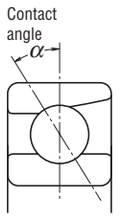
3. ANGULAR CONTACT BALL BEARINGS

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 serial number will have different load ratings if the type of cage or number of balls are different.

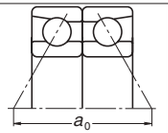
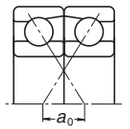
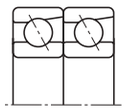
Angular contact ball bearings with contact angles of 15° (designation **C**) and 25° (designation **A5**) are primarily for high precision or high-speed applications, and molded polyamide cages (designation TYN) or machined-brass cages or synthetic resin cages (designation T) are used.

The maximum operating temperature of molded polyamide cages is 150℃.

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

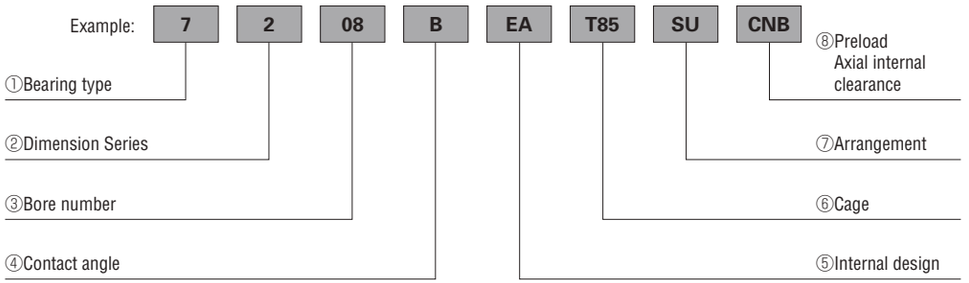
Figure	Arrangement	Features
	Back-to-Back (DB) (Example) 7208 A DB	Radial loads and axial loads in both directions can be sustained. Since the distance between the effective load centers a_0 is large, this type is suitable if moments are applied.
	Face-to-Face (DF) (Example) 7208 B DF	Radial loads and 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.

NSKHPS™ ANGULAR CONTACT BALL BEARINGS

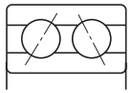
NSKHPS bearings feature high capacity, high limiting speed, and highly accurate universal matching. Molded polyamide cages are standard for the NSKHPS type.

☐ 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	Less than 03, Bearing bore 00 : 10mm, 01 : 12mm, 02 : 15mm, 03 : 17mm Over 04, Bearing bore 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, T85 : 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)

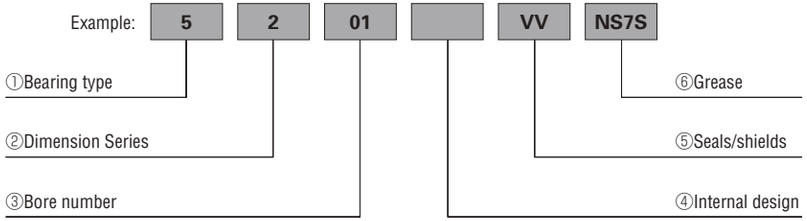


DOUBLE-ROW ANGULAR CONTACT BALL BEARINGS

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.

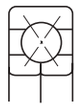
☐ Formulation of Bearing Designations

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	03 and under: 00 : 10mm, 01 : 12mm, 02 : 15mm, 03 : 17mm 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 noncontact 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

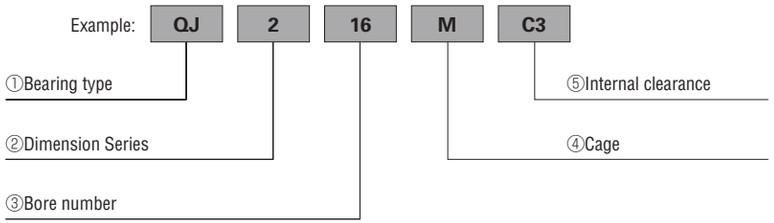
The inner ring is split radially into two pieces. This design allows one bearing to sustain significant axial loads in either direction.

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 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	Less than 03, Bearing bore 00 : 10mm, 01 : 12mm, 02 : 15mm, 03 : 17mm Over 04, Bearing bore 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)
NSKHPS 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 NSKHPS 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.

NSKHPS 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.

The limiting speeds of bearings with contact angles of 15° (designation **C**) and 25° (designation **A5**) are for bearings with a precision class of P5 or better with machined synthetic resin cages (T) or molded polyamide cages (TYN).

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

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.

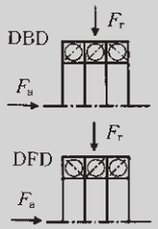
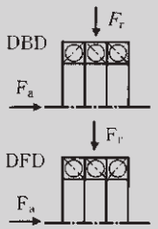
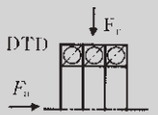
Assuming the dynamic equivalent radial load as P_r, the radial load as F_r, and axial load as F_a, the relationship between the dynamic equivalent radial load and bearing load may be approximated as follows:

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

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)	

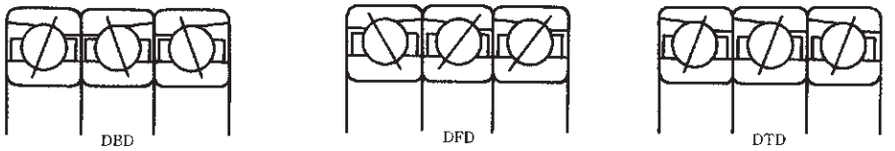


Table 1 Factors X and Y for Triplex Angular Contact Ball Bearing

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.

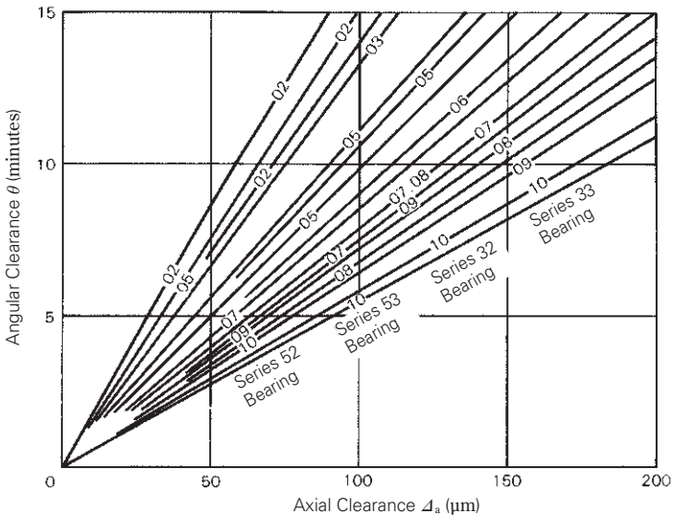


Fig. 1 Relationship Between Axial and Angular Clearances

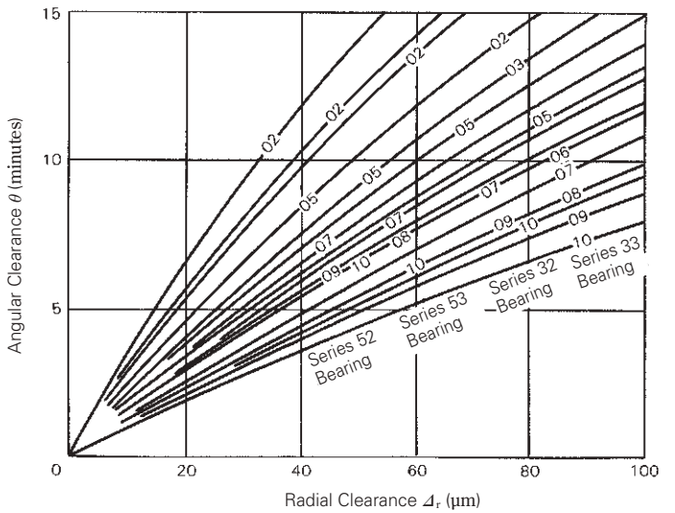


Fig. 2 Relationship Between Radial and Angular Clearances

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.

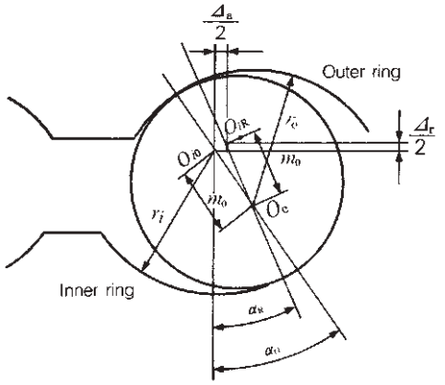


Fig. 1

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).

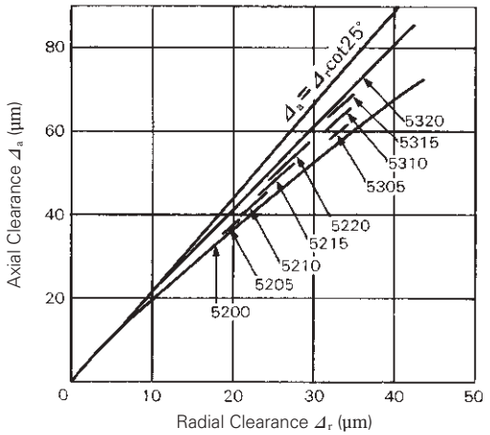


Fig. 2 Radial and Axial Clearances of Series 52 and 53 Bearings

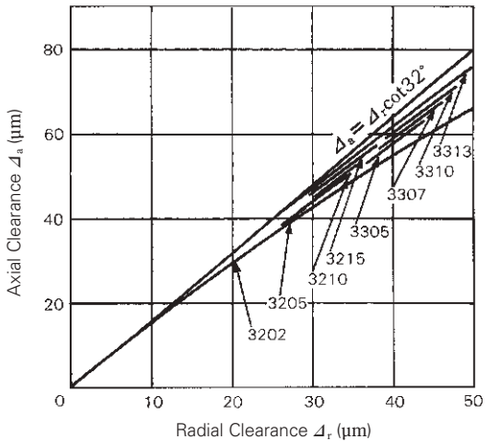
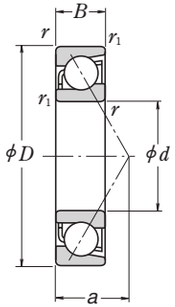


Fig. 3 Radial and Axial Clearances of Series 32 and 33 Bearings

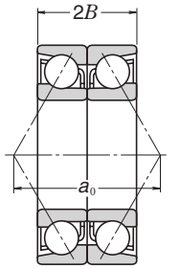
■ANGULAR CONTACT BALL BEARINGS

SINGLE/MATCHED MOUNTINGS

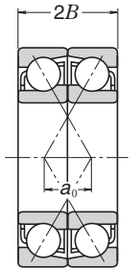
Bore Diameter 10 – 15 mm



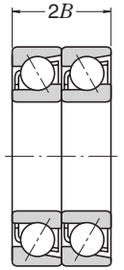
Single



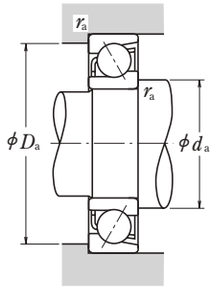
Back-to-Back
DB

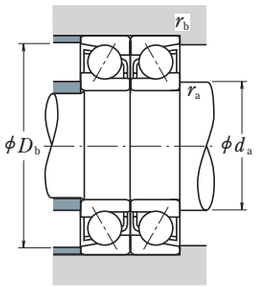


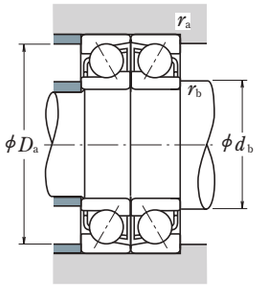
Face-to-Face
DF



Tandem
DT







Dynamic Equivalent Load $P = XF_r + YF_a$

Contact Angle	if_0F_a* / C_{0r}	e	Single, DT $F_a/F_r \leqq e$ X	Single, DT $F_a/F_r \leqq e$ Y	Single, DT $F_a/F_r > e$ X	Single, DT $F_a/F_r > e$ Y	DB or DF $F_a/F_r \leqq e$ X	DB or DF $F_a/F_r \leqq e$ Y	DB or DF $F_a/F_r > e$ X	DB or DF $F_a/F_r > e$ Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40	1	0	0.44	1.40	1	1.57	0.72	2.28
	0.714	0.43	1	0	0.44	1.30	1	1.46	0.72	2.11
	1.07	0.46	1	0	0.44	1.23	1	1.38	0.72	2.00
	1.43	0.47	1	0	0.44	1.19	1	1.34	0.72	1.93
	2.14	0.50	1	0	0.44	1.12	1	1.26	0.72	1.82
	3.57	0.55	1	0	0.44	1.02	1	1.14	0.72	1.66
	5.35	0.56	1	0	0.44	1.00	1	1.12	0.72	1.63
25°	—	0.68	1	0	0.41	0.87	1	0.92	0.67	1.41
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 X_0	Single, DT Y_0	DB or DF X_0	DB or DF Y_0
15°	0.5	0.46	1	0.92
25°	0.5	0.38	1	0.76
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) d	D	B	r min.	r_1 min.	Basic Load Ratings (Single) (N) C_r	C_{0r}	Factor f_0	Limiting Speeds (1) (min^{-1}) Grease	Oil	Eff.Load Center (mm) a	Abutment and Fillet Dimensions (mm) d_a min.	D_a max.	r_a max.	Mass (kg) approx.	Bearing Designations (2) Cage Designation (4) Single	Standard	Option	Arrangement	Basic Load Ratings (Matched) (N) C_r	C_{0r}	Limiting Speeds (1) (Matched) (min^{-1}) Grease	Oil	Load Center Spacings (mm) a_0 DB	DF	Abutment and Fillet Dimensions (mm) d_b(3) min.	D_b max.	r_b(3) max.
10	22	6	0.3	0.15	2 880	1 450	—	40 000	56 000	6.7	12.5	19.5	0.3	0.010	**7900 A5**	**TYN**	**(M)**	**DB DF DT**	4 700	2 900	32 000	43 000	13.5	1.5	—	20.8	0.15
	22	6	0.3	0.15	3 000	1 520	14.1	48 000	63 000	5.1	12.5	19.5	0.3	0.010	**7900 C**	**TYN**	**(M),T**	**DB DF DT**	4 900	3 050	38 000	53 000	10.3	1.7	—	20.8	0.15
	26	8	0.3	0.15	5 350	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**	8 750	5 200	20 000	28 000	18.4	2.4	11.2	24.8	0.15
	26	8	0.3	0.15	5 300	2 490	12.6	45 000	63 000	6.4	12.5	23.5	0.3	0.019	**7000 C**	**TYN**	**W,(M),T**	**DB DF DT**	8 650	5 000	36 000	50 000	12.8	3.2	—	24.8	0.15
	30	9	0.6	0.3	5 400	2 710	—	22 000	30 000	10.3	15	25	0.6	0.032	**7200 A**	**W**	**(M), TYN**	**DB DF DT**	8 800	5 400	18 000	24 000	20.5	2.5	12.5	27.5	0.3
	30	9	0.6	0.3	5 000	2 500	—	16 000	22 000	12.9	15	25	0.6	0.032	**7200 B**	**W**	**(M), T**	**DB DF DT**	8 100	5 000	13 000	18 000	25.8	7.8	12.5	27.5	0.3
	30	9	0.6	0.3	5 400	2 610	13.2	40 000	56 000	7.2	15	25	0.6	0.032	**7200 C**	**TYN**	**W,(M),T**	**DB DF DT**	8 800	5 200	32 000	45 000	14.4	3.6	—	27.5	0.3
	35	11	0.6	0.3	9 300	4 300	—	16 000	22 000	12.0	15	30	0.6	0.053	**7300 A**	**W**	**(M), T**	**DB DF DT**	15 100	8 600	13 000	17 000	24.0	2.0	12.5	32.5	0.3
	35	11	0.6	0.3	8 750	4 050	—	14 000	20 000	14.9	15	30	0.6	0.054	**7300 B**	**W**	**(M), T**	**DB DF DT**	14 200	8 100	11 000	16 000	29.9	7.9	12.5	32.5	0.3
12	24	6	0.3	0.15	3 200	1 770	—	38 000	53 000	7.2	14.5	21.5	0.3	0.011	**7901 A5**	**TYN**	**(M),T**	**DB DF DT**	5 200	3 550	30 000	43 000	14.4	2.4	—	22.8	0.15
	24	6	0.3	0.15	3 350	1 860	14.7	45 000	63 000	5.4	14.5	21.5	0.3	0.011	**7901 C**	**TYN**	**(M),T**	**DB DF DT**	5 450	3 700	36 000	50 000	10.8	1.2	—	22.8	0.15
	28	8	0.3	0.15	5 800	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**	9 400	5 950	18 000	24 000	19.5	3.5	13.2	26.8	0.15
	28	8	0.3	0.15	5 800	2 900	13.2	40 000	56 000	6.7	14.5	25.5	0.3	0.021	**7001 C**	**TYN**	**W,(M),T**	**DB DF DT**	9 400	5 800	32 000	45 000	13.4	2.6	—	26.8	0.15
	32	10	0.6	0.3	8 000	4 050	—	20 000	28 000	11.4	17	27	0.6	0.037	**7201 A**	**W**	**(M), T,TYN**	**DB DF DT**	13 000	8 050	16 000	22 000	22.7	2.7	14.5	29.5	0.3
	32	10	0.6	0.3	7 450	3 750	—	15 000	20 000	14.2	17	27	0.6	0.038	**7201 B**	**W**	**(M),T**	**DB DF DT**	12 100	7 500	12 000	16 000	28.5	8.5	14.5	29.5	0.3
	32	10	0.6	0.3	8 150	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
	32	10	0.6	0.3	7 900	3 850	12.5	36 000	50 000	7.9	17	27	0.6	0.036	**7201 C**	**TYN**	**W,(M),T**	**DB DF DT**	12 800	7 700	30 000	40 000	15.9	4.1	—	29.5	0.3
	37	12	1	0.6	9 450	4 500	—	15 000	20 000	13.1	18	31	1	0.060	**7301 A**	**W**	**(M), T**	**DB DF DT**	15 400	9 000	12 000	16 000	26.1	2.1	17	32	0.6
	37	12	1	0.6	8 850	4 200	—	13 000	18 000	16.3	18	31	1	0.062	**7301 B**	**W**	**(M), T**	**DB DF DT**	14 400	8 400	10 000	14 000	32.6	8.6	17	32	0.6
	37	12	1	0.6	11 100	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	28	7	0.3	0.15	4 550	2 530	—	32 000	43 000	8.5	17.5	25.5	0.3	0.016	**7902 A5**	**TYN**	**(M),T**	**DB DF DT**	7 400	5 050	26 000	34 000	17.0	3.0	—	26.8	0.15
	28	7	0.3	0.15	4 750	2 640	14.5	38 000	53 000	6.4	17.5	25.5	0.3	0.016	**7902 C**	**TYN**	**(M),T**	**DB DF DT**	7 750	5 300	30 000	43 000	12.8	1.2	—	26.8	0.15
	32	9	0.3	0.15	6 100	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**	9 950	6 850	15 000	22 000	22.6	4.6	16.2	30.8	0.15
	32	9	0.3	0.15	6 250	3 400	14.1	34 000	48 000	7.6	17.5	29.5	0.3	0.030	**7002 C**	**TYN**	**W, (M),T**	**DB DF DT**	10 100	6 750	28 000	38 000	15.3	2.7	—	30.8	0.15
	35	11	0.6	0.3	8 650	4 650	—	18 000	24 000	12.7	20	30	0.6	0.045	**7202 A**	**W**	**(M), T,TYN**	**DB DF DT**	14 000	9 300	14 000	20 000	25.4	3.4	17.5	32.5	0.3
	35	11	0.6	0.3	7 950	4 300	—	13 000	18 000	16.0	20	30	0.6	0.046	**7202 B**	**W**	**(M),T**	**DB DF DT**	12 900	8 600	10 000	14 000	32.0	10.0	17.5	32.5	0.3
	35	11	0.6	0.3	9 800	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
	35	11	0.6	0.3	8 650	4 550	13.2	32 000	45 000	8.8	20	30	0.6	0.045	**7202 C**	**TYN**	**W,(M),T**	**DB DF DT**	14 100	9 050	26 000	36 000	17.7	4.3	—	32.5	0.3
	42	13	1	0.6	13 400	7 100	—	13 000	17 000	14.7	21	36	1	0.084	**7302 A**	**W**	**(M), T**	**DB DF DT**	21 800	14 200	10 000	13 000	29.5	3.5	20	37	0.6
	42	13	1	0.6	12 500	6 600	—	11 000	15 000	18.5	21	36	1	0.086	**7302 B**	**W**	**(M), T**	**DB DF DT**	20 200	13 200	9 000	12 000	36.9	10.9	20	37	0.6
	42	13	1	0.6	14 300	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

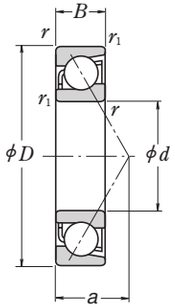
Notes (1) For applications operating near the limiting speed, refer to Page C077.
(2) Suffixes A, A5, B, and C represent contact angles of 30°, 25°, 40°, and 15° respectively.
(3) Use the values of d_a (min) and r_a (max) for bearings with "—" in the d_b column.

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

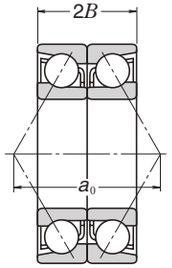
ANGULAR CONTACT BALL BEARINGS

SINGLE/MATCHED MOUNTINGS

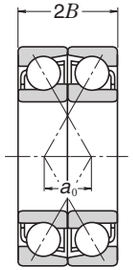
Bore Diameter 17 – 25 mm



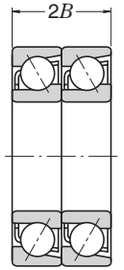
Single



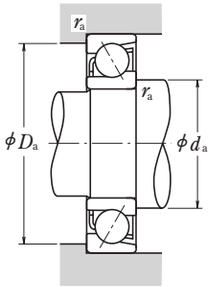
Back-to-Back
DB

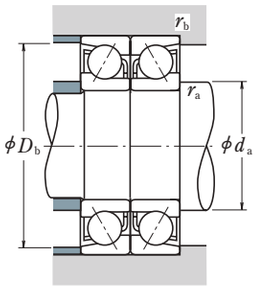


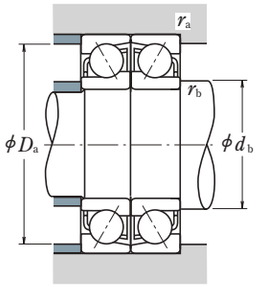
Face-to-Face
DF



Tandem
DT







Dynamic Equivalent Load $P = XF_r + YF_a$

Contact Angle	$\frac{if_0F_a}{C_{or}}$*	e	Single, DT $F_a/F_r \leqq e$ X	Y	$F_a/F_r > e$ X	Y	DB or DF $F_a/F_r \leqq e$ X	Y	$F_a/F_r > e$ X	Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40	1	0	0.44	1.40	1	1.57	0.72	2.28
	0.714	0.43	1	0	0.44	1.30	1	1.46	0.72	2.11
	1.07	0.46	1	0	0.44	1.23	1	1.38	0.72	2.00
	1.43	0.47	1	0	0.44	1.19	1	1.34	0.72	1.93
	2.14	0.50	1	0	0.44	1.12	1	1.26	0.72	1.82
	3.57	0.55	1	0	0.44	1.02	1	1.14	0.72	1.66
	5.35	0.56	1	0	0.44	1.00	1	1.12	0.72	1.63
25°	—	0.68	1	0	0.41	0.87	1	0.92	0.67	1.41
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 X_0	Y_0	DB or DF X_0	Y_0
15°	0.5	0.46	1	0.92
25°	0.5	0.38	1	0.76
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) d	D	B	r min.	r_1 min.	Basic Load Ratings (Single) (N) C_r	C_{0r}	Factor f_0	Limiting Speeds (1) (min⁻¹) Grease	Oil	Eff.Load Center (mm) a	Abutment and Fillet Dimensions (mm) d_a min.	D_a max.	r_a max.	Mass (kg) approx.	Bearing Designations (2) Cage Designation (4) Single	Standard	Option	Arrangement	Basic Load Ratings (Matched) (N) C_r	C_{0r}	Limiting Speeds (1) (Matched) (min⁻¹) Grease	Oil	Load Center Spacings (mm) a_0 DB	DF	Abutment and Fillet Dimensions (mm) d_b(3) min.	D_b max.	r_b(3) max.
17	30	7	0.3	0.15	4 750	2 800	—	30 000	40 000	9.0	19.5	27.5	0.3	0.017	**7903 A5**	**TYN**	**(M),T**	**DB DF DT**	7 750	5 600	24 000	32 000	18.0	4.0	—	28.8	0.15
	30	7	0.3	0.15	5 000	2 940	14.8	34 000	48 000	6.6	19.5	27.5	0.3	0.017	**7903 C**	**TYN**	**(M),T**	**DB DF DT**	8 150	5 850	28 000	38 000	13.3	0.7	—	28.8	0.15
	35	10	0.3	0.15	6 400	3 800	—	17 000	24 000	12.5	19.5	32.5	0.3	0.040	**7003 A**	**W**	**(M), T,TYN**	**DB DF DT**	10 400	7 650	14 000	19 000	25.0	5.0	18.2	33.8	0.15
	35	10	0.3	0.15	6 600	3 800	14.5	32 000	43 000	8.5	19.5	32.5	0.3	0.040	**7003 C**	**TYN**	**W, (M),T**	**DB DF DT**	10 700	7 600	26 000	34 000	17.0	3.0	—	33.8	0.15
	40	12	0.6	0.3	10 800	6 000	—	16 000	22 000	14.2	22	35	0.6	0.067	**7203 A**	**W**	**(M), T,TYN**	**DB DF DT**	17 600	12 000	13 000	17 000	28.5	4.5	19.5	37.5	0.3
	40	12	0.6	0.3	9 950	5 500	—	11 000	15 000	18.0	22	35	0.6	0.068	**7203 B**	**W**	**(M),T**	**DB DF DT**	16 100	11 000	9 000	12 000	35.9	11.9	19.5	37.5	0.3
	40	12	0.6	0.3	11 600	6 100	—	16 000	22 000	18.2	22	35	0.6	0.065	***7203 BEA**	**T85**	**T7**	— — —	—	—	13 000	18 000	36.3	12.3	19.5	37.5	0.3
	40	12	0.6	0.3	10 900	5 850	13.3	28 000	38 000	9.8	22	35	0.6	0.065	**7203 C**	**TYN**	**W,(M),T**	**DB DF DT**	17 600	11 700	22 000	32 000	19.6	4.4	—	37.5	0.3
	47	14	1	0.6	15 900	8 650	—	11 000	15 000	16.2	23	41	1	0.116	**7303 A**	**W**	**(M), T**	**DB DF DT**	25 900	17 300	9 000	12 000	32.5	4.5	22	42	0.6
	47	14	1	0.6	14 800	8 000	—	10 000	14 000	20.4	23	41	1	0.118	**7303 B**	**W**	**(M), T**	**DB DF DT**	24 000	16 000	8 000	11 000	40.9	12.9	22	42	0.6
	47	14	1	0.6	16 800	8 300	—	14 000	20 000	20.4	23	41	1	0.113	***7303 BEA**	**T85**	—	— — —	—	—	11 000	16 000	40.9	12.9	22	42	0.6
20	37	9	0.3	0.15	6 600	4 050	—	24 000	32 000	11.1	22.5	34.5	0.3	0.037	**7904 A5**	**TYN**	**(M),T**	**DB DF DT**	10 700	8 100	19 000	26 000	22.3	4.3	—	35.8	0.15
	37	9	0.3	0.15	6 950	4 250	14.9	28 000	38 000	8.3	22.5	34.5	0.3	0.036	**7904 C**	**TYN**	**(M),T**	**DB DF DT**	11 300	8 500	22 000	32 000	16.6	1.4	—	35.8	0.15
	42	12	0.6	0.3	10 800	6 600	—	14 000	20 000	14.9	25	37	0.6	0.068	**7004 A**	**W**	**(M), T,TYN**	**DB DF DT**	17 600	13 200	12 000	16 000	29.9	5.9	22.5	39.5	0.3
	42	12	0.6	0.3	11 100	6 550	14.0	26 000	36 000	10.1	25	37	0.6	0.068	**7004 C**	**TYN**	**W,(M),T**	**DB DF DT**	18 000	13 100	20 000	30 000	20.3	3.7	—	39.5	0.3
	47	14	1	0.6	14 500	8 300	—	13 000	18 000	16.7	26	41	1	0.106	**7204 A**	**W**	**(M), T,TYN**	**DB DF DT**	23 500	16 600	11 000	15 000	33.3	5.3	25	42	0.6
	47	14	1	0.6	13 300	7 650	—	9 500	13 000	21.1	26	41	1	0.109	**7204 B**	**W**	**(M),T**	**DB DF DT**	21 600	15 300	7 500	11 000	42.1	14.1	25	42	0.6
	47	14	1	0.6	15 600	8 150	—	13 000	19 000	21.1	26	41	1	0.103	***7204 BEA**	**T85**	**T7**	— — —	—	—	11 000	16 000	42.1	14.1	25	42	0.6
	47	14	1	0.6	14 600	8 050	13.3	24 000	34 000	11.5	26	41	1	0.104	**7204 C**	**TYN**	**W,(M),T**	**DB DF DT**	23 600	16 100	19 000	26 000	23.0	5.0	—	42	0.6
	52	15	1.1	0.6	18 700	10 400	—	10 000	13 000	17.9	27	45	1	0.146	**7304 A**	**W**	**(M), T**	**DB DF DT**	30 500	20 800	8 000	11 000	35.8	5.8	25	47	0.6
	52	15	1.1	0.6	17 300	9 650	—	9 000	12 000	22.6	27	45	1	0.150	**7304 B**	**W**	**(M), T**	**DB DF DT**	28 200	19 300	7 100	10 000	45.2	15.2	25	47	0.6
	52	15	1.1	0.6	19 800	10 500	—	13 000	18 000	22.6	27	45	1	0.149	***7304 BEA**	**T85**	**MR, T7**	— — —	—	—	10 000	14 000	45.2	15.2	25	47	0.6
25	42	9	0.3	0.15	7 450	5 150	—	20 000	28 000	12.3	27.5	39.5	0.3	0.043	**7905 A5**	**TYN**	**(M),T**	**DB DF DT**	12 100	10 300	16 000	22 000	24.6	6.6	—	40.8	0.15
	42	9	0.3	0.15	7 850	5 400	15.5	24 000	34 000	9.0	27.5	39.5	0.3	0.043	**7905 C**	**TYN**	**(M),T**	**DB DF DT**	12 700	10 800	19 000	26 000	18.0	0.0	—	40.8	0.15
	47	12	0.6	0.3	11 300	7 400	—	12 000	17 000	16.4	30	42	0.6	0.079	**7005 A**	**W**	**(M), T,TYN**	**DB DF DT**	18 300	14 800	10 000	14 000	32.8	8.8	27.5	44.5	0.3
	47	12	0.6	0.3	11 700	7 400	14.7	22 000	30 000	10.8	30	42	0.6	0.078	**7005 C**	**TYN**	**W,(M),T**	**DB DF DT**	19 000	14 800	18 000	26 000	21.6	2.4	—	44.5	0.3
	52	15	1	0.6	16 200	10 300	—	12 000	16 000	18.6	31	46	1	0.130	**7205 A**	**W**	**(M), T,TYN**	**DB DF DT**	26 300	20 500	9 500	13 000	37.2	7.2	30	47	0.6
	52	15	1	0.6	14 800	9 400	—	8 500	11 000	23.7	31	46	1	0.133	**7205 B**	**W**	**(M),T**	**DB DF DT**	24 000	18 800	6 700	9 000	47.3	17.3	30	47	0.6
	52	15	1	0.6	17 600	10 200	—	12 000	17 000	23.7	31	46	1	0.127	***7205 BEA**	**T85**	**T7**	— — —	—	—	9 500	14 000	47.3	17.3	30	47	0.6
	52	15	1	0.6	16 600	10 200	14.0	22 000	28 000	12.7	31	46	1	0.129	**7205 C**	**TYN**	**W,(M),T**	**DB DF DT**	27 000	20 400	17 000	24 000	25.3	4.7	—	47	0.6
	62	17	1.1	0.6	26 400	15 800	—	8 500	11 000	21.1	32	55	1	0.235	**7305 A**	**W**	**(M), T**	**DB DF DT**	43 000	31 500	6 700	9 000	42.1	8.1	30	57	0.6

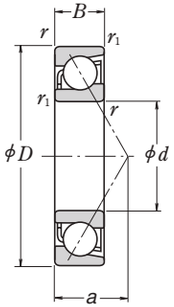
Notes (1) For applications operating near the limiting speed, refer to Page C077.
(2) Suffixes A, A5, B, and C represent contact angles of 30°, 25°, 40°, and 15° respectively.
(3) Use the values of d_a (min) and r_a (max) for bearings with "—" in the d_b column.

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

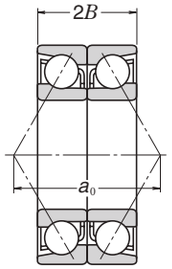
ANGULAR CONTACT BALL BEARINGS

SINGLE/MATCHED MOUNTINGS

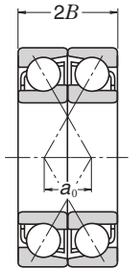
Bore Diameter 25 – 40 mm



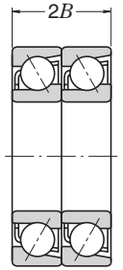
Single



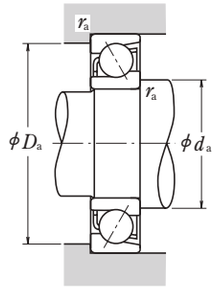
Back-to-Back
DB

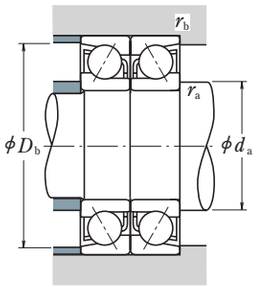


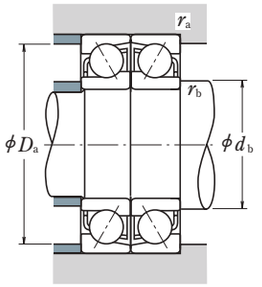
Face-to-Face
DF



Tandem
DT







Dynamic Equivalent Load $P = XF_r + YF_a$

Contact Angle	$\frac{if_0F_a}{C_{or}}$*	e	Single, DT $F_a/F_r \leqq e$ X	Y	$F_a/F_r > e$ X	Y	DB or DF $F_a/F_r \leqq e$ X	Y	$F_a/F_r > e$ X	Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40	1	0	0.44	1.40	1	1.57	0.72	2.28
	0.714	0.43	1	0	0.44	1.30	1	1.46	0.72	2.11
	1.07	0.46	1	0	0.44	1.23	1	1.38	0.72	2.00
	1.43	0.47	1	0	0.44	1.19	1	1.34	0.72	1.93
	2.14	0.50	1	0	0.44	1.12	1	1.26	0.72	1.82
	3.57	0.55	1	0	0.44	1.02	1	1.14	0.72	1.66
	5.35	0.56	1	0	0.44	1.00	1	1.12	0.72	1.63
25°	—	0.68	1	0	0.41	0.87	1	0.92	0.67	1.41
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 X_0	Y_0	DB or DF X_0	Y_0
15°	0.5	0.46	1	0.92
25°	0.5	0.38	1	0.76
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) d	D	B	r min.	r_1 min.	Basic Load Ratings (Single) (N) C_r	C_{0r}	Factor f_0	Limiting Speeds (1) (min^{-1}) Grease	Oil	Eff.Load Center (mm) a	Abutment and Fillet Dimensions (mm) d_a min.	D_a max.	r_a max.	Mass (kg) approx.	Bearing Designations (2) Cage Designation (4) Single	Standard	Option	Arrangement	Basic Load Ratings (Matched) (N) C_r	C_{0r}	Limiting Speeds (1) (Matched) (min^{-1}) Grease	Oil	Load Center Spacings (mm) a_0 DB	DF	Abutment and Fillet Dimensions (mm) d_b(3) min.	D_b max.	r_b(3) max.
25	62	17	1.1	0.6	24 400	14 600	—	7 500	10 000	26.7	32	55	1	0.241	**7305 B**	**W**	**(M), T**	**DB DF DT**	39 500	29 300	6 000	8 000	53.5	19.5	30	57	0.6
	62	17	1.1	0.6	27 200	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	47	9	0.3	0.15	7 850	5 950	—	18 000	24 000	13.5	32.5	44.5	0.3	0.050	**7906 A5**	**TYN**	**(M),T**	**DB DF DT**	12 800	11 900	14 000	19 000	27.0	9.0	—	45.8	0.15
	47	9	0.3	0.15	8 300	6 250	15.9	22 000	28 000	9.7	32.5	44.5	0.3	0.049	**7906 C**	**TYN**	**(M),T**	**DB DF DT**	13 500	12 500	17 000	24 000	19.3	1.3	—	45.8	0.15
	55	13	1	0.6	14 500	10 100	—	11 000	14 000	18.8	36	49	1	0.116	**7006 A**	**W**	**(M), T,TYN**	**DB DF DT**	23 600	20 200	8 500	12 000	37.5	11.5	35	50	0.6
	55	13	1	0.6	15 100	10 300	14.9	19 000	26 000	12.2	36	49	1	0.115	**7006 C**	**TYN**	**W,(M),T**	**DB DF DT**	24 600	20 500	15 000	22 000	24.4	1.6	—	50	0.6
	62	16	1	0.6	22 500	14 800	—	9 500	13 000	21.3	36	56	1	0.197	**7206 A**	**W**	**(M), T,TYN**	**DB DF DT**	36 500	29 500	8 000	11 000	42.6	10.6	35	57	0.6
	62	16	1	0.6	20 500	13 500	—	7 100	9 500	27.3	36	56	1	0.202	**7206 B**	**W**	**(M),T**	**DB DF DT**	33 500	27 000	5 600	7 500	54.6	22.6	35	57	0.6
	62	16	1	0.6	23 700	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
	62	16	1	0.6	23 000	14 700	13.9	18 000	24 000	14.2	36	56	1	0.197	**7206 C**	**TYN**	**W,(M),T**	**DB DF DT**	37 500	29 300	14 000	20 000	28.3	3.7	—	57	0.6
	72	19	1.1	0.6	33 500	20 900	—	7 100	9 500	24.2	37	65	1	0.346	**7306 A**	**W**	**(M), T**	**DB DF DT**	54 500	41 500	5 600	7 500	48.4	10.4	35	67	0.6
	72	19	1.1	0.6	31 000	19 300	—	6 300	8 500	30.9	37	65	1	0.354	**7306 B**	**W**	**(M), T**	**DB DF DT**	50 500	38 500	5 000	7 100	61.8	23.8	35	67	0.6
	72	19	1.1	0.6	36 500	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	55	10	0.6	0.3	11 400	8 700	—	15 000	20 000	15.5	40	50	0.6	0.075	**7907 A5**	**TYN**	**(M),T**	**DB DF DT**	18 600	17 400	12 000	17 000	31.0	11.0	—	52.5	0.3
	55	10	0.6	0.3	12 100	9 150	15.7	18 000	24 000	11.0	40	50	0.6	0.075	**7907 C**	**TYN**	**(M),T**	**DB DF DT**	19 600	18 300	14 000	20 000	22.1	2.1	—	52.5	0.3
	62	14	1	0.6	18 300	13 400	—	9 000	13 000	21.0	41	56	1	0.153	**7007 A**	**W**	**(M), T,TYN**	**DB DF DT**	29 700	26 800	7 500	10 000	42.0	14.0	40	57	0.6
	62	14	1	0.6	19 100	13 700	15.0	17 000	22 000	13.5	41	56	1	0.153	**7007 C**	**TYN**	**W,(M),T**	**DB DF DT**	31 000	27 300	13 000	19 000	27.0	1.0	—	57	0.6
	72	17	1.1	0.6	29 700	20 100	—	8 500	12 000	23.9	42	65	1	0.287	**7207 A**	**W**	**(M), T,TYN**	**DB DF DT**	48 500	40 000	6 700	9 500	47.9	13.9	40	67	0.6
	72	17	1.1	0.6	27 100	18 400	—	6 000	8 000	30.9	42	65	1	0.294	**7207 B**	**W**	**(M),T**	**DB DF DT**	44 000	36 500	4 800	6 700	61.9	27.9	40	67	0.6
	72	17	1.1	0.6	32 500	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
	72	17	1.1	0.6	30 500	19 900	13.9	15 000	20 000	15.7	42	65	1	0.320	**7207 C**	**(M)**	**W,T,TYN**	**DB DF DT**	49 500	40 000	12 000	17 000	31.3	2.7	—	67	0.6
	80	21	1.5	1	40 000	26 300	—	6 300	8 500	27.1	44	71	1.5	0.464	**7307 A**	**W**	**(M), T**	**DB DF DT**	65 000	52 500	5 000	6 700	54.2	12.2	41	74	1
	80	21	1.5	1	40 500	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	40 500	24 400	—	5 600	7 500	34.6	44	71	1.5	0.469	**7307 BEA**	**W**	**MR, T7**	**DB DF DT**	65 500	49 000	4 500	6 000	69.2	27.2	41	74	1
40	62	12	0.6	0.3	14 300	11 200	—	14 000	18 000	17.9	45	57	0.6	0.110	**7908 A5**	**TYN**	**(M),T**	**DB DF DT**	23 300	22 300	11 000	15 000	35.8	11.8	—	59.5	0.3
	62	12	0.6	0.3	15 100	11 700	15.7	16 000	22 000	12.8	45	57	0.6	0.109	**7908 C**	**TYN**	**(M),T**	**DB DF DT**	24 600	23 500	13 000	18 000	25.7	1.7	—	59.5	0.3
	68	15	1	0.6	19 500	15 400	—	8 500	11 000	23.1	46	62	1	0.190	**7008 A**	**W**	**(M), T,TYN**	**DB DF DT**	31 500	31 000	6 700	9 000	46.2	16.2	45	63	0.6
	68	15	1	0.6	20 600	15 900	15.4	15 000	20 000	14.7	46	62	1	0.213	**7008 C**	**(M)**	**W,T, TYN**	**DB DF DT**	33 500	32 000	12 000	17 000	29.5	0.5	—	63	0.6
	80	18	1.1	0.6	35 500	25 100	—	7 500	10 000	26.3	47	73	1	0.375	**7208 A**	**W**	**(M), T,TYN**	**DB DF DT**	57 500	50 500	6 000	8 500	52.6	16.6	45	75	0.6
	80	18	1.1	0.6	32 000	23 000	—	5 300	7 500	34.2	47	73	1	0.383	**7208 B**	**W**	**(M),T**	**DB DF DT**	52 000	46 000	4 300	6 000	68.3	32.3	45	75	0.6

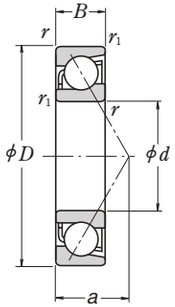
Notes (1) For applications operating near the limiting speed, refer to Page C077.
(2) Suffixes A, A5, B, and C represent contact angles of 30°, 25°, 40°, and 15° respectively.
(3) Use the values of d_a (min) and r_a (max) for bearings with "—" in the d_b column.

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

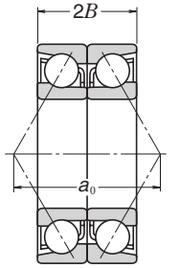
ANGULAR CONTACT BALL BEARINGS

SINGLE/MATCHED MOUNTINGS

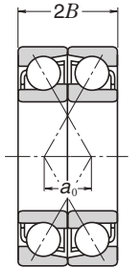
Bore Diameter 40 – 55 mm



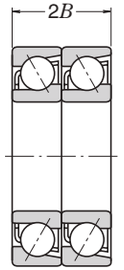
Single



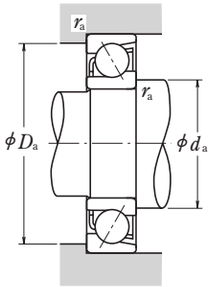
Back-to-Back
DB

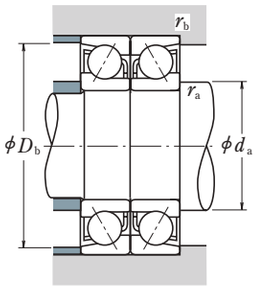


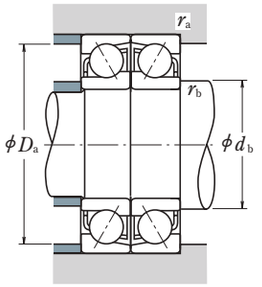
Face-to-Face
DF



Tandem
DT







Dynamic Equivalent Load $P = XF_r + YF_a$

Contact Angle	$\frac{if_0F_a}{C_{or}}$*	e	Single, DT $F_a/F_r \leqq e$ X	Y	$F_a/F_r > e$ X	Y	DB or DF $F_a/F_r \leqq e$ X	Y	$F_a/F_r > e$ X	Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40	1	0	0.44	1.40	1	1.57	0.72	2.28
	0.714	0.43	1	0	0.44	1.30	1	1.46	0.72	2.11
	1.07	0.46	1	0	0.44	1.23	1	1.38	0.72	2.00
	1.43	0.47	1	0	0.44	1.19	1	1.34	0.72	1.93
	2.14	0.50	1	0	0.44	1.12	1	1.26	0.72	1.82
	3.57	0.55	1	0	0.44	1.02	1	1.14	0.72	1.66
	5.35	0.56	1	0	0.44	1.00	1	1.12	0.72	1.63
25°	—	0.68	1	0	0.41	0.87	1	0.92	0.67	1.41
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 X_0	Y_0	DB or DF X_0	Y_0
15°	0.5	0.46	1	0.92
25°	0.5	0.38	1	0.76
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) d	D	B	r min.	r_1 min.	Basic Load Ratings (Single) (N) C_r	C_{0r}	Factor f_0	Limiting Speeds (1) (min⁻¹) Grease	Oil	Eff.Load Center (mm) a	Abutment and Fillet Dimensions (mm) d_a min.	D_a max.	r_a max.	Mass (kg) approx.	Bearing Designations (2) Cage Designation (4) Single	Standard	Option	Arrangement	Basic Load Ratings (Matched) (N) C_r	C_{0r}	Limiting Speeds (1) (Matched) (min⁻¹) Grease	Oil	Load Center Spacings (mm) a_0 DB	DF	Abutment and Fillet Dimensions (mm) d_b(3) min.	D_b max.	r_b(3) max.
40	80	18	1.1	0.6	38 500	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
	80	18	1.1	0.6	36 500	25 200	14.1	14 000	19 000	17.0	47	73	1	0.418	7208 C	(M)	W,T,TYN	DB DF DT	59 000	50 500	11 000	15 000	34.1	1.9	—	75	0.6
	90	23	1.5	1	49 000	33 000	—	5 600	7 500	30.3	49	81	1.5	0.633	7308 A	W	(M), T	DB DF DT	79 500	66 000	4 500	6 000	60.5	14.5	46	84	1
	90	23	1.5	1	53 000	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	53 000	33 000	—	5 000	6 700	38.8	49	81	1.5	0.644	7308 BEA	W	MR, T7	DB DF DT	86 500	65 500	4 000	5 300	77.5	31.5	46	84	1
45	68	12	0.6	0.3	15 100	12 700	—	12 000	17 000	19.2	50	63	0.6	0.130	7909 A5	(M)	T,TYN	DB DF DT	24 600	25 400	9 500	13 000	38.4	14.4	—	65.5	0.3
	68	12	0.6	0.3	16 000	13 400	16.0	14 000	20 000	13.6	50	63	0.6	0.129	7909 C	(M)	T, TYN	DB DF DT	26 000	26 800	12 000	16 000	27.1	3.1	—	65.5	0.3
	75	16	1	0.6	23 100	18 700	—	7 500	10 000	25.3	51	69	1	0.250	7009 A	W	(M), TYN	DB DF DT	37 500	37 500	6 000	8 500	50.6	18.6	50	70	0.6
	75	16	1	0.6	24 400	19 300	15.4	14 000	19 000	16.0	51	69	1	0.274	7009 C	(M)	W,TYN	DB DF DT	39 500	38 500	11 000	15 000	32.1	0.1	—	70	0.6
	85	19	1.1	0.6	39 500	28 700	—	6 700	9 500	28.3	52	78	1	0.411	7209 A	W	(M), T,TYN	DB DF DT	64 500	57 500	5 600	7 500	56.5	18.5	50	80	0.6
	85	19	1.1	0.6	36 000	26 200	—	5 000	6 700	36.8	52	78	1	0.421	7209 B	W	(M),T	DB DF DT	58 500	52 500	4 000	5 300	73.5	35.5	50	80	0.6
	85	19	1.1	0.6	40 500	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
	85	19	1.1	0.6	41 000	28 800	14.2	12 000	17 000	18.2	52	78	1	0.468	7209 C	(M)	W,T, TYN	DB DF DT	66 500	57 500	10 000	14 000	36.4	1.6	—	80	0.6
	100	25	1.5	1	63 500	43 500	—	5 000	6 700	33.4	54	91	1.5	0.848	7309 A	W	(M), T	DB DF DT	103 000	87 000	4 000	5 300	66.9	16.9	51	94	1
	100	25	1.5	1	62 500	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	62 500	39 500	—	4 500	6 000	42.9	54	91	1.5	0.860	7309 BEA	W	MR, T7	DB DF DT	102 000	79 500	3 600	4 800	85.8	35.8	51	94	1
50	72	12	0.6	0.3	15 900	14 200	—	11 000	15 000	20.2	55	67	0.6	0.132	7910 A5	(M)	T,TYN	DB DF DT	25 900	28 400	9 000	12 000	40.5	16.5	—	69.5	0.3
	72	12	0.6	0.3	16 900	15 000	16.2	13 000	18 000	14.2	55	67	0.6	0.130	7910 C	(M)	T, TYN	DB DF DT	27 400	30 000	11 000	15 000	28.3	4.3	—	69.5	0.3
	80	16	1	0.6	24 500	21 100	—	6 700	9 500	26.8	56	74	1	0.263	7010 A	W	(M), T,TYN	DB DF DT	40 000	42 000	5 600	7 500	53.5	21.5	55	75	0.6
	80	16	1	0.6	26 000	21 900	15.7	12 000	17 000	16.7	56	74	1	0.293	7010 C	(M)	W,T, TYN	DB DF DT	42 000	44 000	10 000	14 000	33.4	1.4	—	75	0.6
	90	20	1.1	0.6	41 500	31 500	—	6 300	9 000	30.2	57	83	1	0.466	7210 A	W	(M), T,TYN	DB DF DT	67 000	63 000	5 000	7 100	60.4	20.4	55	85	0.6
	90	20	1.1	0.6	37 500	28 600	—	4 500	6 300	39.4	57	83	1	0.477	7210 B	W	(M),T	DB DF DT	60 500	57 000	3 600	5 000	78.7	38.7	55	85	0.6
	90	20	1.1	0.6	42 000	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
	90	20	1.1	0.6	43 000	31 500	14.5	12 000	16 000	19.4	57	83	1	0.528	7210 C	(M)	W,T,TYN	DB DF DT	69 500	63 500	9 500	13 000	38.7	1.3	—	85	0.6
	110	27	2	1	74 000	52 000	—	4 500	6 000	36.6	60	100	2	1.10	7310 A	W	(M), T	DB DF DT	121 000	104 000	3 600	4 800	73.2	19.2	56	104	1
	110	27	2	1	78 000	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	78 000	50 500	—	4 000	5 600	47.1	60	100	2	1.11	7310 BEA	W	MR, T7	DB DF DT	127 000	101 000	3 200	4 500	94.1	40.1	56	104	1
55	80	13	1	0.6	18 100	16 800	—	10 000	14 000	22.2	61	74	1	0.184	7911 A5	(M)	T,TYN	DB DF DT	29 300	33 500	8 000	11 000	44.5	18.5	—	75	0.6
	80	13	1	0.6	19 100	17 700	16.3	12 000	16 000	15.5	61	74	1	0.182	7911 C	(M)	T, TYN	DB DF DT	31 000	35 500	9 500	13 000	31.1	5.1	—	75	0.6
	90	18	1.1	0.6	32 500	27 700	—	6 300	8 500	29.9	62	83	1	0.391	7011 A	W	(M), T,TYN	DB DF DT	52 500	55 500	5 000	6 700	59.9	23.9	60	85	0.6

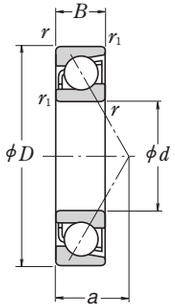
Notes (1) For applications operating near the limiting speed, refer to Page C077.
(2) Suffixes A, A5, B, and C represent contact angles of 30°, 25°, 40°, and 15° respectively.
(3) Use the values of d_a (min) and r_a (max) for bearings with "—" in the d_b column.

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

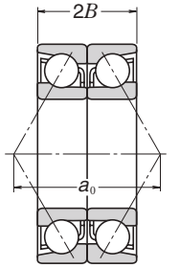
ANGULAR CONTACT BALL BEARINGS

SINGLE/MATCHED MOUNTINGS

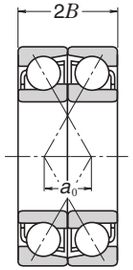
Bore Diameter 55 – 65 mm



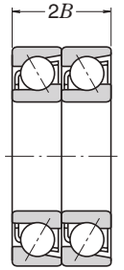
Single



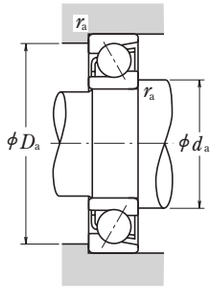
Back-to-Back
DB

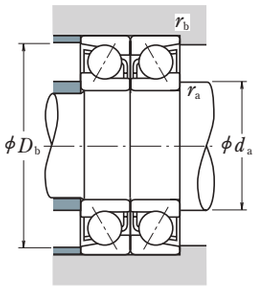


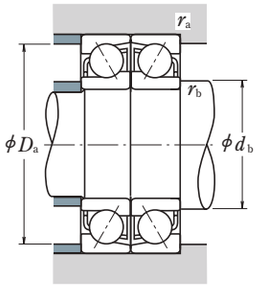
Face-to-Face
DF



Tandem
DT







Dynamic Equivalent Load $P = XF_r + YF_a$

Contact Angle	if_0F_a*/C_{or}	e	Single, DT $F_a/F_r \leqq e$ X	Single, DT $F_a/F_r \leqq e$ Y	Single, DT $F_a/F_r > e$ X	Single, DT $F_a/F_r > e$ Y	DB or DF $F_a/F_r \leqq e$ X	DB or DF $F_a/F_r \leqq e$ Y	DB or DF $F_a/F_r > e$ X	DB or DF $F_a/F_r > e$ Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40	1	0	0.44	1.40	1	1.57	0.72	2.28
	0.714	0.43	1	0	0.44	1.30	1	1.46	0.72	2.11
	1.07	0.46	1	0	0.44	1.23	1	1.38	0.72	2.00
	1.43	0.47	1	0	0.44	1.19	1	1.34	0.72	1.93
	2.14	0.50	1	0	0.44	1.12	1	1.26	0.72	1.82
	3.57	0.55	1	0	0.44	1.02	1	1.14	0.72	1.66
	5.35	0.56	1	0	0.44	1.00	1	1.12	0.72	1.63
25°	—	0.68	1	0	0.41	0.87	1	0.92	0.67	1.41
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 X_0	Single, DT Y_0	DB or DF X_0	DB or DF Y_0
15°	0.5	0.46	1	0.92
25°	0.5	0.38	1	0.76
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) d	D	B	r min.	r_1 min.	Basic Load Ratings (Single) (N) C_r	C_{0r}	Factor f_0	Limiting Speeds (1) (min⁻¹) Grease	Oil	Eff.Load Center (mm) a	Abutment and Fillet Dimensions (mm) d_a min.	D_a max.	r_a max.	Mass (kg) approx.	Bearing Designations (2) Cage Designation (4) Single	Standard	Option	Arrangement	Basic Load Ratings (Matched) (N) C_r	C_{0r}	Limiting Speeds (1) (Matched) (min⁻¹) Grease	Oil	Load Center Spacings (mm) a_0 DB	DF	Abutment and Fillet Dimensions (mm) d_b(3) min.	D_b max.	r_b(3) max.
55	90	18	1.1	0.6	34 000	28 600	15.5	11 000	15 000	18.7	62	83	1	0.430	**7011 C**	**(M)**	**W,T, TYN**	**DB DF DT**	55 500	57 500	9 000	12 000	37.4	1.4	—	85	0.6
	100	21	1.5	1	51 000	39 500	—	5 600	8 000	32.9	64	91	1.5	0.613	**7211 A**	**W**	**(M), T,TYN**	**DB DF DT**	83 000	79 000	4 500	6 300	65.7	23.7	61	94	1
	100	21	1.5	1	46 500	36 000	—	4 000	5 600	43.0	64	91	1.5	0.627	**7211 B**	**W**	**(M),T**	**DB DF DT**	75 000	72 000	3 400	4 500	86.0	44.0	61	94	1
	100	21	1.5	1	51 500	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
	100	21	1.5	1	53 000	40 000	14.5	10 000	14 000	20.9	64	91	1.5	0.688	**7211 C**	**(M)**	**W,T,TYN**	**DB DF DT**	86 000	80 000	8 500	12 000	41.7	0.3	—	94	1
	120	29	2	1	86 000	61 500	—	4 000	5 600	39.8	65	110	2	1.41	**7311 A**	**W**	**(M), T**	**DB DF DT**	139 000	123 000	3 200	4 300	79.5	21.5	61	114	1
	120	29	2	1	89 000	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	89 000	58 500	—	3 600	5 000	51.2	65	110	2	1.42	**7311 BEA**	**W**	**MR, T7**	**DB DF DT**	145 000	117 000	3 000	4 000	102.4	44.4	61	114	1
60	85	13	1	0.6	18 300	17 700	—	9 500	13 000	23.4	66	79	1	0.197	**7912 A5**	**(M)**	**T,TYN**	**DB DF DT**	29 800	35 500	7 500	10 000	46.8	20.8	—	80	0.6
	85	13	1	0.6	19 400	18 700	16.5	11 000	15 000	16.2	66	79	1	0.194	**7912 C**	**(M)**	**T, TYN**	**DB DF DT**	31 500	37 500	9 000	12 000	32.4	6.4	—	80	0.6
	95	18	1.1	0.6	33 000	29 500	—	5 600	8 000	31.4	67	88	1	0.417	**7012 A**	**W**	**(M), T,TYN**	**DB DF DT**	53 500	59 000	4 500	6 300	62.7	26.7	65	90	0.6
	95	18	1.1	0.6	35 000	30 500	15.7	10 000	14 000	19.4	67	88	1	0.460	**7012 C**	**(M)**	**W,T, TYN**	**DB DF DT**	57 000	61 500	8 500	12 000	38.8	2.8	—	90	0.6
	110	22	1.5	1	62 000	48 500	—	5 300	7 100	35.5	69	101	1.5	0.798	**7212 A**	**W**	**(M), T,TYN**	**DB DF DT**	100 000	97 500	4 300	6 000	71.1	27.1	66	104	1
	110	22	1.5	1	56 000	44 500	—	3 800	5 300	46.7	69	101	1.5	0.815	**7212 B**	**W**	**(M),T**	**DB DF DT**	91 000	89 000	3 000	4 000	93.3	49.3	66	104	1
	110	22	1.5	1	61 500	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
	110	22	1.5	1	64 000	49 000	14.4	9 500	13 000	22.4	69	101	1.5	0.889	**7212 C**	**(M)**	**W,T,TYN**	**DB DF DT**	104 000	98 500	7 500	11 000	44.8	0.8	—	104	1
	130	31	2.1	1.1	98 000	71 500	—	3 800	5 000	42.9	72	118	2	1.74	**7312 A**	**W**	**(M), T**	**DB DF DT**	159 000	143 000	3 000	4 000	85.9	23.9	67	123	1
	130	31	2.1	1.1	102 000	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	102 000	68 500	—	3 400	4 500	55.4	72	118	2	1.77	**7312 BEA**	**W**	**MR, T7**	**DB DF DT**	166 000	137 000	2 600	3 800	110.7	48.7	67	123	1
65	90	13	1	0.6	19 100	19 400	—	9 000	12 000	24.6	71	84	1	0.211	**7913 A5**	**(M)**	**T,TYN**	**DB DF DT**	31 000	39 000	7 100	9 500	49.1	23.1	—	85	0.6
	90	13	1	0.6	20 200	20 500	16.7	10 000	14 000	16.9	71	84	1	0.208	**7913 C**	**(M)**	**T, TYN**	**DB DF DT**	33 000	41 000	8 500	12 000	33.8	7.8	—	85	0.6
	100	18	1.1	0.6	35 000	33 000	—	5 300	7 500	32.8	72	93	1	0.455	**7013 A**	**W**	**(M), T,TYN**	**DB DF DT**	56 500	65 500	4 300	6 000	65.6	29.6	70	95	0.6
	100	18	1.1	0.6	37 000	34 500	15.9	10 000	13 000	20.0	72	93	1	0.493	**7013 C**	**(M)**	**W,T, TYN**	**DB DF DT**	60 500	68 500	8 000	11 000	40.1	4.1	—	95	0.6
	120	23	1.5	1	70 500	58 000	—	4 800	6 700	38.2	74	111	1.5	1.03	**7213 A**	**W**	**(M), T,TYN**	**DB DF DT**	114 000	116 000	3 800	5 300	76.4	30.4	71	114	1
	120	23	1.5	1	63 500	52 500	—	3 400	4 800	50.3	74	111	1.5	1.05	**7213 B**	**W**	**(M),T**	**DB DF DT**	103 000	105 000	2 800	3 800	100.6	54.6	71	114	1
	120	23	1.5	1	70 000	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
	120	23	1.5	1	73 000	58 500	14.6	9 000	12 000	23.9	74	111	1.5	1.14	**7213 C**	**(M)**	**W,T,TYN**	**DB DF DT**	119 000	117 000	7 100	9 500	47.8	1.8	—	114	1
	140	33	2.1	1.1	111 000	82 000	—	3 600	4 800	46.1	77	128	2	2.12	**7313 A**	**W**	**(M), T**	**DB DF DT**	180 000	164 000	2 800	3 800	92.2	26.2	72	133	1
	140	33	2.1	1.1	114 000	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	114 000	77 000	—	3 200	4 300	59.5	77	128	2	2.17	**7313 BEA**	**W**	**MR, T7**	**DB DF DT**	184 000	154 000	2 400	3 400	119.0	53.0	72	133	1

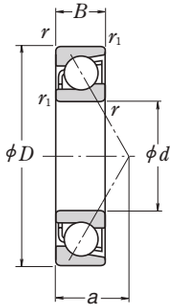
Notes (1) For applications operating near the limiting speed, refer to Page C077.
(2) Suffixes A, A5, B, and C represent contact angles of 30°, 25°, 40°, and 15° respectively.
(3) Use the values of d_a (min) and r_a (max) for bearings with "—" in the d_b column.

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

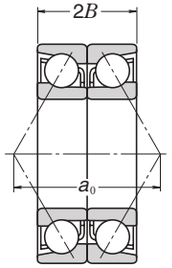
ANGULAR CONTACT BALL BEARINGS

SINGLE/MATCHED MOUNTINGS

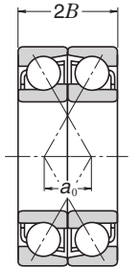
Bore Diameter 70 – 80 mm



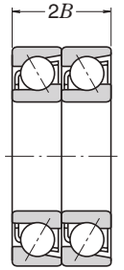
Single



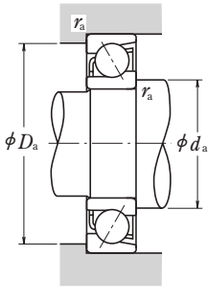
Back-to-Back DB

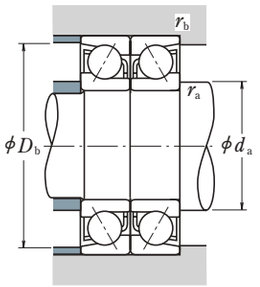


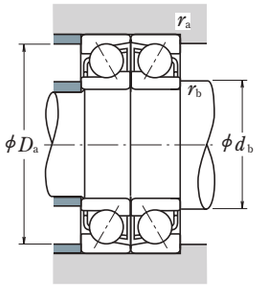
Face-to-Face DF



Tandem DT







Dynamic Equivalent Load $P = XF_r + YF_a$

Contact Angle	$\frac{if_0F_a}{C_{or}}$*	e	Single, DT $F_a/F_r \leqq e$ X	Y	Single, DT $F_a/F_r > e$ X	Y	DB or DF $F_a/F_r \leqq e$ X	Y	DB or DF $F_a/F_r > e$ X	Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40	1	0	0.44	1.40	1	1.57	0.72	2.28
	0.714	0.43	1	0	0.44	1.30	1	1.46	0.72	2.11
	1.07	0.46	1	0	0.44	1.23	1	1.38	0.72	2.00
	1.43	0.47	1	0	0.44	1.19	1	1.34	0.72	1.93
	2.14	0.50	1	0	0.44	1.12	1	1.26	0.72	1.82
	3.57	0.55	1	0	0.44	1.02	1	1.14	0.72	1.66
	5.35	0.56	1	0	0.44	1.00	1	1.12	0.72	1.63
25°	—	0.68	1	0	0.41	0.87	1	0.92	0.67	1.41
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 X_0	Y_0	DB or DF X_0	Y_0
15°	0.5	0.46	1	0.92
25°	0.5	0.38	1	0.76
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) d	D	B	r min.	r_1 min.	Basic Load Ratings (Single) (N) C_r	C_{0r}	Factor f_0	Limiting Speeds (1) (min⁻¹) Grease	Oil	Eff.Load Center (mm) a	Abutment and Fillet Dimensions (mm) d_a min.	D_a max.	r_a max.	Mass (kg) approx.	Bearing Designations (2) Cage Designation (4) Single	Standard	Option	Arrangement	Basic Load Ratings (Matched) (N) C_r	C_{0r}	Limiting Speeds (1) (Matched) (min⁻¹) Grease	Oil	Load Center Spacings (mm) a_0 DB	DF	Abutment and Fillet Dimensions (mm) d_b(3) min.	D_b max.	r_b(3) max.
70	100	16	1	0.6	26 500	26 300	—	8 000	11 000	27.8	76	94	1	0.341	**7914 A5**	**(M)**	**T,TYN**	**DB DF DT**	43 000	52 500	6 300	9 000	55.6	23.6	—	95	0.6
	100	16	1	0.6	28 100	27 800	16.4	9 500	13 000	19.4	76	94	1	0.338	**7914 C**	**(M)**	**T, TYN,T85**	**DB DF DT**	45 500	55 500	7 500	11 000	38.8	6.8	—	95	0.6
	110	20	1.1	0.6	44 000	41 500	—	5 000	6 700	36.0	77	103	1	0.625	**7014 A**	**W**	**(M), T,TYN**	**DB DF DT**	71 500	82 500	4 000	5 600	72.0	32.0	75	105	0.6
	110	20	1.1	0.6	47 000	43 000	15.7	9 000	12 000	22.1	77	103	1	0.698	**7014 C**	**(M)**	**W,T, TYN**	**DB DF DT**	76 000	86 000	7 100	10 000	44.1	4.1	—	105	0.6
	125	24	1.5	1	76 500	63 500	—	4 500	6 300	40.1	79	116	1.5	1.11	**7214 A**	**W**	**(M), T,TYN**	**DB DF DT**	124 000	127 000	3 600	5 000	80.3	32.3	76	119	1
	125	24	1.5	1	69 000	58 000	—	3 200	4 500	52.9	79	116	1.5	1.14	**7214 B**	**W**	**(M),T**	**DB DF DT**	112 000	116 000	2 600	3 600	105.8	57.8	76	119	1
	125	24	1.5	1	75 500	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
	125	24	1.5	1	79 500	64 500	14.6	8 500	11 000	25.1	79	116	1.5	1.24	**7214 C**	**(M)**	**W,T,TYN,T7**	**DB DF DT**	129 000	129 000	6 700	9 000	50.1	2.1	—	119	1
	150	35	2.1	1.1	125 000	93 500	—	3 200	4 300	49.3	82	138	2	2.60	**7314 A**	**W**	**(M), T**	**DB DF DT**	203 000	187 000	2 600	3 400	98.5	28.5	77	143	1
	150	35	2.1	1.1	124 000	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	124 000	87 500	—	2 800	4 000	63.6	82	138	2	2.62	**7314 BEA**	**W**	**MR, T7**	**DB DF DT**	201 000	175 000	2 400	3 200	127.3	57.3	77	143	1
75	105	16	1	0.6	26 900	27 700	—	7 500	10 000	29.0	81	99	1	0.355	**7915 A5**	**(M)**	**TYN**	**DB DF DT**	44 000	55 500	6 000	8 500	58.0	26.0	—	100	0.6
	105	16	1	0.6	28 600	29 300	16.6	9 000	12 000	20.1	81	99	1	0.357	**7915 C**	**(M)**	**T, TYN**	**DB DF DT**	46 500	58 500	7 100	10 000	40.1	8.1	—	100	0.6
	115	20	1.1	0.6	45 000	43 500	—	4 800	6 300	37.4	82	108	1	0.661	**7015 A**	**W**	**(M), T,TYN**	**DB DF DT**	73 000	87 500	3 800	5 300	74.8	34.8	80	110	0.6
	115	20	1.1	0.6	48 000	45 500	15.9	8 500	12 000	22.7	82	108	1	0.748	**7015 C**	**(M)**	**W,T, TYN**	**DB DF DT**	78 000	91 500	6 700	9 500	45.4	5.4	—	110	0.6
	130	25	1.5	1	76 000	64 500	—	4 300	6 000	42.1	84	121	1.5	1.19	**7215 A**	**W**	**(M), T,TYN**	**DB DF DT**	123 000	129 000	3 600	4 800	84.2	34.2	81	124	1
	130	25	1.5	1	68 500	58 500	—	3 200	4 300	55.5	84	121	1.5	1.22	**7215 B**	**W**	**(M),T**	**DB DF DT**	112 000	117 000	2 400	3 400	111.0	61.0	81	124	1
	130	25	1.5	1	78 500	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
	130	25	1.5	1	83 000	70 000	14.8	8 000	11 000	26.2	84	121	1.5	1.36	**7215 C**	**(M)**	**W,T,TYN,T7**	**DB DF DT**	134 000	140 000	6 300	9 000	52.4	2.4	—	124	1
	160	37	2.1	1.1	136 000	106 000	—	3 000	4 000	52.4	87	148	2	3.13	**7315 A**	**W**	**(M), T**	**DB DF DT**	221 000	212 000	2 400	3 200	104.8	30.8	82	153	1
	160	37	2.1	1.1	134 000	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	134 000	98 500	—	2 800	3 800	67.8	87	148	2	3.13	**7315 BEA**	**W**	**MR, T7**	**DB DF DT**	217 000	197 000	2 200	3 000	135.6	61.6	82	153	1
80	110	16	1	0.6	27 300	29 000	—	7 100	10 000	30.2	86	104	1	0.380	**7916 A5**	**(M)**	**T,TYN**	**DB DF DT**	44 500	58 000	5 600	8 000	60.3	28.3	—	105	0.6
	110	16	1	0.6	29 000	30 500	16.7	8 500	12 000	20.7	86	104	1	0.376	**7916 C**	**(M)**	**T, TYN**	**DB DF DT**	47 000	61 500	6 700	9 500	41.5	9.5	—	105	0.6
	125	22	1.1	0.6	55 000	53 000	—	4 300	6 000	40.6	87	118	1	0.880	**7016 A**	**W**	**(M), T,TYN**	**DB DF DT**	89 500	106 000	3 600	4 800	81.2	37.2	85	120	0.6
	125	22	1.1	0.6	58 500	55 500	15.7	8 000	11 000	24.7	87	118	1	0.966	**7016 C**	**(M)**	**W,T, TYN**	**DB DF DT**	95 500	111 000	6 300	9 000	49.4	5.4	—	120	0.6
	140	26	2	1	89 000	76 000	—	4 000	5 600	44.8	90	130	2	1.46	**7216 A**	**W**	**(M), T,TYN**	**DB DF DT**	145 000	152 000	3 200	4 500	89.5	37.5	86	134	1
	140	26	2	1	80 500	69 500	—	2 800	4 000	59.1	90	130	2	1.49	**7216 B**	**W**	**(M),T**	**DB DF DT**	131 000	139 000	2 400	3 200	118.3	66.3	86	134	1
	140	26	2	1	87 500	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
	140	26	2	1	93 000	77 500	14.7	7 500	10 000	27.7	90	130	2	1.63	**7216 C**	**(M)**	**W,T,TYN**	**DB DF DT**	151 000	155 000	6 000	8 000	55.5	3.5	—	134	1
	170	39	2.1	1.1	147 000	119 000	—	2 800	3 800	55.6	92	158	2	3.71	**7316 A**	**W**	**(M), T**	**DB DF DT**	239 000	238 000	2 200	3 000	111.2	33.2	87	163	1
	170	39	2.1	1.1	144 000	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	144 000	110 000	—	2 600	3 400	71.9	92	158	2	3.84	**7316 BEA**	**W**	**MR, T7**	**DB DF DT**	235 000	220 000	2 000	2 800	143.9	65.9	87	163	1

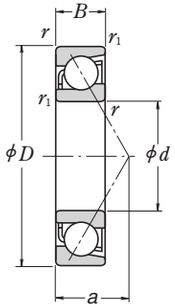
Notes (1) For applications operating near the limiting speed, refer to Page C077.
(2) Suffixes A, A5, B, and C represent contact angles of 30°, 25°, 40°, and 15° respectively.
(3) Use the values of d_a (min) and r_a (max) for bearings with "—" in the d_b column.

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

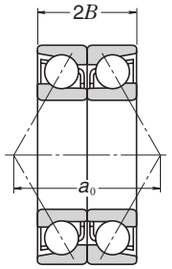
ANGULAR CONTACT BALL BEARINGS

SINGLE/MATCHED MOUNTINGS

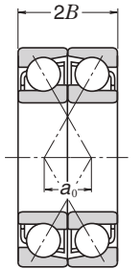
Bore Diameter 85 – 100 mm



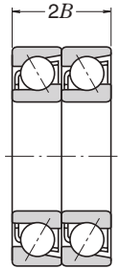
Single



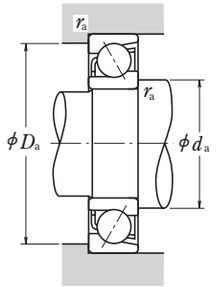
Back-to-Back
DB

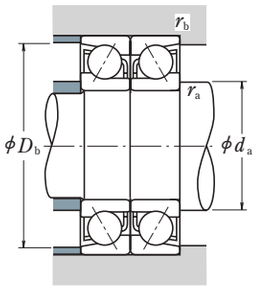


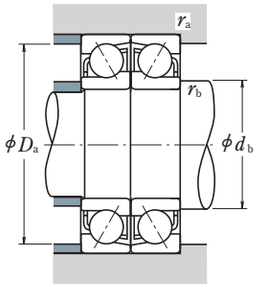
Face-to-Face
DF



Tandem
DT







Dynamic Equivalent Load $P = XF_r + YF_a$

Contact Angle	$\frac{if_0F_a}{C_{or}}$*	e	Single, DT $F_a/F_r \leqq e$ X	Y	Single, DT $F_a/F_r > e$ X	Y	DB or DF $F_a/F_r \leqq e$ X	Y	DB or DF $F_a/F_r > e$ X	Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40	1	0	0.44	1.40	1	1.57	0.72	2.28
	0.714	0.43	1	0	0.44	1.30	1	1.46	0.72	2.11
	1.07	0.46	1	0	0.44	1.23	1	1.38	0.72	2.00
	1.43	0.47	1	0	0.44	1.19	1	1.34	0.72	1.93
	2.14	0.50	1	0	0.44	1.12	1	1.26	0.72	1.82
	3.57	0.55	1	0	0.44	1.02	1	1.14	0.72	1.66
	5.35	0.56	1	0	0.44	1.00	1	1.12	0.72	1.63
25°	—	0.68	1	0	0.41	0.87	1	0.92	0.67	1.41
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 X_0	Y_0	DB or DF X_0	Y_0
15°	0.5	0.46	1	0.92
25°	0.5	0.38	1	0.76
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) d	D	B	r min.	r_1 min.	Basic Load Ratings (Single) (N) C_r	C_{0r}	Factor f_0	Limiting Speeds (1) (min^{-1}) Grease	Oil	Eff.Load Center (mm) a	Abutment and Fillet Dimensions (mm) d_a min.	D_a max.	r_a max.	Mass (kg) approx.	Bearing Designations (2) Cage Designation (4) Single	Standard	Option	Arrangement	Basic Load Ratings (Matched) (N) C_r	C_{0r}	Limiting Speeds (1) (Matched) (min^{-1}) Grease	Oil	Load Center Spacings (mm) a_0 DB	DF	Abutment and Fillet Dimensions (mm) d_b(3) min.	D_b max.	r_b(3) max.
85	120	18	1.1	0.6	36 500	38 500	—	6 700	9 000	32.9	92	113	1	0.541	**7917 A5**	(M)	T,TYN	DB DF DT	59 500	77 000	5 300	7 500	65.8	29.8	—	115	0.6
	120	18	1.1	0.6	39 000	40 500	16.5	8 000	11 000	22.7	92	113	1	0.534	**7917 C**	(M)	T, TYN	DB DF DT	63 000	81 500	6 300	9 000	45.5	9.5	—	115	0.6
	130	22	1.1	0.6	56 500	56 000	—	4 300	5 600	42.0	92	123	1	0.913	**7017 A**	W	(M), T,TYN	DB DF DT	91 500	112 000	3 400	4 500	84.1	40.1	90	125	0.6
	130	22	1.1	0.6	60 000	58 500	15.9	7 500	10 000	25.4	92	123	1	1.01	**7017 C**	(M)	W,T, TYN	DB DF DT	98 000	117 000	6 000	8 500	50.8	6.8	—	125	0.6
	150	28	2	1	103 000	89 000	—	3 800	5 300	47.9	95	140	2	1.83	**7217 A**	W	(M), T,TYN	DB DF DT	167 000	178 000	3 000	4 300	95.8	39.8	91	144	1
	150	28	2	1	93 000	81 000	—	2 800	3 800	63.3	95	140	2	1.87	**7217 B**	W	(M), T	DB DF DT	151 000	162 000	2 200	3 000	126.6	70.6	91	144	1
	150	28	2	1	96 000	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
	150	28	2	1	107 000	90 500	14.7	6 700	9 500	29.7	95	140	2	2.04	**7217 C**	(M)	W,T,TYN	DB DF DT	174 000	181 000	5 600	7 500	59.5	3.5	—	144	1
	180	41	3	1.1	159 000	133 000	—	2 600	3 600	58.8	99	166	2.5	4.33	**7317 A**	W	(M), T	DB DF DT	258 000	265 000	2 200	2 800	117.5	35.5	92	173	1
	180	41	3	1.1	146 000	122 000	—	2 400	3 200	76.1	99	166	2.5	4.42	**7317 B**	W	(M), T	DB DF DT	236 000	244 000	1 900	2 600	152.2	70.2	92	173	1
	180	41	3	1.1	157 000	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	125	18	1.1	0.6	39 500	43 500	—	6 300	8 500	34.1	97	118	1	0.560	**7918 A5**	(M)	T,TYN	DB DF DT	64 000	87 000	5 000	7 100	68.1	32.1	—	120	0.6
	125	18	1.1	0.6	41 500	46 000	16.6	7 500	10 000	23.4	97	118	1	0.563	**7918 C**	(M)	T, TYN	DB DF DT	67 500	92 000	6 000	8 500	46.8	10.8	—	120	0.6
	140	24	1.5	1	67 500	66 500	—	3 800	5 300	45.2	99	131	1.5	1.19	**7018 A**	W	(M), T,TYN	DB DF DT	109 000	133 000	3 200	4 300	90.4	42.4	96	134	1
	140	24	1.5	1	71 500	69 000	15.7	7 100	9 500	27.4	99	131	1.5	1.34	**7018 C**	(M)	W,T, TYN	DB DF DT	116 000	138 000	5 600	8 000	54.8	6.8	—	134	1
	160	30	2	1	118 000	103 000	—	3 600	4 800	51.1	100	150	2	2.25	**7218 A**	W	(M), T,TYN	DB DF DT	191 000	206 000	2 800	4 000	102.2	42.2	96	154	1
	160	30	2	1	107 000	94 000	—	2 600	3 400	67.4	100	150	2	2.29	**7218 B**	W	(M), T	DB DF DT	173 000	188 000	2 000	2 800	134.9	74.9	96	154	1
	160	30	2	1	109 000	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
	160	30	2	1	123 000	105 000	14.6	6 300	9 000	31.7	100	150	2	2.51	**7218 C**	(M)	W,T,TYN	DB DF DT	199 000	209 000	5 300	7 100	63.5	3.5	—	154	1
	190	43	3	1.1	171 000	147 000	—	2 600	3 400	61.9	104	176	2.5	5.06	**7318 A**	W	(M), T	DB DF DT	277 000	294 000	2 000	2 800	123.8	37.8	97	183	1
	190	43	3	1.1	156 000	135 000	—	2 200	3 000	80.2	104	176	2.5	5.17	**7318 B**	W	(M), T	DB DF DT	254 000	270 000	1 800	2 400	160.5	74.5	97	183	1
	190	43	3	1.1	169 000	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	130	18	1.1	0.6	40 000	45 500	—	6 000	8 500	35.2	102	123	1	0.597	**7919 A5**	(M)	T,TYN	DB DF DT	64 500	91 000	4 800	6 700	70.5	34.5	—	125	0.6
	130	18	1.1	0.6	42 500	48 000	16.7	7 100	10 000	24.1	102	123	1	0.591	**7919 C**	(M)	T, TYN	DB DF DT	68 500	96 000	5 600	8 000	48.1	12.1	—	125	0.6
	145	24	1.5	1	67 000	67 000	—	4 500	6 300	46.6	104	136	1.5	1.43	**7019 A**	(M)	T,TYN	DB DF DT	109 000	134 000	3 800	5 000	93.3	45.3	—	139	1
	145	24	1.5	1	73 500	73 000	15.9	6 700	9 000	28.1	104	136	1.5	1.42	**7019 C**	(M)	T, TYN	DB DF DT	119 000	146 000	5 300	7 500	56.1	8.1	—	139	1
	170	32	2.1	1.1	128 000	111 000	—	3 400	4 500	54.2	107	158	2	2.68	**7219 A**	W	(M), T,TYN	DB DF DT	208 000	221 000	2 600	3 600	108.5	44.5	102	163	1
	170	32	2.1	1.1	116 000	101 000	—	2 400	3 200	71.6	107	158	2	2.74	**7219 B**	W	(M), T	DB DF DT	188 000	202 000	1 900	2 600	143.2	79.2	102	163	1
	170	32	2.1	1.1	123 000	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
	170	32	2.1	1.1	133 000	112 000	14.6	6 000	8 500	33.7	107	158	2	3.05	**7219 C**	(M)	W,T,TYN	DB DF DT	216 000	224 000	4 800	6 700	67.5	3.5	—	163	1
	200	45	3	1.1	183 000	162 000	—	2 400	3 200	65.1	109	186	2.5	5.83	**7319 A**	W	(M), T	DB DF DT	297 000	325 000	1 900	2 600	130.2	40.2	102	193	1
	200	45	3	1.1	167 000	149 000	—	2 200	3 000	84.3	109	186	2.5	5.98	**7319 B**	W	(M), T	DB DF DT	272 000	298 000	1 700	2 400	168.7	78.7	102	193	1
	200	45	3	1.1	180 000	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	140	20	1.1	0.6	47 500	51 500	—	5 600	8 000	38.0	107	133	1	0.804	**7920 A5**	(M)	T,TYN	DB DF DT	77 000	103 000	4 500	6 300	76.0	36.0	—	135	0.6
	140	20	1.1	0.6	50 000	54 000	16.5	6 700	9 000	26.1	107	133	1	0.794	**7920 C**	(M)	T, TYN	DB DF DT	81 500	108 000	5 300	7 500	52.2	12.2	—	135	0.6
	150	24	1.5	1	68 500	70 500	—	4 500	6 000	48.1	109	141	1.5	1.48	**7020 A**	(M)	T,TYN	DB DF DT	111 000	141 000	3 600	5 000	96.2	48.2	—	144	1

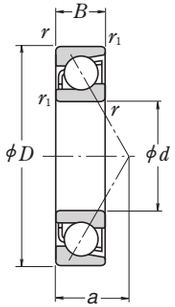
Notes (1) For applications operating near the limiting speed, refer to Page C077.
(2) Suffixes A, A5, B, and C represent contact angles of 30°, 25°, 40°, and 15° respectively.
(3) Use the values of d_a (min) and r_a (max) for bearings with "—" in the d_b column.

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

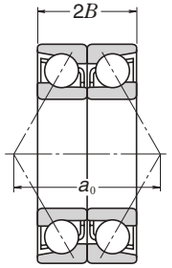
ANGULAR CONTACT BALL BEARINGS

SINGLE/MATCHED MOUNTINGS

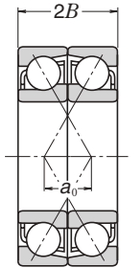
Bore Diameter 100 – 120 mm



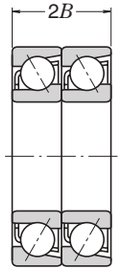
Single



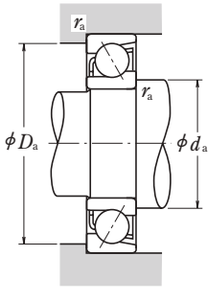
Back-to-Back
DB

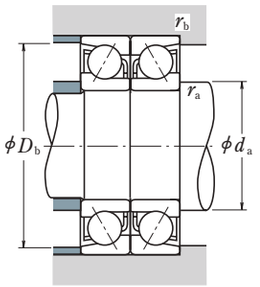


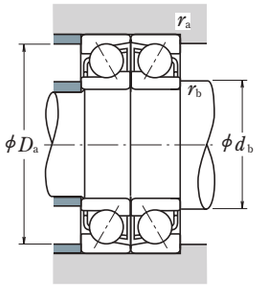
Face-to-Face
DF



Tandem
DT







Dynamic Equivalent Load $P = XF_r + YF_a$

Contact Angle	$if_0F_a^*/C_{or}$	e	Single, DT $F_a/F_r \leqq e$ X	Y	Single, DT $F_a/F_r > e$ X	Y	DB or DF $F_a/F_r \leqq e$ X	Y	DB or DF $F_a/F_r > e$ X	Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40	1	0	0.44	1.40	1	1.57	0.72	2.28
	0.714	0.43	1	0	0.44	1.30	1	1.46	0.72	2.11
	1.07	0.46	1	0	0.44	1.23	1	1.38	0.72	2.00
	1.43	0.47	1	0	0.44	1.19	1	1.34	0.72	1.93
	2.14	0.50	1	0	0.44	1.12	1	1.26	0.72	1.82
	3.57	0.55	1	0	0.44	1.02	1	1.14	0.72	1.66
	5.35	0.56	1	0	0.44	1.00	1	1.12	0.72	1.63
25°	—	0.68	1	0	0.41	0.87	1	0.92	0.67	1.41
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 X_0	Y_0	DB or DF X_0	Y_0
15°	0.5	0.46	1	0.92
25°	0.5	0.38	1	0.76
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) d	D	B	r min.	r_1 min.	Basic Load Ratings (Single) (N) C_r	C_{0r}	Factor f_0	Limiting Speeds (1) (min⁻¹) Grease	Oil	Eff.Load Center (mm) a	Abutment and Fillet Dimensions (mm) d_a min.	D_a max.	r_a max.	Mass (kg) approx.	Bearing Designations (2) Cage Designation (4) Single	Standard	Option	Arrangement	Basic Load Ratings (Matched) (N) C_r	C_{0r}	Limiting Speeds (1) (Matched) (min⁻¹) Grease	Oil	Load Center Spacings (mm) a_0 DB	DF	Abutment and Fillet Dimensions (mm) d_b (3) min.	D_b max.	r_b (3) max.
100	150	24	1.5	1	75 500	77 000	16.0	6 300	9 000	28.7	109	141	1.5	1.46	**7020 C**	**(M)**	**T, TYN**	**DB DF DT**	122 000	154 000	5 300	7 100	57.5	9.5	—	144	1
	180	34	2.1	1.1	144 000	126 000	—	3 200	4 300	57.4	112	168	2	3.22	**7220 A**	**W**	**(M), T,TYN**	**DB DF DT**	233 000	251 000	2 600	3 400	114.8	46.8	107	173	1
	180	34	2.1	1.1	130 000	114 000	—	2 200	3 000	75.7	112	168	2	3.28	**7220 B**	**W**	**(M), T**	**DB DF DT**	212 000	229 000	1 800	2 400	151.5	83.5	107	173	1
	180	34	2.1	1.1	136 000	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
	180	34	2.1	1.1	149 000	127 000	14.5	5 600	8 000	35.7	112	168	2	3.65	**7220 C**	**(M)**	**W,T,TYN**	**DB DF DT**	242 000	254 000	4 500	6 300	71.5	3.5	—	173	1
	215	47	3	1.1	207 000	193 000	—	2 200	3 000	69.0	114	201	2.5	7.29	**7320 A**	**W**	**(M), T**	**DB DF DT**	335 000	385 000	1 800	2 400	137.9	43.9	107	208	1
	215	47	3	1.1	190 000	178 000	—	2 000	2 800	89.6	114	201	2.5	7.43	**7320 B**	**W**	**(M), T**	**DB DF DT**	310 000	355 000	1 600	2 200	179.2	85.2	107	208	1
	215	47	3	1.1	202 000	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	145	20	1.1	0.6	48 000	54 000	—	5 600	7 500	39.2	112	138	1	0.820	**7921 A5**	**(M)**	**T,TYN**	**DB DF DT**	78 500	108 000	4 300	6 000	78.3	38.3	—	140	0.6
	145	20	1.1	0.6	51 000	57 000	16.6	6 300	9 000	26.7	112	138	1	0.826	**7921 C**	**(M)**	**T, TYN**	**DB DF DT**	83 000	114 000	5 300	7 100	53.5	13.5	—	140	0.6
	160	26	2	1	80 000	81 500	—	4 300	5 600	51.2	115	150	2	1.84	**7021 A**	**(M)**	**T,TYN**	**DB DF DT**	130 000	163 000	3 400	4 500	102.5	50.5	—	154	1
	160	26	2	1	88 000	89 500	15.9	6 000	8 500	30.7	115	150	2	1.82	**7021 C**	**(M)**	**T, TYN**	**DB DF DT**	143 000	179 000	4 800	6 700	61.5	9.5	—	154	1
	190	36	2.1	1.1	157 000	142 000	—	3 000	4 000	60.6	117	178	2	3.84	**7221 A**	**W**	**(M), T**	**DB DF DT**	254 000	283 000	2 400	3 400	121.2	49.2	112	183	1
	190	36	2.1	1.1	142 000	129 000	—	2 200	3 000	79.9	117	178	2	3.92	**7221 B**	**W**	**(M), T**	**DB DF DT**	231 000	258 000	1 700	2 400	159.8	87.8	112	183	1
	190	36	2.1	1.1	148 000	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
	190	36	2.1	1.1	162 000	143 000	14.5	5 300	7 500	37.7	117	178	2	4.33	**7221 C**	**(M)**	**W,T,TYN**	**DB DF DT**	264 000	286 000	4 300	6 000	75.5	3.5	—	183	1
	225	49	3	1.1	208 000	193 000	—	2 600	3 600	72.1	119	211	2.5	9.34	**7321 A**	**(M)**	**T**	**DB DF DT**	335 000	385 000	2 200	2 800	144.3	46.3	—	218	1
	225	49	3	1.1	191 000	177 000	—	2 400	3 200	93.7	119	211	2.5	9.43	**7321 B**	**(M)**	**T**	**DB DF DT**	310 000	355 000	1 900	2 600	187.4	89.4	—	218	1
	225	49	3	1.1	213 000	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	150	20	1.1	0.6	49 000	56 000	—	5 300	7 100	40.3	117	143	1	0.877	**7922 A5**	**(M)**	**T,TYN**	**DB DF DT**	79 500	112 000	4 300	5 600	80.6	40.6	—	145	0.6
	150	20	1.1	0.6	52 000	59 500	16.7	6 300	8 500	27.4	117	143	1	0.867	**7922 C**	**(M)**	**T, TYN**	**DB DF DT**	84 500	119 000	5 000	6 700	54.8	14.8	—	145	0.6
	170	28	2	1	96 500	95 500	—	4 000	5 300	54.4	120	160	2	2.28	**7022 A**	**(M)**	**T,TYN**	**DB DF DT**	157 000	191 000	3 200	4 300	108.8	52.8	—	164	1
	170	28	2	1	106 000	104 000	15.6	5 600	8 000	32.7	120	160	2	2.26	**7022 C**	**(M)**	**T, TYN**	**DB DF DT**	172 000	208 000	4 500	6 300	65.5	9.5	—	164	1
	200	38	2.1	1.1	170 000	158 000	—	2 800	3 800	63.7	122	188	2	4.49	**7222 A**	**W**	**(M), T,TYN**	**DB DF DT**	276 000	315 000	2 200	3 200	127.5	51.5	117	193	1
	200	38	2.1	1.1	154 000	144 000	—	2 000	2 800	84.0	122	188	2	4.58	**7222 B**	**W**	**(M), T**	**DB DF DT**	250 000	289 000	1 600	2 200	168.1	92.1	117	193	1
	200	38	2.1	1.1	154 000	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
	200	38	2.1	1.1	176 000	160 000	14.5	5 000	7 100	39.8	122	188	2	5.10	**7222 C**	**(M)**	**W,T,TYN**	**DB DF DT**	286 000	320 000	4 000	5 600	79.5	3.5	—	193	1
	240	50	3	1.1	220 000	215 000	—	2 600	3 400	75.5	124	226	2.5	11.1	**7322 A**	**(M)**	**W,T**	**DB DF DT**	360 000	430 000	2 000	2 600	151.0	51.0	—	233	1
	240	50	3	1.1	201 000	197 000	—	2 200	3 000	98.4	124	226	2.5	11.2	**7322 B**	**(M)**	**W,T**	**DB DF DT**	325 000	395 000	1 800	2 400	196.8	96.8	—	233	1
	240	50	3	1.1	226 000	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	165	22	1.1	0.6	67 500	77 000	—	4 800	6 300	44.2	127	158	1	1.15	**7924 A5**	**(M)**	**T,TYN**	**DB DF DT**	110 000	154 000	3 800	5 300	88.5	44.5	—	160	0.6
	165	22	1.1	0.6	72 000	81 000	16.5	5 600	7 500	30.1	127	158	1	1.15	**7924 C**	**(M)**	**T, TYN**	**DB DF DT**	117 000	162 000	4 500	6 300	60.2	16.2	—	160	0.6
	180	28	2	1	102 000	107 000	—	3 600	5 000	57.3	130	170	2	2.45	**7024 A**	**(M)**	**T,TYN**	**DB DF DT**	166 000	213 000	3 000	4 000	114.6	58.6	—	174	1
	215	40	2.1	1.1	183 000	177 000	—	3 200	4 500	68.3	132	203	2	6.22	**7224 A**	**(M)**	**T**	**DB DF DT**	297 000	355 000	2 600	3 600	136.7	56.7	—	208	1
	215	40	2.1	1.1	165 000	162 000	—	2 400	3 200	90.3	132	203	2	6.26	**7224 B**	**(M)**	**T**	**DB DF DT**	269 000	325 000	1 900	2 600	180.5	100.5	—	208	1
	215	40	2.1	1.1	179 000	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	246 000	252 000	—	2 200	3 000	82.3	134	246	2.5	14.5	**7324 A**	**(M)**	**T**	**DB DF DT**	400 000	505 000	1 800	2 400	164.7	54.7	—	253	1
	260	55	3	1.1	225 000	231 000	—	2 000	2 800	107.2	134	246	2.5	14.4	**7324 B**	**(M)**	**T**	**DB DF DT**	365 000	460 000	1 600	2 200	214.4	104.4	—	253	1
	260	55	3	1.1	238 000	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

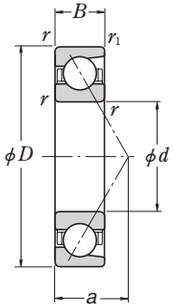
Notes (1) For applications operating near the limiting speed, refer to Page C077.
(2) Suffixes A, A5, B, and C represent contact angles of 30°, 25°, 40°, and 15° respectively.
(3) Use the values of d_a (min) and r_a (max) for bearings with "—" in the d_b column.

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

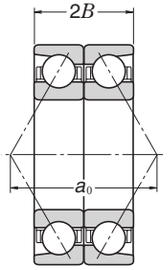
ANGULAR CONTACT BALL BEARINGS

SINGLE/MATCHED MOUNTINGS

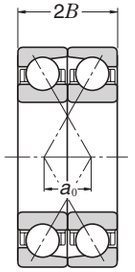
Bore Diameter 130 – 170 mm



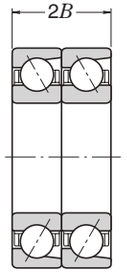
Single



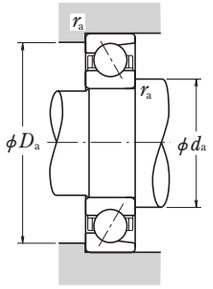
Back-to-Back
DB

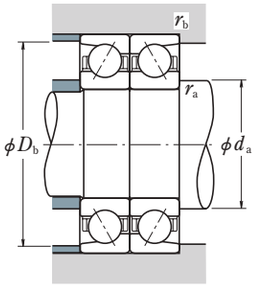


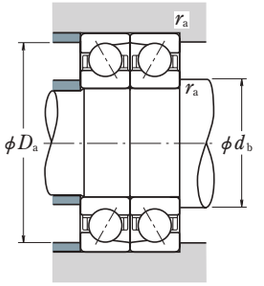
Face-to-Face
DF



Tandem
DT







Dynamic Equivalent Load $P = XF_r + YF_a$

Contact Angle	if_0F_a* / C_{0r}	e	Single, DT $F_a/F_r \leqq e$ X	Single, DT $F_a/F_r \leqq e$ Y	Single, DT $F_a/F_r > e$ X	Single, DT $F_a/F_r > e$ Y	DB or DF $F_a/F_r \leqq e$ X	DB or DF $F_a/F_r \leqq e$ Y	DB or DF $F_a/F_r > e$ X	DB or DF $F_a/F_r > e$ Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40	1	0	0.44	1.40	1	1.57	0.72	2.28
	0.714	0.43	1	0	0.44	1.30	1	1.46	0.72	2.11
	1.07	0.46	1	0	0.44	1.23	1	1.38	0.72	2.00
	1.43	0.47	1	0	0.44	1.19	1	1.34	0.72	1.93
	2.14	0.50	1	0	0.44	1.12	1	1.26	0.72	1.82
	3.57	0.55	1	0	0.44	1.02	1	1.14	0.72	1.66
	5.35	0.56	1	0	0.44	1.00	1	1.12	0.72	1.63
25°	—	0.68	1	0	0.41	0.87	1	0.92	0.67	1.41
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 X_0	Single, DT Y_0	DB or DF X_0	DB or DF Y_0
15°	0.5	0.46	1	0.92
25°	0.5	0.38	1	0.76
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) d	D	B	r min.	r_1 min.	Basic Load Ratings (Single) (N) C_r	C_{0r}	Factor f_0	Limiting Speeds (1) (min^{-1}) Grease	Oil	Eff.Load Center (mm) a	Abutment and Fillet Dimensions (mm) d_a min.	D_a max.	r_a max.	Mass (kg) approx.	Bearing Designations (2) Cage Designation (4) Single	Standard	Option	Arrangement	Basic Load Ratings (Matched) (N) C_r	C_{0r}	Limiting Speeds (1) (Matched) (min^{-1}) Grease	Oil	Load Center Spacings (mm) a_0 DB	DF	Abutment and Fillet Dimensions (mm) d_b (3) min.	D_b max.	r_b (3) max.
130	180	24	1.5	1	74 000	86 000	—	4 300	6 000	48.1	139	171	1.5	1.54	**7926 A5**	**(M)**	**T,TYN**	**DB DF DT**	120 000	172 000	3 400	4 800	96.3	48.3	—	174	1
	180	24	1.5	1	78 500	91 000	16.5	5 000	7 100	32.8	139	171	1.5	1.50	**7926 C**	**(M)**	**T, TYN**	**DB DF DT**	128 000	182 000	4 000	5 600	65.5	17.5	—	174	1
	200	33	2	1	117 000	125 000	—	3 400	4 500	64.1	140	190	2	3.68	**7026 A**	**(M)**	**T,TYN**	**DB DF DT**	191 000	251 000	2 600	3 600	128.3	62.3	—	194	1
	230	40	3	1.1	189 000	193 000	—	2 400	3 200	72.0	144	216	2.5	7.06	**7226 A**	**(M)**	**T**	**DB DF DT**	310 000	385 000	1 900	2 600	143.9	63.9	—	223	1
	230	40	3	1.1	171 000	175 000	—	2 200	3 000	95.5	144	216	2.5	7.10	**7226 B**	**(M)**	**T**	**DB DF DT**	278 000	350 000	1 700	2 400	191.0	111.0	—	223	1
	280	58	4	1.5	273 000	293 000	—	2 200	2 800	88.2	148	262	3	17.5	**7326 A**	**(M)**	**T**	**DB DF DT**	445 000	585 000	1 700	2 200	176.3	60.3	—	271	1.5
	280	58	4	1.5	250 000	268 000	—	1 900	2 600	115.0	148	262	3	17.6	**7326 B**	**(M)**	**T**	**DB DF DT**	405 000	535 000	1 500	2 000	230.0	114.0	—	271	1.5
140	190	24	1.5	1	75 000	90 000	—	4 000	5 600	50.5	149	181	1.5	1.63	**7928 A5**	**(M)**	**T,TYN**	**DB DF DT**	122 000	180 000	3 200	4 500	100.9	52.9	—	184	1
	190	24	1.5	1	79 500	95 500	16.7	4 800	6 700	34.1	149	181	1.5	1.63	**7928 C**	**(M)**	**T, TYN**	**DB DF DT**	129 000	191 000	3 800	5 300	68.2	20.2	—	184	1
	210	33	2	1	120 000	133 000	—	3 200	4 300	67.0	150	200	2	3.90	**7028 A**	**(M)**	**T**	**DB DF DT**	194 000	265 000	2 600	3 400	134.0	68.0	—	204	1
	250	42	3	1.1	218 000	234 000	—	2 200	3 000	77.3	154	236	2.5	8.92	**7228 A**	**(M)**	**T**	**DB DF DT**	355 000	470 000	1 800	2 400	154.6	70.6	—	243	1
	250	42	3	1.1	197 000	213 000	—	2 000	2 800	102.8	154	236	2.5	8.94	**7228 B**	**(M)**	**T**	**DB DF DT**	320 000	425 000	1 600	2 200	205.6	121.6	—	243	1
	300	62	4	1.5	300 000	335 000	—	2 000	2 600	94.5	158	282	3	21.4	**7328 A**	**(M)**	**T**	**DB DF DT**	490 000	670 000	1 600	2 000	189.0	65.0	—	291	1.5
	300	62	4	1.5	275 000	310 000	—	1 700	2 400	123.3	158	282	3	21.6	**7328 B**	**(M)**	**T**	**DB DF DT**	445 000	615 000	1 400	1 900	246.6	122.6	—	291	1.5
150	210	28	2	1	96 500	115 000	—	3 800	5 000	56.0	160	200	2	2.97	**7930 A5**	**(M)**	**—**	**DB DF DT**	157 000	231 000	3 000	4 000	112.0	56.0	—	204	1
	210	28	2	1	102 000	122 000	16.6	4 300	6 000	38.1	160	200	2	2.96	**7930 C**	**(M)**	**—**	**DB DF DT**	166 000	244 000	3 600	4 800	76.2	20.2	—	204	1
	225	35	2.1	1.1	137 000	154 000	—	2 400	3 000	71.6	162	213	2	4.75	**7030 A**	**(M)**	**T**	**DB DF DT**	222 000	305 000	1 900	2 400	143.3	73.3	—	218	1
	270	45	3	1.1	248 000	280 000	—	2 000	2 800	83.1	164	256	2.5	11.2	**7230 A**	**(M)**	**—**	**DB DF DT**	405 000	560 000	1 600	2 200	166.3	76.3	—	263	1
	270	45	3	1.1	225 000	254 000	—	1 800	2 600	110.6	164	256	2.5	11.2	**7230 B**	**(M)**	**T**	**DB DF DT**	365 000	510 000	1 500	2 000	221.2	131.2	—	263	1
	320	65	4	1.5	315 000	370 000	—	1 800	2 400	100.3	168	302	3	26.0	**7330 A**	**(M)**	**—**	**DB DF DT**	515 000	745 000	1 500	1 900	200.7	70.7	—	311	1.5
	320	65	4	1.5	289 000	340 000	—	1 600	2 200	131.1	168	302	3	25.9	**7330 B**	**(M)**	**T**	**DB DF DT**	470 000	680 000	1 300	1 800	262.2	132.2	—	311	1.5
160	220	28	2	1	106 000	133 000	16.7	3 800	5 000	39.4	170	210	2	3.10	**7932 C**	**(M)**	**TYN**	**DB DF DT**	173 000	265 000	3 000	4 000	78.9	22.9	—	214	1
	240	38	2.1	1.1	155 000	176 000	—	2 200	2 800	76.7	172	228	2	5.77	**7032 A**	**(M)**	**T**	**DB DF DT**	252 000	355 000	1 700	2 400	153.5	77.5	—	233	1
	290	48	3	1.1	263 000	305 000	—	1 900	2 600	89.0	174	276	2.5	14.1	**7232 A**	**(M)**	**T**	**DB DF DT**	425 000	615 000	1 500	2 000	177.9	81.9	—	283	1
	290	48	3	1.1	238 000	279 000	—	1 700	2 400	118.4	174	276	2.5	14.2	**7232 B**	**(M)**	**—**	**DB DF DT**	385 000	555 000	1 400	1 900	236.8	140.8	—	283	1
	340	68	4	1.5	345 000	420 000	—	1 700	2 200	106.2	178	322	3	30.7	**7332 A**	**(M)**	**T**	**DB DF DT**	565 000	845 000	1 400	1 800	212.3	76.3	—	331	1.5
	340	68	4	1.5	315 000	385 000	—	1 500	2 000	138.9	178	322	3	30.8	**7332 B**	**(M)**	**T**	**DB DF DT**	515 000	770 000	1 200	1 700	277.8	141.8	—	331	1.5
170	230	28	2	1	113 000	148 000	16.8	3 600	4 800	40.8	180	220	2	3.36	**7934 C**	**(M)**	**—**	**DB DF DT**	183 000	297 000	2 800	3 800	81.6	25.6	—	224	1
	260	42	2.1	1.1	186 000	214 000	—	2 000	2 600	83.1	182	248	2	7.90	**7034 A**	**(M)**	**—**	**DB DF DT**	300 000	430 000	1 600	2 200	166.1	82.1	—	253	1
	310	52	4	1.5	295 000	360 000	—	1 800	2 400	95.3	188	292	3	17.3	**7234 A**	**(M)**	**—**	**DB DF DT**	480 000	715 000	1 400	1 900	190.6	86.6	—	301	1.5
	310	52	4	1.5	266 000	325 000	—	1 600	2 200	126.7	188	292	3	17.6	**7234 B**	**(M)**	**—**	**DB DF DT**	435 000	650 000	1 300	1 700	253.4	149.4	—	301	1.5
	360	72	4	1.5	390 000	485 000	—	1 600	2 200	112.5	188	342	3	35.8	**7334 A**	**(M)**	**—**	**DB DF DT**	630 000	970 000	1 300	1 700	225.0	81.0	—	351	1.5
	360	72	4	1.5	355 000	445 000	—	1 400	2 000	147.2	188	342	3	35.6	**7334 B**	**(M)**	**T**	**DB DF DT**	575 000	890 000	1 100	1 600	294.3	150.3	—	351	1.5

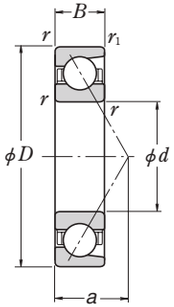
Notes (1) For applications operating near the limiting speed, refer to Page C077.
(2) Suffixes A, A5, B, and C represent contact angles of 30°, 25°, 40°, and 15° respectively.
(3) Use the values of d_a (min) and r_a (max) for bearings with "—" in the d_b column.

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

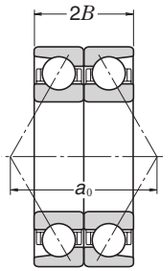
ANGULAR CONTACT BALL BEARINGS

SINGLE/MATCHED MOUNTINGS

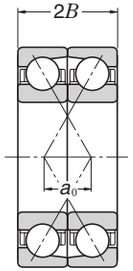
Bore Diameter 180 – 200 mm



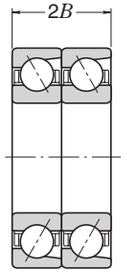
Single



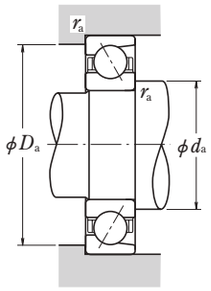
Back-to-Back
DB

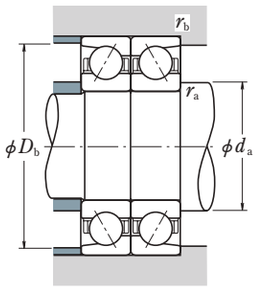


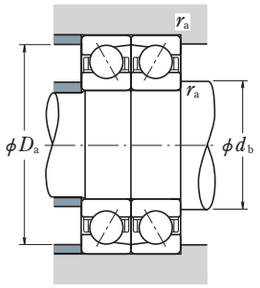
Face-to-Face
DF



Tandem
DT







Dynamic Equivalent Load $P = XF_r + YF_a$

Contact Angle	if_0F_a* / C_{0r}	e	Single, DT $F_a/F_r \leqq e$ X	Single, DT $F_a/F_r \leqq e$ Y	Single, DT $F_a/F_r > e$ X	Single, DT $F_a/F_r > e$ Y	DB or DF $F_a/F_r \leqq e$ X	DB or DF $F_a/F_r \leqq e$ Y	DB or DF $F_a/F_r > e$ X	DB or DF $F_a/F_r > e$ Y
15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
	0.357	0.40	1	0	0.44	1.40	1	1.57	0.72	2.28
	0.714	0.43	1	0	0.44	1.30	1	1.46	0.72	2.11
	1.07	0.46	1	0	0.44	1.23	1	1.38	0.72	2.00
	1.43	0.47	1	0	0.44	1.19	1	1.34	0.72	1.93
	2.14	0.50	1	0	0.44	1.12	1	1.26	0.72	1.82
	3.57	0.55	1	0	0.44	1.02	1	1.14	0.72	1.66
	5.35	0.56	1	0	0.44	1.00	1	1.12	0.72	1.63
25°	—	0.68	1	0	0.41	0.87	1	0.92	0.67	1.41
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 X_0	Single, DT Y_0	DB or DF X_0	DB or DF Y_0
15°	0.5	0.46	1	0.92
25°	0.5	0.38	1	0.76
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 $P_0 = F_r$

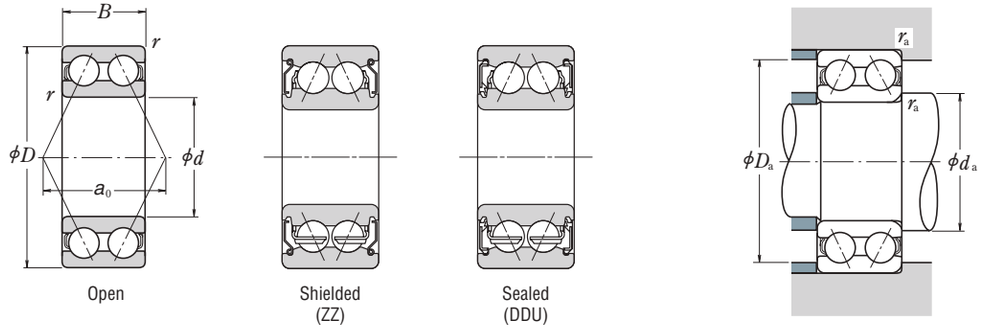
Boundary Dimensions (mm) d	D	B	r min.	r_1 min.	Basic Load Ratings (Single) (N) C_r	C_{0r}	Factor f_0	Limiting Speeds (1) (min^{-1}) Grease	Oil	Eff.Load Center (mm) a	Abutment and Fillet Dimensions (mm) d_a min.	D_a max.	r_a max.	Mass (kg) approx.	Bearing Designations (2) Cage Designation (4) Single	Standard	Option	Arrangement	Basic Load Ratings (Matched) (N) C_r	C_{0r}	Limiting Speeds (1) (Matched) (min^{-1}) Grease	Oil	Load Center Spacings (mm) a_0 DB	DF	Abutment and Fillet Dimensions (mm) d_b(3) min.	D_b max.	r_b(3) max.
180	250	33	2	1	145 000	184 000	16.6	3 200	4 500	45.3	190	240	2	4.90	**7936 C**	**(M)**	—	**DB DF DT**	236 000	370 000	2 600	3 600	90.6	24.6	—	244	1
	280	46	2.1	1.1	207 000	252 000	—	1 900	2 400	89.4	192	268	2	10.5	**7036 A**	**(M)**	—	**DB DF DT**	335 000	505 000	1 500	2 000	178.8	86.8	—	273	1
	320	52	4	1.5	305 000	385 000	—	1 700	2 200	98.2	198	302	3	18.1	**7236 A**	**(M)**	—	**DB DF DT**	495 000	770 000	1 400	1 800	196.3	92.3	—	311	1.5
	320	52	4	1.5	276 000	350 000	—	1 500	2 000	130.9	198	302	3	18.4	**7236 B**	**(M)**	—	**DB DF DT**	450 000	700 000	1 200	1 700	261.8	157.8	—	311	1.5
	380	75	4	1.5	410 000	535 000	—	1 500	2 000	118.3	198	362	3	42.1	**7336 A**	**(M)**	—	**DB DF DT**	665 000	1 070 000	1 200	1 600	236.6	86.6	—	371	1.5
	380	75	4	1.5	375 000	490 000	—	1 300	1 800	155.0	198	362	3	42.6	**7336 B**	**(M)**	—	**DB DF DT**	605 000	975 000	1 100	1 500	309.9	159.9	—	371	1.5
190	260	33	2	1	147 000	192 000	16.7	3 000	4 300	46.6	200	250	2	4.98	**7938 C**	**(M)**	**TYN**	**DB DF DT**	239 000	385 000	2 400	3 400	93.3	27.3	—	254	1
	290	46	2.1	1.1	224 000	280 000	—	1 800	2 400	92.3	202	278	2	11.3	**7038 A**	**(M)**	—	**DB DF DT**	365 000	560 000	1 400	1 900	184.6	92.6	—	283	1
	340	55	4	1.5	315 000	410 000	—	1 600	2 200	104.0	208	322	3	22.4	**7238 A**	**(M)**	—	**DB DF DT**	510 000	825 000	1 300	1 700	208.0	98.0	—	331	1.5
	340	55	4	1.5	284 000	375 000	—	1 400	2 000	138.7	208	322	3	22.5	**7238 B**	**(M)**	—	**DB DF DT**	460 000	750 000	1 100	1 600	277.3	167.3	—	331	1.5
	400	78	5	2	450 000	600 000	—	1 400	1 900	124.2	212	378	4	47.5	**7338 A**	**(M)**	**T**	**DB DF DT**	730 000	1 200 000	1 100	1 500	248.3	92.3	—	390	2
	400	78	5	2	410 000	550 000	—	1 300	1 700	162.8	212	378	4	47.2	**7338 B**	**(M)**	—	**DB DF DT**	670 000	1 100 000	1 000	1 400	325.5	169.5	—	390	2
200	280	38	2.1	1.1	189 000	244 000	16.5	2 800	4 000	51.2	212	268	2	6.85	**7940 C**	**(M)**	—	**DB DF DT**	305 000	490 000	2 200	3 200	102.3	26.3	—	273	1
	310	51	2.1	1.1	240 000	310 000	—	1 700	2 200	99.1	212	298	2	13.7	**7040 A**	**(M)**	**T**	**DB DF DT**	390 000	620 000	1 300	1 800	198.2	96.2	—	303	1
	360	58	4	1.5	335 000	450 000	—	1 500	2 000	109.8	218	342	3	26.5	**7240 A**	**(M)**	—	**DB DF DT**	550 000	900 000	1 200	1 600	219.6	103.6	—	351	1.5
	360	58	4	1.5	305 000	410 000	—	1 300	1 800	146.5	218	342	3	26.6	**7240 B**	**(M)**	—	**DB DF DT**	495 000	815 000	1 100	1 500	292.9	176.9	—	351	1.5
	420	80	5	2	475 000	660 000	—	1 300	1 800	129.5	222	398	4	54.4	**7340 A**	**(M)**	**T**	**DB DF DT**	770 000	1 320 000	1 100	1 400	259.0	99.0	—	410	2
	420	80	5	2	430 000	600 000	—	1 200	1 600	170.1	222	398	4	55.3	**7340 B**	**(M)**	—	**DB DF DT**	700 000	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, A5, B, and C represent contact angles of 30°, 25°, 40°, and 15° 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



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

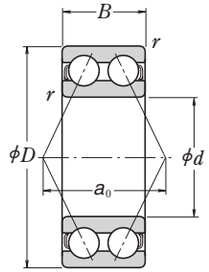
Static Equivalent Load

$P_0 = F_r + 0.76\,F_a$

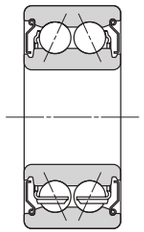
Boundary Dimensions (mm)				Basic Load Ratings (N)		Limiting Speeds (min^{-1}) Grease		Oil	Bearing Designations			Load Center Spacings (mm)	Abutment and Fillet Dimensions (mm)			Mass (kg)
d	D	B	r min.	C_r	C_{0r}	Open ZZ	DDU	Open	Open	Shielded	Sealed	a_0	d_a min.	D_a max.	r_a max.	approx.
10	30	14.3	0.6	7 150	3 900	17 000	—	22 000	**5200**	—	—	14.5	15	25	0.6	0.050
	30	14.3	0.6	7 150	3 900	17 000	15 000	—	—	**5200ZZ**	**5200DDU**	14.5	14	26	0.6	0.050
12	32	15.9	0.6	10 500	5 800	15 000	—	20 000	**5201**	—	—	16.7	17	27	0.6	0.060
	32	15.9	0.6	8 500	5 300	15 000	12 000	—	—	**5201BZZ**	**5201BDDU**	16.3	16	28	0.6	0.060
15	35	15.9	0.6	11 700	7 050	13 000	—	17 000	**5202**	—	—	18.3	20	30	0.6	0.070
	35	15.9	0.6	8 500	5 300	13 000	12 000	—	—	**5202BZZ**	**5202BDDU**	16.3	19	31	0.6	0.070
	42	19	1	17 600	10 200	11 000	—	15 000	**5302**	—	—	22	21	36	1	0.13
	42	19	1	14 700	9 100	11 000	10 000	—	—	**5302AZZ**	**5302ADDU**	21	21	36	1	0.13
17	40	17.5	0.6	14 600	9 050	11 000	—	15 000	**5203**	—	—	20.8	22	35	0.6	0.10
	40	17.5	0.6	12 700	8 300	11 000	10 000	—	—	**5203AZZ**	**5203ADDU**	20.1	21	36	0.6	0.10
	47	22.2	1	21 000	12 600	10 000	—	13 000	**5303**	—	—	25	23	41	1	0.18
	47	22.2	1	19 600	12 400	10 000	9 500	—	—	**5303AZZ**	**5303ADDU**	24.3	23	41	1	0.18
20	47	20.6	1	19 600	12 400	10 000	—	13 000	**5204**	—	—	24.3	26	41	1	0.16
	47	20.6	1	15 900	10 700	10 000	9 000	—	—	**5204AZZ**	**5204ADDU**	23	26	41	1	0.16
	52	22.2	1.1	24 600	15 000	9 000	—	12 000	**5304**	—	—	26.7	27	45	1	0.22
	52	22.2	1.1	19 700	12 800	9 000	8 500	—	—	**5304AZZ**	**5304ADDU**	25.4	27	45	1	0.22
25	52	20.6	1	21 300	14 700	8 500	—	11 000	**5205**	—	—	26.8	31	46	1	0.18
	52	20.6	1	16 900	12 300	8 500	7 500	—	—	**5205BZZ**	**5205BDDU**	25.4	31	46	1	0.18
	62	25.4	1.1	32 500	20 700	7 500	—	10 000	**5305**	—	—	31.8	32	55	1	0.35
	62	25.4	1.1	25 200	18 200	7 500	6 300	—	—	**5305AZZ**	**5305ADDU**	30.9	32	55	1	0.36
30	62	23.8	1	29 600	21 100	7 100	—	9 500	**5206**	—	—	31.6	36	56	1	0.30
	62	23.8	1	25 200	18 200	7 100	6 300	—	—	**5206BZZ**	**5206BDDU**	30.9	36	56	1	0.30
	72	30.2	1.1	40 500	28 100	6 300	—	8 500	**5306**	—	—	36.5	37	65	1	0.57
	72	30.2	1.1	39 000	28 700	6 300	5 300	—	—	**5306AZZ**	**5306ADDU**	36.6	37	65	1	0.57
35	72	27	1.1	39 000	28 700	6 300	—	8 000	**5207**	—	—	36.6	42	65	1	0.46
	72	27	1.1	34 000	25 300	6 300	5 300	—	—	**5207AZZ**	**5207ADDU**	36.3	42	65	1	0.46
	80	34.9	1.5	51 000	36 000	5 600	—	7 500	**5307**	—	—	41.6	44	71	1.5	0.76
	80	34.9	1.5	44 000	33 500	5 600	4 800	—	—	**5307AZZ**	**5307ADDU**	41.5	44	71	1.5	0.79
40	80	30.2	1.1	44 000	33 500	5 600	—	7 100	**5208**	—	—	41.5	47	73	1	0.62
	80	30.2	1.1	36 500	29 000	5 600	4 800	—	—	**5208AZZ**	**5208ADDU**	39.4	47	73	1	0.63
	90	36.5	1.5	56 500	41 000	5 300	—	6 700	**5308**	—	—	45.5	49	81	1.5	1.03
	90	36.5	1.5	49 500	38 000	5 300	4 500	—	—	**5308AZZ**	**5308ADDU**	43.8	49	81	1.5	1.05
45	85	30.2	1.1	49 500	38 000	5 000	—	6 700	**5209**	—	—	43.4	52	78	1	0.67
	85	30.2	1.1	41 500	33 500	5 000	4 300	—	—	**5209A1ZZ**	**5209A1DDU**	42.5	52	78	1	0.67
	100	39.7	1.5	68 500	51 000	4 500	—	6 000	**5309**	—	—	50.6	54	91	1.5	1.37

■DOUBLE-ROW ANGULAR CONTACT BALL BEARINGS

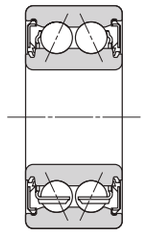
Bore Diameter 50 – 85 mm



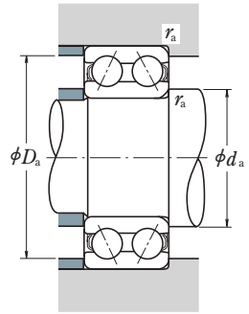
Open



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	53 000	43 500	4 800	—	6 000	**5210**	—	—	45.9	57	83	1	0.72
	90	30.2	1.1	40 500	36 000	4 800	4 000	—	—	**5210AZZ**	**5210ADDU**	44	57	83	1	0.73
	110	44.4	2	81 500	61 500	4 300	—	5 600	**5310**	—	—	55.6	60	100	2	1.84
55	100	33.3	1.5	56 000	49 000	4 300	—	5 600	**5211**	—	—	50.1	64	91	1.5	1.01
	100	33.3	1.5	49 500	43 500	4 300	3 600	—	—	**5211AZZ**	**5211ADDU**	49.2	64	91	1.5	1.01
	120	49.2	2	95 000	73 000	3 800	—	5 000	**5311**	—	—	60.6	65	110	2	2.40
60	110	36.5	1.5	69 000	62 000	3 800	—	5 000	**5212**	—	—	56.5	69	101	1.5	1.33
	130	54	2.1	125 000	98 500	3 400	—	4 500	**5312**	—	—	69.2	72	118	2	2.92
65	120	38.1	1.5	76 500	69 000	3 600	—	4 500	**5213**	—	—	59.7	74	111	1.5	1.71
	140	58.7	2.1	142 000	113 000	3 200	—	4 300	**5313**	—	—	72.8	77	128	2	3.67
70	125	39.7	1.5	94 000	82 000	3 400	—	4 500	**5214**	—	—	63.8	79	116	1.5	1.75
	150	63.5	2.1	159 000	128 000	3 000	—	3 800	**5314**	—	—	78.3	82	138	2	4.55
75	130	41.3	1.5	93 500	83 000	3 200	—	4 300	**5215**	—	—	66.1	84	121	1.5	1.88
80	140	44.4	2	99 000	93 000	3 000	—	3 800	**5216**	—	—	69.6	90	130	2	2.51
85	150	49.2	2	116 000	110 000	2 800	—	3 600	**5217**	—	—	75.3	95	140	2	3.16