

# KOYO



# Angular contact ball bearings

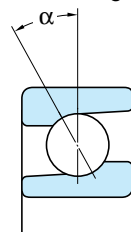
Angular contact ball bearings are suitable for applications which require high accuracy and good high-speed performance. This type of bearing is designed to carry a combined load.

■ **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". Bearings 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



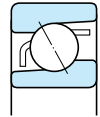
- Angular contact ball bearings are often preloaded to enhance their rigidity and rotating performance. For high-precision matched pair angular contact ball bearings of class 5 or higher, which are used in machine tools and other precision equipment, the standard preload is specified in three levels: 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.

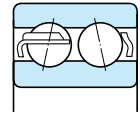
Table 3 shows major types and their characteristics.

**Single-row angular contact ball bearings**



Bore diameter **10 – 200 mm**

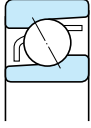
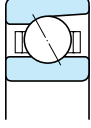
**Double-row angular contact ball bearings**



Bore diameter **15 – 100 mm**

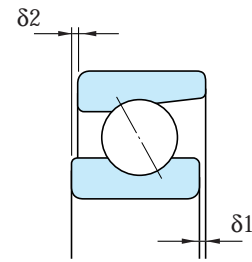
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**Table 1 Single-row angular contact ball bearings**

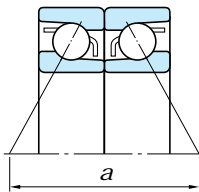
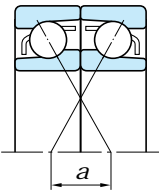
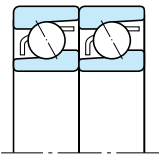
 (with pressed cage)	<ul style="list-style-type: none"> <li>• Single-row angular contact ball bearings accommodate radial load and axial load in one direction.</li> <li>• Bearings with a machined cage are suitable for high-speed applications.</li> </ul>
 (with machined cage)	

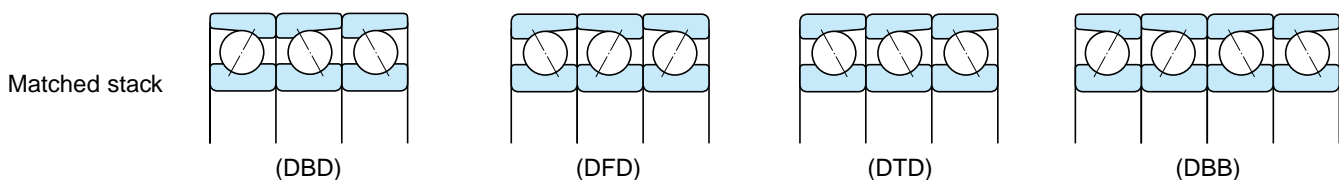
**Reference G-shaped bearing**

"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)		<ul style="list-style-type: none"> <li>• Carries radial load and axial load in both directions.</li> <li>• Suitable for applications involving moment loading because the distance between the load centers (<math>a</math>) is long.</li> <li>• 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.</li> </ul>
Face-to-face arrangement (DF)		<ul style="list-style-type: none"> <li>• Carries radial load and axial load in both directions.</li> <li>• Has a smaller moment load accommodating capacity than the back-to-back arrangement, because the distance between the load centers (<math>a</math>) is shorter.</li> <li>• 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.</li> </ul>
Tandem arrangement (DT)		<ul style="list-style-type: none"> <li>• Carries radial load and axial load in one direction.</li> <li>• Suitable for applications which involve a high degree of axial loading.</li> </ul>



**Table 3 Double-row angular contact ball bearings**

 (with filling slot) 32, 33	 (without filling slot) 52, 53	<ul style="list-style-type: none"> <li>Accommodates radial load and axial load in both directions. Also able to accommodate moment load.</li> <li>The 32 and 33 series are provided with a filling slot, while the 52 and 53 series are not.</li> <li>32 and 33 series : contact angle 32° 52 and 53 series : contact angle 24°</li> </ul>
 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	<ul style="list-style-type: none"> <li>As specified in JIS B 1514.</li> <li>Koyo has established "special tolerances" for bore diameter and outside diameter, as listed in the table to the right, to make it easy to produce highprecision matched stack bearings. Bearings which are produced based on these tolerances are identified by the supplementary code "K5."</li> </ul>	<p style="text-align: right;"><b>Special tolerances (K5)</b>      Unit <math>\mu\text{m}</math></p> <table border="1"> <thead> <tr> <th colspan="2" rowspan="2">Nominal bore diameter <math>d</math> (mm)</th> <th colspan="4">Single plane mean bore diameter (<math>\Delta d_{mp}</math>) or single plane mean outside diameter deviation (<math>\Delta D_{mp}</math>)</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 ( $\Delta d_{mp}$ ) or single plane mean outside diameter deviation ( $\Delta D_{mp}$ )				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
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Internal clearance	<ul style="list-style-type: none"> <li>Matched pair bearing axial internal clearance ..... (refer to Table 2-3 on p. A 12.)</li> <li>Double-row bearing radial internal clearance ..... (refer to Table 2-4 on p. A 13.)</li> </ul>																																			
Recommended fits	<ul style="list-style-type: none"> <li>Classes 5 and 4 bearings ..... as listed in the table below.</li> </ul> <table border="1" style="margin-left: auto; margin-right: auto;"> <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											
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<p>Standard cages</p>	<ul style="list-style-type: none"> <li>• Pressed steel cage (supplementary code : //)</li> <li>• Copper alloy machined cage (supplementary code : FY)</li> </ul> <p>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.</p>	<p><b>Application of standard cages</b></p> <table border="1"> <thead> <tr> <th>Bearing series</th> <th>Pressed cage</th> <th>Machined cage</th> </tr> </thead> <tbody> <tr> <td>70</td> <td>–</td> <td>7000 – 7040</td> </tr> <tr> <td>70B</td> <td>–</td> <td>7000 B – 7040 B</td> </tr> <tr> <td>70C</td> <td>–</td> <td>7000 C – 7040 C</td> </tr> <tr> <td>72</td> <td>7200 – 7220</td> <td>7200 – 7240</td> </tr> <tr> <td>72B</td> <td>7200 B – 7220 B</td> <td>7200 B – 7240 B</td> </tr> <tr> <td>72C</td> <td>7200 C – 7220 C</td> <td>7200 C – 7240 C</td> </tr> <tr> <td>73</td> <td>7300 – 7320</td> <td>7300 – 7340</td> </tr> <tr> <td>73B</td> <td>7303 B – 7320 B</td> <td>7303 B – 7340 B</td> </tr> <tr> <td>73C</td> <td>7303 C – 7320 C</td> <td>7303 C – 7334 C</td> </tr> <tr> <td>74</td> <td>7405 – 7409</td> <td>7404 – 7418</td> </tr> <tr> <td>74B</td> <td>7405 B – 7409 B</td> <td>7404 B – 7418 B</td> </tr> <tr> <td>32</td> <td>3200 – 3215</td> <td>3216 – 3222</td> </tr> <tr> <td>33</td> <td>3302 – 3313</td> <td>3314 – 3322</td> </tr> <tr> <td>52</td> <td>5203 – 5214</td> <td>–</td> </tr> <tr> <td>53</td> <td>5304 – 5315</td> <td>–</td> </tr> </tbody> </table>	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	–																																																																																											
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<p>Equivalent radial load</p> <p>[ Single-row and matched pair angular contact ball bearings ]</p> <p>Note) When two single-row angular contact ball bearings are used facing one another, an axial component of force is produced under radial load.</p>	<p>Dynamic equivalent radial load</p> $P_r = X F_r + Y F_a$ <p>Static equivalent radial load</p> $P_{0r} = X_0 F_r + Y_0 F_a$ <p>In reference to single-row and tandem arrangement bearings,</p> <p>when <math>P_{0r} &lt; F_r</math>,</p> $P_{0r} = F_r$	<table border="1"> <thead> <tr> <th rowspan="3">Contact angle</th> <th rowspan="3"><math>\frac{F_a}{C_{0r}}</math></th> <th rowspan="3"><math>e</math></th> <th colspan="4">Single-row and tandem arrangement</th> <th colspan="4">Back-to-back and face-to-face arrangement</th> </tr> <tr> <th colspan="2"><math>F_a / F_r \leq e</math></th> <th colspan="2"><math>F_a / F_r &gt; e</math></th> <th colspan="2"><math>F_a / F_r \leq e</math></th> <th colspan="2"><math>F_a / F_r &gt; e</math></th> </tr> <tr> <th>X</th> <th>Y</th> <th>X</th> <th>Y</th> <th>X</th> <th>Y</th> <th>X</th> <th>Y</th> </tr> </thead> <tbody> <tr> <td rowspan="6">15°</td> <td>0.015</td> <td>0.38</td> <td></td> <td></td> <td></td> <td>1.47</td> <td></td> <td>1.65</td> <td></td> <td>2.39</td> </tr> <tr> <td>0.029</td> <td>0.40</td> <td></td> <td></td> <td></td> <td>1.40</td> <td></td> <td>1.57</td> <td></td> <td>2.28</td> </tr> <tr> <td>0.058</td> <td>0.43</td> <td></td> <td></td> <td></td> <td>1.30</td> <td></td> <td>1.46</td> <td></td> <td>2.21</td> </tr> <tr> <td>0.087</td> <td>0.46</td> <td rowspan="4">1</td> <td rowspan="4">0</td> <td rowspan="4">0.44</td> <td>1.23</td> <td rowspan="4">1</td> <td>1.38</td> <td rowspan="4">0.72</td> <td>2.00</td> </tr> <tr> <td>0.12</td> <td>0.47</td> <td>1.19</td> <td>1.34</td> <td>1.93</td> </tr> <tr> <td>0.17</td> <td>0.50</td> <td>1.12</td> <td>1.26</td> <td>1.82</td> </tr> <tr> <td>0.29</td> <td>0.55</td> <td>1.02</td> <td>1.14</td> <td>1.66</td> </tr> <tr> <td>0.44</td> <td>0.56</td> <td>1.00</td> <td>1.12</td> <td>1.63</td> </tr> <tr> <td>0.58</td> <td>0.56</td> <td>1.00</td> <td>1.12</td> <td>1.63</td> </tr> <tr> <td>30°</td> <td>–</td> <td>0.80</td> <td>1</td> <td>0</td> <td>0.39</td> <td>0.76</td> <td>1</td> <td>0.78</td> <td>0.63</td> <td>1.24</td> </tr> <tr> <td>40°</td> <td>–</td> <td>1.14</td> <td>1</td> <td>0</td> <td>0.35</td> <td>0.57</td> <td>1</td> <td>0.55</td> <td>0.57</td> <td>0.93</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th rowspan="2">Contact angle</th> <th colspan="2">Single-row and tandem arrangement</th> <th colspan="2">Back-to-back and face-to-face arrangement</th> </tr> <tr> <th><math>X_0</math></th> <th><math>Y_0</math></th> <th><math>X_0</math></th> <th><math>Y_0</math></th> </tr> </thead> <tbody> <tr> <td>15°</td> <td>0.5</td> <td>0.46</td> <td>1</td> <td>0.92</td> </tr> <tr> <td>30°</td> <td>0.5</td> <td>0.33</td> <td>1</td> <td>0.66</td> </tr> <tr> <td>40°</td> <td>0.5</td> <td>0.26</td> <td>1</td> <td>0.52</td> </tr> </tbody> </table>	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				1.47		1.65		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	0	0.44	1.23	1	1.38	0.72	2.00	0.12	0.47	1.19	1.34	1.93	0.17	0.50	1.12	1.26	1.82	0.29	0.55	1.02	1.14	1.66	0.44	0.56	1.00	1.12	1.63	0.58	0.56	1.00	1.12	1.63	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	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
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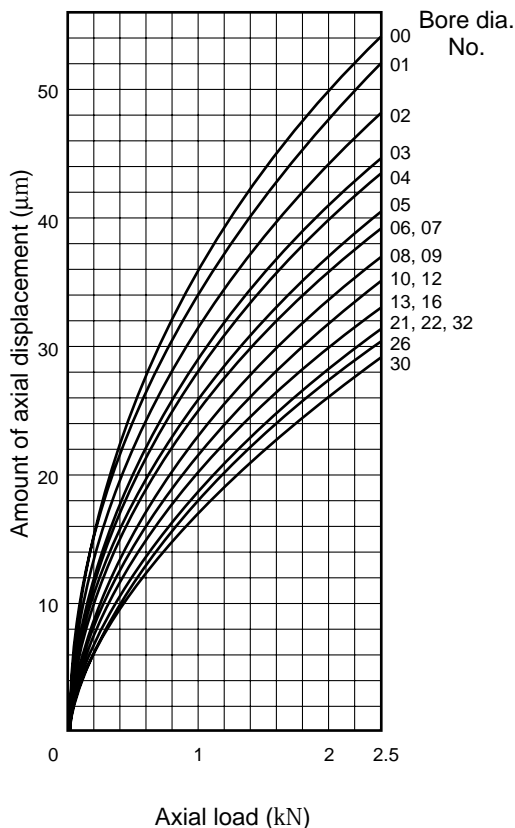
Equivalent radial load [ Double-row angular contact ball bearings ]	Dynamic equivalent radial load $P_r = XF_r + YF_a$	<table border="1"> <thead> <tr> <th rowspan="2">Contact angle</th> <th rowspan="2"><math>e</math></th> <th colspan="2"><math>F_a / F_r \leq e</math></th> <th colspan="2"><math>F_a / F_r &gt; e</math></th> <th rowspan="2">(reference)</th> </tr> <tr> <th><math>X</math></th> <th><math>Y</math></th> <th><math>X</math></th> <th><math>Y</math></th> </tr> </thead> <tbody> <tr> <td>24°</td> <td>0.66</td> <td>1</td> <td>0.95</td> <td>0.68</td> <td>1.45</td> <td>52, 53 series</td> </tr> <tr> <td>32°</td> <td>0.86</td> <td>1</td> <td>0.73</td> <td>0.62</td> <td>1.17</td> <td>32, 33 series</td> </tr> </tbody> </table>	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
	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 $P_{0r} = X_0 F_r + Y_0 F_a$	<table border="1"> <thead> <tr> <th>Contact angle</th> <th><math>X_0</math></th> <th><math>Y_0</math></th> <th>(reference)</th> </tr> </thead> <tbody> <tr> <td>24°</td> <td>1</td> <td>0.78</td> <td>52, 53 series</td> </tr> <tr> <td>32°</td> <td>1</td> <td>0.63</td> <td>32, 33 series</td> </tr> </tbody> </table>	Contact angle	$X_0$	$Y_0$	(reference)	24°	1	0.78	52, 53 series	32°	1	0.63	32, 33 series														
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 Koyo when these bearings are used under the above conditions.

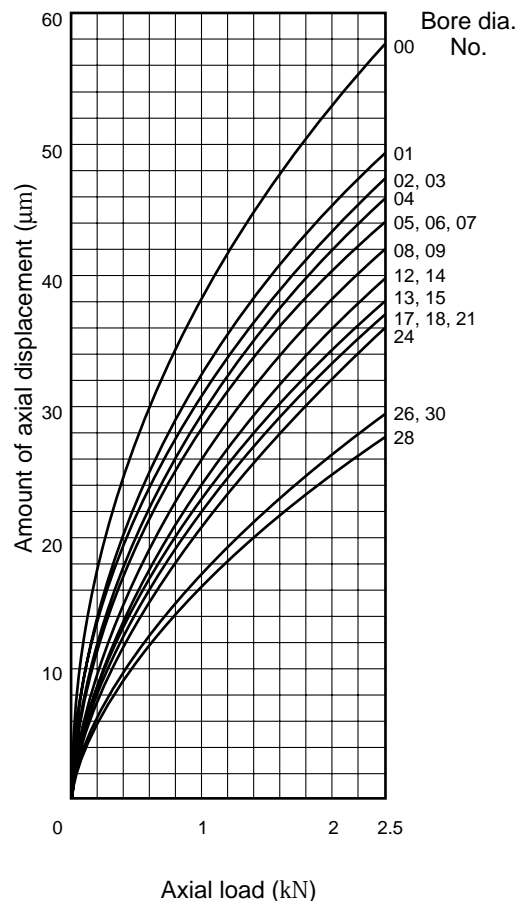
### [ Reference ] Relationship between axial load and axial displacement

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

(1) 7000C (contact angle 15°)

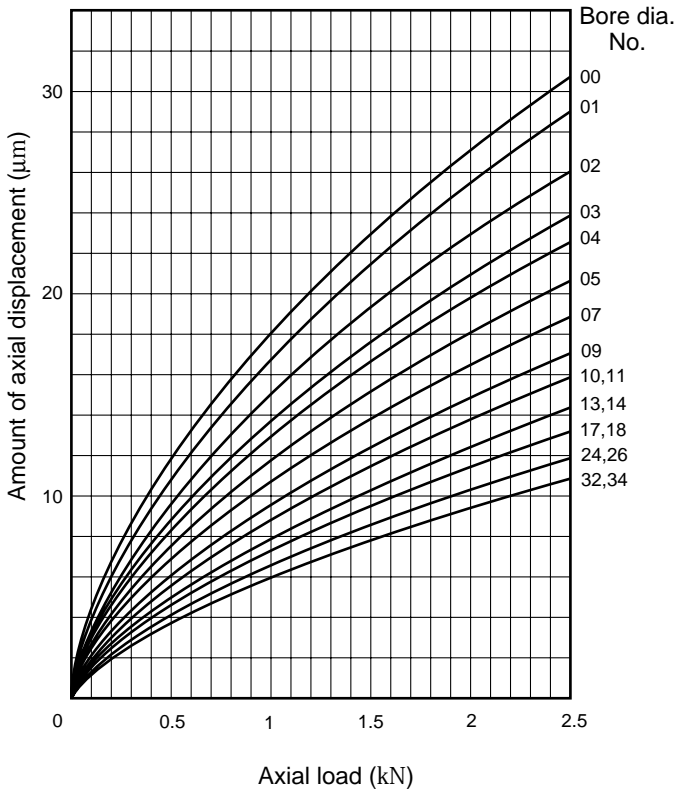


(2) 7200C (contact angle 15°)

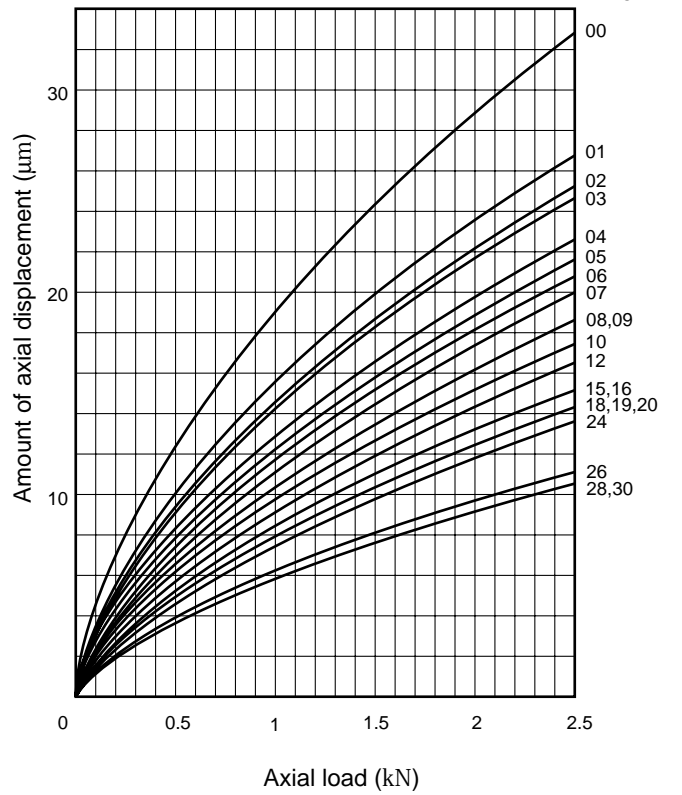


# Angular contact ball bearings

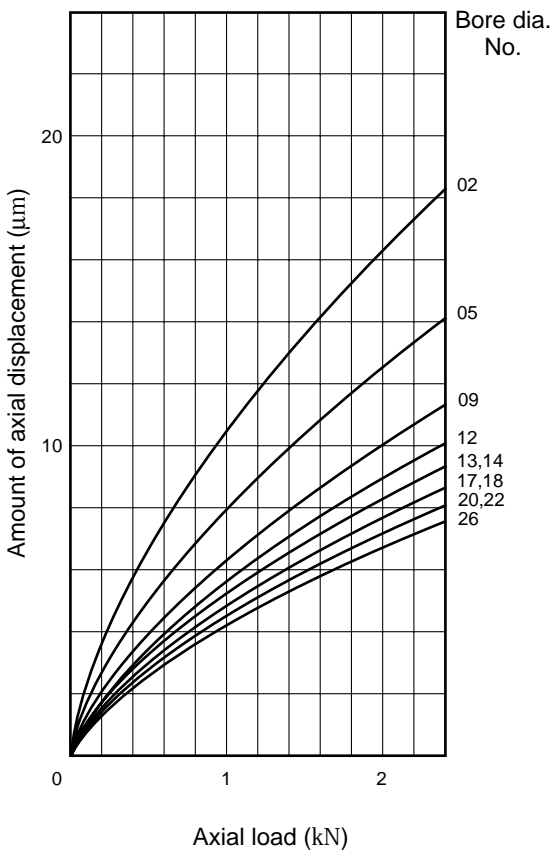
**(3) 7000 (contact angle 30°)**



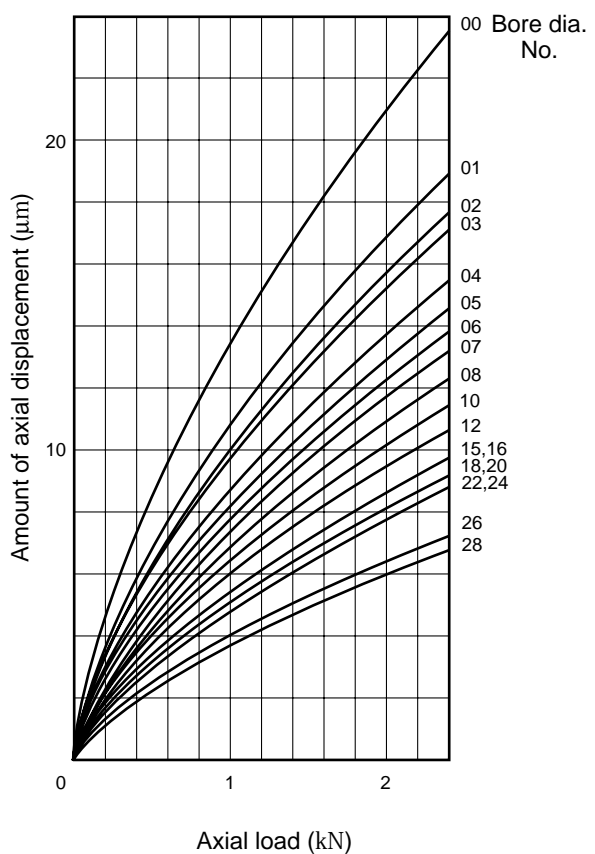
**(4) 7200 (contact angle 30°)**



**(5) 7000B (contact angle 40°)**



**(6) 7200B (contact angle 40°)**

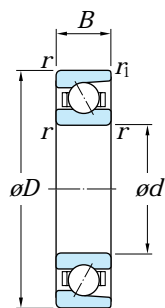




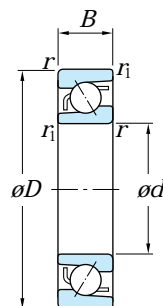


# Single-row angular contact ball bearings

$d$  10 – (25) mm



With machined cage



With pressed cage

Boundary dimensions (mm)					Basic load ratings (kN)				Limiting speeds <sup>1)</sup> (min <sup>-1</sup> )		Bearing <sup>2)</sup> 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 7201	0.024
	32	10	0.6	0.3	7.45	3.65	8.00	4.05	27 000	34 000		7201B
	32	10	0.6	0.3	6.95	3.40	7.40	3.75	20 000	27 000		
	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 7202	0.035
	35	11	0.6	0.3	8.10	4.25	8.10	4.25	24 000	29 000		7202B
	35	11	0.6	0.3	7.45	3.95	7.45	3.95	18 000	24 000		
	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 7203	0.045
	40	12	0.6	0.3	10.2	5.50	10.2	5.50	21 000	26 000		7203B
	40	12	0.6	0.3	9.35	5.05	9.35	5.05	16 000	21 000		
	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
20	42	12	0.6	0.3	10.3	6.10	—	—	19 000	24 000	7004 7204	0.079
	47	14	1	0.6	14.5	8.40	15.4	9.15	17 000	22 000		7204B
	47	14	1	0.6	13.3	7.70	14.1	8.40	13 000	17 000		
	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	
25	47	12	0.6	0.3	11.3	7.40	—	—	17 000	21 000	7005 7005C	0.091
	47	12	0.6	0.3	12.3	8.00	—	—	23 000	30 000		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 <sup>1)</sup> (min <sup>-1</sup> )		Bearing <sup>2)</sup> No.	(Refer.) Mass (kg)	
<i>d</i>	<i>D</i>	<i>B</i>	<i>r</i> min.	<i>r</i> <sub>1</sub> min.	With machined cage		With pressed cage		Grease lub.	Oil lub.			
					<i>C</i> <sub>r</sub>	<i>C</i> <sub>0r</sub>	<i>C</i> <sub>r</sub>	<i>C</i> <sub>0r</sub>					
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	
35		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	
45		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.

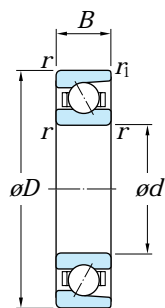
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

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

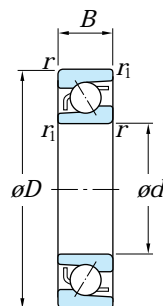
Remark) Standard cage types used for the above bearings are described earlier in this section.

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

<i>d</i>	Boundary dimensions (mm)				Basic load ratings (kN)				Limiting speeds <sup>1)</sup> (min <sup>-1</sup> )		Bearing <sup>2)</sup> No.	(Refer.) Mass (kg)	
	<i>D</i>	<i>B</i>	<i>r</i> <sub>min.</sub>	<i>r</i> <sub>1 min.</sub>	With machined cage		With pressed cage		Grease lub.	Oil lub.			
	<i>C<sub>r</sub></i>	<i>C<sub>0r</sub></i>	<i>C<sub>r</sub></i>	<i>C<sub>0r</sub></i>									
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	
	70	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	
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	
75		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	
	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	
	80	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	
85	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	
	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.

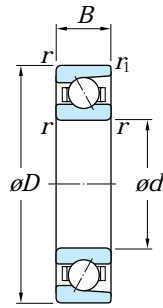
For bearings with 15° contact angle, this figure is applied to the high precision bearings ranked higher than class 5, used with machined cage or molded cage.

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

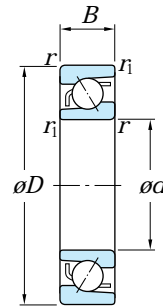
Remark) Standard cage types used for the above bearings are described earlier in this section.

# Single-row angular contact ball bearings

***d* (85) – (105) mm**



With machined cage



With pressed cage

<i>d</i>	Boundary dimensions (mm)				Basic load ratings (kN)				Limiting speeds <sup>1)</sup> (min <sup>-1</sup> )		Bearing <sup>2)</sup> No.	(Refer.) Mass (kg)	
	<i>D</i>	<i>B</i>	<i>r</i> min.	<i>r</i> <sub>1</sub> min.	With machined cage		With pressed cage		Grease lub.	Oil lub.			
					<i>C</i> <sub>r</sub>	<i>C</i> <sub>0r</sub>	<i>C</i> <sub>r</sub>	<i>C</i> <sub>0r</sub>					
<b>85</b>	210	52	4	1.5	204	180	–	–	3 000	3 900	<b>7417</b>	8.54	
	210	52	4	1.5	189	167	–	–	2 600	3 600	<b>7417B</b>	8.54	
<b>90</b>	140	24	1.5	1	65.2	63.3	–	–	5 100	6 400	<b>7018</b>	1.26	
	140	24	1.5	1	71.7	69.1	–	–	7 100	9 400	<b>7018C</b>	1.26	
	160	30	2	1	113	96.7	118	103	4 700	5 900	<b>7218</b>	2.30	
	160	30	2	1	102	88.0	107	93.8	3 500	4 700	<b>7218B</b>	2.30	
	160	30	2	1	123	105	128	112	6 500	8 600	<b>7218C</b>	2.30	
	190	43	3	1.1	161	135	171	147	4 200	5 200	<b>7318</b>	5.30	
	190	43	3	1.1	148	124	156	135	3 100	4 200	<b>7318B</b>	5.30	
	225	54	4	1.5	216	196	–	–	2 800	3 700	<b>7418</b>	11.4	
	225	54	4	1.5	200	182	–	–	2 500	3 400	<b>7418B</b>	11.4	
	<b>95</b>	145	24	1.5	1	66.6	67.1	–	–	4 800	6 000	<b>7019</b>	1.32
145		24	1.5	1	73.4	73.4	–	–	6 700	8 900	<b>7019C</b>	1.32	
170		32	2.1	1.1	122	103	128	111	4 400	5 500	<b>7219</b>	2.78	
170		32	2.1	1.1	111	94.0	116	101	3 300	4 400	<b>7219B</b>	2.78	
170		32	2.1	1.1	133	112	139	120	6 100	8 100	<b>7219C</b>	2.78	
200		45	3	1.1	172	149	183	162	4 000	4 900	<b>7319</b>	6.12	
200		45	3	1.1	158	137	167	149	3 000	4 000	<b>7319B</b>	6.12	
<b>100</b>		150	24	1.5	1	68.4	70.6	–	–	4 700	5 900	<b>7020</b>	1.37
	150	24	1.5	1	61.2	63.6	–	–	3 500	4 700	<b>7020B</b>	1.37	
	150	24	1.5	1	75.3	77.2	–	–	6 500	8 600	<b>7020C</b>	1.37	
	180	34	2.1	1.1	137	117	144	126	4 100	5 200	<b>7220</b>	3.32	
	180	34	2.1	1.1	124	107	130	115	3 100	4 200	<b>7220B</b>	3.32	
	180	34	2.1	1.1	149	127	156	136	5 700	7 600	<b>7220C</b>	3.32	
	215	47	3	1.1	184	161	207	194	3 600	4 600	<b>7320</b>	7.53	
	215	47	3	1.1	168	148	190	178	2 700	3 600	<b>7320B</b>	7.53	
	<b>105</b>	160	26	2	1	79.8	81.9	–	–	4 400	5 500	<b>7021</b>	1.73
		190	36	2.1	1.1	149	132	–	–	3 900	4 900	<b>7221</b>	3.95
190		36	2.1	1.1	135	121	–	–	2 900	3 900	<b>7221B</b>	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

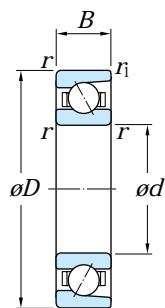
$d$	Boundary dimensions (mm)				Basic load ratings (kN)				Limiting speeds (min <sup>-1</sup> )		Bearing <sup>1)</sup> No.	(Refer.) Mass (kg)
	$D$	$B$	$r$ <sub>min.</sub>	$r_1$ <sub>min.</sub>	With machined cage		With pressed cage		Grease lub.	Oil lub.		
					$C_r$	$C_{0r}$	$C_r$	$C_{0r}$				
<b>105</b>	225	49	3	1.1	208	193	–	–	3 500	4 400	<b>7321</b> <b>7321B</b>	8.62
	225	49	3	1.1	191	177	–	–	2 600	3 500		8.62
<b>110</b>	170	28	2	1	91.9	92.8	–	–	4 200	5 200	<b>7022</b> <b>7222</b> <b>7222B</b>	2.14
	200	38	2.1	1.1	162	148	–	–	3 700	4 600		4.65
	200	38	2.1	1.1	147	135	–	–	2 800	3 700		4.65
	240	50	3	1.1	232	226	–	–	3 200	4 000	<b>7322</b> <b>7322B</b>	10.1
	240	50	3	1.1	213	208	–	–	2 400	3 200		10.1
<b>120</b>	180	28	2	1	96.6	103	–	–	3 900	4 900	<b>7024</b> <b>7224</b> <b>7224B</b>	2.27
	215	40	2.1	1.1	174	166	–	–	3 400	4 300		5.49
	215	40	2.1	1.1	158	151	–	–	2 600	3 400		5.49
	260	55	3	1.1	246	252	–	–	3 000	3 700	<b>7324</b> <b>7324B</b>	12.6
	260	55	3	1.1	225	231	–	–	2 200	3 000		12.6
<b>130</b>	200	33	2	1	117	125	–	–	3 500	4 400	<b>7026</b> <b>7026B</b> <b>7226</b>	3.43
	200	33	2	1	105	113	–	–	2 600	3 500		3.43
	230	40	3	1.1	196	198	–	–	3 200	4 000		6.21
	230	40	3	1.1	177	180	–	–	2 400	3 200	<b>7226B</b> <b>7326</b> <b>7326B</b>	6.21
	280	58	4	1.5	301	329	–	–	2 700	3 400		15.4
	280	58	4	1.5	250	268	–	–	2 100	2 700		15.4
<b>140</b>	210	33	2	1	120	133	–	–	3 300	4 100	<b>7028</b> <b>7028B</b> <b>7228</b>	3.64
	210	33	2	1	107	119	–	–	2 500	3 300		3.64
	250	42	3	1.1	218	234	–	–	2 900	3 600		7.76
	250	42	3	1.1	197	213	–	–	2 200	2 900	<b>7228B</b> <b>7328</b> <b>7328B</b>	7.76
	300	62	4	1.5	329	374	–	–	2 500	3 200		18.8
	300	62	4	1.5	302	344	–	–	1 900	2 500		18.8
<b>150</b>	225	35	2.1	1.1	137	154	–	–	3 000	3 800	<b>7030</b> <b>7030B</b> <b>7230</b>	4.43
	225	35	2.1	1.1	122	138	–	–	2 300	3 000		4.43
	270	45	3	1.1	248	280	–	–	2 700	3 300		9.75
	270	45	3	1.1	225	254	–	–	2 000	2 700	<b>7230B</b> <b>7330</b> <b>7330B</b>	9.75
	320	65	4	1.5	348	414	–	–	2 300	2 900		22.4
	320	65	4	1.5	318	380	–	–	1 800	2 300		22.4
<b>160</b>	240	38	2.1	1.1	155	176	–	–	2 800	3 500	<b>7032</b> <b>7032B</b> <b>7232</b>	5.45
	240	38	2.1	1.1	139	158	–	–	2 100	2 800		5.45
	290	48	3	1.1	230	263	–	–	2 500	3 100		12.1
	290	48	3	1.1	238	279	–	–	1 800	2 500	<b>7232B</b> <b>7332B</b>	12.1
	340	68	4	1.5	332	416	–	–	1 600	2 200		26.4
<b>170</b>	260	42	2.1	1.1	186	214	–	–	2 600	3 200	<b>7034</b> <b>7034B</b> <b>7234B</b>	7.58
	260	42	2.1	1.1	166	193	–	–	1 900	2 600		7.77
	310	52	4	1.5	245	300	–	–	1 700	2 300		15.1
	360	72	4	1.5	355	444	–	–	1 500	2 000	<b>7334B</b>	31.2
<b>180</b>	280	46	2.1	1.1	212	253	–	–	2 400	3 000	<b>7036</b> <b>7036B</b> <b>7236B</b>	10.1
	280	46	2.1	1.1	190	228	–	–	1 800	2 400		10.2
	320	52	4	1.5	265	329	–	–	1 600	2 200		15.7
	380	75	4	1.5	373	488	–	–	1 400	1 900	<b>7336B</b>	40.0

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

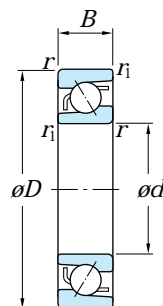
Remark) Standard cage types used for the above bearings are described earlier in this section.

# Single-row angular contact ball bearings

***d* 190 – 200 mm**



With machined cage



With pressed cage

<i>d</i>	Boundary dimensions (mm)				Basic load ratings (kN)				Limiting speeds (min <sup>-1</sup> )		Bearing <sup>1)</sup> No.	(Refer.) Mass (kg)
	<i>D</i>	<i>B</i>	<i>r</i> min.	<i>r</i> <sub>1</sub> min.	With machined cage		With pressed cage		Grease lub.	Oil lub.		
					<i>C</i> <sub>r</sub>	<i>C</i> <sub>0r</sub>	<i>C</i> <sub>r</sub>	<i>C</i> <sub>0r</sub>				
<b>190</b>	290	46	2.1	1.1	217	268	–	–	2 300	2 800	<b>7038</b>	10.8
	290	46	2.1	1.1	194	241	–	–	1 700	2 300	<b>7038B</b>	10.8
	340	55	4	1.5	273	353	–	–	1 500	2 000	<b>7238B</b>	18.8
	400	78	5	2	411	548	–	–	1 300	1 800	<b>7338B</b>	45.5
<b>200</b>	360	58	4	1.5	292	384	–	–	1 400	1 900	<b>7240B</b>	22.4
	420	80	5	2	432	602	–	–	1 200	1 700	<b>7340B</b>	52.0

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

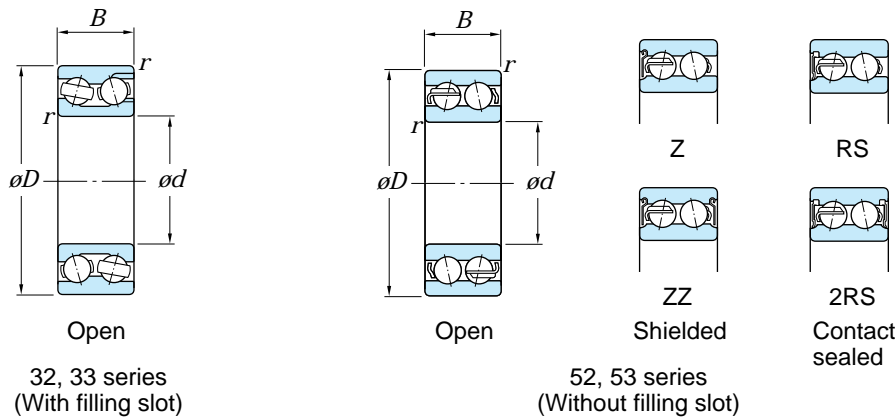
Remark) Standard cage types used for the above bearings are described earlier in this section.





# Double-row angular contact ball bearings

***d* 15 – 45 mm**



Boundary dimensions (mm)				Basic load ratings (kN)				Limiting speeds (min <sup>-1</sup> )			Bearing No.			(Refer.) Mass (kg)
<i>d</i>	<i>D</i>	<i>B</i>	<i>r</i> <sub>min.</sub>	Open		Shielded-sealed		Grease lub.		Oil lub.	Open	Shielded ZZ	Sealed 2RS	
				<i>C<sub>r</sub></i>	<i>C<sub>0r</sub></i>	<i>C<sub>r</sub></i>	<i>C<sub>0r</sub></i>	[ <i>Open</i> Z, ZZ]	(RS, 2RS)	[ <i>Open</i> Z]				
15	35	15.9	0.6	9.70	7.45	–	–	12 000	–	16 000	<b>3202</b>	–	–	0.072
	42	19	1	15.2	11.9	–	–	10 000	–	14 000	<b>3302</b>	–	–	0.132
17	40	17.5	0.6	13.8	10.8	–	–	11 000	–	14 000	<b>3203</b>	–	–	0.100
	40	17.5	0.6	13.2	8.15	12.7	8.35	11 000	11 000	14 000	<b>5203</b>	<b>ZZ</b>	<b>2RS</b>	0.091
	47	22.2	1	21.7	17.1	–	–	9 400	–	13 000	<b>3303</b>	–	–	0.192
20	47	20.6	1	17.2	15.0	–	–	9 000	–	12 000	<b>3204</b>	–	–	0.170
	47	20.6	1	19.7	12.6	16.0	10.8	8 800	8 800	12 000	<b>5204</b>	<b>ZZ</b>	<b>2RS</b>	0.120
	52	22.2	1.1	20.8	18.4	–	–	8 200	–	11 000	<b>3304</b>	–	–	0.230
	52	22.2	1.1	24.7	15.0	19.8	12.8	8 300	8 300	11 000	<b>5304</b>	<b>ZZ</b>	<b>2RS</b>	0.230
25	52	20.6	1	18.9	18.2	–	–	7 800	–	10 000	<b>3205</b>	–	–	0.190
	52	20.6	1	21.4	14.8	18.9	13.8	7 700	7 700	10 000	<b>5205</b>	<b>ZZ</b>	<b>2RS</b>	0.190
	62	25.4	1.1	28.9	26.5	–	–	6 800	–	9 100	<b>3305</b>	–	–	0.369
	62	25.4	1.1	32.7	20.8	27.5	18.5	6 900	6 900	9 200	<b>5305</b>	<b>ZZ</b>	<b>2RS</b>	0.340
30	62	23.8	1	27.3	27.0	–	–	6 500	–	8 700	<b>3206</b>	–	–	0.320
	62	23.8	1	29.7	21.3	25.4	18.3	6 400	6 400	8 600	<b>5206</b>	<b>ZZ</b>	<b>2RS</b>	0.290
	72	30.2	1.1	38.1	36.1	–	–	5 800	–	7 800	<b>3306</b>	–	–	0.585
	72	30.2	1.1	41.0	28.5	34.3	25.2	5 800	5 800	7 700	<b>5306</b>	<b>ZZ</b>	<b>2RS</b>	0.510
35	72	27	1.1	36.8	37.5	–	–	5 600	–	7 500	<b>3207</b>	–	–	0.480
	72	27	1.1	39.2	29.0	31.7	24.6	5 500	5 500	7 300	<b>5207</b>	<b>ZZ</b>	<b>2RS</b>	0.430
	80	34.9	1.5	48.6	46.8	–	–	5 200	–	7 000	<b>3307</b>	–	–	0.816
	80	34.9	1.5	51.2	36.2	46.1	32.8	5 100	5 100	6 800	<b>5307</b>	<b>ZZ</b>	<b>2RS</b>	0.790
40	80	30.2	1.1	42.0	43.9	–	–	5 000	–	6 700	<b>3208</b>	–	–	0.650
	80	30.2	1.1	44.4	33.6	36.5	29.1	5 000	5 000	6 700	<b>5208</b>	<b>ZZ</b>	<b>2RS</b>	0.570
	90	36.5	1.5	54.1	53.8	–	–	4 600	–	6 100	<b>3308</b>	–	–	1.07
	90	36.5	1.5	62.7	45.4	51.4	37.8	4 600	4 600	6 100	<b>5308</b>	<b>ZZ</b>	<b>2RS</b>	1.05
45	85	30.2	1.1	45.4	51.4	–	–	4 600	–	6 100	<b>3209</b>	–	–	0.710
	85	30.2	1.1	49.9	38.4	41.7	33.9	4 600	4 600	6 100	<b>5209</b>	<b>ZZ</b>	<b>2RS</b>	0.620
	100	39.7	1.5	66.1	67.3	–	–	4 100	–	5 500	<b>3309</b>	–	–	1.42
	100	39.7	1.5	75.1	55.7	68.9	51.4	4 100	4 100	5 500	<b>5309</b>	<b>ZZ</b>	<b>2RS</b>	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 <sup>-1</sup> )			Bearing No.			(Refer.) Mass (kg)
<i>d</i>	<i>D</i>	<i>B</i>	<i>r</i> <sub>min.</sub>	Open		Shielded-sealed		Grease lub.		Oil lub.	Open	Shielded ZZ	Sealed 2RS	
				<i>C</i> <sub>r</sub>	<i>C</i> <sub>0r</sub>	<i>C</i> <sub>r</sub>	<i>C</i> <sub>0r</sub>	[ Open Z, ZZ ]	(RS, 2RS)	[ Open Z ]				
<b>50</b>	90	30.2	1.1	45.1	52.1	–	–	4 300	–	5 700	<b>3210</b>	–	–	0.760
	90	30.2	1.1	53.3	43.6	44.1	37.9	4 300	4 300	5 600	<b>5210</b>	<b>ZZ</b>	<b>2RS</b>	0.670
	110	44.4	2	86.1	88.6	–	–	3 800	–	5 000	<b>3310</b>	–	–	1.95
	110	44.4	2	88.5	67.0	81.8	62.2	3 600	3 600	4 800	<b>5310</b>	<b>ZZ</b>	<b>2RS</b>	1.93
<b>55</b>	100	33.3	1.5	50.9	60.2	–	–	3 900	–	5 100	<b>3211</b>	–	–	1.05
	100	33.3	1.5	65.9	55.2	52.9	44.7	3 800	3 800	5 100	<b>5211</b>	<b>ZZ</b>	<b>2RS</b>	0.960
	120	49.2	2	101	106	–	–	3 400	–	4 500	<b>3311</b>	–	–	2.53
	120	49.2	2	110	85.1	95.7	74.3	3 300	3 300	4 500	<b>5311</b>	<b>ZZ</b>	<b>2RS</b>	2.30
<b>60</b>	110	36.5	1.5	64.0	76.8	–	–	3 500	–	4 700	<b>3212</b>	–	–	1.40
	110	36.5	1.5	74.4	60.8	62.6	55.9	3 500	3 500	4 700	<b>5212</b>	<b>ZZ</b>	<b>2RS</b>	1.36
	130	54	2.1	125	132	–	–	3 100	–	4 200	<b>3312</b>	–	–	3.24
	130	54	2.1	126	98.7	110	87.1	3 100	3 100	4 100	<b>5312</b>	<b>ZZ</b>	<b>2RS</b>	3.16
<b>65</b>	120	38.1	1.5	76.4	97.4	–	–	3 200	–	4 300	<b>3213</b>	–	–	1.75
	120	38.1	1.5	86.9	75.3	69.2	63.1	3 200	3 200	4 300	<b>5213</b>	<b>ZZ</b>	<b>2RS</b>	1.66
	140	58.7	2.1	142	153	–	–	2 900	–	3 900	<b>3313</b>	–	–	4.08
	140	58.7	2.1	142	113	142	113	2 900	2 900	3 900	<b>5313</b>	<b>ZZ</b>	<b>2RS</b>	3.91
<b>70</b>	125	39.7	1.5	77.9	96.4	–	–	3 100	–	4 100	<b>3214</b>	–	–	1.92
	125	39.7	1.5	94.5	82.6	76.3	70.3	3 100	3 100	4 100	<b>5214</b>	<b>ZZ</b>	<b>2RS</b>	1.81
	150	63.5	2.1	151	160	–	–	2 700	–	3 600	<b>3314</b>	–	–	5.04
	150	63.5	2.1	160	129	160	129	2 700	2 700	3 600	<b>5314</b>	<b>ZZ</b>	<b>2RS</b>	4.89
<b>75</b>	130	41.3	1.5	92.4	120	–	–	2 900	–	3 900	<b>3215</b>	–	–	2.10
	160	68.3	2.1	169	189	–	–	2 500	–	3 300	<b>3315</b>	–	–	6.16
	160	68.3	2.1	174	147	174	147	2 500	2 500	3 300	<b>5315</b>	<b>ZZ</b>	<b>2RS</b>	5.97
<b>80</b>	140	44.4	2	97.5	121	–	–	2 700	–	3 600	<b>3216</b>	–	–	2.64
	170	68.3	2.1	184	213	–	–	2 400	–	3 100	<b>3316</b>	–	–	6.93
<b>85</b>	150	49.2	2	114	143	–	–	2 500	–	3 400	<b>3217</b>	–	–	3.39
	180	73	3	188	219	–	–	2 200	–	3 000	<b>3317</b>	–	–	8.30
<b>90</b>	160	52.4	2	132	167	–	–	2 400	–	3 100	<b>3218</b>	–	–	4.14
	190	73	3	205	242	–	–	2 100	–	2 800	<b>3318</b>	–	–	9.23
<b>95</b>	170	55.6	2.1	152	193	–	–	2 200	–	3 000	<b>3219</b>	–	–	5.00
	200	77.8	3	218	270	–	–	2 000	–	2 600	<b>3319</b>	–	–	10.9
<b>100</b>	180	60.3	2.1	172	221	–	–	2 100	–	2 800	<b>3220</b>	–	–	6.10
	215	82.6	3	249	324	–	–	1 800	–	2 500	<b>3320</b>	–	–	13.5

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