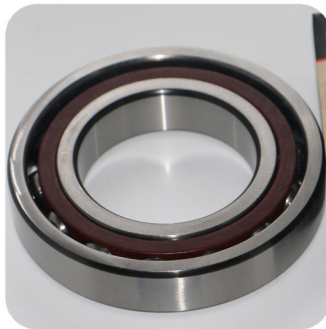




Angular Contact Ball Bearing



**POWER
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Wuxi LOTTON Bearing Manufacturing Co., Ltd.



Angular contact ball bearings

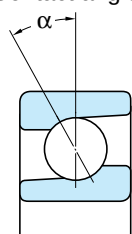
LOTTON Angular contact ball bearings are suitable for applications which require high accuracy and good high-speed performance. This type of bearing is designed to carry a combined load.

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

- The standard contact angles are 15° , 30° and 40° .

They are identified, respectively, by the supplementary codes "C", "A" (omitted) and "B". Bearing with a smaller contact angle are more suitable for applications involving high-speed rotation. Those with a larger contact angle feature superior axial load resistance.

Contact angle



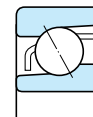
- Angular contact ball bearings are often preloaded to enhance their rigidity and rotating performance. For high-precision matched pair angular contact ball bearings of class 5 or higher, which are used in machine tools and other precision equipment, the standard preload is specified in three levels: light (L), medium (M) and heavy (H).
- When this type of bearing is loaded radially, an axial component of force is produced. In this case, two bearings are used together facing one another, or two or more bearings are matched and used.
- Tables 1 and 2 list the different types of single-row and matched pair/stack angular contact ball bearings and describe their characteristics.

■ Double-row angular contact ball bearings

Consist of two single-row angular contact ball bearings matched back-to-back, with inner and outer rings integrated.

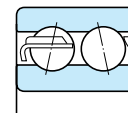
Table 3 shows major types and their characteristics.

Single-row angular contact ball bearings



Bore diameter **10 – 200 mm**

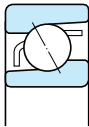
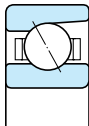
Double-row angular contact ball bearings



Bore diameter **15 – 100 mm**

Angular contact ball bearings

Table 1 Single-row angular contact ball bearings

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

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

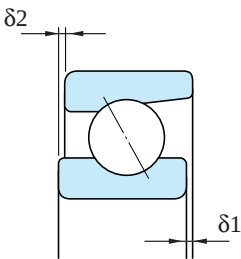
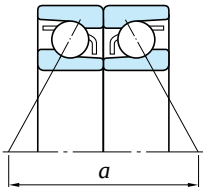
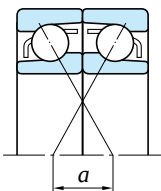
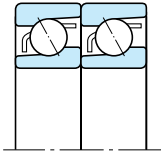


Table 2 Matched pair and stack angular contact ball bearings

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

Matched stack

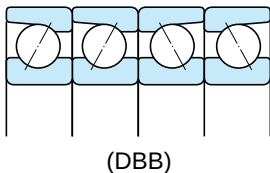
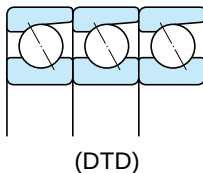
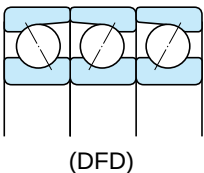
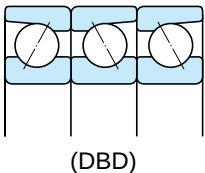
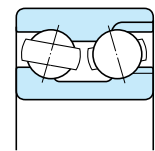
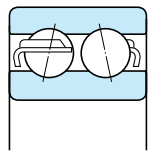
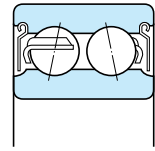
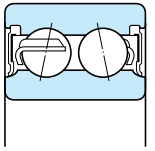


Table 3 Double-row angular contact ball bearings

		- Accommodates radial load and axial load in both directions. Also able to accommodate moment load. - The 32 and 33 series are provided with a filling slot, while the 52 and 53 series are not. 32 and 33 series : contact angle 32° 52 and 53 series : contact angle 24° - Inferior to single-row and matched pair angular contact ball bearings in terms of high-speed and high accuracy performance. - Shielded or sealed 52 and 53 series bearings are also available.
(with filling slot) 32, 33	(without filling slot) 52, 53	
		
Shielded 52...ZZ, 53...ZZ	Sealed 52...2RS, 53...2RS	

Boundary dimensions	The dimensions of standard series are as specified in JIS B 1512.																																							
Tolerances	• As specified in JIS B 1514. • LOTTON has established "special diameter, as listed in the table to matched stack bearings. Bearings which are produced by supplementary code "K5." ■ Matched pair bearing axial internal clearance ■ Double-row bearing radial internal clearance ■ Classes 5 and 4 bearings .																																							
	Special tolerances (K5) Unit μm <table><thead><tr><th colspan="2" rowspan="2">Nominal bore diameter d (mm)</th><th colspan="4">Single plane mean bore diameter (Δd_{mp}) or single plane mean outside diameter deviation (ΔD_{mp})</th></tr><tr><th colspan="2">Class 5</th><th colspan="2">Class 4</th></tr><tr><th>over</th><th>up to</th><th>upper</th><th>lower</th><th>upper</th><th>lower</th></tr></thead><tbody><tr><td>—</td><td>50</td><td>−1</td><td>−4</td><td>−1</td><td>−3</td></tr><tr><td>50</td><td>80</td><td>−1</td><td>−5</td><td>−1</td><td>−4</td></tr><tr><td>80</td><td>120</td><td>−1</td><td>−5</td><td>−1</td><td>−4</td></tr></tbody></table>						Nominal bore diameter d (mm)		Single plane mean bore diameter (Δd_{mp}) or single plane mean outside diameter deviation (ΔD_{mp})				Class 5		Class 4		over	up to	upper	lower	upper	lower	—	50	−1	−4	−1	−3	50	80	−1	−5	−1	−4	80	120	−1	−5	−1	−4
	Nominal bore diameter d (mm)		Single plane mean bore diameter (Δd_{mp}) or single plane mean outside diameter deviation (ΔD_{mp})																																					
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over	up to	upper	lower	upper	lower																																			
—	50	−1	−4	−1	−3																																			
50	80	−1	−5	−1	−4																																			
80	120	−1	−5	−1	−4																																			
Internal clearance																																								
Recommended fits																																								
	<table><thead><tr><th colspan="2" rowspan="2">Fit</th><th>Class 5</th><th>Class 4</th></tr><tr><th colspan="2">Tolerance class</th></tr></thead><tbody><tr><td rowspan="2">With shaft</td><td>Inner ring rotation</td><td>js 5</td><td>js 4</td></tr><tr><td>Outer ring rotation</td><td>h 5</td><td>h 4</td></tr><tr><td rowspan="3">With housing</td><td>Fixed side</td><td>JS 6</td><td>JS 5</td></tr><tr><td>Free side</td><td>H 6</td><td>H 5</td></tr><tr><td>Outer ring rotation</td><td>M 5</td><td>M 4</td></tr></tbody></table>						Fit		Class 5	Class 4	Tolerance class		With shaft	Inner ring rotation	js 5	js 4	Outer ring rotation	h 5	h 4	With housing	Fixed side	JS 6	JS 5	Free side	H 6	H 5	Outer ring rotation	M 5	M 4											
	Fit		Class 5	Class 4																																				
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	Free side	H 6	H 5																																					
	Outer ring rotation	M 5	M 4																																					

Angular contact ball bearings

Standard cages	• Pressed steel cage (supplementary code : //) • Copper alloy machined cage (supplementary code : FY) Note) Machine tools are generally equipped with bearings that have a phenolic resin machined cage (FT). Bearings with a polyamide molded cage can also be used depending on the applications.	Application of standard cages										
		Bearing series		Pressed cage				Machined cage				
		70		—				7000 – 7040				
		70B		—				7000 B – 7040 B				
		70C		—				7000 C – 7040 C				
		72		7200 – 7220				7200 – 7240				
		72B		7200 B – 7220 B				7200 B – 7240 B				
		72C		7200 C – 7220 C				7200 C – 7240 C				
		73		7300 – 7320				7300 – 7340				
		73B		7303 B – 7320 B				7303 B – 7340 B				
		73C		7303 C – 7320 C				7303 C – 7334 C				
		74		7405 – 7409				7404 – 7418				
74B		7405 B – 7409 B				7404 B – 7418 B						
32		3200 – 3215				3216 – 3222						
33		3302 – 3313				3314 – 3322						
52		5203 – 5214				—						
53		5304 – 5315				—						
Allowable misalignment	Single-row ... 0.000 6 rad (2'), double-row ... misalignment not allowed											
Equivalent radial load [Single-row and matched pair angular contact ball bearings] Note) When two single-row angular contact ball bearings are used facing one another, an axial component of force is produced under radial load.	Dynamic equivalent radial load $P_r = XF_r + YF_a$	Contact angle	$\frac{F_a}{C_{0r}}$	e	Single-row and tandem arrangement				Back-to-back and face-to-face arrangement			
					$F_a / F_r \leq e$		$F_a / F_r > e$		$F_a / F_r \leq e$		$F_a / F_r > e$	
					X	Y	X	Y	X	Y	X	Y
		15°	0.015	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
			0.029	0.40				1.40		1.57		2.28
			0.058	0.43				1.30		1.46		2.21
			0.087	0.46				1.23		1.38		2.00
			0.12	0.47				1.19		1.34		1.93
			0.17	0.50				1.12		1.26		1.82
		30°	0.29	0.55	1	0	0.39	1.02	1	1.14	0.63	1.66
			0.44	0.56				1.00		1.12		1.63
			0.58	0.56				1.00		1.12		1.63
		40°	—	0.80	1	0	0.35	0.76	1	0.55	0.57	0.93
		Static equivalent radial load $P_{0r} = X_0 F_r + Y_0 F_a$ In reference to single-row and tandem arrangement bearings, when $P_{0r} < F_r$, $P_{0r} = F_r$	Contact angle	Single-row and tandem arrangement				Back-to-back and face-to-face arrangement				
		X_0		Y_0		X_0		Y_0				
		15°		0.5		0.46		1		0.92		
		30°		0.5		0.33		1		0.66		
		40°		0.5		0.26		1		0.52		

Equivalent radial load Double-row angular contact ball bearings	Dynamic equivalent radial load $P_r = XF_r + YF_a$							
	Contact angle	e	$F_a / F_r \leq e$		$F_a / F_r > e$		(reference)	
			X	Y	X	Y		
	24°	0.66	1	0.95	0.68	1.45	52, 53 series	
	32°	0.86	1	0.73	0.62	1.17	32, 33 series	
	Static equivalent radial load $P_{0r} = X_0 F_r + Y_0 F_a$		Contact angle	X_0	Y_0	(reference)		
		24°	1	0.78	52, 53 series			
		32°	1	0.63	32, 33 series			

Remark) In angular contact ball bearings, slippage occurs between the balls and raceways under too small a load, causing smearing to develop.

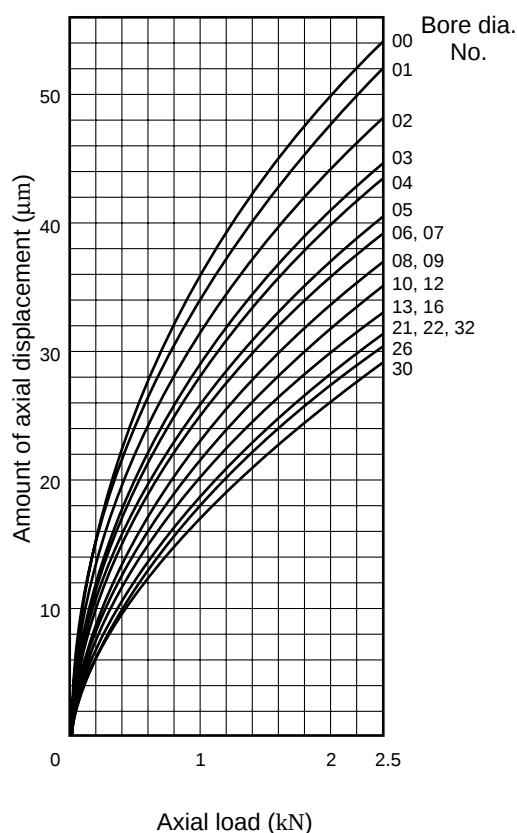
Matched pair bearings may develop smearing when the ratio of the axial load to the radial load exceeds the value of e ($F_a / F_r > e$), as listed in the specification table.

Consult LOTTON when these bearings are used under the above conditions.

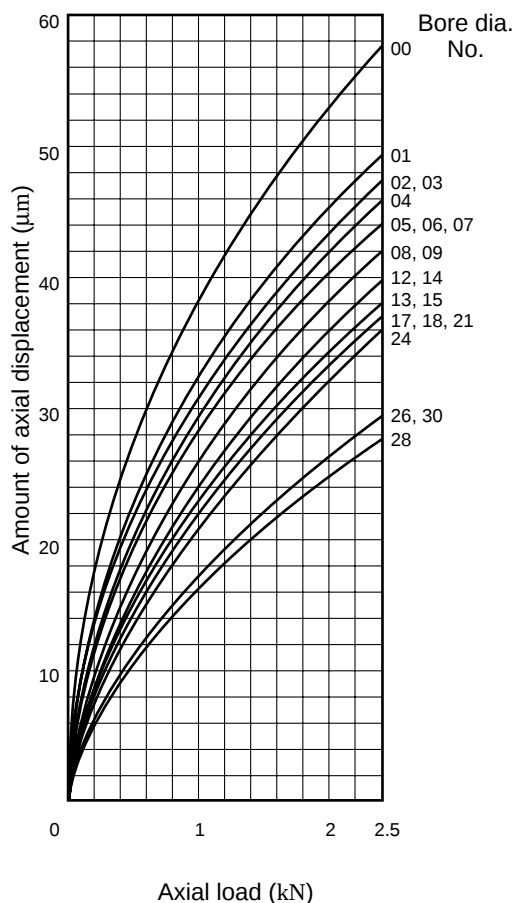
[Reference] Relationship between axial load and axial displacement

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

(1) 7000C (contact angle 15°)

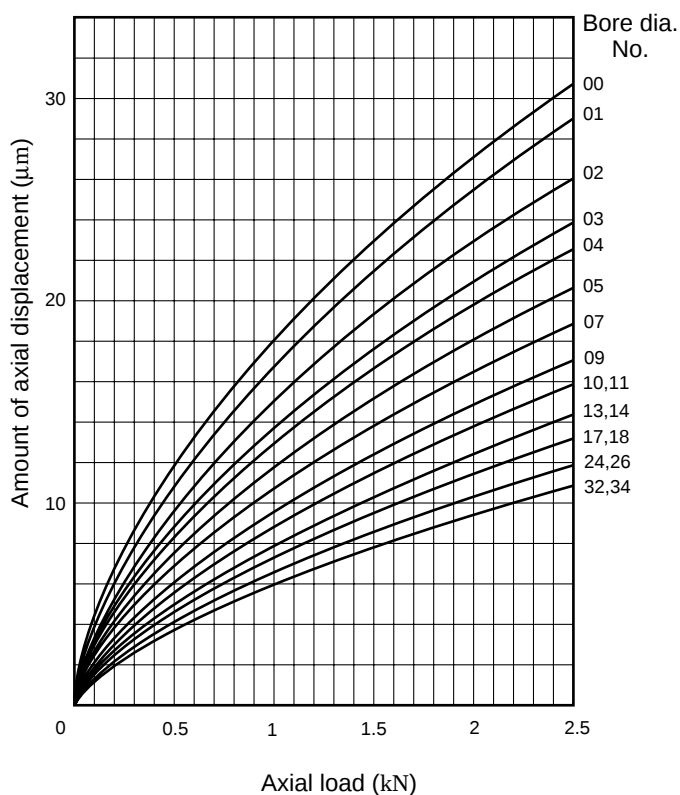


(2) 7200C (contact angle 15°)

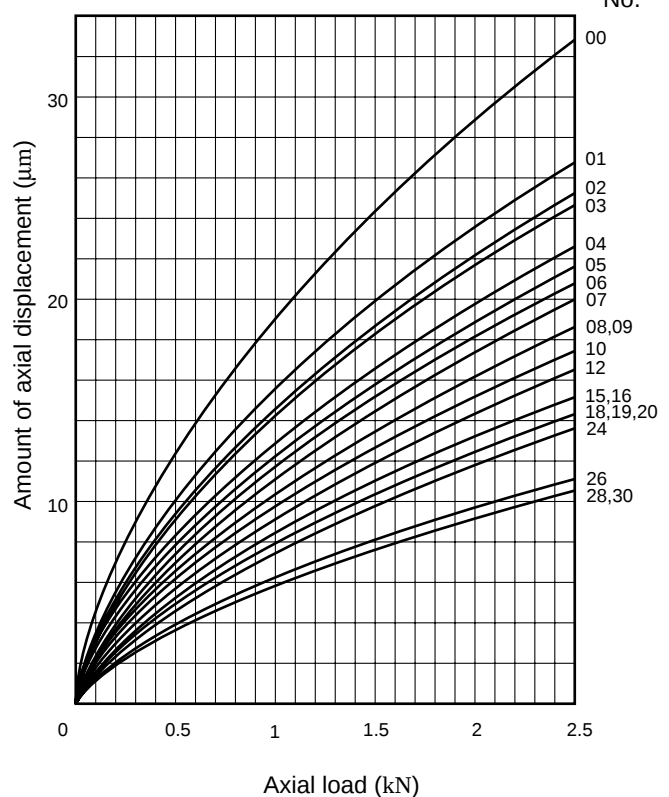


Angular contact ball bearings

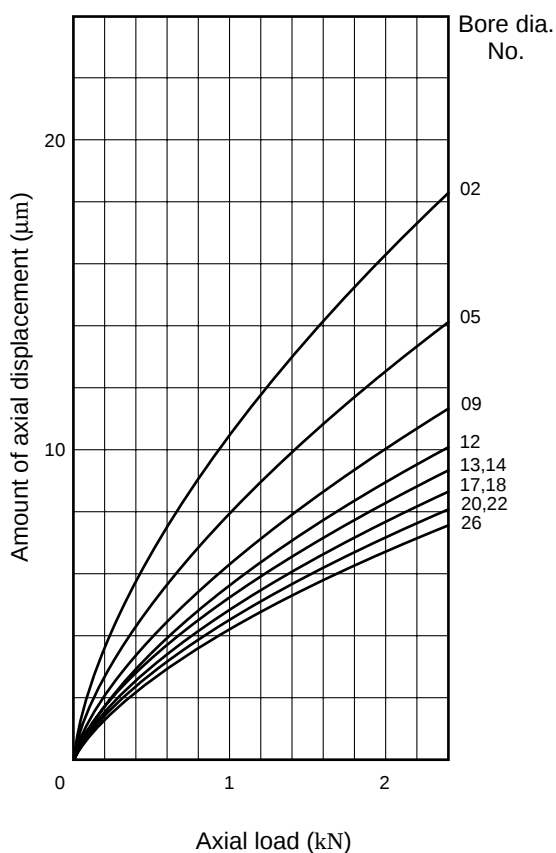
(3) 7000 (contact angle 30°)



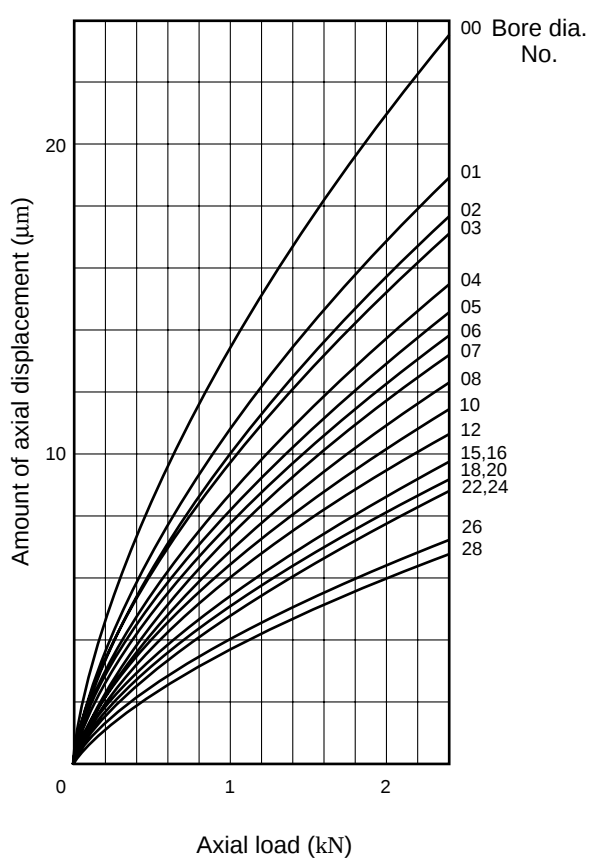
(4) 7200 (contact angle 30°)



(5) 7000B (contact angle 40°)

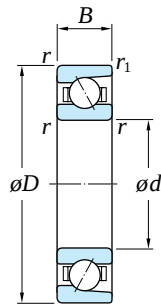


(6) 7200B (contact angle 40°)

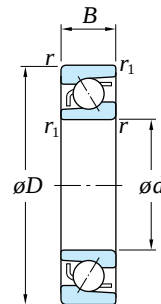


Single-row angular contact ball bearings

d 10 – (25) mm



With machined cage



With pressed cage

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

Notes 1) Rotation speed limits shown above are applicable to machined cage bearings.

Rotation speed limits of pressed cage bearings should be kept to under 80 % of this value.

For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

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

d (25) – (45) mm

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

Notes 1) Rotation speed limits shown above are applicable to machined cage bearings.

Rotation speed limits of pressed cage bearings should be kept to under 80 % of this value.

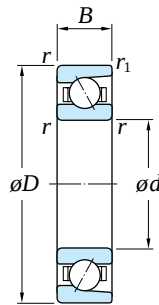
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

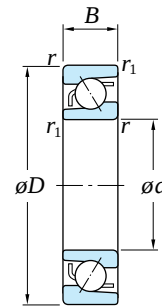
Remark) Standard cage types used for the above bearings are described earlier in this section.

Single-row angular contact ball bearings

d (45) – (60) mm



With machined cage



With pressed cage

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

Notes 1) Rotation speed limits shown above are applicable to machined cage bearings.

Rotation speed limits of pressed cage bearings should be kept to under 80 % of this value.

For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

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

d (60) – (85) mm

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

Notes 1) Rotation speed limits shown above are applicable to machined cage bearings.

Rotation speed limits of pressed cage bearings should be kept to under 80 % of this value.

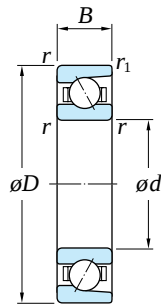
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

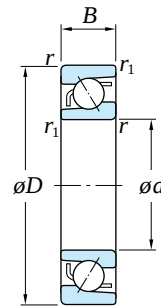
Remark) Standard cage types used for the above bearings are described earlier in this section.

Single-row angular contact ball bearings

d (85) – (105) mm



With machined cage



With pressed cage

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

Notes 1) Rotation speed limits shown above are applicable to machined cage bearings.

Rotation speed limits of pressed cage bearings should be kept to under 80 % of this value.

For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

2) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

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

d (105) – 180 mm

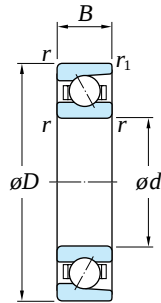
Boundary dimensions (mm)					Basic load ratings (kN)				Limiting speeds (min ⁻¹)		Bearing ¹⁾ No.	(Refer.) Mass (kg)
d	D	B	r min.	r_1 min.	With machined cage		With pressed cage		Grease lub.	Oil lub.		
					C_r	C_{0r}	C_r	C_{0r}				
105	225	49	3	1.1	208	193	—	—	3 500	4 400	7321	8.62
	225	49	3	1.1	191	177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

Note 1) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

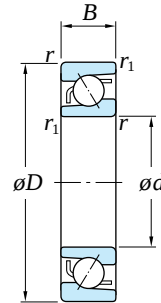
Remark) Standard cage types used for the above bearings are described earlier in this section.

Single-row angular contact ball bearings

d 190 – 200 mm



With machined cage



With pressed cage

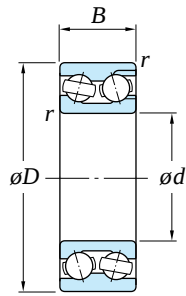
Boundary dimensions (mm)					Basic load ratings (kN)				Limiting speeds (min ⁻¹)		Bearing ¹⁾ No.	(Refer.) Mass (kg)
d	D	B	$r_{\min.}$	$r_{1\min.}$	With machined cage		With pressed cage		Grease lub.	Oil lub.		
190	290	46	2.1	1.1	217	268	—	—	2 300	2 800	7038	10.8
	290	46	2.1	1.1	194	241	—	—	1 700	2 300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

Note 1) B, C or no indication after the bearing number indicates nominal contact angle of 40°, 15° and 30° respectively.

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

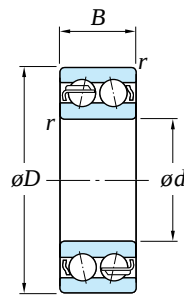
Double-row angular contact ball bearings

d 15 – 45 mm



Open

32, 33 series
(With filling slot)



Open

52, 53 series
(Without filling slot)



ZZ



Shielded



RS



2RS

Contact
sealed

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

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

d 50 – 100 mm

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

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



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