 000	15.6	2 000	—	2 400	**6036**	**ZZS**	**VV**	—	191	208	269	2	8.88
	320	52	4	250 000	241 000	15.1	1 700	—	2 000	**6236**	**ZZS**	—	—	196	223	304	3	15.9
	380	75	4	390 000	405 000	13.9	1 500	—	1 800	**6336**	—	—	—	196	—	364	3	43.1
190	240	24	1.5	80 500	93 500	17.1	2 200	—	2 600	**6838**	—	**VV**	—	198	202.5	232	1.5	2.53
	260	33	2	124 000	127 000	16.6	2 200	—	2 600	**6938**	—	—	—	199	—	251	2	5.18
	290	31	2	164 000	168 000	16.4	2 000	—	2 400	**16038**	—	—	—	199	—	281	2	7.78
	290	46	2.1	207 000	201 000	15.8	2 000	—	2 400	**6038**	**ZZS**	—	—	201	218	279	2	9.39
	340	55	4	280 000	282 000	15.0	1 600	—	2 000	**6238**	**ZZS**	—	—	206	236	324	3	22.3
	400	78	5	390 000	415 000	14.1	1 400	—	1 700	**6338**	—	—	—	210	—	380	4	49.7
200	250	24	1.5	81 500	98 000	17.2	2 200	—	2 600	**6840**	—	—	—	208	—	242	1.5	2.67
	280	38	2.1	158 000	158 000	16.4	2 000	—	2 400	**6940**	**ZZS**	—	—	211	222	269	2	7.28
	310	34	2	177 000	180 000	16.4	1 900	—	2 200	**16040**	—	—	—	209	—	301	2	10
	310	51	2.1	228 000	226 000	15.6	1 900	—	2 200	**6040**	**ZZS**	—	—	211	231.5	299	2	12
	360	58	4	296 000	310 000	15.2	1 500	—	1 800	**6240**	**ZZS**	—	—	216	252	344	3	26.7
	420	80	5	415 000	445 000	13.8	1 300	—	1 600	**6340**	—	—	—	220	—	400	4	55.3
220	270	24	1.5	84 000	107 000	17.4	1 900	—	2 400	**6844**	**ZZS**	—	—	228	233.5	262	1.5	2.9
	300	38	2.1	161 000	169 000	16.6	1 800	—	2 200	**6944**	**ZZS**	—	—	231	242	289	2	7.88
	340	37	2.1	198 000	217 000	16.5	1 600	—	2 000	**16044**	—	—	—	231	—	329	2	13.1
	340	56	3	259 000	271 000	15.6	1 700	—	2 000	**6044**	**ZZS**	—	—	233	254.5	327	2.5	18.6
	400	65	4	340 000	375 000	15.1	1 300	—	1 600	**6244**	—	—	—	236	—	384	3	37.4
	460	88	5	450 000	520 000	14.3	1 200	—	1 500	**6344**	—	—	—	240	—	440	4	73.9
240	300	28	2	108 000	137 000	17.3	1 700	—	2 000	**6848**	—	—	—	249	—	291	2	4.48
	320	38	2.1	170 000	190 000	16.8	1 700	—	2 000	**6948**	**ZZS**	—	—	251	262	309	2	8.49
	360	37	2.1	215 000	243 000	16.5	1 500	—	1 900	**16048**	—	—	—	251	—	349	2	13.9
	360	56	3	269 000	296 000	15.9	1 500	—	1 900	**6048**	—	—	—	253	—	347	2.5	19.9
	440	72	4	375 000	430 000	15.2	1 200	—	1 500	**6248**	—	—	—	256	—	424	3	50.5
	500	95	5	515 000	625 000	14.2	1 100	—	1 300	**6348**	—	—	—	260	—	480	4	94.4

Note (1) When heavy axial loads are applied, d_a and D_a can be adjusted up to the shoulder diameter of the races. Please consult NSK for details.

Remark When using bearings with rotating outer rings, contact NSK if they are sealed or shielded.

Dynamic Equivalent Load

$P = XF_r + YF_a$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22	1	0	0.56	1.99
0.689	0.26	1	0	0.56	1.71
1.03	0.28	1	0	0.56	1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34	1	0	0.56	1.31
3.45	0.38	1	0	0.56	1.15
5.17	0.42	1	0	0.56	1.04
6.89	0.44	1	0	0.56	1.00

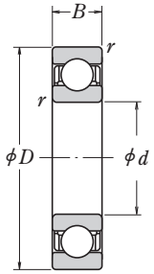
Static Equivalent Load

$\frac{F_a}{F_r} > 0.8$, $P_0 = 0.6F_r + 0.5F_a$

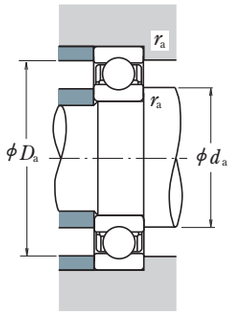
$\frac{F_a}{F_r} \leqq 0.8$, $P_0 = F_r$

■SINGLE-ROW DEEP GROOVE BALL BEARINGS

Bore Diameter 260 – 360 mm



Open



Boundary Dimensions (mm)				Basic Load Ratings (N)		Factor	Limiting Speeds (min^{-1})		Bearing Designations	Abutment and Fillet Dimensions (mm)			Mass (kg)
d	D	B	r min.	C_r	C_{0r}	f_0	Grease	Oil	Open	d_a(1) min.	D_a(1) max.	r_a max.	approx.
260	320	28	2	111 000	148 000	17.4	1 600	1 900	**6852**	269	311	2	4.84
	360	46	2.1	224 000	255 000	16.5	1 500	1 800	**6952**	271	349	2	14
	400	44	3	260 000	310 000	16.4	1 400	1 700	**16052**	273	387	2.5	21.1
	400	65	4	320 000	375 000	15.8	1 400	1 700	**6052**	276	384	3	29.4
	480	80	5	440 000	540 000	15.1	1 100	1 300	**6252**	280	460	4	67
	540	102	6	555 000	710 000	14.6	1 000	1 200	**6352**	286	514	5	118
280	350	33	2	146 000	191 000	17.3	1 500	1 700	**6856**	289	341	2	7.2
	380	46	2.1	230 000	272 000	16.6	1 400	1 700	**6956**	291	369	2	15.1
	420	44	3	267 000	330 000	16.5	1 300	1 600	**16056**	293	407	2.5	22.7
	420	65	4	330 000	410 000	16.0	1 300	1 600	**6056**	296	404	3	31.2
	500	80	5	440 000	550 000	15.2	1 000	1 300	**6256**	300	480	4	70.4
	580	108	6	625 000	840 000	14.5	900	1 100	**6356**	306	554	5	144
300	380	38	2.1	183 000	233 000	17.1	1 300	1 600	**6860**	311	369	2	10.3
	420	56	3	296 000	370 000	16.4	1 300	1 500	**6960**	313	407	2.5	23.9
	460	50	4	315 000	405 000	16.4	1 200	1 400	**16060**	316	444	3	31.5
	460	74	4	390 000	500 000	15.8	1 200	1 400	**6060**	316	444	3	44.2
	540	85	5	510 000	670 000	15.1	950	1 200	**6260**	320	520	4	87.8
320	400	38	2.1	185 000	244 000	17.2	1 300	1 500	**6864**	331	389	2	10.8
	440	56	3	292 000	375 000	16.5	1 200	1 400	**6964**	333	427	2.5	25.3
	480	50	4	320 000	430 000	16.5	1 100	1 300	**16064**	336	464	3	33.2
	480	74	4	430 000	570 000	15.7	1 100	1 300	**6064**	336	464	3	46.5
	580	92	5	585 000	805 000	15.0	850	1 100	**6264**	340	560	4	111
340	420	38	2.1	192 000	265 000	17.3	1 200	1 400	**6868**	351	409	2	11.5
	460	56	3	300 000	400 000	16.6	1 100	1 300	**6968**	353	447	2.5	26.6
	520	82	5	485 000	660 000	15.6	1 000	1 200	**6068**	360	500	4	62.3
	620	92	6	580 000	820 000	15.3	800	1 000	**6268**	366	594	5	129
360	440	38	2.1	211 000	290 000	17.3	1 100	1 300	**6872**	371	429	2	11.8
	480	56	3	310 000	425 000	16.7	1 100	1 300	**6972**	373	467	2.5	27.9
	540	82	5	505 000	720 000	15.7	950	1 200	**6072**	380	520	4	65.3
	650	95	6	615 000	905 000	15.4	750	950	**6272**	386	624	5	145

Note (1) When heavy axial loads are applied, d_a and D_a can be adjusted up to the shoulder diameter of the races. Please consult NSK for details.

Dynamic Equivalent Load

$P = XF_r + YF_a$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22	1	0	0.56	1.99
0.689	0.26	1	0	0.56	1.71
1.03	0.28	1	0	0.56	1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34	1	0	0.56	1.31
3.45	0.38	1	0	0.56	1.15
5.17	0.42	1	0	0.56	1.04
6.89	0.44	1	0	0.56	1.00

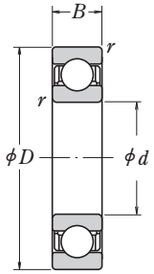
Static Equivalent Load

$\frac{F_a}{F_r} > 0.8,\ P_0 = 0.6F_r + 0.5F_a$

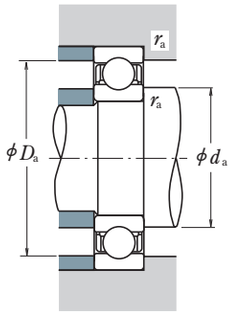
$\frac{F_a}{F_r} \leqq 0.8,\ P_0 = F_r$

SINGLE-ROW DEEP GROOVE BALL BEARINGS

Bore Diameter 380 – 600 mm



Open



Boundary Dimensions (mm)				Basic Load Ratings (N)		Factor	Limiting Speeds (min^{-1})		Bearing Designations	Abutment and Fillet Dimensions (mm)			Mass (kg)
d	D	B	r min.	C_r	C_{0r}	f_0	Grease	Oil	Open	d_a(1) min.	D_a(1) max.	r_a max.	approx.
380	480	46	2.1	261 000	375 000	17.1	1 000	1 200	**6876**	391	469	2	19.5
	520	65	4	355 000	510 000	16.6	950	1 200	**6976**	396	504	3	40
	560	82	5	505 000	725 000	15.9	900	1 100	**6076**	400	540	4	68
400	500	46	2.1	265 000	390 000	17.2	950	1 200	**6880**	411	489	2	20.5
	540	65	4	365 000	540 000	16.7	900	1 100	**6980**	416	524	3	42
	600	90	5	560 000	825 000	15.7	850	1 000	**6080**	420	580	4	88.4
420	520	46	2.1	269 000	410 000	17.3	900	1 100	**6884**	431	509	2	21.4
	560	65	4	375 000	570 000	16.8	900	1 100	**6984**	436	544	3	43.6
	620	90	5	585 000	895 000	15.8	800	1 000	**6084**	440	600	4	92.2
440	540	46	2.1	273 000	425 000	17.4	900	1 100	**6888**	451	529	2	22.3
	600	74	4	435 000	680 000	16.6	800	1 000	**6988**	456	584	3	60.2
	650	94	6	605 000	965 000	16.0	750	900	**6088**	466	624	5	106
460	580	56	3	340 000	550 000	17.1	800	1 000	**6892**	473	567	2.5	34.3
	620	74	4	450 000	720 000	16.7	800	950	**6992**	476	604	3	62.6
	680	100	6	665 000	1 080 000	15.8	710	850	**6092**	486	654	5	123
480	600	56	3	350 000	575 000	17.2	800	950	**6896**	493	587	2.5	35.4
	650	78	5	495 000	815 000	16.6	750	900	**6996**	500	630	4	73.5
	700	100	6	665 000	1 090 000	15.9	710	850	**6096**	506	674	5	127
500	620	56	3	355 000	600 000	17.3	750	900	**68/500**	513	607	2.5	37.2
	670	78	5	505 000	865 000	16.7	710	850	**69/500**	520	650	4	82
	720	100	6	690 000	1 170 000	16.0	670	800	**60/500**	526	694	5	131
530	650	56	3	360 000	625 000	17.4	710	850	**68/530**	543	637	2.5	39.8
	710	82	5	500 000	870 000	16.8	670	800	**69/530**	550	690	4	89.8
	780	112	6	745 000	1 300 000	16.0	600	750	**60/530**	556	754	5	184
560	680	56	3	360 000	650 000	17.4	670	800	**68/560**	573	667	2.5	41.5
	750	85	5	575 000	1 040 000	16.7	600	750	**69/560**	580	730	4	105
	820	115	6	810 000	1 500 000	16.2	560	670	**60/560**	586	793.5	5	203
600	730	60	3	390 000	735 000	17.5	600	710	**68/600**	613	717	2.5	50.9
	800	90	5	605 000	1 160 000	16.9	560	670	**69/600**	620	780	4	120
	870	118	6	870 000	1 640 000	16.1	530	630	**60/600**	626	844	5	236

Note (1) When heavy axial loads are applied, d_a and D_a can be adjusted up to the shoulder diameter of the races. Please consult NSK for details.

Dynamic Equivalent Load

$P = XF_r + YF_a$

$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22	1	0	0.56	1.99
0.689	0.26	1	0	0.56	1.71
1.03	0.28	1	0	0.56	1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34	1	0	0.56	1.31
3.45	0.38	1	0	0.56	1.15
5.17	0.42	1	0	0.56	1.04
6.89	0.44	1	0	0.56	1.00

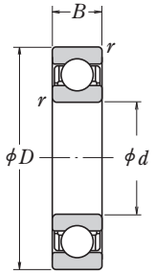
Static Equivalent Load

$\frac{F_a}{F_r} > 0.8$, $P_0 = 0.6F_r + 0.5F_a$

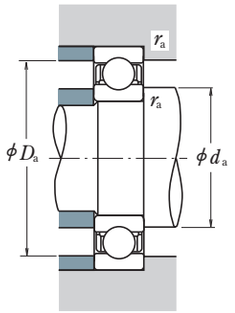
$\frac{F_a}{F_r} \leqq 0.8$, $P_0 = F_r$

■SINGLE-ROW DEEP GROOVE BALL BEARINGS

Bore Diameter 630 – 800 mm



Open



Boundary Dimensions (mm)				Basic Load Ratings (N)		Factor	Limiting Speeds (min^{-1})		Bearing Designations	Abutment and Fillet Dimensions (mm)			Mass (kg)
d	D	B	r min.	C_r	C_{0r}	f_0	Grease	Oil	Open	d_a(1) min.	D_a(1) max.	r_a max.	approx.
630	780	69	4	460 000	890 000	17.3	560	670	**68/630**	646	764	3	71.3
	850	100	6	690 000	1 350 000	16.7	530	630	**69/630**	656	824	5	163
	920	128	7.5	825 000	1 620 000	16.4	480	600	**60/630**	662	888	6	285
670	820	69	4	480 000	965 000	17.4	500	630	**68/670**	686	804	3	75.4
	900	103	6	740 000	1 460 000	16.7	480	560	**69/670**	696	874	5	181
	980	136	7.5	840 000	1 730 000	16.6	450	530	**60/670**	702	948	6	351
710	870	74	4	530 000	1 100 000	17.4	480	560	**68/710**	726	854	3	92.6
	950	106	6	785 000	1 640 000	16.8	450	530	**69/710**	736	924	5	208
750	920	78	5	580 000	1 260 000	17.4	430	530	**68/750**	770	900	4	110
	1 000	112	6	865 000	1 840 000	16.7	400	500	**69/750**	776	974	5	245
800	980	82	5	585 000	1 310 000	17.5	400	480	**68/800**	820	960	4	132
	1 060	115	6	910 000	2 050 000	16.8	380	450	**69/800**	826	1 034	5	275

Note (1) When heavy axial loads are applied, d_a and D_a can be adjusted up to the shoulder diameter of the races. Please consult NSK for details.

Dynamic Equivalent Load

$P = XF_r + YF_a$

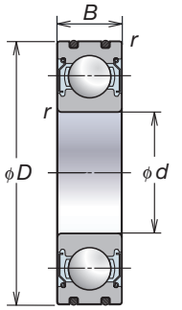
$\frac{f_0F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22	1	0	0.56	1.99
0.689	0.26	1	0	0.56	1.71
1.03	0.28	1	0	0.56	1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34	1	0	0.56	1.31
3.45	0.38	1	0	0.56	1.15
5.17	0.42	1	0	0.56	1.04
6.89	0.44	1	0	0.56	1.00

Static Equivalent Load

$\frac{F_a}{F_r} > 0.8$, $P_0 = 0.6F_r + 0.5F_a$

$\frac{F_a}{F_r} \leqq 0.8$, $P_0 = F_r$

Bore Diameter 10 – 100 mm



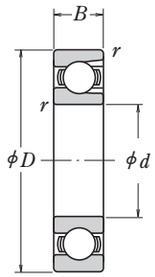
Boundary Dimensions (mm)			Basic Load Ratings (N)		Recommended Fits (1)	Bearing Designations			
d	D	B	C_r	C_{0r}		Basic Designation (Open)	Shields	Contact Seal (2)	Non-Contact Seal
10	26	8	5 050	1 970		**6000**	**ZZ**	**DDU**	**VV**
	30	9	5 600	2 390		**6200**	**ZZ**	**DDU**	**VV**
	35	11	8 900	3 450		**6300**	**ZZ**	**DDU**	**VV**
12	28	8	5 600	2 370		**6001**	**ZZ**	**DDU**	**VV**
	32	10	7 500	3 050		**6201**	**ZZ**	**DDU**	**VV**
	37	12	10 700	4 200		**6301**	**ZZ**	**DDU**	**VV**
15	32	9	6 150	2 830		**6002**	**ZZ**	**DDU**	**VV**
	35	11	8 400	3 750		**6202**	**ZZ**	**DDU**	**VV**
	42	13	12 600	5 450		**6302**	**ZZ**	**DDU**	**VV**
17	35	10	6 600	3 250		**6003**	**ZZ**	**DDU**	**VV**
	40	12	10 500	4 800		**6203**	**ZZ**	**DDU**	**VV**
	47	14	15 000	6 650		**6303**	**ZZ**	**DDU**	**VV**
20	42	12	10 300	5 000		**6004**	**ZZ**	**DDU**	**VV**
	47	14	14 100	6 600		**6204**	**ZZ**	**DDU**	**VV**
	52	15	17 500	7 900		**6304**	**ZZ**	**DDU**	**VV**
25	47	12	11 100	5 850		**6005**	**ZZ**	**DDU**	**VV**
	52	15	15 400	7 850		**6205**	**ZZ**	**DDU**	**VV**
	62	17	22 600	11 200		**6305**	**ZZ**	**DDU**	**VV**
30	55	13	14 600	8 300		**6006**	**ZZ**	**DDU**	**VV**
	62	16	21 400	11 300		**6206**	**ZZ**	**DDU**	**VV**
	72	19	29 300	15 000		**6306**	**ZZ**	**DDU**	**VV**
35	62	14	17 600	10 300		**6007**	**ZZ**	**DDU**	**VV**
	72	17	28 200	15 300		**6207**	**ZZ**	**DDU**	**VV**
	80	21	36 500	19 200		**6307**	**ZZ**	**DDU**	**VV**
40	68	15	18 400	11 500	H7 or	**6008**	**ZZ**	**DDU**	**VV**
	80	18	32 000	17 900	G6	**6208**	**ZZ**	**DDU**	**VV**
	90	23	45 000	24 000		**6308**	**ZZ**	**DDU**	**VV**
45	75	16	23 000	15 200		**6009**	**ZZ**	**DDU**	**VV**
	85	19	34 500	20 400		**6209**	**ZZ**	**DDU**	**VV**
	100	25	58 500	32 000		**6309**	**ZZ**	**DDU**	**VV**
50	80	16	24 000	16 600		**6010**	**ZZ**	**DDU**	**VV**
	90	20	38 500	23 200		**6210**	**ZZ**	**DDU**	**VV**
	110	27	68 000	38 500		**6310**	**ZZ**	**DDU**	**VV**
55	90	18	31 000	21 200		**6011**	**ZZ**	**DDU**	**VV**
	100	21	47 500	29 300		**6211**	**ZZ**	**DDU**	**VV**
	120	29	78 500	44 500		**6311**	**ZZ**	**DDU**	**VV**
60	95	18	32 500	23 200		**6012**	**ZZ**	**DDU**	**VV**
	110	22	57 500	36 000		**6212**	**ZZ**	**DDU**	**VV**
	130	31	90 000	52 000		**6312**	**ZZ**	**DDU**	**VV**
65	100	18	33 500	25 200		**6013**	**ZZ**	**DDU**	**VV**
	120	23	63 000	40 000		**6213**	**ZZ**	**DDU**	**VV**
	140	33	102 000	60 000		**6313**	**ZZ**	**DDU**	**VV**
70	110	20	42 000	31 000		**6014**	**ZZ**	**DDU**	**VV**
	125	24	68 500	44 000		**6214**	**ZZ**	**DDU**	**VV**
	150	35	115 000	68 000		**6314**	**ZZ**	**DDU**	**VV**
75	115	20	43 500	33 500		**6015**	**ZZ**	**DDU**	**VV**
	130	25	73 000	49 500		**6215**	**ZZ**	**DDU**	**VV**
80	125	22	52 500	40 000		**6016**	**ZZ**	**DDU**	**VV**
	140	26	80 000	53 000		**6216**	**ZZ**	**DDU**	**VV**
85	130	22	54 500	43 000		**6017**	**ZZ**	**DDU**	**VV**
	150	28	92 500	62 000		**6217**	**ZZ**	**DDU**	**VV**
90	140	24	64 000	50 000		**6018**	**ZZ**	**DDU**	**VV**
95	145	24	66 500	54 000		**6019**	**ZZ**	**DDU**	**VV**
100	150	24	66 000	54 000		**6020**	**ZZ**	**DDU**	**VV**

Notes (1) Although recommended fits are H7 or G6, G6 is recommended when used under conditions that prioritize insertion under light preload.

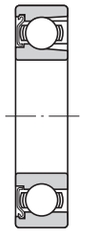
(2) Low-contact seals are available for sealed bearings; contact NSK for details.

MAXIMUM BALL BEARINGS

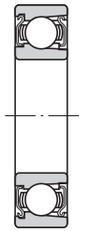
Bore Diameter 25 – 110 mm



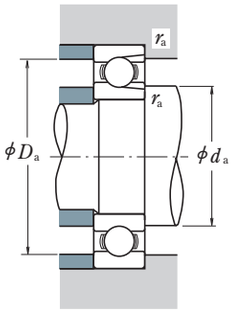
Open

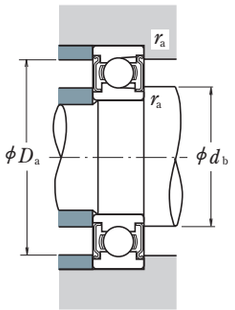


Shielded
(One Shield) Z



Shielded
(Two Shields) ZZ



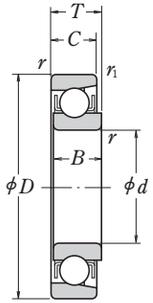


Boundary Dimensions (mm)				Basic Load Ratings (N)		Limiting Speeds (min^{-1})		Bearing Designations			Abutment and Fillet Dimensions (mm)				Mass (kg)
d	D	B	r min.	C_r	C_{0r}	Grease Open Z · ZZ	Oil Open Z	Open	With One Shield	With Two Shields	d_a min.	d_b max.	D_a max.	r_a max.	approx.
25	52	15	1	15 800	10 500	12 000	15 000	**BL 205**	**BL 205 Z**	**BL 205 ZZ**	30	32	47	1	0.133
	62	17	1.1	23 700	15 500	11 000	13 000	**BL 305**	**BL 305 Z**	**BL 305 ZZ**	31.5	36	55.5	1	0.246
30	62	16	1	23 200	16 300	10 000	12 000	**BL 206**	**BL 206 Z**	**BL 206 ZZ**	35	38.5	57	1	0.215
	72	19	1.1	30 500	20 700	9 000	11 000	**BL 306**	**BL 306 Z**	**BL 306 ZZ**	36.5	42	65.5	1	0.364
35	72	17	1.1	30 500	22 100	9 000	11 000	**BL 207**	**BL 207 Z**	**BL 207 ZZ**	41.5	44.5	65.5	1	0.307
	80	21	1.5	41 000	29 100	8 000	9 500	**BL 307**	**BL 307 Z**	**BL 307 ZZ**	43	44.5	72	1.5	0.486
40	80	18	1.1	39 000	28 800	8 000	9 500	**BL 208**	**BL 208 Z**	**BL 208 ZZ**	46.5	50	73.5	1	0.394
	90	23	1.5	51 000	36 000	7 500	9 000	**BL 308**	**BL 308 Z**	**BL 308 ZZ**	48	52.5	82	1.5	0.685
45	85	19	1.1	41 000	32 000	7 500	9 000	**BL 209**	**BL 209 Z**	**BL 209 ZZ**	51.5	55.5	78.5	1	0.449
	100	25	1.5	61 000	44 000	6 300	8 000	**BL 309**	**BL 309 Z**	**BL 309 ZZ**	53	61.5	92	1.5	0.883
50	90	20	1.1	43 000	35 000	6 700	8 500	**BL 210**	**BL 210 Z**	**BL 210 ZZ**	56.5	60	83.5	1	0.504
	110	27	2	71 500	52 500	6 000	7 100	**BL 310**	**BL 310 Z**	**BL 310 ZZ**	59	68	101	2	1.16
55	100	21	1.5	53 000	44 000	6 300	7 500	**BL 211**	**BL 211 Z**	**BL 211 ZZ**	63	66.5	92	1.5	0.667
	120	29	2	82 500	61 500	5 600	6 700	**BL 311**	**BL 311 Z**	**BL 311 ZZ**	64	72.5	111	2	1.49
60	110	22	1.5	64 000	54 000	5 600	6 700	**BL 212**	**BL 212 Z**	**BL 212 ZZ**	68	74.5	102	1.5	0.856
	130	31	2.1	94 000	71 500	5 000	6 000	**BL 312**	**BL 312 Z**	**BL 312 ZZ**	71	79	119	2	1.88
65	120	23	1.5	70 000	60 000	5 300	6 300	**BL 213**	**BL 213 Z**	**BL 213 ZZ**	73	80	112	1.5	1.09
	140	33	2.1	113 000	89 500	4 800	5 600	**BL 313**	**BL 313 Z**	**BL 313 ZZ**	76	85.5	129	2	2.36
70	125	24	1.5	76 000	66 000	5 000	6 000	**BL 214**	**BL 214 Z**	**BL 214 ZZ**	78	84	117	1.5	1.19
	150	35	2.1	127 000	102 000	4 300	5 300	**BL 314**	**BL 314 Z**	**BL 314 ZZ**	81	92	139	2	2.87
75	130	25	1.5	79 000	72 000	4 500	5 600	**BL 215**	**BL 215 Z**	**BL 215 ZZ**	83	90	122	1.5	1.29
	160	37	2.1	138 000	116 000	4 000	5 000	**BL 315**	**BL 315 Z**	**BL 315 ZZ**	86	98.5	149	2	3.43
80	140	26	2	92 500	85 000	4 300	5 300	**BL 216**	**BL 216 Z**	**BL 216 ZZ**	89	95.5	131	2	1.61
	170	39	2.1	150 000	130 000	3 800	4 500	**BL 316**	**BL 316 Z**	**BL 316 ZZ**	91	104.5	159	2	4.08
85	150	28	2	102 000	93 000	4 000	5 000	**BL 217**	**BL 217 Z**	**BL 217 ZZ**	94	102	141	2	1.97
	180	41	3	162 000	145 000	3 600	4 300	**BL 317**	**BL 317 Z**	**BL 317 ZZ**	98	110.5	167	2.5	4.77
90	160	30	2	117 000	107 000	3 800	4 500	**BL 218**	**BL 218 Z**	**BL 218 ZZ**	99	107.5	151	2	2.43
	190	43	3	174 000	161 000	3 400	4 000	**BL 318**	**BL 318 Z**	**BL 318 ZZ**	103	117	177	2.5	5.45
95	170	32	2.1	133 000	123 000	3 600	4 300	**BL 219**	**BL 219 Z**	**BL 219 ZZ**	106	114	159	2	2.95
	200	45	3	186 000	178 000	2 800	3 600	**BL 319**	**BL 319 Z**	**BL 319 ZZ**	108	124	187	2.5	6.4
100	180	34	2.1	149 000	140 000	3 400	4 000	**BL 220**	**BL 220 Z**	**BL 220 ZZ**	111	121.5	169	2	3.54
105	190	36	2.1	162 000	157 000	3 200	3 800	**BL 221**	**BL 221 Z**	**BL 221 ZZ**	116	127.5	179	2	4.23
110	200	38	2.1	176 000	176 000	2 800	3 400	**BL 222**	—	—	121	—	189	2	4.84

Remark When using maximum ball bearings, please contact NSK.

MAGNETO BEARINGS

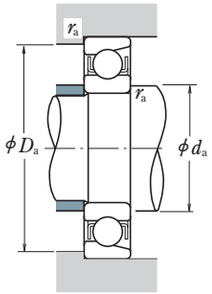
Bore Diameter 4 – 20 mm



Outside Diameter Tolerance (Class N)

Units : μm

Nominal Outside Diameter D (mm)		Single Plane Mean Outside Diameter Δ_{Dmp}			
		E Series		EN Series	
Over	Incl.	High	Low	High	Low
—	10	+ 8	0	0	− 8
10	18	+ 8	0	0	− 8
18	30	+ 9	0	0	− 9
30	50	+11	0	0	−11



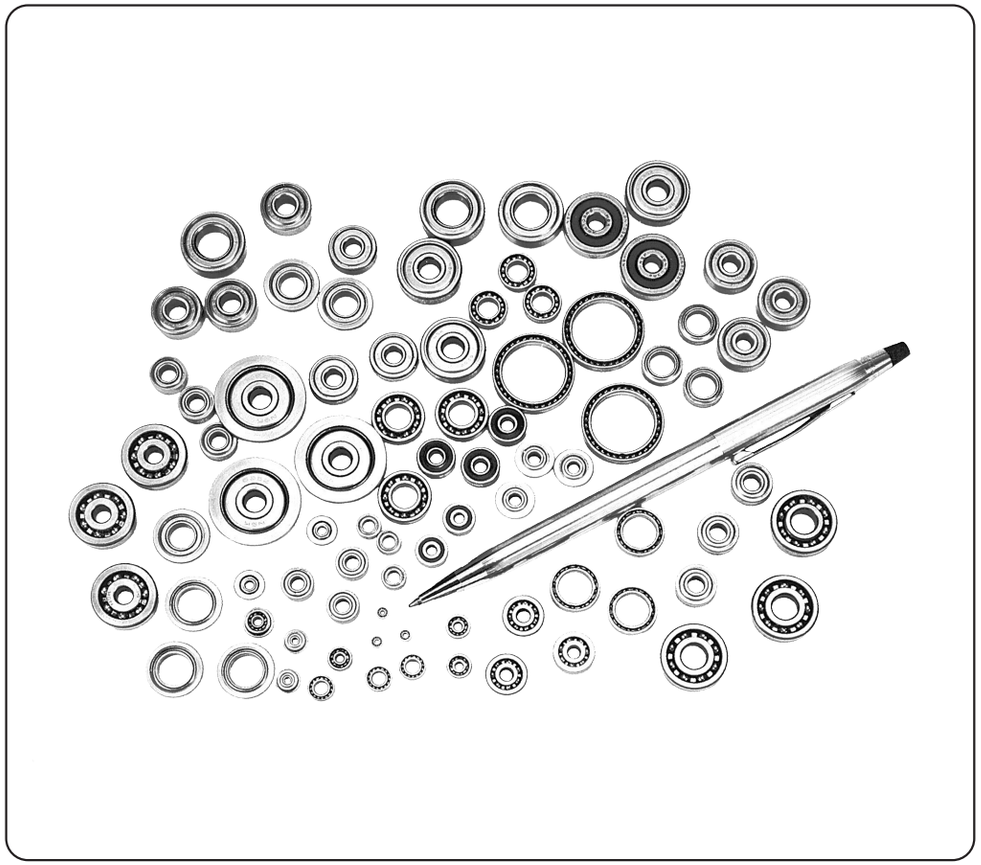
Dynamic Equivalent Load

$P = XF_r + YF_a$

$F_a/F_r \leqq e$		$F_a/F_r > e$		e
X	Y	X	Y	
1	0	0.5	2.5	0.2

Boundary Dimensions (mm)					Basic Load Ratings (N)		Limiting Speeds (min^{-1})		Bearing Designations		Abutment and Fillet Dimensions (mm)			Mass (kg)
d	D	B,C,T	r min.	r_1 min.	C_r	C_{0r}	Grease	Oil	E Series	EN Series	d_a min.	D_a max.	r_a max.	approx.
4	16	5	0.15	0.1	1 820	289	34 000	40 000	**E 4**	**EN 4**	5.2	14.8	0.15	0.005
5	16	5	0.15	0.1	1 820	289	34 000	40 000	**E 5**	**EN 5**	6.2	14.8	0.15	0.004
6	21	7	0.3	0.15	2 740	445	30 000	36 000	**E 6**	**EN 6**	8	19	0.3	0.011
7	22	7	0.3	0.15	2 740	445	30 000	36 000	**E 7**	**EN 7**	9	20	0.3	0.013
8	24	7	0.3	0.15	3 750	650	28 000	34 000	**E 8**	**EN 8**	10	22	0.3	0.014
9	28	8	0.3	0.15	5 000	880	24 000	30 000	**E 9**	**EN 9**	11	26	0.3	0.022
10	28	8	0.3	0.15	5 000	880	24 000	30 000	**E 10**	**EN 10**	12	26	0.3	0.021
11	32	7	0.3	0.15	4 850	845	22 000	26 000	**E 11**	**EN 11**	13	30	0.3	0.029
12	32	7	0.3	0.15	4 850	845	22 000	26 000	**E 12**	**EN 12**	14	30	0.3	0.028
13	30	7	0.3	0.15	4 850	845	22 000	26 000	**E 13**	**EN 13**	15	28	0.3	0.021
14	35	8	0.3	0.15	6 400	1 150	19 000	22 000	—	**EN 14**	16	33	0.3	0.035
15	35	8	0.3	0.15	6 400	1 150	19 000	22 000	**E 15**	**EN 15**	17	33	0.3	0.034
	40	10	0.6	0.3	8 100	1 500	17 000	20 000	**BO 15**	—	19	36	0.6	0.055
16	38	10	0.6	0.2	7 600	1 380	17 000	22 000	—	**EN 16**	20	34	0.6	0.049
17	40	10	0.6	0.3	8 100	1 500	17 000	20 000	**L 17**	—	21	36	0.6	0.051
	44	11	0.6	0.3	8 100	1 500	16 000	19 000	—	**EN 17**	21	40	0.6	0.080
	44	11	0.6	0.3	8 100	1 500	16 000	19 000	**BO 17**	—	21	40	0.6	0.080
18	40	9	0.6	0.2	5 550	1 030	17 000	20 000	—	**EN 18**	22	36	0.6	0.051
19	40	9	0.6	0.2	5 550	1 030	17 000	20 000	**E 19**	**EN 19**	23	36	0.6	0.049
20	47	12	1	0.6	12 100	2 380	14 000	17 000	**E 20**	**EN 20**	25	42	1	0.089
	47	14	1	0.6	12 100	2 380	14 000	17 000	**L 20**	—	25	42	1	0.101

Remarks 1. The outside diameters of Series E magneto bearings always have plus tolerances.
2. Please contact NSK when using magneto bearings outside of the E Series.



2. EXTRA SMALL BALL BEARINGS AND MINIATURE BALL BEARINGS

INTRODUCTION ..... C 054

BEARING TABLES

EXTRA SMALL BALL BEARINGS · MINIATURE BALL BEARINGS

Metric Series — Bore Diameter 1 – 9mm ..... C 058

With Flange — Bore Diameter 1 – 9mm ..... C 062

Inch Series — Bore Diameter 1.016 – 9.525mm ..... C 066

With Flange — Bore Diameter 1.191 – 9.525mm ..... C 068

DESIGN AND TYPES

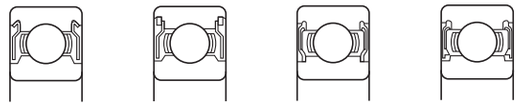
The size ranges of extra small and miniature ball bearings are shown in Table 1, and design/types and type designations are shown in Table 2. Types listed in the bearing tables are indicated by shading ▬ in Table 2.

Table 1 Size Ranges of Bearings

Units : mm

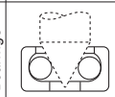
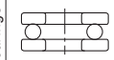
Series	Extra Small Ball Bearings	Miniature Ball Bearings
Metric	Outside diameter $D \geqq 9$ Bore diameter $d < 10$	Outside diameter $D < 9$
Inch	Outside diameter $D \geqq 9.525$ Bore diameter $d < 10$	Outside diameter $D < 9.525$

Please refer to NSK Miniature Ball Bearings (CAT. No. E126) for details.



ZZ ZZS DD VV

Table 2 Design/Types and Type Designations of Miniature and Extra Small Bearings

Design/Types		Type Designations				Remarks
		Metric	Inch	Special		
				Metric	Inch	
Single-Row Deep Groove Ball Bearings		6○○	R	MR	—	Shielded and sealed bearings are available.
	 Thin section	—	—	SMT	—	
	 With flange	F6○○	FR	MF	—	Shielded and sealed bearings are available.
	 Extended inner ring	—	—	—	RW	Shielded bearings are available.
	 With flange and extended inner ring	—	—	—	FRW	Shielded bearings are available.
	 For synchro motors	—	—	—	SR00X00	Shielded bearings are available.
Pivot Ball Bearings		—	—	BCF	—	
Thrust Ball Bearings		—	—	F	—	

Remark Other bearings, such as single-row angular contact ball bearings, are available.

TOLERANCES AND RUNNING ACCURACY

METRIC SERIES BEARINGS ····· Table 7.2 (Pages A128 to A131)

The flange tolerances for metric series bearings are listed in Table 3.

Table 3 Flange Tolerances for Metric Flanged Bearings

(1) Tolerances of Flange Outside Diameter — Units : μm

Nominal Outer Ring Flange Outside Diameter D_1(mm)		Deviation of a Single Outside Diameter of Outer Ring Flange $\Delta_{D_{1S}}$			
		Position Flange		Non-Position Flange	
over	incl.	high	low	high	low
–	6	+220	−36	0	−36
6	10	+220	−36	0	−36
10	18	+270	−43	0	−43
18	30	+330	−52	0	−52

(2) Flange Width Tolerances and Running Accuracies — Units : μm

Nominal Outside Diameter D (mm)		Deviation of a Single Outer Ring Flange Width $\Delta_{C_{1S}}$		Variation of Outer Ring Flange Width $V_{C_{1S}}$				Perpendicularity of Outer Ring Outside Surface With Respect to the Flange Back Face S_{D1}			Axial Runout of Outer Ring Flange Back Face of Assembled Bearing S_{ea1}		
		Normal and Classes 6,5,4,2		Normal and Class 6	Class 5	Class 4	Class 2	Class 5	Class 4	Class 2	Class 5	Class 4	Class 2
over	incl.	high	low	max.				max.			max.		
2.5(1)	6	Use the Δ_{B_S} tolerance for d of the same bearing in the same class		Use the Δ_{VB_S} tolerance for d of the same bearing in the same class	5	2.5	1.5	8	4	1.5	11	7	3
6	18				5	2.5	1.5	8	4	1.5	11	7	3
18	30				5	2.5	1.5	8	4	1.5	11	7	3

Notes (1) Including 2.5 mm

INCH SERIES BEARINGS ····· Table 7.2 (Pages A128 to A131)

The flange tolerances for inch design flanged bearings are listed in Table 7.9(2) (Pages A146 and A147).

INSTRUMENT BALL BEARINGS ····· Table 7.9 (Pages A146 and A147)

RECOMMENDED FITS

Please refer to NSK Miniature Ball Bearings (CAT.No.E126).

INTERNAL CLEARANCES ····· Table 8.11 (Page A169)

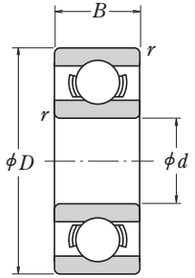
LIMITING SPEEDS

The limiting speeds listed in the bearing tables should be adjusted depending on bearing load conditions. In addition, higher speeds can be attained by making changes in the lubrication method, cage design, etc. Refer to Page A098 for detailed information.

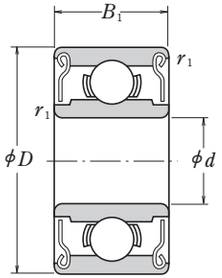
EXTRA SMALL BALL BEARINGS · MINIATURE BALL BEARINGS

Metric Series

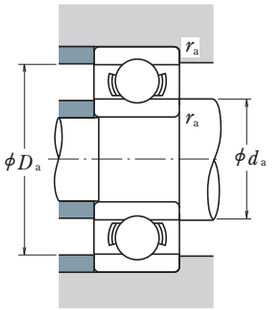
Bore Diameter 1 – 4 mm

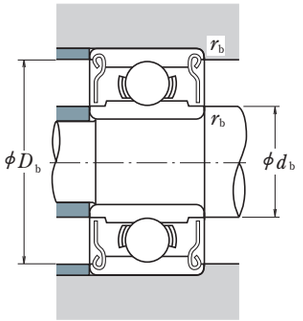


Open



Shielded
ZZ · ZZ1





Boundary Dimensions (mm)						Basic Load Ratings (N)		Limiting Speeds (min⁻¹)		Bearing Designations			Abutment and Fillet Dimensions (mm)						Mass (g)	
d	D	B	B_1	r (1) min.	r_1 (1) min.	C_r	C_{0r}	Grease Open Z · ZZ	Oil Open Z	Open	Shielded	Sealed	d_a min.	d_b max.	D_a max.	D_b min.	r_a max.	r_b max.	approx. Open	approx. Shielded
1	3	1	—	0.05	—	88	23	130 000	150 000	**681**	—	— —	1.4	—	2.6	—	0.05	—	0.03	—
	3	1.5	—	0.05	—	88	23	130 000	150 000	**MR 31**	—	— —	1.4	—	2.6	—	0.05	—	0.04	—
	4	1.6	—	0.1	—	153	35	100 000	120 000	**691**	—	— —	1.8	—	3.2	—	0.1	—	0.09	—
1.2	4	1.8	2.5	0.1	0.1	153	35	110 000	130 000	**MR 41 X**	**MR 41 XZZ**	— —	2.0	1.9	3.2	3.5	0.1	0.1	0.10	0.14
1.5	4	1.2	2	0.05	0.05	124	33	100 000	120 000	**681 X**	**681 XZZ**	— —	1.9	2.1	3.6	3.6	0.05	0.05	0.07	0.11
	5	2	2.6	0.15	0.15	262	69	85 000	100 000	**691 X**	**691 XZZ**	— —	2.7	2.5	3.8	4.3	0.15	0.15	0.17	0.20
	6	2.5	3	0.15	0.15	365	98	75 000	90 000	**601 X**	**601 XZZ**	— —	2.7	3.0	4.8	5.4	0.15	0.15	0.33	0.38
2	5	1.5	2.3	0.08	0.08	186	50	85 000	100 000	**682**	**682 ZZ**	— —	2.6	2.7	4.4	4.2	0.08	0.08	0.12	0.17
	5	2	2.5	0.1	0.1	206	58	85 000	100 000	**MR 52 B**	**MR 52 BZZ**	— —	2.8	2.7	4.2	4.4	0.1	0.1	0.16	0.23
	6	2.3	3	0.15	0.15	365	98	75 000	90 000	**692**	**692 ZZ**	— —	3.2	3.0	4.8	5.4	0.15	0.15	0.28	0.38
	6	2.5	2.5	0.15	0.15	365	98	75 000	90 000	**MR 62**	**MR 62 ZZ**	— —	3.2	3.0	4.8	5.2	0.15	0.15	0.30	0.29
	7	2.5	3	0.15	0.15	425	127	63 000	75 000	**MR 72**	**MR 72 ZZ**	— —	3.2	3.8	5.8	6.2	0.15	0.15	0.45	0.49
	7	2.8	3.5	0.15	0.15	425	127	63 000	75 000	**602**	**602 ZZ**	— —	3.2	3.8	5.8	6.2	0.15	0.15	0.51	0.58
2.5	6	1.8	2.6	0.08	0.08	230	74	71 000	80 000	**682 X**	**682 XZZ**	— —	3.1	3.7	5.4	5.4	0.08	0.08	0.23	0.29
	7	2.5	3.5	0.15	0.15	425	127	63 000	75 000	**692 X**	**692 XZZ**	— —	3.7	3.8	5.8	6.2	0.15	0.15	0.41	0.55
	8	2.5	—	0.2	—	615	179	60 000	67 000	**MR 82 X**	—	— —	4.1	—	6.4	—	0.2	—	0.56	—
	8	2.8	4	0.15	0.15	605	175	60 000	71 000	**602 X**	**602 XZZ**	— —	3.7	4.1	6.8	7.0	0.15	0.15	0.63	0.83
3	6	2	2.5	0.1	0.1	230	74	71 000	80 000	**MR 63**	**MR 63 ZZ**	— —	3.8	3.7	5.2	5.4	0.1	0.1	0.20	0.27
	7	2	3	0.1	0.1	425	130	63 000	75 000	**683 A**	**683 AZZ**	— —	3.8	4.0	6.2	6.4	0.1	0.1	0.32	0.45
	8	2.5	—	0.15	—	615	179	60 000	67 000	**MR 83**	—	— —	4.2	—	6.8	—	0.15	—	0.54	—
	8	3	4	0.15	0.15	615	179	60 000	67 000	**693**	**693 ZZ**	— —	4.2	4.3	6.8	7.3	0.15	0.15	0.61	0.83
	9	2.5	4	0.2	0.15	630	187	56 000	67 000	**MR 93**	**MR 93 ZZ**	— —	4.6	4.3	7.4	7.9	0.2	0.15	0.73	1.18
	9	3	5	0.15	0.15	630	187	56 000	67 000	**603**	**603 ZZ**	— —	4.2	4.3	7.8	7.9	0.15	0.15	0.87	1.45
	10	4	4	0.15	0.15	695	218	50 000	60 000	**623**	**623 ZZ**	— —	4.2	4.3	8.8	8.0	0.15	0.15	1.65	1.66
	13	5	5	0.2	0.2	1 430	485	40 000	48 000	**633**	**633 ZZ1**	— —	4.6	6.0	11.4	11.3	0.2	0.2	3.38	3.33
4	7	2	—	0.1	—	345	115	60 000	67 000	**MR 74**	—	— —	4.8	—	6.2	—	0.1	—	0.22	—
	7	—	2.5	—	0.1	280	107	60 000	71 000	—	**MR 74 ZZ**	— —	—	4.8	—	6.3	—	0.1	—	0.29
	8	2	3	0.15	0.1	435	139	56 000	67 000	**MR 84**	**MR 84 ZZ**	— —	5.2	5.0	6.8	7.4	0.15	0.1	0.36	0.56
	9	2.5	4	(0.15)	(0.15)	705	225	53 000	63 000	**684 A**	**684 AZZ1**	— —	4.8	5.2	8.2	8.1	0.1	0.1	0.63	1.01
	10	3	4	0.2	0.15	780	270	50 000	60 000	**MR 104 B**	**MR 104 BZZ**	— —	5.6	5.9	8.4	8.8	0.2	0.15	1.04	1.42
	11	4	4	0.15	0.15	1 050	345	48 000	56 000	**694**	**694 ZZ**	— —	5.2	5.6	9.8	9.9	0.15	0.15	1.7	1.75
	12	4	4	0.2	0.2	1 050	345	48 000	56 000	**604**	**604 ZZ**	— —	5.6	5.6	10.4	9.9	0.2	0.2	2.25	2.29
	13	5	5	0.2	0.2	1 430	485	40 000	48 000	**624**	**624 ZZ1**	— —	5.6	6.0	11.4	11.3	0.2	0.2	3.03	3.04
	16	5	5	0.3	0.3	1 910	670	36 000	43 000	**634**	**634 ZZ1**	— —	6.0	7.5	14.0	13.8	0.3	0.3	5.24	5.21

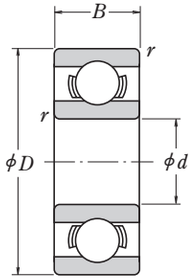
Note (1) Values in parentheses are not based on ISO 15.

Remark When using shielded bearings with a rotating outer ring, please contact NSK.

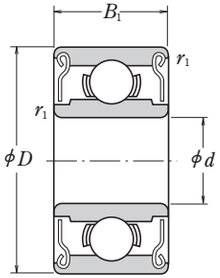
EXTRA SMALL BALL BEARINGS · MINIATURE BALL BEARINGS

Metric Series

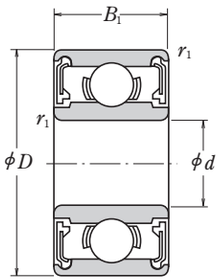
Bore Diameter 5 – 9 mm



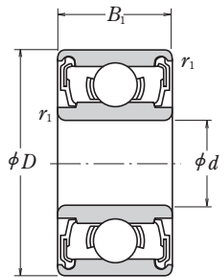
Open



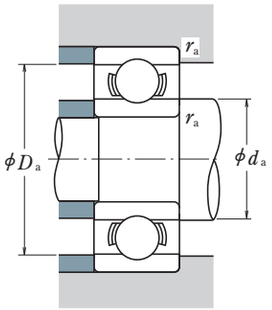
Shielded
ZZ · ZZ1

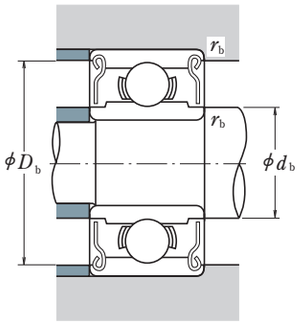


Non-Contact
Sealed
VV



Contact
Sealed
DD





Boundary Dimensions (mm)						Basic Load Ratings (N)		Limiting Speeds (min⁻¹) Grease		Oil	Bearing Designations			Abutment and Fillet Dimensions (mm)						Mass (g)	
d	D	B	B_1	r(1) min.	r_1(1) min.	C_r	C_{0r}	Open Z · ZZ V · VV	D · DD	Open Z	Open	Shielded	Sealed	d_a min.	d_b max.	D_a max.	D_b min.	r_a max.	r_b max.	approx. Open	approx. Shielded
5	8	2	—	0.1	—	340	120	53 000	—	63 000	**MR 85**	—	— —	5.8	—	7.2	—	0.1	—	0.26	—
	8	—	2.5	—	0.1	305	131	53 000	—	63 000	—	**MR 85 ZZ**	— —	—	5.8	—	7.4	—	0.1	—	0.34
	9	2.5	3	0.15	0.15	475	168	50 000	—	60 000	**MR 95**	**MR 95 ZZ1**	— —	6.2	6.0	7.8	8.2	0.15	0.15	0.50	0.58
	10	3	4	0.15	0.15	475	168	50 000	—	60 000	**MR 105**	**MR 105 ZZ**	— —	6.2	6.0	8.8	8.4	0.15	0.15	0.95	1.29
	11	—	4	—	0.15	790	276	48 000	—	56 000	—	**MR 115 ZZ**	VV —	—	6.3	—	9.8	—	0.15	—	1.49
	11	3	5	0.15	0.15	790	281	45 000	—	53 000	**685**	**685 ZZ**	— —	6.2	6.2	9.8	9.9	0.15	0.15	1.2	1.96
	13	4	4	0.2	0.2	1 190	430	43 000	40 000	50 000	**695**	**695 ZZ1**	VV DD	6.6	6.6	11.4	11.2	0.2	0.2	2.45	2.5
	14	5	5	0.2	0.2	1 460	505	40 000	38 000	50 000	**605**	**605 ZZ**	— DD	6.6	6.9	12.4	12.2	0.2	0.2	3.54	3.48
	16	5	5	0.3	0.3	1 910	670	36 000	32 000	43 000	**625**	**625 ZZ1**	VV DD	7.0	7.5	14.0	13.8	0.3	0.3	4.95	4.86
	19	6	6	0.3	0.3	2 570	885	32 000	30 000	40 000	**635**	**635 ZZ1**	VV DD	7.0	8.5	17.0	16.5	0.3	0.3	8.56	8.34
6	10	2.5	3	0.15	0.1	545	218	45 000	—	53 000	**MR 106**	**MR 106 ZZ1**	— —	7.2	7.0	8.8	9.3	0.15	0.1	0.56	0.68
	12	3	4	0.2	0.15	790	292	43 000	40 000	50 000	**MR 126**	**MR 126 ZZ**	— DD	7.6	7.2	10.4	10.9	0.2	0.15	1.27	1.74
	13	3.5	5	0.15	0.15	1 190	440	40 000	38 000	50 000	**686 A**	**686 AZZ1**	VV DD	7.2	7.4	11.8	11.7	0.15	0.15	1.91	2.69
	15	5	5	0.2	0.2	1 910	670	40 000	36 000	45 000	**696**	**696 ZZ1**	VV DD	7.6	7.9	13.4	13.3	0.2	0.2	3.88	3.72
	17	6	6	0.3	0.3	2 490	835	38 000	34 000	45 000	**606**	**606 ZZ**	VV DD	8.0	8.2	15.0	14.8	0.3	0.3	5.97	6.08
	19	6	6	0.3	0.3	2 570	885	32 000	30 000	40 000	**626**	**626 ZZ1**	VV DD	8.0	8.5	17.0	16.5	0.3	0.3	8.15	7.94
	22	7	7	0.3	0.3	3 650	1 370	30 000	28 000	36 000	**636**	**636 ZZ1**	VV DD	8.0	10.5	20.0	19.0	0.3	0.3	14	14
7	11	2.5	3	0.15	0.1	500	201	43 000	—	50 000	**MR 117**	**MR 117 ZZ**	— —	8.2	8.0	9.8	10.5	0.15	0.1	0.62	0.72
	13	3	4	0.2	0.15	595	276	40 000	—	48 000	**MR 137**	**MR 137 ZZ**	— —	8.6	9.0	11.4	11.6	0.2	0.15	1.58	2.02
	14	3.5	5	0.15	0.15	1 290	510	40 000	34 000	45 000	**687**	**687 ZZ1**	VV DD	8.2	8.5	12.8	12.7	0.15	0.15	2.13	2.97
	17	5	5	0.3	0.3	1 770	710	36 000	28 000	43 000	**697**	**697 ZZ1**	VV DD	9.0	10.2	15.0	14.8	0.3	0.3	5.26	5.12
	19	6	6	0.3	0.3	2 570	885	36 000	32 000	43 000	**607**	**607 ZZ1**	VV DD	9.0	9.1	17.0	16.5	0.3	0.3	7.67	7.51
	22	7	7	0.3	0.3	3 650	1 370	30 000	28 000	36 000	**627**	**627 ZZ1**	VV DD	9.0	10.5	20.0	19.0	0.3	0.3	12.7	12.9
	26	9	9	0.3	0.3	5 050	1 970	28 000	22 000	34 000	**637**	**637 ZZ1**	VV DD	9.0	12.8	24.0	22.8	0.3	0.3	24	25
8	12	2.5	3.5	0.15	0.1	600	274	40 000	—	48 000	**MR 128**	**MR 128 ZZ1**	— —	9.2	9.0	10.8	11.3	0.15	0.1	0.71	0.97
	14	3.5	4	0.2	0.15	900	385	38 000	32 000	45 000	**MR 148**	**MR 148 ZZ**	VV DD	9.6	9.2	12.4	12.8	0.2	0.15	1.86	2.16
	16	4	5	0.2	0.2	1 770	710	36 000	28 000	43 000	**688 A**	**688 AZZ1**	VV DD	9.6	10.2	14.4	14.2	0.2	0.2	3.12	4.02
	19	6	6	0.3	0.3	2 460	910	36 000	28 000	43 000	**698**	**698 ZZ1**	VV DD	10.0	10.0	17.0	16.5	0.3	0.3	7.23	7.18
	22	7	7	0.3	0.3	3 650	1 370	34 000	28 000	40 000	**608**	**608 ZZ1**	VV DD	10.0	10.5	20.0	19.0	0.3	0.3	12.1	12.2
	24	8	8	0.3	0.3	3 700	1 430	28 000	24 000	34 000	**628**	**628 ZZ**	VV DD	10.0	12.0	22.0	20.5	0.3	0.3	17.2	17.4
	28	9	9	0.3	0.3	5 050	1 970	28 000	22 000	34 000	**638**	**638 ZZ1**	VV DD	10.0	12.8	26.0	22.8	0.3	0.3	28.3	28.6
9	17	4	5	0.2	0.2	1 460	665	36 000	24 000	43 000	**689**	**689 ZZ1**	VV DD	10.6	11.5	15.4	15.2	0.2	0.2	3.53	4.43
	20	6	6	0.3	0.3	1 890	840	34 000	24 000	40 000	**699**	**699 ZZ1**	VV DD	11.0	12.0	18.0	17.2	0.3	0.3	8.45	8.33
	24	7	7	0.3	0.3	3 700	1 430	32 000	24 000	38 000	**609**	**609 ZZ1**	VV DD	11.0	12.0	22.8	20.5	0.3	0.3	14.5	14.7
	26	8	8	(0.6)	(0.6)	5 050	1 970	28 000	22 000	34 000	**629**	**629 ZZ**	VV DD	11.0	12.8	24.0	22.8	0.3	0.3	19.5	19.3
	30	10	10	0.6	0.6	5 600	2 390	24 000	—	30 000	**639**	**639 ZZ**	VV —	13.0	16.1	26.0	25.6	0.6	0.6	36.5	36

Note (1) Values in parentheses are not based on ISO 15.

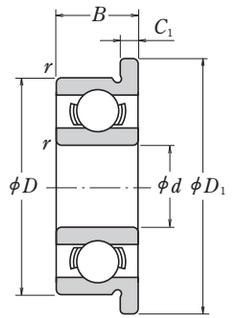
Remarks 1. When using sealed or shielded bearings with a rotating outer ring, please contact NSK.

2. Bearings with snap rings are also available, please contact NSK for details.

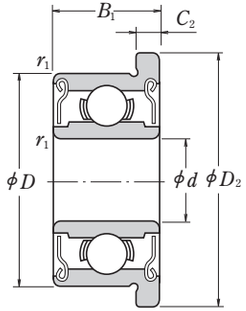
EXTRA SMALL BALL BEARINGS · MINIATURE BALL BEARINGS

Metric Series With Flange

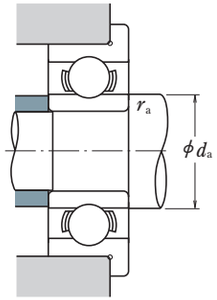
Bore Diameter 1 – 4 mm

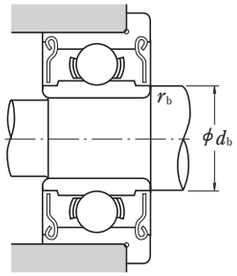


Open



Shielded
ZZ · ZZ1





Boundary Dimensions (mm)										Basic Load Ratings (N)		Limiting Speeds (min⁻¹)		Bearing Designations			Abutment and Fillet Dimensions (mm)				Mass (g)	
d	D	D_1	D_2	B	B_1	C_1	C_2	r(1) min.	r_1(1) min.	C_r	C_{0r}	Grease Open Z · ZZ	Oil Open Z	Open	Shielded	Sealed	d_a min.	d_b max.	r_a max.	r_b max.	approx. Open	approx. Shielded
1	3	3.8	—	1	—	0.3	—	0.05	—	88	23	130 000	150 000	**F 681**	—	— —	1.4	—	0.05	—	0.04	—
	4	5	—	1.6	—	0.5	—	0.1	—	153	36	100 000	120 000	**F 691**	—	— —	1.8	—	0.1	—	0.14	—
1.2	4	4.8	—	1.8	—	0.4	—	0.1	—	153	35	110 000	130 000	**MF 41 X**	—	— —	2.0	—	0.1	—	0.12	—
1.5	4	5	5	1.2	2	0.4	0.6	0.05	0.05	124	33	100 000	120 000	**F 681 X**	**F 681 XZZ**	— —	1.9	2.1	0.05	0.05	0.09	0.14
	5	6.5	6.5	2	2.6	0.6	0.8	0.15	0.15	262	69	85 000	100 000	**F 691 X**	**F 691 XZZ**	— —	2.7	2.5	0.15	0.15	0.23	0.28
	6	7.5	7.5	2.5	3	0.6	0.8	0.15	0.15	365	98	75 000	90 000	**F 601 X**	**F 601 XZZ**	— —	2.7	3.0	0.15	0.15	0.42	0.52
2	5	6.1	6.1	1.5	2.3	0.5	0.6	0.08	0.08	186	50	85 000	100 000	**F 682**	**F 682 ZZ**	— —	2.6	2.7	0.08	0.08	0.16	0.22
	5	6.2	6.2	2	2.5	0.6	0.6	0.1	0.1	206	58	85 000	100 000	**MF 52 B**	**MF 52 BZZ**	— —	2.8	2.7	0.1	0.1	0.21	0.27
	6	7.5	7.5	2.3	3	0.6	0.8	0.15	0.15	365	98	75 000	90 000	**F 692**	**F 692 ZZ**	— —	3.2	3.0	0.15	0.15	0.35	0.48
	6	7.2	—	2.5	—	0.6	—	0.15	—	365	98	75 000	90 000	**MF 62**	—	— —	3.2	—	0.15	—	0.36	—
	7	8.2	8.2	2.5	3	0.6	0.6	0.15	0.15	425	127	63 000	75 000	**MF 72**	**MF 72 ZZ**	— —	3.2	3.8	0.15	0.15	0.52	0.56
	7	8.5	8.5	2.8	3.5	0.7	0.9	0.15	0.15	425	127	63 000	75 000	**F 602**	**F 602 ZZ**	— —	3.2	3.1	0.15	0.15	0.60	0.71
2.5	6	7.1	7.1	1.8	2.6	0.5	0.8	0.08	0.08	230	74	71 000	80 000	**F 682 X**	**F 682 XZZ**	— —	3.1	3.7	0.08	0.08	0.25	0.36
	7	8.5	8.5	2.5	3.5	0.7	0.9	0.15	0.15	425	127	63 000	75 000	**F 692 X**	**F 692 XZZ**	— —	3.7	3.8	0.15	0.15	0.51	0.68
	8	9.2	—	2.5	—	0.6	—	0.2	—	615	179	60 000	67 000	**MF 82 X**	—	— —	4.1	—	0.2	—	0.62	—
	8	9.5	9.5	2.8	4	0.7	0.9	0.15	0.15	605	175	60 000	71 000	**F 602 X**	**F 602 XZZ**	— —	3.7	3.5	0.15	0.15	0.74	0.98
3	6	7.2	7.2	2	2.5	0.6	0.6	0.1	0.1	230	74	71 000	80 000	**MF 63**	**MF 63 ZZ**	— —	3.8	3.7	0.1	0.1	0.27	0.33
	7	8.1	8.1	2	3	0.5	0.8	0.1	0.1	425	130	63 000	75 000	**F 683 A**	**F 683 AZZ**	— —	3.8	4.0	0.1	0.1	0.37	0.53
	8	9.2	—	2.5	—	0.6	—	0.15	—	615	179	60 000	67 000	**MF 83**	—	— —	4.2	—	0.15	—	0.56	—
	8	9.5	9.5	3	4	0.7	0.9	0.15	0.15	615	179	60 000	67 000	**F 693**	**F 693 ZZ**	— —	4.2	4.3	0.15	0.15	0.70	0.97
	9	10.2	10.6	2.5	4	0.6	0.8	0.2	0.15	630	187	56 000	67 000	**MF 93**	**MF 93 ZZ**	— —	4.6	4.3	0.2	0.15	0.81	1.34
	9	10.5	10.5	3	5	0.7	1	0.15	0.15	630	187	56 000	67 000	**F 603**	**F 603 ZZ**	— —	4.2	4.3	0.15	0.15	1.0	1.63
	10	11.5	11.5	4	4	1	1	0.15	0.15	695	218	50 000	60 000	**F 623**	**F 623 ZZ**	— —	4.2	4.3	0.15	0.15	1.85	1.86
	13	15	15	5	5	1	1	0.2	0.2	1 430	485	36 000	43 000	**F 633**	**F 633 ZZ1**	— —	4.6	6.0	0.2	0.2	3.73	3.59
4	7	8.2	—	2	—	0.6	—	0.1	—	345	115	60 000	67 000	**MF 74**	—	— —	4.8	—	0.1	—	0.29	—
	7	—	8.2	—	2.5	—	0.6	—	0.1	280	107	60 000	71 000	—	**MF 74 ZZ**	— —	—	4.8	—	0.1	—	0.35
	8	9.2	9.2	2	3	0.6	0.6	0.15	0.1	435	139	56 000	67 000	**MF 84**	**MF 84 ZZ**	— —	5.2	5.0	0.15	0.1	0.44	0.63
	9	10.3	10.3	2.5	4	0.6	1	(0.15)	(0.15)	705	225	53 000	63 000	**F 684**	**F 684 ZZ**	— —	4.8	5.2	0.1	0.1	0.70	1.14
	10	11.2	11.6	3	4	0.6	0.8	0.2	0.15	780	270	50 000	60 000	**MF 104 B**	**MF 104 BZZ**	— —	5.6	5.9	0.2	0.15	1.13	1.59
	11	12.5	12.5	4	4	1	1	0.15	0.15	1 050	345	48 000	56 000	**F 694**	**F 694 ZZ**	— —	5.2	5.6	0.15	0.15	1.91	1.96
	12	13.5	13.5	4	4	1	1	0.2	0.2	1 050	345	48 000	56 000	**F 604**	**F 604 ZZ**	— —	5.6	5.6	0.2	0.2	2.53	2.53
	13	15	15	5	5	1	1	0.2	0.2	1 430	485	40 000	48 000	**F 624**	**F 624 ZZ**	— —	5.6	6.0	0.2	0.2	3.38	3.53
	16	18	18	5	5	1	1	0.3	0.3	1 910	670	36 000	43 000	**F 634**	**F 634 ZZ1**	— —	6.0	7.5	0.3	0.3	5.73	5.62

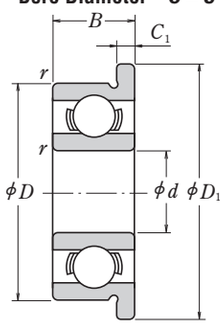
Note (1) Values in parentheses are not based on ISO 15.

Remark When using shielded bearings with a rotating outer ring, please contact NSK.

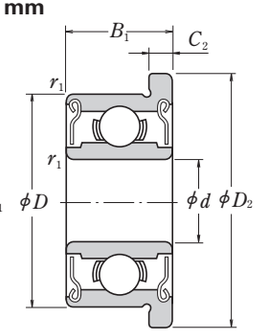
EXTRA SMALL BALL BEARINGS · MINIATURE BALL BEARINGS

Metric Series With Flange

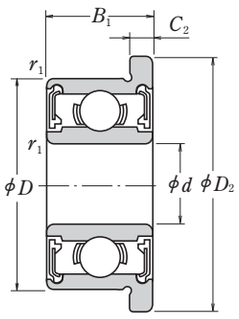
Bore Diameter 5 – 9 mm



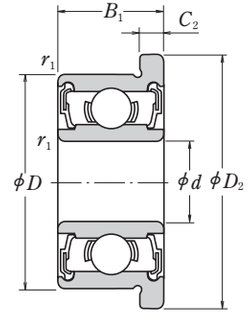
Open



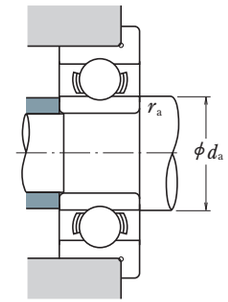
Shielded
ZZ · ZZ1

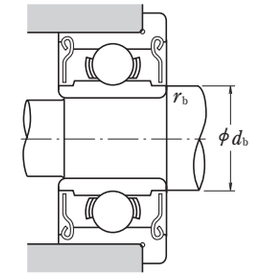


Non-Contact
Sealed
VV



Contact
Sealed
DD





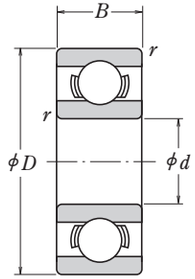
d	D	D1	D2	B	B1	C1	C2	r min.	r1 min.	Cr	C0r	Limiting Speeds (min⁻¹) Grease: Open Z · ZZ V · VV	Grease: D · DD	Oil: Open Z	Bearing Designations: Open	Shielded	Sealed	da min.	db max.	ra max.	rb max.	Mass (g) approx. Open	Shielded
5	8	9.2	—	2	—	0.6	—	0.1	—	340	120	53 000	—	63 000	**MF 85**	—	— —	5.8	—	0.1	—	0.33	—
	8	—	9.2	—	2.5	—	0.6	—	0.1	305	131	53 000	—	63 000	—	**MF 85 ZZ**	— —	—	5.8	—	0.1	—	0.41
	9	10.2	10.2	2.5	3	0.6	0.6	0.15	0.15	475	168	50 000	—	60 000	**MF 95**	**MF 95 ZZ**	— —	6.2	6.0	0.15	0.15	0.59	0.66
	10	11.2	11.6	3	4	0.6	0.8	0.15	0.15	475	168	50 000	—	60 000	**MF 105**	**MF 105 ZZ**	— —	6.2	6.0	0.15	0.15	1.05	1.46
	11	12.5	12.5	3	5	0.8	1	0.15	0.15	790	281	45 000	—	53 000	**F 685**	**F 685 ZZ**	— —	6.2	6.2	0.15	0.15	1.37	2.18
	13	15	15	4	4	1	1	0.2	0.2	1 190	430	43 000	40 000	50 000	**F 695**	**F 695 ZZ1**	**VV DD**	6.6	6.6	0.2	0.2	2.79	2.84
	14	16	16	5	5	1	1	0.2	0.2	1 460	505	40 000	38 000	50 000	**F 605**	**F 605 ZZ**	— **DD**	6.6	6.9	0.2	0.2	3.9	3.85
	16	18	18	5	5	1	1	0.3	0.3	1 910	670	36 000	32 000	43 000	**F 625**	**F 625 ZZ1**	**VV DD**	7.0	7.5	0.3	0.3	5.37	5.27
	19	22	22	6	6	1.5	1.5	0.3	0.3	2 570	885	32 000	30 000	40 000	**F 635**	**F 635 ZZ1**	**VV DD**	7.0	8.5	0.3	0.3	9.49	9.49
6	10	11.2	11.2	2.5	3	0.6	0.6	0.15	0.1	545	218	45 000	—	53 000	**MF 106**	**MF 106 ZZ1**	— —	7.2	7.0	0.15	0.1	0.65	0.77
	12	13.2	13.6	3	4	0.6	0.8	0.2	0.15	790	292	43 000	40 000	50 000	**MF 126**	**MF 126 ZZ**	— **DD**	7.6	7.2	0.2	0.15	1.38	1.94
	13	15	15	3.5	5	1	1.1	0.15	0.15	1 190	440	40 000	38 000	50 000	**F 686 A**	**F 686 AZZ1**	**VV DD**	7.2	7.4	0.15	0.15	2.25	3.04
	15	17	17	5	5	1.2	1.2	0.2	0.2	1 910	670	40 000	36 000	45 000	**F 696**	**F 696 ZZ1**	**VV DD**	7.6	7.9	0.2	0.2	4.34	4.26
	17	19	19	6	6	1.2	1.2	0.3	0.3	2 490	835	38 000	34 000	45 000	**F 606**	**F 606 ZZ**	**VV DD**	8.0	8.2	0.3	0.3	6.58	6.61
	19	22	22	6	6	1.5	1.5	0.3	0.3	2 570	885	32 000	30 000	40 000	**F 626**	**F 626 ZZ1**	**VV DD**	8.0	8.5	0.3	0.3	9.09	9.09
	22	25	25	7	7	1.5	1.5	0.3	0.3	3 650	1 370	30 000	28 000	36 000	**F 636**	**F 636 ZZ**	**VV DD**	8.0	10.5	0.3	0.3	14.6	14.7
7	11	12.2	12.2	2.5	3	0.6	0.6	0.15	0.1	500	201	43 000	—	50 000	**MF 117**	**MF 117 ZZ**	— —	8.2	8.0	0.15	0.1	0.72	0.82
	13	14.2	14.6	3	4	0.6	0.8	0.2	0.15	595	276	40 000	—	48 000	**MF 137**	**MF 137 ZZ**	— —	8.6	9.0	0.2	0.15	1.7	2.23
	14	16	16	3.5	5	1	1.1	0.15	0.15	1 290	510	40 000	34 000	45 000	**F 687**	**F 687 ZZ1**	**VV DD**	8.2	8.5	0.15	0.15	2.48	3.37
	17	19	19	5	5	1.2	1.2	0.3	0.3	1 770	715	36 000	28 000	43 000	**F 697**	**F 697 ZZ1**	**VV DD**	9.0	10.2	0.3	0.3	5.65	5.65
	19	22	22	6	6	1.5	1.5	0.3	0.3	2 570	885	36 000	32 000	43 000	**F 607**	**F 607 ZZ1**	**VV DD**	9.0	9.1	0.3	0.3	8.66	8.66
	22	25	25	7	7	1.5	1.5	0.3	0.3	3 650	1 370	30 000	28 000	36 000	**F 627**	**F 627 ZZ**	**VV DD**	9.0	10.5	0.3	0.3	14.2	14.2
8	12	13.2	13.6	2.5	3.5	0.6	0.8	0.15	0.1	600	274	40 000	—	48 000	**MF 128**	**MF 128 ZZ1**	— —	9.2	9.0	0.15	0.1	0.82	1.15
	14	15.6	15.6	3.5	4	0.8	0.8	0.2	0.15	900	385	38 000	32 000	45 000	**MF 148**	**MF 148 ZZ**	**VV DD**	9.6	9.2	0.2	0.15	2.09	2.39
	16	18	18	4	5	1	1.1	0.2	0.2	1 770	710	36 000	30 000	43 000	**F 688 A**	**F 688 AZZ1**	**VV DD**	9.6	10.2	0.2	0.2	3.54	4.47
	19	22	22	6	6	1.5	1.5	0.3	0.3	2 460	910	36 000	28 000	43 000	**F 698**	**F 698 ZZ**	**VV DD**	10.0	10.0	0.3	0.3	8.35	8.3
	22	25	25	7	7	1.5	1.5	0.3	0.3	3 650	1 370	34 000	28 000	40 000	**F 608**	**F 608 ZZ**	**VV DD**	10.0	10.5	0.3	0.3	13.4	13.5
9	17	19	19	4	5	1	1.1	0.2	0.2	1 460	665	36 000	24 000	43 000	**F 689**	**F 689 ZZ1**	**VV DD**	10.6	11.5	0.2	0.2	3.97	4.91
	20	23	23	6	6	1.5	1.5	0.3	0.3	1 890	840	34 000	24 000	40 000	**F 699**	**F 699 ZZ1**	**VV DD**	11.0	12.0	0.3	0.3	9.51	9.51

Remark When using shielded bearings with a rotating outer ring, please contact NSK.

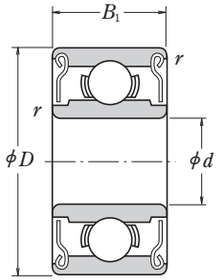
EXTRA SMALL BALL BEARINGS · MINIATURE BALL BEARINGS

Inch Series

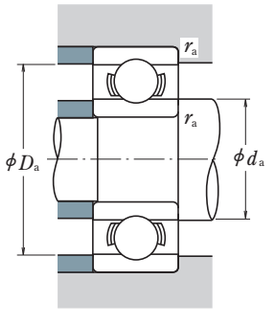
Bore Diameter 1.016 – 9.525 mm

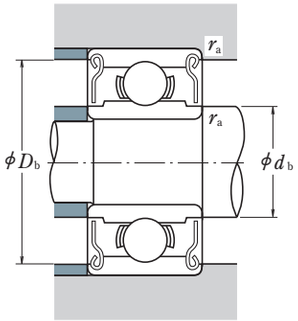


Open



Shielded
ZZ · ZZS





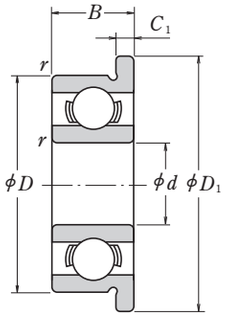
Boundary Dimensions (mm)					Basic Load Ratings (N)		Limiting Speeds (min^{-1})		Bearing	Designations	Abutment and Fillet Dimensions (mm)					Mass (g)	
d	D	B	B_1	r min.	C_r	C_{0r}	Grease Open Z · ZZ	Oil Open Z	Open	Shielded	d_a min.	d_b max.	D_a max.	D_b min.	r_a max.	approx. Open	approx. Shielded
1.016	3.175	1.191	—	0.1	105	23	130 000	150 000	**R 09**	—	1.9	—	2.3	—	0.1	0.04	—
1.191	3.967	1.588	2.380	0.1	153	35	110 000	130 000	**R 0**	**R 0 ZZ**	2.0	1.9	3.1	3.5	0.1	0.09	0.11
1.397	4.762	1.984	2.779	0.1	255	66	90 000	110 000	**R 1**	**R 1 ZZ**	2.2	2.3	3.9	4.1	0.1	0.15	0.19
1.984	6.350	2.380	3.571	0.1	340	108	67 000	80 000	**R 1-4**	**R 1-4 ZZ**	2.8	3.9	5.5	5.9	0.1	0.35	0.50
2.380	4.762	1.588	—	0.1	208	60	80 000	95 000	**R 133**	—	3.2	—	3.9	—	0.1	0.10	—
	4.762	—	2.380	0.1	159	52	80 000	95 000	—	**R 133 ZZS**	—	3.0	—	4.2	0.1	—	0.13
	7.938	2.779	3.571	0.15	605	175	60 000	71 000	**R 1-5**	**R 1-5 ZZ**	3.6	4.1	6.7	7.0	0.15	0.60	0.72
3.175	6.350	2.380	2.779	0.1	310	95	67 000	80 000	**R 144**	**R 144 ZZ**	4.0	3.9	5.5	5.9	0.1	0.25	0.27
	7.938	2.779	3.571	0.1	615	179	60 000	67 000	**R 2-5**	**R 2-5 ZZ**	4.0	4.3	7.1	7.3	0.1	0.55	0.72
	9.525	2.779	3.571	0.15	705	225	53 000	63 000	**R 2-6**	**R 2-6 ZZS**	4.4	4.6	8.3	8.2	0.15	0.96	1.13
	9.525	3.967	3.967	0.3	695	218	56 000	67 000	**R 2**	**R 2 ZZ**	5.2	4.8	7.5	8.0	0.3	1.36	1.39
	12.700	4.366	4.366	0.3	705	225	53 000	63 000	**R 2A**	**R 2A ZZ**	5.2	4.6	10.7	8.2	0.3	3.3	3.23
3.967	7.938	2.779	3.175	0.1	395	149	53 000	63 000	**R 155**	**R 155 ZZS**	4.8	5.5	7.1	7.3	0.1	0.51	0.56
4.762	7.938	2.779	3.175	0.1	395	149	53 000	63 000	**R 156**	**R 156 ZZS**	5.6	5.5	7.1	7.3	0.1	0.39	0.42
	9.525	3.175	3.175	0.1	780	270	50 000	60 000	**R 166**	**R 166 ZZ**	5.6	5.9	8.7	8.8	0.1	0.81	0.85
	12.700	3.967	4.978	0.3	1 430	485	43 000	53 000	**R 3**	**R 3 ZZ**	6.8	6.5	10.7	11.2	0.3	2.21	2.79
6.350	9.525	3.175	3.175	0.1	460	204	48 000	56 000	**R 168B**	**R 168 BZZ**	7.2	7.0	8.7	8.9	0.1	0.58	0.62
	12.700	3.175	4.762	0.15	1 190	440	40 000	50 000	**R 188**	**R 188 ZZ**	7.6	7.4	11.5	11.6	0.15	1.53	2.21
	15.875	4.978	4.978	0.3	1 770	660	38 000	45 000	**R 4B**	**R 4B ZZ**	8.4	8.4	13.8	13.8	0.3	4.5	4.43
	19.050	5.558	7.142	0.4	2 880	1 060	36 000	43 000	**R 4AA**	**R 4AA ZZ**	9.4	9.0	16.0	16.6	0.4	7.48	9.17
7.938	12.700	3.967	3.967	0.15	595	276	40 000	48 000	**R 1810**	**R 1810 ZZ**	9.2	9.0	11.5	11.6	0.15	1.56	1.48
9.525	22.225	5.558	7.142	0.4	3 650	1 410	32 000	38 000	**R 6**	**R 6 ZZ**	12.6	11.9	19.2	20.0	0.4	9.02	11

Remarks 1. When using shielded bearings with a rotating outer ring, please contact NSK.
2. Bearings with double shields (ZZ, ZZS) are also available with single shields (Z, ZS).

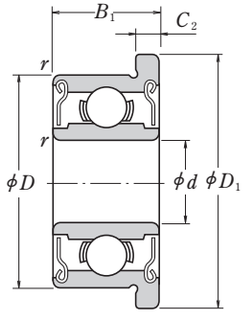
EXTRA SMALL BALL BEARINGS · MINIATURE BALL BEARINGS

Inch Series With Flange

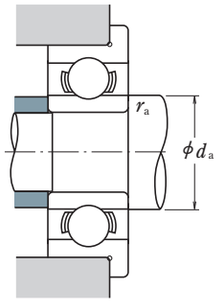
Bore Diameter 1.191 – 9.525 mm

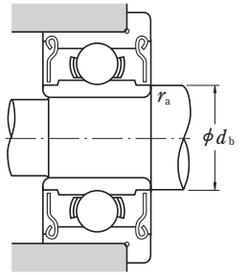


Open



Shielded
ZZ · ZZS





Boundary Dimensions (mm)								Basic Load Ratings (N)		Limiting Speeds (min^{-1})		Bearing Designations		Abutment and Fillet Dimensions (mm)			Mass (g)	
d	D	D_1	B	B_1	C_1	C_2	r min.	C_r	C_{0r}	Grease Open Z · ZZ	Oil Open Z	Open	Shielded	d_a min.	d_b max.	r_a max.	approx. Open	approx. Shielded
1.191	3.967	5.156	1.588	2.380	0.330	0.790	0.1	153	35	110 000	130 000	**FR 0**	**FR 0 ZZ**	2.0	1.9	0.1	0.11	0.16
1.397	4.762	5.944	1.984	2.779	0.580	0.790	0.1	255	66	90 000	110 000	**FR 1**	**FR 1 ZZ**	2.2	2.3	0.1	0.20	0.25
1.984	6.350	7.518	2.380	3.571	0.580	0.790	0.1	340	108	67 000	80 000	**FR 1-4**	**FR 1-4 ZZ**	2.8	3.9	0.1	0.41	0.58
2.380	4.762	5.944	1.588	—	0.460	—	0.1	208	60	80 000	95 000	**FR 133**	—	3.2	—	0.1	0.13	—
	4.762	5.944	—	2.380	—	0.790	0.1	159	52	80 000	95 000	—	**FR 133 ZZS**	—	3.0	0.1	—	0.19
	7.938	9.119	2.779	3.571	0.580	0.790	0.15	605	175	60 000	71 000	**FR 1-5**	**FR 1-5 ZZ**	3.6	4.1	0.15	0.68	0.82
3.175	6.350	7.518	2.380	2.779	0.580	0.790	0.1	310	95	67 000	80 000	**FR 144**	**FR 144 ZZ**	4.0	3.9	0.1	0.31	0.35
	7.938	9.119	2.779	3.571	0.580	0.790	0.1	615	179	60 000	67 000	**FR 2-5**	**FR 2-5 ZZ**	4.0	4.3	0.1	0.62	0.81
	9.525	10.719	2.779	3.571	0.580	0.790	0.15	705	225	53 000	63 000	**FR 2-6**	**FR 2-6 ZZS**	4.4	4.6	0.15	1.04	1.25
	9.525	11.176	3.967	3.967	0.760	0.760	0.3	695	218	56 000	67 000	**FR 2**	**FR 2 ZZ**	5.2	4.8	0.3	1.51	1.55
3.967	7.938	9.119	2.779	3.175	0.580	0.910	0.1	395	149	53 000	63 000	**FR 155**	**FR 155 ZZS**	4.8	5.5	0.1	0.59	0.67
4.762	7.938	9.119	2.779	3.175	0.580	0.910	0.1	395	149	53 000	63 000	**FR 156**	**FR 156 ZZS**	5.6	5.5	0.1	0.47	0.53
	9.525	10.719	3.175	3.175	0.580	0.790	0.1	780	270	50 000	60 000	**FR 166**	**FR 166 ZZ**	5.6	5.9	0.1	0.90	0.98
	12.700	14.351	4.978	4.978	1.070	1.070	0.3	1 430	485	43 000	53 000	**FR 3**	**FR 3 ZZ**	6.8	6.5	0.3	2.97	3.09
6.350	9.525	10.719	3.175	3.175	0.580	0.910	0.1	460	204	48 000	56 000	**FR 168B**	**FR 168 BZZ**	7.2	7.0	0.1	0.66	0.75
	12.700	13.894	3.175	4.762	0.580	1.140	0.15	1 190	440	40 000	50 000	**FR 188**	**FR 188 ZZ**	7.6	7.4	0.15	1.64	2.49
	15.875	17.526	4.978	4.978	1.070	1.070	0.3	1 770	660	38 000	45 000	**FR 4B**	**FR 4B ZZ**	8.4	8.4	0.3	4.78	4.78
7.938	12.700	13.894	3.967	3.967	0.790	0.790	0.15	595	276	40 000	48 000	**FR 1810**	**FR 1810 ZZ**	9.2	9.0	0.15	1.71	1.63
9.525	22.225	24.613	7.142	7.142	1.570	1.570	0.4	3 650	1 410	32 000	38 000	**FR 6**	**FR 6 ZZ**	12.6	11.9	0.4	10.1	12.1

Remarks 1. When using shielded bearings with a rotating outer ring, please contact NSK.
2. Bearings with double shields (ZZ, ZZS) are also available with single shields (Z, ZS).



3. ANGULAR CONTACT BALL BEARINGS

INTRODUCTION ..... C 072

TECHNICAL DATA

Free Space of Angular Contact Ball Bearings ..... C 078

Dynamic Equivalent Load of Triplex Angular Contact Ball Bearings ..... C 080

Angular Clearances in Double-Row Angular Contact Ball Bearings ..... C 082

Relationship Between Radial and Axial Clearances in Double-Row Angular Contact Ball Bearings ..... C 084

BEARING TABLES

Single-Row and Matched Angular Contact Ball Bearings

Bore Diameter 10 – 200 mm ..... C 086

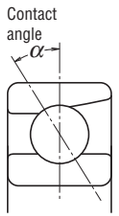
Double-Row Angular Contact Ball Bearings Open, Shielded, and Sealed Types

Bore Diameter 10 – 85 mm ..... C 106

Four-Point-Contact Ball Bearings

Bore Diameter 30 – 200 mm ..... C 110

DESIGN, TYPES, AND FEATURES



SINGLE-ROW ANGULAR CONTACT BALL BEARINGS

Single-row angular contact ball bearings have a contact angle allowing them to sustain significant axial loads in one direction together with radial loads. Because of their design, when a radial load is applied, an axial force component is produced; therefore, two or more opposed bearings must be used.

Since the rigidity of single-row angular contact ball bearings can be increased by preloading, they are often used in the main spindles of machine tools where high running accuracy is required (refer to Chapter 9: Preload on Page A192 for more information).

Usually, the cages for angular contact ball bearings with a contact angle of 30° (designation **A**) or 40°(designation **B**) are made in accordance with Table 1, but depending on the application, machined synthetic-resin cages or molded polyamide-resin cages may also be used. The basic load ratings given in the bearing tables are based on standard cages.

Though the figures in the bearing tables on Pages C086 to C101 for bearing bore diameters of 10 to 120 show bearings with single-shoulder inner rings, dual-shoulder bearings are also available. Please consult NSK for more detailed information.

Table 1 Features of Single-Row Angular Contact Ball Bearings

Cage	Material	Steel	Nylon 46		L-PPS resin	Brass	
Spec.	Method	Pressed	Molded		Molded	Machined	
	Designation	W	TYN	T85	T7	Omitted	MR
Features	High Load Capacity	◎	○	◎	◎	○	◎
	High-Speed	△	◎	○	○	△	○
	High-Temperature	◎	△	△	◎	◎	◎
	Vibration	△	△	△	△	◎	◎

◎ Excellent ○ Good △ Fair

In addition, bearings with the same designation will have different load ratings if the type of cage or number of balls are different.

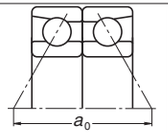
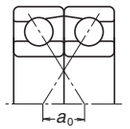
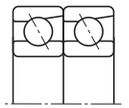
Angular contact ball bearings with contact angles of 15° (designation **C**) and 25° (designation **A5**) are primarily for high precision or high-speed applications, and molded polyamide cages (designation TYN) or machined-brass cages or synthetic resin cages (designation T) are used.

The maximum operating temperature of molded polyamide cages is 150°C.

MATCHED ANGULAR CONTACT BALL BEARINGS

The types and features of matched angular contact ball bearings are shown in Table 2.

Table 2 Types and Features of Matched Angular Contact Ball Bearings

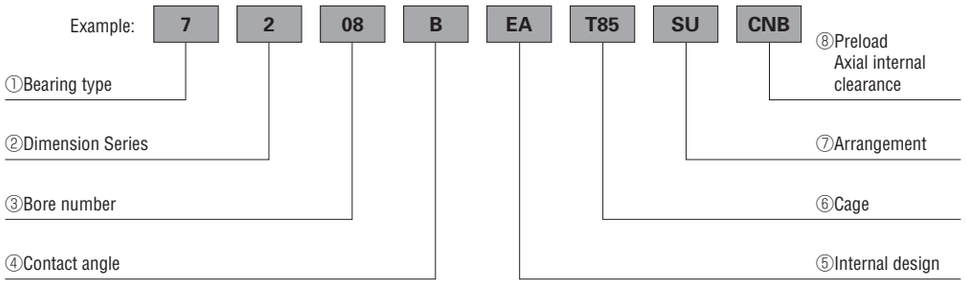
Figure	Arrangement	Features
	Back-to-Back (DB) (Example) 7208 A DB	Radial loads and axial loads in both directions can be sustained. Since the distance between the effective load centers a_0 is large, this type is suitable if moments are applied.
	Face-to-Face (DF) (Example) 7208 B DF	Radial loads and axial loads in both directions can be sustained. Compared with the DB Type, the distance between the effective load centers is small, so the capacity to sustain moments is inferior.
	Tandem (DT) (Example) 7208 A DT	Radial loads and axial loads in one direction can be sustained. Since two bearings share the axial load, this arrangement is used when the load in one direction is heavy.

HIGH-ACCURACY ANGULAR CONTACT BALL BEARINGS

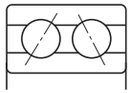
High-accuracy ACBBs come standard with molded polyamide cages and feature high load capacity, high limiting speeds, and the capability for highly accurate universal matching.

☐ Formulation of Bearing Designations

Single-Row Matched Angular Contact Ball Bearings



①Bearing type	7: Single-row angular contact ball bearings, matched angular contact ball bearings
②Dimension Series	2: 02 Series, 3: 03 Series, 9: 19 Series, 0: 10 Series
③Bore number	Bore diameter for 03 and under—00: 10 mm, 01: 12 mm, 02: 15 mm, 03: 17 mm 04 and over—Bore diameter = Bore number × 5 (mm)
④Contact angle	C: 15°, A5: 25°, A: 30°, B: 40°
⑤Internal design	EA: High Load Capacity
⑥Cage	W: Pressed steel Cage, MR: Machined brass cage (ball-guided), No designation: Machined brass cage (inner ring guided), TYN: Polyamide resin cage, T85: Polyamide 46 resin cage, T7: L-PPS resin cage
⑦Arrangement	SU: Universal arrangement (single-row), DU: Universal arrangement (double-row), DB: Back-to-back arrangement, DF: Face-to-face arrangement, DT: Tandem arrangement
⑧Preload / Axial internal clearance	EL: Extra light preload, L: Light preload, M: Medium preload, H: Heavy preload Omitted: CN clearance, C3: Clearance greater than CN, C4: Clearance greater than C3, CNB: CN Clearance equivalent (universal arrangement)

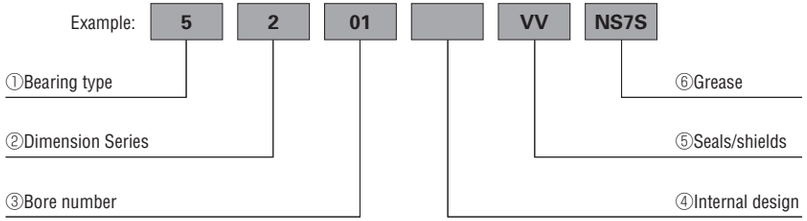


DOUBLE-ROW ANGULAR CONTACT BALL BEARINGS

Double-row angular contact ball bearings are essentially a back-to-back mounting of two single-row angular contact ball bearings, but their inner and outer rings are each integrated into one. These bearings can sustain axial loads in both directions and offer good capacity for sustaining moment loads. They are often used as fixed-end bearings and contain cages made of pressed steel.

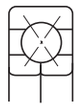
☐ Formulation of Bearing Designations

Double-Row Angular Contact Ball Bearings



①Bearing type	5: Double-row angular contact ball bearings
②Dimension Series	2: 02 Series 3: 03 Series
③Bore number	Bore diameter for 03 and under—00: 10 mm, 01: 12 mm, 02: 15 mm, 03: 17 mm 04 and over—Bore diameter = Bore number × 5 (mm)
④Internal design	ZZ: Steel shield on both sides, DDU: Rubber contact seal on both sides VV: Rubber non-contact seal on both sides
⑤Seals/shields	Z: Steel shield on one sides, DU: Rubber contact seal on one side, V: Rubber non-contact seal on one side
⑥Grease*	NS7: NS HI-LUBE

*A grease code is required when using shields or seals on both sides.



Four-Point-Contact Ball Bearings

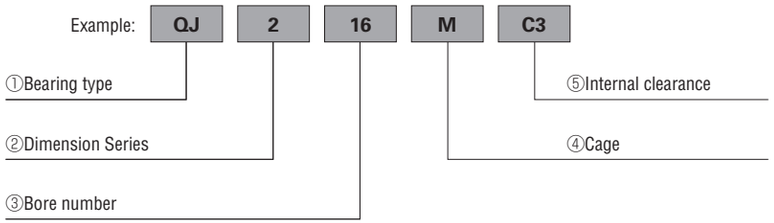
The inner ring is split radially into two pieces. This design allows one bearing to sustain significant axial loads in either direction.

The contact angle is 35°, so axial load capacity is high. These bearings are suitable for carrying pure axial loads or combined loads where axial loads are high.

The cages used are made of machined brass.

☐ Formulation of Bearing Designations

Four-Point-Contact Ball Bearings



①Bearing type	QJ: Four-point contact ball bearings
②Dimension Series	10: 10 Series, 2: 02 Series, 3: 03 Series
③Bore number	Bore diameter for 03 and under—00: 10 mm, 01: 12 mm, 02: 15 mm, 03: 17 mm 04 and over—Bore diameter = Bore number × 5 (mm)
④Cage	M: Machined-brass Cage (outer ring guided)
⑤Internal clearance	Omitted: CN clearance, C3: Clearance greater than CN, C4: Clearance greater than C3

PRECAUTIONS FOR USE OF ANGULAR CONTACT BALL BEARINGS

Under severe operating conditions where speed and temperature are close to bearing limits, lubrication is marginal, and vibration and moment loads are heavy, angular contact ball bearings may not be suitable, particularly when using certain types of cages. In such cases, please consult with NSK beforehand.

If the load on angular contact ball bearings becomes too small, or if the ratio of the axial and radial loads for matched bearings exceeds '*e*' (listed in the bearing tables) during operation, slippage occurs between the balls and raceways, which may result in smearing. This is especially true with large bearings since the weight of the balls and cage is high. If such load conditions are expected, please consult with NSK for bearing selection.

TOLERANCES AND RUNNING ACCURACY

SINGLE-ROW ANGULAR CONTACT BALL BEARINGS.....Table 7.2 (Pages A128 to A131)
HIGH-ACCURACY ANGULAR CONTACT BALL BEARINGS Tolerances: Class 6, Running Accuracy: Class 5.....Table 7.2 (Pages A128 to A131)
MATCHED ANGULAR CONTACT BALL BEARINGS.....Table 7.2 (Pages A128 to A131)
DOUBLE-ROW ANGULAR CONTACT BALL BEARINGS.....Table 7.2 (Pages A128 to A131)
FOUR-POINT-CONTACT BALL BEARINGS.....Table 7.2 (Pages A128 to A131)

RECOMMENDED FITS

SINGLE-ROW ANGULAR CONTACT BALL BEARINGS AND HIGH-ACCURACY ANGULAR CONTACT BALL BEARINGS..... Table 8.3 (Page A164)
Table 8.5 (Page A165)
MATCHED ANGULAR CONTACT BALL BEARINGS.. Table 8.3 (Page A164)
Table 8.5 (Page A165)
DOUBLE-ROW ANGULAR CONTACT BALL BEARINGS..... Table 8.3 (Page A164)
Table 8.5 (Page A165)
FOUR-POINT-CONTACT BALL BEARINGS..... Table 8.3 (Page A164)
Table 8.5 (Page A165)

INTERNAL CLEARANCES

MATCHED ANGULAR CONTACT BALL BEARINGS..... Table 8.18 (Page A174)

Matched angular contact ball bearings with precision classes over P5 are primarily used in the main spindles of machine tools; as such, they are used with a preload for rigidity. For ease of selection, internal clearances are adjusted to produce Very Light, Light, Medium, and Heavy preloads. These bearings also use a special fitting; please refer to Tables 9.1 and 9.5 (Pages A194 and A197) for more information.

The clearance (or preload) of matched bearings is obtained by axially tightening a pair of bearings till the side faces of their inner or outer rings are pressed against each other.

HIGH-ACCURACY ANGULAR CONTACT BALL BEARINGS

Axial Internal Clearance (Measured Clearances) Units : μm

Nominal Bore Diameter *d* (mm)		Axial Internal Clearance			
		CNB		GA	
over	incl.	min.	max.	min.	max.
12	**18**	17	25	–2	6
18	**30**	20	28		
30	**50**	24	32		
50	**80**	29	41	–3	9

DOUBLE-ROW ANGULAR CONTACT BALL BEARINGS

For the clearance in double-row angular contact ball bearings, please consult with NSK.

FOUR-POINT CONTACT BALL BEARINGS.....Table 8.19 (Page A174)

LIMITING SPEEDS (Grease/Oil)

Limiting speeds (grease/oil) listed in the bearing tables are for matched angular contact ball bearings with standard cages. Please consult NSK regarding bearings with optional cages, as limiting speeds (grease/oil) may differ from those listed. For example, limiting speeds (grease/oil) of machined cages (no designation) are 1.25 times higher than pressed cages.

TECHNICAL DATA

Free Space of Angular Contact Ball Bearings

Angular contact ball bearings are used in various components, such as spindles of machine tools, vertical pump motors, and worm gear reducers.

Grease lubrication is usually used with these bearings; however, such grease lubrication may affect the bearing in terms of temperature rise or durability. To allow a bearing to demonstrate its full performance, the bearing must be filled with the proper amount of a suitable grease. To do so, knowledge of the bearing's free space is critical.

Various angular contact ball bearings are available independent of the numerous combinations of bearing series, contact angle, and cage type. The free space of frequently used bearings are listed below. Table 1 shows the free space of a bearing with a pressed cage for general use and Table 2 shows that of bearings with a high-tension brass machined cage. The contact angle designations A, B, and C in each table refer to the nominal contact angles of 30°, 40°, and 15° for each bearing.

Table 1 Free Space of Angular Contact Ball Bearings (1) (With Pressed Steel Cages)

Units: cm^3

Bearing Bore No.	Bearing Free Space			
	Bearing Series — Contact Angle Designation			
	72-A	72-B	73-A	73-B
00	1.5	1.4	2.9	2.8
01	2.1	2.0	3.7	3.5
02	2.8	2.7	4.8	4.6
03	3.7	3.6	6.2	5.9
04	6.2	5.9	8.4	8.0
05	7.8	7.4	13	12
06	12	11	20	19
07	16	15	26	24
08	20	19	36	34
09	25	24	48	45
10	28	27	63	60

Table 2 Free Space of Angular Contact Ball Bearings (2) (With High-Tension Brass Machined Cages)

Units: cm^3

Bearing Bore No.	Bearing Free Space				
	Bearing Series — Contact Angle Designation				
	70-C	72-A 72-C	72-B	73-A 73-C	73-B
00	0.9	1.0	1.0	2.2	2.1
01	0.9	1.6	1.6	2.5	2.5
02	1.2	1.9	1.9	3.4	3.3
03	1.6	2.7	2.7	4.6	4.4
04	3.0	4.7	4.2	6.1	5.9
05	3.5	6.0	5.3	9.2	9.0
06	4.3	8.5	8.1	14	13
07	6.5	12	11	18	17
08	8.3	14	14	25	24
09	10	18	17	34	33
10	11	20	20	45	44
11	16	26	25	57	55
12	17	33	31	71	69
13	18	38	37	87	83
14	24	43	42	107	103
15	24	47	45	129	123
16	34	58	57	152	146
17	37	71	70	179	172
18	44	88	85	207	201
19	44	105	105	261	244
20	47	127	127	282	278

Dynamic Equivalent Load of Triplex Angular Contact Ball Bearings

Three separate single-row bearings may be used side by side as shown in the figure when angular contact ball bearings are used to carry a large axial load. There are three combination patterns, which are expressed by combination designations DBD, DFD, and DTD.

As in the case of single-row and double-row bearings, the dynamic equivalent load, which is determined from the radial and axial loads acting on a bearing, is used to calculate the fatigue life for these combined bearings.

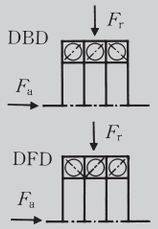
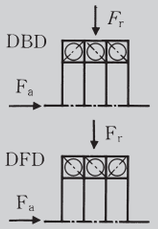
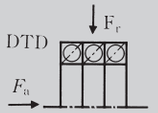
Assuming the dynamic equivalent radial load as P_r, the radial load as F_r, and axial load as F_a, the relationship between the dynamic equivalent radial load and bearing load may be approximated as follows:

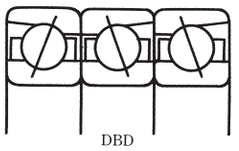
$$P_r = XF_r + YF_a \quad \cdots\cdots (1)$$

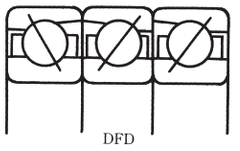
where X: Radial load factor, Y: Axial load factor } See Table 1

The axial load factor varies with contact angle. A small contact angle in an angular contact ball bearing varies substantially when axial load increases.

A change in the contact angle can be expressed by the ratio between the basic static load rating C_{0r} and axial load F_a. Axial load factors corresponding to this ratio at a contact angle of 15° are shown in Table 1. If angular contact ball bearings have contact angles of 25°, 30° and 40°, the effect of change in the contact angle on the axial load factor may be ignored and thus the axial load factor is assumed as constant.

Arrangement	Load Direction
3-row matched stack, axial load is supported by 2 rows. (Symbol DBD or DFD)	
3-row matched stack, axial load is supported by 1 row. (Symbol DBD or DFD)	
3-row tandem matched stack (Symbol DTD)	





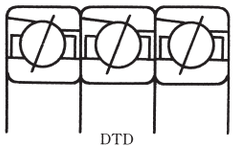


Table 1 Factors X and Y for Triplex Angular Contact Ball Bearing

Contact Angle α	j	$\frac{C_{0r}}{jF_a}$	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$		e	Basic Load Rating of 3-Row Ball Bearings	
			X	Y	X	Y		C_r	C_{0r}
15°	1.5	5	1	0.64	0.58	1.46	0.51	2.16 times that of a single bearing	3 times that of a single bearing
		10		0.70		1.61	0.47		
		15		0.74		1.70	0.44		
		20		0.76		1.75	0.42		
		25		0.78		1.81	0.41		
		30		0.80		1.83	0.40		
		50		0.83		1.91	0.39		
25°	—	—	1	0.48	0.54	1.16	0.68		
30°	—	—	1	0.41	0.52	1.01	0.80		
40°	—	—	1	0.29	0.46	0.76	1.14		
15°	3	5	1	2.28	0.95	2.37	0.51	2.16 times that of a single bearing	3 times that of a single bearing
		10		2.51		2.61	0.47		
		15		2.64		2.76	0.44		
		20		2.73		2.85	0.42		
		25		2.80		2.93	0.41		
		30		2.85		2.98	0.40		
		50		2.98		3.11	0.39		
25°	—	—	1	1.70	0.88	1.88	0.68		
30°	—	—	1	1.45	0.84	1.64	0.80		
40°	—	—	1	1.02	0.76	1.23	1.14		
15°	1	5	1	0	0.44	1.10	0.51	2.16 times that of a single bearing	3 times that of a single bearing
		10				1.21	0.47		
		15				1.28	0.44		
		20				1.32	0.42		
		25				1.36	0.41		
		30				1.38	0.40		
		50				1.44	0.39		
25°	—	—	1	0	0.41	0.87	0.68		
30°	—	—	1	0	0.39	0.76	0.80		
40°	—	—	1	0	0.35	0.57	1.14		

Angular Clearances in Double-Row Angular Contact Ball Bearings

The angular clearance for double-row bearings is defined in exactly the same way as for single-row bearings; i.e., with one of the bearing rings fixed, the angular clearance refers to the greatest possible angular displacement of the axis of the other ring.

Since the angular clearance is the greatest total relative displacement of the two ring axes, it is twice the possible angle of inner and outer ring movement (the maximum angular displacement in one direction from the center without creating a moment).

The relationship between axial and angular clearance for double-row angular contact ball bearings is given by Equation (1) below:

$$\Delta_a = 2m_0\left\{\sin\alpha_0 + \frac{\theta R_i}{2m_0} - \sqrt{1-\left(\cos\alpha_0 + \frac{\theta l}{4m_0}\right)^2}\right\} \quad \cdots\cdots (1)$$

where Δ_a : Axial clearance (mm)
m_0 : Distance between inner and outer ring groove curvature centers
$m_0 = r_e + r_i - D_w$ (mm)
r_e : Outer ring groove radius (mm)
r_i : Inner ring groove radius (mm)
α_0 : Initial contact angle (°)
θ : Angular clearance (rad)
R_i : Distance between shaft center and inner ring groove curvature center (mm)
l : Distance between left and right groove centers of inner ring (mm)

The above equation is shown plotted in Fig. 1 for Series 52, 53, 32, and 33 double-row angular contact ball bearings.

The relationship between radial clearance Δ_r and axial clearance Δ_a for double-row angular contact ball bearings is listed on pages C086 and C087. Fig. 2 shows the relationship between angular clearance θ and radial clearance Δ_r based on equations from those pages.

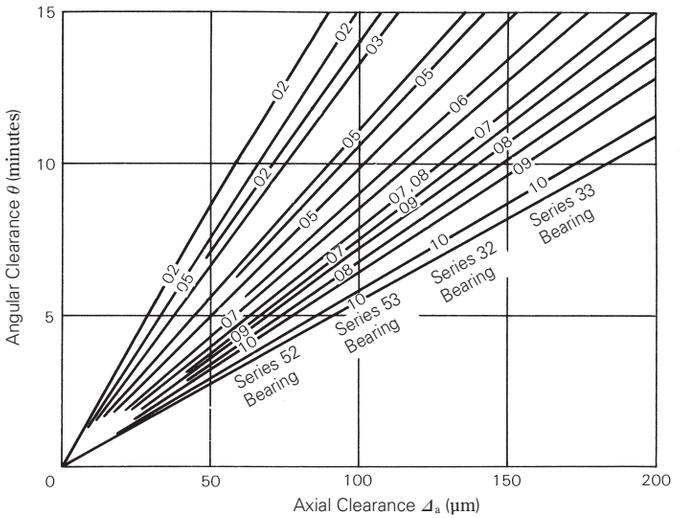


Fig. 1 Relationship Between Axial and Angular Clearances

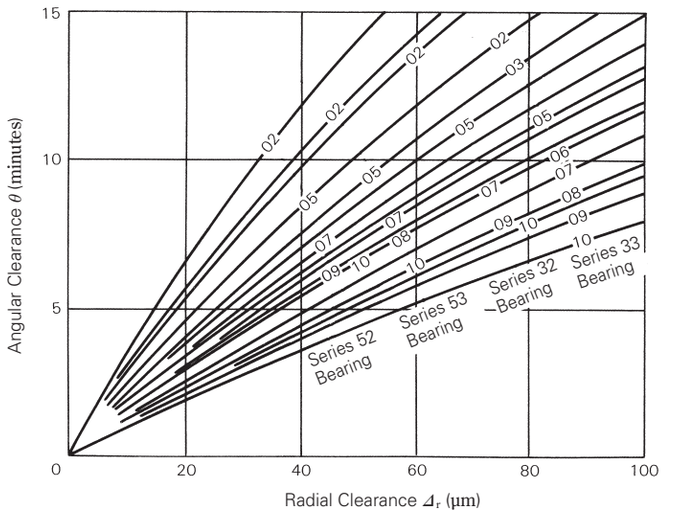


Fig. 2 Relationship Between Radial and Angular Clearances

Relationship Between Radial and Axial Clearances in Double-Row Angular Contact Ball Bearings

The relationship between the radial and axial internal clearances in double-row angular contact ball bearings can be determined geometrically as shown in Fig. 1 below.

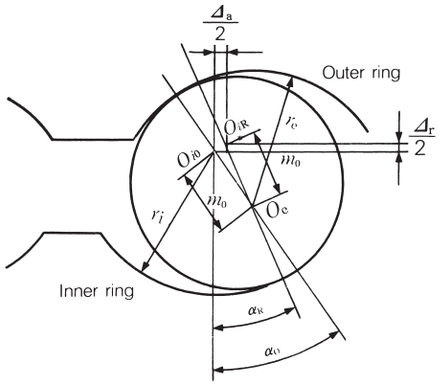


Fig. 1

where Δ_r : Radial clearance (mm)
Δ_a : Axial clearance (mm)
α_0 : Initial contact angle, inner or outer ring displaced axially
α_R : Initial contact angle, inner or outer ring displaced radially
O_e : Center of outer ring groove curvature (outer ring fixed)
O_{i0} : Center of inner ring groove curvature (inner ring displaced axially)
O_{iR} : Center of inner ring groove curvature (inner ring displaced radially)
m_0 : Distance between inner and outer ring groove-curvature centers
$m_0=r_i+r_e-D_w$
D_w : Ball diameter (mm)
r_i : Radius of inner ring groove (mm)
r_e : Radius of outer ring groove (mm)

The following relations can be derived from Fig. 1:

$$m_0 \sin\alpha_0=m_0\sin\alpha_R+\frac{\Delta_a}{2} \quad \cdots\cdots (1)$$

$$m_0 \cos\alpha_0=m_0\cos\alpha_R-\frac{\Delta_r}{2} \quad \cdots\cdots (2)$$

since $\sin^2\alpha_0=1-\cos^2\alpha_0$,

$$(m_0 \sin\alpha_0)^2=m_0^2-(m_0\cos\alpha_0)^2 \quad \cdots\cdots (3)$$

By combining Equations (1), (2), and (3), we obtain the following:

$$\left(m_0 \sin\alpha_R+\frac{\Delta_a}{2}\right)^2=m_0^2-\left(m_0\cos\alpha_R-\frac{\Delta_r}{2}\right)^2 \quad \cdots\cdots (4)$$

$$\therefore \Delta_a=2\sqrt{m_0^2-\left(m_0\cos\alpha_R-\frac{\Delta_r}{2}\right)^2}-2m_0\sin\alpha_R \quad \cdots\cdots (5)$$

α_R is 25° for Series 52 and 53 bearings and 32° for Series 32 and 33 bearings. If we set α_R equal to 0°, Equation (5) becomes:

$$\Delta_a=2\sqrt{m_0^2-\left(m_0-\frac{\Delta_r}{2}\right)^2}$$

$$=2\sqrt{m_0\Delta_r-\frac{\Delta_r^2}{4}}$$

However, $\frac{\Delta_r^2}{4}$ is negligible.

$$\therefore \Delta_a \fallingdotseq 2m_0^{1/2}\Delta_r^{1/2} \quad \cdots\cdots (6)$$

This is identical to the relationship between the radial and axial clearances in single-row deep groove ball bearings.

The value of m_0 is dependent on the inner and outer ring groove radii. The relation between Δ_r and Δ_a, as given by Equation (5), is shown in Figs. 2 and 3 for Series 52, 53, 32, and 33 double-row angular contact ball bearings. When the clearance range is small, axial clearance is given approximately by the following:

$$\Delta_a \fallingdotseq \Delta_r \cot\alpha_R \quad \cdots\cdots (7)$$

However, when the clearance is relatively large, (when $\Delta_r/D_w > 0.002$) the error in Equation (7) can be quite large.

The contact angle α_R is independent of the radial clearance; however, the initial contact angle α_0 varies with the radial clearance when the inner or outer ring is displaced axially. This relationship is given by Equation (2).

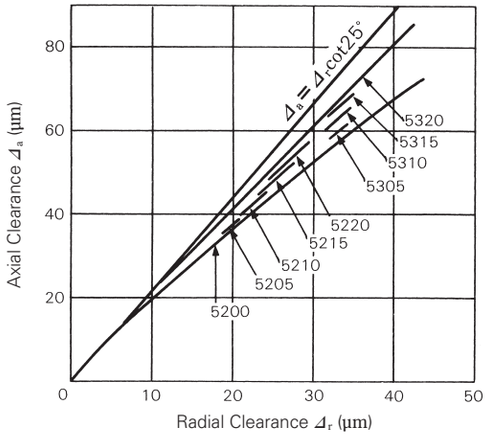


Fig. 2 Radial and Axial Clearances of Series 52 and 53 Bearings

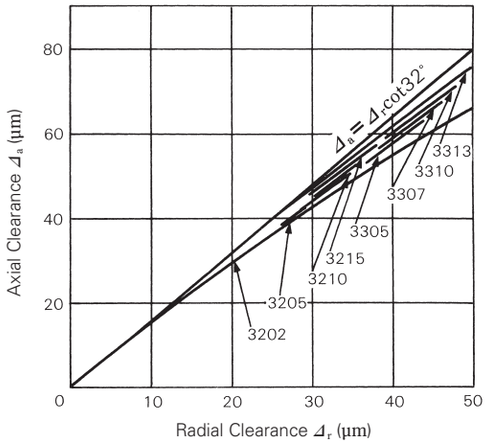
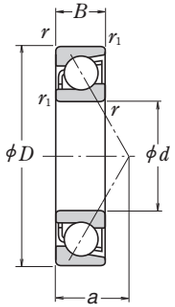


Fig. 3 Radial and Axial Clearances of Series 32 and 33 Bearings

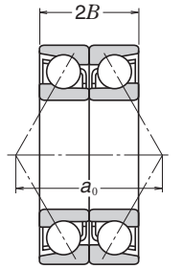
■ANGULAR CONTACT BALL BEARINGS

SINGLE/MATCHED MOUNTINGS

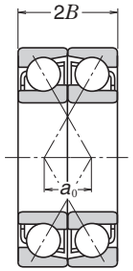
Bore Diameter 10 – 15 mm



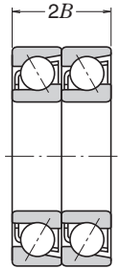
Single



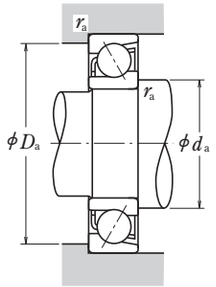
Back-to-Back
DB

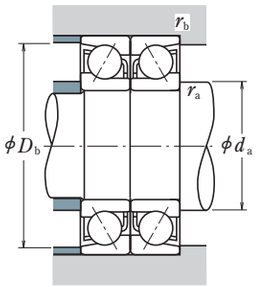


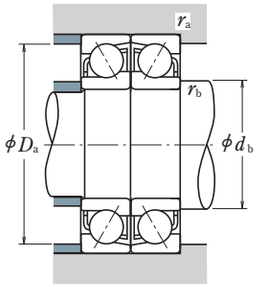
Face-to-Face
DF



Tandem
DT







Dynamic Equivalent Load $P = XF_r + YF_a$

Contact Angle	$if_0F_a^*/C_{0r}$	e	Single, DT				DB or DF			
			$F_a/F_r \leqq e$		$F_a/F_r > e$		$F_a/F_r \leqq e$		$F_a/F_r > e$	
			X	Y	X	Y	X	Y	X	Y
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

*For i, use 2 for DB and DF and 1 for DT

Static Equivalent Load $P_0 = X_0F_r + Y_0F_a$

Contact Angle	Single, DT		DB or DF		
	X_0	Y_0	X_0	Y_0	
30°	0.5	0.33	1	0.66	Single or DT mounting When $F_r > 0.5F_r + Y_0F_a$ use $P_0 = F_r$
40°	0.5	0.26	1	0.52	

Boundary Dimensions (mm)					Basic Load Ratings (Single) (N)		Factor	Limiting Speeds (1) (min⁻¹)		Eff.Load Center (mm)	Abutment and Fillet Dimensions (mm)			Mass (kg)	Bearing Designations (2) Cage Designation (4)				Arrangement			Basic Load Ratings (Matched) (N)		Limiting Speeds (1) (Matched) (min⁻¹)		Load Center Spacings (mm)		Abutment and Fillet Dimensions (mm)		
d	D	B	r min.	r_1 min.	C_r	C_{0r}	f_0	Grease	Oil	a	d_a min.	D_a max.	r_a max.	approx.	Single	Standard	Option					C_r	C_{0r}	Grease	Oil	DB	DF	d_b(3) min.	D_b max.	r_b(3) max.
10	26	8	0.3	0.15	5 900	2 600	—	24 000	34 000	9.2	12.5	23.5	0.3	0.019	**7000 A**	**W**	**(M), T,TYN**	**DB**	**DF**	**DT**	9 600	5 200	20 000	28 000	18.4	2.4	11.2	24.8	0.15
	30	9	0.6	0.3	5 950	2 710	—	22 000	30 000	10.3	15	25	0.6	0.032	**7200 A**	**W**	**(M), T,TYN**	**DB**	**DF**	**DT**	9 700	5 400	18 000	24 000	20.5	2.5	12.5	27.5	0.3
	30	9	0.6	0.3	5 500	2 500	—	16 000	22 000	12.9	15	25	0.6	0.032	**7200 B**	**W**	**(M), T**	**DB**	**DF**	**DT**	8 900	5 000	13 000	18 000	25.8	7.8	12.5	27.5	0.3
	35	11	0.6	0.3	10 200	4 300	—	16 000	22 000	12.0	15	30	0.6	0.053	**7300 A**	**W**	**(M), T**	**DB**	**DF**	**DT**	16 600	8 600	13 000	17 000	24.0	2.0	12.5	32.5	0.3
	35	11	0.6	0.3	9 600	4 050	—	14 000	20 000	14.9	15	30	0.6	0.054	**7300 B**	**W**	**(M), T**	**DB**	**DF**	**DT**	15 600	8 100	11 000	16 000	29.9	7.9	12.5	32.5	0.3
12	28	8	0.3	0.15	6 350	2 980	—	22 000	30 000	9.8	14.5	25.5	0.3	0.021	**7001 A**	**W**	**(M), T,TYN**	**DB**	**DF**	**DT**	10 300	5 950	18 000	24 000	19.5	3.5	13.2	26.8	0.15
	32	10	0.6	0.3	8 800	4 050	—	20 000	28 000	11.4	17	27	0.6	0.037	**7201 A**	**W**	**(M), T,TYN**	**DB**	**DF**	**DT**	14 300	8 050	16 000	22 000	22.7	2.7	14.5	29.5	0.3
	32	10	0.6	0.3	8 150	3 750	—	15 000	20 000	14.2	17	27	0.6	0.038	**7201 B**	**W**	**(M),T**	**DB**	**DF**	**DT**	13 300	7 500	12 000	16 000	28.5	8.5	14.5	29.5	0.3
	32	10	0.6	0.3	8 500	3 750	—	20 000	30 000	14.2	17	27	0.6	0.036	***7201 BEA**	**T85**	—	—	—	—	—	—	16 000	24 000	28.5	8.5	14.5	29.5	0.3
	37	12	1	0.6	10 400	4 500	—	15 000	20 000	13.1	18	31	1	0.060	**7301 A**	**W**	**(M), T**	**DB**	**DF**	**DT**	16 900	9 000	12 000	16 000	26.1	2.1	17	32	0.6
	37	12	1	0.6	9 750	4 200	—	13 000	18 000	16.3	18	31	1	0.062	**7301 B**	**W**	**(M), T**	**DB**	**DF**	**DT**	15 800	8 400	10 000	14 000	32.6	8.6	17	32	0.6
	37	12	1	0.6	11 600	4 950	—	18 000	26 000	16.3	18	31	1	0.061	***7301 BEA**	**T85**	—	—	—	—	—	—	15 000	22 000	32.6	8.6	17	32	0.6
15	32	9	0.3	0.15	6 750	3 450	—	19 000	26 000	11.3	17.5	29.5	0.3	0.030	**7002 A**	**W**	**(M), T,TYN**	**DB**	**DF**	**DT**	10 900	6 850	15 000	22 000	22.6	4.6	16.2	30.8	0.15
	35	11	0.6	0.3	9 500	4 650	—	18 000	24 000	12.7	20	30	0.6	0.045	**7202 A**	**W**	**(M), T,TYN**	**DB**	**DF**	**DT**	15 400	9 300	14 000	20 000	25.4	3.4	17.5	32.5	0.3
	35	11	0.6	0.3	8 750	4 300	—	13 000	18 000	16.0	20	30	0.6	0.046	**7202 B**	**W**	**(M),T**	**DB**	**DF**	**DT**	14 200	8 600	10 000	14 000	32.0	10.0	17.5	32.5	0.3
	35	11	0.6	0.3	10 200	4 800	—	18 000	26 000	16.0	20	30	0.6	0.044	***7202 BEA**	**T85**	—	—	—	—	—	—	14 000	20 000	32.0	10.0	17.5	32.5	0.3
	42	13	1	0.6	14 700	7 100	—	13 000	17 000	14.7	21	36	1	0.084	**7302 A**	**W**	**(M), T**	**DB**	**DF**	**DT**	23 900	14 200	10 000	13 000	29.5	3.5	20	37	0.6
	42	13	1	0.6	13 700	6 600	—	11 000	15 000	18.5	21	36	1	0.086	**7302 B**	**W**	**(M), T**	**DB**	**DF**	**DT**	22 300	13 200	9 000	12 000	36.9	10.9	20	37	0.6
	42	13	1	0.6	15 000	6 900	—	16 000	22 000	18.5	21	36	1	0.084	***7302 BEA**	**T85**	—	—	—	—	—	—	13 000	18 000	36.9	10.9	20	37	0.6

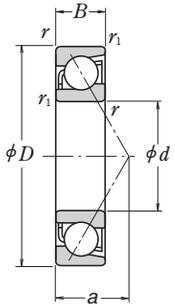
Notes (1) For applications operating near the limiting speed, refer to Page C077.
(2) Suffixes A and B represent contact angles of 30° and 40° respectively.
(3) Use the values of d_a (min) and r_a (max) for bearings with "—" in the d_b column.

Note (4) Cage designation (M) is usually omitted from the bearing designation.
Remark Bearings with an asterisk (*) are high-accuracy angular contact ball bearings. In arrangements, they are limited to SU universal matching types. See Page C073 for details.

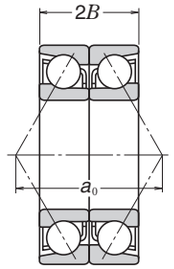
■ANGULAR CONTACT BALL BEARINGS

SINGLE/MATCHED MOUNTINGS

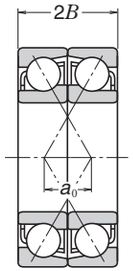
Bore Diameter 17 – 25 mm



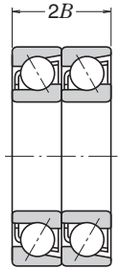
Single



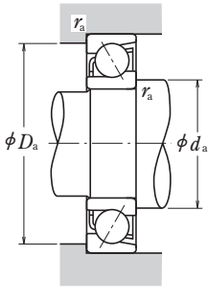
Back-to-Back
DB

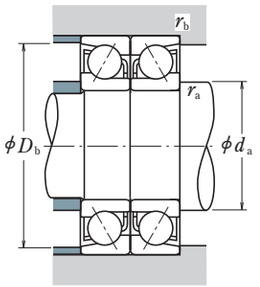


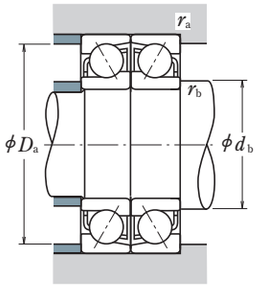
Face-to-Face
DF



Tandem
DT







Dynamic Equivalent Load $P = XF_r + YF_a$

Contact Angle	$if_0F_a^*/C_{0r}$	e	Single, DT				DB or DF			
			$F_a/F_r \leqq e$		$F_a/F_r > e$		$F_a/F_r \leqq e$		$F_a/F_r > e$	
			X	Y	X	Y	X	Y	X	Y
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

*For i, use 2 for DB and DF and 1 for DT

Static Equivalent Load $P_0 = X_0F_r + Y_0F_a$

Contact Angle	Single, DT		DB or DF	
	X_0	Y_0	X_0	Y_0
30°	0.5	0.33	1	0.66
40°	0.5	0.26	1	0.52

Single or DT mounting When $F_r > 0.5F_r + Y_0F_a$ use $P_0 = F_r$

Boundary Dimensions (mm)					Basic Load Ratings (Single) (N)		Factor	Limiting Speeds (1) (min^{-1})		Eff.Load Center (mm)	Abutment and Fillet Dimensions (mm)			Mass (kg)
d	D	B	r min.	r_1 min.	C_r	C_{0r}	f_0	Grease	Oil	a	d_a min.	D_a max.	r_a max.	approx.
17	35	10	0.3	0.15	7 050	3 800	—	17 000	24 000	12.5	19.5	32.5	0.3	0.040
	40	12	0.6	0.3	11 900	6 000	—	16 000	22 000	14.2	22	35	0.6	0.067
	40	12	0.6	0.3	10 900	5 500	—	11 000	15 000	18.0	22	35	0.6	0.068
	40	12	0.6	0.3	12 100	6 100	—	16 000	22 000	18.2	22	35	0.6	0.065
	47	14	1	0.6	17 500	8 650	—	11 000	15 000	16.2	23	41	1	0.116
	47	14	1	0.6	16 300	8 000	—	10 000	14 000	20.4	23	41	1	0.118
	47	14	1	0.6	17 600	8 300	—	14 000	20 000	20.4	23	41	1	0.113
20	42	12	0.6	0.3	11 900	6 600	—	14 000	20 000	14.9	25	37	0.6	0.068
	47	14	1	0.6	15 900	8 300	—	13 000	18 000	16.7	26	41	1	0.106
	47	14	1	0.6	14 700	7 650	—	9 500	13 000	21.1	26	41	1	0.109
	47	14	1	0.6	16 300	8 150	—	13 000	19 000	21.1	26	41	1	0.103
	52	15	1.1	0.6	20 600	10 400	—	10 000	13 000	17.9	27	45	1	0.146
	52	15	1.1	0.6	19 100	9 650	—	9 000	12 000	22.6	27	45	1	0.150
	52	15	1.1	0.6	20 800	10 500	—	13 000	18 000	22.6	27	45	1	0.149
25	47	12	0.6	0.3	12 400	7 400	—	12 000	17 000	16.4	30	42	0.6	0.079
	52	15	1	0.6	17 800	10 300	—	12 000	16 000	18.6	31	46	1	0.130
	52	15	1	0.6	16 300	9 400	—	8 500	11 000	23.7	31	46	1	0.133
	52	15	1	0.6	18 400	10 200	—	12 000	17 000	23.7	31	46	1	0.127
	62	17	1.1	0.6	29 100	15 800	—	8 500	11 000	21.1	32	55	1	0.235

Bearing Designations (2) Cage Designation (4)			Arrangement			Basic Load Ratings (Matched) (N)		Limiting Speeds (1) (Matched) (min^{-1})		Load Center Spacings (mm) a_0		Abutment and Fillet Dimensions (mm)		
Single	Standard	Option				C_r	C_{0r}	Grease	Oil	DB	DF	d_b (3) min.	D_b max.	r_b (3) max.
7003 A	**W**	**(M), T,TYN**	**DB**	**DF**	**DT**	11 500	7 650	14 000	19 000	25.0	5.0	18.2	33.8	0.15
7203 A	**W**	**(M), T,TYN**	**DB**	**DF**	**DT**	19 300	12 000	13 000	17 000	28.5	4.5	19.5	37.5	0.3
7203 B	**W**	**(M),T**	**DB**	**DF**	**DT**	17 800	11 000	9 000	12 000	35.9	11.9	19.5	37.5	0.3
*7203 BEA	T85	T7	—	—	—	—	—	13 000	18 000	36.3	12.3	19.5	37.5	0.3
7303 A	**W**	**(M), T**	**DB**	**DF**	**DT**	28 500	17 300	9 000	12 000	32.5	4.5	22	42	0.6
7303 B	**W**	**(M), T**	**DB**	**DF**	**DT**	26 400	16 000	8 000	11 000	40.9	12.9	22	42	0.6
*7303 BEA	T85	—	—	—	—	—	—	11 000	16 000	40.9	12.9	22	42	0.6
7004 A	**W**	**(M), T,TYN**	**DB**	**DF**	**DT**	19 400	13 200	12 000	16 000	29.9	5.9	22.5	39.5	0.3
7204 A	**W**	**(M), T,TYN**	**DB**	**DF**	**DT**	25 900	16 600	11 000	15 000	33.3	5.3	25	42	0.6
7204 B	**W**	**(M),T**	**DB**	**DF**	**DT**	23 800	15 300	7 500	11 000	42.1	14.1	25	42	0.6
*7204 BEA	T85	T7	—	—	—	—	—	11 000	16 000	42.1	14.1	25	42	0.6
7304 A	**W**	**(M), T**	**DB**	**DF**	**DT**	33 500	20 800	8 000	11 000	35.8	5.8	25	47	0.6
7304 B	**W**	**(M), T**	**DB**	**DF**	**DT**	31 000	19 300	7 100	10 000	45.2	15.2	25	47	0.6
*7304 BEA	T85	MR, T7	—	—	—	—	—	10 000	14 000	45.2	15.2	25	47	0.6
7005 A	**W**	**(M), T,TYN**	**DB**	**DF**	**DT**	20 200	14 800	10 000	14 000	32.8	8.8	27.5	44.5	0.3
7205 A	**W**	**(M), T,TYN**	**DB**	**DF**	**DT**	29 000	20 500	9 500	13 000	37.2	7.2	30	47	0.6
7205 B	**W**	**(M),T**	**DB**	**DF**	**DT**	26 400	18 800	6 700	9 000	47.3	17.3	30	47	0.6
*7205 BEA	T85	T7	—	—	—	—	—	9 500	14 000	47.3	17.3	30	47	0.6
7305 A	**W**	**(M), T**	**DB**	**DF**	**DT**	47 000	31 500	6 700	9 000	42.1	8.1	30	57	0.6

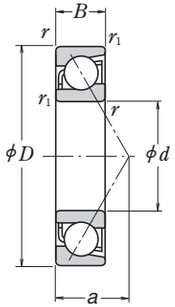
Notes (1) For applications operating near the limiting speed, refer to Page C077.
(2) Suffixes A and B represent contact angles of 30° and 40° respectively.
(3) Use the values of d_a (min) and r_a (max) for bearings with "—" in the d_b column.

Note (4) Cage designation (M) is usually omitted from the bearing designation.
Remark Bearings with an asterisk (*) are high-accuracy angular contact ball bearings. In arrangements, they are limited to SU universal matching types. See Page C073 for details.

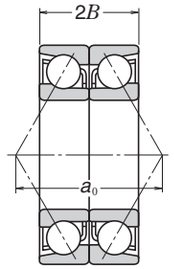
ANGULAR CONTACT BALL BEARINGS

SINGLE/MATCHED MOUNTINGS

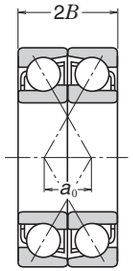
Bore Diameter 25 – 40 mm



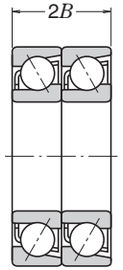
Single



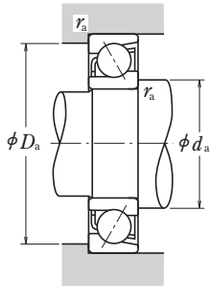
Back-to-Back
DB

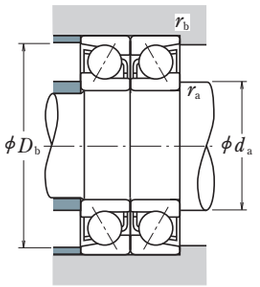


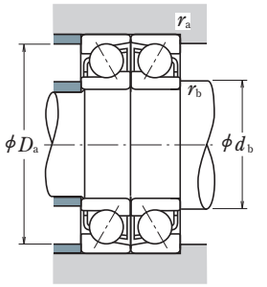
Face-to-Face
DF



Tandem
DT







Dynamic Equivalent Load $P = XF_r + YF_a$

Contact Angle	$if_0F_a^*/C_{0r}$	e	Single, DT				DB or DF			
			$F_a/F_r \leqq e$		$F_a/F_r > e$		$F_a/F_r \leqq e$		$F_a/F_r > e$	
			X	Y	X	Y	X	Y	X	Y
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

*For i, use 2 for DB and DF and 1 for DT

Static Equivalent Load $P_0 = X_0F_r + Y_0F_a$

Contact Angle	Single, DT		DB or DF		
	X_0	Y_0	X_0	Y_0	
30°	0.5	0.33	1	0.66	Single or DT mounting When $F_r > 0.5F_r + Y_0F_a$ use $P_0 = F_r$
40°	0.5	0.26	1	0.52	

Boundary Dimensions (mm)					Basic Load Ratings (Single) (N)		Factor	Limiting Speeds (1) (min⁻¹)		Eff.Load Center (mm)	Abutment and Fillet Dimensions (mm)			Mass (kg)	Bearing Designations (2) Cage Designation (4)			Arrangement			Basic Load Ratings (Matched) (N)		Limiting Speeds (1) (Matched) (min⁻¹)		Load Center Spacings (mm)		Abutment and Fillet Dimensions (mm)		
d	D	B	r min.	r_1 min.	C_r	C_{0r}	f_0	Grease	Oil	a	d_a min.	D_a max.	r_a max.	approx.	Single	Standard	Option				C_r	C_{0r}	Grease	Oil	DB	DF	d_b(3) min.	D_b max.	r_b(3) max.
25	62	17	1.1	0.6	26 800	14 600	—	7 500	10 000	26.7	32	55	1	0.241	**7305 B**	**W**	**(M), T**	**DB**	**DF**	**DT**	43 500	29 300	6 000	8 000	53.5	19.5	30	57	0.6
	62	17	1.1	0.6	28 400	14 900	—	10 000	15 000	26.8	32	55	1	0.229	***7305 BEA**	**T85**	**MR, T7**	—	—	—	—	—	8 500	12 000	53.5	19.5	30	57	0.6
30	55	13	1	0.6	16 000	10 100	—	11 000	14 000	18.8	36	49	1	0.116	**7006 A**	**W**	**(M), T,TYN**	**DB**	**DF**	**DT**	26 000	20 200	8 500	12 000	37.5	11.5	35	50	0.6
	62	16	1	0.6	24 800	14 800	—	9 500	13 000	21.3	36	56	1	0.197	**7206 A**	**W**	**(M), T,TYN**	**DB**	**DF**	**DT**	40 000	29 500	8 000	11 000	42.6	10.6	35	57	0.6
	62	16	1	0.6	22 600	13 500	—	7 100	9 500	27.3	36	56	1	0.202	**7206 B**	**W**	**(M),T**	**DB**	**DF**	**DT**	36 500	27 000	5 600	7 500	54.6	22.6	35	57	0.6
	62	16	1	0.6	24 900	14 300	—	10 000	14 000	27.3	36	56	1	0.194	***7206 BEA**	**T85**	**MR, T7**	—	—	—	—	—	8 000	11 000	54.6	22.6	35	57	0.6
	72	19	1.1	0.6	37 000	20 900	—	7 100	9 500	24.2	37	65	1	0.346	**7306 A**	**W**	**(M), T**	**DB**	**DF**	**DT**	60 000	41 500	5 600	7 500	48.4	10.4	35	67	0.6
	72	19	1.1	0.6	34 000	19 300	—	6 300	8 500	30.9	37	65	1	0.354	**7306 B**	**W**	**(M), T**	**DB**	**DF**	**DT**	55 500	38 500	5 000	7 100	61.8	23.8	35	67	0.6
	72	19	1.1	0.6	38 000	20 600	—	9 000	13 000	30.9	37	65	1	0.336	***7306 BEA**	**T85**	**MR, T7**	—	—	—	—	—	7 100	10 000	61.8	23.8	35	67	0.6
35	62	14	1	0.6	20 100	13 400	—	9 000	13 000	21.0	41	56	1	0.153	**7007 A**	**W**	**(M), T,TYN**	**DB**	**DF**	**DT**	32 500	26 800	7 500	10 000	42.0	14.0	40	57	0.6
	72	17	1.1	0.6	32 500	20 100	—	8 500	12 000	23.9	42	65	1	0.287	**7207 A**	**W**	**(M), T,TYN**	**DB**	**DF**	**DT**	53 000	40 000	6 700	9 500	47.9	13.9	40	67	0.6
	72	17	1.1	0.6	29 800	18 400	—	6 000	8 000	30.9	42	65	1	0.294	**7207 B**	**W**	**(M),T**	**DB**	**DF**	**DT**	48 500	36 500	4 800	6 700	61.9	27.9	40	67	0.6
	72	17	1.1	0.6	34 000	19 600	—	8 500	12 000	30.9	42	65	1	0.271	***7207 BEA**	**T85**	**MR, T7**	—	—	—	—	—	6 700	9 500	61.9	27.9	40	67	0.6
	80	21	1.5	1	44 000	26 300	—	6 300	8 500	27.1	44	71	1.5	0.464	**7307 A**	**W**	**(M), T**	**DB**	**DF**	**DT**	71 500	52 500	5 000	6 700	54.2	12.2	41	74	1
	80	21	1.5	1	42 000	24 400	—	8 000	11 000	34.6	44	71	1.5	0.451	***7307 BEA**	**T85**	**MR, T7**	—	—	—	—	—	6 300	9 000	69.2	27.2	41	74	1
	80	21	1.5	1	42 000	24 400	—	5 600	7 500	34.6	44	71	1.5	0.469	**7307 BEA**	**W**	**MR, T7**	**DB**	**DF**	**DT**	68 500	49 000	4 500	6 000	69.2	27.2	41	74	1
40	68	15	1	0.6	21 500	15 400	—	8 500	11 000	23.1	46	62	1	0.190	**7008 A**	**W**	**(M), T,TYN**	**DB**	**DF**	**DT**	35 000	31 000	6 700	9 000	46.2	16.2	45	63	0.6
	80	18	1.1	0.6	39 000	25 100	—	7 500	10 000	26.3	47	73	1	0.375	**7208 A**	**W**	**(M), T,TYN**	**DB**	**DF**	**DT**	63 000	50 500	6 000	8 500	52.6	16.6	45	75	0.6
	80	18	1.1	0.6	35 500	23 000	—	5 300	7 500	34.2	47	73	1	0.383	**7208 B**	**W**	**(M),T**	**DB**	**DF**	**DT**	57 500	46 000	4 300	6 000	68.3	32.3	45	75	0.6

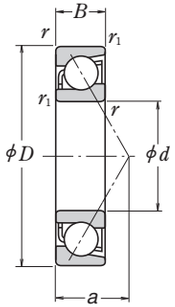
Notes (1) For applications operating near the limiting speed, refer to Page C077.
(2) Suffixes A and B represent contact angles of 30° and 40° respectively.
(3) Use the values of d_a (min) and r_a (max) for bearings with "—" in the d_b column.

Note (4) Cage designation (M) is usually omitted from the bearing designation.
Remark Bearings with an asterisk (*) are high-accuracy angular contact ball bearings. In arrangements, they are limited to SU universal matching types. See Page C073 for details.

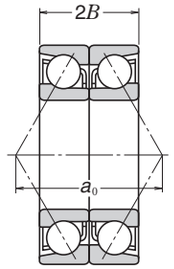
ANGULAR CONTACT BALL BEARINGS

SINGLE/MATCHED MOUNTINGS

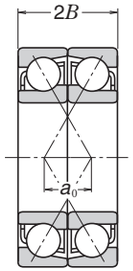
Bore Diameter 40 – 55 mm



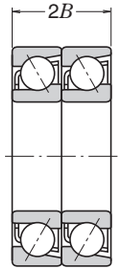
Single



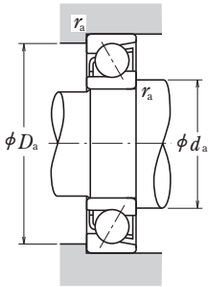
Back-to-Back
DB

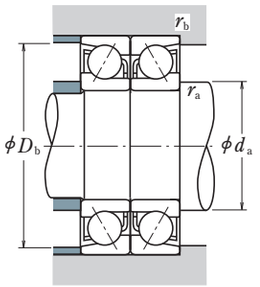


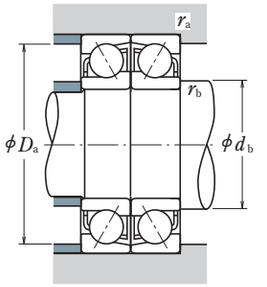
Face-to-Face
DF



Tandem
DT







Dynamic Equivalent Load $P = XF_r + YF_a$

Contact Angle	$if_0F_a^*/C_{0r}$	e	Single, DT				DB or DF			
			$F_a/F_r \leqq e$		$F_a/F_r > e$		$F_a/F_r \leqq e$		$F_a/F_r > e$	
			X	Y	X	Y	X	Y	X	Y
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

*For i, use 2 for DB and DF and 1 for DT

Static Equivalent Load $P_0 = X_0F_r + Y_0F_a$

Contact Angle	Single, DT		DB or DF		
	X_0	Y_0	X_0	Y_0	
30°	0.5	0.33	1	0.66	Single or DT mounting When $F_r > 0.5F_r + Y_0F_a$ use $P_0 = F_r$
40°	0.5	0.26	1	0.52	

Boundary Dimensions (mm)					Basic Load Ratings (Single) (N)		Factor	Limiting Speeds (1) (min⁻¹)		Eff.Load Center (mm)	Abutment and Fillet Dimensions (mm)			Mass (kg)	Bearing Designations (2) Cage Designation (4)				Basic Load Ratings (Matched) (N)		Limiting Speeds (1) (Matched) (min⁻¹)		Load Center Spacings (mm)		Abutment and Fillet Dimensions (mm)		
d	D	B	r min.	r_1 min.	C_r	C_{0r}	f_0	Grease	Oil	a	d_a min.	D_a max.	r_a max.	approx.	Single	Standard	Option	Arrangement	C_r	C_{0r}	Grease	Oil	DB	DF	d_b(3) min.	D_b max.	r_b(3) max.
40	80	18	1.1	0.6	40 500	24 500	—	7 500	11 000	34.2	47	73	1	0.357	*7208 BEA	T85	MR, T7	— — —	—	—	6 000	8 500	68.3	32.3	45	75	0.6
	90	23	1.5	1	53 500	33 000	—	5 600	7 500	30.3	49	81	1.5	0.633	7308 A	W	(M), T	DB DF DT	87 000	66 000	4 500	6 000	60.5	14.5	46	84	1
	90	23	1.5	1	55 500	33 000	—	7 100	10 000	38.8	49	81	1.5	0.619	*7308 BEA	T85	MR, T7	— — —	—	—	5 600	8 000	77.5	31.5	46	84	1
	90	23	1.5	1	55 500	33 000	—	5 000	6 700	38.8	49	81	1.5	0.644	7308 BEA	W	MR, T7	DB DF DT	90 500	65 500	4 000	5 300	77.5	31.5	46	84	1
45	75	16	1	0.6	25 400	18 700	—	7 500	10 000	25.3	51	69	1	0.250	7009 A	W	(M), TYN	DB DF DT	41 500	37 500	6 000	8 500	50.6	18.6	50	70	0.6
	85	19	1.1	0.6	43 500	28 700	—	6 700	9 500	28.3	52	78	1	0.411	7209 A	W	(M), T,TYN	DB DF DT	71 000	57 500	5 600	7 500	56.5	18.5	50	80	0.6
	85	19	1.1	0.6	39 500	26 200	—	5 000	6 700	36.8	52	78	1	0.421	7209 B	W	(M),T	DB DF DT	64 500	52 500	4 000	5 300	73.5	35.5	50	80	0.6
	85	19	1.1	0.6	42 500	27 100	—	7 100	10 000	36.8	52	78	1	0.400	*7209 BEA	T85	MR, T7	— — —	—	—	5 600	8 000	73.5	35.5	50	80	0.6
	100	25	1.5	1	70 000	43 500	—	5 000	6 700	33.4	54	91	1.5	0.848	7309 A	W	(M), T	DB DF DT	113 000	87 000	4 000	5 300	66.9	16.9	51	94	1
	100	25	1.5	1	65 500	39 500	—	6 300	9 000	42.9	54	91	1.5	0.823	*7309 BEA	T85	MR, T7	— — —	—	—	5 000	7 100	85.8	35.8	51	94	1
	100	25	1.5	1	65 500	39 500	—	4 500	6 000	42.9	54	91	1.5	0.860	7309 BEA	W	MR, T7	DB DF DT	107 000	79 500	3 600	4 800	85.8	35.8	51	94	1
50	80	16	1	0.6	26 900	21 100	—	6 700	9 500	26.8	56	74	1	0.263	7010 A	W	(M), T,TYN	DB DF DT	43 500	42 000	5 600	7 500	53.5	21.5	55	75	0.6
	90	20	1.1	0.6	45 500	31 500	—	6 300	9 000	30.2	57	83	1	0.466	7210 A	W	(M), T,TYN	DB DF DT	74 000	63 000	5 000	7 100	60.4	20.4	55	85	0.6
	90	20	1.1	0.6	41 000	28 600	—	4 500	6 300	39.4	57	83	1	0.477	7210 B	W	(M),T	DB DF DT	67 000	57 000	3 600	5 000	78.7	38.7	55	85	0.6
	90	20	1.1	0.6	44 000	29 700	—	6 300	9 500	39.4	57	83	1	0.453	*7210 BEA	T85	MR, T7	— — —	—	—	5 000	7 500	78.7	38.7	55	85	0.6
	110	27	2	1	81 500	52 000	—	4 500	6 000	36.6	60	100	2	1.10	7310 A	W	(M), T	DB DF DT	133 000	104 000	3 600	4 800	73.2	19.2	56	104	1
	110	27	2	1	82 000	50 500	—	5 600	8 000	47.1	60	100	2	1.07	*7310 BEA	T85	MR, T7	— — —	—	—	4 500	6 700	94.1	40.1	56	104	1
	110	27	2	1	82 000	50 500	—	4 000	5 600	47.1	60	100	2	1.11	7310 BEA	W	MR, T7	DB DF DT	133 000	101 000	3 200	4 500	94.1	40.1	56	104	1
55	90	18	1.1	0.6	35 500	27 700	—	6 300	8 500	29.9	62	83	1	0.391	7011 A	W	(M), T,TYN	DB DF DT	57 500	55 500	5 000	6 700	59.9	23.9	60	85	0.6

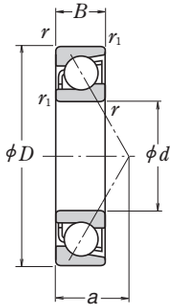
Notes (1) For applications operating near the limiting speed, refer to Page C077.
(2) Suffixes A and B represent contact angles of 30° and 40° respectively.
(3) Use the values of d_a (min) and r_a (max) for bearings with "—" in the d_b column.

Note (4) Cage designation (M) is usually omitted from the bearing designation.
Remark Bearings with an asterisk (*) are high-accuracy angular contact ball bearings. In arrangements, they are limited to SU universal matching types. See Page C073 for details.

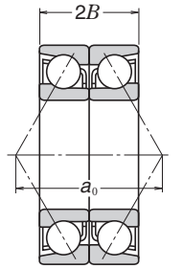
ANGULAR CONTACT BALL BEARINGS

SINGLE/MATCHED MOUNTINGS

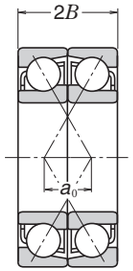
Bore Diameter 55 – 65 mm



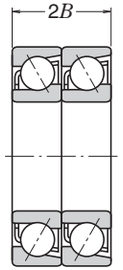
Single



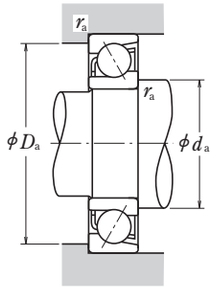
Back-to-Back
DB

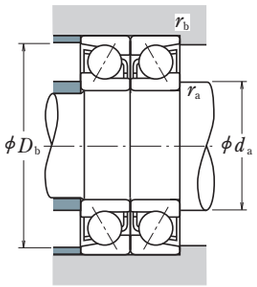


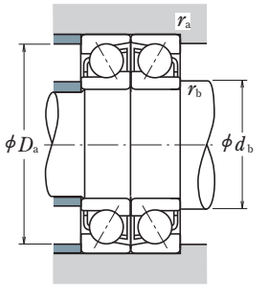
Face-to-Face
DF



Tandem
DT







Dynamic Equivalent Load $P = XF_r + YF_a$

Contact Angle	$if_0F_a^*/C_{0r}$	e	Single, DT				DB or DF			
			$F_a/F_r \leqq e$		$F_a/F_r > e$		$F_a/F_r \leqq e$		$F_a/F_r > e$	
			X	Y	X	Y	X	Y	X	Y
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

*For i, use 2 for DB and DF and 1 for DT

Static Equivalent Load $P_0 = X_0F_r + Y_0F_a$

Contact Angle	Single, DT		DB or DF	
	X_0	Y_0	X_0	Y_0
30°	0.5	0.33	1	0.66
40°	0.5	0.26	1	0.52

Single or DT mounting
When $F_r > 0.5F_r + Y_0F_a$ use $P_0 = F_r$

Boundary Dimensions (mm)					Basic Load Ratings (Single) (N)		Factor	Limiting Speeds (1) (min⁻¹)		Eff.Load Center (mm)	Abutment and Fillet Dimensions (mm)			Mass (kg)	Bearing Designations (2) Cage Designation (4)				Basic Load Ratings (Matched) (N)		Limiting Speeds (1) (Matched) (min⁻¹)		Load Center Spacings (mm)		Abutment and Fillet Dimensions (mm)		
d	D	B	r min.	r_1 min.	C_r	C_{0r}	f_0	Grease	Oil	a	d_a min.	D_a max.	r_a max.	approx.	Single	Standard	Option	Arrangement	C_r	C_{0r}	Grease	Oil	DB a_0	DF a_0	d_b(3) min.	D_b max.	r_b(3) max.
55	100	21	1.5	1	56 000	39 500	—	5 600	8 000	32.9	64	91	1.5	0.613	**7211 A**	**W**	**(M), T,TYN**	**DB DF DT**	91 500	79 000	4 500	6 300	65.7	23.7	61	94	1
	100	21	1.5	1	51 000	36 000	—	4 000	5 600	43.0	64	91	1.5	0.627	**7211 B**	**W**	**(M),T**	**DB DF DT**	83 000	72 000	3 400	4 500	86.0	44.0	61	94	1
	100	21	1.5	1	54 000	37 000	—	6 000	8 500	43.0	64	91	1.5	0.596	***7211 BEA**	**T85**	**MR, T7**	— — —	—	—	4 500	6 700	86.0	44.0	61	94	1
	120	29	2	1	94 500	61 500	—	4 000	5 600	39.8	65	110	2	1.41	**7311 A**	**W**	**(M), T**	**DB DF DT**	153 000	123 000	3 200	4 300	79.5	21.5	61	114	1
	120	29	2	1	93 500	58 500	—	5 000	7 500	51.2	65	110	2	1.36	***7311 BEA**	**T85**	**MR, T7**	— — —	—	—	4 000	6 000	102.4	44.4	61	114	1
	120	29	2	1	93 500	58 500	—	3 600	5 000	51.2	65	110	2	1.42	**7311 BEA**	**W**	**MR, T7**	**DB DF DT**	152 000	117 000	3 000	4 000	102.4	44.4	61	114	1
60	95	18	1.1	0.6	36 500	29 500	—	5 600	8 000	31.4	67	88	1	0.417	**7012 A**	**W**	**(M), T,TYN**	**DB DF DT**	59 000	59 000	4 500	6 300	62.7	26.7	65	90	0.6
	110	22	1.5	1	68 000	48 500	—	5 300	7 100	35.5	69	101	1.5	0.798	**7212 A**	**W**	**(M), T,TYN**	**DB DF DT**	110 000	97 500	4 300	6 000	71.1	27.1	66	104	1
	110	22	1.5	1	61 500	44 500	—	3 800	5 300	46.7	69	101	1.5	0.815	**7212 B**	**W**	**(M),T**	**DB DF DT**	100 000	89 000	3 000	4 000	93.3	49.3	66	104	1
	110	22	1.5	1	64 500	45 000	—	5 300	7 500	46.7	69	101	1.5	0.791	***7212 BEA**	**T85**	**MR, T7**	— — —	—	—	4 300	6 000	93.3	49.3	66	104	1
	130	31	2.1	1.1	108 000	71 500	—	3 800	5 000	42.9	72	118	2	1.74	**7312 A**	**W**	**(M), T**	**DB DF DT**	175 000	143 000	3 000	4 000	85.9	23.9	67	123	1
	130	31	2.1	1.1	107 000	68 500	—	4 800	6 700	55.4	72	118	2	1.70	***7312 BEA**	**T85**	**MR, T7**	— — —	—	—	3 800	5 600	110.7	48.7	67	123	1
	130	31	2.1	1.1	107 000	68 500	—	3 400	4 500	55.4	72	118	2	1.77	**7312 BEA**	**W**	**MR, T7**	**DB DF DT**	174 000	137 000	2 600	3 800	110.7	48.7	67	123	1
65	100	18	1.1	0.6	38 500	33 000	—	5 300	7 500	32.8	72	93	1	0.455	**7013 A**	**W**	**(M), T,TYN**	**DB DF DT**	62 000	65 500	4 300	6 000	65.6	29.6	70	95	0.6
	120	23	1.5	1	77 500	58 000	—	4 800	6 700	38.2	74	111	1.5	1.03	**7213 A**	**W**	**(M), T,TYN**	**DB DF DT**	126 000	116 000	3 800	5 300	76.4	30.4	71	114	1
	120	23	1.5	1	70 000	52 500	—	3 400	4 800	50.3	74	111	1.5	1.05	**7213 B**	**W**	**(M),T**	**DB DF DT**	114 000	105 000	2 800	3 800	100.6	54.6	71	114	1
	120	23	1.5	1	73 500	53 500	—	4 800	7 100	50.3	74	111	1.5	1.01	***7213 BEA**	**T85**	**MR, T7**	— — —	—	—	3 800	5 600	100.6	54.6	71	114	1
	140	33	2.1	1.1	122 000	82 000	—	3 600	4 800	46.1	77	128	2	2.12	**7313 A**	**W**	**(M), T**	**DB DF DT**	198 000	164 000	2 800	3 800	92.2	26.2	72	133	1
	140	33	2.1	1.1	119 000	77 000	—	4 300	6 300	59.5	77	128	2	2.09	***7313 BEA**	**T85**	**MR, T7**	— — —	—	—	3 600	5 000	119.0	53.0	72	133	1
	140	33	2.1	1.1	119 000	77 000	—	3 200	4 300	59.5	77	128	2	2.17	**7313 BEA**	**W**	**MR, T7**	**DB DF DT**	193 000	154 000	2 400	3 400	119.0	53.0	72	133	1

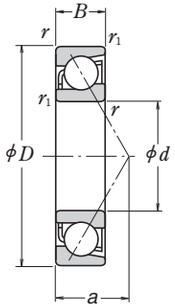
Notes (1) For applications operating near the limiting speed, refer to Page C077.
(2) Suffixes A and B represent contact angles of 30° and 40° respectively.
(3) Use the values of d_a (min) and r_a (max) for bearings with "—" in the d_b column.

Note (4) Cage designation (M) is usually omitted from the bearing designation.
Remark Bearings with an asterisk (*) are high-accuracy angular contact ball bearings. In arrangements, they are limited to SU universal matching types. See Page C073 for details.

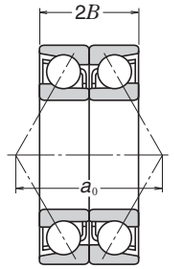
■ANGULAR CONTACT BALL BEARINGS

SINGLE/MATCHED MOUNTINGS

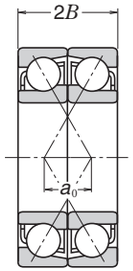
Bore Diameter 70 – 80 mm



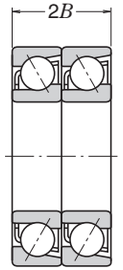
Single



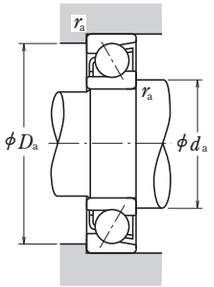
Back-to-Back
DB

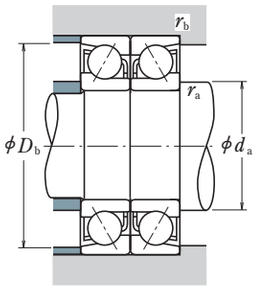


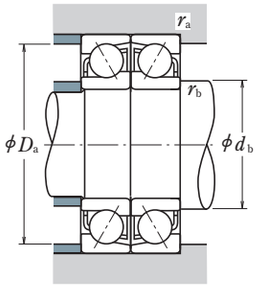
Face-to-Face
DF



Tandem
DT







Dynamic Equivalent Load $P = XF_r + YF_a$

Contact Angle	$if_0F_a^*/C_{0r}$	e	Single, DT				DB or DF			
			$F_a/F_r \leqq e$		$F_a/F_r > e$		$F_a/F_r \leqq e$		$F_a/F_r > e$	
			X	Y	X	Y	X	Y	X	Y
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

*For i, use 2 for DB and DF and 1 for DT

Static Equivalent Load $P_0 = X_0F_r + Y_0F_a$

Contact Angle	Single, DT		DB or DF		
	X_0	Y_0	X_0	Y_0	
30°	0.5	0.33	1	0.66	Single or DT mounting When $F_r > 0.5F_r + Y_0F_a$ use $P_0 = F_r$
40°	0.5	0.26	1	0.52	

Boundary Dimensions (mm)					Basic Load Ratings (Single) (N)		Factor	Limiting Speeds (1) (min⁻¹)		Eff.Load Center (mm)	Abutment and Fillet Dimensions (mm)			Mass (kg)	Bearing Designations (2) Cage Designation (4)				Basic Load Ratings (Matched) (N)		Limiting Speeds (1) (Matched) (min⁻¹)		Load Center Spacings (mm)		Abutment and Fillet Dimensions (mm)		
d	D	B	r min.	r_1 min.	C_r	C_{0r}	f_0	Grease	Oil	a	d_a min.	D_a max.	r_a max.	approx.	Single	Standard	Option	Arrangement	C_r	C_{0r}	Grease	Oil	DB a_0	DF a_0	d_b(3) min.	D_b max.	r_b(3) max.
70	110	20	1.1	0.6	48 500	41 500	—	5 000	6 700	36.0	77	103	1	0.625	**7014 A**	**W**	**(M), T,TYN**	**DB DF DT**	79 000	82 500	4 000	5 600	72.0	32.0	75	105	0.6
	125	24	1.5	1	84 000	63 500	—	4 500	6 300	40.1	79	116	1.5	1.11	**7214 A**	**W**	**(M), T,TYN**	**DB DF DT**	136 000	127 000	3 600	5 000	80.3	32.3	76	119	1
	125	24	1.5	1	76 000	58 000	—	3 200	4 500	52.9	79	116	1.5	1.14	**7214 B**	**W**	**(M),T**	**DB DF DT**	124 000	116 000	2 600	3 600	105.8	57.8	76	119	1
	125	24	1.5	1	79 500	58 500	—	4 500	6 700	52.9	79	116	1.5	1.08	***7214 BEA**	**T85**	**MR, T7**	— — —	—	—	3 600	5 300	105.8	57.8	76	119	1
	150	35	2.1	1.1	137 000	93 500	—	3 200	4 300	49.3	82	138	2	2.60	**7314 A**	**W**	**(M), T**	**DB DF DT**	223 000	187 000	2 600	3 400	98.5	28.5	77	143	1
	150	35	2.1	1.1	129 000	87 500	—	4 000	6 000	63.7	82	138	2	2.53	***7314 BEA**	**T85**	**MR, T7**	— — —	—	—	3 200	4 800	127.3	57.3	77	143	1
	150	35	2.1	1.1	129 000	87 500	—	2 800	4 000	63.6	82	138	2	2.62	**7314 BEA**	**W**	**MR, T7**	**DB DF DT**	210 000	175 000	2 400	3 200	127.3	57.3	77	143	1
75	115	20	1.1	0.6	49 500	43 500	—	4 800	6 300	37.4	82	108	1	0.661	**7015 A**	**W**	**(M), T,TYN**	**DB DF DT**	80 500	87 500	3 800	5 300	74.8	34.8	80	110	0.6
	130	25	1.5	1	83 500	64 500	—	4 300	6 000	42.1	84	121	1.5	1.19	**7215 A**	**W**	**(M), T,TYN**	**DB DF DT**	136 000	129 000	3 600	4 800	84.2	34.2	81	124	1
	130	25	1.5	1	75 500	58 500	—	3 200	4 300	55.5	84	121	1.5	1.22	**7215 B**	**W**	**(M),T**	**DB DF DT**	123 000	117 000	2 400	3 400	111.0	61.0	81	124	1
	130	25	1.5	1	82 500	63 500	—	4 300	6 300	55.5	84	121	1.5	1.18	***7215 BEA**	**T85**	**MR**	— — —	—	—	3 600	5 000	111.0	61.0	81	124	1
	160	37	2.1	1.1	149 000	106 000	—	3 000	4 000	52.4	87	148	2	3.13	**7315 A**	**W**	**(M), T**	**DB DF DT**	243 000	212 000	2 400	3 200	104.8	30.8	82	153	1
	160	37	2.1	1.1	140 000	98 500	—	3 800	5 600	67.8	87	148	2	3.03	***7315 BEA**	**T85**	**MR**	— — —	—	—	3 000	4 500	135.6	61.6	82	153	1
	160	37	2.1	1.1	140 000	98 500	—	2 800	3 800	67.8	87	148	2	3.13	**7315 BEA**	**W**	**MR, T7**	**DB DF DT**	228 000	197 000	2 200	3 000	135.6	61.6	82	153	1
80	125	22	1.1	0.6	60 500	53 000	—	4 300	6 000	40.6	87	118	1	0.880	**7016 A**	**W**	**(M), T,TYN**	**DB DF DT**	98 500	106 000	3 600	4 800	81.2	37.2	85	120	0.6
	140	26	2	1	98 000	76 000	—	4 000	5 600	44.8	90	130	2	1.46	**7216 A**	**W**	**(M), T,TYN**	**DB DF DT**	159 000	152 000	3 200	4 500	89.5	37.5	86	134	1
	140	26	2	1	88 500	69 500	—	2 800	4 000	59.1	90	130	2	1.49	**7216 B**	**W**	**(M),T**	**DB DF DT**	144 000	139 000	2 400	3 200	118.3	66.3	86	134	1
	140	26	2	1	92 000	70 000	—	4 000	6 000	59.2	90	130	2	1.42	***7216 BEA**	**T85**	**MR, T7**	— — —	—	—	3 200	4 800	118.3	66.3	86	134	1
	170	39	2.1	1.1	162 000	119 000	—	2 800	3 800	55.6	92	158	2	3.71	**7316 A**	**W**	**(M), T**	**DB DF DT**	263 000	238 000	2 200	3 000	111.2	33.2	87	163	1
	170	39	2.1	1.1	151 000	110 000	—	3 600	5 300	71.9	92	158	2	3.59	***7316 BEA**	**T85**	**MR, T7**	— — —	—	—	2 800	4 300	143.9	65.9	87	163	1
	170	39	2.1	1.1	151 000	110 000	—	2 600	3 400	71.9	92	158	2	3.84	**7316 BEA**	**W**	**MR, T7**	**DB DF DT**	246 000	220 000	2 000	2 800	143.9	65.9	87	163	1

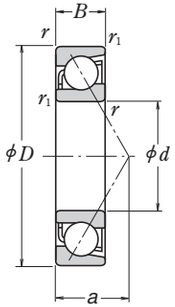
Notes (1) For applications operating near the limiting speed, refer to Page C077.
(2) Suffixes A and B represent contact angles of 30° and 40° respectively.
(3) Use the values of d_a (min) and r_a (max) for bearings with "—" in the d_b column.

Note (4) Cage designation (M) is usually omitted from the bearing designation.
Remark Bearings with an asterisk (*) are high-accuracy angular contact ball bearings. In arrangements, they are limited to SU universal matching types. See Page C073 for details.

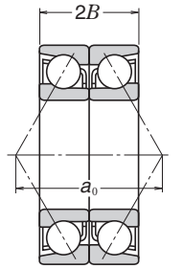
■ANGULAR CONTACT BALL BEARINGS

SINGLE/MATCHED MOUNTINGS

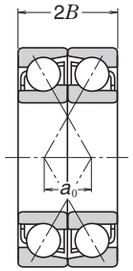
Bore Diameter 85 – 100 mm



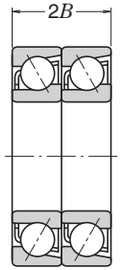
Single



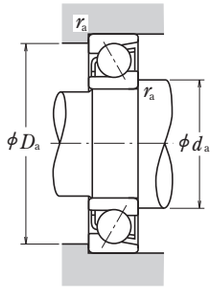
Back-to-Back
DB

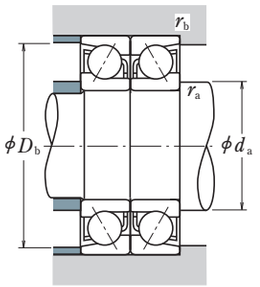


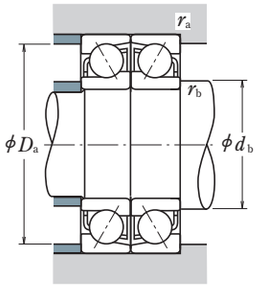
Face-to-Face
DF



Tandem
DT







Dynamic Equivalent Load $P = XF_r + YF_a$

Contact Angle	$if_0F_a^*/C_{0r}$	e	Single, DT				DB or DF			
			$F_a/F_r \leqq e$		$F_a/F_r > e$		$F_a/F_r \leqq e$		$F_a/F_r > e$	
			X	Y	X	Y	X	Y	X	Y
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

*For i, use 2 for DB and DF and 1 for DT

Static Equivalent Load $P_0 = X_0F_r + Y_0F_a$

Contact Angle	Single, DT		DB or DF	
	X_0	Y_0	X_0	Y_0
30°	0.5	0.33	1	0.66
40°	0.5	0.26	1	0.52

Single or DT mounting When $F_r > 0.5F_r + Y_0F_a$ use $P_0 = F_r$

Boundary Dimensions (mm)					Basic Load Ratings (Single) (N)		Factor	Limiting Speeds (1) (min⁻¹)		Eff.Load Center (mm)	Abutment and Fillet Dimensions (mm)			Mass (kg)	Bearing Designations (2) Cage Designation (4)				Arrangement			Basic Load Ratings (Matched) (N)		Limiting Speeds (1) (Matched) (min⁻¹)		Load Center Spacings (mm)		Abutment and Fillet Dimensions (mm)		
d	D	B	r min.	r_1 min.	C_r	C_{0r}	f_0	Grease	Oil	a	d_a min.	D_a max.	r_a max.	approx.	Single	Standard	Option					C_r	C_{0r}	Grease	Oil	DB	DF	d_b(3) min.	D_b max.	r_b(3) max.
85	130	22	1.1	0.6	62 000	56 000	—	4 300	5 600	42.0	92	123	1	0.913	**7017 A**	**W**	**(M), T,TYN**		**DB**	**DF**	**DT**	101 000	112 000	3 400	4 500	84.1	40.1	90	125	0.6
	150	28	2	1	113 000	89 000	—	3 800	5 300	47.9	95	140	2	1.83	**7217 A**	**W**	**(M), T,TYN**		**DB**	**DF**	**DT**	184 000	178 000	3 000	4 300	95.8	39.8	91	144	1
	150	28	2	1	102 000	81 000	—	2 800	3 800	63.3	95	140	2	1.87	**7217 B**	**W**	**(M), T**		**DB**	**DF**	**DT**	166 000	162 000	2 200	3 000	126.6	70.6	91	144	1
	150	28	2	1	106 000	81 500	—	3 800	5 600	63.3	95	140	2	1.75	**7217 BEA**	**T85**	**—**		—	—	—	—	—	3 200	4 500	126.6	70.6	91	144	1
	180	41	3	1.1	175 000	133 000	—	2 600	3 600	58.8	99	166	2.5	4.33	**7317 A**	**W**	**(M), T**		**DB**	**DF**	**DT**	284 000	265 000	2 200	2 800	117.5	35.5	92	173	1
	180	41	3	1.1	160 000	122 000	—	2 400	3 200	76.1	99	166	2.5	4.42	**7317 B**	**W**	**(M), T**		**DB**	**DF**	**DT**	260 000	244 000	1 900	2 600	152.2	70.2	92	173	1
	180	41	3	1.1	172 000	133 000	—	3 400	5 000	76.1	99	166	2.5	4.34	**7317 BEA**	**T85**	**MR, T7**		—	—	—	—	—	2 800	4 000	152.2	70.2	92	173	1
90	140	24	1.5	1	74 000	66 500	—	3 800	5 300	45.2	99	131	1.5	1.19	**7018 A**	**W**	**(M), T,TYN**		**DB**	**DF**	**DT**	120 000	133 000	3 200	4 300	90.4	42.4	96	134	1
	160	30	2	1	130 000	103 000	—	3 600	4 800	51.1	100	150	2	2.25	**7218 A**	**W**	**(M), T,TYN**		**DB**	**DF**	**DT**	210 000	206 000	2 800	4 000	102.2	42.2	96	154	1
	160	30	2	1	117 000	94 000	—	2 600	3 400	67.4	100	150	2	2.29	**7218 B**	**W**	**(M), T**		**DB**	**DF**	**DT**	191 000	188 000	2 000	2 800	134.9	74.9	96	154	1
	160	30	2	1	120 000	93 500	—	3 600	5 300	67.4	100	150	2	2.19	**7218 BEA**	**T85**	**MR**		—	—	—	—	—	3 000	4 300	134.9	74.9	96	154	1
	190	43	3	1.1	188 000	147 000	—	2 600	3 400	61.9	104	176	2.5	5.06	**7318 A**	**W**	**(M), T**		**DB**	**DF**	**DT**	305 000	294 000	2 000	2 800	123.8	37.8	97	183	1
	190	43	3	1.1	172 000	135 000	—	2 200	3 000	80.2	104	176	2.5	5.17	**7318 B**	**W**	**(M), T**		**DB**	**DF**	**DT**	279 000	270 000	1 800	2 400	160.5	74.5	97	183	1
	190	43	3	1.1	186 000	146 000	—	3 200	4 500	80.2	104	176	2.5	4.97	**7318 BEA**	**T85**	**MR**		—	—	—	—	—	2 600	3 600	160.5	74.5	97	183	1
95	145	24	1.5	1	73 500	67 000	—	4 500	6 300	46.6	104	136	1.5	1.43	**7019 A**	**(M)**	**T,TYN**		**DB**	**DF**	**DT**	119 000	134 000	3 800	5 000	93.3	45.3	—	139	1
	170	32	2.1	1.1	141 000	111 000	—	3 400	4 500	54.2	107	158	2	2.68	**7219 A**	**W**	**(M), T,TYN**		**DB**	**DF**	**DT**	228 000	221 000	2 600	3 600	108.5	44.5	102	163	1
	170	32	2.1	1.1	127 000	101 000	—	2 400	3 200	71.6	107	158	2	2.74	**7219 B**	**W**	**(M), T**		**DB**	**DF**	**DT**	207 000	202 000	1 900	2 600	143.2	79.2	102	163	1
	170	32	2.1	1.1	136 000	107 000	—	3 400	5 000	71.6	107	158	2	2.67	**7219 BEA**	**T85**	**MR, T7**		—	—	—	—	—	2 800	4 000	143.2	79.2	102	163	1
	200	45	3	1.1	201 000	162 000	—	2 400	3 200	65.1	109	186	2.5	5.83	**7319 A**	**W**	**(M), T**		**DB**	**DF**	**DT**	325 000	325 000	1 900	2 600	130.2	40.2	102	193	1
	200	45	3	1.1	184 000	149 000	—	2 200	3 000	84.3	109	186	2.5	5.98	**7319 B**	**W**	**(M), T**		**DB**	**DF**	**DT**	299 000	298 000	1 700	2 400	168.7	78.7	102	193	1
	200	45	3	1.1	198 000	160 000	—	3 000	4 500	84.3	109	186	2.5	5.82	**7319 BEA**	**T85**	**MR**		—	—	—	—	—	2 400	3 600	168.7	78.7	102	193	1
100	150	24	1.5	1	75 000	70 500	—	4 500	6 000	48.1	109	141	1.5	1.48	**7020 A**	**(M)**	**T,TYN**		**DB**	**DF**	**DT**	122 000	141 000	3 600	5 000	96.2	48.2	—	144	1

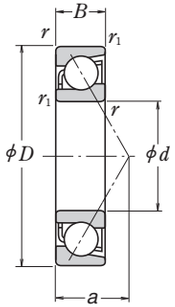
Notes (1) For applications operating near the limiting speed, refer to Page C077.
(2) Suffixes A and B represent contact angles of 30° and 40° respectively.
(3) Use the values of d_a (min) and r_a (max) for bearings with "—" in the d_b column.

Note (4) Cage designation (M) is usually omitted from the bearing designation.

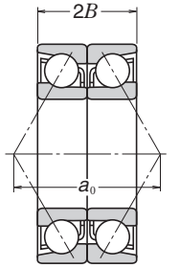
ANGULAR CONTACT BALL BEARINGS

SINGLE/MATCHED MOUNTINGS

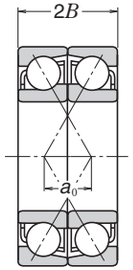
Bore Diameter 100 – 120 mm



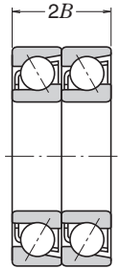
Single



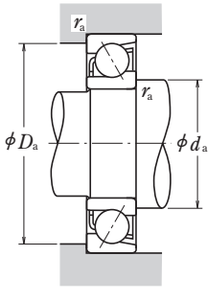
Back-to-Back
DB

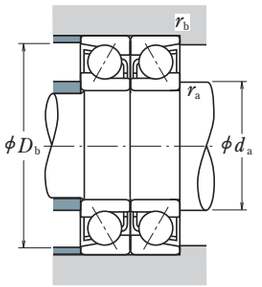


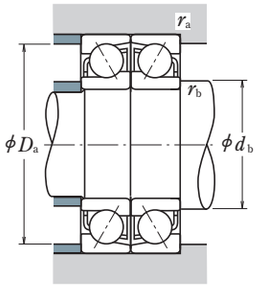
Face-to-Face
DF



Tandem
DT







Dynamic Equivalent Load $P = XF_r + YF_a$

Contact Angle	$if_0F_a^*/C_{0r}$	e	Single, DT				DB or DF			
			$F_a/F_r \leqq e$		$F_a/F_r > e$		$F_a/F_r \leqq e$		$F_a/F_r > e$	
			X	Y	X	Y	X	Y	X	Y
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

*For i, use 2 for DB and DF and 1 for DT

Static Equivalent Load $P_0 = X_0F_r + Y_0F_a$

Contact Angle	Single, DT		DB or DF		
	X_0	Y_0	X_0	Y_0	
30°	0.5	0.33	1	0.66	Single or DT mounting When $F_r > 0.5F_r + Y_0F_a$ use $P_0 = F_r$
40°	0.5	0.26	1	0.52	

Boundary Dimensions (mm)					Basic Load Ratings (Single) (N)		Factor	Limiting Speeds (1) (min^{-1})		Eff.Load Center (mm)	Abutment and Fillet Dimensions (mm)			Mass (kg)	Bearing Designations (2) Cage Designation (4)				Basic Load Ratings (Matched) (N)		Limiting Speeds (1) (Matched) (min^{-1})		Load Center Spacings (mm)		Abutment and Fillet Dimensions (mm)		
d	D	B	r min.	r_1 min.	C_r	C_{0r}	f_0	Grease	Oil	a	d_a min.	D_a max.	r_a max.	approx.	Single	Standard	Option	Arrangement	C_r	C_{0r}	Grease	Oil	DB	DF	d_b (3) min.	D_b max.	r_b (3) max.
100	180	34	2.1	1.1	158 000	126 000	—	3 200	4 300	57.4	112	168	2	3.22	**7220 A**	**W**	**(M), T,TYN**	**DB DF DT**	257 000	251 000	2 600	3 400	114.8	46.8	107	173	1
	180	34	2.1	1.1	143 000	114 000	—	2 200	3 000	75.7	112	168	2	3.28	**7220 B**	**W**	**(M), T**	**DB DF DT**	233 000	229 000	1 800	2 400	151.5	83.5	107	173	1
	180	34	2.1	1.1	150 000	122 000	—	3 200	4 500	75.7	112	168	2	3.27	**7220 BEA**	**T85**	**MR**	— — —	—	—	2 600	3 600	151.5	83.5	107	173	1
	215	47	3	1.1	228 000	193 000	—	2 200	3 000	69.0	114	201	2.5	7.29	**7320 A**	**W**	**(M), T**	**DB DF DT**	370 000	385 000	1 800	2 400	137.9	43.9	107	208	1
	215	47	3	1.1	209 000	178 000	—	2 000	2 800	89.6	114	201	2.5	7.43	**7320 B**	**W**	**(M), T**	**DB DF DT**	340 000	355 000	1 600	2 200	179.2	85.2	107	208	1
	215	47	3	1.1	222 000	187 000	—	2 800	4 000	89.6	114	201	2.5	7.14	**7320 BEA**	**T85**	**MR, T7**	— — —	—	—	2 200	3 200	179.2	85.2	107	208	1
105	160	26	2	1	88 000	81 500	—	4 300	5 600	51.2	115	150	2	1.84	**7021 A**	**(M)**	**T,TYN**	**DB DF DT**	143 000	163 000	3 400	4 500	102.5	50.5	—	154	1
	190	36	2.1	1.1	172 000	142 000	—	3 000	4 000	60.6	117	178	2	3.84	**7221 A**	**W**	**(M), T**	**DB DF DT**	280 000	283 000	2 400	3 400	121.2	49.2	112	183	1
	190	36	2.1	1.1	156 000	129 000	—	2 200	3 000	79.9	117	178	2	3.92	**7221 B**	**W**	**(M), T**	**DB DF DT**	254 000	258 000	1 700	2 400	159.8	87.8	112	183	1
	190	36	2.1	1.1	162 000	133 000	—	3 000	4 500	79.9	117	178	2	3.69	**7221 BEA**	**T85**	—	— — —	—	—	2 400	3 600	159.8	87.8	112	183	1
	225	49	3	1.1	228 000	193 000	—	2 600	3 600	72.1	119	211	2.5	9.34	**7321 A**	**(M)**	**T**	**DB DF DT**	370 000	385 000	2 200	2 800	144.3	46.3	—	218	1
	225	49	3	1.1	210 000	177 000	—	2 400	3 200	93.7	119	211	2.5	9.43	**7321 B**	**(M)**	**T**	**DB DF DT**	340 000	355 000	1 900	2 600	187.4	89.4	—	218	1
	225	49	3	1.1	235 000	203 000	—	2 600	4 000	93.7	119	211	2.5	8.12	**7321 BEA**	**T85**	**T7**	— — —	—	—	2 200	3 200	187.4	89.4	—	218	1
110	170	28	2	1	106 000	95 500	—	4 000	5 300	54.4	120	160	2	2.28	**7022 A**	**(M)**	**T,TYN**	**DB DF DT**	173 000	191 000	3 200	4 300	108.8	52.8	—	164	1
	200	38	2.1	1.1	187 000	158 000	—	2 800	3 800	63.7	122	188	2	4.49	**7222 A**	**W**	**(M), T,TYN**	**DB DF DT**	305 000	315 000	2 200	3 200	127.5	51.5	117	193	1
	200	38	2.1	1.1	169 000	144 000	—	2 000	2 800	84.0	122	188	2	4.58	**7222 B**	**W**	**(M), T**	**DB DF DT**	275 000	289 000	1 600	2 200	168.1	92.1	117	193	1
	200	38	2.1	1.1	169 000	144 000	—	2 800	4 300	84.0	122	188	2	4.48	**7222 BEA**	**T85**	**MR**	— — —	—	—	2 400	3 400	168.1	92.1	117	193	1
	240	50	3	1.1	242 000	215 000	—	2 600	3 400	75.5	124	226	2.5	11.1	**7322 A**	**(M)**	**W,T**	**DB DF DT**	395 000	430 000	2 000	2 600	151.0	51.0	—	233	1
	240	50	3	1.1	222 000	197 000	—	2 200	3 000	98.4	124	226	2.5	11.2	**7322 B**	**(M)**	**W,T**	**DB DF DT**	360 000	395 000	1 800	2 400	196.8	96.8	—	233	1
	240	50	3	1.1	249 000	226 000	—	2 600	3 800	98.4	124	226	2.5	9.91	**7322 BEA**	**T85**	**MR**	— — —	—	—	2 000	3 000	196.8	96.8	—	233	1
120	180	28	2	1	112 000	107 000	—	3 600	5 000	57.3	130	170	2	2.45	**7024 A**	**(M)**	**T,TYN**	**DB DF DT**	182 000	213 000	3 000	4 000	114.6	58.6	—	174	1
	215	40	2.1	1.1	201 000	177 000	—	3 200	4 500	68.3	132	203	2	6.22	**7224 A**	**(M)**	**T**	**DB DF DT**	325 000	355 000	2 600	3 600	136.7	56.7	—	208	1
	215	40	2.1	1.1	182 000	162 000	—	2 400	3 200	90.3	132	203	2	6.26	**7224 B**	**(M)**	**T**	**DB DF DT**	296 000	325 000	1 900	2 600	180.5	100.5	—	208	1
	215	40	2.1	1.1	197 000	177 000	—	2 600	3 800	90.3	132	203	2	5.37	**7224 BEA**	**T85**	**MR, T7**	— — —	—	—	2 200	3 000	180.5	100.5	—	208	1
	260	55	3	1.1	271 000	252 000	—	2 200	3 000	82.3	134	246	2.5	14.5	**7324 A**	**(M)**	**T**	**DB DF DT**	440 000	505 000	1 800	2 400	164.7	54.7	—	253	1
	260	55	3	1.1	248 000	231 000	—	2 000	2 800	107.2	134	246	2.5	14.4	**7324 B**	**(M)**	**T**	**DB DF DT**	400 000	460 000	1 600	2 200	214.4	104.4	—	253	1
	260	55	3	1.1	261 000	250 000	—	2 200	3 400	107.2	134	246	2.5	12.8	**7324 BEA**	**T85**	**MR**	— — —	—	—	1 900	2 800	214.4	104.4	—	253	1

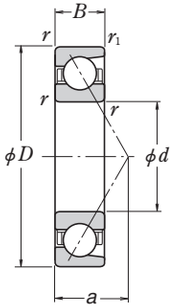
Notes (1) For applications operating near the limiting speed, refer to Page C077.
(2) Suffixes A and B represent contact angles of 30° and 40° respectively.
(3) Use the values of d_a (min) and r_a (max) for bearings with "—" in the d_b column.

Note (4) Cage designation (M) is usually omitted from the bearing designation.

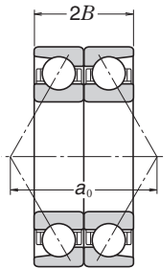
ANGULAR CONTACT BALL BEARINGS

SINGLE/MATCHED MOUNTINGS

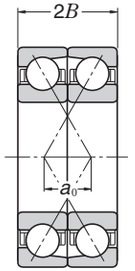
Bore Diameter 130 – 170 mm



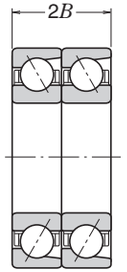
Single



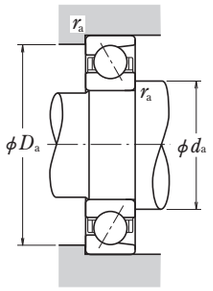
Back-to-Back
DB

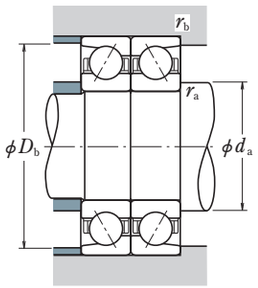


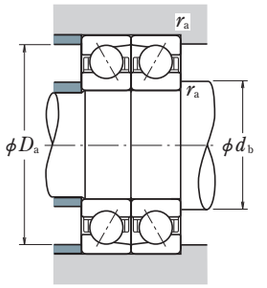
Face-to-Face
DF



Tandem
DT







Dynamic Equivalent Load $P = XF_r + YF_a$

Contact Angle	$if_0F_a^*/C_{or}$	e	Single, DT				DB or DF			
			$F_a/F_r \leqq e$		$F_a/F_r > e$		$F_a/F_r \leqq e$		$F_a/F_r > e$	
			X	Y	X	Y	X	Y	X	Y
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

*For i, use 2 for DB and DF and 1 for DT

Static Equivalent Load $P_0 = X_0F_r + Y_0F_a$

Contact Angle	Single, DT		DB or DF	
	X_0	Y_0	X_0	Y_0
30°	0.5	0.33	1	0.66
40°	0.5	0.26	1	0.52

Single or DT mounting
When $F_r > 0.5F_r + Y_0F_a$ use $P_0 = F_r$

Boundary Dimensions (mm)					Basic Load Ratings (Single) (N)		Factor	Limiting Speeds (1) (min⁻¹)		Eff.Load Center (mm)	Abutment and Fillet Dimensions (mm)			Mass (kg)	Bearing Designations (2) Cage Designation (4)			Arrangement			Basic Load Ratings (Matched) (N)		Limiting Speeds (1) (Matched) (min⁻¹)		Load Center Spacings (mm)		Abutment and Fillet Dimensions (mm)		
d	D	B	r min.	r_1 min.	C_r	C_{0r}	f_0	Grease	Oil	a	d_a min.	D_a max.	r_a max.	approx.	Single	Standard	Option				C_r	C_{0r}	Grease	Oil	DB	DF	d_b (3) min.	D_b max.	r_b (3) max.
130	200	33	2	1	129 000	125 000	—	3 400	4 500	64.1	140	190	2	3.68	**7026 A**	(M)	**T,TYN**	**DB**	**DF**	**DT**	210 000	251 000	2 600	3 600	128.3	62.3	—	194	1
	230	40	3	1.1	208 000	193 000	—	2 400	3 200	72.0	144	216	2.5	7.06	**7226 A**	(M)	**T**	**DB**	**DF**	**DT**	340 000	385 000	1 900	2 600	143.9	63.9	—	223	1
	230	40	3	1.1	188 000	175 000	—	2 200	3 000	95.5	144	216	2.5	7.10	**7226 B**	(M)	**T**	**DB**	**DF**	**DT**	305 000	350 000	1 700	2 400	191.0	111.0	—	223	1
	280	58	4	1.5	300 000	293 000	—	2 200	2 800	88.2	148	262	3	17.5	**7326 A**	(M)	**T**	**DB**	**DF**	**DT**	490 000	585 000	1 700	2 200	176.3	60.3	—	271	1.5
	280	58	4	1.5	275 000	268 000	—	1 900	2 600	115.0	148	262	3	17.6	**7326 B**	(M)	**T**	**DB**	**DF**	**DT**	445 000	535 000	1 500	2 000	230.0	114.0	—	271	1.5
140	210	33	2	1	132 000	133 000	—	3 200	4 300	67.0	150	200	2	3.90	**7028 A**	(M)	**T**	**DB**	**DF**	**DT**	214 000	265 000	2 600	3 400	134.0	68.0	—	204	1
	250	42	3	1.1	240 000	234 000	—	2 200	3 000	77.3	154	236	2.5	8.92	**7228 A**	(M)	**T**	**DB**	**DF**	**DT**	390 000	470 000	1 800	2 400	154.6	70.6	—	243	1
	250	42	3	1.1	217 000	213 000	—	2 000	2 800	102.8	154	236	2.5	8.94	**7228 B**	(M)	**T**	**DB**	**DF**	**DT**	355 000	425 000	1 600	2 200	205.6	121.6	—	243	1
	300	62	4	1.5	330 000	335 000	—	2 000	2 600	94.5	158	282	3	21.4	**7328 A**	(M)	**T**	**DB**	**DF**	**DT**	540 000	670 000	1 600	2 000	189.0	65.0	—	291	1.5
	300	62	4	1.5	305 000	310 000	—	1 700	2 400	123.3	158	282	3	21.6	**7328 B**	(M)	**T**	**DB**	**DF**	**DT**	490 000	615 000	1 400	1 900	246.6	122.6	—	291	1.5
150	225	35	2.1	1.1	151 000	154 000	—	2 400	3 000	71.6	162	213	2	4.75	**7030 A**	(M)	**T**	**DB**	**DF**	**DT**	245 000	305 000	1 900	2 400	143.3	73.3	—	218	1
	270	45	3	1.1	273 000	280 000	—	2 000	2 800	83.1	164	256	2.5	11.2	**7230 A**	(M)	—	**DB**	**DF**	**DT**	445 000	560 000	1 600	2 200	166.3	76.3	—	263	1
	270	45	3	1.1	247 000	254 000	—	1 800	2 600	110.6	164	256	2.5	11.2	**7230 B**	(M)	**T**	**DB**	**DF**	**DT**	400 000	510 000	1 500	2 000	221.2	131.2	—	263	1
	320	65	4	1.5	350 000	370 000	—	1 800	2 400	100.3	168	302	3	26.0	**7330 A**	(M)	—	**DB**	**DF**	**DT**	565 000	745 000	1 500	1 900	200.7	70.7	—	311	1.5
	320	65	4	1.5	320 000	340 000	—	1 600	2 200	131.1	168	302	3	25.9	**7330 B**	(M)	**T**	**DB**	**DF**	**DT**	515 000	680 000	1 300	1 800	262.2	132.2	—	311	1.5
160	240	38	2.1	1.1	171 000	176 000	—	2 200	2 800	76.7	172	228	2	5.77	**7032 A**	(M)	**T**	**DB**	**DF**	**DT**	277 000	355 000	1 700	2 400	153.5	77.5	—	233	1
	290	48	3	1.1	289 000	305 000	—	1 900	2 600	89.0	174	276	2.5	14.1	**7232 A**	(M)	**T**	**DB**	**DF**	**DT**	470 000	615 000	1 500	2 000	177.9	81.9	—	283	1
	290	48	3	1.1	261 000	279 000	—	1 700	2 400	118.4	174	276	2.5	14.2	**7232 B**	(M)	—	**DB**	**DF**	**DT**	425 000	555 000	1 400	1 900	236.8	140.8	—	283	1
	340	68	4	1.5	380 000	420 000	—	1 700	2 200	106.2	178	322	3	30.7	**7332 A**	(M)	**T**	**DB**	**DF**	**DT**	620 000	845 000	1 400	1 800	212.3	76.3	—	331	1.5
	340	68	4	1.5	350 000	385 000	—	1 500	2 000	138.9	178	322	3	30.8	**7332 B**	(M)	**T**	**DB**	**DF**	**DT**	565 000	770 000	1 200	1 700	277.8	141.8	—	331	1.5
170	260	42	2.1	1.1	204 000	214 000	—	2 000	2 600	83.1	182	248	2	7.90	**7034 A**	(M)	—	**DB**	**DF**	**DT**	330 000	430 000	1 600	2 200	166.1	82.1	—	253	1
	310	52	4	1.5	325 000	360 000	—	1 800	2 400	95.3	188	292	3	17.3	**7234 A**	(M)	—	**DB**	**DF**	**DT**	525 000	715 000	1 400	1 900	190.6	86.6	—	301	1.5
	310	52	4	1.5	293 000	325 000	—	1 600	2 200	126.7	188	292	3	17.6	**7234 B**	(M)	—	**DB**	**DF**	**DT**	475 000	650 000	1 300	1 700	253.4	149.4	—	301	1.5
	360	72	4	1.5	425 000	485 000	—	1 600	2 200	112.5	188	342	3	35.8	**7334 A**	(M)	—	**DB**	**DF**	**DT**	695 000	970 000	1 300	1 700	225.0	81.0	—	351	1.5
	360	72	4	1.5	390 000	445 000	—	1 400	2 000	147.2	188	342	3	35.6	**7334 B**	(M)	**T**	**DB**	**DF**	**DT**	635 000	890 000	1 100	1 600	294.3	150.3	—	351	1.5

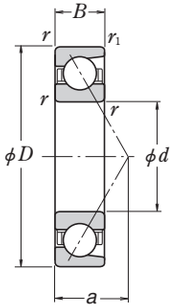
Notes (1) For applications operating near the limiting speed, refer to Page C077.
(2) Suffixes A and B represent contact angles of 30° and 40° respectively.
(3) Use the values of d_a (min) and r_a (max) for bearings with "—" in the d_b column.

Note (4) Cage designation (M) is usually omitted from the bearing designation.

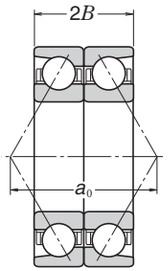
■ANGULAR CONTACT BALL BEARINGS

SINGLE/MATCHED MOUNTINGS

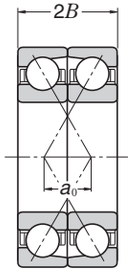
Bore Diameter 180 – 200 mm



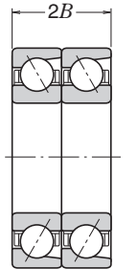
Single



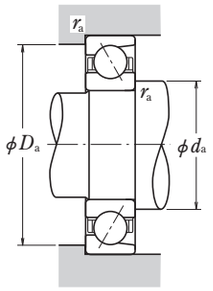
Back-to-Back
DB

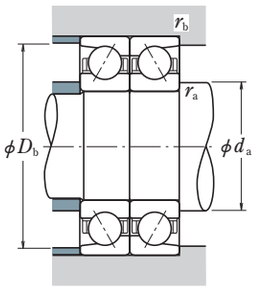


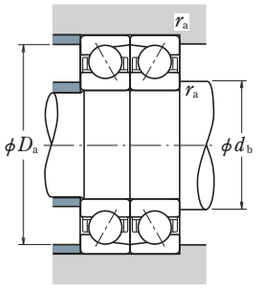
Face-to-Face
DF



Tandem
DT







Dynamic Equivalent Load $P = XF_r + YF_a$

Contact Angle	$if_0F_a^*/C_{0r}$	e	Single, DT				DB or DF			
			$F_a/F_r \leqq e$		$F_a/F_r > e$		$F_a/F_r \leqq e$		$F_a/F_r > e$	
			X	Y	X	Y	X	Y	X	Y
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

*For i, use 2 for DB and DF and 1 for DT

Static Equivalent Load $P_0 = X_0F_r + Y_0F_a$

Contact Angle	Single, DT		DB or DF	
	X_0	Y_0	X_0	Y_0
30°	0.5	0.33	1	0.66
40°	0.5	0.26	1	0.52

Single or DT mounting
When $F_r > 0.5F_r + Y_0F_a$ use $P_0 = F_r$

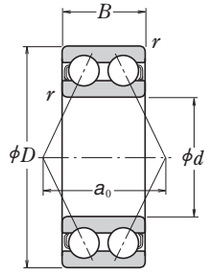
Boundary Dimensions (mm)					Basic Load Ratings (Single) (N)		Factor	Limiting Speeds (1) (min^{-1})		Eff.Load Center (mm)	Abutment and Fillet Dimensions (mm)			Mass (kg)	Bearing Designations (2) Cage Designation (4)				Basic Load Ratings (Matched) (N)		Limiting Speeds (1) (Matched) (min^{-1})		Load Center Spacings (mm)		Abutment and Fillet Dimensions (mm)		
d	D	B	r min.	r_1 min.	C_r	C_{0r}	f_0	Grease	Oil	a	d_a min.	D_a max.	r_a max.	approx.	Single	Standard	Option	Arrangement	C_r	C_{0r}	Grease	Oil	DB a_0	DF a_0	d_b (3) min.	D_b max.	r_b (3) max.
180	280	46	2.1	1.1	228 000	252 000	—	1 900	2 400	89.4	192	268	2	10.5	**7036 A**	**(M)**	—	**DB DF DT**	370 000	505 000	1 500	2 000	178.8	86.8	—	273	1
	320	52	4	1.5	335 000	385 000	—	1 700	2 200	98.2	198	302	3	18.1	**7236 A**	**(M)**	—	**DB DF DT**	545 000	770 000	1 400	1 800	196.3	92.3	—	311	1.5
	320	52	4	1.5	305 000	350 000	—	1 500	2 000	130.9	198	302	3	18.4	**7236 B**	**(M)**	—	**DB DF DT**	495 000	700 000	1 200	1 700	261.8	157.8	—	311	1.5
	380	75	4	1.5	450 000	535 000	—	1 500	2 000	118.3	198	362	3	42.1	**7336 A**	**(M)**	—	**DB DF DT**	730 000	1 070 000	1 200	1 600	236.6	86.6	—	371	1.5
	380	75	4	1.5	410 000	490 000	—	1 300	1 800	155.0	198	362	3	42.6	**7336 B**	**(M)**	—	**DB DF DT**	665 000	975 000	1 100	1 500	309.9	159.9	—	371	1.5
190	290	46	2.1	1.1	246 000	280 000	—	1 800	2 400	92.3	202	278	2	11.3	**7038 A**	**(M)**	—	**DB DF DT**	400 000	560 000	1 400	1 900	184.6	92.6	—	283	1
	340	55	4	1.5	345 000	410 000	—	1 600	2 200	104.0	208	322	3	22.4	**7238 A**	**(M)**	—	**DB DF DT**	565 000	825 000	1 300	1 700	208.0	98.0	—	331	1.5
	340	55	4	1.5	310 000	375 000	—	1 400	2 000	138.7	208	322	3	22.5	**7238 B**	**(M)**	—	**DB DF DT**	505 000	750 000	1 100	1 600	277.3	167.3	—	331	1.5
	400	78	5	2	495 000	600 000	—	1 400	1 900	124.2	212	378	4	47.5	**7338 A**	**(M)**	**T**	**DB DF DT**	805 000	1 200 000	1 100	1 500	248.3	92.3	—	390	2
	400	78	5	2	455 000	550 000	—	1 300	1 700	162.8	212	378	4	47.2	**7338 B**	**(M)**	—	**DB DF DT**	735 000	1 100 000	1 000	1 400	325.5	169.5	—	390	2
200	310	51	2.1	1.1	264 000	310 000	—	1 700	2 200	99.1	212	298	2	13.7	**7040 A**	**(M)**	**T**	**DB DF DT**	430 000	620 000	1 300	1 800	198.2	96.2	—	303	1
	360	58	4	1.5	370 000	450 000	—	1 500	2 000	109.8	218	342	3	26.5	**7240 A**	**(M)**	—	**DB DF DT**	605 000	900 000	1 200	1 600	219.6	103.6	—	351	1.5
	360	58	4	1.5	335 000	410 000	—	1 300	1 800	146.5	218	342	3	26.6	**7240 B**	**(M)**	—	**DB DF DT**	545 000	815 000	1 100	1 500	292.9	176.9	—	351	1.5
	420	80	5	2	520 000	660 000	—	1 300	1 800	129.5	222	398	4	54.4	**7340 A**	**(M)**	**T**	**DB DF DT**	850 000	1 320 000	1 100	1 400	259.0	99.0	—	410	2
	420	80	5	2	475 000	600 000	—	1 200	1 600	170.1	222	398	4	55.3	**7340 B**	**(M)**	—	**DB DF DT**	775 000	1 200 000	950	1 300	340.1	180.1	—	410	2

Notes (1) For applications operating near the limiting speed, refer to Page C077.
(2) Suffixes A and B represent contact angles of 30° and 40° respectively.
(3) Use the values of d_a (min) and r_a (max) for bearings with "—" in the d_b column.

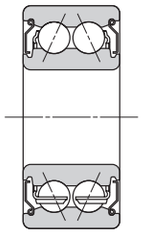
Note (4) Cage designation (M) is usually omitted from the bearing designation.

DOUBLE-ROW ANGULAR CONTACT BALL BEARINGS

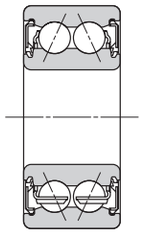
Bore Diameter 10 – 45 mm



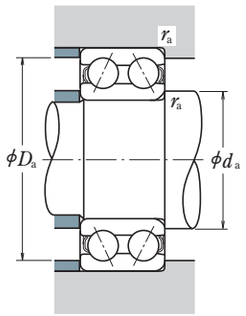
Open



Shielded (ZZ)



Sealed (DDU)



Dynamic Equivalent Load

$P = XF_r + YF_a$

$F_a/F_r \leqq e$		$F_a/F_r > e$		e
X	Y	X	Y	
1	0.92	0.67	1.41	0.68

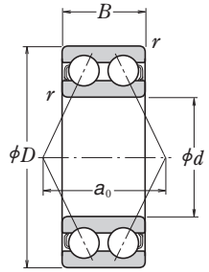
Static Equivalent Load

$P_0 = F_r + 0.76\,F_a$

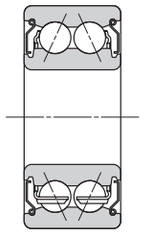
Boundary Dimensions (mm)				Basic Load Ratings (N)		Limiting Speeds (min^{-1}) Grease		Oil	Bearing Designations			Load Center Spacings (mm)	Abutment and Fillet Dimensions (mm)			Mass (kg)
d	D	B	r min.	C_r	C_{0r}	Open ZZ	DDU	Open	Open	Shielded	Sealed	a_0	d_a min.	D_a max.	r_a max.	approx.
10	30	14.3	0.6	7 850	3 900	17 000	—	22 000	**5200**	—	—	14.5	15	25	0.6	0.050
	30	14.3	0.6	7 850	3 900	17 000	15 000	—	—	**5200ZZ**	**5200DDU**	14.5	14	26	0.6	0.050
12	32	15.9	0.6	11 600	5 800	15 000	—	20 000	**5201**	—	—	16.7	17	27	0.6	0.060
	32	15.9	0.6	9 350	5 300	15 000	12 000	—	—	**5201BZZ**	**5201BDDU**	16.3	16	28	0.6	0.060
15	35	15.9	0.6	12 900	7 050	13 000	—	17 000	**5202**	—	—	18.3	20	30	0.6	0.070
	35	15.9	0.6	9 350	5 300	13 000	12 000	—	—	**5202BZZ**	**5202BDDU**	16.3	19	31	0.6	0.070
	42	19	1	19 400	10 200	11 000	—	15 000	**5302**	—	—	22	21	36	1	0.13
	42	19	1	16 100	9 100	11 000	10 000	—	—	**5302AZZ**	**5302ADDU**	21	21	36	1	0.13
17	40	17.5	0.6	16 100	9 050	11 000	—	15 000	**5203**	—	—	20.8	22	35	0.6	0.10
	40	17.5	0.6	14 000	8 300	11 000	10 000	—	—	**5203AZZ**	**5203ADDU**	20.1	21	36	0.6	0.10
	47	22.2	1	23 100	12 600	10 000	—	13 000	**5303**	—	—	25	23	41	1	0.18
	47	22.2	1	21 600	12 400	10 000	9 500	—	—	**5303AZZ**	**5303ADDU**	24.3	23	41	1	0.18
20	47	20.6	1	21 600	12 400	10 000	—	13 000	**5204**	—	—	24.3	26	41	1	0.16
	47	20.6	1	17 500	10 700	10 000	9 000	—	—	**5204AZZ**	**5204ADDU**	23	26	41	1	0.16
	52	22.2	1.1	27 100	15 000	9 000	—	12 000	**5304**	—	—	26.7	27	45	1	0.22
	52	22.2	1.1	21 600	12 800	9 000	8 500	—	—	**5304AZZ**	**5304ADDU**	25.4	27	45	1	0.22
25	52	20.6	1	23 400	14 700	8 500	—	11 000	**5205**	—	—	26.8	31	46	1	0.18
	52	20.6	1	18 600	12 300	8 500	7 500	—	—	**5205BZZ**	**5205BDDU**	25.4	31	46	1	0.18
	62	25.4	1.1	36 000	20 700	7 500	—	10 000	**5305**	—	—	31.8	32	55	1	0.35
	62	25.4	1.1	27 800	18 200	7 500	6 300	—	—	**5305AZZ**	**5305ADDU**	30.9	32	55	1	0.36
30	62	23.8	1	32 500	21 100	7 100	—	9 500	**5206**	—	—	31.6	36	56	1	0.30
	62	23.8	1	27 800	18 200	7 100	6 300	—	—	**5206BZZ**	**5206BDDU**	30.9	36	56	1	0.30
	72	30.2	1.1	45 000	28 100	6 300	—	8 500	**5306**	—	—	36.5	37	65	1	0.57
	72	30.2	1.1	43 000	28 700	6 300	5 300	—	—	**5306AZZ**	**5306ADDU**	36.6	37	65	1	0.57
35	72	27	1.1	43 000	28 700	6 300	—	8 000	**5207**	—	—	36.6	42	65	1	0.46
	72	27	1.1	37 500	25 300	6 300	5 300	—	—	**5207AZZ**	**5207ADDU**	36.3	42	65	1	0.46
	80	34.9	1.5	56 000	36 000	5 600	—	7 500	**5307**	—	—	41.6	44	71	1.5	0.76
	80	34.9	1.5	48 500	33 500	5 600	4 800	—	—	**5307AZZ**	**5307ADDU**	41.5	44	71	1.5	0.79
40	80	30.2	1.1	48 500	33 500	5 600	—	7 100	**5208**	—	—	41.5	47	73	1	0.62
	80	30.2	1.1	40 000	29 000	5 600	4 800	—	—	**5208AZZ**	**5208ADDU**	39.4	47	73	1	0.63
	90	36.5	1.5	62 500	41 000	5 300	—	6 700	**5308**	—	—	45.5	49	81	1.5	1.03
	90	36.5	1.5	54 500	38 000	5 300	4 500	—	—	**5308AZZ**	**5308ADDU**	43.8	49	81	1.5	1.05
45	85	30.2	1.1	54 500	38 000	5 000	—	6 700	**5209**	—	—	43.4	52	78	1	0.67
	85	30.2	1.1	45 500	33 500	5 000	4 300	—	—	**5209A1ZZ**	**5209A1DDU**	42.5	52	78	1	0.67
	100	39.7	1.5	75 500	51 000	4 500	—	6 000	**5309**	—	—	50.6	54	91	1.5	1.37

■DOUBLE-ROW ANGULAR CONTACT BALL BEARINGS

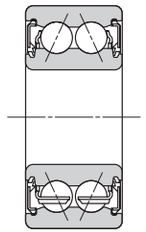
Bore Diameter 50 – 85 mm



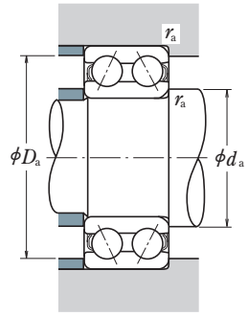
Open



Shielded (ZZ)



Sealed (DDU)



Dynamic Equivalent Load

$P = XF_r + YF_a$

$F_a/F_r \leqq e$		$F_a/F_r > e$		e
X	Y	X	Y	
1	0.92	0.67	1.41	0.68

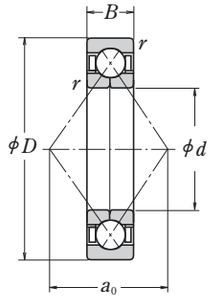
Static Equivalent Load

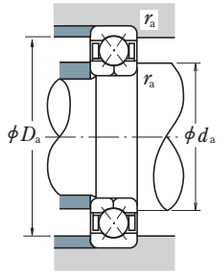
$P_0 = F_r + 0.76\,F_a$

Boundary Dimensions (mm)				Basic Load Ratings (N)		Limiting Speeds (min^{-1})			Bearing Designations			Load Center Spacings (mm)	Abutment and Fillet Dimensions (mm)			Mass (kg)
						Grease		Oil								
d	D	B	r min.	C_r	C_{0r}	Open ZZ	DDU	Open	Open	Shielded	Sealed	a_0	d_a min.	D_a max.	r_a max.	approx.
50	90	30.2	1.1	58 500	43 500	4 800	—	6 000	**5210**	—	—	45.9	57	83	1	0.72
	90	30.2	1.1	44 500	36 000	4 800	4 000	—	—	**5210AZZ**	**5210ADDU**	44	57	83	1	0.73
	110	44.4	2	89 500	61 500	4 300	—	5 600	**5310**	—	—	55.6	60	100	2	1.84
55	100	33.3	1.5	61 500	49 000	4 300	—	5 600	**5211**	—	—	50.1	64	91	1.5	1.01
	100	33.3	1.5	54 500	43 500	4 300	3 600	—	—	**5211AZZ**	**5211ADDU**	49.2	64	91	1.5	1.01
	120	49.2	2	105 000	73 000	3 800	—	5 000	**5311**	—	—	60.6	65	110	2	2.40
60	110	36.5	1.5	76 000	62 000	3 800	—	5 000	**5212**	—	—	56.5	69	101	1.5	1.33
	130	54	2.1	138 000	98 500	3 400	—	4 500	**5312**	—	—	69.2	72	118	2	2.92
65	120	38.1	1.5	84 000	69 000	3 600	—	4 500	**5213**	—	—	59.7	74	111	1.5	1.71
	140	58.7	2.1	156 000	113 000	3 200	—	4 300	**5313**	—	—	72.8	77	128	2	3.67
70	125	39.7	1.5	103 000	82 000	3 400	—	4 500	**5214**	—	—	63.8	79	116	1.5	1.75
	150	63.5	2.1	175 000	128 000	3 000	—	3 800	**5314**	—	—	78.3	82	138	2	4.55
75	130	41.3	1.5	103 000	83 000	3 200	—	4 300	**5215**	—	—	66.1	84	121	1.5	1.88
80	140	44.4	2	109 000	93 000	3 000	—	3 800	**5216**	—	—	69.6	90	130	2	2.51
85	150	49.2	2	128 000	110 000	2 800	—	3 600	**5217**	—	—	75.3	95	140	2	3.16

FOUR-POINT-CONTACT BALL BEARINGS

Bore Diameter 30 – 95 mm





Dynamic Equivalent Load

$P_a = F_a$

Static Equivalent Load

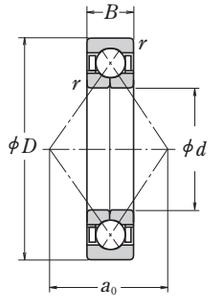
$P_{0a} = F_a$

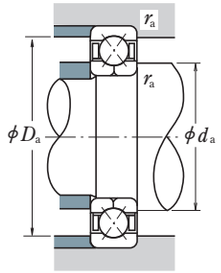
Boundary Dimensions (mm)				Basic Load Ratings (N)		Limiting Speeds (min^{-1})		Bearing Designation	Load Center Spacing (mm)	Abutment and Fillet Dimensions (mm)			Mass (kg)
d	D	B	r min.	C_a	C_{0a}	Grease	Oil		a_0	d_a min.	D_a max.	r_a max.	approx.
30	62	16	1	34 000	45 000	8 500	12 000	**QJ 206**	32.2	36	56	1	0.24
	72	19	1.1	51 000	63 000	8 000	11 000	**QJ 306**	35.7	37	65	1	0.42
35	72	17	1.1	45 000	61 500	7 500	10 000	**QJ 207**	37.5	42	65	1	0.35
	80	21	1.5	60 500	80 000	7 100	9 500	**QJ 307**	40.3	44	71	1.5	0.57
40	80	18	1.1	53 500	77 500	6 700	9 000	**QJ 208**	42.0	47	73	1	0.45
	90	23	1.5	74 000	100 000	6 300	8 500	**QJ 308**	45.5	49	81	1.5	0.78
45	85	19	1.1	60 000	88 500	6 300	8 500	**QJ 209**	45.5	52	78	1	0.52
	100	25	1.5	96 000	133 000	5 600	7 500	**QJ 309**	50.8	54	91	1.5	1.05
50	90	20	1.1	63 000	97 000	5 600	8 000	**QJ 210**	49.0	57	83	1	0.59
	110	27	2	112 000	159 000	5 000	6 700	**QJ 310**	56.0	60	100	2	1.35
55	100	21	1.5	78 000	122 000	5 300	7 100	**QJ 211**	54.3	64	91	1.5	0.77
	120	29	2	130 000	187 000	4 500	6 300	**QJ 311**	61.3	65	110	2	1.75
60	110	22	1.5	94 000	150 000	4 800	6 300	**QJ 212**	59.5	69	101	1.5	0.98
	130	31	2.1	148 000	217 000	4 300	5 600	**QJ 312**	66.5	72	118	2	2.15
65	120	23	1.5	107 000	179 000	4 300	6 000	**QJ 213**	64.8	74	111	1.5	1.2
	140	33	2.1	168 000	250 000	3 800	5 300	**QJ 313**	71.8	77	128	2	2.7
70	125	24	1.5	117 000	197 000	4 000	5 600	**QJ 214**	68.3	79	116	1.5	1.3
	150	35	2.1	189 000	285 000	3 600	5 000	**QJ 314**	77.0	82	138	2	3.18
75	130	25	1.5	121 000	212 000	3 800	5 300	**QJ 215**	71.8	84	121	1.5	1.5
	160	37	2.1	206 000	320 000	3 400	4 800	**QJ 315**	82.3	87	148	2	3.9
80	125	22	1.1	84 500	167 000	3 800	5 300	**QJ 1016**	71.8	87	118	1	1.05
	140	26	2	136 000	236 000	3 600	5 000	**QJ 216**	77.0	90	130	2	1.85
	170	39	2.1	223 000	360 000	3 200	4 300	**QJ 316**	87.5	92	158	2	4.6
85	130	22	1.1	86 500	176 000	3 800	5 000	**QJ 1017**	75.3	92	123	1	1.1
	150	28	2	157 000	276 000	3 400	4 800	**QJ 217**	82.3	95	140	2	2.2
	180	41	3	240 000	405 000	3 000	4 000	**QJ 317**	92.8	99	166	2.5	5.34
90	140	24	1.5	103 000	208 000	3 400	4 800	**QJ 1018**	80.5	99	131	1.5	1.45
	160	30	2	180 000	320 000	3 200	4 300	**QJ 218**	87.5	100	150	2	2.75
	190	43	3	258 000	450 000	2 800	3 800	**QJ 318**	98.0	104	176	2.5	6.4
95	145	24	1.5	106 000	220 000	3 400	4 500	**QJ 1019**	84.0	104	136	1.5	1.5
	170	32	2.1	195 000	340 000	3 000	4 000	**QJ 219**	92.8	107	158	2	3.35
	200	45	3	276 000	495 000	2 600	3 600	**QJ 319**	103.3	109	186	2.5	7.4

Remark Please contact NSK when using four-point contact ball bearings.

FOUR-POINT-CONTACT BALL BEARINGS

Bore Diameter 100 – 200 mm





Dynamic Equivalent Load

$P_a = F_a$

Static Equivalent Load

$P_{0a} = F_a$

Boundary Dimensions (mm)				Basic Load Ratings (N)		Limiting Speeds (min^{-1})		Bearing Designation	Load Center Spacing (mm)	Abutment and Fillet Dimensions (mm)			Mass (kg)
d	D	B	r min.	C_a	C_{0a}	Grease	Oil		a_0	d_a min.	D_a max.	r_a max.	approx.
100	150	24	1.5	108 000	232 000	3 200	4 300	**QJ 1020**	87.5	109	141	1.5	1.6
	180	34	2.1	219 000	390 000	2 800	3 800	**QJ 220**	98.0	112	168	2	4.0
	215	47	3	335 000	640 000	2 400	3 400	**QJ 320**	110.3	114	201	2.5	9.3
105	160	26	2	127 000	269 000	3 000	4 000	**QJ 1021**	92.8	115	150	2	2.0
	190	36	2.1	239 000	435 000	2 600	3 600	**QJ 221**	103.3	117	178	2	4.7
	225	49	3	335 000	640 000	2 400	3 200	**QJ 321**	115.5	119	211	2.5	10.5
110	170	28	2	153 000	315 000	2 800	3 800	**QJ 1022**	98.0	120	160	2	2.5
	200	38	2.1	259 000	490 000	2 600	3 400	**QJ 222**	108.5	122	188	2	5.6
	240	50	3	355 000	710 000	2 200	3 000	**QJ 322**	122.5	124	226	2.5	12.5
120	180	28	2	162 000	350 000	2 600	3 600	**QJ 1024**	105.0	130	170	2	2.65
	215	40	2.1	291 000	585 000	2 400	3 200	**QJ 224**	117.3	132	203	2	6.9
	260	55	3	395 000	835 000	2 000	2 800	**QJ 324**	133.0	134	246	2.5	15.4
130	200	33	2	186 000	415 000	2 400	3 200	**QJ 1026**	115.5	140	190	2	4.0
	230	40	3	300 000	635 000	2 200	3 000	**QJ 226**	126.0	144	216	2.5	7.7
	280	58	4	440 000	970 000	1 900	2 600	**QJ 326**	143.5	148	262	3	19
140	210	33	2	190 000	435 000	2 200	3 000	**QJ 1028**	122.5	150	200	2	4.3
	250	42	3	350 000	775 000	2 000	2 800	**QJ 228**	136.5	154	236	2.5	9.8
	300	62	4	480 000	1 110 000	1 700	2 400	**QJ 328**	154.0	158	282	3	24
150	225	35	2.1	217 000	505 000	2 000	2 800	**QJ 1030**	131.3	162	213	2	5.2
	270	45	3	395 000	925 000	1 800	2 600	**QJ 230**	147.0	164	256	2.5	12
	320	65	4	505 000	1 230 000	1 600	2 200	**QJ 330**	164.5	168	302	3	29
160	240	38	2.1	246 000	580 000	1 900	2 600	**QJ 1032**	140.0	172	228	2	6.4
	290	48	3	420 000	1 010 000	1 700	2 400	**QJ 232**	157.5	174	276	2.5	15
	340	68	4	555 000	1 400 000	1 500	2 000	**QJ 332**	175.1	178	322	3	31
170	260	42	2.1	295 000	705 000	1 800	2 400	**QJ 1034**	150.5	182	248	2	8.6
	310	52	4	470 000	1 180 000	1 600	2 200	**QJ 234**	168.0	188	292	3	19.5
	360	72	4	620 000	1 610 000	1 400	2 000	**QJ 334**	185.6	188	342	3	41
180	280	46	2.1	330 000	830 000	1 700	2 200	**QJ 1036**	161.0	192	268	2	11
	320	52	4	485 000	1 270 000	1 500	2 000	**QJ 236**	175.1	198	302	3	20.5
	380	75	4	655 000	1 770 000	1 300	1 800	**QJ 336**	196.1	198	362	3	48
190	290	46	2.1	355 000	925 000	1 600	2 200	**QJ 1038**	168.0	202	278	2	11.5
	340	55	4	480 000	1 290 000	1 400	2 000	**QJ 238**	185.6	208	322	3	23
	400	78	5	720 000	1 980 000	1 300	1 700	**QJ 338**	206.6	212	378	4	54.5
200	310	51	2.1	380 000	1 020 000	1 500	2 000	**QJ 1040**	178.6	212	298	2	15
	360	58	4	535 000	1 480 000	1 300	1 800	**QJ 240**	196.1	218	342	3	27
	420	80	5	760 000	2 180 000	1 200	1 600	**QJ 340**	217.1	222	398	4	61.5

Remark Please contact NSK when using four-point contact ball bearings.