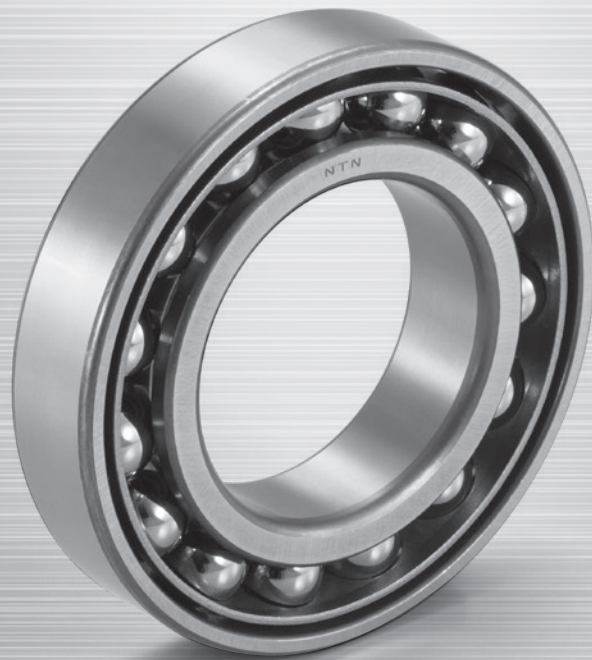


Angular Contact Ball Bearings



Angular contact ball bearing



Four-point contact ball bearing



Double row angular contact ball bearing

1. Design features and characteristics

1.1 Angular contact ball bearing

Angular contact ball bearings are non-separable bearings with a defined contact angle in the radial direction relative to the straight line that runs through the point where each ball makes contact with the inner and outer rings (see Fig. 1). Table 1 provides information on contact angles and their designated codes.

In addition to radial loads, angular contact ball bearings can accommodate single direction axial loads. Since an axial load is generated from a radial force, these bearings are generally used in pairs. Table 2 shows general angular contact ball bearing characteristics, Table 3 shows information on using duplex (side by side) angular contact ball bearings, and Table 4 shows information on

multiple-row angular contact ball bearings.

For bearings with a contact angle of 15° and bearing tolerance JIS Class 5 or higher, see special catalog "Precision Rolling Bearings (CAT. No. 2260/E)."

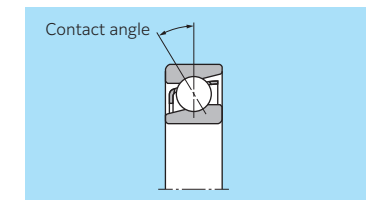


Fig. 1

Table 1 Contact angle and contact angle codes

Contact angle	15°	30°	40°
Contact angle code	C	A ¹⁾	B

¹⁾ Contact angle code A is omitted from part number.

Table 2 Angular contact ball bearing types and characteristics

Type	Design	Characteristics
Standard type		- Available in bearing series 79, 70, 72, 72B, 73, and 73B. - Contact angles: 30° and 40° (with B) available. - Standard bearing cage type differs depending on bearing number (see Table 5).

Table 3 Duplex angular contact ball bearings — types and characteristics

Duplex type	Design	Characteristics
Back-to-back arrangement (DB)		- Can accommodate radial loads and axial loads in either direction. - Has a large distance between the acting load centers of the bearings, and therefore a large momentary force load capacity. - Allowable misalignment angle is small.
Face-to-face arrangement (DF)		- Can accommodate radial loads and axial loads in either direction. - Has a smaller distance between the acting load centers of the bearings, and therefore a smaller momentary force load capacity. - Has a larger allowable misalignment angle than back-to-back duplex type.
Tandem arrangement (DT)		- Can accommodate radial loads and single direction axial loads. - Axial loads are received by both bearings as a set, and therefore heavy axial loads can be accommodated.

Note: 1. Duplex angular contact ball bearings are manufactured in a set to specified clearance and preload; therefore, they must be assembled side by side with identically numbered bearings and not be mixed with other arrangements.

2. To satisfy specified clearance and preload, tightening must be performed until the inner ring width surfaces or outer ring width surfaces come in contact with each other.

Table 4 Combination examples of multiple-row angular contact ball bearings

Duplex type	3-row arrangement	4-row arrangement
Back-to-back arrangement	 (DBT)	 (DTBT)
Face-to-face arrangement	 (DFT)	 (DTFT)
Tandem arrangement	 (DTT)	 (DTTT)

Note: Other combinations are also available. Consult **NTN Engineering** for details.

1.2 Four-point angular contact ball bearings

Four-point angular contact ball bearings have a contact angle of 30° and a split inner ring. As shown in **Fig. 2**, when the inner and outer rings receive a radial load, the ball contacts the inner and outer rings at four points. This construction enables a single bearing to accommodate axial loads from either direction, and when under a simple axial load or heavy axial load, the bearing relies on two contact points like ordinary bearings.

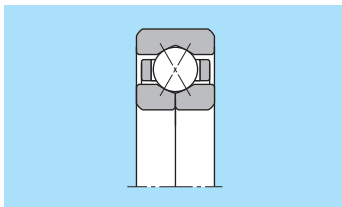


Fig. 2

■ Flush ground

"Flush ground" is the name given to the finishing method shown in **Fig. 3** where the offset of the front and back faces of the bearing are ground to the same value. This allows a designated clearance or preload to be achieved when using bearings with identical codes in DB or DF orientations. DT series bearings can also be used in various arrangements to achieve uniform load distribution.

General angular contact ball bearings are not flush ground. If it is necessary to flush grind any of these other bearings, please consult **NTN Engineering**.

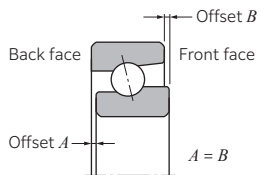


Fig. 3

1.3 Double row angular contact ball bearings

The structure of double row angular contact ball bearings is designed by arranging two single row angular contact bearings back-to-back in duplex (DB) to form a single bearing with a contact angle of 25°.

These bearings are capable of accommodating radial loads, axial loads in either direction, and have a high capacity for moment loads.

As shown in **Fig. 4**, sealed and shielded type double row angular contact ball bearings are also available. Rated loads vary from those of open type bearings.

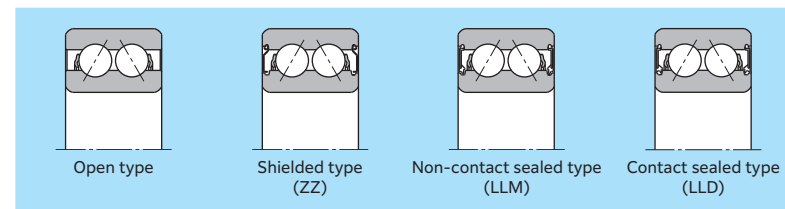


Fig. 4

2. Standard cage type

Table 5 lists the standard cage types for angular contact ball bearings.

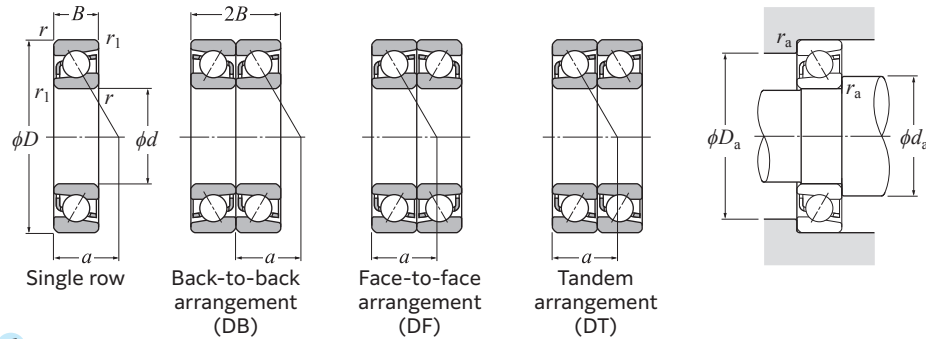
Table 5 Standard cages for angular contact ball bearings

Type	Bearing series	Resin cage	Pressed cage	Machined cage
Standard type	79 70 72 73 72B 73B	7904 to 7913 7000 to 7024 — — — — — 	— — 7200 to 7222 7300 to 7322 7200B to 7222B 7300B to 7322B 	7914 to 7960 7026 to 7040 7224 to 7240 7324 to 7340 7224B to 7240B 7324B to 7340B
4-point contact	QJ2 QJ3	— —	— —	QJ208 to QJ224 QJ306 to QJ324
Double row	52 53	— —	5200S to 5217S 5302S to 5314S 	— —

Note: Depending on the usage conditions, some cage types may not be suitable. For example, due to the material characteristics of resin cages, use at application temperatures in excess of 120 °C is not possible. For details, please contact **NTN Engineering**.

Single and Duplex Angular Contact Ball Bearings

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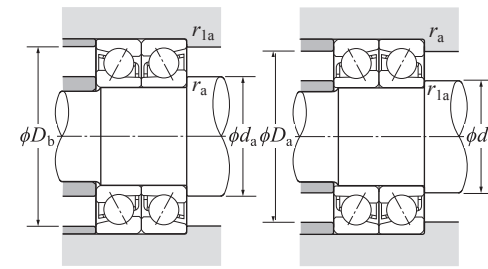
d 10–30 mm

Boundary dimensions						Basic load rating		Fatigue load limit	Allowable speed ¹⁾		Bearing number ²⁾	Load center	Mass
mm						dynamic	static	kN	min ⁻¹			mm	kg
d	D	B	2B	r _s min ³⁾	r _{1s} min ³⁾	C _r	C _{0r}	C _u	Grease lubrication	Oil lubrication		a	Single row (approx.)
10	26	8	16	0.3	0.15	5.10	2.07	0.162	29 000	39 000	7000	9	0.023
	30	9	18	0.6	0.3	6.00	2.74	0.214	28 000	37 000	7200	10.5	0.029
	30	9	18	0.6	0.3	5.50	2.52	0.197	24 000	32 000	7200B	13	0.029
	35	11	22	0.6	0.3	11.2	4.95	0.385	26 000	34 000	7300	12	0.04
	35	11	22	0.6	0.3	10.5	4.60	0.360	22 000	29 000	7300B	15	0.041
12	28	8	16	0.3	0.15	5.60	2.46	0.193	26 000	35 000	7001	10	0.025
	32	10	20	0.6	0.3	8.40	3.95	0.310	25 000	33 000	7201	11.5	0.035
	32	10	20	0.6	0.3	7.75	3.65	0.287	21 000	28 000	7201B	14	0.036
	37	12	24	1	0.6	12.4	5.25	0.410	23 000	30 000	7301	13	0.044
	37	12	24	1	0.6	11.7	4.95	0.385	19 000	26 000	7301B	16.5	0.045
15	32	9	18	0.3	0.15	6.40	3.15	0.246	23 000	31 000	7002	11.5	0.035
	35	11	22	0.6	0.3	10.0	4.70	0.370	22 000	29 000	7202	12.5	0.046
	35	11	22	0.6	0.3	9.25	4.35	0.340	18 000	25 000	7202B	16	0.046
	42	13	26	1	0.6	14.9	7.20	0.560	19 000	26 000	7302	15	0.055
	42	13	26	1	0.6	13.8	6.65	0.520	17 000	22 000	7302B	19	0.057
17	35	10	20	0.3	0.15	7.95	3.85	0.299	21 000	28 000	7003	12.5	0.046
	40	12	24	0.6	0.3	13.2	6.60	0.515	19 000	26 000	7203	14.5	0.064
	40	12	24	0.6	0.3	12.2	6.10	0.480	17 000	22 000	7203B	18	0.066
	47	14	28	1	0.6	17.7	8.65	0.675	18 000	24 000	7303	16	0.107
	47	14	28	1	0.6	16.4	8.05	0.630	15 000	20 000	7303B	20.5	0.109
20	42	12	24	0.6	0.3	10.7	5.60	0.440	19 000	25 000	7004	15	0.08
	47	14	28	1	0.6	16.1	8.40	0.655	17 000	23 000	7204	17	0.1
	47	14	28	1	0.6	14.7	7.70	0.605	15 000	20 000	7204B	21.5	0.102
	52	15	30	1.1	0.6	20.7	10.4	0.815	16 000	21 000	7304	18	0.138
	52	15	30	1.1	0.6	19.2	9.65	0.755	13 000	18 000	7304B	22.5	0.141
25	42	9	18	0.3	0.15	7.90	4.95	0.360	17 000	22 000	7905	14	0.05
	47	12	24	0.6	0.3	11.9	6.85	0.535	16 000	21 000	7005	16.5	0.093
	52	15	30	1	0.6	18.0	10.3	0.805	14 000	19 000	7205	19	0.125
	52	15	30	1	0.6	16.4	9.40	0.740	12 000	16 000	7205B	24	0.129
	62	17	34	1.1	0.6	29.3	15.8	1.24	13 000	17 000	7305	21	0.23
	62	17	34	1.1	0.6	27.0	14.6	1.14	11 000	15 000	7305B	27	0.234
30	47	9	18	0.3	0.15	8.35	5.75	0.395	14 000	19 000	7906	15.5	0.058
	55	13	26	1	0.6	15.4	9.45	0.725	13 000	18 000	7006	19	0.135

1) This value achieved with machined cages; when pressed cages are used, 80 % of this value is acceptable. 2) Bearing numbers appended with the code "B" have a contact angle of 40°; bearings without this code have a contact angle of 30°. 3) Smallest allowable dimension for chamfer dimension r or r₁.

Single and Duplex Angular Contact Ball Bearings

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Dynamic equivalent radial load

$$P_r = X F_r + Y F_a$$

Contact angle	e	Single, DT				DB, DF			
		F _a /F _r ≤ e	F _a /F _r > e	F _a /F _r ≤ e	F _a /F _r > e	F _a /F _r ≤ e	F _a /F _r > e	F _a /F _r ≤ e	F _a /F _r > e
30°	0.80	X	Y	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

Static equivalent radial load

$$P_{0r} = X_0 F_r + Y_0 F_a$$

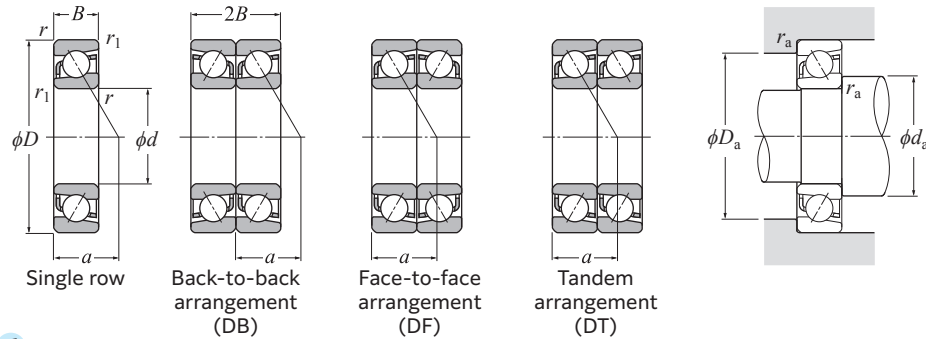
Contact angle	Single, DT		DB, DF	
	X ₀	Y ₀	X ₀	Y ₀
30°	0.5	0.33	1	0.66
40°	0.5	0.26	1	0.52

For single and DT arrangement, when $P_{0r} < F_r$ use $P_{0r} = F_r$.

Basic load rating		Allowable speed ¹⁾		Bearing number			Installation-related dimensions					
dynamic	static	(duplex)		DB	DF	DT	mm					
(duplex)		Grease	Oil				<i>d</i> _a	<i>d</i> _b	<i>D</i> _a	<i>D</i> _b	<i>r</i> _{as}	<i>r</i> _{1as}
<i>C</i> _r	<i>C</i> _{0r}	lubrication	lubrication				Min.	Min.	Max.	Max.	Max.	Max.
8.30	4.15	23 000	31 000	DB	DF	DT	12.5	12.5	23.5	24.8	0.3	0.15
9.75	5.45	22 000	30 000	DB	DF	DT	14.5	12.5	25.5	27.5	0.6	0.3
8.95	5.05	19 000	26 000	DB	DF	DT	14.5	12.5	25.5	27.5	0.6	0.3
18.2	9.85	20 000	27 000	DB	DF	DT	14.5	12.5	30.5	32.5	0.6	0.3
17.1	9.20	18 000	24 000	DB	DF	DT	14.5	12.5	30.5	32.5	0.6	0.3
9.10	4.90	21 000	28 000	DB	DF	DT	14.5	14.5	25.5	26.8	0.3	0.15
13.7	7.95	20 000	26 000	DB	DF	DT	16.5	14.5	27.5	29.5	0.6	0.3
12.6	7.35	17 000	23 000	DB	DF	DT	16.5	14.5	27.5	29.5	0.6	0.3
20.1	10.5	18 000	24 000	DB	DF	DT	17.5	16.5	31.5	32.5	1	0.6
19.0	9.90	16 000	21 000	DB	DF	DT	17.5	16.5	31.5	32.5	1	0.6
10.4	6.30	18 000	24 000	DB	DF	DT	17.5	17.5	29.5	30.8	0.3	0.15
16.3	9.40	17 000	23 000	DB	DF	DT	19.5	17.5	30.5	32.5	0.6	0.3
15.1	8.70	15 000	20 000	DB	DF	DT	19.5	17.5	30.5	32.5	0.6	0.3
24.2	14.4	15 000	21 000	DB	DF	DT	20.5	19.5	36.5	37.5	1	0.6
22.5	13.3	13 000	18 000	DB	DF	DT	20.5	19.5	36.5	37.5	1	0.6
12.9	7.65	17 000	22 000	DB	DF	DT	19.5	19.5	32.5	33.8	0.3	0.15
21.5	13.2	15 000	21 000	DB	DF	DT	21.5	19.5	35.5	37.5	0.6	0.3
19.8	12.2	13 000	18 000	DB	DF	DT	21.5	19.5	35.5	37.5	0.6	0.3
28.7	17.3	14 000	19 000	DB	DF	DT	22.5	21.5	41.5	42.5	1	0.6
26.6	16.1	12 000	16 000	DB	DF	DT	22.5	21.5	41.5	42.5	1	0.6
17.5	11.2	15 000	20 000	DB	DF	DT	24.5	24.5	37.5	39.5	0.6	0.3
26.1	16.8	14 000	18 000	DB	DF	DT	25.5	24.5	41.5	42.5	1	0.6
23.9	15.4	12 000	16 000	DB	DF	DT	25.5	24.5	41.5	42.5	1	0.6
33.5	20.8	12 000	17 000	DB	DF	DT	27	24.5	45	47.5	1	0.6
31.0	19.3	11 000	14 000	DB	DF	DT	27	24.5	45	47.5	1	0.6
12.9	9.95	13 000	18 000	DB	DF	DT	27.5	27.5	39.5	40.8	0.3	0.15
19.3	13.7	12 000	17 000	DB	DF	DT	29.5	29.5	42.5	44.5	0.6	0.3
29.2	20.6	11 000	15 000	DB	DF	DT	30.5	29.5	46.5	47.5	1	0.6
26.6	18.8	10 000	13 000	DB	DF	DT	30.5	29.5	46.5	47.5	1	0.6
47.5	31.5	10 000	14 000	DB	DF	DT	32	29.5	55	57.5	1	0.6
44.0	29.3	9 100	12 000	DB	DF	DT	32	29.5	55	57.5	1	0.6
13.6	11.5	12 000	15 000	DB	DF	DT	32.5	32.5	44.5	45.8	0.3	0.15
25.0	18.9	11 000	14 000	DB	DF	DT	35.5	35.5	49.5	50.5	1	0.6

Single and Duplex Angular Contact Ball Bearings

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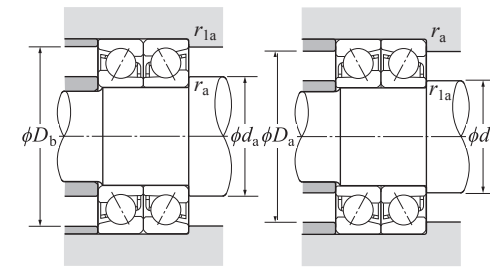
d 30–55 mm

Boundary dimensions						Basic load rating		Fatigue load limit	Allowable speed ¹⁾		Bearing number ²⁾	Load center	Mass
mm						dynamic	static	kN	min ⁻¹			mm	kg
d	D	B	2B	r _s min ³⁾	r _{1s} min ³⁾	C _r	C _{0r}	C _u	Grease lubrication	Oil lubrication		a	Single row (approx.)
30	62	16	32	1	0.6	24.9	14.8	1.16	12 000	16 000	7206	21.5	0.193
	62	16	32	1	0.6	22.7	13.5	1.06	11 000	14 000	7206B	27.5	0.197
	72	19	38	1.1	0.6	37.5	22.3	1.75	11 000	15 000	7306	24.5	0.345
	72	19	38	1.1	0.6	34.0	20.5	1.61	9 600	13 000	7306B	31.5	0.352
35	55	10	20	0.6	0.3	13.3	8.85	0.640	13 000	17 000	7907	18	0.088
	62	14	28	1	0.6	19.4	12.6	0.955	12 000	16 000	7007	21	0.18
	72	17	34	1.1	0.6	33.0	20.1	1.57	11 000	14 000	7207	24	0.281
	72	17	34	1.1	0.6	30.0	18.4	1.44	9 300	12 000	7207B	31	0.287
	80	21	42	1.5	1	44.0	26.3	2.05	9 800	13 000	7307	27	0.462
	80	21	42	1.5	1	40.5	24.2	1.89	8 400	11 000	7307B	34.5	0.469
40	62	12	24	0.6	0.3	14.0	10.2	0.705	11 000	15 000	7908	20.5	0.13
	68	15	30	1	0.6	20.8	14.6	1.07	10 000	14 000	7008	23	0.222
	80	18	36	1.1	0.6	39.0	25.1	1.97	9 600	13 000	7208	26.5	0.355
	80	18	36	1.1	0.6	35.5	23.0	1.80	8 300	11 000	7208B	34	0.375
	90	23	46	1.5	1	54.0	33.0	2.58	8 600	12 000	7308	30.5	0.625
	90	23	46	1.5	1	49.5	30.5	2.37	7 400	9 900	7308B	39	0.636
45	68	12	24	0.6	0.3	17.4	12.9	0.895	10 000	14 000	7909	22.5	0.15
	75	16	32	1	0.6	24.7	17.7	1.29	9 500	13 000	7009	25.5	0.282
	85	19	38	1.1	0.6	44.0	28.7	2.25	8 700	12 000	7209	28.5	0.404
	85	19	38	1.1	0.6	40.0	26.2	2.04	7 400	9 900	7209B	37	0.41
	100	25	50	1.5	1	70.5	44.0	3.45	7 800	10 000	7309	33.5	0.837
	100	25	50	1.5	1	64.5	40.5	3.15	6 600	8 900	7309B	43	0.854
50	72	12	24	0.6	0.3	18.4	14.5	0.985	9 200	12 000	7910	23.5	0.157
	80	16	32	1	0.6	26.2	20.1	1.42	8 600	11 000	7010	27	0.306
	90	20	40	1.1	0.6	45.5	31.5	2.46	7 900	10 000	7210	30	0.457
	90	20	40	1.1	0.6	41.5	28.6	2.16	6 700	9 000	7210B	39.5	0.466
	110	27	54	2	1	82.5	52.5	4.10	7 100	9 400	7310	36.5	1.09
	110	27	54	2	1	75.5	48.5	3.80	6 000	8 100	7310B	47	1.11
55	80	13	26	1	0.6	19.2	16.1	1.07	8 400	11 000	7911	26	0.214
	90	18	36	1.1	0.6	34.5	26.3	1.90	7 900	11 000	7011	30	0.447
	100	21	42	1.5	1	56.5	39.5	3.10	7 100	9 500	7211	33	0.6
	100	21	42	1.5	1	51.5	36.0	2.74	6 100	8 200	7211B	43	0.612
	120	29	58	2	1	95.0	61.5	4.80	6 400	8 600	7311	40	1.39
	120	29	58	2	1	87.0	56.5	4.45	5 500	7 300	7311B	52	1.42

1) This value achieved with machined cages; when pressed cages are used, 80 % of this value is acceptable. 2) Bearing numbers appended with the code "B" have a contact angle of 40°; bearings without this code have a contact angle of 30°. 3) Smallest allowable dimension for chamfer dimension r or r₁.

Single and Duplex Angular Contact Ball Bearings

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Dynamic equivalent radial load

$$P_r = X F_r + Y F_a$$

Contact angle	e	Single, DT				DB, DF			
		F _a /F _r ≤ e	F _a /F _r > e	X	Y	F _a /F _r ≤ e	F _a /F _r > e	X	Y
30°	0.80	1	0	0.39	0.76	1	0.78	0.63	1.24
40°	1.14	1	0	0.35	0.57	1	0.55	0.57	0.93

Static equivalent radial load

$$P_{0r} = X_0 F_r + Y_0 F_a$$

Contact angle	Single, DT		DB, DF	
	X ₀	Y ₀	X ₀	Y ₀
30°	0.5	0.33	1	0.66
40°	0.5	0.26	1	0.52

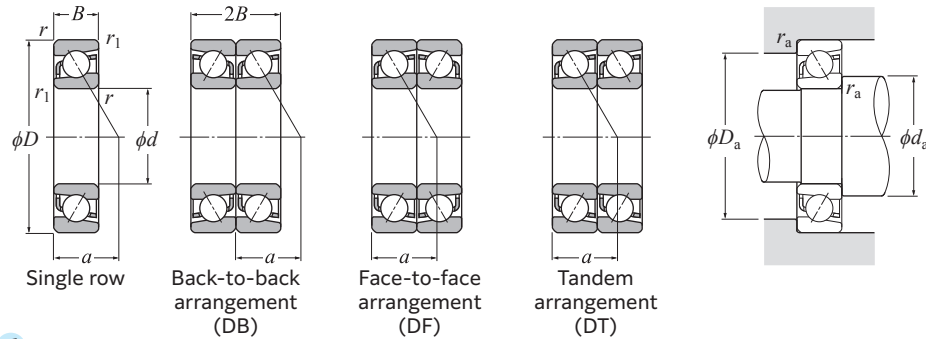
For single and DT arrangement, when $P_{0r} < F_r$ use $P_{0r} = F_r$.

Basic load rating		Allowable speed ¹⁾		Bearing number			Installation-related dimensions					
dynamic	static	(duplex)	(duplex)	DB	DF	DT	mm					
C _r	C _{0r}	Grease lubrication	Oil lubrication				d _a Min.	d _b Min.	D _a Max.	D _b Max.	r _{as} Max.	r _{1as} Max.
40.5	29.6	9 800	13 000	DB	DF	DT	35.5	34.5	56.5	57.5	1	0.6
37.0	27.1	8 600	11 000	DB	DF	DT	35.5	34.5	56.5	57.5	1	0.6
60.5	44.5	8 900	12 000	DB	DF	DT	37	34.5	65	67.5	1	0.6
55.5	41.0	7 700	10 000	DB	DF	DT	37	34.5	65	67.5	1	0.6
21.6	17.7	10 000	13 000	DB	DF	DT	39.5	39.5	50.5	52.5	0.6	0.3
31.5	25.1	9 400	13 000	DB	DF	DT	40.5	40.5	56.5	57.5	1	0.6
53.5	40.0	8 600	11 000	DB	DF	DT	42	39.5	65	67.5	1	0.6
49.0	36.5	7 500	10 000	DB	DF	DT	42	39.5	65	67.5	1	0.6
72.0	52.5	7 800	10 000	DB	DF	DT	43.5	40.5	71.5	74.5	1.5	1
66.0	48.5	6 800	9 000	DB	DF	DT	43.5	40.5	71.5	74.5	1.5	1
22.8	20.4	9 000	12 000	DB	DF	DT	44.5	44.5	57.5	59.5	0.6	0.3
34.0	29.2	8 300	11 000	DB	DF	DT	45.5	45.5	62.5	63.5	1	0.6
63.5	50.5	7 700	10 000	DB	DF	DT	47	44.5	73	75.5	1	0.6
58.0	46.0	6 700	8 900	DB	DF	DT	47	44.5	73	75.5	1	0.6
88.0	66.0	6 900	9 200	DB	DF	DT	48.5	45.5	81.5	84.5	1.5	1
80.5	60.5	6 000	8 000	DB	DF	DT	48.5	45.5	81.5	84.5	1.5	1
28.3	25.7	8 100	11 000	DB	DF	DT	49.5	49.5	63.5	65.5	0.6	0.3
40.0	35.5	7 500	10 000	DB	DF	DT	50.5	50.5	69.5	70.5	1	0.6
71.5	57.5	6 900	9 200	DB	DF	DT	52	49.5	78	80.5	1	0.6
65.0	52.5	6 000	8 000	DB	DF	DT	52	49.5	78	80.5	1	0.6
114	88.0	6 200	8 200	DB	DF	DT	53.5	50.5	91.5	94.5	1.5	1
105	81.0	5 400	7 200	DB	DF	DT	53.5	50.5	91.5	94.5	1.5	1
29.9	28.9	7 300	9 800	DB	DF	DT	54.5	54.5	67.5	69.5	0.6	0.3
42.5	40.0	6 800	9 100	DB	DF	DT	55.5	55.5	74.5	75.5	1	0.6
74.5	63.0	6 300	8 300	DB	DF	DT	57	54.5	83	85.5	1	0.6
67.5	57.0	5 500	7 300	DB	DF	DT	57	54.5	83	85.5	1	0.6
134	105	5 600	7 500	DB	DF	DT	60	55.5	100	104.5	2	1
123	96.5	4 900	6 500	DB	DF	DT	60	55.5	100	104.5	2	1
31.0	32.0	6 700	8 900	DB	DF	DT	60.5	60.5	74.5	75.5	1	0.6
56.0	52.5	6 300	8 400	DB	DF	DT	62	62	83	85.5	1	0.6
92.0	79.0	5 700	7 600	DB	DF	DT	63.5	60.5	91.5	94.5	1.5	1
83.5	72.0	5 000	6 600	DB	DF	DT	63.5	60.5	91.5	94.5	1.5	1
154	123	5 100	6 800	DB	DF	DT	65	60.5	110	114.5	2	1
142	113	4 500	5 900	DB	DF	DT	65	60.5	110	114.5	2	1

Note: For bearing series 79 and 70, inner rings are constructed with groove abutments on both sides. Therefore, the inner ring chamfer dimension r₁ is identical to dimension r. Furthermore, the radius r_{1a} of the shaft corner roundness is likewise identical to r_a.

Single and Duplex Angular Contact Ball Bearings

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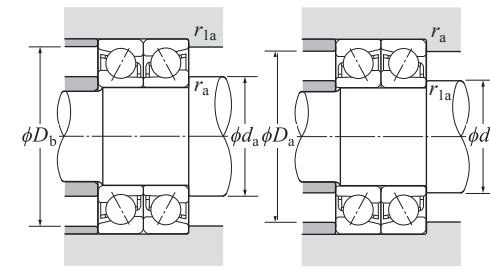
d 60–85 mm

Boundary dimensions						Basic load rating		Fatigue load limit	Allowable speed ¹⁾		Bearing number ²⁾	Load center	Mass
mm						dynamic	static	kN	min ⁻¹			mm	kg
d	D	B	2B	r _s min ³⁾	r _{is} min ³⁾	C _r	C _{0r}	C _u	Grease lubrication	Oil lubrication		a	Single row (approx.)
60	85	13	26	1	0.6	20.0	17.4	1.16	7 800	10 000	7912	27.5	0.23
	95	18	36	1.1	0.6	35.5	28.1	1.99	7 200	9 600	7012	31.5	0.478
	110	22	44	1.5	1	68.5	49.0	3.85	6 600	8 800	7212	36	0.765
	110	22	44	1.5	1	62.0	44.5	3.40	5 700	7 600	7212B	47.5	0.78
	130	31	62	2.1	1.1	109	71.5	5.60	5 900	7 900	7312	43	1.74
	130	31	62	2.1	1.1	99.5	66.0	5.15	5 100	6 800	7312B	56	1.77
65	90	13	26	1	0.6	20.2	18.0	1.20	7 200	9 600	7913	29	0.245
	100	18	36	1.1	0.6	37.5	31.5	2.18	6 700	9 000	7013	33	0.509
	120	23	46	1.5	1	78.0	58.0	4.55	6 100	8 100	7213	38	0.962
	120	23	46	1.5	1	70.5	52.5	3.95	5 200	7 000	7213B	50.5	0.981
	140	33	66	2.1	1.1	123	82.0	6.35	5 500	7 300	7313	46	2.11
	140	33	66	2.1	1.1	113	75.5	5.85	4 700	6 300	7313B	59.5	2.15
70	100	16	32	1	0.6	29.0	26.2	1.74	6 700	9 000	7914	32.5	0.397
	110	20	40	1.1	0.6	47.5	39.5	2.78	6 200	8 300	7014	36	0.705
	125	24	48	1.5	1	84.5	63.5	5.00	5 700	7 600	7214	40	1.09
	125	24	48	1.5	1	76.5	58.0	4.35	4 900	6 500	7214B	53	1.11
	150	35	70	2.1	1.1	138	93.5	6.95	5 100	6 800	7314	49.5	2.56
	150	35	70	2.1	1.1	127	86	6.40	4 400	5 800	7314B	63.5	2.61
75	105	16	32	1	0.6	29.4	27.1	1.80	6 300	8 400	7915	34	0.42
	115	20	40	1.1	0.6	48.5	41.5	2.90	5 800	7 800	7015	37.5	0.745
	130	25	50	1.5	1	87.5	68.5	5.20	5 300	7 100	7215	42.5	1.17
	130	25	50	1.5	1	79.0	62.0	4.50	4 500	6 000	7215B	56	1.19
	160	37	74	2.1	1.1	150	106	7.65	4 800	6 300	7315	52.5	3.07
	160	37	74	2.1	1.1	138	97.5	7.00	4 100	5 400	7315B	68	3.13
80	110	16	32	1	0.6	29.8	28.0	1.86	5 900	7 800	7916	35.5	0.444
	125	22	44	1.1	0.6	59.0	50.5	3.50	5 500	7 300	7016	40.5	0.994
	140	26	52	2	1	98.5	76.0	5.65	5 000	6 600	7216	45	1.39
	140	26	52	2	1	89.0	69.5	4.90	4 300	5 700	7216B	59	1.42
	170	39	78	2.1	1.1	163	119	8.30	4 500	5 900	7316	55.5	3.65
	170	39	78	2.1	1.1	149	109	7.65	3 800	5 100	7316B	72	3.72
85	120	18	36	1.1	0.6	40.0	38.0	2.49	5 500	7 400	7917	38.5	0.628
	130	22	44	1.1	0.6	60.5	53.5	3.60	5 100	6 900	7017	42	1.04
	150	28	56	2	1	110	88.5	6.25	4 700	6 200	7217	48	1.78
	150	28	56	2	1	99.5	80.5	5.45	4 000	5 300	7217B	63.5	1.82

1) This value achieved with machined cages; when pressed cages are used, 80 % of this value is acceptable. 2) Bearing numbers appended with the code "B" have a contact angle of 40°; bearings without this code have a contact angle of 30°. 3) Smallest allowable dimension for chamfer dimension r or r₁.

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Dynamic equivalent radial load

$$P_r = X F_r + Y F_a$$

Contact angle	e	Single, DT				DB, DF			
		F _a /F _r ≤ e		F _a /F _r > e		F _a /F _r ≤ e		F _a /F _r > e	
		X	Y	X	Y	X	Y	X	Y
30°	0.80	1	0	0.39	0.76	1	0.78	0.63	1.24
40°	1.14	1	0	0.35	0.57	1	0.55	0.57	0.93

Static equivalent radial load

$$P_{0r} = X_0 F_r + Y_0 F_a$$

Contact angle	Single, DT		DB, DF	
	X ₀	Y ₀	X ₀	Y ₀
30°	0.5	0.33	1	0.66
40°	0.5	0.26	1	0.52

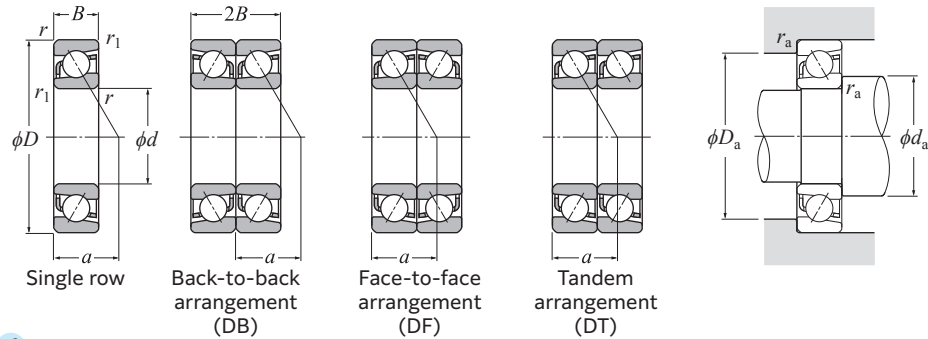
For single and DT arrangement, when $P_{0r} < F_r$ use $P_{0r} = F_r$.

Basic load rating		Allowable speed ¹⁾		Bearing number			Installation-related dimensions					
dynamic	static	(duplex)	(duplex)	DB	DF	DT	mm					
C _r	C _{0r}	Grease lubrication	Oil lubrication				d _a Min.	d _b Min.	D _a Max.	D _b Max.	r _{as} Max.	r _{1as} Max.
32.5	35.0	6 200	8 300	DB	DF	DT	65.5	65.5	79.5	80.5	1	0.6
57.5	56.0	5 800	7 700	DB	DF	DT	67	67	88	90.5	1	0.6
111	98.0	5 300	7 000	DB	DF	DT	68.5	65.5	101.5	104.5	1.5	1
101	89.0	4 600	6 100	DB	DF	DT	68.5	65.5	101.5	104.5	1.5	1
176	143	4 700	6 300	DB	DF	DT	72	67	118	123	2	1
162	132	4 100	5 500	DB	DF	DT	72	67	118	123	2	1
33.0	36.0	5 700	7 600	DB	DF	DT	70.5	70.5	84.5	85.5	1	0.6
60.5	62.5	5 400	7 100	DB	DF	DT	72	72	93	95.5	1	0.6
126	116	4 900	6 500	DB	DF	DT	73.5	70.5	111.5	114.5	1.5	1
115	105	4 200	5 600	DB	DF	DT	73.5	70.5	111.5	114.5	1.5	1
200	164	4 400	5 800	DB	DF	DT	77	72	128	133	2	1
183	151	3 800	5 100	DB	DF	DT	77	72	128	133	2	1
47.0	52.5	5 300	7 100	DB	DF	DT	75.5	75.5	94.5	95.5	1	0.6
77.0	78.5	5 000	6 600	DB	DF	DT	77	77	103	105.5	1	0.6
137	127	4 500	6 000	DB	DF	DT	78.5	75.5	116.5	119.5	1.5	1
124	116	3 900	5 200	DB	DF	DT	78.5	75.5	116.5	119.5	1.5	1
224	187	4 100	5 400	DB	DF	DT	82	77	138	143	2	1
206	172	3 500	4 700	DB	DF	DT	82	77	138	143	2	1
48.0	54.0	5 000	6 700	DB	DF	DT	80.5	80.5	99.5	100.5	1	0.6
78.5	83.5	4 600	6 200	DB	DF	DT	82	82	108	110.5	1	0.6
142	137	4 200	5 600	DB	DF	DT	83.5	80.5	121.5	124.5	1.5	1
128	124	3 700	4 900	DB	DF	DT	83.5	80.5	121.5	124.5	1.5	1
244	212	3 800	5 000	DB	DF	DT	87	82	148	153	2	1
224	195	3 300	4 400	DB	DF	DT	87	82	148	153	2	1
48.5	56.0	4 700	6 200	DB	DF	DT	85.5	85.5	104.5	105.5	1	0.6
96.0	101	4 400	5 800	DB	DF	DT	87	87	118	120.5	1	0.6
160	152	3 900	5 300	DB	DF	DT	90	85.5	130	134.5	2	1
145	139	3 400	4 600	DB	DF	DT	90	85.5	130	134.5	2	1
265	238	3 500	4 700	DB	DF	DT	92	87	158	163	2	1
243	218	3 100	4 100	DB	DF	DT	92	87	158	163	2	1
65.0	76.0	4 400	5 900	DB	DF	DT	92	92	113	115.5	1	0.6
98.5	107	4 100	5 500	DB	DF	DT	92	92	123	125.5	1	0.6
179	177	3 700	5 000	DB	DF	DT	95	90.5	140	144.5	2	1
162	161	3 200	4 300	DB	DF	DT	95	90.5	140	144.5	2	1

Note: For bearing series 79 and 70, inner rings are constructed with groove abutments on both sides. Therefore, the inner ring chamfer dimension r₁ is identical to dimension r. Furthermore, the radius r_{1a} of the shaft corner roundness is likewise identical to r₁.

Single and Duplex Angular Contact Ball Bearings

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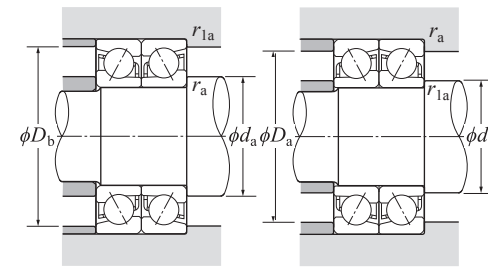
d 85–120 mm

Boundary dimensions						Basic load rating		Fatigue load limit	Allowable speed ¹⁾		Bearing number ²⁾	Load center	Mass
mm						dynamic	static	kN	min ⁻¹			mm	kg
d	D	B	2B	r _s min ³⁾	r _{is} min ³⁾	C _r	C _{0r}	C _u	Grease lubrication	Oil lubrication		a	Single row (approx.)
85	180	41	82	3	1.1	176	133	9.00	4 200	5 600	7317	59	4.34
	180	41	82	3	1.1	161	122	8.30	3 600	4 800	7317B	76	4.43
90	125	18	36	1.1	0.6	39.5	38.0	2.42	5 200	7 000	7918	40	0.658
	140	24	48	1.5	1	72.0	63.5	4.15	4 900	6 500	7018	45	1.35
	160	30	60	2	1	130	103	7.20	4 400	5 900	7218	51	2.18
	160	30	60	2	1	118	94.0	6.30	3 800	5 000	7218B	67.5	2.22
	190	43	86	3	1.1	189	147	9.70	4 000	5 300	7318	62	5.06
	190	43	86	3	1.1	173	135	8.95	3 400	4 500	7318B	80.5	5.16
95	130	18	36	1.1	0.6	41.5	40.5	2.54	5 000	6 600	7919	41.5	0.688
	145	24	48	1.5	1	74.0	67.0	4.25	4 600	6 100	7019	46.5	1.41
	170	32	64	2.1	1.1	148	118	8.05	4 100	5 500	7219	54.5	2.67
	170	32	64	2.1	1.1	134	107	7.00	3 500	4 700	7219B	71.5	2.72
	200	45	90	3	1.1	202	162	10.5	3 700	5 000	7319	65	5.89
	200	45	90	3	1.1	185	149	9.60	3 200	4 200	7319B	84.5	6
100	140	20	40	1.1	0.6	53.0	52.5	3.20	4 700	6 200	7920	44.5	0.934
	150	24	48	1.5	1	75.5	70.5	4.35	4 400	5 800	7020	48	1.47
	180	34	68	2.1	1.1	159	126	8.30	3 900	5 200	7220	57.5	3.2
	180	34	68	2.1	1.1	144	114	7.30	3 400	4 500	7220B	76	3.26
	215	47	94	3	1.1	230	193	12.0	3 500	4 700	7320	69	7.18
	215	47	94	3	1.1	211	178	11.1	3 000	4 000	7320B	89.5	7.32
105	145	20	40	1.1	0.6	54.0	54.5	3.25	4 400	5 900	7921	46	0.972
	160	26	52	2	1	88.5	81.5	4.95	4 100	5 500	7021	51.5	1.86
	190	36	72	2.1	1.1	173	142	9.10	3 700	5 000	7221	60.5	3.79
	190	36	72	2.1	1.1	157	129	8.05	3 200	4 300	7221B	80	3.87
	225	49	98	3	1.1	244	210	12.8	3 400	4 500	7321	72	8.2
	225	49	98	3	1.1	224	194	11.8	2 900	3 800	7321B	93.5	8.36
110	150	20	40	1.1	0.6	54.5	56.0	3.25	4 200	5 700	7922	47.5	1.01
	170	28	56	2	1	102	93.0	5.50	3 900	5 300	7022	54.5	2.3
	200	38	76	2.1	1.1	188	158	9.95	3 500	4 700	7222	64	4.45
	200	38	76	2.1	1.1	170	144	8.80	3 000	4 000	7222B	84	4.54
	240	50	100	3	1.1	273	246	14.5	3 200	4 300	7322	76	9.6
	240	50	100	3	1.1	250	226	13.3	2 700	3 700	7322B	99	9.8
120	165	22	44	1.1	0.6	67.5	69.5	3.90	3 900	5 200	7924	52	1.66

1) This value achieved with machined cages; when pressed cages are used, 80 % of this value is acceptable. 2) Bearing numbers appended with the code "B" have a contact angle of 40°; bearings without this code have a contact angle of 30°. 3) Smallest allowable dimension for chamfer dimension r or r₁.

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Dynamic equivalent radial load

$$P_r = X F_r + Y F_a$$

Contact angle	e	Single, DT				DB, DF			
		$F_a/F_r \leq e$	$F_a/F_r > e$	$F_a/F_r \leq e$	$F_a/F_r > e$	$F_a/F_r \leq e$	$F_a/F_r > e$	$F_a/F_r \leq e$	$F_a/F_r > e$
30°	0.80	X	Y	X	Y	X	Y	X	Y
40°	1.14	1	0	0.39	0.76	1	0.78	0.63	1.24
		1	0	0.35	0.57	1	0.55	0.57	0.93

Static equivalent radial load

$$P_{0r} = X_0 F_r + Y_0 F_a$$

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

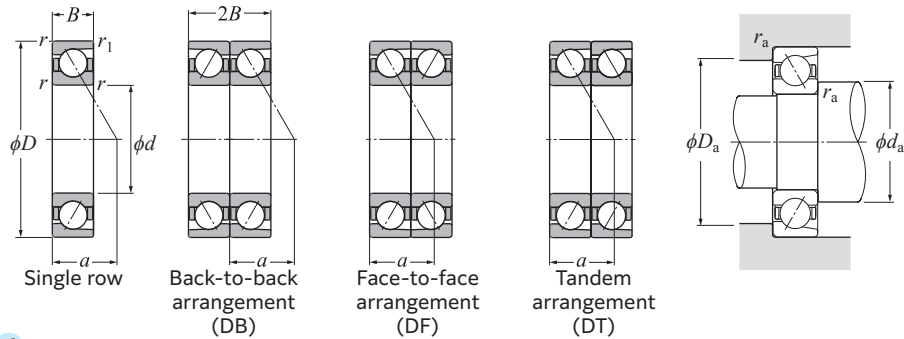
For single and DT arrangement, when $P_{0r} < F_r$ use $P_{0r} = F_r$.

Basic load rating		Allowable speed ¹⁾		Bearing number			Installation-related dimensions					
dynamic	static	(duplex)	(duplex)	DB	DF	DT	mm					
C_r	C_{0r}	Grease lubrication	Oil lubrication				d_a Min.	d_b Min.	D_a Max.	D_b Max.	r_{as} Max.	r_{1as} Max.
286	265	3 300	4 500	DB	DF	DT	99	92	166	173	2.5	1
262	244	2 900	3 900	DB	DF	DT	99	92	166	173	2.5	1
65.5	75.5	4 200	5 500	DB	DF	DT	97	97	118	120.5	1	0.6
117	127	3 900	5 200	DB	DF	DT	98.5	98.5	131.5	134.5	1.5	1
212	206	3 500	4 700	DB	DF	DT	100	95.5	150	154.5	2	1
192	188	3 100	4 100	DB	DF	DT	100	95.5	150	154.5	2	1
305	294	3 200	4 200	DB	DF	DT	104	97	176	183	2.5	1
281	270	2 700	3 700	DB	DF	DT	104	97	176	183	2.5	1
67.0	81.5	3 900	5 300	DB	DF	DT	102	102	123	125.5	1	0.6
120	134	3 700	4 900	DB	DF	DT	103.5	103.5	136.5	139.5	1.5	1
240	236	3 300	4 400	DB	DF	DT	107	102	158	163	2	1
218	215	2 900	3 800	DB	DF	DT	107	102	158	163	2	1
330	325	3 000	3 900	DB	DF	DT	109	102	186	193	2.5	1
300	298	2 600	3 400	DB	DF	DT	109	102	186	193	2.5	1
86.0	105	3 700	5 000	DB	DF	DT	107	107	133	135.5	1	0.6
123	141	3 500	4 600	DB	DF	DT	108.5	108.5	141.5	144.5	1.5	1
259	251	3 100	4 200	DB	DF	DT	112	107	168	173	2	1
234	229	2 700	3 600	DB	DF	DT	112	107	168	173	2	1
375	385	2 800	3 700	DB	DF	DT	114	107	201	208	2.5	1
340	355	2 400	3 300	DB	DF	DT	114	107	201	208	2.5	1
87.5	109	3 500	4 700	DB	DF	DT	112	112	138	140.5	1	0.6
144	163	3 300	4 400	DB	DF	DT	115	115	150	154.5	2	1
282	283	3 000	4 000	DB	DF	DT	117	112	178	183	2	1
255	258	2 600	3 500	DB	DF	DT	117	112	178	183	2	1
395	420	2 700	3 600	DB	DF	DT	119	112	211	218	2.5	1
365	385	2 300	3 100	DB	DF	DT	119	112	211	218	2.5	1
89.0	112	3 400	4 500	DB	DF	DT	117	117	143	145.5	1	0.6
165	186	3 100	4 200	DB	DF	DT	120	120	160	164.5	2	1
305	315	2 800	3 800	DB	DF	DT	122	117	188	193	2	1
277	289	2 500	3 300	DB	DF	DT	122	117	188	193	2	1
445	490	2 600	3 400	DB	DF	DT	124	117	226	233	2.5	1
405	455	2 200	3 000	DB	DF	DT	124	117	226	233	2.5	1
109	139	3 100	4 100	DB	DF	DT	127	127	158	160.5	1	0.6

Note: For bearing series 79 and 70, inner rings are constructed with groove abutments on both sides. Therefore, the inner ring chamfer dimension r_1 is identical to dimension r . Furthermore, the radius r_{1a} of the shaft corner roundness is likewise identical to r_{1a} .

Single and Duplex Angular Contact Ball Bearings

NTN



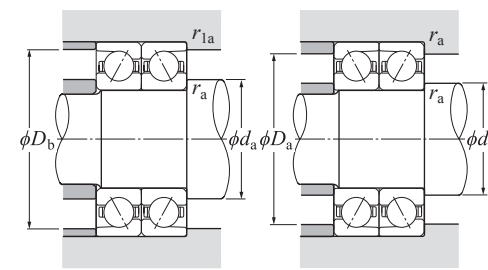
d 120–170 mm

Boundary dimensions						Basic load rating		Fatigue load limit	Allowable speed		Bearing number ¹⁾	Load center	Mass
mm						dynamic	static	kN	min ⁻¹			mm	kg
d	D	B	2B	r _s min ²⁾	r _{1s} min ²⁾	C _r	C _{0r}	C _u	Grease lubrication	Oil lubrication		a	Single row (approx.)
120	180	28	56	2	1	104	98.5	5.55	3 600	4 800	7024	57.5	2.47
	215	40	80	2.1	1.1	202	177	10.7	3 200	4 300	7224	68.5	6.26
	215	40	80	2.1	1.1	183	162	9.40	2 800	3 700	7224B	90.5	6.26
	260	55	110	3	1.1	273	252	14.3	2 900	3 900	7324	82.5	14.7
	260	55	110	3	1.1	249	231	13.1	2 500	3 300	7324B	107	14.7
130	180	24	48	1.5	1	83.0	87.5	4.65	3 600	4 700	7926	56.5	1.82
	200	33	66	2	1	130	125	6.75	3 300	4 400	7026	64	3.73
	230	40	80	3	1.1	217	198	11.5	3 000	4 000	7226	72	7.15
	230	40	80	3	1.1	196	180	10.0	2 500	3 400	7226B	95.5	7.15
	280	58	116	4	1.5	305	293	16.0	2 700	3 600	7326	88	17.6
	280	58	116	4	1.5	277	268	14.7	2 300	3 100	7326B	115	17.6
140	190	24	48	1.5	1	83.5	90.0	4.65	3 300	4 400	7928	59.5	1.94
	210	33	66	2	1	133	133	6.85	3 100	4 100	7028	67	3.96
	250	42	84	3	1.1	225	215	11.7	2 700	3 600	7228	77.5	8.78
	250	42	84	3	1.1	203	195	10.1	2 300	3 100	7228B	103	8.78
	300	62	124	4	1.5	335	335	17.7	2 500	3 300	7328	94.5	21.5
	300	62	124	4	1.5	305	310	16.3	2 100	2 800	7328B	123	21.5
150	210	28	56	2	1	108	117	5.80	3 100	4 100	7930	66	2.96
	225	35	70	2.1	1.1	152	154	7.65	2 800	3 800	7030	71.5	4.82
	270	45	90	3	1.1	257	259	13.7	2 500	3 400	7230	83	11
	270	45	90	3	1.1	232	235	11.9	2 200	2 900	7230B	111	11
	320	65	130	4	1.5	365	380	19.5	2 300	3 100	7330	100	25.1
	320	65	130	4	1.5	335	350	17.9	2 000	2 600	7330B	131	25.1
160	220	28	56	2	1	109	121	5.80	2 800	3 800	7932	69	3.13
	240	38	76	2.1	1.1	172	176	8.55	2 700	3 600	7032	77	5.96
	290	48	96	3	1.1	291	305	15.8	2 400	3 200	7232	89	13.7
	290	48	96	3	1.1	263	279	13.7	2 000	2 700	7232B	118	13.7
	340	68	136	4	1.5	385	420	20.9	2 100	2 800	7332	106	29.8
	340	68	136	4	1.5	350	385	19.1	1 800	2 400	7332B	139	29.8
170	230	28	56	2	1	115	129	6.05	2 700	3 600	7934	71.5	3.29
	260	42	84	2.1	1.1	206	214	10.2	2 500	3 300	7034	83	7.96
	310	52	104	4	1.5	325	360	18.0	2 200	3 000	7234	95.5	17
	310	52	104	4	1.5	295	325	15.6	1 900	2 500	7234B	127	17
	360	72	144	4	1.5	430	485	23.3	2 000	2 700	7334	113	35.3

1) Bearing numbers appended with the code "B" have a contact angle of 40°; bearings without this code have a contact angle of 30°.
2) Smallest allowable dimension for chamfer dimension r or r_1 .

Single and Duplex Angular Contact Ball Bearings

NTN



Dynamic equivalent radial load

$$P_r = X F_r + Y F_a$$

Contact angle	e	Single, DT				DB, DF			
		$F_a/F_r \leq e$		$F_a/F_r > e$		$F_a/F_r \leq e$		$F_a/F_r > e$	
		X	Y	X	Y	X	Y	X	Y
30°	0.80	1	0	0.39	0.76	1	0.78	0.63	1.24
40°	1.14	1	0	0.35	0.57	1	0.55	0.57	0.93

Static equivalent radial load

$$P_{0r} = X_0 F_r + Y_0 F_a$$

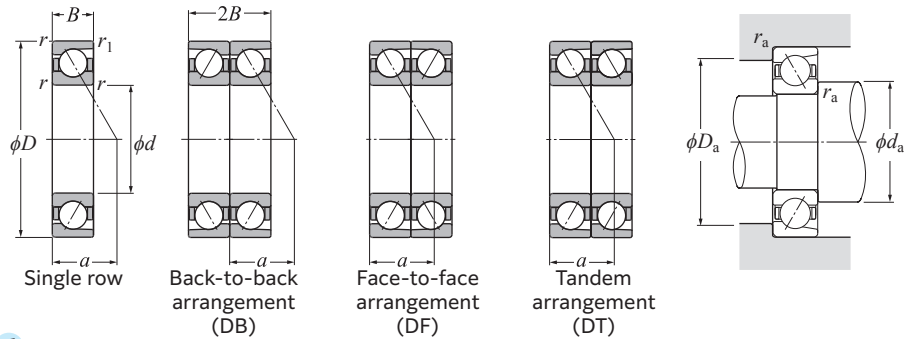
Contact angle	Single, DT		DB, DF	
	X_0	Y_0	X_0	Y_0
30°	0.5	0.33	1	0.66
40°	0.5	0.26	1	0.52

For single and DT arrangement, when $P_{0r} < F_r$ use $P_{0r} = F_r$.

Basic load rating		Allowable speed ¹⁾		Bearing number			Installation-related dimensions				
dynamic	static	(duplex)	(duplex)	DB	DF	DT	d_a	D_a	mm	r_{as}	r_{1as}
C_r	C_{0r}	Grease lubrication	Oil lubrication				Min.	Max.	D_b Max.	Max.	Max.
169	197	2 900	3 800	DB	DF	DT	130	170	174.5	2	1
330	355	2 600	3 400	DB	DF	DT	132	203	208	2	1
298	325	2 300	3 000	DB	DF	DT	132	203	208	2	1
445	505	2 300	3 100	DB	DF	DT	134	246	253	2.5	1
405	460	2 000	2 700	DB	DF	DT	134	246	253	2.5	1
135	175	2 800	3 800	DB	DF	DT	138.5	171.5	174.5	1.5	1
211	251	2 600	3 500	DB	DF	DT	140	190	194.5	2	1
355	395	2 400	3 100	DB	DF	DT	144	216	223	2.5	1
320	360	2 100	2 700	DB	DF	DT	144	216	223	2.5	1
490	585	2 100	2 800	DB	DF	DT	148	262	271.5	3	1.5
450	535	1 900	2 500	DB	DF	DT	148	262	271.5	3	1.5
136	180	2 600	3 500	DB	DF	DT	148.5	181.5	184.5	1.5	1
215	265	2 400	3 300	DB	DF	DT	150	200	204.5	2	1
365	430	2 200	2 900	DB	DF	DT	154	236	243	2.5	1
330	390	1 900	2 500	DB	DF	DT	154	236	243	2.5	1
540	670	2 000	2 600	DB	DF	DT	158	282	291.5	3	1.5
495	615	1 700	2 300	DB	DF	DT	158	282	291.5	3	1.5
175	234	2 400	3 300	DB	DF	DT	160	200	204.5	2	1
246	305	2 300	3 000	DB	DF	DT	162	213	218	2	1
420	515	2 000	2 700	DB	DF	DT	164	256	263	2.5	1
375	470	1 800	2 400	DB	DF	DT	164	256	263	2.5	1
595	765	1 800	2 400	DB	DF	DT	168	302	311.5	3	1.5
540	700	1 600	2 100	DB	DF	DT	168	302	311.5	3	1.5
177	241	2 300	3 000	DB	DF	DT	170	210	214.5	2	1
279	355	2 100	2 800	DB	DF	DT	172	228	233	2	1
475	615	1 900	2 500	DB	DF	DT	174	276	283	2.5	1
430	555	1 600	2 200	DB	DF	DT	174	276	283	2.5	1
625	845	1 700	2 300	DB	DF	DT	178	322	331.5	3	1.5
570	770	1 500	2 000	DB	DF	DT	178	322	331.5	3	1.5
183	257	2 100	2 800	DB	DF	DT	180	220	224.5	2	1
335	430	2 000	2 600	DB	DF	DT	182	248	253	2	1
530	715	1 800	2 400	DB	DF	DT	188	292	301.5	3	1.5
480	650	1 500	2 100	DB	DF	DT	188	292	301.5	3	1.5
700	970	1 600	2 100	DB	DF	DT	188	342	351.5	3	1.5

Single and Duplex Angular Contact Ball Bearings

NTN



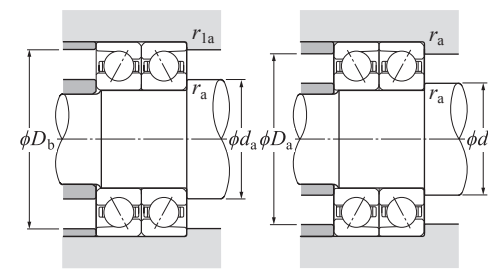
d 170–300 mm

	Boundary dimensions						Basic load rating		Fatigue load limit kN C_u	Allowable speed		Bearing number ¹⁾	Load center mm a	Mass kg Single row (approx.)
	mm						dynamic kN C_r	static C_{0r}		min^{-1}				
	d	D	B	$2B$	$r_s \text{ min}^{(2)}$	$r_{ls} \text{ min}^{(2)}$				Grease lubrication	Oil lubrication			
170	360	72	144	4	1.5		395	445	21.3	1 700	2 300	7334B	147	35.3
180	250	33	66	2	1		145	163	7.40	2 500	3 300	7936	78.5	4.87
	280	46	92	2.1	1.1		242	266	12.3	2 300	3 100	7036	89.5	10.4
	320	52	104	4	1.5		340	385	18.6	2 100	2 800	7236	98	17.7
	320	52	104	4	1.5		305	350	16.1	1 800	2 400	7236B	131	17.7
	380	75	150	4	1.5		455	535	24.9	1 900	2 500	7336	118	40.9
	380	75	150	4	1.5		415	490	22.8	1 600	2 100	7336B	155	40.9
190	260	33	66	2	1		147	169	7.45	2 400	3 200	7938	81.5	5.1
	290	46	92	2.1	1.1		248	280	12.6	2 200	2 900	7038	92.5	10.8
	340	55	110	4	1.5		335	390	17.9	2 000	2 600	7238	104	21.3
	340	55	110	4	1.5		300	355	15.5	1 700	2 200	7238B	139	21.3
	400	78	156	5	2		475	585	26.6	1 800	2 300	7338	124	47
	400	78	156	5	2		430	535	24.0	1 500	2 000	7338B	163	47
200	280	38	76	2.1	1.1		205	231	9.90	2 200	3 000	7940	88.5	7.15
	310	51	102	2.1	1.1		279	325	14.3	2 100	2 800	7040	99	14
	360	58	116	4	1.5		375	450	20.2	1 900	2 500	7240	110	25.3
	360	58	116	4	1.5		335	410	17.6	1 600	2 100	7240B	146	25.3
	420	80	160	5	2		500	610	27.0	1 700	2 200	7340	130	53.1
	420	80	160	5	2		455	555	24.7	1 400	1 900	7340B	170	53.1
220	300	38	76	2.1	1.1		207	239	9.85	2 000	2 700	7944	94	7.74
240	320	38	76	2.1	1.1		213	255	10.1	1 800	2 400	7948	100	8.34
260	360	46	92	2.1	1.1		285	375	14.1	1 700	2 200	7952	112	14
280	380	46	92	2.1	1.1		289	385	14.1	1 500	2 100	7956	118	14.8
300	420	56	112	3	1.1		360	520	18.2	1 400	1 900	7960	132	23.7

1) Bearing numbers appended with the code "B" have a contact angle of 40°; bearings without this code have a contact angle of 30°.
2) Smallest allowable dimension for chamfer dimension r or r_1 .

Single and Duplex Angular Contact Ball Bearings

NTN



Dynamic equivalent radial load

$$P_r = X F_r + Y F_a$$

Contact angle	e	Single, DT				DB, DF			
		$F_a/F_r \leq e$		$F_a/F_r > e$		$F_a/F_r \leq e$		$F_a/F_r > e$	
		X	Y	X	Y	X	Y	X	Y
30°	0.80	1	0	0.39	0.76	1	0.78	0.63	1.24
40°	1.14	1	0	0.35	0.57	1	0.55	0.57	0.93

Static equivalent radial load

$$P_{0r} = X_0 F_r + Y_0 F_a$$

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

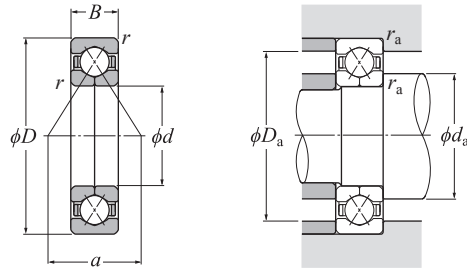
For single and DT arrangement, when $P_{0r} < F_r$ use $P_{0r} = F_r$.

Basic load rating dynamic (duplex) kN C_r	static (duplex) kN C_{0r}	Allowable speed ¹⁾ (duplex) min ⁻¹		Bearing number			Installation-related dimensions				
		Grease lubrication	Oil lubrication	DB	DF	DT	d_a Min.	D_a Max.	mm D_b Max.	r_{as} Max.	r_{1as} Max.
640	890	1 400	1 800	DB	DF	DT	188	342	351.5	3	1.5
236	325	2 000	2 700	DB	DF	DT	190	240	244.5	2	1
395	530	1 900	2 500	DB	DF	DT	192	268	273	2	1
550	770	1 700	2 200	DB	DF	DT	198	302	311.5	3	1.5
495	700	1 400	1 900	DB	DF	DT	198	302	311.5	3	1.5
735	1 070	1 500	2 000	DB	DF	DT	198	362	371.5	3	1.5
670	975	1 300	1 700	DB	DF	DT	198	362	371.5	3	1.5
239	335	1 900	2 500	DB	DF	DT	200	250	254.5	2	1
405	560	1 800	2 300	DB	DF	DT	202	278	283	2	1
545	780	1 600	2 100	DB	DF	DT	208	322	331.5	3	1.5
490	705	1 400	1 800	DB	DF	DT	208	322	331.5	3	1.5
770	1 170	1 400	1 900	DB	DF	DT	212	378	390	4	2
700	1 070	1 200	1 600	DB	DF	DT	212	378	390	4	2
335	465	1 800	2 400	DB	DF	DT	212	268	273	2	1
455	650	1 700	2 200	DB	DF	DT	212	298	303	2	1
605	900	1 500	2 000	DB	DF	DT	218	342	351.5	3	1.5
545	815	1 300	1 700	DB	DF	DT	218	342	351.5	3	1.5
810	1 220	1 300	1 800	DB	DF	DT	222	398	410	4	2
740	1 110	1 200	1 500	DB	DF	DT	222	398	410	4	2
335	475	1 600	2 100	DB	DF	DT	232	288	293	2	1
345	510	1 500	1 900	DB	DF	DT	252	308	313	2	1
465	750	1 300	1 800	DB	DF	DT	272	348	353	2	1
470	775	1 200	1 600	DB	DF	DT	292	368	373	2	1
590	1 040	1 100	1 500	DB	DF	DT	314	406	413	2.5	1

Four-Point Contact Ball Bearings

NTN

QJ type



Dynamic equivalent axial load
 $P_a = F_a$

Static equivalent axial load
 $P_{0a} = F_a$

d 30–90 mm

Boundary dimensions				Basic load rating		Fatigue load limit	Allowable speed		Bearing number	Installation-related dimensions			Load center	Mass
mm				dynamic	static	kN	min ⁻¹			mm				
<i>d</i>	<i>D</i>	<i>B</i>	<i>r</i> _{s min} ¹⁾	<i>C</i> _a	<i>C</i> _{0a}		<i>C</i> _u	Grease lubrication		Oil lubrication	<i>d</i> _a Min.	<i>D</i> _a Max.	<i>r</i> _{as} Max.	<i>a</i>
30	72	19	1.1	44.0	57.5	2.46	8 000	11 000	QJ306	37	65	1	30	0.42
35	80	21	1.5	55.0	73.0	3.15	7 000	9 300	QJ307	43.5	71.5	1.5	33	0.57
40	80	18	1.1	49.0	70.5	3.05	6 900	9 200	QJ208	47	73	1	34.5	0.45
	90	23	1.5	67.0	91.5	3.95	6 200	8 200	QJ308	48.5	81.5	1.5	37.5	0.78
45	85	19	1.1	55.0	81.0	3.50	6 200	8 200	QJ209	52	78	1	37.5	0.52
	100	25	1.5	87.0	121	5.20	5 500	7 400	QJ309	53.5	91.5	1.5	42	1.05
50	90	20	1.1	57.5	89.0	3.80	5 600	7 500	QJ210	57	83	1	40.5	0.603
	110	27	2	102	145	6.20	5 000	6 700	QJ310	60	100	2	46	1.38
55	100	21	1.5	71.0	112	4.80	5 100	6 800	QJ211	63.5	91.5	1.5	44.5	0.78
	120	29	2	118	170	7.30	4 600	6 100	QJ311	65	110	2	50.5	1.76
60	110	22	1.5	86.0	138	5.90	4 700	6 300	QJ212	68.5	101.5	1.5	49	0.98
	130	31	2.1	135	198	8.50	4 200	5 700	QJ312	72	118	2	55	2.18
65	120	23	1.5	93.5	153	6.55	4 400	5 800	QJ213	73.5	111.5	1.5	53.5	1.24
	140	33	2.1	153	228	9.70	3 900	5 200	QJ313	77	128	2	59	2.7
70	125	24	1.5	102	168	7.15	4 000	5 400	QJ214	78.5	116.5	1.5	56.5	1.36
	150	35	2.1	172	260	10.7	3 600	4 800	QJ314	82	138	2	63.5	3.27
75	130	25	1.5	106	183	7.55	3 800	5 000	QJ215	83.5	121.5	1.5	59	1.53
	160	37	2.1	187	294	11.7	3 400	4 500	QJ315	87	148	2	68	3.9
80	140	26	2	124	217	8.65	3 500	4 700	QJ216	90	130	2	63.5	1.83
	170	39	2.1	202	330	12.7	3 200	4 200	QJ316	92	158	2	72	4.64
85	150	28	2	139	252	9.65	3 300	4 400	QJ217	95	140	2	68	2.3
	180	41	3	218	370	13.8	3 000	4 000	QJ317	99	166	2.5	76.5	5.43
90	160	30	2	164	293	11.1	3 100	4 200	QJ218	100	150	2	72	2.76
	190	43	3	235	410	14.8	2 800	3 800	QJ318	104	176	2.5	81	6.31

1) Smallest allowable dimension for chamfer dimension r.

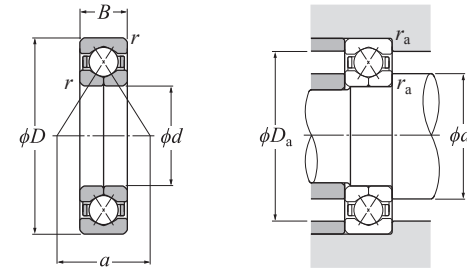
Note: 1. These bearings are also manufactured with a slot in the chamfer section of the outer ring to stop whirling.

2. This bearing is widely used in applications where the only type of load is axial. When considering it for use where radial loads are applied, consult **NTN Engineering**.

Four-Point Contact Ball Bearings

NTN

QJ type



Dynamic equivalent axial load
 $P_a = F_a$

Static equivalent axial load
 $P_{0a} = F_a$

d 95–120 mm

Boundary dimensions				Basic load rating		Fatigue load limit kN C _u	Allowable speed		Bearing number	Installation-related dimensions			Load center mm a	Mass kg (approx.)
mm				dynamic	static		min ⁻¹			mm	mm			
d	D	B	r _{s min} ⁽¹⁾	C _a	C _{0a}		Grease lubrication	Oil lubrication		d _a Min.	D _a Max.	r _{as} Max.		
95	170	32	2.1	186	335	12.4	3 000	3 900	QJ219	107	158	2	76.5	3.35
	200	45	3	251	450	16.0	2 700	3 500	QJ319	109	186	2.5	85	7.41
100	180	34	2.1	200	355	12.9	2 800	3 700	QJ220	112	168	2	81	4.02
	215	47	3	300	585	20.0	2 500	3 400	QJ320	114	201	2.5	91	9.14
105	190	36	2.1	218	400	14.2	2 700	3 600	QJ221	117	178	2	85	4.75
	225	49	3	305	585	19.6	2 400	3 200	QJ321	119	211	2.5	95.5	10.4
110	200	38	2.1	236	450	15.5	2 500	3 400	QJ222	122	188	2	89.5	5.62
	240	50	3	340	680	22.1	2 300	3 100	QJ322	124	226	2.5	101	12
120	215	40	2.1	266	540	17.7	2 300	3 100	QJ224	132	203	2	96.5	6.75
	260	55	3	360	765	23.8	2 100	2 800	QJ324	134	246	2.5	110	15.9

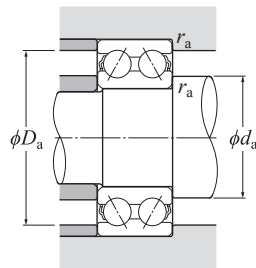
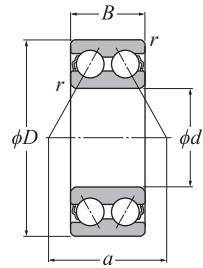
1) Smallest allowable dimension for chamfer dimension r.

Note: 1. These bearings are also manufactured with a slot in the chamfer section of the outer ring to stop whirling.

2. This bearing is widely used in applications where the only type of load is axial. When considering it for use where radial loads are applied, consult **NTN Engineering**.

● Double Row Angular Contact Ball Bearings

NTN



Dynamic equivalent radial load

$$P_r = XF_r + YF_a$$

e	$\frac{F_a}{F_r} \leq e$			$\frac{F_a}{F_r} > e$	
	X	Y		X	Y
0.68	1	0.92		0.67	1.41

Static equivalent radial load

$$P_{0r} = F_r + 0.7F_a$$

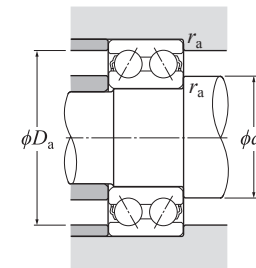
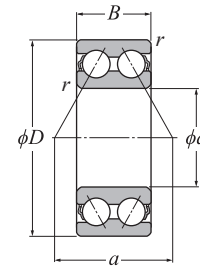
d 10–65 mm

Boundary dimensions				Basic load rating		Fatigue load limit kN C_u	Allowable speed		Bearing number	Installation-related dimensions			Load center mm a	Mass kg (approx.)
mm				dynamic kN C_r	static kN C_{0r}		min ⁻¹ Grease lubrication	min ⁻¹ Oil lubrication		mm d_a Min.	mm D_a Max.	mm r_{as} Max.		
d	D	B	$r_s \min^{1)}$											
10	30	14.3	0.6	7.15	3.90	0.230	17 000	22 000	5200S	15	25	0.6	14.5	0.05
12	32	15.9	0.6	10.5	5.80	0.350	15 000	20 000	5201S	17	27	0.6	16.7	0.06
15	35	15.9	0.6	11.7	7.05	0.420	13 000	17 000	5202S	20	30	0.6	18.3	0.07
	42	19	1	17.6	10.2	0.620	11 000	15 000	5302S	21	36	1	22	0.13
17	40	17.5	0.6	14.6	9.05	0.540	11 000	15 000	5203S	22	35	0.6	20.8	0.1
	47	22.2	1	21.0	12.6	0.770	10 000	13 000	5303S	23	41	1	25	0.18
20	47	20.6	1	19.6	12.4	0.750	10 000	13 000	5204S	26	41	1	24.3	0.16
	52	22.2	1.1	24.6	15.0	0.930	9 000	12 000	5304S	27	45	1	26.7	0.22
25	52	20.6	1	21.3	14.7	0.880	8 500	11 000	5205S	31	46	1	26.8	0.18
	62	25.4	1.1	32.5	20.7	1.30	7 500	10 000	5305S	32	55	1	31.8	0.35
30	62	23.8	1	29.6	21.1	1.30	7 100	9 500	5206S	36	56	1	31.6	0.3
	72	30.2	1.1	40.5	28.1	1.70	6 300	8 500	5306S	37	65	1	36.5	0.57
35	72	27	1.1	39.0	28.7	1.70	6 300	8 000	5207S	42	65	1	36.6	0.46
	80	34.9	1.5	51.0	36.0	2.20	5 600	7 500	5307S	44	71	1.5	41.6	0.76
40	80	30.2	1.1	44.0	33.5	2.00	5 600	7 100	5208S	47	73	1	41.5	0.62
	90	36.5	1.5	56.5	41.0	2.50	5 300	6 700	5308S	49	81	1.5	45.5	1.03
45	85	30.2	1.1	49.5	38.0	2.30	5 000	6 700	5209S	52	78	1	43.4	0.67
	100	39.7	1.5	68.5	51.0	3.10	4 500	6 000	5309S	54	91	1.5	50.6	1.37
50	90	30.2	1.1	53.0	43.5	2.70	4 800	6 000	5210S	57	83	1	45.9	0.72
	110	44.4	2	81.5	61.5	3.80	4 300	5 600	5310S	60	100	2	55.6	1.84
55	100	33.3	1.5	56.0	49.0	3.00	4 300	5 600	5211S	64	91	1.5	50.1	1.01
	120	49.2	2	95.0	73.0	4.50	3 800	5 000	5311S	65	110	2	60.6	2.4
60	110	36.5	1.5	69.0	62.0	3.80	3 800	5 000	5212S	69	101	1.5	56.5	1.33
	130	54	2.1	125	98.5	6.00	3 400	4 500	5312S	72	118	2	69.2	2.92
65	120	38.1	1.5	76.5	69.0	4.20	3 600	4 500	5213S	74	111	1.5	59.7	1.71
	140	58.7	2.1	142	113	7.00	3 200	4 300	5313S	77	128	2	72.8	3.67

1) Smallest allowable dimension for chamfer dimension r.

● Double Row Angular Contact Ball Bearings

NTN



Dynamic equivalent radial load

$$P_r = XF_r + YF_a$$

e	$\frac{F_a}{F_r} \leq e$			$\frac{F_a}{F_r} > e$	
	X	Y		X	Y
0.68	1	0.92		0.67	1.41

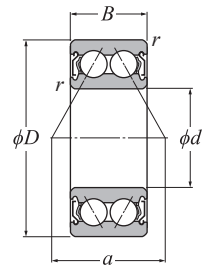
Static equivalent radial load

$$P_{0r} = F_r + 0.7F_a$$

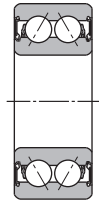
d 70–85 mm

Boundary dimensions				Basic load rating		Fatigue load limit kN C_u	Allowable speed		Bearing number	Installation-related dimensions			Load center mm a	Mass kg (approx.)
mm				dynamic kN C_r	static kN C_{0r}		min ⁻¹ Grease lubrication	min ⁻¹ Oil lubrication		mm d_a Min.	mm D_a Max.	mm r_{as} Max.		
d	D	B	$r_s \min^{1)}$											
70	125	39.7	1.5	94.0	82.0	5.00	3 400	4 500	5214S	79	116	1.5	63.8	1.75
	150	63.5	2.1	159	128	7.90	3 000	3 800	5314S	82	138	2	78.3	4.55
75	130	41.3	1.5	93.5	83.0	5.10	3 200	4 300	5215S	84	121	1.5	66.1	1.88
80	140	44.4	2	99.0	93.0	5.70	3 000	3 800	5216S	90	130	2	69.6	2.51
85	150	49.2	2	116	110	6.70	2 800	3 600	5217S	95	140	2	75.3	3.16

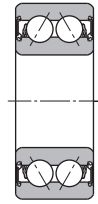
1) Smallest allowable dimension for chamfer dimension r.



Shielded type (ZZ)



Non-contact sealed type (LLM)



Contact sealed type (LLD)

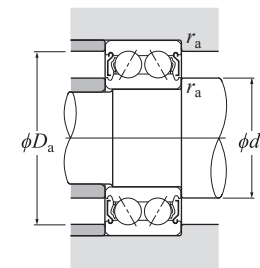
d 10–40 mm

Boundary dimensions	Basic load rating			Fatigue load limit	Allowable speed			Bearing number ²⁾		
	mm	dynamic kN	static kN		Grease lubrication	Oil lubrication		Shielded type	Non-contact sealed type	Contact sealed type
d	D	B	r _s min ¹⁾	C _r	C _{0r}	C _u	ZZ, LLM	Z, LM	LLD, LD	
10	30	14.3	0.6	7.15	3.90	0.230	17 000	22 000	15 000	5200SCZZ LLM LLD
12	32	15.9	0.6	8.50	5.30	0.310	15 000	20 000	12 000	5201SCZZ LLM LLD
15	35	15.9	0.6	8.50	5.30	0.310	13 000	17 000	12 000	5202SCZZ LLM LLD
17	40	17.5	0.6	12.7	8.30	0.490	11 000	15 000	10 000	5203SCZZ LLM LLD
	47	22.2	1	19.6	12.4	0.750	10 000	13 000	9 500	5303SCZZ LLM LLD
20	47	20.6	1	15.9	10.7	0.640	10 000	13 000	9 000	5204SCZZ LLM LLD
25	52	20.6	1	16.9	12.3	0.740	8 500	11 000	7 500	5205SCZZ ³⁾ LLM LLD
	62	25.4	1.1	25.2	18.2	1.10	7 500	10 000	6 300	5305SCZZ LLM LLD
30	62	23.8	1	25.2	18.2	1.10	7 100	9 500	6 300	5206SCZZ LLM LLD
	72	30.2	1.1	39.0	28.7	1.70	6 300	8 500	5 300	5306SCZZ LLM LLD
35	72	27.0	1.1	34.0	25.3	1.50	6 300	8 500	5 300	5207SCZZ LLM LLD
	80	34.9	1.5	44.0	33.5	2.00	5 600	7 500	4 800	5307SCZZ LLM LLD
40	80	30.2	1.1	36.5	29.0	1.70	5 600	7 100	4 800	5208SCZZ ³⁾ LLM LLD
	90	36.5	1.5	49.5	38.0	2.30	5 300	6 700	4 500	5308SCZZ LLM LLD

1) Smallest allowable dimension for chamfer dimension r.

2) This bearing number is for double sealed and double shielded type bearings, but single sealed and single shielded types are also available.

3) Resin cage is standard for 5205SC and 5208SC.



Dynamic equivalent radial load

$$P_r = XF_r + YF_a$$

e	$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
	X	Y	X	Y
0.68	1	0.92	0.67	1.41

Static equivalent radial load

$$P_{0r} = F_r + 0.76F_a$$

Installation-related dimensions				Load center	Mass (approx.)
mm	mm	mm	mm	mm	kg
Min.	Max.	Max.	Max.	a	Sealed type
14	15.5	26	0.6	14.5	0.05
16	19	28	0.6	16.3	0.06
19	19	31	0.6	16.3	0.07
21	23.5	36	0.6	20.1	0.10
23	25.5	41	1	24.3	0.18
26	26.5	41	1	23	0.16
31	32	46	1	25.4	0.18
32	38.5	55	1	30.9	0.36
36	38.5	56	1	30.9	0.30
37	44.5	65	1	36.6	0.57
42	45	65	1	36.3	0.46
44	50.5	71	1.5	41.5	0.79
47	50.5	73	1	39.4	0.63
49	53	81	1.5	43	1.04