WBW BEARINGS

Angular Contact Ball Bearing

Ningbo Amol Machinery Co., Ltd.
Jiangsu Amol Bearing Co., Ltd.
Ningbo Amol Intl. Trade Co., Ltd.

www.wbwbearing.com
TEL: +86-574-63106248 FAX: 63104480 EMAIL: info@amolbearing.com

Angular Contact Bearing covers the following three variants:

Angular contact ball bearing | Four-point contact ball bearing | Double row 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.

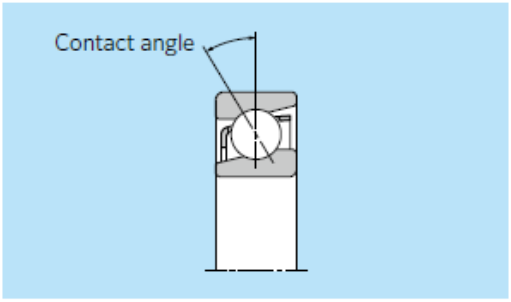


Fig. 1

Table 1 Contact angle and contact angle codes

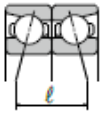
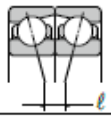
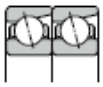
Contact angle	15°	30°	40°
Contact angle code	C	A [1)]	B

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

Table 2 Angular contact ball bearing types and characteristics

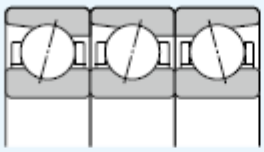
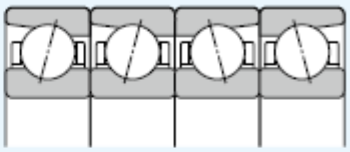
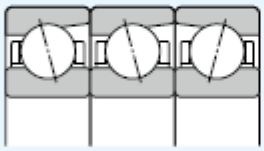
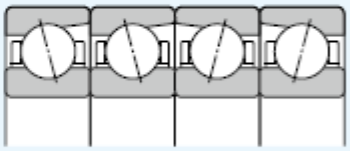
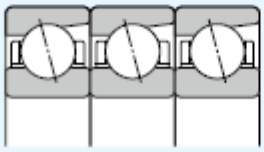
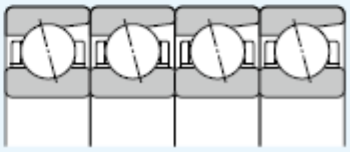
Type	Design	Characteristics
Standard type		• Available in bearing series 79, 70, 72, 72B, 73, and 73B. • Contact angles: 30° and 40° (with B) available. • Standard bearing cage type differs depending on bearing number. (see **Table 5**)

Table 3 Duplex angular contact ball bearings — types and characteristics

Duplex type		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 values; 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 values, 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)

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.

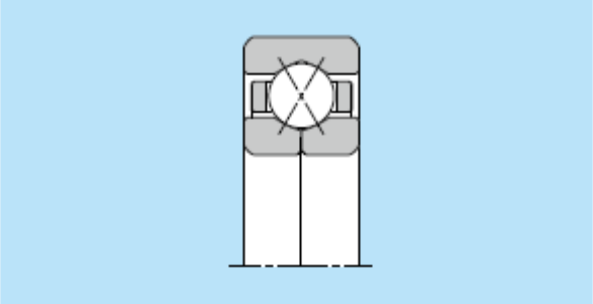


Fig. 2

Double row angular contact ball bearings have the structure of double row angular contact ball. The 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°.

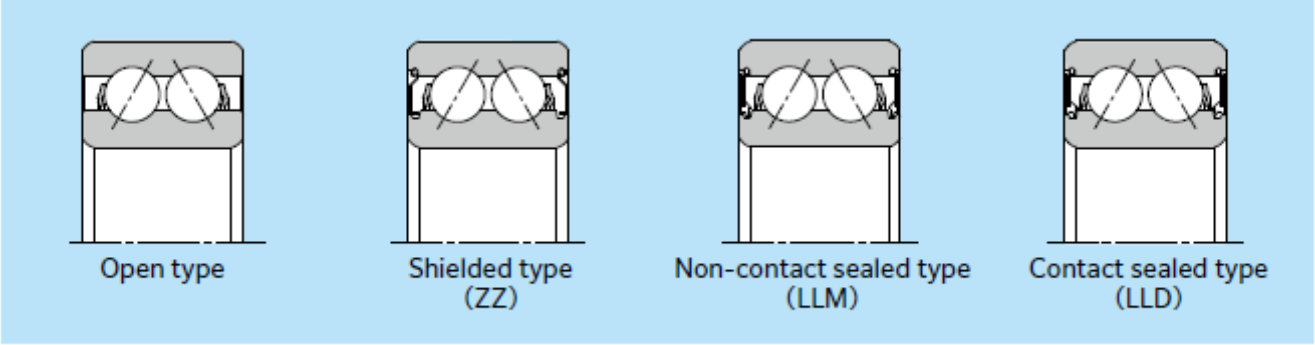


Fig. 4

Table 8.10 (1) Radial internal clearance for duplex angular contact ball bearings

Unit: μm

Nominal bearing bore diameter d mm Over	Incl.	C1 Min.	C1 Max.	C2 Min.	C2 Max.	CN Min.	CN Max.	C3 Min.	C3 Max.	C4 Min.	C4 Max.
—	10	3	8	6	12	8	15	15	22	22	30
10	18	3	8	6	12	8	15	15	24	30	40
18	30	3	10	6	12	10	20	20	32	40	55
30	50	3	10	8	14	14	25	25	40	55	75
50	80	3	11	11	17	17	32	32	50	75	95
80	100	3	13	13	22	22	40	40	60	95	120
100	120	3	15	15	30	30	50	50	75	110	140
120	150	3	16	16	33	35	55	55	80	130	170
150	180	3	18	18	35	35	60	60	90	150	200
180	200	3	20	20	40	40	65	65	100	180	240

Note: The clearance group in the table is applied only to contact angles in the table below.

Contact angle symbol	Nominal contact angle	Applicable clearance 2)
C	15°	C1, C2
A 1)	30°	C2, CN, C3
B	40°	CN, C3, C4

1) Not indicated for bearing number.
2) For information concerning clearance other than applicable clearance, please contact **NTN** Engineering.

Table 8.10 (2) Radial internal clearance of double row angular contact ball bearings

Unit: μm

Nominal bearing bore diameter d mm Over	Incl.	C2 Min.	C2 Max.	CN Min.	CN Max.	C3 Min.	C3 Max.	C4 Min.	C4 Max.	C5 Min.	C5 Max.
10only		0	10	5	15	10	21	16	28	24	36
10	18	1	11	6	16	12	23	19	31	28	40
18	24	1	11	6	16	13	24	21	33	31	43
24	30	1	13	6	19	13	26	21	35	31	45
30	40	2	15	7	22	15	30	24	39	35	50
40	50	2	15	9	24	17	32	28	45	40	57
50	65	0	15	7	24	16	33	28	48	41	61
65	80	1	17	11	31	21	42	34	56	50	74
80	100	3	20	13	36	25	49	40	65	58	67

Table 8.11 Radial internal clearance of bearings for electric motor

Unit: μm

Nominal bearing bore diameter d mm Over	Incl.	Radial internal clearance CM: Deep groove ball bearing Min.	Deep groove ball bearing Max.	Cylindrical roller bearing Min.	Cylindrical roller bearing Max.
10	18	4	11	—	—
18	24	5	12	—	—
24	30	5	12	15	30
30	40	9	17	15	30
40	50	9	17	20	35
50	65	12	22	25	40
65	80	12	22	30	45
80	100	18	30	35	55
100	120	18	30	35	60
120	140	24	38	40	65
140	160	24	38	50	80
160	180	—	—	60	90
180	200	—	—	65	100

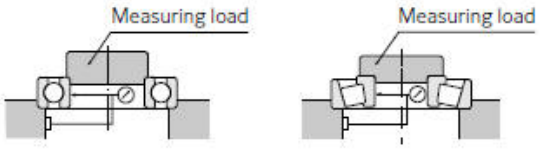
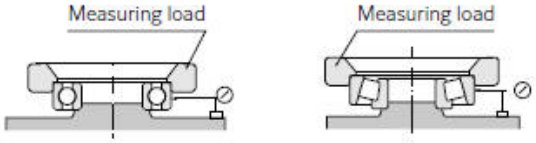
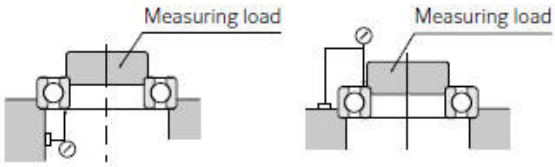
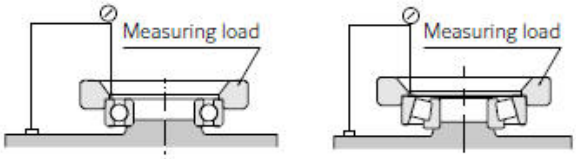
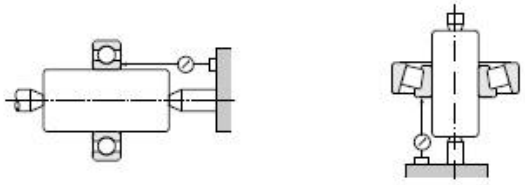
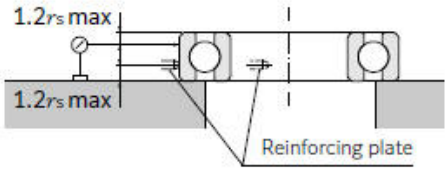
Note: 1. Suffix CM is added to bearing numbers.
Example: 6205 ZZ CM
2. Clearance not interchangeable for cylindrical roller bearings.

Parameters you often see on a bearing or bearing spare part drawings:

Terms	Quantifiers	Description
Nominal bore diameter	*d*	Reference dimension representing the bore diameter size, and reference value with respect to the dimensional difference of the actual bore diameter surface.

Single bore diameter	*d*s	Distance between two parallel straight lines that are in contact with the intersection line of the actual bearing bore diameter surface and the radial plane.
Deviation of a single bore diameter	Δ *d*s	Difference between *d*s and *d* (difference of nominal diameter serving as the measured bore and standard).
Mean bore diameter in a single plane	*d*mp	Arithmetic mean of the maximum and minimum measured bore diameters within one radial plane. In the model figure, in arbitrary radial plane A*i*, when the maximum bore diameter is *dsi*1 and the minimum bore diameter is *dsi*3, the value is obtained by (*dsi*1 + *dsi*3)/2. There is one value for each plane.
Mean bore diameter	*d*m	Arithmetic mean of the maximum and minimum measured bore diameters obtained from all the cylindrical surfaces. In the model figure, when the maximum measured bore diameter is *d*s11 and the minimum measured bore diameter is *d*s23, which are obtained from the all the planes A1, A2,…Ai, the mean bore diameter is obtained by (*d*s11 + *d*s23)/2. There is one value for one cylindrical surface.
Deviation of mean bore diameter	Δ *d*m	Difference between the mean bore diameter and the nominal bore diameter.
Deviation of mean bore diameter in a single plane	Δ *d*mp	Difference between the arithmetic mean and the nominal bore diameter of the maximum and minimum measured bore diameters within one radial plane. The value is specified in JIS.
Variation of bore diameter in a single plane	*Vd*sp	Difference between the maximum and minimum measured bore diameters within one radial plane. In the model figure, in radial plane A1, when the maximum measured bore diameter is *d*s11 and the minimum measured bore diameter is *d*s13, the difference is *Vd*sp and one value can be obtained for one plane. This characteristic is an index that indicates the roundness. The value is specified in JIS.
Variation of mean bore diameter	*Vd*mp	Difference between the maximum and minimum values of the mean bore diameter within a plane that are obtained from all the planes. A unique value is obtained for each product, and it is near to cylindricity (that is different from geometric cylindricity). The value is specified in JIS.

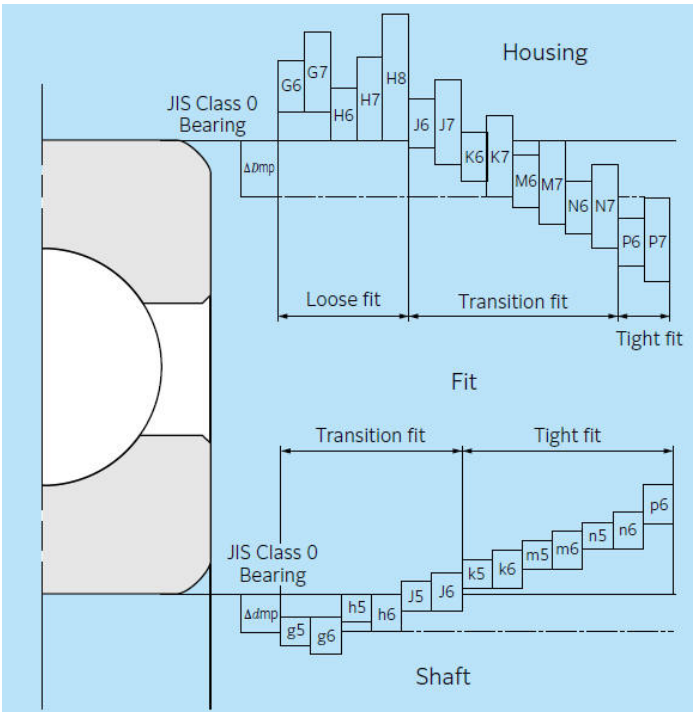
Nominal inner ring width	*B*	Distance between both theoretical side surfaces of a raceway. This value is a reference dimension that represents the raceway surface (distance between both side surfaces).
Single inner ring width	*B*s	Distance between two intersections. The straight is perpendicular to the plane that is in contact with the inner ring reference side and both actual side surfaces. This value represents the actual width dimension of an inner ring.
Deviation of a single inner ring width	Δ *B*s	Difference between the measured inner ring width and the nominal inner ring width. This value is also the difference between the measured inner ring width dimension and the reference dimension that represents the inner ring width. The value is specified in JIS.
Variation of inner ring width	*VB*s	Difference between the maximum and minimum measured inner ring widths, which are specified in JIS.
Radial runout of inner ring of assembled bearing	*K*ia	Difference between the maximum and minimum values of the radial distance between the inner ring bore diameter at each angle position and one fixed point of the outer ring outer diameter surface with respect to radial runout.
Axial runout of inner ring of assembled bearing	*S*ia	Difference between the maximum and minimum values of the axial distance between the inner ring reference side surface at each angle position and one fixed point of the outer ring outer diameter surface with respect to half the radial distance of the raceway contact diameter from the inner ring central axis and the inner ring of a deep groove ball bearing.

Accuracy characteristics	Measurement methods	
Radial runout of inner ring of assembled bearing (K_{ia})		Radial runout of the inner ring is the difference between the maximum and minimum reading of the measuring device when the inner ring is turned one revolution.
Radial runout of outer ring of assembled bearing (K_{ea})		Radial runout of the outer ring is the difference between the maximum and minimum reading of the measuring device when the outer ring is turned one revolution.
Axial runout of inner ring of assembled bearing (S_{ia})		Axial runout of the inner ring is the difference between the maximum and minimum reading of the measuring device when the inner ring is turned one revolution.
Axial runout of outer ring of assembled bearing (S_{ea})		Axial runout of the outer ring is the difference between the maximum and minimum reading of the measuring device when the outer ring is turned one revolution.
Perpendicularity of inner ring face with respect to the bore (S_d)		The squareness of the inner ring side surface is the difference between the maximum and minimum readings of the measuring device when the inner ring is turned one revolution together with the tapered mandrel.
Perpendicularity of outer ring outside surface with respect to the face (S_D)		The squareness of the outer ring outer diameter surface is the difference between the maximum and minimum readings of the measuring device when the outside ring is turned one revolution along the reinforcing plate.

Bearing Precision Level Definitions and Comparison:

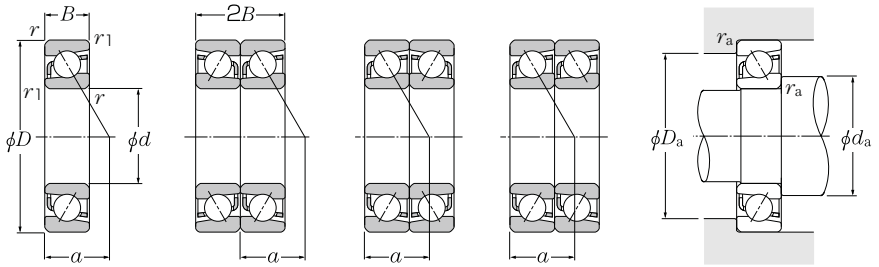
Standard	Applicable standard	Accuracy class					Bearing type
Japanese industrial standard (JIS)	JIS B 1514-1	Class 0, 6	Class 6	Class 5	Class 4	Class 2	Radial bearings
	JIS B 1514-2	Class 0	Class 6	Class 5	Class 4	—	Thrust bearings
International Organization for Standardization (ISO)	ISO 492	Normal class Class 6X	Class 6	Class 5	Class 4	Class 2	Radial bearings
	ISO 199	Normal Class	Class 6	Class 5	Class 4	—	Thrust bearings
	ISO 578	Class 4	—	Class 3	Class 0	Class 00	Tapered roller bearings (Inch series)
	ISO 1224	—	—	Class 5A	Class 4A	—	Precision instrument bearings
Deutsches Institut fur Normung (DIN)	DIN 620	P0	P6	P5	P4	P2	All types
American National Standards Institute (ANSI) American Bearing Manufacturer's Association (ABMA)	ANSI/ABMA Std.20 1)	ABEC-1 RBEC-1	ABEC-3 RBEC-3	ABEC-5 RBEC-5	ABEC-7	ABEC-9	Radial bearings (excluding tapered roller bearings)
	ANSI/ABMA Std.19.1	Class K	Class N	Class C	Class B	Class A	Tapered roller bearings (Metric series)
	ANSI/ABMA Std.19	Class 4	Class 2	Class 3	Class 0	Class 00	Tapered roller bearings (Inch series)

How to select bearing – housing tolerance range:



Bearing Damage and Cause

Bearing damage	Damaged parts	Causes														
		Handling		Bearing periphery			Lubrication		Load			Speed			Bearing selection	
		Poor storage condition/ vibration during transportation	Improper handling/ installation	Insufficient accuracy of shaft/housing	Infiltration of bearing by foreign matter (insufficient sealing performance)	Temperature (heat effect)	Lubricant (insufficient/ improper quality)	Lubrication method (insufficient)	Excessively large impact load/preload	Excessively large moment	Excessively small load	High speed/ rapid acceleration and deceleration	Large vibration	Swinging/vibration/ standstill	Excessively large/ small clearance	Excessively large/ small interference
Flaking (separation)	Raceway surface/ rolling element surface		○	○	○	○	○	○	○	○					○	
Seizure	Raceway/ rolling element/cage		○			○	○	○	○	○		○			○	
Cracks/chips	Raceway/rolling element		○	○			○		○	○						○
Cage damage	Rivets break or become loose		○		○		○	○	○	○		○	○			
Rolling path skewing	Raceway surface		○	○											○	
Smearing/ scuffing	Raceway surface/ rolling element surface/ rib surface/ roller end surface		○		○		○	○	○		○					
Rust/ corrosion	Rust on a part of or the entire surface of the rolling element pitch	○	○		○		○	○								
Fretting	Red rust on fitting surface		○						○				○			
	Brinelling indentations form on the raceway of the rolling element pitch	○					○	○						○		○
Wear	Raceway surface/ rolling element surface/ rib surface/ roller end surface		○		○		○	○								
Electrolytic corrosion	Pits form on the raceway. The pits gradually grow into ripples.		○													
Dents and scratches	Raceway surface/ rolling element surface		○		○				○	○						
Creeping	Fitting surface		○	○		○			○							○
Speckles and discoloration	Raceway surface/ rolling element surface				○		○	○								
Peeling	Raceway surface/ rolling element surface				○		○	○								

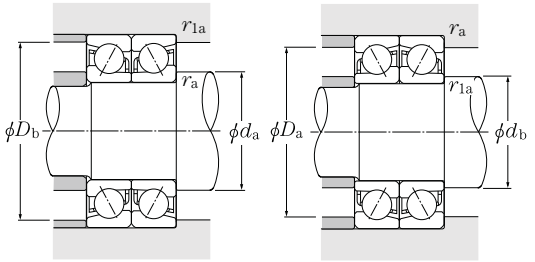


Single row | Back-to-back arrangement (DB) | Face-to-face arrangement (DF) | Tandem arrangement (DT)

d 10 ～ 30mm

Boundary dimensions mm						Basic load rating dynamic kN	static kN	Fatigue load limit kN	Allowable speed 1) min-1		Bearing number 2)	Load center mm	Mass kg
d	D	B	2B	$r_{s\,min}$ 3)	$r_{ls\,min}$ 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 r_1.



Dynamic equivalent radial load

$P_r = XF_r + YF_a$

Contact angle	e	Single, DT $F_a/F_r \leqq e$		Single, DT $F_a/F_r > e$		DB, DF $F_a/F_r \leqq e$		DB, DF $F_a/F_r > e$	
		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

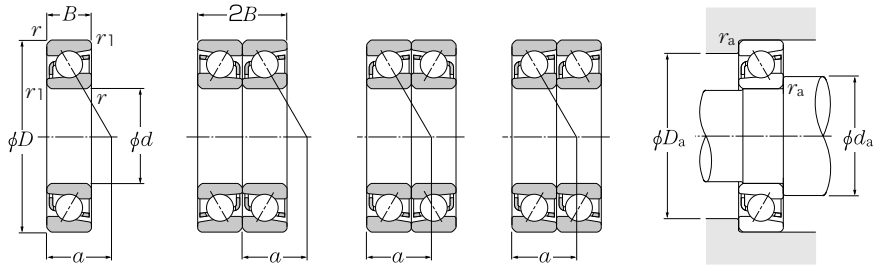
$P_{0r} = X_0 F_r + Y_0 F_a$

Contact angle	Single, DT X_0	Single, DT Y_0	DB, DF X_0	DB, DF 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	static kN	Allowable speed 1) (duplex) min-1		Bearing number			Installation-related dimensions mm					
C_r	C_{0r}	Grease lubrication	Oil lubrication	DB	DF	DT	d_a Min.	d_b Min.	D_a Max.	D_b Max.	r_{as} Max.	r_{1as} 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

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_a.

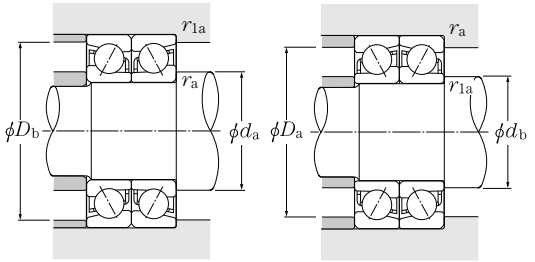


Single row | Back-to-back arrangement (DB) | Face-to-face arrangement (DF) | Tandem arrangement (DT)

d 30 ～ 55mm

Boundary dimensions mm						Basic load rating dynamic kN	static kN	Fatigue load limit kN	Allowable speed 1) min-1		Bearing number 2)	Load center mm	Mass kg
d	D	B	2B	$r_{s\,min}$ 3)	$r_{ls\,min}$ 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 r_1.



Dynamic equivalent radial load

$P_r = XF_r + YF_a$

Contact angle	e	Single, DT $F_a/F_r \leqq e$		Single, DT $F_a/F_r > e$		DB, DF $F_a/F_r \leqq e$		DB, DF $F_a/F_r > e$	
		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

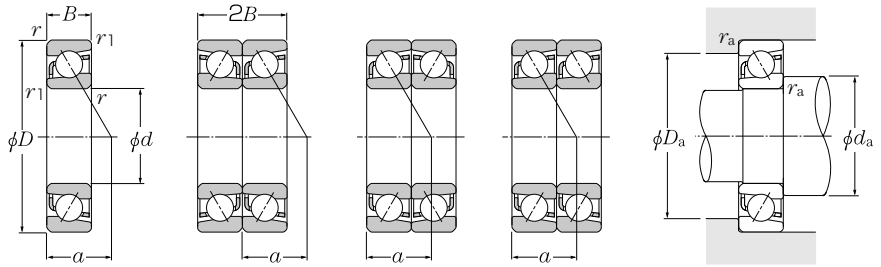
For single and DT arrangement, when $P_{0r} < F_r$ use $P_{0r} = F_r$.

Basic load rating dynamic (duplex) kN	static kN	Allowable speed 1) (duplex) min-1 Grease lubrication	Oil lubrication	Bearing number DB	DF	DT	Installation-related dimensions mm d_a Min.	d_b Min.	D_a Max.	D_b Max.	r_{as} Max.	r_{1as} Max.
C_r	C_{0r}											
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 r_1 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

WBW



Single row | Back-to-back arrangement (DB) | Face-to-face arrangement (DF) | Tandem arrangement (DT)

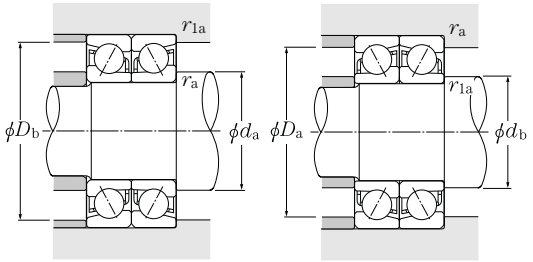
d 60 ～ 85mm

Boundary dimensions mm						Basic load rating dynamic kN	static kN	Fatigue load limit kN	Allowable speed 1) min-1 Grease lubrication	Allowable speed 1) min-1 Oil lubrication	Bearing number 2)	Load center mm	Mass kg
d	D	B	2B	$r_{s\,min}$ 3)	$r_{ls\,min}$ 3)	C_r	C_{0r}	C_u				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 r_1.

Single and Duplex Angular Contact Ball Bearings

WBW



Dynamic equivalent radial load

$P_r = XF_r + YF_a$

Contact angle	e	Single, DT $F_a/F_r \leqq e$ X	Y	Single, DT $F_a/F_r > e$ X	Y	DB, DF $F_a/F_r \leqq e$ X	Y	DB, DF $F_a/F_r > e$ 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 X_0	Y_0	DB, DF X_0	Y_0
30°	0.5	0.33	1	0.66
40°	0.5	0.26	1	0.52

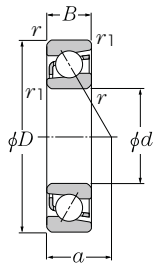
For single and DT arrangement, when $P_{0r} < F_r$ use $P_{0r} = F_r$.

Basic load rating dynamic (duplex) kN	static kN	Allowable speed 1) (duplex) min-1 Grease lubrication	Oil lubrication	Bearing number DB	DF	DT	Installation-related dimensions mm d_a Min.	d_b Min.	D_a Max.	D_b Max.	r_{as} Max.	r_{1as} Max.
C_r	C_{0r}											
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

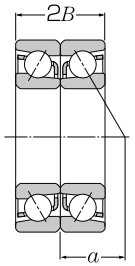
Note: For bearing series **79** and **70**, inner rings are constructed with groove abutments on both sides. Therefore, the inner ring chamfer dimension r_1 is identical to dimension r. Furthermore, the radius r_{1a} of the shaft corner roundness is likewise identical to r_a.

Single and Duplex Angular Contact Ball Bearings

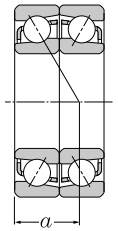
WBW



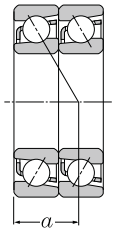
Single row



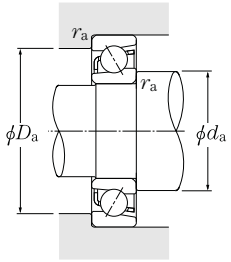
Back-to-back arrangement (DB)



Face-to-face arrangement (DF)



Tandem arrangement (DT)



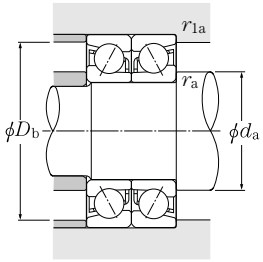
d 85 ~ 120mm

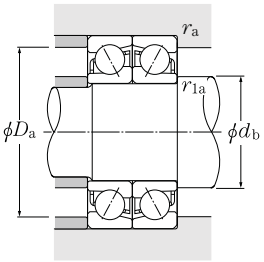
Boundary dimensions mm						Basic load rating dynamic kN	static kN	Fatigue load limit kN	Allowable speed 1) min-1 Grease lubrication	Allowable speed 1) min-1 Oil lubrication	Bearing number 2)	Load center mm	Mass kg
d	D	B	2B	$r_{s\,min}$ 3)	$r_{ls\,min}$ 3)	C_r	C_{0r}	C_u				a	Single row (approx.)
85	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 r_1.

Single and Duplex Angular Contact Ball Bearings

WBW





Dynamic equivalent radial load

$P_r = XF_r + YF_a$

Contact angle	e	Single, DT $F_a/F_r \leqq e$ X	Y	Single, DT $F_a/F_r > e$ X	Y	DB, DF $F_a/F_r \leqq e$ X	Y	DB, DF $F_a/F_r > e$ 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

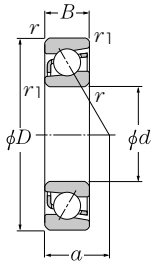
$P_{0r} = X_0 F_r + Y_0 F_a$

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

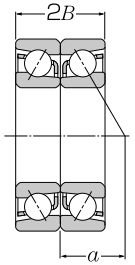
For single and DT arrangement, when $P_{0r} < F_r$ use $P_{0r} = F_r$.

Basic load rating dynamic (duplex) kN	static kN	Allowable speed 1) (duplex) min-1 Grease lubrication	Allowable speed 1) (duplex) min-1 Oil lubrication	Bearing number DB	DF	DT	Installation-related dimensions mm d_a Min.	d_b Min.	D_a Max.	D_b Max.	r_{as} Max.	r_{1as} Max.
C_r	C_{0r}											
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

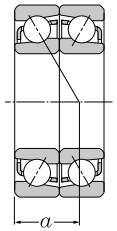
Note: For bearing series **79** and **70**, inner rings are constructed with groove abutments on both sides. Therefore, the inner ring chamfer dimension r_1 is identical to dimension r. Furthermore, the radius r_{1a} of the shaft corner roundness is likewise identical to r_a.



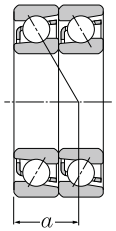
Single row



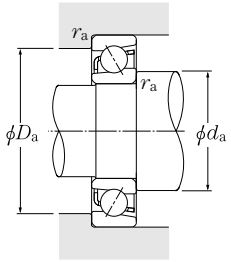
Back-to-back arrangement (DB)



Face-to-face arrangement (DF)



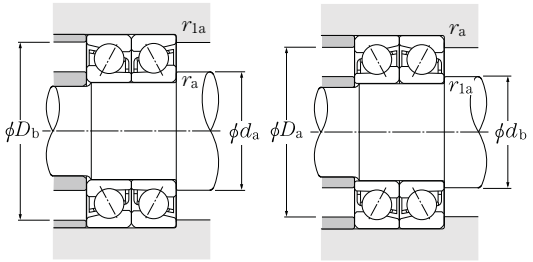
Tandem arrangement (DT)



d 120 ~ 170mm

Boundary dimensions mm						Basic load rating dynamic kN	static kN	Fatigue load limit kN	Allowable speed min-1		Bearing number 1)	Load center mm	Mass kg
d	D	B	2B	$r_{s\,min}$ 2)	$r_{ls\,min}$ 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.



Dynamic equivalent radial load

$P_r = XF_r + YF_a$

Contact angle	e	Single, DT $F_a/F_r \leqq e$ X	Y	Single, DT $F_a/F_r > e$ X	Y	DB, DF $F_a/F_r \leqq e$ X	Y	DB, DF $F_a/F_r > e$ 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

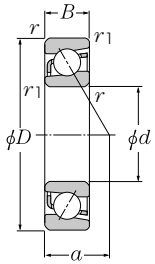
Static equivalent radial load

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

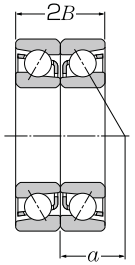
Contact angle	Single, DT X_0	Y_0	DB, DF X_0	Y_0
30°	0.5	0.33	1	0.66
40°	0.5	0.26	1	0.52

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

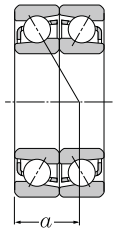
Basic load rating dynamic (duplex) kN	static (duplex) kN	Allowable speed 1) (duplex) min-1 Grease lubrication	Oil lubrication	Bearing number DB	DF	DT	Installation-related dimensions mm d_a Min.	D_a Max.	D_b Max.	r_{as} Max.	r_{1as} Max.
C_r	C_{0r}										
169	197	2 900	3 800	**DB**	**DF**	**DT**	130	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



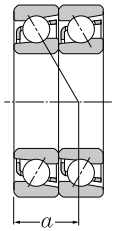
Single row



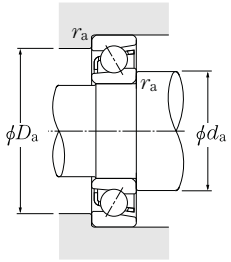
Back-to-back arrangement (DB)



Face-to-face arrangement (DF)



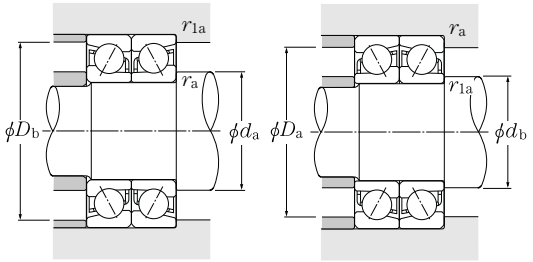
Tandem arrangement (DT)



d 170 ～ 300mm

Boundary dimensions mm						Basic load rating dynamic kN	static kN	Fatigue load limit kN	Allowable speed min-1 Grease lubrication	Allowable speed min-1 Oil lubrication	Bearing number [1]	Load center mm	Mass kg
d	D	B	2B	$r_{s\,min}$ [2]	$r_{ls\,min}$ [2]	C_r	C_{0r}	C_u				a	Single row (approx.)
170	360	72	144	4	1.5	395	445	21.3	1 700	2 300	**7334B**	147	35.3
	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
180	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
	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
190	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
	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
200	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.



Dynamic equivalent radial load

$P_r = XF_r + YF_a$

Contact angle	e	Single, DT $F_a/F_r \leqq e$		Single, DT $F_a/F_r > e$		DB, DF $F_a/F_r \leqq e$		DB, DF $F_a/F_r > e$	
		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 X_0	Single, DT Y_0	DB, DF X_0	DB, DF Y_0
30°	0.5	0.33	1	0.66
40°	0.5	0.26	1	0.52

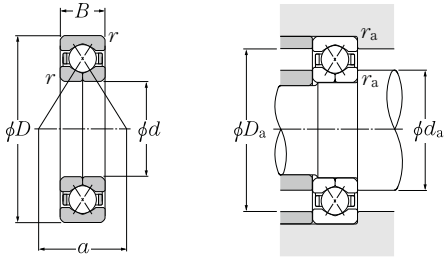
For single and DT arrangement, when $P_{0r} < F_r$ use $P_{0r} = F_r$.

Basic load rating dynamic (duplex) kN	static kN	Allowable speed [1] (duplex) min-1 Grease lubrication	Allowable speed [1] (duplex) min-1 Oil lubrication	Bearing number DB	DF	DT	Installation-related dimensions mm d_a Min.	D_a Max.	D_b Max.	r_{as} Max.	r_{1as} Max.
C_r	C_{0r}										
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

WBW

QJ type



Dynamic equivalent axial load
$P_a = F_a$

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

d 30 ～ 90mm

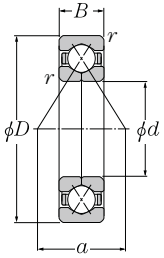
Boundary dimensions mm				Basic load rating dynamic kN	static kN	Fatigue load limit kN	Allowable speed min^{-1} Grease lubrication	Allowable speed min^{-1} Oil lubrication	Bearing number	Installation-related dimensions mm			Load center mm	Mass kg
d	D	B	$r_{s\,min}$[1]	C_a	C_{0a}	C_u				d_a Min.	D_a Max.	r_{as} Max.	a	(approx.)
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

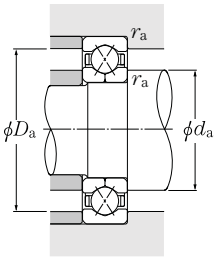
1) Smallest allowable dimension for chamfer dimension *r*.
Note: 1. These bearings are also manufactured with a slot in the chamfer section of the outer ring to stop whirling.
2. This bearing is widely used in applications where the only type of load is axial. When considering it for use where radial loads are applied, consult **NTN** Engineering.

Four-Point Contact Ball Bearings

WBW

QJ type





Dynamic equivalent axial load
$P_a = F_a$

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

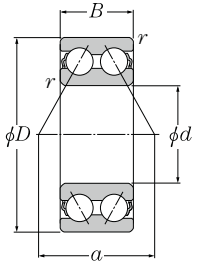
d 95 ～ 120mm

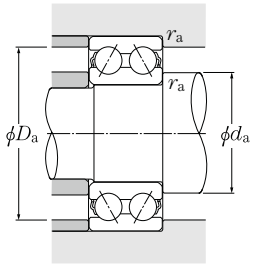
Boundary dimensions mm				Basic load rating dynamic kN	static kN	Fatigue load limit kN	Allowable speed min^{-1} Grease lubrication	Allowable speed min^{-1} Oil lubrication	Bearing number	Installation-related dimensions mm			Load center mm	Mass kg
d	D	B	$r_{s\,min}$[1]	C_a	C_{0a}	C_u				d_a Min.	D_a Max.	r_{as} Max.	a	(approx.)
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	302	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	303	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	338	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	359	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

WBW





Dynamic equivalent radial load

$P_r = XF_r + YF_a$

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

Static equivalent radial load

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

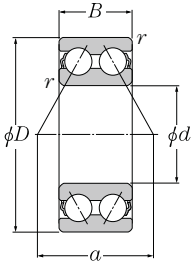
d 10 ～ 65mm

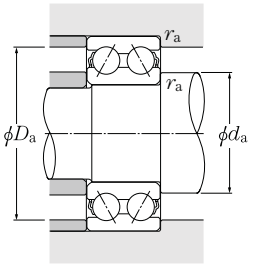
Boundary dimensions mm				Basic load rating dynamic kN	Basic load rating static kN	Fatigue load limit kN	Allowable speed min^{-1} Grease lubrication	Allowable speed min^{-1} Oil lubrication	Bearing number	Installation-related dimensions mm			Load center mm	Mass kg
d	D	B	$r_{s\,min}$[1]	C_r	C_{0r}	C_u				d_a Min.	D_a Max.	r_{as} Max.	a	(approx.)
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

WBW





Dynamic equivalent radial load

$P_r = XF_r + YF_a$

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

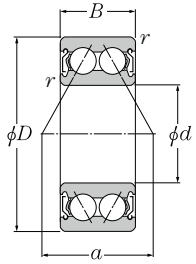
Static equivalent radial load

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

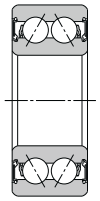
d 70 ～ 85mm

Boundary dimensions mm				Basic load rating dynamic kN	Basic load rating static kN	Fatigue load limit kN	Allowable speed min^{-1} Grease lubrication	Allowable speed min^{-1} Oil lubrication	Bearing number	Installation-related dimensions mm			Load center mm	Mass kg
d	D	B	$r_{s\,min}$[1]	C_r	C_{0r}	C_u				d_a Min.	D_a Max.	r_{as} Max.	a	(approx.)
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

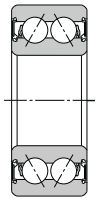
1) Smallest allowable dimension for chamfer dimension r.



Shielded type (ZZ)



Non-contact sealed type (LLM)

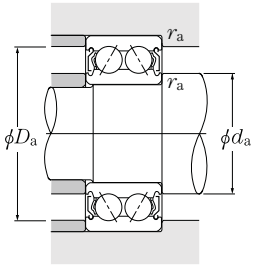


Contact sealed type (LLD)

d 10 ～ 40mm

Boundary dimensions mm				Basic load rating kN		Fatigue load limit kN	Allowable speed min^{-1}			Bearing number [2]		
				dynamic	static		Grease lubrication ZZ, LLM	Oil lubrication				
d	D	B	$r_{s\,min}$ [1]	C_r	C_{0r}	C_u	Z, LM	Z, LM	LLD, LD	Shielded type	Non-contact sealed type	Contact sealed type
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 formed cage is standard for 5205SC and 5208SC.



Dynamic equivalent radial load

$P_r = XF_r + YF_a$

e	$\frac{F_a}{F_r} \leqq e$		$\frac{F_a}{F_r} > e$	
	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 mm				Load center mm
d_a		D_a	r_{as}	a
Min.	Max.	Max.	Max.	
14	15.5	26	0.6	14.5
16	19	28	0.6	16.3
19	19	31	0.6	16.3
21	23.5	36	0.6	20.1
23	25.5	41	1	24.3
26	26.5	41	1	23
31	32	46	1	25.4
32	38.5	55	1	30.9
36	38.5	56	1	30.9
37	44.5	65	1	36.6
42	45	65	1	36.3
44	50.5	71	1.5	41.5
47	50.5	73	1	39.4
49	53	81	1.5	43