Deep Groove Ball Bearings




Open type


Shielded type


Sealed type (non-contact)


Expansion compensating bearing

1. Design features and characteristics

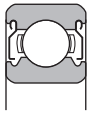
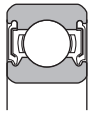
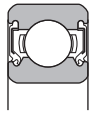
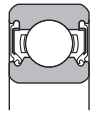
Deep groove ball bearings are very widely used. A deep groove is formed on the inner and outer ring of the bearing enabling the bearing to sustain radial and axial loads in either direction as well as the complex loads which result from the combination of these forces. Deep groove ball bearings are suitable for high speed applications.

When two or more deep groove ball bearings are used in combination and mounted adjacent to each other a duplex set (D2) should be used. Duplex bearings (D2) utilize controlled tolerances to more evenly distribute the loading between the individual bearing rows which improves the overall performance of the assembly.

In addition to unsealed and unlubricated "open" bearings, **NTN** provides deep groove ball bearings that are pre-lubricated with grease and enclosed by seals or shields. See section "11. Lubrication" for a list of some of the greases which can be used.

Table 1 shows the construction and special characteristics of various sealed deep groove ball bearings.

Table 1 Sealed ball bearings: construction and characteristics

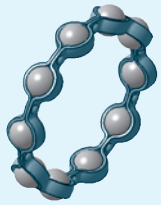
Types and codes		Shielded type	Sealed type		
		Non-contact type ZZ	Non-contact type LLB	Contact type LLU	Low torque type LLH
Construction					
		● Metal shield plate is affixed to the outer ring; the inner ring incorporates a V-groove and labyrinth clearance.	● The outer ring incorporates synthetic rubber molded to a steel plate; seal edge is aligned with V-groove along inner ring surface with labyrinth clearance.	● The outer ring incorporates synthetic rubber molded to a steel plate; seal edge contacts V-groove along inner ring surface.	● Basic construction is the same as LLU type, but a specially designed lip on the edge of the seal prevents foreign matter penetration; low torque construction.
Performance comparison	Torque	Small	Small	Higher	Medium
	Dust proofing	Good	Better than ZZ-type	Excellent	Much better than LLB-type
	Water proofing	Poor	Poor	Very good	Good
	High speed capacity	Same as open type	Same as open type	Limited by contact seals	Much better than LLU-type
	Allowable temp. range[1)]	Depends on lubricant	−20 to 120 °C	−20 to 110 °C	−20 to 120 °C

1) Please consult **NTN** Engineering about applications which exceed the allowable temperature range of products listed on this table.
Note: This chart lists double shielded and double sealed bearings, but single shielded (Z) and single sealed (LB, LU, LH) are also available. Grease lubrication should be used with single shielded and single sealed bearings.

2. Standard cage type

As shown in **Table 2**, pressed cages are generally used for most deep groove ball bearings. Larger size deep groove ball bearings, and bearings operating at high rotational speeds often utilize a machined cage.

Table 2 Standard cage types

Cage type / Bearing series	Pressed cage	Machined cage
		
67	6700 to 6706	—
68	6800 to 6834	6836 to 68/600
69	6900 to 6934	6936 to 69/500
160	16001 to 16052	16056 to 16072
60	6000 to 6052	6056 to 6084
62	6200 to 6244	—
63	6300 to 6344	—
64	6403 to 6416	—

3. Other deep groove ball bearing enhancements

3.1 Bearings with snap rings

A snap ring grove or snap ring groove with snap ring combination are optional enhancements for the outside diameter of most deep groove ball bearings. Snap rings allow for simpler axial positioning and installation in the housing. Snap rings can be utilized with both open type and sealed or shielded deep groove ball bearings. Consult **NTN** Engineering.

3.2 Expansion compensating bearings (creep prevention bearings)

NTN offers the innovative Expansion Compensating (EC) feature to help with bearing retention when mounted in light alloy housings which is often a problem at elevated temperatures due to property differences between the bearing steel and the housing. This functionality is achieved by machining circumferential grooves into the outside diameter of an otherwise standard outer ring. These grooves are filled with an optimized polymer which has an expansion rate higher than that of the typical light alloy housing. The net result is a more consistent interference fit across a wide operating temperature range. This more consistent fit condition helps prevent the bearing from rotating within the housing (known as bearing creep) which helps ensure good performance and long life.

(1) Allowable load

As a result of having grooves machined in the outside diameter, the ring strength is lower compared with a standard bearing. Thus, **in order to prevent outer ring fracture, it is necessary to limit the maximum load applied to the bearing to be equal to or less than the allowable load C_p (see dimension table)**.

(2) Fit with housing

Table 3 shows the recommended fits for bearings with light metal alloy housings. In cases where the bearing is going to be interference fit with the housing, it is very important not to damage the polymer material. Therefore, it is essential that the lip of the housing diameter be given a 10 to 15° chamfer as shown in **Fig. 2**.

Furthermore, as shown in **Fig. 2**, it is also advisable to apply the interference fit using a press in order not to force the bearing into the housing in a misaligned position.

Table 3 Recommended fits for outer ring and housing bore

Condition		Housing material	Suitable bearing	Housing bore tolerance class
Load type, etc.				
Rotating outer ring load Rotating inner ring load Indeterminate load	Light load Normal load	Light alloys such as Al alloy and Mg alloy	Deep groove ball bearings Cylindrical roller bearings	H6
Rotating outer ring load Indeterminate load	Heavy load Impact load	Light alloys such as Al alloy and Mg alloy	Thick-walled type deep groove ball bearings	N6

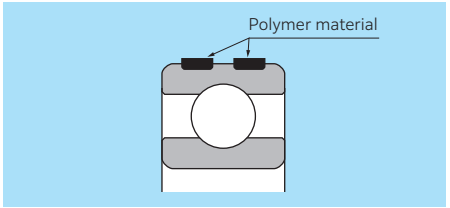


Fig. 1 Expansion compensating bearings

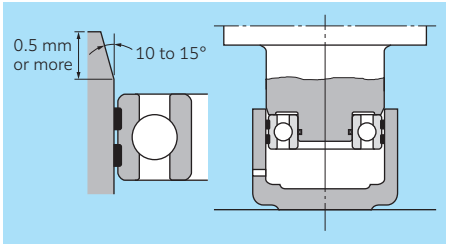


Fig. 2 Fitting method and housing bore diameter chamfer

(3) Radial internal clearance

Radial internal clearance are the same as those for standard deep groove ball bearings. With standard fit and application conditions, a C3 clearance is used. For more detailed information concerning this bearing, and the also manufactured of roller bearings contact **NTN** Engineering.

(4) Allowable temperature range

−20 to 120 °C

3.3 AC bearings (creep prevention bearings)

NTN Offers the AC type bearing which performs a similar function to the EC bearing. AC bearings have the same outside diameter dimensions as standard bearings with the addition of two O-rings located in circumferential grooves on the outside diameter of the outer ring (see **Fig. 3**).

While the EC bearing is more beneficial when using a light alloy housing at elevated temperatures, AC bearings are suitable for applications where a “tight fit” is not possible but outer ring creeping exists under rotating load on the outer ring. AC bearing can also be installed as a floating side bearing to accommodate expansion of shaft by heat as it is more axial. Before installing the bearing into the housing, a high viscosity oil (base oil viscosity, 100 mm^2/s or more) or grease must be applied to the space between two O-rings. This lubricant forms a thin oil layer on the bearing outer ring which prevents contact between the outer ring and housing, lowers the friction, and can minimize the occurrence of creeping by utilizing the friction force of the O-rings.

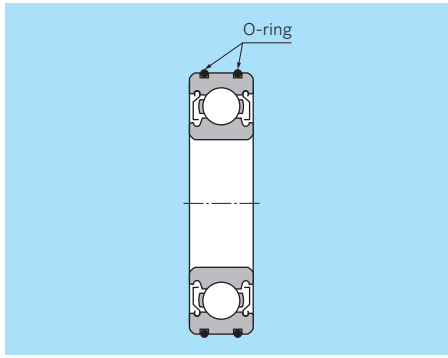


Fig. 3 AC bearing

(1) Allowable load

As is the case with the EC bearing, the load applied to an AC bearing shall be limited to C_p **(see dimension table) in order to ensure the strength limit of the modified outer ring is not exceeded**.

(2) Housing dimensions and shape

Fig. 4 shows the recommended shape of steel housings, and **Table 4** shows the dimensions.

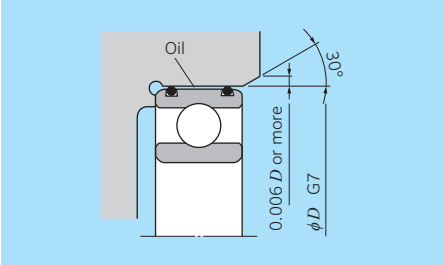


Fig. 4 Design of housing

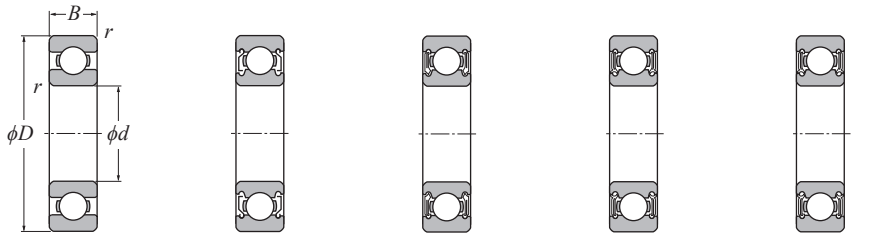
Table 4 Dimensions and design

Housing bore tolerance	G7
Housing bore entrance chamfer	Max. 30°
Housing bore chamfer undercut	0.006D or more
Housing bore surface roughness Ra	2.5
Housing bore roundness	1/2 of housing bore tolerance

(3) Allowable temperature range

−20 to 120 °C

Deep Groove Ball Bearings NTN

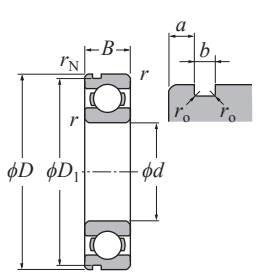


Open type | Shielded type (ZZ) | Non-contact sealed type (LLB, LLF) | Low torque sealed type (LLH) | Contact sealed type (LLU)

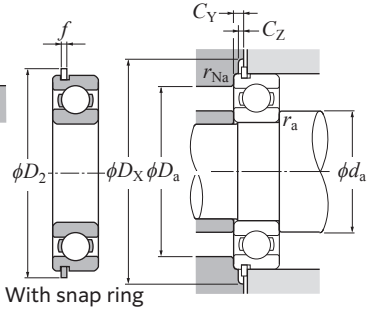
d 10–20 mm

Boundary dimensions mm				Basic load rating dynamic kN	static kN	Fatigue load limit kN	Factor	Allowable speed min^{-1} Grease	Oil			Bearing number Open type	Shielded or sealed type [2] (See drawings)			
								Open type ZZ, LLB, LLF	Open type Z, LB, LF							
d	*D*	*B*	$r_{s\,min}$ [1]	r_{Ns} Min.	C_r	C_{0r}	C_u	f_0	Z, LB, LF	LLH LH	LLU LU					
10	15	3	0.1	—	0.950	0.435	0.018	15.7	10 000	12 000	—	—	6700	—	—	—	—
	19	5	0.3	—	2.03	0.925	0.072	14.8	32 000	38 000	—	24 000	6800	ZZ	LLB	—	LLU
	22	6	0.3	0.3	2.99	1.27	0.099	14.0	30 000	36 000	25 000	21 000	6900	ZZ	LLB	LLH	LLU
	26	8	0.3	—	5.05	1.96	0.138	12.4	29 000	34 000	25 000	21 000	6000	ZZ	LLB	LLH	LLU
	30	9	0.6	0.5	5.65	2.39	0.182	13.2	25 000	30 000	21 000	18 000	6200	ZZ	LLB	LLH	LLU
	35	11	0.6	0.5	9.10	3.50	0.273	11.4	23 000	27 000	20 000	16 000	6300	ZZ	LLB	LLH	LLU
12	18	4	0.2	—	1.03	0.530	0.021	16.2	8 300	9 500	—	—	6701	—	LLF	—	—
	21	5	0.3	—	2.12	1.04	0.080	15.3	29 000	35 000	—	20 000	6801	ZZ	LLB	—	LLU
	24	6	0.3	0.3	3.20	1.46	0.115	14.5	27 000	32 000	22 000	19 000	6901	ZZ	LLB	LLH	LLU
	28	7	0.3	—	5.65	2.39	0.187	13.2	26 000	30 000	—	—	16001JRX	—	—	—	—
	28	8	0.3	—	5.65	2.39	0.182	13.2	26 000	30 000	21 000	18 000	6001JRX	ZZ	LLB	LLH	LLU
	32	10	0.6	0.5	6.75	2.75	0.214	12.7	22 000	26 000	20 000	16 000	6201	ZZ	LLB	LLH	LLU
	37	12	1	0.5	10.8	4.20	0.325	11.1	20 000	24 000	19 000	15 000	6301	ZZ	LLB	LLH	LLU
15	21	4	0.2	—	1.04	0.585	0.024	16.5	6 600	7 600	—	—	6702	—	LLF	—	—
	24	5	0.3	—	2.30	1.26	0.091	15.8	26 000	31 000	—	17 000	6802	ZZ	LLB	—	LLU
	28	7	0.3	0.3	4.05	2.00	0.157	14.8	24 000	28 000	—	16 000	6902	ZZ	LLB	—	LLU
	32	8	0.3	—	6.20	2.84	0.222	13.9	22 000	26 000	—	—	16002	—	—	—	—
	32	9	0.3	0.3	6.20	2.84	0.199	13.9	22 000	26 000	18 000	15 000	6002	ZZ	LLB	LLH	LLU
	35	11	0.6	0.5	8.60	3.60	0.279	12.7	19 000	23 000	18 000	15 000	6202	ZZ	LLB	LLH	LLU
	42	13	1	0.5	12.7	5.45	0.425	12.3	17 000	21 000	15 000	12 000	6302	ZZ	LLB	LLH	LLU
17	23	4	0.2	—	1.11	0.660	0.027	16.3	5 000	6 700	—	—	6703	—	LLF	—	—
	26	5	0.3	—	2.47	1.46	0.102	16.1	24 000	28 000	—	15 000	6803	ZZ	LLB	—	LLU
	30	7	0.3	0.3	5.15	2.58	0.202	14.7	22 000	26 000	—	14 000	6903JRX	ZZ	LLB	—	LLU
	35	8	0.3	—	7.55	3.35	0.263	13.6	20 000	24 000	—	—	16003	—	—	—	—
	35	10	0.3	0.3	7.55	3.35	0.243	13.6	20 000	24 000	16 000	14 000	6003	ZZ	LLB	LLH	LLU
	40	12	0.6	0.5	10.6	4.60	0.355	12.8	18 000	21 000	15 000	12 000	6203	ZZ	LLB	LLH	LLU
	47	14	1	0.5	15.0	6.55	0.510	12.2	16 000	19 000	14 000	11 000	6303	ZZ	LLB	LLH	LLU
	62	17	1.1	—	25.2	10.8	0.840	11.1	14 000	16 000	—	—	6403	ZZ	—	—	—
20	27	4	0.2	—	1.15	0.730	0.031	16.1	5 000	5 700	—	—	6704	—	LLF	—	—
	32	7	0.3	0.3	4.45	2.47	0.185	15.5	21 000	25 000	—	13 000	6804JR	ZZ	LLB	—	LLU
	37	9	0.3	0.3	7.05	3.70	0.288	14.7	19 000	23 000	—	12 000	6904	ZZ	LLB	—	LLU
	42	8	0.3	—	8.75	4.50	0.350	14.5	18 000	21 000	—	—	16004	—	—	—	—
	42	12	0.6	0.5	10.4	5.05	0.355	13.9	18 000	21 000	13 000	11 000	6004	ZZ	LLB	LLH	LLU
	47	14	1	0.5	14.2	6.65	0.505	13.2	16 000	18 000	12 000	10 000	6204	ZZ	LLB	LLH	LLU
	52	15	1.1	0.5	17.6	7.90	0.615	12.4	14 000	17 000	12 000	10 000	6304	ZZ	LLB	LLH	LLU

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 type are also available.



With snap ring groove



With snap ring

Dynamic equivalent radial load

$P_r = XF_r + YF_a$

$\frac{f_0 \cdot F_a}{C_{0r}}$	*e*	$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
		X	*Y*	*X*	*Y*
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

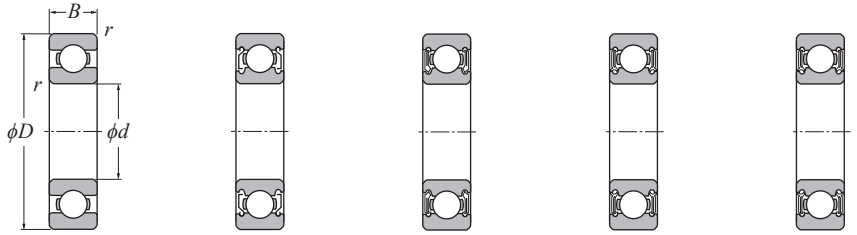
Static equivalent radial load

$P_{0r} = 0.6F_r + 0.5F_a$

When $P_{0r} < F_r$ use $P_{0r} = F_r$.

Bearing number Groove / Snap ring [3] (See drawings)		Snap ring groove dimensions mm				Snap ring dimensions mm		Installation-related dimensions mm							Mass [5] kg
		D_1 Max.	*a* Max.	*b* Min.	r_o Max.	D_2 Max.	*f* Max.	d_a Min.	d_a Max. [4]	D_a Max.	D_X (approx.)	C_Y Max.	C_Z Min.	r_{as} Max.	r_{Nas} Max.	(approx.)
—	—	—	—	—	—	—	—	10.8	—	14.2	—	—	—	0.1	—	0.0015
—	—	—	—	—	—	—	—	12	12.5	17	—	—	—	0.3	—	0.005
N	NR	20.8	1.05	0.8	0.2	24.8	0.7	12	13	20	25.5	1.5	0.7	0.3	0.3	0.009
—[6]	—[6]	—	—	—	—	—	—	12	13.5	24	—	—	—	0.3	—	0.019
N	NR	28.17	2.06	1.35	0.4	34.7	1.12	14	16	26	35.5	2.9	1.2	0.6	0.5	0.032
N	NR	33.17	2.06	1.35	0.4	39.7	1.12	14	17	31	40.5	2.9	1.2	0.6	0.5	0.053
—	—	—	—	—	—	—	—	13.6	13.8	16.4	—	—	—	0.2	—	0.002
—	—	—	—	—	—	—	—	14	14.5	19	—	—	—	0.3	—	0.006
N	NR	22.8	1.05	0.8	0.2	26.8	0.7	14	15	22	27.5	1.5	0.7	0.3	0.3	0.011
—	—	—	—	—	—	—	—	14	—	26	—	—	—	0.3	—	0.019
NX2	NX2RX3	26.44	2.20	0.90	0.3	32.7	0.85	14	16	26	33.4	2.8	0.9	0.3	0.3	0.021
N	NR	30.15	2.06	1.35	0.4	36.7	1.12	16	17	28	37.5	2.9	1.2	0.6	0.5	0.037
N	NR	34.77	2.06	1.35	0.4	41.3	1.12	17	18.5	32	42	2.9	1.2	1	0.5	0.06
—	—	—	—	—	—	—	—	16.6	16.8	19.4	—	—	—	0.2	—	0.0025
—	—	—	—	—	—	—	—	17	17.5	22	—	—	—	0.3	—	0.007
N	NR	26.7	1.3	0.95	0.25	30.8	0.85	17	17.5	26	31.5	1.9	0.9	0.3	0.3	0.016
—	—	—	—	—	—	—	—	17	—	30	—	—	—	0.3	—	0.025
N	NR	30.15	2.06	1.35	0.4	36.7	1.12	17	19	30	37.5	2.9	1.2	0.3	0.3	0.03
N	NR	33.17	2.06	1.35	0.4	39.7	1.12	19	20	31	40.5	2.9	1.2	0.6	0.5	0.045
N	NR	39.75	2.06	1.35	0.4	46.3	1.12	20	23	37	47	2.9	1.2	1	0.5	0.082
—	—	—	—	—	—	—	—	18.6	18.8	21.4	—	—	—	0.2	—	0.0025
—	—	—	—	—	—	—	—	19	19.5	24	—	—	—	0.3	—	0.008
N	NR	28.7	1.3	0.95	0.25	32.8	0.85	19	20	28	33.5	1.9	0.9	0.3	0.3	0.018
—	—	—	—	—	—	—	—	19	—	33	—	—	—	0.3	—	0.032
N	NR	33.17	2.06	1.35	0.4	39.7	1.12	19	21	33	40.5	2.9	1.2	0.3	0.3	0.039
N	NR	38.1	2.06	1.35	0.4	44.6	1.12	21	23	36	45.5	2.9	1.2	0.6	0.5	0.066
N	NR	44.6	2.46	1.35	0.4	52.7	1.12	22	25	42	53.5	3.3	1.2	1	0.5	0.115
—	—	—	—	—	—	—	—	23.5	30	55.5	—	—	—	1	—	0.27
—	—	—	—	—	—	—	—	21.6	22.3	25.4	—	—	—	0.2	—	0.0045
N	NR	30.7	1.3	0.95	0.25	34.8	0.85	22	22.5	30	35.5	1.9	0.9	0.3	0.3	0.019
N	NR	35.7	1.7	0.95	0.25	39.8	0.85	22	24	35	40.5	2.3	0.9	0.3	0.3	0.036
—	—	—	—	—	—	—	—	22	—	40	—	—	—	0.3	—	0.051
N	NR	39.75	2.06	1.35	0.4	46.3	1.12	24	26	38	47	2.9	1.2	0.6	0.5	0.069
N	NR	44.6	2.46	1.35	0.4	52.7	1.12	25	28	42	53.5	3.3	1.2	1	0.5	0.106
N	NR	49.73	2.46	1.35	0.4	57.9	1.12	26.5	28.5	45.5	58.5	3.3	1.2	1	0.5	0.144

3) Sealed and shielded bearings are also available. 4) This dimension applies to sealed and shielded bearings.
5) Does not include bearings with snap rings. 6) Refer to page B-54.

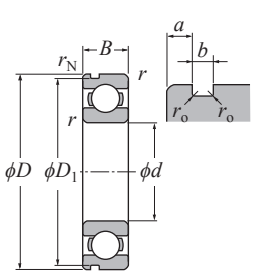


Open type | Shielded type (ZZ) | Non-contact sealed type (LLB, LLF) | Low torque sealed type (LLH) | Contact sealed type (LLU)

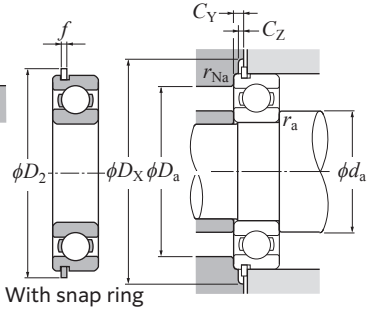
d 20–35 mm

Boundary dimensions mm				Basic load rating dynamic kN	static kN	Fatigue load limit kN	Factor	Allowable speed min^{-1} Grease	Oil			Bearing number Open type	Shielded or sealed type [2] (See drawings)			
d	*D*	*B*	$r_{s\,min}$ [1]	r_{Ns} Min.	C_r	C_{0r}	C_u	f_0	Open type ZZ, LLB, LLF Z, LB, LF	Open type Z, LB, LF	LLH LH	LLU LU					
20	72	19	1.1	—	31.5	13.9	1.09	11.4	12 000	14 000	—	—	**6404**	**ZZ**	—	—	—
	44	12	0.6	0.5	10.4	5.05	0.395	13.9	17 000	20 000	13 000	10 000	**60/22**	**ZZ**	**LLB**	**LLH**	**LLU**
22	50	14	1	0.5	14.3	6.80	0.500	13.5	14 000	17 000	12 000	9 700	**62/22**	**ZZ**	**LLB**	**LLH**	**LLU**
	56	16	1.1	0.5	20.4	9.25	0.725	12.4	13 000	15 000	11 000	9 200	**63/22**	**ZZ**	**LLB**	**LLH**	**LLU**
	32	4	0.2	—	1.21	0.840	0.036	15.8	4 000	4 600	—	—	**6705**	—	**LLF**	—	—
	37	7	0.3	0.3	4.75	2.95	0.208	16.1	18 000	21 000	—	10 000	**6805JR**	**ZZ**	**LLB**	—	**LLU**
	42	9	0.3	0.3	7.80	4.55	0.345	15.4	16 000	19 000	11 700	9 800	**6905**	**ZZ**	**LLB**	**LLH**	**LLU**
25	47	8	0.3	—	9.25	5.10	0.400	15.1	15 000	18 000	—	—	**16005**	—	—	—	—
	47	12	0.6	0.5	11.2	5.85	0.380	14.5	15 000	18 000	11 000	9 400	**6005**	**ZZ**	**LLB**	**LLH**	**LLU**
	52	15	1	0.5	15.5	7.85	0.550	13.9	13 000	15 000	11 000	8 900	**6205**	**ZZ**	**LLB**	**LLH**	**LLU**
	62	17	1.1	0.5	23.5	10.9	0.855	12.6	12 000	14 000	9 700	8 100	**6305**	**ZZ**	**LLB**	**LLH**	**LLU**
	80	21	1.5	—	38.5	17.5	1.36	11.6	10 000	12 000	—	—	**6405**	**ZZ**	—	—	—
	52	12	0.6	0.5	13.8	7.40	0.580	14.5	14 000	16 000	10 000	8 400	**60/28**	**ZZ**	**LLB**	**LLH**	**LLU**
28	58	16	1	0.5	19.8	9.75	0.720	13.4	12 000	14 000	9 700	8 100	**62/28**	**ZZ**	**LLB**	**LLH**	**LLU**
	68	18	1.1	0.5	29.6	14.0	1.10	12.4	11 000	13 000	8 900	7 400	**63/28**	**ZZ**	**LLB**	**LLH**	**LLU**
	37	4	0.2	—	1.27	0.950	0.041	15.7	3 300	3 800	—	—	**6706**	—	**LLF**	—	—
	42	7	0.3	0.3	5.20	3.65	0.244	16.5	15 000	18 000	10 500	8 800	**6806JR**	**ZZ**	**LLB**	**LLH**	**LLU**
	47	9	0.3	0.3	8.00	5.00	0.365	15.8	14 000	17 000	10 000	8 400	**6906**	**ZZ**	**LLB**	**LLH**	**LLU**
30	55	9	0.3	—	12.5	7.35	0.570	15.2	13 000	15 000	—	—	**16006**	—	—	—	—
	55	13	1	0.5	14.7	8.30	0.650	14.8	13 000	15 000	9 200	7 700	**6006**	**ZZ**	**LLB**	**LLH**	**LLU**
	62	16	1	0.5	21.6	11.3	0.795	13.8	11 000	13 000	8 800	7 300	**6206**	**ZZ**	**LLB**	**LLH**	**LLU**
	72	19	1.1	0.5	29.5	15.0	1.14	13.3	10 000	12 000	7 900	6 600	**6306**	**ZZ**	**LLB**	**LLH**	**LLU**
	90	23	1.5	—	48.0	23.9	1.86	12.3	8 800	10 000	—	—	**6406**	**ZZ**	—	—	—
	58	13	1	0.5	13.1	8.05	0.615	15.4	12 000	15 000	8 700	7 200	**60/32**	**ZZ**	**LLB**	**LLH**	**LLU**
32	65	17	1	0.5	23.0	11.6	0.840	13.6	11 000	12 000	8 400	7 100	**62/32**	**ZZ**	**LLB**	**LLH**	**LLU**
	75	20	1.1	0.5	33.0	16.9	1.30	13.1	9 500	11 000	7 700	6 500	**63/32**	**ZZ**	**LLB**	**LLH**	**LLU**
	47	7	0.3	0.3	5.45	4.05	0.268	16.4	13 000	16 000	—	7 600	**6807JR**	**ZZ**	**LLB**	—	**LLU**
	55	10	0.6	0.5	10.6	6.85	0.495	15.8	12 000	15 000	8 500	7 100	**6907**	**ZZ**	**LLB**	**LLH**	**LLU**
	62	9	0.3	—	12.9	8.20	0.605	15.6	12 000	14 000	—	—	**16007**	—	—	—	—
35	62	14	1	0.5	17.7	10.3	0.805	14.8	12 000	14 000	8 200	6 800	**6007**	**ZZ**	**LLB**	**LLH**	**LLU**
	72	17	1.1	0.5	28.4	15.3	1.09	13.8	9 800	11 000	7 600	6 300	**6207**	**ZZ**	**LLB**	**LLH**	**LLU**
	80	21	1.5	0.5	37.0	19.1	1.47	13.1	8 800	10 000	7 300	6 000	**6307**	**ZZ**	**LLB**	**LLH**	**LLU**
	100	25	1.5	—	61.0	31.0	2.43	12.3	7 800	9 100	—	—	**6407**	**ZZ**	—	—	—

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 type are also available.



With snap ring groove



With snap ring

Dynamic equivalent radial load

$P_r = XF_r + YF_a$

$\frac{f_0 \cdot F_a}{C_{0r}}$	*e*	$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
		X	*Y*	*X*	*Y*
0.172	0.19				2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

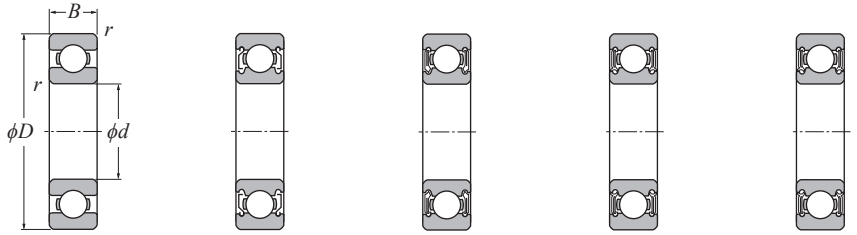
Static equivalent radial load

$P_{0r} = 0.6F_r + 0.5F_a$

When $P_{0r} < F_r$ use $P_{0r} = F_r$.

Bearing number Groove / Snap ring [3] (See drawings)		Snap ring groove dimensions mm				Snap ring dimensions mm		Installation-related dimensions mm							Mass [5] kg
		D_1 Max.	*a* Max.	*b* Min.	r_o Max.	D_2 Max.	*f* Max.	d_a Min.	d_a Max. [4]	D_a Max.	D_X (approx.)	C_Y Max.	C_Z Min.	r_{as} Max.	r_{Nas} Max.	(approx.)
—	—	—	—	—	—	—	—	26.5	35.5	65.5	—	—	—	1	—	0.4
N	**NR**	41.75	2.06	1.35	0.4	48.3	1.12	26	26.5	40	49	2.9	1.2	0.6	0.5	0.074
N	**NR**	47.6	2.46	1.35	0.4	55.7	1.12	27	29.5	45	56.5	3.3	1.2	1	0.5	0.117
N	**NR**	53.6	2.46	1.35	0.4	61.7	1.12	28.5	31	49.5	62.5	3.3	1.2	1	0.5	0.176
—	—	—	—	—	—	—	—	26.6	27.3	30.4	—	—	—	0.2	—	0.005
N	**NR**	35.7	1.3	0.95	0.25	39.8	0.85	27	28	35	40.5	1.9	0.9	0.3	0.3	0.022
N	**NR**	40.7	1.7	0.95	0.25	44.8	0.85	27	29	40	45.5	2.3	0.9	0.3	0.3	0.042
—	—	—	—	—	—	—	—	27	—	45	—	—	—	0.3	—	0.06
N	**NR**	44.6	2.06	1.35	0.4	52.7	1.12	29	30.5	43	53.5	2.9	1.2	0.6	0.5	0.08
N	**NR**	49.73	2.46	1.35	0.4	57.9	1.12	30	32	47	58.5	3.3	1.2	1	0.5	0.128
N	**NR**	59.61	3.28	1.9	0.6	67.7	1.7	31.5	35	55.5	68.5	4.6	1.7	1	0.5	0.232
—	—	—	—	—	—	—	—	33	41	72	—	—	—	1.5	—	0.53
N	**NR**	49.73	2.06	1.35	0.4	57.9	1.12	32	34	48	58.5	2.9	1.2	0.6	0.5	0.098
N	**NR**	55.6	2.46	1.35	0.4	63.7	1.12	33	35.5	53	64.5	3.3	1.2	1	0.5	0.171
N	**NR**	64.82	3.28	1.9	0.6	74.6	1.7	34.5	38.5	61.5	76	4.6	1.7	1	0.5	0.284
—	—	—	—	—	—	—	—	31.6	32.3	35.4	—	—	—	0.2	—	0.006
N	**NR**	40.7	1.3	0.95	0.25	44.8	0.85	32	33	40	45.5	1.9	0.9	0.3	0.3	0.026
N	**NR**	45.7	1.7	0.95	0.25	49.8	0.85	32	34	45	50.5	2.3	0.9	0.3	0.3	0.048
—	—	—	—	—	—	—	—	32	—	53	—	—	—	0.3	—	0.091
N	**NR**	52.6	2.08	1.35	0.4	60.7	1.12	35	37	50	61.5	2.9	1.2	1	0.5	0.116
N	**NR**	59.61	3.28	1.9	0.6	67.7	1.7	35	39	57	68.5	4.6	1.7	1	0.5	0.199
N	**NR**	68.81	3.28	1.9	0.6	78.6	1.7	36.5	43	65.5	80	4.6	1.7	1	0.5	0.36
—	—	—	—	—	—	—	—	38	49	82	—	—	—	1.5	—	0.735
N	**NR**	55.6	2.08	1.35	0.4	63.7	1.12	37	39	53	64.5	2.9	1.2	1	0.5	0.129
N	**NR**	62.6	3.28	1.9	0.6	70.7	1.7	37	40	60	71.5	4.6	1.7	1	0.5	0.226
N	**NR**	71.83	3.28	1.9	0.6	81.6	1.7	38.5	43.5	68.5	83	4.6	1.7	1	0.5	0.382
N	**NR**	45.7	1.3	0.95	0.25	49.8	0.85	37	38	45	50.5	1.9	0.9	0.3	0.3	0.029
N	**NR**	53.7	1.7	0.95	0.25	57.8	0.85	39	40	51	58.5	2.3	0.9	0.6	0.5	0.074
—	—	—	—	—	—	—	—	37	—	60	—	—	—	0.3	—	0.11
N	**NR**	59.61	2.08	1.9	0.6	67.7	1.7	40	42	57	68.5	3.4	1.7	1	0.5	0.155
N	**NR**	68.81	3.28	1.9	0.6	78.6	1.7	41.5	45	65.5	80	4.6	1.7	1	0.5	0.288
N	**NR**	76.81	3.28	1.9	0.6	86.6	1.7	43	47	72	88	4.6	1.7	1.5	0.5	0.457
—	—	—	—	—	—	—	—	43	56.5	92	—	—	—	1.5	—	0.952

3) Sealed and shielded bearings are also available. 4) This dimension applies to sealed and shielded bearings.
5) Does not include bearings with snap rings.

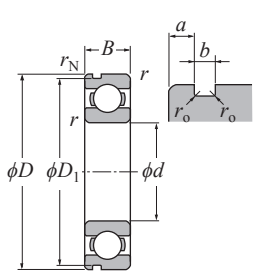


Open type | Shielded type (ZZ) | Non-contact sealed type (LLB) | Low torque sealed type (LLH) | Contact sealed type (LLU)

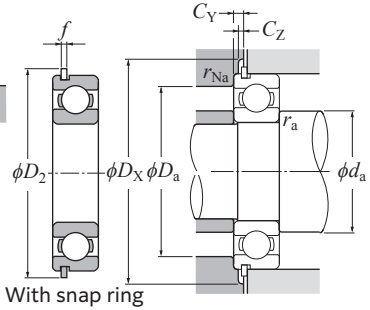
d 40–60 mm

Boundary dimensions mm					Basic load rating dynamic kN	static kN	Fatigue load limit kN	Factor	Allowable speed min^{-1} Grease Open type, ZZ, LLB Z, LB	Oil Open type, Z, LB	LLH LH	LLU LU	Bearing number Open type	Shielded or sealed type [2] (See drawings)			
d	*D*	*B*	$r_{s\,min}$ [1]	r_{Ns} Min.	C_r	C_{0r}	C_u	f_0									
	52	7	0.3	0.3	5.65	4.40	0.291	16.3	12 000	14 000	8 000	6 700	6808JR	ZZ	LLB	LLH	LLU
	62	12	0.6	0.5	13.5	8.90	0.645	15.8	11 000	13 000	7 500	6 300	6908	ZZ	LLB	LLH	LLU
	68	9	0.3	—	14.0	9.65	0.685	16.0	10 000	12 000	—	—	16008	—	—	—	—
40	68	15	1	0.5	18.6	11.5	0.890	15.2	10 000	12 000	7 300	6 100	6008	ZZ	LLB	LLH	LLU
	80	18	1.1	0.5	32.5	17.8	1.24	14.0	8 700	10 000	6 700	5 600	6208	ZZ	LLB	LLH	LLU
	90	23	1.5	0.5	45.0	24.0	1.83	13.2	7 800	9 200	6 400	5 300	6308	ZZ	LLB	LLH	LLU
	110	27	2	—	70.5	36.5	2.85	12.3	7 000	8 200	—	—	6408	ZZ	—	—	—
	58	7	0.3	0.3	5.95	4.95	0.325	16.1	11 000	12 000	—	5 900	6809JR	ZZ	LLB	—	LLU
	68	12	0.6	0.5	14.5	10.4	0.730	16.1	9 800	12 000	—	5 600	6909	ZZ	LLB	—	LLU
	75	10	0.6	—	14.3	10.5	0.725	16.2	9 200	11 000	—	—	16009	—	—	—	—
45	75	16	1	0.5	23.2	15.1	1.16	15.3	9 200	11 000	6 500	5 400	6009	ZZ	LLB	LLH	LLU
	85	19	1.1	0.5	36.0	20.4	1.60	14.1	7 800	9 200	6 200	5 200	6209	ZZ	LLB	LLH	LLU
	100	25	1.5	0.5	58.5	32.0	2.50	13.1	7 000	8 200	5 600	4 700	6309	ZZ	LLB	LLH	LLU
	120	29	2	—	85.5	45.0	3.50	12.1	6 300	7 400	—	—	6409	ZZ	—	—	—
	65	7	0.3	0.3	7.30	6.10	0.405	16.1	9 600	11 000	—	5 300	6810JR	ZZ	LLB	—	LLU
	72	12	0.6	0.5	14.9	11.2	0.765	16.3	8 900	11 000	6 100	5 100	6910	ZZ	LLB	LLH	LLU
	80	10	0.6	—	14.7	11.3	0.760	16.4	8 400	9 800	—	—	16010	—	—	—	—
50	80	16	1	0.5	24.2	16.6	1.24	15.5	8 400	9 800	6 000	5 000	6010	ZZ	LLB	LLH	LLU
	90	20	1.1	0.5	39.0	23.2	1.82	14.4	7 100	8 300	5 700	4 700	6210	ZZ	LLB	LLH	LLU
	110	27	2	0.5	68.5	38.5	2.99	13.2	6 400	7 500	5 000	4 200	6310	ZZ	LLB	LLH	LLU
	130	31	2.1	—	92.0	49.5	3.85	12.5	5 700	6 700	—	—	6410	ZZ	—	—	—
	72	9	0.3	0.3	9.75	8.10	0.540	16.2	8 700	10 000	—	4 800	6811JR	ZZ	LLB	—	LLU
	80	13	1	0.5	17.7	13.3	0.915	16.2	8 200	9 600	5 500	4 600	6911	ZZ	LLB	LLH	LLU
	90	11	0.6	—	20.6	15.3	1.06	16.2	7 700	9 000	—	—	16011	—	—	—	—
55	90	18	1.1	0.5	31.5	21.2	1.62	15.3	7 700	9 000	—	4 500	6011	ZZ	LLB	—	LLU
	100	21	1.5	0.5	48.0	29.2	2.29	14.3	6 400	7 600	—	4 300	6211	ZZ	LLB	—	LLU
	120	29	2	0.5	79.5	45.0	3.50	13.2	5 800	6 800	—	3 900	6311	ZZ	LLB	—	LLU
	140	33	2.1	—	98.5	54.0	4.20	12.7	5 200	6 100	—	—	6411	ZZ	—	—	—
	78	10	0.3	0.3	12.7	10.6	0.705	16.3	8 000	9 400	—	4 400	6812	ZZ	LLB	—	LLU
	85	13	1	0.5	18.2	14.3	0.965	16.4	7 600	8 900	—	4 300	6912	ZZ	LLB	—	LLU
	95	11	0.6	—	22.1	17.5	1.20	16.3	7 000	8 300	—	—	16012	—	—	—	—
60	95	18	1.1	0.5	32.5	23.2	1.73	15.6	7 000	8 300	—	4 100	6012	ZZ	LLB	—	LLU
	110	22	1.5	0.5	58.0	36.0	2.83	14.3	6 000	7 000	4 500	3 800	6212	ZZ	LLB	LLH	LLU
	130	31	2.1	0.5	90.5	52.0	4.10	13.2	5 400	6 300	—	3 600	6312	ZZ	LLB	—	LLU
	150	35	2.1	—	113	64.5	4.90	12.6	4 800	5 700	—	—	6412	ZZ	—	—	—

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 type are also available.



With snap ring groove



With snap ring

Dynamic equivalent radial load

$P_r = XF_r + YF_a$

$\frac{f_0 \cdot F_a}{C_{0r}}$	*e*	$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
		X	*Y*	*X*	*Y*
0.172	0.19				2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

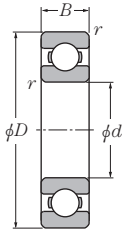
Static equivalent radial load

$P_{0r} = 0.6F_r + 0.5F_a$

When $P_{0r} < F_r$ use $P_{0r} = F_r$.

Bearing number Groove / Snap ring [3] (See drawings)		Snap ring groove dimensions mm				Snap ring dimensions mm		Installation-related dimensions mm							Mass [5] kg
		D_1 Max.	*a* Max.	*b* Min.	r_o Max.	D_2 Max.	*f* Max.	d_a Min.	d_a Max. [4]	D_a Max.	D_X (approx.)	C_Y Max.	C_Z Min.	r_{as} Max.	r_{Nas} Max.	(approx.)
N	NR	50.7	1.3	0.95	0.25	54.8	0.85	42	43	50	55.5	1.9	0.9	0.3	0.3	0.033
N	NR	60.7	1.7	0.95	0.25	64.8	0.85	44	45	58	65.5	2.3	0.9	0.6	0.5	0.11
—	—	—	—	—	—	—	—	42	—	66	—	—	—	0.3	—	0.125
N	NR	64.82	2.49	1.9	0.6	74.6	1.7	45	47	63	76	3.8	1.7	1	0.5	0.19
N	NR	76.81	3.28	1.9	0.6	86.6	1.7	46.5	51	73.5	88	4.6	1.7	1	0.5	0.366
N	NR	86.79	3.28	2.7	0.6	96.5	2.46	48	54	82	98	5.4	2.5	1.5	0.5	0.63
—	—	—	—	—	—	—	—	49	61.5	101	—	—	—	2.0	—	1.23
N	NR	56.7	1.3	0.95	0.25	60.8	0.85	47	48	56	61.5	1.9	0.9	0.3	0.3	0.04
N	NR	66.7	1.7	0.95	0.25	70.8	0.85	49	51	64	72	2.3	0.9	0.6	0.5	0.128
—	—	—	—	—	—	—	—	49	—	71	—	—	—	0.6	—	0.171
N	NR	71.83	2.49	1.9	0.6	81.6	1.7	50	52.5	70	83	3.8	1.7	1	0.5	0.237
N	NR	81.81	3.28	1.9	0.6	91.6	1.7	51.5	55.5	78.5	93	4.6	1.7	1	0.5	0.398
N	NR	96.8	3.28	2.7	0.6	106.5	2.46	53	61.5	92	108	5.4	2.5	1.5	0.5	0.814
—	—	—	—	—	—	—	—	54	66.5	111	—	—	—	2	—	1.53
N	NR	63.7	1.3	0.95	0.25	67.8	0.85	52	54	63	68.5	1.9	0.9	0.3	0.3	0.052
N	NR	70.7	1.7	0.95	0.25	74.8	0.85	54	55.5	68	76	2.3	0.9	0.6	0.5	0.132
—	—	—	—	—	—	—	—	54	—	76	—	—	—	0.6	—	0.18
N	NR	76.81	2.49	1.9	0.6	86.6	1.7	55	57.5	75	88	3.8	1.7	1	0.5	0.261
N	NR	86.79	3.28	2.7	0.6	96.5	2.46	56.5	60	83.5	98	5.4	2.5	1	0.5	0.454
N	NR	106.81	3.28	2.7	0.6	116.6	2.46	59	68.5	101	118	5.4	2.5	2	0.5	1.07
—	—	—	—	—	—	—	—	61	73.5	119	—	—	—	2	—	1.88
N	NR	70.7	1.7	0.95	0.25	74.8	0.85	57	59	70	76	2.3	0.9	0.3	0.3	0.083
N	NR	77.9	2.1	1.3	0.4	84.4	1.12	60	61.5	75	86	2.9	1.2	1	0.5	0.18
—	—	—	—	—	—	—	—	59	—	86	—	—	—	0.6	—	0.258
N	NR	86.79	2.87	2.7	0.6	96.5	2.46	61.5	64	83.5	98	5	2.5	1	0.5	0.388
N	NR	96.8	3.28	2.7	0.6	106.5	2.46	63	67	92	108	5.4	2.5	1.5	0.5	0.601
N	NR	115.21	4.06	3.1	0.6	129.7	2.82	64	74	111	131.5	6.5	2.9	2	0.5	1.37
—	—	—	—	—	—	—	—	66	80	129	—	—	—	2	—	2.29
N	NR	76.2	1.7	1.3	0.4	82.7	1.12	62	64.5	76	84	2.5	1.2	0.3	0.3	0.106
N	NR	82.9	2.1	1.3	0.4	89.4	1.12	65	66.5	80	91	2.9	1.2	1	0.5	0.193
—	—	—	—	—	—	—	—	64	—	91	—	—	—	0.6	—	0.283
N	NR	91.82	2.87	2.7	0.6	101.6	2.46	66.5	69	88.5	103	5	2.5	1	0.5	0.414
N	NR	106.81	3.28	2.7	0.6	116.6	2.46	68	75	102	118	5.4	2.5	1.5	0.5	0.783
N	NR	125.22	4.06	3.1	0.6	139.7	2.82	71	80.5	119	141.5	6.5	2.9	2	0.5	1.73
—	—	—	—	—	—	—	—	71	86	139	—	—	—	2	—	2.77

3) Sealed and shielded bearings are also available. 4) This dimension applies to sealed and shielded bearings.
5) Does not include bearings with snap rings.



Open type



Shielded type (ZZ)



Non-contact sealed type (LLB)

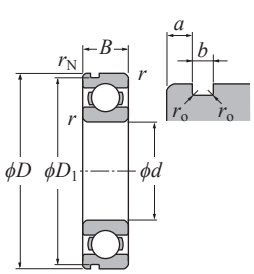


Contact sealed type (LLU)

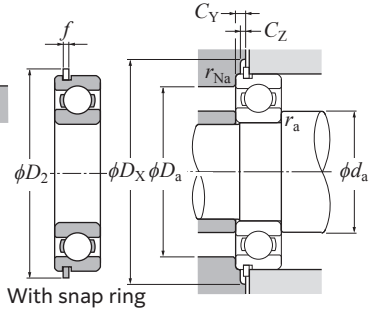
d 65–85 mm

Boundary dimensions mm					Basic load rating dynamic kN	Basic load rating static kN	Fatigue load limit kN	Factor	Allowable speed min^{-1} Grease	Allowable speed min^{-1} Oil		Bearing number			
									Open type ZZ, LLB	Open type Z, LB	LLU	Open type	Shielded or sealed type [2] (See drawings)		
d	D	B	$r_{s\,min}$ [1]	r_{Ns} Min.	C_r	C_{0r}	C_u	f_0	Z, LB		LU				
	85	10	0.6	0.5	12.8	11.0	0.730	16.2	7 400	8 700	4 100	**6813**	ZZ	LLB	LLU
	90	13	1	0.5	19.3	16.1	1.07	16.6	7 000	8 200	4 000	**6913**	ZZ	LLB	LLU
	100	11	0.6	—	22.7	18.7	1.26	16.5	6 500	7 700	—	**16013**	—	—	—
65	100	18	1.1	0.5	34.0	25.2	1.83	15.8	6 500	7 700	3 900	**6013**	ZZ	LLB	LLU
	120	23	1.5	0.5	63.5	40.0	3.15	14.4	5 500	6 500	3 600	**6213**	ZZ	LLB	LLU
	140	33	2.1	0.5	103	60.0	4.60	13.2	4 900	5 800	3 300	**6313**	ZZ	LLB	LLU
	160	37	2.1	—	123	72.5	5.35	12.7	4 400	5 200	—	**6413**	—	—	—
	90	10	0.6	0.5	13.4	11.9	0.795	16.1	6 900	8 100	3 800	**6814**	ZZ	LLB	LLU
	100	16	1	0.5	26.3	21.2	1.45	16.3	6 500	7 700	3 700	**6914**	ZZ	LLB	LLU
	110	13	0.6	—	27.0	22.6	1.52	16.5	6 100	7 100	—	**16014**	—	—	—
70	110	20	1.1	0.5	42.0	31.0	2.30	15.6	6 100	7 100	3 600	**6014**	ZZ	LLB	LLU
	125	24	1.5	0.5	69.0	44.0	3.45	14.5	5 100	6 000	3 400	**6214**	ZZ	LLB	LLU
	150	35	2.1	0.5	115	68.0	5.10	13.2	4 600	5 400	3 100	**6314**	ZZ	LLB	LLU
	180	42	3	—	142	89.5	6.25	12.7	4 100	4 800	—	**6414**	—	—	—
	95	10	0.6	0.5	13.9	12.9	0.855	16.0	6 400	7 600	3 600	**6815**	ZZ	LLB	LLU
	105	16	1	0.5	27.0	22.6	1.52	16.5	6 100	7 200	3 500	**6915**	ZZ	LLB	LLU
	115	13	0.6	—	27.6	24.0	1.60	16.6	5 700	6 700	—	**16015**	—	—	—
75	115	20	1.1	0.5	44.0	33.5	2.44	15.8	5 700	6 700	3 300	**6015**	ZZ	LLB	LLU
	130	25	1.5	0.5	73.5	49.5	3.80	14.7	4 800	5 600	3 200	**6215**	ZZ	LLB	LLU
	160	37	2.1	0.5	126	77.0	5.55	13.2	4 300	5 000	2 900	**6315**	ZZ	LLB	LLU
	190	45	3	—	152	99.0	6.70	12.7	3 800	4 500	—	**6415**	—	—	—
	100	10	0.6	0.5	14.0	13.3	0.885	16.0	6 000	7 100	3 400	**6816**	ZZ	LLB	LLU
	110	16	1	0.5	27.6	24.0	1.59	16.6	5 700	6 700	3 200	**6916**	ZZ	LLB	LLU
	125	14	0.6	—	28.1	25.1	1.64	16.4	5 300	6 200	—	**16016**	—	—	—
80	125	22	1.1	0.5	53.0	40.0	2.91	15.6	5 300	6 200	3 100	**6016**	ZZ	LLB	LLU
	140	26	2	0.5	80.5	53.0	3.95	14.6	4 500	5 300	3 000	**6216**	ZZ	LLB	LLU
	170	39	2.1	0.5	136	86.5	6.05	13.3	4 000	4 700	2 700	**6316**	ZZ	LLB	LLU
	200	48	3	—	181	125	8.20	12.3	3 600	4 200	—	**6416**	—	—	—
	110	13	1	0.5	20.7	19.0	1.26	16.2	5 700	6 700	3 100	**6817**	ZZ	LLB	LLU
	120	18	1.1	0.5	35.5	29.6	1.99	16.4	5 400	6 300	3 000	**6917**	ZZ	LLB	LLU
	130	14	0.6	—	28.7	26.2	1.68	16.4	5 000	5 900	—	**16017**	—	—	—
85	130	22	1.1	0.5	55.0	43.0	3.00	15.8	5 000	5 900	2 900	**6017**	ZZ	LLB	LLU
	150	28	2	0.5	92.0	64.0	4.60	14.7	4 200	5 000	2 800	**6217**	ZZ	LLB	LLU
	180	41	3	0.5	147	97.0	6.55	13.3	3 800	4 500	2 600	**6317**	ZZ	LLB	LLU

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 type are also available.



With snap ring groove



With snap ring

Dynamic equivalent radial load

$P_r = XF_r + YF_a$

$\frac{f_0 \cdot F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19				2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

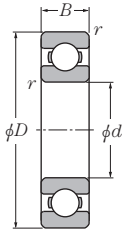
Static equivalent radial load

$P_{0r} = 0.6F_r + 0.5F_a$

When $P_{0r} < F_r$ use $P_{0r} = F_r$.

Bearing number Groove / Snap ring [3] (See drawings)		Snap ring groove dimensions mm				Snap ring dimensions mm		Installation-related dimensions mm								Mass [5] kg
		D_1 Max.	a Max.	b Min.	r_o Max.	D_2 Max.	f Max.	d_a Min.	d_a Max. [4]	D_a Max.	D_X (approx.)	C_Y Max.	C_Z Min.	r_{as} Max.	r_{Nas} Max.	(approx.)
N	**NR**	82.9	1.7	1.3	0.4	89.4	1.12	69	70	81	91	2.5	1.2	0.6	0.5	0.128
N	**NR**	87.9	2.1	1.3	0.4	94.4	1.12	70	71.5	85	96	2.9	1.2	1	0.5	0.206
—	—	—	—	—	—	—	—	69	—	96	—	—	—	0.6	—	0.307
N	**NR**	96.8	2.87	2.7	0.6	106.5	2.46	71.5	74	93.5	108	5	2.5	1	0.5	0.421
N	**NR**	115.21	4.06	3.1	0.6	129.7	2.82	73	80.5	112	131.5	6.5	2.9	1.5	0.5	0.99
N	**NR**	135.23	4.9	3.1	0.6	149.7	2.82	76	86	129	152	7.3	2.9	2	0.5	2.08
—	—	—	—	—	—	—	—	76	—	149	—	—	—	2	—	3.3
N	**NR**	87.9	1.7	1.3	0.4	94.4	1.12	74	75.5	86	96	2.5	1.2	0.6	0.5	0.137
N	**NR**	97.9	2.5	1.3	0.4	104.4	1.12	75	77.5	95	106	3.3	1.2	1	0.5	0.334
—	—	—	—	—	—	—	—	74	—	106	—	—	—	0.6	—	0.441
N	**NR**	106.81	2.87	2.7	0.6	116.6	2.46	76.5	80.5	103.5	118	5	2.5	1	0.5	0.604
N	**NR**	120.22	4.06	3.1	0.6	134.7	2.82	78	85	117	136.5	6.5	2.9	1.5	0.5	1.07
N	**NR**	145.24	4.9	3.1	0.6	159.7	2.82	81	92.5	139	162	7.3	2.9	2	0.5	2.52
—	—	—	—	—	—	—	—	83	—	167	—	—	—	2.5	—	4.83
N	**NR**	92.9	1.7	1.3	0.4	99.4	1.12	79	80	91	101	2.5	1.2	0.6	0.5	0.145
N	**NR**	102.6	2.5	1.3	0.4	110.7	1.12	80	82.5	100	112	3.3	1.2	1	0.5	0.353
—	—	—	—	—	—	—	—	79	—	111	—	—	—	0.6	—	0.464
N	**NR**	111.81	2.87	2.7	0.6	121.6	2.46	81.5	85.5	108.5	123	5	2.5	1	0.5	0.649
N	**NR**	125.22	4.06	3.1	0.6	139.7	2.82	83	90.5	122	141.5	6.5	2.9	1.5	0.5	1.18
N	**NR**	155.22	4.9	3.1	0.6	169.7	2.82	86	99	149	172	7.3	2.9	2	0.5	3.02
—	—	—	—	—	—	—	—	88	—	177	—	—	—	2.5	—	5.72
N	**NR**	97.9	1.7	1.3	0.4	104.4	1.12	84	85	96	106	2.5	1.2	0.6	0.5	0.154
N	**NR**	107.6	2.5	1.3	0.4	115.7	1.12	85	88	105	117	3.3	1.2	1	0.5	0.373
—	—	—	—	—	—	—	—	84	—	121	—	—	—	0.6	—	0.597
N	**NR**	120.22	2.87	3.1	0.6	134.7	2.82	86.5	91.5	118.5	136.5	5.3	2.9	1	0.5	0.854
N	**NR**	135.23	4.9	3.1	0.6	149.7	2.82	89	95.5	131	152	7.3	2.9	2	0.5	1.4
N	**NR**	163.65	5.69	3.5	0.6	182.9	3.1	91	105	159	185	8.4	3.1	2	0.5	3.59
—	—	—	—	—	—	—	—	93	—	187	—	—	—	2.5	—	6.76
N	**NR**	107.6	2.1	1.3	0.4	115.7	1.12	90	91	105	117	2.9	1.2	1	0.5	0.27
N	**NR**	117.6	3.3	1.3	0.4	125.7	1.12	91.5	94	113.5	127	4.1	1.2	1	0.5	0.536
—	—	—	—	—	—	—	—	89	—	126	—	—	—	0.6	—	0.626
N	**NR**	125.22	2.87	3.1	0.6	139.7	2.82	91.5	97	123.5	141.5	5.3	2.9	1	0.5	0.89
N	**NR**	145.24	4.9	3.1	0.6	159.7	2.82	94	103	141	162	7.3	2.9	2	0.5	1.79
N	**NR**	173.66	5.69	3.5	0.6	192.9	3.1	98	112	167	195	8.4	3.1	2.5	0.5	4.23

3) Sealed and shielded bearings are also available. 4) This dimension applies to sealed and shielded bearings.
5) Does not include bearings with snap rings.



Open type



Shielded type (ZZ)



Non-contact sealed type (LLB)

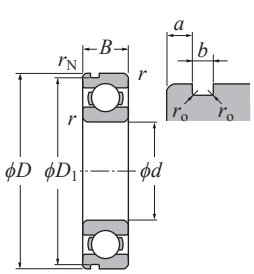


Contact sealed type (LLU)

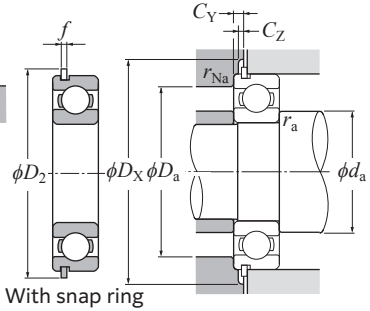
d 90–120 mm

Boundary dimensions mm					Basic load rating dynamic kN	Basic load rating static kN	Fatigue load limit kN	Factor	Allowable speed min^{-1} Grease Open type ZZ, LLB Z, LB	Allowable speed min^{-1} Oil Open type Z, LB	Allowable speed min^{-1} Oil LLU	Bearing number Open type	Bearing number Shielded or sealed type [2] (See drawings)		
d	*D*	*B*	$r_{s\,min}$ [1]	r_{Ns} Min.	C_r	C_{0r}	C_u	f_0							
90	115	13	1	0.5	21.1	19.7	1.30	16.1	5 400	6 300	3 000	**6818**	**ZZ**	**LLB**	**LLU**
	125	18	1.1	0.5	36.5	31.5	2.05	16.5	5 100	6 000	2 900	**6918**	**ZZ**	**LLB**	**LLU**
	140	16	1	—	37.0	33.5	2.07	16.5	4 700	5 600	—	**16018**	—	—	—
	140	24	1.5	0.5	64.5	49.5	3.45	15.6	4 700	5 600	2 800	**6018**	**ZZ**	**LLB**	**LLU**
	160	30	2	0.5	106	71.5	5.00	14.5	4 000	4 700	2 600	**6218**	**ZZ**	**LLB**	**LLU**
	190	43	3	0.5	158	107	7.10	13.3	3 600	4 200	2 400	**6318**	**ZZ**	**LLB**	**LLU**
95	120	13	1	0.5	21.4	20.5	1.31	16.1	5 000	5 900	2 800	**6819**	**ZZ**	**LLB**	**LLU**
	130	18	1.1	0.5	37.5	33.5	2.10	16.6	4 800	5 700	2 800	**6919**	**ZZ**	**LLB**	**LLU**
	145	16	1	—	38.0	35.0	2.13	16.5	4 500	5 300	—	**16019**	—	—	—
	145	24	1.5	0.5	67.0	54.0	3.55	15.8	4 500	5 300	2 600	**6019**	**ZZ**	**LLB**	**LLU**
	170	32	2.1	0.5	121	82.0	5.55	14.4	3 700	4 400	2 500	**6219**	**ZZ**	**LLB**	**LLU**
	200	45	3	0.5	169	119	7.65	13.3	3 300	3 900	2 300	**6319**	**ZZ**	**LLB**	**LLU**
100	125	13	1	0.5	21.7	21.2	1.33	16.0	4 800	5 600	2 700	**6820**	**ZZ**	**LLB**	**LLU**
	140	20	1.1	0.5	45.5	39.5	2.44	16.4	4 500	5 300	2 600	**6920**	**ZZ**	**LLB**	**LLU**
	150	16	1	—	39.0	36.5	2.18	16.4	4 200	5 000	—	**16020**	—	—	—
	150	24	1.5	0.5	66.5	54.0	3.50	15.9	4 200	5 000	2 600	**6020**	**ZZ**	**LLB**	**LLU**
	180	34	2.1	0.5	135	93.0	6.15	14.4	3 500	4 200	2 300	**6220**	**ZZ**	**LLB**	**LLU**
	215	47	3	—	192	141	8.75	13.2	3 200	3 700	2 200	**6320**	**ZZ**	**LLB**	**LLU**
105	130	13	1	0.5	22.0	22.0	1.35	15.9	4 600	5 400	2 500	**6821**	**ZZ**	—	**LLU**
	145	20	1.1	0.5	47.0	42.0	2.52	16.5	4 300	5 100	2 500	**6921**	**ZZ**	**LLB**	**LLU**
	160	18	1	—	57.5	50.5	3.00	16.3	4 000	4 700	—	**16021**	—	—	—
	160	26	2	0.5	80.5	65.5	4.15	15.8	4 000	4 700	2 400	**6021**	**ZZ**	**LLB**	**LLU**
	190	36	2.1	0.5	147	105	6.75	14.4	3 400	4 000	2 300	**6221**	**ZZ**	**LLB**	**LLU**
	225	49	3	—	204	153	9.35	13.2	3 000	3 600	2 100	**6321**	**ZZ**	—	**LLU**
110	140	16	1	0.5	27.5	28.2	1.68	16.0	4 300	5 100	2 400	**6822**	**ZZ**	**LLB**	**LLU**
	150	20	1.1	0.5	48.5	44.5	2.60	16.6	4 100	4 800	2 400	**6922**	**ZZ**	**LLB**	**LLU**
	170	19	1	—	63.5	56.5	3.25	16.3	3 800	4 500	—	**16022**	—	—	—
	170	28	2	0.5	91.0	73.0	4.55	15.6	3 800	4 500	2 300	**6022**	**ZZ**	**LLB**	**LLU**
	200	38	2.1	0.5	160	117	7.35	14.3	3 200	3 800	2 200	**6222**	**ZZ**	**LLB**	**LLU**
	240	50	3	—	227	179	10.5	13.1	2 900	3 400	1 900	**6322**	**ZZ**	**LLB**	**LLU**
120	150	16	1	0.5	32.0	33.0	1.89	16.0	4 000	4 700	2 200	**6824**	**ZZ**	**LLB**	**LLU**
	165	22	1.1	0.5	59.0	54.0	3.05	16.5	3 800	4 400	2 100	**6924**	**ZZ**	—	**LLU**
	180	19	1	—	70.0	63.5	3.50	16.4	3 500	4 100	—	**16024**	—	—	—
	180	28	2	0.5	94.0	79.5	4.65	15.9	3 500	4 100	2 100	**6024**	**ZZ**	**LLB**	**LLU**

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 type are also available.



With snap ring groove



With snap ring

Dynamic equivalent radial load

$P_r = XF_r + YF_a$

$\frac{f_0 \cdot F_a}{C_{0r}}$	*e*	$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
		X	*Y*	*X*	*Y*
0.172	0.19				2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

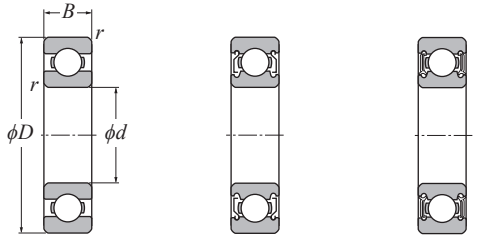
Static equivalent radial load

$P_{0r} = 0.6F_r + 0.5F_a$

When $P_{0r} < F_r$ use $P_{0r} = F_r$.

Bearing number Groove / Snap ring [3] (See drawings)		Snap ring groove dimensions mm				Snap ring dimensions mm		Installation-related dimensions mm								Mass [5] kg
		D_1 Max.	*a* Max.	*b* Min.	r_o Max.	D_2 Max.	*f* Max.	d_a Min.	d_a Max. [4]	D_a Max.	D_X (approx.)	C_Y Max.	C_Z Min.	r_{as} Max.	r_{Nas} Max.	(approx.)
N	**NR**	112.6	2.1	1.3	0.4	120.7	1.12	95	96	110	122	2.9	1.2	1	0.5	0.285
N	**NR**	122.6	3.3	1.3	0.4	130.7	1.12	96.5	99	118.5	132	4.1	1.2	1	0.5	0.554
—	—	—	—	—	—	—	—	95	—	135	—	—	—	1	—	0.848
N	**NR**	135.23	3.71	3.1	0.6	149.7	2.82	98	102	132	152	6.1	2.9	1.5	0.5	1.02
N	**NR**	155.22	4.9	3.1	0.6	169.7	2.82	99	109	151	172	7.3	2.9	2	0.5	2.15
N	**NR**	183.64	5.69	3.5	0.6	202.9	3.1	103	118	177	205	8.4	3.1	2.5	0.5	4.91
N	**NR**	117.6	2.1	1.3	0.4	125.7	1.12	100	101	115	127	2.9	1.2	1	0.5	0.3
N	**NR**	127.6	3.3	1.3	0.4	135.7	1.12	101.5	104	123.5	137	4.1	1.2	1	0.5	0.579
—	—	—	—	—	—	—	—	100	—	140	—	—	—	1	—	0.885
N	**NR**	140.23	3.71	3.1	0.6	154.7	2.82	103	109	137	157	6.1	2.9	1.5	0.5	1.08
N	**NR**	163.65	5.69	3.5	0.6	182.9	3.1	106	116	159	185	8.4	3.1	2	0.5	2.62
N	**NR**	193.65	5.69	3.5	0.6	212.9	3.1	108	125	187	215	8.4	3.1	2.5	0.5	5.67
N	**NR**	122.6	2.1	1.3	0.4	130.7	1.12	105	106	120	132	2.9	1.2	1	0.5	0.313
N	**NR**	137.6	3.3	1.9	0.6	145.7	1.7	106.5	110	133.5	147	4.7	1.7	1	0.5	0.785
—	—	—	—	—	—	—	—	105	—	145	—	—	—	1	—	0.91
N	**NR**	145.24	3.71	3.1	0.6	159.7	2.82	108	110	142	162	6.1	2.9	1.5	0.5	1.15
N	**NR**	173.66	5.69	3.5	0.6	192.9	3.1	111	122	169	195	8.4	3.1	2	0.5	3.14
N	**NR**	208.6	5.69	3.5	1	227.8	3.1	113	133	202	230	8.4	3.1	2.5	0.5	7
N	**NR**	127.6	2.1	1.3	0.4	135.7	1.12	110	111	125	137	2.9	1.2	1	0.5	0.33
N	**NR**	142.6	3.3	1.9	0.6	150.7	1.7	111.5	115	138.5	152	4.7	1.7	1	0.5	0.816
—	—	—	—	—	—	—	—	110	—	155	—	—	—	1	—	1.2
N	**NR**	155.22	3.71	3.1	0.6	169.7	2.82	114	119	151	172	6.1	2.9	2	0.5	1.59
N	**NR**	183.64	5.69	3.5	0.6	202.9	3.1	116	125	179	205	8.4	3.1	2	0.5	3.7
N	**NR**	217.0	6.5	4.5	1	237	3.5	118	134	212	239	9.6	3.5	2.5	0.5	8.05
N	**NR**	137.6	2.5	1.9	0.6	145.7	1.7	115	118	135	147	3.9	1.7	1	0.5	0.515
N	**NR**	147.6	3.3	1.9	0.6	155.7	1.7	116.5	120	143.5	157	4.7	1.7	1	0.5	0.849
—	—	—	—	—	—	—	—	115	—	165	—	—	—	1	—	1.46
N	**NR**	163.65	3.71	3.5	0.6	182.9	3.1	119	126	161	185	6.4	3.1	2	0.5	1.96
N	**NR**	193.65	5.69	3.5	0.6	212.9	3.1	121	132	189	215	8.4	3.1	2	0.5	4.36
N	**NR**	232.0	6.5	4.5	1	252	3.5	123	149	227	254	9.6	3.5	2.5	0.5	9.54
N	**NR**	147.6	2.5	1.9	0.6	155.7	1.7	125	128	145	157	3.9	1.7	1	0.5	0.555
N	**NR**	161.8	3.7	1.9	0.6	171.5	1.7	126.5	132	158.5	173	5.1	1.7	1	0.5	1.15
—	—	—	—	—	—	—	—	125	—	175	—	—	—	1	—	1.56
N	**NR**	173.66	3.71	3.5	0.6	192.9	3.1	129	136	171	195	6.4	3.1	2	0.5	2.07

3) Sealed and shielded bearings are also available. 4) This dimension applies to sealed and shielded bearings.
5) Does not include bearings with snap rings.

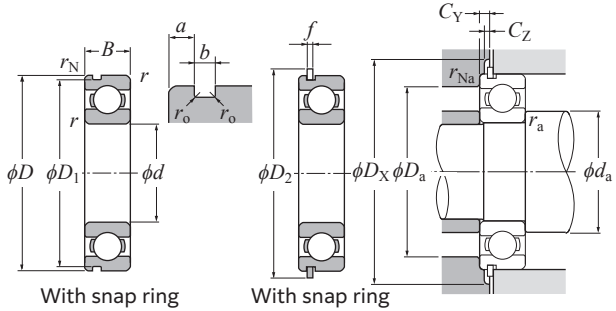


Open type | Shielded type (ZZ) | Contact sealed type (LLU)

d 120–170 mm

Boundary dimensions mm					Basic load rating dynamic kN	static kN	Fatigue load limit kN	Factor	Allowable speed min^{-1} Grease	Oil		Bearing number Open type	Shielded or sealed type [2] (See drawings)	
									Open type	Open type	LLU			
d	*D*	*B*	$r_{s\,min}$ [1]	r_{Ns} Min.	C_r	C_{0r}	C_u	f_0	ZZ, Z	Z	LU			
120	215	40	2.1	—	172	131	7.95	14.4	2 900	3 400	2 000	**6224**	**ZZ**	**LLU**
	260	55	3	—	229	185	10.5	13.5	2 600	3 100	1 700	**6324**	**ZZ**	**LLU**
130	165	18	1.1	0.5	41.0	41.0	2.25	16.1	3 700	4 300	2 000	**6826**	**ZZ**	**LLU**
	180	24	1.5	0.5	72.0	67.5	3.65	16.5	3 500	4 100	1 900	**6926**	**ZZ**	**LLU**
	200	22	1.1	—	88.5	79.5	4.25	16.2	3 200	3 800	—	**16026**	—	—
	200	33	2	0.5	118	101	5.70	15.8	3 200	3 800	1 900	**6026**	**ZZ**	**LLU**
	230	40	3	—	185	146	8.55	14.5	2 700	3 100	1 800	**6226**	**ZZ**	**LLU**
	280	58	4	—	254	214	11.7	13.6	2 400	2 800	—	**6326**	—	—
140	175	18	1.1	0.5	42.5	44.5	2.35	16.0	3 400	4 000	1 900	**6828**	**ZZ**	**LLU**
	190	24	1.5	0.5	74.0	71.5	3.70	16.6	3 200	3 800	1 800	**6928**	**ZZ**	**LLU**
	210	22	1.1	—	91.0	85.0	4.35	16.4	3 000	3 500	—	**16028**	—	—
	210	33	2	—	122	109	5.85	15.9	3 000	3 500	1 800	**6028**	**ZZ**	**LLU**
	250	42	3	—	184	150	8.40	14.8	2 500	2 900	1 600	**6228**	**ZZ**	**LLU**
	300	62	4	—	280	246	13.0	13.6	2 200	2 600	—	**6328**	—	—
150	190	20	1.1	0.5	53.0	55.0	2.80	16.1	3 100	3 700	1 700	**6830**	**ZZ**	**LLU**
	210	28	2	—	94.0	90.5	4.55	16.5	3 000	3 500	1 700	**6930**	**ZZ**	**LLU**
	225	24	1.1	—	107	101	5.00	16.4	2 800	3 200	—	**16030**	—	—
	225	35	2.1	—	139	126	6.55	15.9	2 800	3 200	1 700	**6030**	**ZZ**	**LLU**
	270	45	3	—	195	168	9.05	15.1	2 300	2 700	1 500	**6230**	**ZZ**	**LLU**
	320	65	4	—	305	284	14.5	13.9	2 100	2 400	—	**6330**	—	—
160	200	20	1.1	0.5	53.5	57.0	2.82	16.1	2 900	3 400	1 600	**6832**	**ZZ**	**LLU**
	220	28	2	—	96.5	96.0	4.65	16.6	2 800	3 300	1 600	**6932**	**ZZ**	**LLU**
	240	25	1.5	—	109	108	5.10	16.5	2 600	3 000	—	**16032**	—	—
	240	38	2.1	—	158	144	7.30	15.9	2 600	3 000	1 600	**6032**	**ZZ**	**LLU**
	290	48	3	—	205	186	9.45	15.4	2 100	2 500	—	**6232**	—	—
	340	68	4	—	310	286	14.2	13.9	1 900	2 300	—	**6332**	—	—
170	215	22	1.1	—	66.5	70.5	3.35	16.1	2 700	3 200	—	**6834**	**ZZ**	—
	230	28	2	—	95.0	95.5	4.50	16.5	2 600	3 100	—	**6934**	**ZZ**	—
	260	28	1.5	—	131	128	5.90	16.4	2 400	2 800	—	**16034**	—	—
	260	42	2.1	—	187	172	8.55	15.8	2 400	2 800	—	**6034**	**ZZ**	—
	310	52	4	—	235	223	11.1	15.3	2 000	2 400	—	**6234**	—	—
	360	72	4	—	360	355	17.0	13.6	1 800	2 100	—	**6334**	—	—

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 type are also available.



With snap ring groove | With snap ring

Dynamic equivalent radial load

$P_r = XF_r + YF_a$

$\frac{f_0 F_a}{C_{0r}}$	*e*	$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
		X	*Y*	*X*	*Y*
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

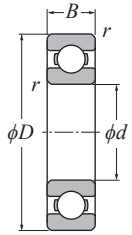
Static equivalent radial load

$P_{0r} = 0.6F_r + 0.5F_a$

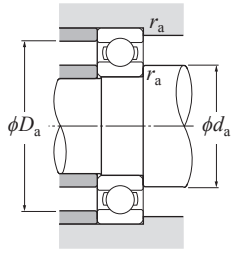
When $P_{0r} < F_r$ use $P_{0r} = F_r$.

Bearing number Groove / Snap ring [3] (See drawings)		Snap ring groove dimensions mm				Snap ring dimensions mm		Installation-related dimensions mm								Mass [5] kg
		D_1 Max.	*a* Max.	*b* Min.	r_o Max.	D_2 Max.	*f* Max.	d_a Min.	d_a Max. [4]	D_a Max.	D_X (approx.)	C_Y Max.	C_Z Min.	r_{as} Max.	r_{Nas} Max.	(approx.)
N	**NR**	217.0	6.5	4.5	1	227.8	3.1	131	143	204	230	9.2	3.1	2	0.5	5.15
—	—	—	—	—	—	—	—	133	162	247	—	—	—	2.5	—	12.4
N	**NR**	161.8	3.3	1.9	0.6	171.5	1.7	136.5	139.5	158.5	173	4.7	1.7	1	0.5	0.8
N	**NR**	176.8	3.7	1.9	0.6	186.5	1.7	138	144	172	188	5.1	1.7	1.5	0.5	1.52
—	—	—			—	—	—	136.5	—	193.5	—	—	—	1	—	2.31
N	**NR**	193.65	5.69	3.5	0.6	212.9	3.1	139	148	191	215	8.4	3.1	2	0.5	3.16
N	**NR**	222.0	6.5	4.5	1	242	3.5	143	158	217	244	9.6	3.5	2.5	0.5	5.82
—	—	—	—	—	—	—	—	146	—	264	—	—	—	3	—	15.3
N	**NR**	171.8	3.3	1.9	0.6	181.5	1.7	146.5	150	168.5	183	4.7	1.7	1	0.5	0.85
N	**NR**	186.8	3.7	1.9	0.6	196.5	1.7	148	154	182	198	5.1	1.7	1.5	0.5	1.62
—	—	—	—	—	—	—	—	146.5	—	203.5	—	—	—	1	—	2.45
—	—	—	—	—	—	—	—	149	158	201	—	—	—	2	—	3.35
N	**NR**	242.0	6.5	4.5	1	262	3.5	153	173	237	264	9.6	3.5	2.5	0.5	7.57
—	—	—	—	—	—	—	—	156	—	284	—	—	—	3	—	18.5
N	**NR**	186.8	3.3	1.9	0.6	196.5	1.7	156.5	161	183.5	198	4.7	1.7	1	0.5	1.16
—	—	—	—	—	—	—	—	159	167	201	—	—	—	2	—	2.47
—	—	—	—	—	—	—	—	156.5	—	218.5	—	—	—	1	—	3.07
—	—	—	—	—	—	—	—	161	169	214	—	—	—	2	—	4.08
—	—	—	—	—	—	—	—	163	188	257	—	—	—	2.5	—	9.41
—	—	—	—	—	—	—	—	166	—	304	—	—	—	3	—	22
N	**NR**	196.8	3.3	1.9	0.6	206.5	1.7	166.5	171	193.5	208	4.7	1.7	1	0.5	1.23
—	—	—	—	—	—	—	—	169	178	211	—	—	—	2	—	2.61
—	—	—	—	—	—	—	—	168	—	232	—	—	—	1.5	—	3.64
—	—	—	—	—	—	—	—	171	183	229	—	—	—	2	—	5.05
—	—	—	—	—	—	—	—	173	—	277	—	—	—	2.5	—	11.7
—	—	—	—	—	—	—	—	176	—	324	—	—	—	3	—	26
—	—	—	—	—	—	—	—	176.5	182	208.5	—	—	—	1	—	1.63
—	—	—	—	—	—	—	—	179	188	221	—	—	—	2	—	2.74
—	—	—	—	—	—	—	—	178	—	252	—	—	—	1.5	—	4.93
—	—	—	—	—	—	—	—	181	196	249	—	—	—	2	—	6.76
—	—	—	—	—	—	—	—	186	—	294	—	—	—	3	—	14.5
—	—	—	—	—	—	—	—	186	—	344	—	—	—	3	—	30.7

3) Sealed and shielded bearings are also available. 4) This dimension applies to sealed and shielded bearings.
5) Does not include bearings with snap rings.



Open type



d 180–260 mm

Boundary dimensions mm				Basic load rating kN dynamic	kN static	Fatigue load limit kN	Factor	Allowable speed min^{-1} Grease lubrication	Allowable speed min^{-1} Oil lubrication	Bearing number
d	D	B	$r_{s\,min}$[1]	C_r	C_{0r}	C_u	f_0			Open type
180	225	22	1.1	67.0	73.0	3.40	16.1	2 600	3 000	**6836**
	250	33	2	122	119	5.45	16.5	2 400	2 900	**6936**
	280	31	2	129	134	5.85	16.5	2 300	2 700	**16036**
	280	46	2.1	210	199	9.70	15.6	2 300	2 700	**6036**
	320	52	4	252	241	11.9	15.1	1 900	2 200	**6236**
	380	75	4	390	405	19.0	13.9	1 700	2 000	**6336**
190	240	24	1.5	81.0	88.0	4.00	16.1	2 400	2 900	**6838**
	260	33	2	125	127	5.65	16.6	2 300	2 700	**6938**
	290	31	2	149	156	6.70	16.6	2 100	2 500	**16038**
	290	46	2.1	218	215	10.1	15.8	2 100	2 500	**6038**
	340	55	4	282	281	13.5	15.0	1 800	2 100	**6238**
	400	78	5	395	415	18.9	14.1	1 600	1 900	**6338**
200	250	24	1.5	82.0	91.5	4.05	16.1	2 300	2 700	**6840**
	280	38	2.1	174	168	7.45	16.2	2 200	2 600	**6940**
	310	34	2	157	160	6.65	16.6	2 000	2 400	**16040**
	310	51	2.1	241	243	11.2	15.6	2 000	2 400	**6040**
	360	58	4	298	310	14.4	15.2	1 700	2 000	**6240**
	420	80	5	455	500	22.3	13.8	1 500	1 800	**6340**
220	270	24	1.5	84.5	98.0	4.15	16.0	2 100	2 400	**6844**
	300	38	2.1	178	180	7.55	16.4	2 000	2 300	**6944**
	340	37	2.1	200	216	8.65	16.5	1 800	2 200	**16044**
	340	56	3	267	289	12.5	15.8	1 800	2 200	**6044**
	400	65	4	330	365	15.8	15.3	1 500	1 800	**6244**
	460	88	5	455	520	22.0	14.3	1 400	1 600	**6344**
240	300	28	2	94.0	112	4.55	15.9	1 900	2 200	**6848**
	320	38	2.1	188	203	8.05	16.5	1 800	2 100	**6948**
	360	37	2.1	197	217	8.30	16.5	1 700	2 000	**16048**
	360	56	3	276	310	12.8	16.0	1 700	2 000	**6048**
260	320	28	2	96.5	120	4.65	15.8	1 700	2 000	**6852**
	360	46	2.1	245	280	10.9	16.3	1 600	1 900	**6952**
	400	44	3	252	299	11.1	16.5	1 500	1 800	**16052**
	400	65	4	325	375	15.1	15.8	1 500	1 800	**6052**

1) Smallest allowable dimension for chamfer dimension r.

Dynamic equivalent radial load

$P_r = XF_r + YF_a$

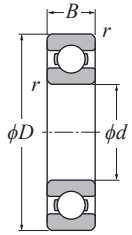
$\frac{f_0 \cdot F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

Static equivalent radial load

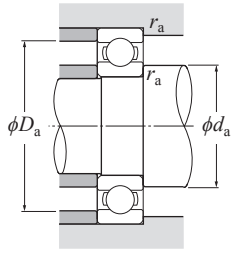
$P_{0r} = 0.6F_r + 0.5F_a$

When $P_{0r} < F_r$ use $P_{0r} = F_r$.

Installation-related dimensions mm d_a Min.	D_a Max.	r_{as} Max.	Mass kg (approx.)
186.5	218.5	1	2.03
189	241	2	4.76
189	271	2	6.49
191	269	2	8.8
196	304	3	15.1
196	364	3	35.6
198	232	1.5	2.62
199	251	2	4.98
199	281	2	6.77
201	279	2	9.18
206	324	3	18.2
210	380	4	41
208	242	1.5	2.73
211	269	2	7.1
209	301	2	8.68
211	299	2	11.9
216	344	3	21.6
220	400	4	46.3
228	262	1.5	3
231	289	2	7.69
231	329	2	11.3
233	327	2.5	15.7
236	384	3	30.2
240	440	4	60.8
249	291	2	4.6
251	309	2	8.28
251	349	2	12.1
253	347	2.5	16.8
269	311	2	5
271	349	2	13.9
273	387	2.5	18.5
276	384	3	25



Open type



d 280–440 mm

Boundary dimensions mm				Basic load rating dynamic kN	Basic load rating static kN	Fatigue load limit kN	Factor	Allowable speed min^{-1} Grease lubrication	Allowable speed min^{-1} Oil lubrication	Bearing number
d	*D*	*B*	$r_{s\,min}$ [1]	C_r	C_{0r}	C_u	f_0			Open type
280	350	33	2	151	177	6.65	16.1	1 600	1 900	**6856**
	380	46	2.1	252	299	11.1	16.5	1 500	1 800	**6956**
	420	44	3	257	315	11.3	16.5	1 400	1 600	**16056**
	420	65	4	360	420	16.9	15.5	1 400	1 600	**6056**
300	380	38	2.1	179	210	7.60	16.1	1 500	1 700	**6860**
	420	56	3	305	375	13.7	16.2	1 400	1 600	**6960**
	460	50	4	325	410	14.5	16.3	1 300	1 500	**16060**
	460	74	4	395	480	18.4	15.6	1 300	1 500	**6060**
320	400	38	2.1	186	228	7.95	16.1	1 400	1 600	**6864**
	440	56	3	315	405	14.1	16.4	1 300	1 500	**6964**
	480	50	4	335	440	14.9	16.4	1 200	1 400	**16064**
	480	74	4	410	530	19.3	15.7	1 200	1 400	**6064**
340	420	38	2.1	189	236	8.05	16.0	1 300	1 500	**6868**
	460	56	3	325	430	14.4	16.5	1 200	1 400	**6968**
	520	57	4	380	515	17.0	16.3	1 100	1 300	**16068**
	520	82	5	465	610	21.9	15.6	1 100	1 300	**6068**
360	440	38	2.1	207	258	8.55	16.0	1 200	1 400	**6872**
	480	56	3	330	455	14.8	16.5	1 100	1 300	**6972**
	540	57	4	390	550	17.6	16.4	1 100	1 200	**16072**
	540	82	5	485	670	23.0	15.7	1 100	1 200	**6072**
380	480	46	2.1	256	340	10.8	16.1	1 100	1 300	**6876**
	520	65	4	360	510	15.9	16.6	1 100	1 200	**6976**
	560	82	5	505	725	24.1	15.9	990	1 200	**6076**
400	500	46	2.1	251	340	10.6	16.0	1 100	1 200	**6880**
	540	65	4	370	535	16.4	16.5	990	1 200	**6980**
	600	90	5	565	825	26.9	15.7	930	1 100	**6080**
420	520	46	2.1	288	405	12.4	16.1	1 000	1 200	**6884**
	560	65	4	380	560	16.8	16.4	940	1 100	**6984**
	620	90	5	590	895	28.3	15.8	880	1 000	**6084**
440	540	46	2.1	292	420	12.6	16.0	950	1 100	**6888**
	600	74	4	405	615	18.0	16.4	890	1 000	**6988**

1) Smallest allowable dimension for chamfer dimension *r*.

Dynamic equivalent radial load

$P_r = XF_r + YF_a$

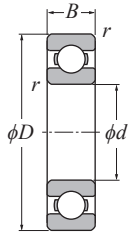
$\frac{f_0 \cdot F_a}{C_{0r}}$	*e*	$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
		X	*Y*	*X*	*Y*
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

Static equivalent radial load

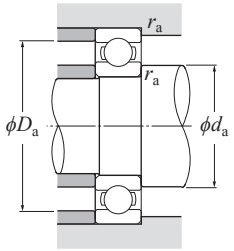
$P_{0r} = 0.6F_r + 0.5F_a$

When $P_{0r} < F_r$ use $P_{0r} = F_r$.

Installation-related dimensions mm			Mass kg
d_a Min.	D_a Max.	r_{as} Max.	(approx.)
289	341	2	7.4
291	369	2	14.8
293	407	2.5	23
296	404	3	31
311	369	2	10.5
313	407	2.5	23.5
316	444	3	32.5
316	444	3	43.8
331	389	2	10.9
333	427	2.5	24.8
336	464	3	34.2
336	464	3	46.1
351	409	2	11.5
353	447	2.5	26.2
356	504	3	47.1
360	500	4	61.8
371	429	2	12.3
373	467	2.5	27.5
376	524	3	49.3
380	520	4	64.7
391	469	2	19.7
396	504	3	39.8
400	540	4	67.5
411	489	2	20.6
416	524	3	41.6
420	580	4	87.6
431	509	2	21.6
436	544	3	43.4
440	600	4	91.1
451	529	2	22.5
456	584	3	60



Open type



d 460–600 mm

Boundary dimensions mm				Basic load rating kN dynamic	Basic load rating kN static	Fatigue load limit kN	Factor	Allowable speed min^{-1} Grease lubrication	Allowable speed min^{-1} Oil lubrication	Bearing number
d	D	B	$r_{s\,min}$ [1]	C_r	C_{0r}	C_u	f_0			Open type
460	580	56	3	350	515	15.1	16.2	900	1 100	**6892**
	620	74	4	415	645	18.5	16.4	850	1 000	**6992**
480	600	56	3	355	540	15.4	16.1	860	1 000	**6896**
	650	78	5	480	770	21.5	16.5	810	950	**6996**
500	620	56	3	360	560	15.7	16.1	820	970	**68/500**
	670	78	5	490	805	22.2	16.5	770	910	**69/500**
530	650	56	3	365	580	15.9	16.0	770	900	**68/530**
560	680	56	3	370	600	16.1	16.0	710	840	**68/560**
600	730	60	3	415	705	18.2	16.0	660	780	**68/600**

1) Smallest allowable dimension for chamfer dimension r.

Dynamic equivalent radial load

$P_r = XF_r + YF_a$

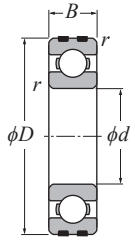
$\frac{f_0 \cdot F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19				2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

Static equivalent radial load

$P_{0r} = 0.6F_r + 0.5F_a$

When $P_{0r} < F_r$ use $P_{0r} = F_r$.

Installation-related dimensions mm			Mass kg
d_a Min.	D_a Max.	r_{as} Max.	(approx.)
473	567	2.5	34.8
476	604	3	62.2
493	587	2.5	36.2
500	630	4	73
513	607	2.5	37.5
520	650	4	75.5
543	637	2.5	39.5
573	667	2.5	41.5
613	717	2.5	51.7



Open type



Shielded type (ZZ)



Non-contact sealed type (LLB)



Low torque sealed type (LLH)

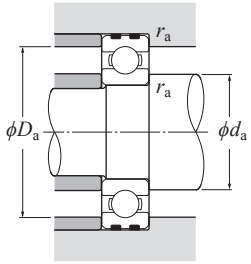


Contact sealed type (LLU)

d 10–50 mm

Boundary dimensions mm				Basic load rating kN		Fatigue load limit kN	Allowable load kN	Factor	Allowable speed min^{-1} Grease lubrication		Allowable speed min^{-1} Oil lubrication		Bearing number	
				dynamic	static				Open type ZZ, LLB	Shielded or sealed type Z, LB	Open type Z, LB		Open type	Shielded or sealed type [2] (See drawings)
d	*D*	*B*	$r_{s\,min}$ [1]	C_r	C_{0r}	C_u	C_p	f_0			LLH	LLU		
	26	8	0.3	5.05	1.96	0.138	1.65	12.4	29 000	34 000	25 000	21 000	EC-6000	ZZ LLB LLH LLU
10	30	9	0.6	5.65	2.39	0.182	2.39	13.2	25 000	30 000	21 000	18 000	EC-6200	ZZ LLB LLH LLU
	35	11	0.6	9.10	3.50	0.273	3.45	11.4	23 000	27 000	20 000	16 000	EC-6300	ZZ LLB LLH LLU
	28	8	0.3	5.65	2.39	0.182	1.78	13.2	26 000	30 000	21 000	18 000	EC-6001JRX	ZZ LLB LLH LLU
12	32	10	0.6	6.75	2.75	0.214	2.29	12.7	22 000	26 000	20 000	16 000	EC-6201	ZZ LLB LLH LLU
	37	12	1	10.8	4.20	0.325	3.65	11.1	20 000	24 000	19 000	15 000	EC-6301	ZZ LLB LLH LLU
	32	9	0.3	6.20	2.83	0.199	2.83	13.9	22 000	26 000	18 000	15 000	EC-6002	ZZ LLB LLH LLU
15	35	11	0.6	8.60	3.60	0.279	2.78	12.7	19 000	23 000	18 000	15 000	EC-6202	ZZ LLB LLH LLU
	42	13	1	12.7	5.45	0.425	4.40	12.3	17 000	21 000	15 000	12 000	EC-6302	ZZ LLB LLH LLU
	35	10	0.3	7.55	3.35	0.263	2.88	13.6	20 000	24 000	16 000	14 000	EC-6003	ZZ LLB LLH LLU
17	40	12	0.6	10.6	4.60	0.243	3.45	12.8	18 000	21 000	15 000	12 000	EC-6203	ZZ LLB LLH LLU
	47	14	1	15.0	6.55	0.355	6.55	12.2	16 000	19 000	14 000	11 000	EC-6303	ZZ LLB LLH LLU
	42	12	0.6	10.4	5.05	0.355	5.05	13.9	18 000	21 000	13 000	11 000	EC-6004	ZZ LLB LLH LLU
20	47	14	1	14.2	6.65	0.505	5.05	13.2	16 000	18 000	12 000	10 000	EC-6204	ZZ LLB LLH LLU
	52	15	1.1	17.6	7.90	0.615	7.90	12.4	14 000	17 000	12 000	10 000	EC-6304	ZZ LLB LLH LLU
	47	12	0.6	11.2	5.85	0.380	5.85	14.5	15 000	18 000	11 000	9 400	EC-6005	ZZ LLB LLH LLU
25	52	15	1	15.5	7.85	0.550	6.55	13.9	13 000	15 000	11 000	8 900	EC-6205	ZZ LLB LLH LLU
	62	17	1.1	23.5	10.9	0.855	10.9	12.6	12 000	14 000	9 700	8 100	EC-6305	ZZ LLB LLH LLU
	55	13	1	14.7	8.30	0.650	8.30	14.8	13 000	15 000	9 200	7 700	EC-6006	ZZ LLB LLH LLU
30	62	16	1	21.6	11.3	0.795	9.85	13.8	11 000	13 000	8 800	7 300	EC-6206	ZZ LLB LLH LLU
	72	19	1.1	29.5	15.0	1.14	15.0	13.3	10 000	12 000	7 900	6 600	EC-6306	ZZ LLB LLH LLU
	62	14	1	17.7	10.3	0.805	10.3	14.8	12 000	14 000	8 200	6 800	EC-6007	ZZ LLB LLH LLU
35	72	17	1.1	28.4	15.3	1.09	14.5	13.8	9 800	11 000	7 600	6 300	EC-6207	ZZ LLB LLH LLU
	80	21	1.5	37.0	19.1	1.47	18.5	13.1	8 800	10 000	7 300	6 000	EC-6307	ZZ LLB LLH LLU
	68	15	1	18.6	11.5	0.890	11.5	15.2	10 000	12 000	7 300	6 100	EC-6008	ZZ LLB LLH LLU
40	80	18	1.1	32.5	17.8	1.24	17.5	14.0	8 700	10 000	6 700	5 600	EC-6208	ZZ LLB LLH LLU
	90	23	1.5	45.0	24.0	1.83	23.4	13.2	7 800	9 200	6 400	5 300	EC-6308	ZZ LLB LLH LLU
	75	16	1	23.2	15.1	1.16	15.1	15.3	9 200	11 000	6 500	5 400	EC-6009	ZZ LLB LLH LLU
45	85	19	1.1	36.0	20.4	1.60	20.3	14.1	7 800	9 200	6 200	5 200	EC-6209	ZZ LLB LLH LLU
	100	25	1.5	58.5	32.0	2.50	27.4	13.1	7 000	8 200	5 600	4 700	EC-6309	ZZ LLB LLH LLU
	80	16	1	24.2	16.6	1.24	16.6	15.5	8 400	9 800	6 000	5 000	EC-6010	ZZ LLB LLH LLU
50	90	20	1.1	39.0	23.2	1.82	17.7	14.4	7 100	8 300	5 700	4 700	EC-6210	ZZ LLB LLH LLU
	110	27	2	68.5	38.5	2.99	33.0	13.2	6 400	7 500	5 000	4 200	EC-6310	ZZ LLB LLH LLU

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 type are also available.



Dynamic equivalent radial load

$P_r = XF_r + YF_a$

$\frac{f_0 \cdot F_a}{C_{0r}}$	*e*	$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
		X	*Y*	*X*	*Y*
0.172	0.19				2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

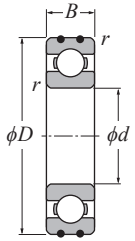
Static equivalent radial load

$P_{0r} = 0.6F_r + 0.5F_a$

When $P_{0r} < F_r$ use $P_{0r} = F_r$.

Installation-related dimensions mm				Mass kg
d_a Min.	d_a Max. [3]	D_a Max.	r_{as} Max.	Open type (approx.)
12	13.5	24	0.3	0.019
14	16	26	0.6	0.031
14	17	31	0.6	0.051
14	16	26	0.3	0.021
16	17.5	28	0.6	0.036
17	18.5	32	1	0.058
17	19	30	0.3	0.029
19	20.5	31	0.6	0.043
20	23	37	1	0.079
19	21	33	0.3	0.037
21	23	36	0.6	0.062
22	25	42	1	0.11
24	26	38	0.6	0.066
25	28	42	1	0.101
26.5	28.5	45.5	1	0.139
29	30.5	43	0.6	0.075
30	32	47	1	0.122
31.5	35	55.5	1	0.223
35	37	50	1	0.11
35	39	57	1	0.191
36.5	43	65.5	1	0.334
40	42	57	1	0.148
41.5	45	65.5	1	0.277
43	47	72	1.5	0.44
45	47	63	1	0.183
46.5	51	73.5	1	0.352
48	54	82	1.5	0.609
50	52.5	70	1	0.233
51.5	55.5	78.5	1	0.391
53	61.5	92	1.5	0.80
55	57.5	75	1	0.246
56.5	60	83.5	1	0.444
59	68.5	101	2	1.03

3) This dimension applies to sealed and shielded bearings.



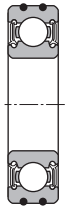
Open type



Shielded type (ZZ)



Non-contact sealed type (LLB)



Low torque sealed type (LLH)

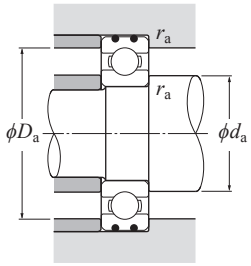


Contact sealed type (LLU)

d 10–45 mm

Boundary dimensions mm				Basic load rating kN		Fatigue load limit kN	Allowable load kN	Factor	Allowable speed min^{-1} Grease Open type ZZ, LLB	Oil Open type Z, LB	LLH	LLU	Bearing number Open type	Shielded or sealed type [2] (See drawings)			
d	*D*	*B*	$r_{s\,min}$ [1]	C_r dynamic	C_{0r} static	C_u	C_p	f_0	Z, LB		LH	LU					
10	26	8	0.3	5.05	1.96	0.138	1.53	12.4	29 000	34 000	25 000	21 000	**AC-6000**	ZZ	LLB	LLH	LLU
	30	9	0.6	5.65	2.39	0.182	2.39	13.2	25 000	30 000	21 000	18 000	**AC-6200**	ZZ	LLB	LLH	LLU
	35	11	0.6	9.10	3.50	0.273	2.98	11.4	23 000	27 000	20 000	16 000	**AC-6300**	ZZ	LLB	LLH	LLU
12	28	8	0.3	5.65	2.39	0.182	1.73	13.2	26 000	30 000	21 000	18 000	**AC-6001JRX**	ZZ	LLB	LLH	LLU
	32	10	0.6	6.75	2.75	0.214	2.75	12.7	22 000	26 000	20 000	16 000	**AC-6201**	ZZ	LLB	LLH	LLU
	37	12	1	10.8	4.20	0.325	3.00	11.1	20 000	24 000	19 000	15 000	**AC-6301**	ZZ	LLB	LLH	LLU
15	32	9	0.3	6.20	2.83	0.199	2.43	13.9	22 000	26 000	18 000	15 000	**AC-6002**	ZZ	LLB	LLH	LLU
	35	11	0.6	8.60	3.60	0.279	2.71	12.7	19 000	23 000	18 000	15 000	**AC-6202**	ZZ	LLB	LLH	LLU
	42	13	1	12.7	5.45	0.425	3.90	12.3	17 000	21 000	15 000	12 000	**AC-6302**	ZZ	LLB	LLH	LLU
17	35	10	0.3	7.55	3.35	0.263	2.44	13.6	20 000	24 000	16 000	14 000	**AC-6003**	ZZ	LLB	LLH	LLU
	40	12	0.6	10.6	4.60	0.243	3.50	12.8	18 000	21 000	15 000	12 000	**AC-6203**	ZZ	LLB	LLH	LLU
	47	14	1	15.0	6.55	0.355	5.10	12.2	16 000	19 000	14 000	11 000	**AC-6303**	ZZ	LLB	LLH	LLU
20	42	12	0.6	10.4	5.05	0.355	3.80	13.9	18 000	21 000	13 000	11 000	**AC-6004**	ZZ	LLB	LLH	LLU
	47	14	1	14.2	6.65	0.505	4.20	13.2	16 000	18 000	12 000	10 000	**AC-6204**	ZZ	LLB	LLH	LLU
	52	15	1.1	17.6	7.90	0.615	5.40	12.4	14 000	17 000	12 000	10 000	**AC-6304**	ZZ	LLB	LLH	LLU
25	47	12	0.6	11.2	5.85	0.380	4.50	14.5	15 000	18 000	11 000	9 400	**AC-6005**	ZZ	LLB	LLH	LLU
	52	15	1	15.5	7.85	0.550	5.80	13.9	13 000	15 000	11 000	8 900	**AC-6205**	ZZ	LLB	LLH	LLU
	62	17	1.1	23.5	10.9	0.855	7.30	12.6	12 000	14 000	9 700	8 100	**AC-6305**	ZZ	LLB	LLH	LLU
30	55	13	1	14.7	8.30	0.650	6.85	14.8	13 000	15 000	9 200	7 700	**AC-6006**	ZZ	LLB	LLH	LLU
	62	16	1	21.6	11.3	0.795	7.55	13.8	11 000	13 000	8 800	7 300	**AC-6206**	ZZ	LLB	LLH	LLU
	72	19	1.1	29.5	15.0	1.14	11.0	13.3	10 000	12 000	7 900	6 600	**AC-6306**	ZZ	LLB	LLH	LLU
35	62	14	1	17.7	10.3	0.805	8.95	14.8	12 000	14 000	8 200	6 800	**AC-6007**	ZZ	LLB	LLH	LLU
	72	17	1.1	28.4	15.3	1.09	9.65	13.8	9 800	11 000	7 600	6 300	**AC-6207**	ZZ	LLB	LLH	LLU
	80	21	1.5	37.0	19.1	1.47	13.4	13.1	8 800	10 000	7 300	6 000	**AC-6307**	ZZ	LLB	LLH	LLU
40	80	18	1.1	32.5	17.8	1.24	11.6	14.0	8 700	10 000	6 700	5 600	**AC-6208**	ZZ	LLB	LLH	LLU
	90	23	1.5	45.0	24.0	1.83	16.6	13.2	7 800	9 200	6 400	5 300	**AC-6308**	ZZ	LLB	LLH	LLU
45	85	19	1.1	36.0	20.4	1.60	14.7	14.1	7 800	9 200	6 200	5 200	**AC-6209**	ZZ	LLB	LLH	LLU
	100	25	1.5	58.5	32.0	2.50	21.8	13.1	7 000	8 200	5 600	4 700	**AC-6309**	ZZ	LLB	LLH	LLU

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 type are also available.



Dynamic equivalent radial load

$P_r = XF_r + YF_a$

$\frac{f_0 \cdot F_a}{C_{0r}}$	*e*	$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
		X	*Y*	*X*	*Y*
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

Static equivalent radial load

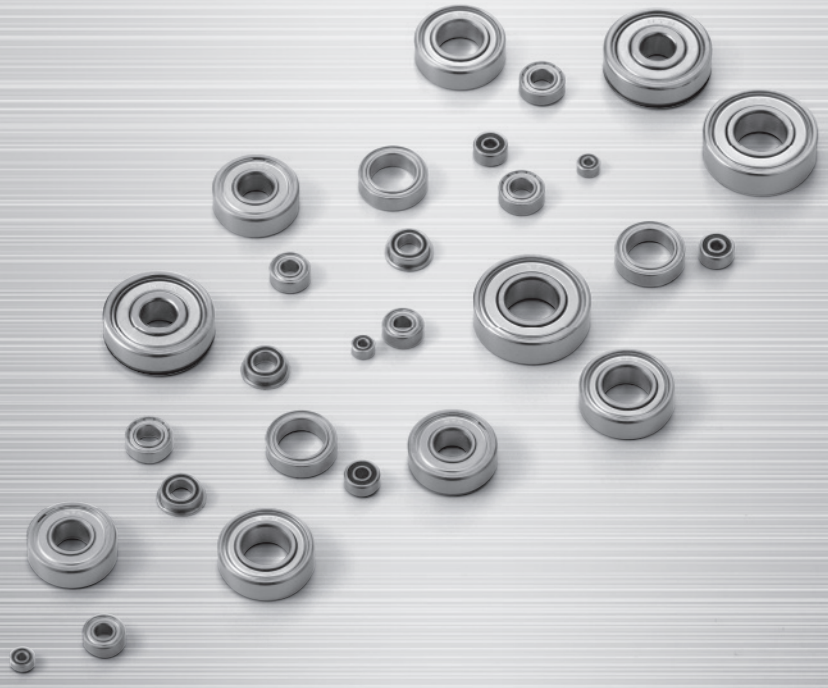
$P_{0r} = 0.6F_r + 0.5F_a$

When $P_{0r} < F_r$ use $P_{0r} = F_r$.

Installation-related dimensions mm				Mass kg	
d_a Min.	d_a Max. [3]	D_a Max.	r_{as} Max.	Open type (approx.)	
12	13.5	24	0.3	0.019	
14	16	26	0.6	0.031	
14	17	31	0.6	0.051	
14	16	26	0.3	0.021	
16	17.5	28	0.6	0.036	
17	18.5	32	1	0.058	
17	19	30	0.3	0.029	
19	20.5	31	0.6	0.043	
20	23	37	1	0.079	
19	21	33	0.3	0.037	
21	23	36	0.6	0.062	
22	25	42	1	0.11	
24	26	38	0.6	0.066	
25	28	42	1	0.101	
26.5	28.5	45.5	1	0.139	
29	30.5	43	0.6	0.075	
30	32	47	1	0.122	
31.5	35	55.5	1	0.223	
35	37	50	1	0.11	
35	39	57	1	0.191	
36.5	43	65.5	1	0.334	
40	42	57	1	0.148	
41.5	45	65.5	1	0.277	
43	47	72	1.5	0.44	
46.5	51	73.5	1	0.352	
48	54	82	1.5	0.609	
51.5	55.5	78.5	1	0.391	
53	61.5	92	1.5	0.8	

3) This dimension applies to sealed and shielded bearings.

Miniature and Small Size Ball Bearings





Open type



Shielded type



Shielded type with snap ring

1. Design features and characteristics

The dimensional range of miniature and small size ball bearings can be found in **Table 1**. Boundary dimensions for both metric and inch series are in accordance with the internationally specified ISO and ANSI/ABMA standards. The most widely used sealed and shielded type ball bearings generally have a 1 to 2 mm wider width dimension than open type bearings.

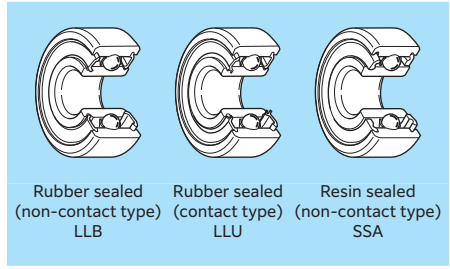
The main variations of these bearings are shown in **Table 2**. Miniature and small size ball bearings can also utilize snap rings, which simplify assembly within the housing. These bearings with snap rings can also be found in the dimensional tables in this catalog.

Among the most generally used sealed and shielded bearings are standard ZZ and ZZA type which incorporate non-contact steel shield plates. **Fig. 1** also shows non-contact type rubber sealed LLB and resin sealed SSA type bearings, as well as the contact-type rubber sealed LLU bearing.

Section "11. Lubrication" provides additional information on grease filled within the sealed and shielded bearings.

Table 1 Dimensional range

Bearing	Dimensional range
Miniature ball bearings	Nominal outside diameter $D <$ 9 mm
Small size ball bearings	Nominal bore diameter $d <$ 10 mm Nominal outside diameter $D \geq$ 9 mm



Rubber sealed (non-contact type) LLB

Rubber sealed (contact type) LLU

Resin sealed (non-contact type) SSA

Fig. 1

Table 2 Main types and construction

Type	Standard type code			Flange-attached type code		
	Construction	Metric series	Inch series	Construction	Metric series	Inch series
Open type		6 BC	R		FL6 FLBC	FLR
Shielded type		6 x x ZZ W6 x x ZZ WBC x x x ZZ	RA x x ZZ		FL6 x x x ZZ FLW6 x x x ZZ FLWBC x x ZZ	FLRA x x ZZ

Note: 1. Representative codes are shown. For further details, please refer to dimension tables.
2. May change to ZA or SA for shielded type bearings, according to the bearing number.

2. Standard cage type

Pressed steel cages are standard for miniature and small size bearings.



3. Dimensional and rotational accuracy

The accuracy of miniature and small size ball bearings complies with JIS standards. Accuracy of these bearings is defined by Table A-54 in section "6. Bearing tolerances". Flange accuracies are listed in **Table 3**.

Table 3 Tolerance and tolerance values for outer ring flange Unit: μm

Accuracy class		Outside diameter dimensional tolerance Δ_{D1s} or Δ_{D2s} Upper Lower	Outer ring surface runout for rear surface S_{D1} Max.	Back face axial runout S_{ea1} Max.	Width deviation Δ_{C1s} or Δ_{C2s} Upper Lower	Width unevenness V_{C1s} or V_{C2s} Max.
ISO standard	Class 0	* (see table below)	—	—	Identical to same bearings inner ring Δ_{Bs}.	Identical to same bearings inner ring V_{Bs}.
	Class 6		—	—		
	Class 5		8	11		5
	Class 4		4	7		2.5
	Class 2		1.5	3 1) / 4		1.5

1) Applies to nominal outside diameter D of 18 mm or less.

* Unit: μm

Flange nominal outside diameter D_1 or D_2 mm Over	Incl.	Outside diameter dimensional tolerance Δ_{D1s} or Δ_{D2s} Upper	Lower
—	10	+220	−36
10	18	+270	−43
18	30	+330	−52
30	50	+390	−62

4. Radial internal clearance

Radial internal clearance is defined by Table A-88 in section "8. Bearing internal clearance and preload".

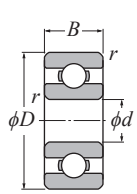
The radial clearance values for high precision miniature and small size ball bearings can be found in **Table 4**.

Table 4 Radial internal clearance for high precision bearings Unit: μm

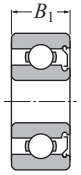
MIL Standard	Tight				Standard						Loose		Extra Loose	
Code	C2S		CNS		CNM		CNL		C3S		C3M		C3L	
Internal clearance	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
	0	5	3	8	5	10	8	13	10	15	13	20	20	28

Note: 1. These standards are specified in accordance with MIL B-23063. However, **NTN** codes are shown.
2. Clearance values do not include compensation for measuring load.

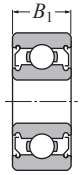
Metric series



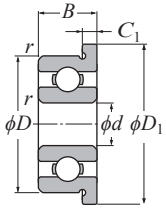
Open type



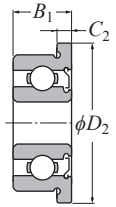
With single shield (Z)



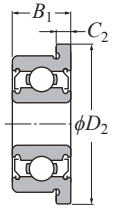
With double shield (ZZ)



Open type with flange (FL)



With flanged OR and single shield (FL···Z)

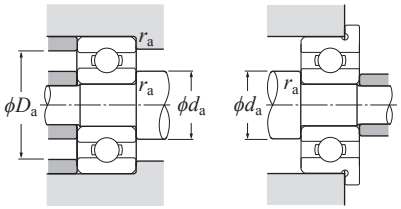


With flanged OR and double shield (FL···ZZ)

d 1.5–5 mm

Boundary dimensions mm									Basic load rating dynamic C_r N	Basic load rating static C_{0r} N	Fatigue load limit C_u N	Factor f_0	Allowable speed min^{-1} Grease lubrication	Allowable speed min^{-1} Oil lubrication
d	D	B	B_1	D_1	D_2	C_1	C_2	$r_{s\,min}$[1]						
1.5	4	1.2	2	5	5	0.4	0.6	0.15	113	29.0	0.775	13.6	88 000	100 000
	5	2	2.6	6.5	6.5	0.6	0.8	0.15	189	51.0	1.35	13.3	79 000	93 000
	6	2.5	3	7.5	7.5	0.6	0.8	0.15	305	86.0	2.28	12.3	71 000	84 000
2	4	1.2	—	—	—	—	—	0.05	115	37.0	0.970	14.8	83 000	98 000
	5	1.5	2.3	6.1	6.1	0.5	0.6	0.08	189	51.0	1.35	13.3	74 000	87 000
	5	2	2.5	—	—	—	—	0.1	189	51.0	1.35	13.3	74 000	87 000
	6	2.3	3	7.5	7.5	0.6	0.8	0.15	310	89.0	2.37	12.8	67 000	79 000
	6	2.5	—	7.2	—	0.6	—	0.15	310	89.0	2.37	12.8	67 000	79 000
	7	2.5	—	—	—	—	—	0.15	430	120	3.20	11.9	59 000	70 000
	7	2.8	3.5	8.5	8.5	0.7	0.9	0.15	425	125	3.30	12.4	62 000	73 000
2.5	5	1.5	2.3	—	—	—	—	0.08	169	59.0	1.56	15.0	70 000	82 000
	6	1.8	2.6	7.1	7.1	0.5	0.8	0.08	231	73.0	1.92	14.2	65 000	76 000
	7	—	3	—	8.2	—	0.6	0.15	315	96.0	2.53	13.7	59 000	70 000
	7	2.5	3.5	8.5	8.5	0.7	0.9	0.15	315	96.0	2.53	13.7	59 000	70 000
	8	2.5	2.8	9.2	—	0.6	—	0.15	475	152	4.05	13.2	56 000	66 000
	8	2.8	4	9.5	9.5	0.7	0.9	0.15	610	174	7.05	11.5	56 000	66 000
3	6	2	2.5	7.2	7.2	0.6	0.6	0.08	268	94.0	2.47	14.7	60 000	71 000
	7	2	3	8.1	8.1	0.5	0.8	0.1	430	130	3.45	12.9	58 000	68 000
	8	2.5	—	9.2	—	0.6	—	0.15	620	180	7.25	11.9	54 000	63 000
	8	3	4	9.5	9.5	0.7	0.9	0.15	620	180	7.25	11.9	54 000	63 000
	9	2.5	4	10.2	10.6	0.6	0.8	0.15	700	219	8.85	12.4	50 000	59 000
	9	3	5	10.5	10.5	0.7	1	0.15	700	219	8.85	12.4	50 000	59 000
	10	4	4	11.5	11.5	1	1	0.15	710	224	9.05	12.7	50 000	58 000
4	7	2	2.5	8.2	8.2	0.6	0.6	0.08	246	88.0	2.31	15.3	54 000	63 000
	8	2	3	9.2	9.2	0.6	0.6	0.08	440	140	5.65	13.9	52 000	61 000
	9	2.5	4	10.3	10.3	0.6	1	0.15	710	224	9.05	12.7	49 000	57 000
	10	3	4	11.2	11.6	0.6	0.8	0.15	720	235	9.50	13.3	46 000	55 000
	11	4	4	12.5	12.5	1	1	0.15	790	276	11.1	13.7	45 000	52 000
	12	4	4	13.5	13.5	1	1	0.2	1 080	360	14.4	12.8	43 000	51 000
	13	5	5	15	15	1	1	0.2	1 450	490	19.8	12.4	42 000	49 000
	16	5	5	—	—	—	—	0.3	1 940	680	23.1	12.4	37 000	44 000
5	8	2	2.5	9.2	9.2	0.6	0.6	0.08	241	91.0	2.39	15.8	49 000	57 000
	9	2.5	3	10.2	10.2	0.6	0.6	0.15	555	211	5.55	14.6	46 000	55 000
	10	3	4	11.2	11.6	0.6	0.8	0.15	790	276	11.1	13.7	45 000	52 000

1) Smallest allowable dimension for chamfer dimension r.



Dynamic equivalent radial load

$P_r = XF_r + YF_a$

$\frac{f_0 \cdot F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

Static equivalent radial load

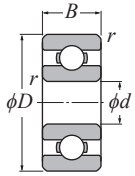
$P_{0r} = 0.6F_r + 0.5F_a$

When $P_{0r} < F_r$ use $P_{0r} = F_r$.

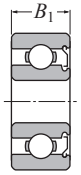
Bearing numbers						Installation-related dimensions mm				Mass (approx.) g	
Open type	With single shield	With double shield	Open type with flange	With flanged OR and single shield	With flanged OR and double shield	d_a Min.	d_a Max.[2]	D_a Max.	r_{as} Max.	Open type	Open type with flange
68/1.5	W68/1.5SA	SSA	FL68/1.5	FLW68/1.5SA	SSA	2.3	2.4	3.2	0.05	0.07	0.09
69/1.5A	W69/1.5ASA	SSA	FL69/1.5A	FLW69/1.5ASA	SSA	2.7	2.9	3.8	0.15	0.18	0.24
60/1.5	W60/1.5ZA	ZZA	FL60/1.5	FLW60/1.5ZA	ZZA	2.7	3	4.8	0.15	0.35	0.42
672	—	—	—	—	—	2.5	2.6	3.5	0.05	0.06	—
682	W682SA	SSA	FL682	FLW682SA	SSA	2.8	2.9	4.2	0.08	0.13	0.17
BC2-5	WBC2-5SA	SSA	—	—	—	2.8	2.9	4.2	0.1	0.16	—
692	W692SA	SSA	FL692	FLW692SA	SSA	3.2	3.3	4.8	0.15	0.31	0.38
BC2-6	—	—	FLBC2-6	—	—	3.2	3.3	4.8	0.15	0.32	0.38
BC2-7A	—	—	—	—	—	3.2	3.6	5.8	0.15	0.44	—
602	W602ZA	ZZA	FL602	FLW602ZA	ZZA	3.2	3.7	5.8	0.15	0.54	0.64
67/2.5	W67/2.5ZA	ZZA	—	—	—	3.1	3.3	4.4	0.08	0.11	—
68/2.5	W68/2.5ZA	ZZA	FL68/2.5	FLW68/2.5ZA	ZZA	3.1	3.6	4.8	0.08	0.22	0.26
—	WBC2.5-7ZA	ZZA	—	FLWBC2.5-7ZA	ZZA	3.7	4	5.8	0.15	0.6[3]	0.67[3]
69/2.5	W69/2.5SA	SSA	FL69/2.5	FLW69/2.5SA	SSA	3.7	4	5.8	0.15	0.43	0.53
BC2.5-8	WBC2.5-8ZA	ZZA	FLBC2.5-8	—	—	3.7	4.3	6.8	0.15	0.57	0.65
60/2.5	W60/2.5ZA	ZZA	FL60/2.5	FLW60/2.5ZA	ZZA	3.7	4.1	6.8	0.15	0.72	0.83
673	WA673SA	SSA	FL673	FLWA673SA	SSA	3.6	4.1	5.4	0.08	0.2	0.26
683	W683Z	ZZ	FL683	FLW683Z	ZZ	3.9	4.1	5.8	0.1	0.33	0.38
BC3-8	—	—	FLBC3-8	—	—	4.2	4.4	6.8	0.15	0.52	0.6
693	W693Z	ZZ	FL693	FLW693Z	ZZ	4.2	4.4	6.8	0.15	0.61	0.72
BC3-9	WBC3-9ZA	ZZA	FLBC3-9	FLAWBC3-9ZA	ZZA	4.2	5	7.8	0.15	0.71	0.79
603	W603Z	ZZ	FL603	FLW603Z	ZZ	4.2	5	7.8	0.15	0.92	1
623	623Z	ZZ	FL623	FL623Z	ZZ	4.2	5.2	8.8	0.15	1.6	1.8
674A	WA674ASA	SSA	FL674A	FLWA674ASA	SSA	4.6	5	6.4	0.08	0.28	0.35
BC4-8	WBC4-8Z	ZZ	FLBC4-8	FLWBC4-8Z	ZZ	4.8	5	6.8	0.08	0.38	0.46
684AX50	W684AX50Z	ZZ	FL684AX50	FLW684AX50Z	ZZ	5	5.2	7.8	0.1	0.67	0.76
BC4-10	WBC4-10Z	ZZ	FLBC4-10	FLAWBC4-10Z	ZZ	5.2	6	8.8	0.15	1	1.1
694	694Z	ZZ	FL694	FL694Z	ZZ	5.2	6.4	9.8	0.15	1.8	2
604	604Z	ZZ	FL604	FL604Z	ZZ	5.6	6.6	10.4	0.2	2.1	2.3
624	624Z	ZZ	FL624	FL624Z	ZZ	5.6	6.2	11.4	0.2	3.2	3.5
634	634Z	ZZ	—	—	—	6	7.6	14	0.3	5.1	—
675	WA675Z	ZZ	FL675	FLWA675Z	ZZ	5.6	6	7.4	0.08	0.32	0.4
BC5-9	WBC5-9Z	ZZ	FLBC5-9	FLWBC5-9Z	ZZ	5.2	6.1	7.8	0.15	0.55	0.63
BC5-10	WBC5-10Z	ZZ	FLBC5-10	FLAWBC5-10Z	ZZ	6.2	6.4	8.8	0.15	0.88	0.97

2) This dimension applies to sealed and shielded bearings. 3) Values for double shielded bearings are shown.

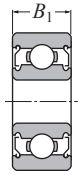
Metric series



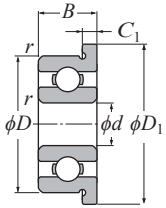
Open type



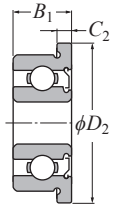
With single shield (Z)



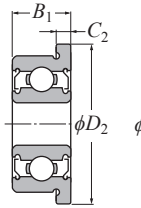
With double shield (ZZ)



Open type with flange (FL)



With flanged OR and single shield (FL···Z)

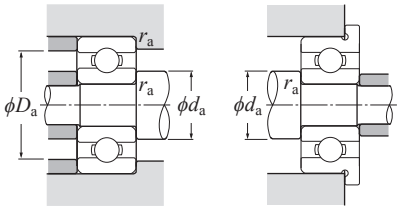


With flanged OR and double shield (FL···ZZ)

d 5–9 mm

Boundary dimensions mm									Basic load rating dynamic C_r N	Basic load rating static C_{0r} N	Fatigue load limit C_u N	Factor f_0	Allowable speed min^{-1} Grease lubrication	Allowable speed min^{-1} Oil lubrication
d	D	B	B_1	D_1	D_2	C_1	C_2	$r_{s\,min}$[1]						
5	11	—	4	—	12.6	—	0.8	0.15	795	282	11.4	14.0	43 000	51 000
	11	3	5	12.5	12.5	0.8	1	0.15	795	282	11.4	14.0	43 000	51 000
	13	4	4	15	15	1	1	0.2	1 190	430	17.3	13.4	40 000	47 000
	13	—	5	—	15	—	1	0.2	1 190	430	17.3	13.4	40 000	47 000
	14	5	5	16	16	1	1	0.2	1 470	505	20.5	12.8	39 000	46 000
	16	5	5	18	18	1	1	0.3	1 940	680	23.1	12.4	37 000	44 000
	19	6	6	—	—	—	—	0.3	2 590	885	64.5	12.1	34 000	40 000
6	10	2.5	3	11.2	11.2	0.6	0.6	0.1	515	196	5.15	15.2	43 000	51 000
	12	3	4	13.2	13.6	0.6	0.8	0.15	920	365	14.8	14.5	40 000	47 000
	13	3.5	5	15	15	1.0	1.1	0.15	1 200	440	17.5	13.7	39 000	46 000
	15	5	5	17	17	1.2	1.2	0.2	1 490	530	21.3	13.3	37 000	44 000
	16	6	6	—	—	—	—	0.2	1 960	695	28.1	12.7	36 000	42 000
	17	6	6	19	19	1.2	1.2	0.3	2 430	865	35.0	12.3	35 000	42 000
	19	6	6	22	22	1.5	1.5	0.3	2 590	885	64.5	12.1	34 000	40 000
7	11	2.5	3	12.2	12.2	0.6	0.6	0.1	610	269	7.05	15.6	40 000	47 000
	13	3	4	14.2	14.6	0.6	0.8	0.15	915	375	15.2	14.9	38 000	45 000
	14	3.5	5	16	16	1	1.1	0.15	1 300	505	20.4	14.0	37 000	44 000
	17	5	5	19	19	1.2	1.2	0.3	1 780	715	28.8	14.0	35 000	41 000
	19	6	6	—	—	—	—	0.3	2 480	910	60.0	12.9	34 000	40 000
	22	7	7	—	—	—	—	0.3	3 700	1 400	97.0	12.5	32 000	37 000
8	12	2.5	3.5	13.2	13.6	0.6	0.8	0.1	570	252	6.60	15.9	38 000	45 000
	14	3.5	4	15.6	15.6	0.8	0.8	0.15	910	385	15.5	15.2	36 000	43 000
	16	4	5	18	18	1	1.1	0.2	1 780	715	28.8	14.0	35 000	41 000
	19	6	6	22	22	1.5	1.5	0.3	2 200	865	35.0	13.8	33 000	39 000
	22	7	7	25	25	1.5	1.5	0.3	3 700	1 400	97.0	12.5	32 000	37 000
	24	8	8	—	—	—	—	0.3	4 450	1 590	122	11.7	31 000	36 000
9	14	3	4.5	—	—	—	—	0.1	1 020	465	18.8	15.5	36 000	42 000
	17	4	5	19	19	1	1.1	0.2	1 910	820	33.0	14.4	33 000	39 000
	20	6	6	—	—	—	—	0.3	2 750	1 090	44.0	13.5	32 000	38 000
	24	7	7	—	—	—	—	0.3	3 750	1 450	94.5	12.9	31 000	36 000
	26	8	8	—	—	—	—	0.6	5 050	1 960	138	12.4	30 000	35 000

1) Smallest allowable dimension for chamfer dimension r.



Dynamic equivalent radial load

$P_r = XF_r + YF_a$

$\frac{f_0 \cdot F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

Static equivalent radial load

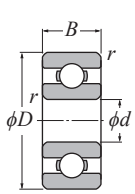
$P_{0r} = 0.6F_r + 0.5F_a$

When $P_{0r} < F_r$ use $P_{0r} = F_r$.

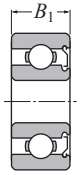
Bearing numbers Open type	With single shield	With double shield	Open type with flange	With flanged OR and single shield	With flanged OR and double shield	Installation-related dimensions mm d_a Min.	d_a Max.[2]	D_a Max.	r_{as} Max.	Mass (approx.) g Open type	Open type with flange
—	WBC5-11Z	ZZ	—	FLWBC5-11Z	ZZ	6.2	6.8	9.8	0.2	1.8[3]	2[3]
685	W685Z	ZZ	FL685	FLW685Z	ZZ	6.2	6.8	9.8	0.15	1.1	1.3
695A	695AZ	ZZ	FL695A	FL695AZ	ZZ	6.6	6.9	11.4	0.2	2.4	2.7
—	WBC5-13Z	ZZ	—	FLWBC5-13Z	ZZ	6.6	6.9	11.4	0.2	3.4[3]	3.7[3]
605	605Z	ZZ	FL605	FL605Z	ZZ	6.6	7.4	12.4	0.2	3.5	3.9
625	625Z	ZZ	FL625	FL625Z	ZZ	7	7.6	14	0.3	4.8	5.2
635	635Z	ZZ	—	—	—	7	9.5	17	0.3	8	—
676A	WA676AZ	ZZ	FL676A	FLWA676AZ	ZZ	6.6	6.7	9.2	0.1	0.65	0.74
BC6-12	WBC6-12Z	ZZ	FLBC6-12	FLAWBC6-12Z	ZZ	7.2	7.9	10.8	0.15	1.3	1.4
686	W686Z	ZZ	FL686	FLW686Z	ZZ	7	7.2	11.8	0.15	1.9	2.2
696	696Z	ZZ	FL696	FL696Z	ZZ	7.6	7.8	13.4	0.2	3.8	4.3
BC6-16A	BC6-16AZ	ZZ	—	—	—	7.6	8	14.4	0.2	5.2	—
606	606Z	ZZ	FL606	FL606Z	ZZ	8	8.6	15	0.3	6	6.5
626	626Z	ZZ	FL626	FL626Z	ZZ	8	9.5	17	0.3	8.1	9.2
677	WA677Z	ZZ	FL677	FLWA677Z	ZZ	7.8	8.1	10.2	0.1	0.67	0.77
BC7-13	WBC7-13Z	ZZ	FLBC7-13	FLAWBC7-13Z	ZZ	8.2	8.9	11.8	0.15	1.4	1.5
687A	W687AZ	ZZ	FL687A	FLW687AZ	ZZ	8.2	8.7	12.8	0.15	2.1	2.4
697	697Z	ZZ	FL697	FL697Z	ZZ	9	10	15	0.3	5.2	5.7
607	607Z	ZZ	—	—	—	9	10.4	17	0.3	8	—
627	627Z	ZZ	—	—	—	9	12.2	20	0.3	13	—
678A	W678AZ	ZZ	FL678A	FLAW678AZ	ZZ	8.8	9.1	11.2	0.1	0.75	0.86
BC8-14	WBC8-14Z	ZZ	FLBC8-14	FLWBC8-14Z	ZZ	9.2	9.5	12.8	0.15	1.8	1.9
688A	W688AZ	ZZ	FL688A	FLW688AZ	ZZ	9.6	10	14.4	0.2	3.1	3.5
698	698Z	ZZ	FL698	FL698Z	ZZ	10	10.6	17	0.3	7.3	8.4
608	608Z	ZZ	FL608	FL608Z	ZZ	10	12.2	20	0.3	12	13
628	628Z	ZZ	—	—	—	10	12.1	22	0.3	17	—
679	W679Z	ZZ	—	—	—	9.8	10.4	13.2	0.1	1.4	—
689	W689Z	ZZ	FL689	FLW689Z	ZZ	10.6	10.7	15.4	0.2	3.2	3.6
699	699Z	ZZ	—	—	—	11	11.6	18	0.3	8.2	—
609JX2	609JX2Z	ZZ	—	—	—	11	13.1	22	0.3	14	—
629X50	629X50Z	ZZ	—	—	—	13	13.9	22	0.3	20	—

2) This dimension applies to sealed and shielded bearings. 3) Values for double shielded bearings are shown.

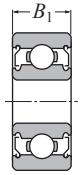
Inch series



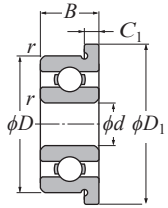
Open type



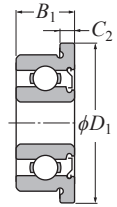
With single shield (Z)



With double shield (ZZ)



Open type with flange (FL)

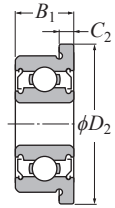


With flanged OR and single shield (FL···Z)

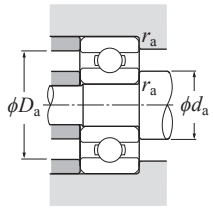
d 1.984–9.525 mm

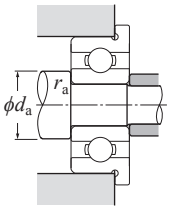
Boundary dimensions mm								Basic load rating N dynamic	N static	Fatigue load limit N	Factor	Allowable speed min^{-1} Grease lubrication	Allowable speed min^{-1} Oil lubrication
d	D	B	B_1	D_1	C_1	C_2	$r_{s\,min}$[1]	C_r	C_{0r}	C_u	f_0		
1.984	6.35	2.38	3.571	7.52	0.58	0.79	0.08	310	89.0	2.37	12.8	67 000	79 000
2.380	4.762	1.588	2.38	5.94	0.46	0.79	0.08	137	42.0	1.12	14.8	73 000	85 000
	7.938	2.779	3.571	9.12	0.58	0.79	0.13	475	152	4.05	13.2	56 000	66 000
3.175	6.35	2.38	2.779	7.52	0.58	0.79	0.08	315	96.0	2.53	13.7	59 000	70 000
	7.938	2.779	3.571	9.12	0.58	0.79	0.08	620	180	7.25	11.9	54 000	63 000
	9.525	2.779	3.571	10.72	0.58	0.79	0.13	710	224	9.05	12.7	49 000	58 000
	9.525	3.967	3.967	11.18	0.76	0.76	0.3	710	224	9.05	12.7	49 000	58 000
	12.7	4.366	4.366	—	—	—	0.3	1 270	395	16.1	11.7	43 000	51 000
3.967	7.938	2.779	3.175	9.12	0.58	0.91	0.08	370	133	3.50	14.8	51 000	60 000
4.762	7.938	2.779	3.175	9.12	0.58	0.91	0.08	440	143	3.80	14.2	49 000	58 000
	9.525	3.175	3.175	10.72	0.58	0.79	0.08	785	268	10.8	13.3	46 000	55 000
	12.7	3.967	—	—	—	—	0.3	1 450	490	19.8	12.4	41 000	48 000
	12.7	4.978	4.978	14.35	1.07	1.07	0.3	1 450	490	19.8	12.4	41 000	48 000
6.350	9.525	3.175	3.175	10.72	0.58	0.91	0.08	232	94.0	2.47	16.4	43 000	51 000
	12.7	3.175	4.762	13.89	0.58	1.14	0.13	920	370	15.0	14.7	39 000	46 000
	15.875	4.978	4.978	17.53	1.07	1.07	0.3	1 640	615	24.9	13.6	36 000	43 000
	19.05	—	7.142	—	—	—	0.41	2 590	885	64.5	12.1	34 000	40 000
9.525	22.225	—	7.142	24.61	—	1.57	0.41	3 700	1 400	94.5	12.7	31 000	37 000

1) Smallest allowable dimension for chamfer dimension r.



With flanged OR and double shield (FL···ZZ)





Dynamic equivalent radial load

$P_r = XF_r + YF_a$

$\frac{f_0 \cdot F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19				2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

Static equivalent radial load

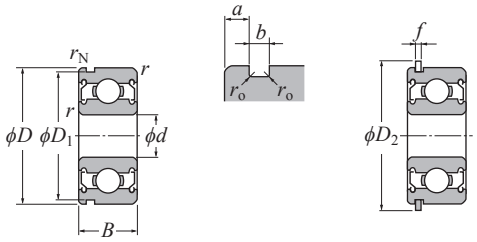
$P_{0r} = 0.6F_r + 0.5F_a$

When $P_{0r} < F_r$ use $P_{0r} = F_r$.

Bearing numbers: Open type	With single shield	With double shield	Open type with flange	With flanged OR and single shield	With flanged OR and double shield	Installation-related dimensions mm: d_a Min.	d_a Max.[2]	D_a Max.	r_{as} Max.	Mass (approx.) g: Open type	Open type with flange
R1-4	RA1-4ZA	ZZA	FLR1-4	FLRA1-4ZA	ZZA	2.8	3.3	5.5	0.08	0.35	0.41
R133	RA133ZA	ZZA	FLR133	FLRA133ZA	ZZA	2.9	3.1	4	0.08	0.12	0.16
R1-5	RA1-5ZA	ZZA	FLR1-5	FLRA1-5ZA	ZZA	3.2	4.3	7.1	0.1	0.69	0.76
R144	RA144ZA	ZZA	FLR144	FLRA144ZA	ZZA	3.9	4	5.5	0.08	0.27	0.33
R2-5	RA2-5Z	ZZ	FLR2-5	FLRA2-5Z	ZZ	4	4.4	7	0.08	0.61	0.68
RA2-6	RA2-6ZA	ZZA	FLR2-6	FLRA2-6ZA	ZZA	4	5.2	8.7	0.1	0.88	0.96
R2	RA2ZA	ZZA	FLR2	FLRA2ZA	ZZA	4.8	5.2	7.8	0.3	1.3	1.5
RA2	RA2Z	ZZ	—	—	—	4.8	5.4	11	0.3	2.5	—
RA155	RA155ZA	ZZA	FLR155	FLRA155ZA	ZZA	4.8	5.3	7	0.08	0.54	0.61
R156	RA156Z	ZZ	FLR156	FLRA156Z	ZZ	5.5	5.6	7	0.08	0.44	0.51
R166	R166Z	ZZ	FLR166	FLAR166Z	ZZ	5.6	5.9	8.7	0.08	0.8	0.89
R3	—	—	—	—	—	6.4	7.2	11	0.3	2.2	—
RA3	RA3Z	ZZ	FLRA3	FLRA3Z	ZZ	6	6.4	11	0.3	2.4	2.7
R168A	R168AZ	AZZ	—	FLAR168AZ	ZZ	7.1	7.3	8.7	0.08	0.6	0.69
R188	RA188ZA	ZZA	FLR188	FLRA188ZA	ZZA	7.2	8.2	11.8	0.1	1.6	1.7
R4	R4Z	ZZ	FLR4	FLR4Z	ZZ	8	8.6	14.2	0.3	4.4	4.8
—	RA4Z	ZZ	—	—	—	8.4	9.5	17	0.4	11[3]	—
—	R6Z	ZZ	—	FLR6Z	ZZ	11.5	11.9	20.2	0.4	14[3]	15[3]

2) This dimension applies to sealed and shielded bearings. 3) Values for double shielded bearings are shown.

With snap ring groove
With snap ring



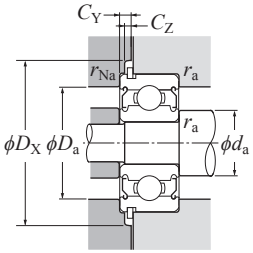
Shielded type with snap ring groove (ZZ)

Shielded type with snap ring (ZZ)

d 5–10 mm

Boundary dimensions mm					Basic load rating dynamic N	static N	Fatigue load limit N	Factor	Allowable speed min^{-1} Grease lubrication	Oil lubrication	Bearing numbers [2] Shielded type with snap ring groove	Shielded type with snap ring
d	D	B	$r_{s\,min}$ [1]	r_{Ns} Min.	C_r	C_{0r}	C_u	f_0				
5	13	4	0.2	0.1	1 190	430	17.3	13.4	40 000	47 000	**SC559ZZN**	**ZZNR**
	14	5	0.2	0.2	1 470	505	20.5	12.8	39 000	46 000	**SC571ZZN**	**ZZNR**
6	12	4	0.15	0.1	640	365	—	14.5	40 000	47 000	***F-SC6A06ZZ1N**	**ZZ1NR**
	13	5	0.15	0.1	1 200	440	17.5	13.7	39 000	46 000	**SC6A04ZZN**	**ZZNR**
	15	5	0.2	0.2	1 490	530	21.3	13.3	37 000	44 000	**SC6A17ZZN**	**ZZNR**
	19	6	0.3	0.3	2 590	885	64.5	12.1	34 000	40 000	**SC669ZZN**	**ZZNR**
8	16	5	0.2	0.1	1 390	585	23.6	14.6	35 000	41 000	**SC890ZZN**	**ZZNR**
	22	7	0.3	0.4	3 700	1 400	97.0	12.5	32 000	37 000	**SC850ZZN**	**ZZNR**
10	26	8	0.3	0.3	5 050	1 960	138	12.4	29 000	34 000	**SC0039ZZN**	**ZZNR**

1) Smallest allowable dimension for chamfer dimension r.
2) "∗" mark indicates that stainless steel is used.



Dynamic equivalent radial load
$P_r = XF_r + YF_a$

$\frac{f_0 \cdot F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

Static equivalent radial load
$P_{0r} = 0.6F_r + 0.5F_a$
When $P_{0r} < F_r$ use $P_{0r} = F_r$.

Snap ring groove dimensions mm				Snap ring dimensions mm		Installation-related dimensions mm							Mass kg
D_1 Max.	a Max.	b Min.	r_o Max.	D_2 Max.	f Max.	d_a Min.	d_a Max.	D_a Max.	D_X (approx.)	C_Y Max.	C_Z Min.	r_{as} Max.	r_{Nas} Max.	With snap ring (approx.)
12.15	0.88	0.55	0.2	15.2	0.55	6.6	6.9	11.4	15.9	1.2	0.6	0.2	0.1	0.002
13.03	1.28	0.65	0.06	16.13	0.54	6.6	7.4	12.4	16.9	1.6	0.6	0.2	0.2	0.004
11.15	0.78	0.60	0.02	14.2	0.55	7.2	7.9	10.8	14.9	1.1	0.6	0.15	0.1	0.001
12.15	1.08	0.55	0.2	15.2	0.55	7	7.2	11.8	15.9	1.4	0.6	0.15	0.1	0.002
14.03	1.03	0.65	0.06	17.2	0.6	7.6	7.8	13.4	17.9	1.4	0.7	0.2	0.2	0.004
17.9	0.93	0.80	0.2	22	0.7	8	9.5	17	22.8	1.4	0.7	0.3	0.3	0.008
14.95	0.53	0.65	0.05	18.2	0.54	9.6	10	14.4	18.9	0.9	0.6	0.2	0.1	0.003
20.8	2.35	0.80	0.2	24.8	0.7	10	12.7	20	25.5	2.8	0.7	0.3	0.4	0.013
24.5	2.20	0.90	0.3	28.8	0.85	12	13.5	24	29.5	2.8	0.9	0.3	0.3	0.02

Angular Contact Ball Bearings





Angular contact ball bearing



Four-point contact ball bearing



Double row angular contact ball bearing

1. Design features and characteristics

1.1 Angular contact ball bearing

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

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

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

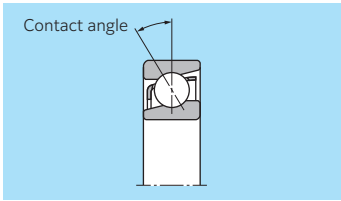


Fig. 1

Table 1 Contact angle and contact angle codes

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

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

Table 2 Angular contact ball bearing types and characteristics

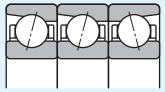
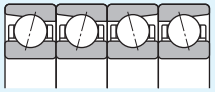
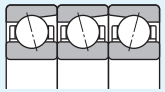
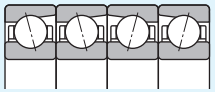
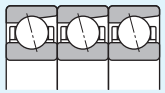
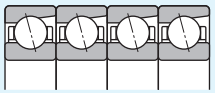
Type	Design	Characteristics
Standard type		● Available in bearing series 79, 70, 72, 72B, 73, and 73B. ● Contact angles: 30° and 40° (with B) available. ● Standard bearing cage type differs depending on bearing number (see **Table 5**).

Table 3 Duplex angular contact ball bearings — types and characteristics

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

Note: 1. Duplex angular contact ball bearings are manufactured in a set to specified clearance and preload; therefore, they must be assembled side by side with identically numbered bearings and not be mixed with other arrangements.
2. To satisfy specified clearance and preload, tightening must be performed until the inner ring width surfaces or outer ring width surfaces come in contact with each other.

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

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

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

1.2 Four-point angular contact ball bearings

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

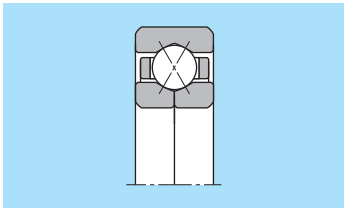


Fig. 2

■Flush ground

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

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

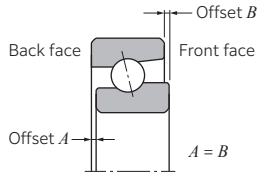


Fig. 3

1.3 Double row angular contact ball bearings

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

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

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

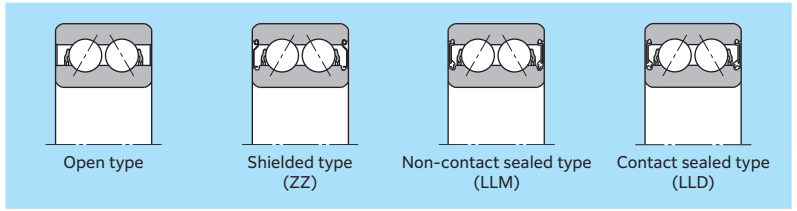


Fig. 4

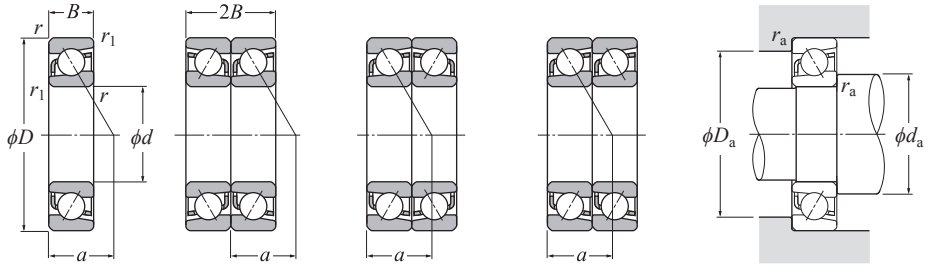
2. Standard cage type

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

Table 5 Standard cage types

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

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

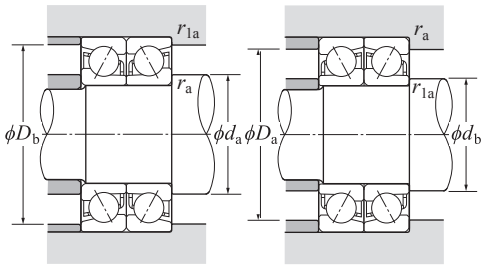


Single row | Back-to-back arrangement (DB) | Face-to-face arrangement (DF) | Tandem arrangement (DT)

d 10–30 mm

Boundary dimensions mm						Basic load rating dynamic kN	static kN	Fatigue load limit kN	Allowable speed 1) min^{-1} Grease lubrication	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.)
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 $F_a/F_r \le e$ X	Single, DT $F_a/F_r \le e$ Y	Single, DT $F_a/F_r > e$ X	Single, DT $F_a/F_r > e$ Y	DB, DF $F_a/F_r \le e$ X	DB, DF $F_a/F_r \le e$ Y	DB, DF $F_a/F_r > e$ X	DB, DF $F_a/F_r > e$ 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

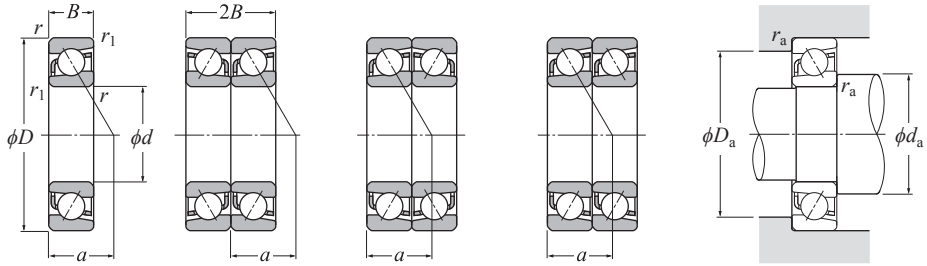
$P_{0r} = X_0 F_r + Y_0 F_a$

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	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_{las} Max.
C_r	C_{0r}											
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.

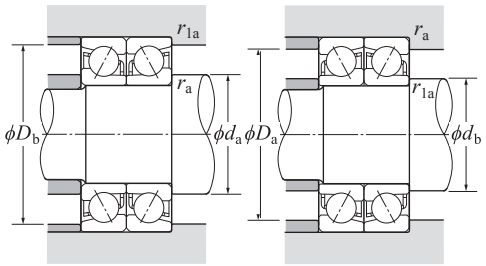


Single row | Back-to-back arrangement (DB) | Face-to-face arrangement (DF) | Tandem arrangement (DT)

d 30–55 mm

Boundary dimensions mm						Basic load rating dynamic kN	static kN	Fatigue load limit kN	Allowable speed 1) min^{-1} Grease lubrication	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.)
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 $F_a/F_r \le e$		Single, DT $F_a/F_r > e$		DB, DF $F_a/F_r \le e$		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

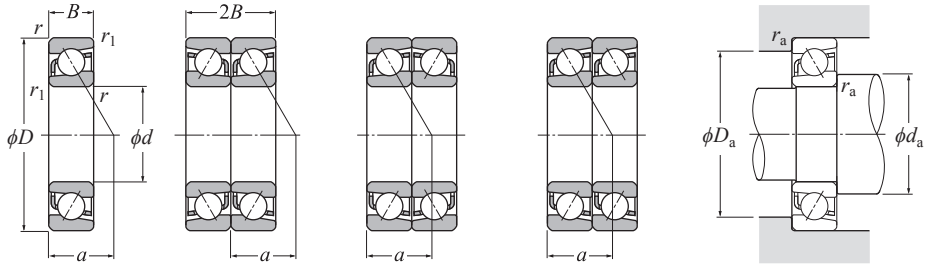
$P_{0r} = X_0 F_r + Y_0 F_a$

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.

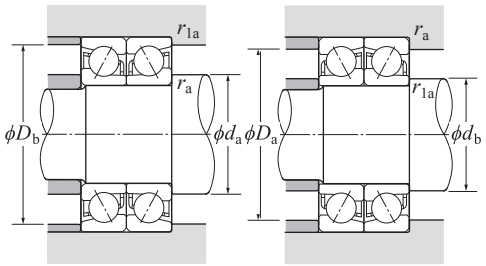


Single row | Back-to-back arrangement (DB) | Face-to-face arrangement (DF) | Tandem arrangement (DT)

d 60–85 mm

Boundary dimensions mm						Basic load rating dynamic kN	static kN	Fatigue load limit kN	Allowable speed 1) min^{-1} Grease lubrication	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.



Dynamic equivalent radial load

$P_r = XF_r + YF_a$

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

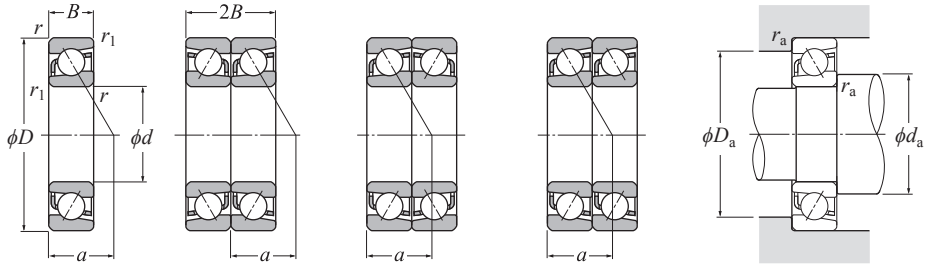
$P_{0r} = X_0 F_r + Y_0 F_a$

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	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.

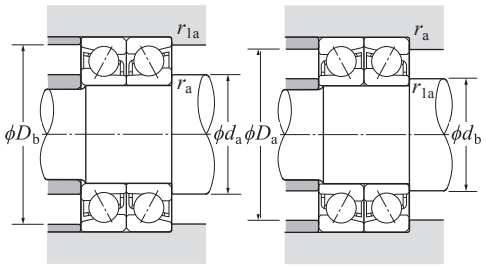


Single row | Back-to-back arrangement (DB) | Face-to-face arrangement (DF) | Tandem arrangement (DT)

d 85–120 mm

Boundary dimensions mm						Basic load rating dynamic kN	static kN	Fatigue load limit kN	Allowable speed 1) min^{-1} Grease lubrication	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.



Dynamic equivalent radial load

$P_r = XF_r + YF_a$

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

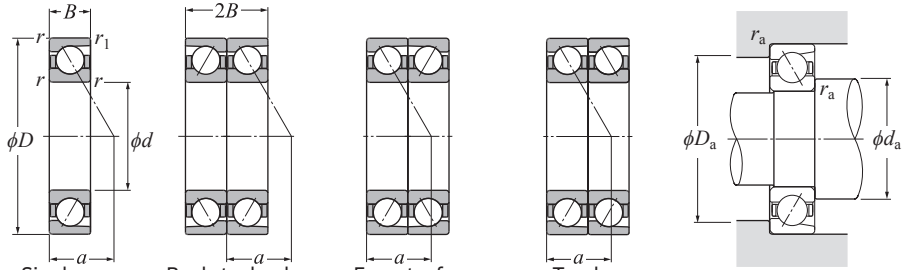
$P_{0r} = X_0 F_r + Y_0 F_a$

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 (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_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.

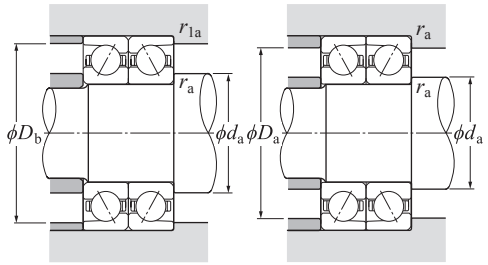


Single row | Back-to-back arrangement (DB) | Face-to-face arrangement (DF) | Tandem arrangement (DT)

d 120–170 mm

Boundary dimensions mm						Basic load rating dynamic kN	static kN	Fatigue load limit kN	Allowable speed min^{-1} Grease lubrication	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.)
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 $F_a/F_r \le e$ X	Y	Single, DT $F_a/F_r > e$ X	Y	DB, DF $F_a/F_r \le e$ 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

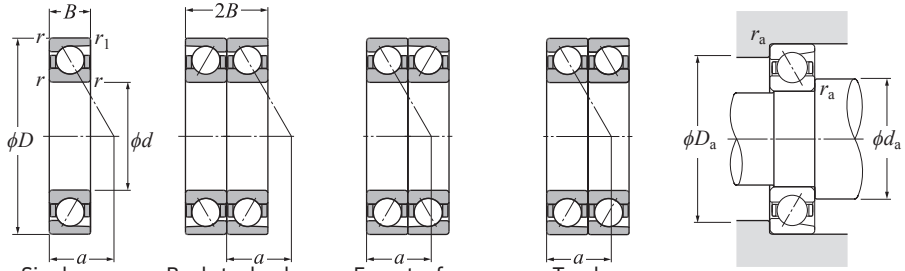
Static equivalent radial load

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

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 (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

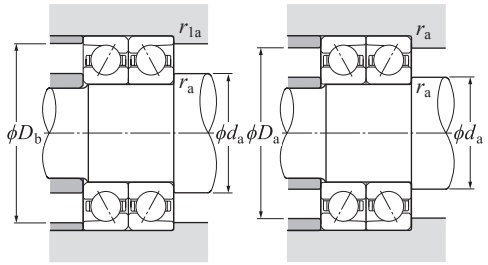


Single row | Back-to-back arrangement (DB) | Face-to-face arrangement (DF) | Tandem arrangement (DT)

d 170–300 mm

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

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



Dynamic equivalent radial load

$P_r = XF_r + YF_a$

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

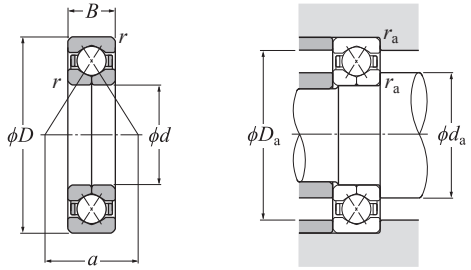
For single and DT arrangement, when $P_{0r} < F_r$ use $P_{0r} = F_r$.

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

Four-Point Contact Ball Bearings

NTN

QJ type



Dynamic equivalent axial load
$P_a = F_a$

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

d 30–90 mm

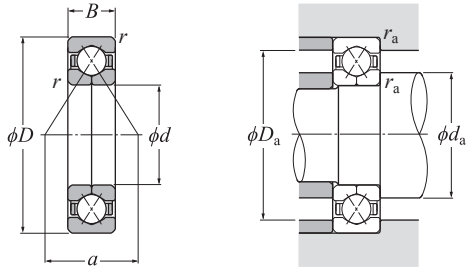
Boundary dimensions mm				Basic load rating dynamic kN	Basic load rating static kN	Fatigue load limit kN	Allowable speed min^{-1} Grease lubrication	Allowable speed min^{-1} Oil lubrication	Bearing number	Installation-related dimensions mm			Load center mm	Mass kg
d	D	B	$r_{s\,min}$[1]	C_a	C_{0a}	C_u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

NTN

QJ type



Dynamic equivalent axial load
$P_a = F_a$

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

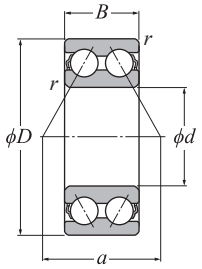
d 95–120 mm

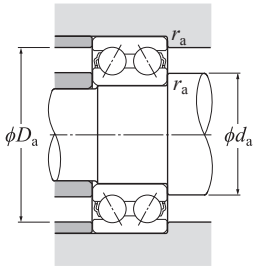
Boundary dimensions mm				Basic load rating dynamic kN	Basic load rating static kN	Fatigue load limit kN	Allowable speed min^{-1} Grease lubrication	Allowable speed min^{-1} Oil lubrication	Bearing number	Installation-related dimensions mm			Load center mm	Mass kg
d	D	B	$r_{s\,min}$[1]	C_a	C_{0a}	C_u				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	300	585	20.0	2 500	3 400	**QJ320**	114	201	2.5	91	9.14
105	190	36	2.1	218	400	14.2	2 700	3 600	**QJ221**	117	178	2	85	4.75
	225	49	3	305	585	19.6	2 400	3 200	**QJ321**	119	211	2.5	95.5	10.4
110	200	38	2.1	236	450	15.5	2 500	3 400	**QJ222**	122	188	2	89.5	5.62
	240	50	3	340	680	22.1	2 300	3 100	**QJ322**	124	226	2.5	101	12
120	215	40	2.1	266	540	17.7	2 300	3 100	**QJ224**	132	203	2	96.5	6.75
	260	55	3	360	765	23.8	2 100	2 800	**QJ324**	134	246	2.5	110	15.9

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

Double Row Angular Contact Ball Bearings

NTN





Dynamic equivalent radial load

$P_r = XF_r + YF_a$

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

Static equivalent radial load

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

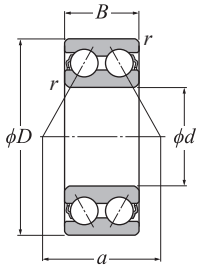
d 10–65 mm

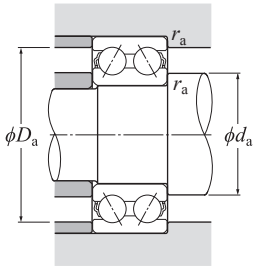
Boundary dimensions mm				Basic load rating dynamic kN	Basic load rating static kN	Fatigue load limit kN	Allowable speed min^{-1} Grease lubrication	Allowable speed min^{-1} Oil lubrication	Bearing number	Installation-related dimensions mm			Load center mm	Mass kg
d	D	B	$r_{s\,min}$[1]	C_r	C_{0r}	C_u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

NTN





Dynamic equivalent radial load

$P_r = XF_r + YF_a$

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

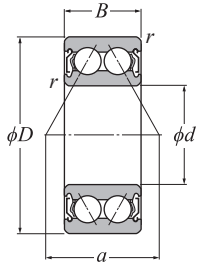
Static equivalent radial load

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

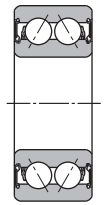
d 70–85 mm

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

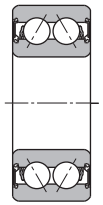
1) Smallest allowable dimension for chamfer dimension r.



Shielded type (ZZ)



Non-contact sealed type (LLM)

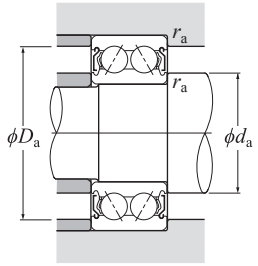


Contact sealed type (LLD)

d 10–40 mm

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



Dynamic equivalent radial load

$P_r = XF_r + YF_a$

e	$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
	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	Mass (approx.) kg
d_a		D_a	r_{as}		Sealed type
Min.	Max.	Max.	Max.	*a*	
14	15.5	26	0.6	14.5	0.05
16	19	28	0.6	16.3	0.06
19	19	31	0.6	16.3	0.07
21	23.5	36	0.6	20.1	0.10
23	25.5	41	1	24.3	0.18
26	26.5	41	1	23	0.16
31	32	46	1	25.4	0.18
32	38.5	55	1	30.9	0.36
36	38.5	56	1	30.9	0.30
37	44.5	65	1	36.6	0.57
42	45	65	1	36.3	0.46
44	50.5	71	1.5	41.5	0.79
47	50.5	73	1	39.4	0.63
49	53	81	1.5	43	1.04

Self-Aligning Ball Bearings





1. Design features and characteristics

The outer ring raceway of self-aligning ball bearings forms a spherical surface whose center is common to the bearing center. The inner ring of the bearing has two raceways.

The balls, cage, and inner ring of these bearings are capable of shifting in order to compensate for a certain degree of misalignment with the outer rings. As a result, the bearing is able to align itself and compensate for shaft / housing finishing unevenness, bearing fitting error, and other sources of misalignment as shown in **Fig. 1**.

Since axial load capacity is limited, self-aligning ball bearing are not suitable for applications with heavy axial loads.

It is recommended to use an adapter on a self-aligning ball bearing with a tapered bore diameter for ease of installation and disassembly. These bearings and adapters are often used on power transmitting shaft applications.

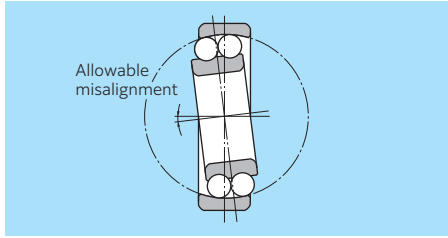
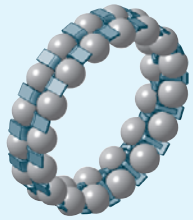
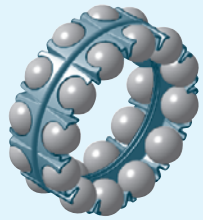
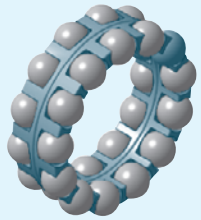


Fig. 1

2. Standard cage type

Pressed cages are the standard. However, 2321S and 2322S are equipped with a machined cage.

Table 1 Standard cage types

Cage type	Pressed cage		Machined cage
			
Bearing series or model	12 and 13 series	22 and 23 series	2321S , 2322S

3. Ball protrusion

Bearings with part numbers listed in **Table 2** below have balls which protrude slightly from the bearing face as illustrated in **Fig. 2**. The total width dimensions are shown in **Table 2**.

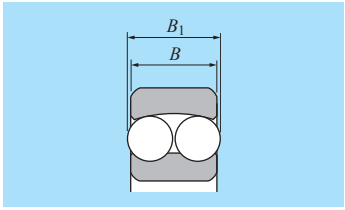


Fig. 2

Table 2 Unit: mm

Bearing numbers	Width dimension B	Total width dimension B_1
2222S (K)	53	54
2316S (K)	58	59
2319S (K)	67	68
2320S (K)	73	74
2321S	77	78
2322S (K)	80	81
1318S (K)	43	46
1319S (K)	45	49
1320S (K)	47	53
1321S	49	55
1322S (K)	50	56

4. Allowable misalignment angle

The allowable misalignment angle can be determined by the following function. This degree of allowable misalignment may be limited by the design of mating components around the bearing.

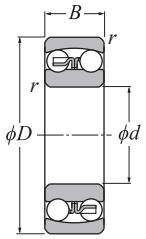
Normal load ····· 1/15

5. Precautions

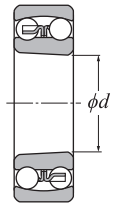
Self-aligning ball bearings are unable to support large axial loads and therefore axial loading shall be limited.

Please consider using spherical roller bearings when a large axial load is to be applied.

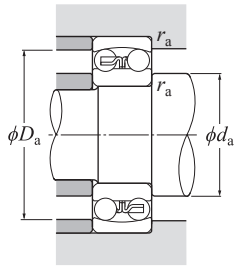
Self-Aligning Ball Bearings NTN



Cylindrical bore



Tapered bore



d 10–35 mm

Boundary dimensions mm				Basic load rating dynamic kN	static kN	Fatigue load limit kN	Allowable speed min^{-1} Grease lubrication	Oil lubrication	Bearing numbers Cylindrical bore	Tapered bore[2]	Installation-related dimensions mm d_a Min.	D_a Max.	r_{as} Max.
d	D	B	$r_{s\,min}$[1]	C_r	C_{0r}	C_u							
10	30	9	0.6	5.55	1.19	0.049	22 000	28 000	**1200S**	—	14.0	26.0	0.6
	30	14	0.6	7.45	1.59	0.067	24 000	28 000	**2200S**	—	14.0	26.0	0.6
	35	11	0.6	7.35	1.62	0.074	20 000	24 000	**1300S**	—	14.0	31.0	0.6
	35	17	0.6	9.20	2.01	0.096	18 000	22 000	**2300S**	—	14.0	31.0	0.6
12	32	10	0.6	5.70	1.27	0.053	22 000	26 000	**1201S**	—	16.0	28.0	0.6
	32	14	0.6	7.75	1.73	0.089	22 000	26 000	**2201S**	—	16.0	28.0	0.6
	37	12	1	9.65	2.16	0.078	18 000	22 000	**1301S**	—	17.0	32.0	1
	37	17	1	12.1	2.73	0.120	17 000	22 000	**2301S**	—	17.0	32.0	1
15	35	11	0.6	7.60	1.75	0.072	18 000	22 000	**1202S**	—	19.0	31.0	0.6
	35	14	0.6	7.80	1.85	0.095	18 000	22 000	**2202S**	—	19.0	31.0	0.6
	42	13	1	9.70	2.29	0.081	16 000	20 000	**1302S**	—	20.0	37.0	1
	42	17	1	12.3	2.91	0.130	14 000	18 000	**2302S**	—	20.0	37.0	1
17	40	12	0.6	8.00	2.01	0.083	16 000	20 000	**1203S**	—	21.0	36.0	0.6
	40	16	0.6	9.95	2.42	0.130	16 000	20 000	**2203S**	—	21.0	36.0	0.6
	47	14	1	12.7	3.20	0.110	14 000	17 000	**1303S**	—	22.0	42.0	1
	47	19	1	14.7	3.55	0.160	13 000	16 000	**2303S**	—	22.0	42.0	1
20	47	14	1	10.0	2.61	0.110	14 000	17 000	**1204S**	**1204SK**	25.0	42.0	1
	47	18	1	12.8	3.30	0.140	14 000	17 000	**2204S**	**2204SK**	25.0	42.0	1
	52	15	1.1	12.6	3.35	0.140	12 000	15 000	**1304S**	**1304SK**	26.5	45.5	1
	52	21	1.1	18.5	4.70	0.210	11 000	14 000	**2304S**	**2304SK**	26.5	45.5	1
25	52	15	1	12.2	3.30	0.130	12 000	14 000	**1205S**	**1205SK**	30.0	47.0	1
	52	18	1	12.4	3.45	0.200	12 000	14 000	**2205S**	**2205SK**	30.0	47.0	1
	62	17	1.1	18.2	5.00	0.150	10 000	13 000	**1305S**	**1305SK**	31.5	55.5	1
	62	24	1.1	24.9	6.60	0.290	9 500	12 000	**2305S**	**2305SK**	31.5	55.5	1
30	62	16	1	15.8	4.65	0.190	10 000	12 000	**1206S**	**1206SK**	35.0	57.0	1
	62	20	1	15.3	4.55	0.260	10 000	12 000	**2206S**	**2206SK**	35.0	57.0	1
	72	19	1.1	21.4	6.30	0.190	8 500	11 000	**1306S**	**1306SK**	36.5	65.5	1
	72	27	1.1	32.0	8.75	0.380	8 000	10 000	**2306S**	**2306SK**	36.5	65.5	1
35	72	17	1.1	15.9	5.10	0.210	8 500	10 000	**1207S**	**1207SK**	41.5	65.5	1
	72	23	1.1	21.7	6.60	0.320	8 500	10 000	**2207S**	**2207SK**	41.5	65.5	1
	80	21	1.5	25.3	7.85	0.280	7 500	9 500	**1307S**	**1307SK**	43.0	72.0	1.5
	80	31	1.5	40.0	11.3	0.480	7 100	9 000	**2307S**	**2307SK**	43.0	72.0	1.5

1) Smallest allowable dimension for chamfer dimension *r*.
2) "**K**" indicates bearings having a tapered bore with a taper ratio of 1:12.

Self-Aligning Ball Bearings NTN

Dynamic equivalent radial load

$P_r = XF_r + YF_a$

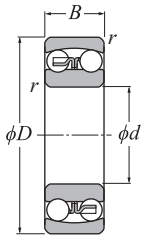
$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	Y_1	0.65	Y_2

Static equivalent radial load

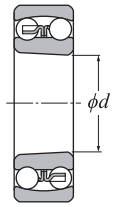
$P_{0r} = F_r + Y_0 F_a$

For values of e, Y_1, Y_2 and Y_0 see the table below.

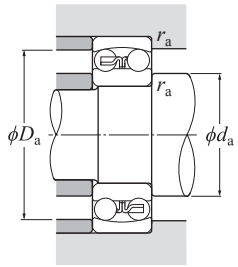
Constant	Axial load factors			Mass (approx.) kg
e	Y_1	Y_2	Y_0	Cylindrical bore
0.32	2.00	3.10	2.10	0.034
0.64	0.98	1.50	1.00	0.046
0.35	1.80	2.80	1.90	0.059
0.71	0.89	1.40	0.93	0.078
0.36	1.80	2.70	1.80	0.041
0.58	1.10	1.70	1.10	0.051
0.33	1.90	2.90	2.00	0.068
0.60	1.10	1.60	1.10	0.087
0.32	2.00	3.10	2.10	0.050
0.50	1.30	1.90	1.30	0.058
0.33	1.90	2.90	2.00	0.101
0.51	1.20	1.90	1.30	0.113
0.31	2.00	3.10	2.10	0.074
0.50	1.30	1.90	1.30	0.089
0.32	2.00	3.10	2.10	0.130
0.51	1.20	1.90	1.30	0.160
0.29	2.20	3.40	2.30	0.120
0.47	1.30	2.10	1.40	0.142
0.29	2.20	3.40	2.30	0.164
0.50	1.20	1.90	1.30	0.207
0.28	2.30	3.50	2.40	0.140
0.41	1.50	2.40	1.60	0.160
0.28	2.30	3.50	2.40	0.261
0.47	1.40	2.10	1.40	0.332
0.25	2.50	3.90	2.60	0.220
0.38	1.60	2.50	1.70	0.262
0.26	2.40	3.70	2.50	0.391
0.44	1.40	2.20	1.50	0.500
0.23	2.70	4.20	2.80	0.330
0.37	1.70	2.60	1.80	0.403
0.26	2.50	3.80	2.60	0.520
0.46	1.40	2.10	1.40	0.671



Cylindrical bore



Tapered bore



d 40–75 mm

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 numbers Cylindrical bore	Bearing numbers Tapered bore[2]	Installation-related dimensions mm d_a Min.	D_a Max.	r_{as} Max.
d	D	B	$r_{s\,min}$[1]	C_r	C_{0r}	C_u							
40	80	18	1.1	19.3	6.50	0.260	7 500	9 000	**1208S**	**1208SK**	46.5	73.5	1
	80	23	1.1	22.4	7.35	0.390	7 500	9 000	**2208S**	**2208SK**	46.5	73.5	1
	90	23	1.5	29.8	9.70	0.300	6 700	8 500	**1308S**	**1308SK**	48.0	82.0	1.5
	90	33	1.5	45.5	13.5	0.580	6 300	8 000	**2308S**	**2308SK**	48.0	82.0	1.5
45	85	19	1.1	22.0	7.35	0.290	7 100	8 500	**1209S**	**1209SK**	51.5	78.5	1
	85	23	1.1	23.3	8.15	0.510	7 100	8 500	**2209S**	**2209SK**	51.5	78.5	1
	100	25	1.5	38.5	12.7	0.330	6 000	7 500	**1309S**	**1309SK**	53.0	92.0	1.5
	100	36	1.5	55.0	16.7	0.710	5 600	7 100	**2309S**	**2309SK**	53.0	92.0	1.5
50	90	20	1.1	22.8	8.10	0.330	6 300	8 000	**1210S**	**1210SK**	56.5	83.5	1
	90	23	1.1	23.3	8.45	0.570	6 300	8 000	**2210S**	**2210SK**	56.5	83.5	1
	110	27	2	43.5	14.1	0.350	5 600	6 700	**1310S**	**1310SK**	59.0	101	2
	110	40	2	65.0	20.2	0.860	5 000	6 300	**2310S**	**2310SK**	59.0	101	2
55	100	21	1.5	26.9	10.0	0.400	6 000	7 100	**1211S**	**1211SK**	63.0	92.0	1.5
	100	25	1.5	26.7	9.90	0.720	6 000	7 100	**2211S**	**2211SK**	63.0	92.0	1.5
	120	29	2	51.5	17.9	0.400	5 000	6 300	**1311S**	**1311SK**	64.0	111	2
	120	43	2	76.5	24.0	1.00	4 800	6 000	**2311S**	**2311SK**	64.0	111	2
60	110	22	1.5	30.5	11.5	0.460	5 300	6 300	**1212S**	**1212SK**	68.0	102	1.5
	110	28	1.5	34.0	12.6	0.840	5 300	6 300	**2212S**	**2212SK**	68.0	102	1.5
	130	31	2.1	57.5	20.8	0.510	4 500	5 600	**1312S**	**1312SK**	71.0	119	2
	130	46	2.1	88.5	28.3	1.20	4 300	5 300	**2312S**	**2312SK**	71.0	119	2
65	120	23	1.5	31.0	12.5	0.500	4 800	6 000	**1213S**	**1213SK**	73.0	112	1.5
	120	31	1.5	43.5	16.4	0.920	4 800	6 000	**2213S**	**2213SK**	73.0	112	1.5
	140	33	2.1	62.5	22.9	0.670	4 300	5 300	**1313S**	**1313SK**	76.0	129	2
	140	48	2.1	97.0	32.5	1.40	3 800	4 800	**2313S**	**2313SK**	76.0	129	2
70	125	24	1.5	35.0	13.8	0.550	4 800	5 600	**1214S**	—	78.0	117	1.5
	125	31	1.5	44.0	17.1	1.10	4 500	5 600	**2214S**	—	78.0	117	1.5
	150	35	2.1	75.0	27.7	0.690	4 000	5 000	**1314S**	—	81.0	139	2
	150	51	2.1	111	37.5	1.60	3 600	4 500	**2314S**	—	81.0	139	2
75	130	25	1.5	39.0	15.7	0.630	4 300	5 300	**1215S**	**1215SK**	83.0	122	1.5
	130	31	1.5	44.5	17.8	1.20	4 300	5 300	**2215S**	**2215SK**	83.0	122	1.5
	160	37	2.1	80.0	30.0	0.720	3 800	4 500	**1315S**	**1315SK**	86.0	149	2
	160	55	2.1	125	43.0	1.80	3 400	4 300	**2315S**	**2315SK**	86.0	149	2

1) Smallest allowable dimension for chamfer dimension *r*.
2) "**K**" indicates bearings having a tapered bore with a taper ratio of 1:12.

Dynamic equivalent radial load

$P_r = XF_r + YF_a$

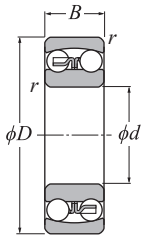
$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	Y_1	0.65	Y_2

Static equivalent radial load

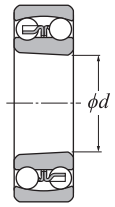
$P_{0r} = F_r + Y_0 F_a$

For values of e, Y_1, Y_2 and Y_0 see the table below.

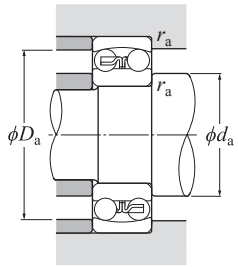
Constant	Axial load factors			Mass (approx.) kg
e	Y_1	Y_2	Y_0	Cylindrical bore
0.22	2.8	4.3	2.9	0.420
0.33	1.9	3.0	2.0	0.506
0.24	2.6	4.0	2.7	0.727
0.43	1.5	2.3	1.5	0.918
0.21	3.0	4.7	3.1	0.470
0.30	2.1	3.2	2.2	0.556
0.25	2.6	4.0	2.7	0.971
0.41	1.5	2.4	1.6	1.200
0.21	3.1	4.7	3.2	0.535
0.28	2.2	3.4	2.3	0.598
0.23	2.7	4.2	2.8	1.230
0.42	1.5	2.3	1.6	1.630
0.20	3.2	4.9	3.3	0.708
0.28	2.3	3.5	2.4	0.807
0.23	2.7	4.2	2.8	1.600
0.41	1.5	2.4	1.6	2.080
0.18	3.4	5.3	3.6	0.910
0.28	2.3	3.5	2.4	1.100
0.23	2.8	4.3	2.9	2.000
0.40	1.6	2.4	1.6	2.580
0.17	3.7	5.7	3.8	1.160
0.28	2.3	3.5	2.4	1.500
0.23	2.7	4.2	2.9	2.470
0.39	1.6	2.5	1.7	3.200
0.18	3.4	5.3	3.6	1.300
0.26	2.4	3.7	2.5	1.550
0.22	2.8	4.4	3.0	3.030
0.38	1.7	2.6	1.8	3.900
0.17	3.6	5.6	3.8	1.360
0.25	2.5	3.9	2.6	1.600
0.22	2.8	4.4	2.9	3.630
0.38	1.6	2.5	1.7	4.780



Cylindrical bore



Tapered bore



d 80–110 mm

Boundary dimensions mm				Basic load rating dynamic kN	static kN	Fatigue load limit kN	Allowable speed min^{-1} Grease lubrication	Oil lubrication	Bearing numbers Cylindrical bore	Tapered bore[2]	Installation-related dimensions mm		
d	*D*	*B*	$r_{s\,min}$[1]	C_r	C_{0r}	C_u					d_a Min.	D_a Max.	r_{as} Max.
80	140	26	2	40.0	17.0	0.680	4 000	5 000	**1216S**	**1216SK**	89	131	2
	140	33	2	49.0	19.9	1.30	4 000	5 000	**2216S**	**2216SK**	89	131	2
	170	39	2.1	89.0	33.0	0.800	3 600	4 300	**1316S**	**1316SK**	91	159	2
	170	58	2.1	130	45.0	1.90	3 200	4 000	**2316S**	**2316SK**	91	159	2
85	150	28	2	49.5	20.8	0.830	3 800	4 500	**1217S**	**1217SK**	94	141	2
	150	36	2	58.5	23.6	1.50	3 800	4 800	**2217S**	**2217SK**	94	141	2
	180	41	3	98.5	38.0	0.950	3 400	4 000	**1317S**	**1317SK**	98	167	2.5
	180	60	3	142	51.5	2.10	3 000	3 800	**2317S**	**2317SK**	98	167	2.5
90	160	30	2	57.5	23.5	0.940	3 600	4 300	**1218S**	**1218SK**	99	151	2
	160	40	2	70.5	28.7	1.80	3 600	4 300	**2218S**	**2218SK**	99	151	2
	190	43	3	117	44.5	1.20	3 200	3 800	**1318S**	**1318SK**	103	177	2.5
	190	64	3	154	57.5	2.40	2 800	3 600	**2318S**	**2318SK**	103	177	2.5
95	170	32	2.1	64.0	27.1	1.10	3 400	4 000	**1219S**	**1219SK**	106	159	2
	170	43	2.1	84.0	34.5	2.00	3 400	4 000	**2219S**	**2219SK**	106	159	2
	200	45	3	129	51.0	1.40	3 000	3 600	**1319S**	**1319SK**	108	187	2.5
	200	67	3	161	64.5	2.70	2 800	3 400	**2319S**	**2319SK**	108	187	2.5
100	180	34	2.1	69.5	29.7	1.20	3 200	3 800	**1220S**	**1220SK**	111	169	2
	180	46	2.1	94.5	38.5	2.30	3 200	3 800	**2220S**	**2220SK**	111	169	2
	215	47	3	140	57.5	1.60	2 800	3 400	**1320S**	**1320SK**	113	202	2.5
	215	73	3	187	79.0	3.30	2 400	3 200	**2320S**	**2320SK**	113	202	2.5
105	190	36	2.1	75.0	32.5	1.30	3 000	3 600	**1221S**	—	116	179	2
	190	50	2.1	109	45.0	2.60	3 000	3 600	**2221S**	—	116	179	2
	225	49	3	154	64.5	1.80	2 600	3 200	**1321S**	—	118	212	2.5
	225	77	3	200	87.0	3.60	2 400	3 000	**2321S**[3]	—	118	212	2.5
110	200	38	2.1	87.0	38.5	1.50	2 800	3 400	**1222S**	**1222SK**	121	189	2
	200	53	2.1	122	51.5	2.90	2 800	3 400	**2222S**	**2222SK**	121	189	2
	240	50	3	161	72.5	2.10	2 400	3 000	**1322S**	**1322SK**	123	227	2.5
	240	80	3	211	94.5	3.90	2 200	2 800	**2322S**[3]	**2322SK**	123	227	2.5

1) Smallest allowable dimension for chamfer dimension *r*.
2) "K" indicates bearings having a tapered bore with a taper ratio of 1:12.
3) A machined cage is the standard for **2321S** and **2322S(K)**.

Dynamic equivalent radial load

$P_r = XF_r + YF_a$

$\frac{F_a}{F_r} \le e$		$\frac{F_a}{F_r} > e$	
X	*Y*	*X*	*Y*
1	Y_1	0.65	Y_2

Static equivalent radial load

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

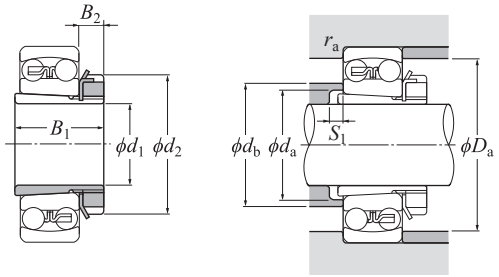
For values of e, Y_1, Y_2 and Y_0 see the table below.

Constant	Axial load factors			Mass (approx.) kg
e	Y_1	Y_2	Y_0	Cylindrical bore
0.16	3.9	6.0	4.1	1.68
0.25	2.5	3.9	2.7	2.02
0.22	2.9	4.5	3.1	4.24
0.39	1.6	2.5	1.7	5.63
0.17	3.7	5.7	3.8	2.10
0.25	2.5	3.9	2.6	2.56
0.21	2.9	4.6	3.1	5.03
0.37	1.7	2.6	1.8	6.56
0.17	3.8	5.8	3.9	2.56
0.27	2.4	3.7	2.5	3.22
0.22	2.8	4.3	2.9	5.83
0.38	1.7	2.6	1.7	7.75
0.17	3.7	5.8	3.9	3.12
0.27	2.4	3.7	2.5	3.96
0.23	2.8	4.3	2.9	6.79
0.38	1.7	2.6	1.8	8.97
0.17	3.6	5.6	3.8	3.74
0.27	2.4	3.7	2.5	4.71
0.24	2.7	4.1	2.8	8.40
0.38	1.7	2.6	1.8	11.5
0.18	3.6	5.5	3.7	4.43
0.28	2.3	3.5	2.4	5.73
0.23	2.7	4.2	2.9	9.58
0.38	1.7	2.6	1.7	14.5
0.18	3.7	5.7	3.9	5.21
0.28	2.2	3.5	2.3	6.75
0.22	2.8	4.4	3.0	11.5
0.37	1.7	2.6	1.8	17.5

Adapters

(For self-aligning ball bearings)

NTN



d_1 17–50 mm

Boundary dimensions mm				Numbers		Installation-related dimensions mm					Mass[1] kg
d_1	B_1	d_2	B_2	Bearing	Adapter	d_a Min.	d_b Max.	S_1 Min.	D_a Max.	r_{as} Max.	(approx.)
17	24	32	7	1204SK	**;H204**	23	27	5	41	1	0.041
	28	32	7	2204SK	**;H304**	24	28	5	41	1	0.045
	28	32	7	1304SK	**;H304**	24	31	8	45	1	0.045
	31	32	7	2304SK	**;H2304**	24	28	5	45	1	0.049
20	26	38	8	1205SK	**;H205X**	28	33	5	46	1	0.07
	29	38	8	2205SK	**;H305X**	29	33	5	46	1	0.075
	29	38	8	1305SK	**;H305X**	29	37	6	55	1	0.075
	35	38	8	2305SK	**;H2305X**	29	34	5	55	1	0.087
25	27	45	8	1206SK	**;H206X**	33	39	5	56	1	0.099
	31	45	8	2206SK	**;H306X**	34	39	5	56	1	0.109
	31	45	8	1306SK	**;H306X**	34	44	6	65	1	0.109
	38	45	8	2306SK	**;H2306X**	35	40	5	65	1	0.126
30	29	52	9	1207SK	**;H207X**	38	46	5	65	1	0.125
	35	52	9	2207SK	**;H307X**	39	45	5	65	1	0.142
	35	52	9	1307SK	**;H307X**	39	50	7	71.5	1.5	0.142
	43	52	9	2307SK	**;H2307X**	40	46	5	71.5	1.5	0.165
35	31	58	10	1208SK	**;H208X**	44	52	5	73	1	0.174
	36	58	10	2208SK	**;H308X**	44	50	5	73	1	0.189
	36	58	10	1308SK	**;H308X**	44	56	5	81.5	1.5	0.189
	46	58	10	2308SK	**;H2308X**	45	52	5	81.5	1.5	0.224
40	33	65	11	1209SK	**;H209X**	49	57	5	78	1	0.227
	39	65	11	2209SK	**;H309X**	49	57	8	78	1	0.248
	39	65	11	1309SK	**;H309X**	49	61	5	91.5	1.5	0.248
	50	65	11	2309SK	**;H2309X**	50	58	5	91.5	1.5	0.28
45	35	70	12	1210SK	**;H210X**	53	62	5	83	1	0.274
	42	70	12	2210SK	**;H310X**	54	63	10	83	1	0.303
	42	70	12	1310SK	**;H310X**	54	67	5	100	2	0.303
	55	70	12	2310SK	**;H2310X**	56	65	5	100	2	0.362
50	37	75	12	1211SK	**;H211X**	60	70	6	91.5	1.5	0.308

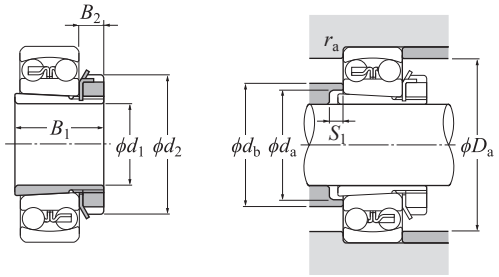
1) Indicates adapter mass.

Note: 1. Refer to page **B-82** through page **B-85** for bearing dimensions, basic rated loads, and mass.
2. Adapters for bearing series **12** can also be used with series **H2** and **H3**. Caution: the B_1 dimension of series **H3** is longer than that of series **H2**.
3. Adapter numbers which are appended with the code "X" indicate narrow slit type adapters which use washers with straight inner tabs.
4. Refer to page **D-2** through page **D-7** and page **D-12** through page **D-14** for adapter locknut and washer dimensions.

Adapters

(For self-aligning ball bearings)

NTN



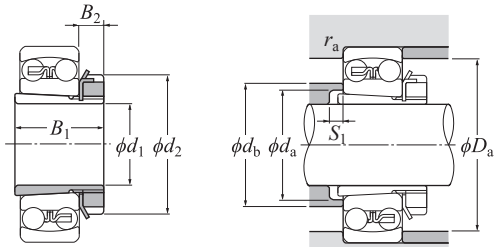
d_1 50–85 mm

Boundary dimensions mm				Numbers		Installation-related dimensions mm					Mass[1] kg
d_1	B_1	d_2	B_2	Bearing	Adapter	d_a Min.	d_b Max.	S_1 Min.	D_a Max.	r_{as} Max.	(approx.)
50	45	75	12	2211SK	**;H311X**	60	69	11	91.5	1.5	0.345
	45	75	12	1311SK	**;H311X**	60	73	6	110	2	0.345
	59	75	12	2311SK	**;H2311X**	61	71	6	110	2	0.42
55	38	80	13	1212SK	**;H212X**	64	76	5	101.5	1.5	0.346
	47	80	13	2212SK	**;H312X**	65	75	9	101.5	1.5	0.394
	47	80	13	1312SK	**;H312X**	65	79	5	118	2	0.394
	62	80	13	2312SK	**;H2312X**	66	77	5	118	2	0.481
60	40	85	14	1213SK	**;H213X**	70	83	5	111.5	1.5	0.401
	50	85	14	2213SK	**;H313X**	70	81	8	111.5	1.5	0.458
	50	85	14	1313SK	**;H313X**	70	85	5	128	2	0.458
	65	85	14	2313SK	**;H2313X**	72	84	5	128	2	0.557
65	43	98	15	1215SK	**;H215X**	80	93	5	121.5	1.5	0.707
	55	98	15	2215SK	**;H315X**	80	93	12	121.5	1.5	0.831
	55	98	15	1315SK	**;H315X**	80	97	5	148	2	0.831
	73	98	15	2315SK	**;H2315X**	82	96	5	148	2	1.05
70	46	105	17	1216SK	**;H216X**	85	100	5	130	2	0.882
	59	105	17	2216SK	**;H316X**	86	98	12	130	2	1.03
	59	105	17	1316SK	**;H316X**	86	103	5	158	2	1.03
	78	105	17	2316SK	**;H2316X**	87	103	5	158	2	1.28
75	50	110	18	1217SK	**;H217X**	90	106	6	140	2	1.02
	63	110	18	2217SK	**;H317X**	91	104	12	140	2	1.18
	63	110	18	1317SK	**;H317X**	91	110	6	166	2.5	1.18
	82	110	18	2317SK	**;H2317X**	94	110	6	166	2.5	1.45
80	52	120	18	1218SK	**;H218X**	95	111	6	150	2	1.19
	65	120	18	2218SK	**;H318X**	96	112	10	150	2	1.37
	65	120	18	1318SK	**;H318X**	96	116	6	176	2.5	1.37
	86	120	18	2318SK	**;H2318X**	99	117	6	176	2.5	1.69
85	55	125	19	1219SK	**;H219X**	101	118	7	158	2	1.37
	68	125	19	2219SK	**;H319X**	102	117	9	158	2	1.56

1) Indicates adapter mass.

Note: 1. Refer to page **B-84** through page **B-87** for bearing dimensions, basic rated loads, and mass.
2. Adapters for bearing series **12** can also be used with series **H2** and **H3**. Caution: the B_1 dimension of series **H3** is longer than that of series **H2**.
3. Adapter numbers which are appended with the code "X" indicate narrow slit type adapters which use washers with straight inner tabs.
4. Refer to page **D-2** through page **D-7** and page **D-12** through page **D-14** for adapter locknut and washer dimensions.

(For self-aligning ball bearings)



d_1 85–100 mm

Boundary dimensions mm				Numbers		Installation-related dimensions mm					Mass[1] kg
				Bearing	Adapter	d_a	d_b	S_1	D_a	r_{as}	
d_1	B_1	d_2	B_2			Min.	Max.	Min.	Max.	Max.	(approx.)
85	68	125	19	1319SK	**;H319X**	102	123	7	186	2.5	1.56
	90	125	19	2319SK	**;H2319X**	105	123	7	186	2.5	1.92
90	58	130	20	1220SK	**;H220X**	106	125	7	168	2	1.49
	71	130	20	2220SK	**;H320X**	107	123	8	168	2	1.69
	71	130	20	1320SK	**;H320X**	107	130	7	201	2.5	1.69
	97	130	20	2320SK	**;H2320X**	110	129	7	201	2.5	2.15
100	63	145	21	1222SK	**;H222X**	116	138	7	188	2	1.93
	77	145	21	2222SK	**;H322X**	117	137	6	188	2	2.18
	77	145	21	1322SK	**;H322X**	117	150	9	226	2.5	2.18
	105	145	21	2322SK	**;H2322X**	121	142	7	226	2.5	2.74

1) Indicates adapter mass.
Note: 1. Refer to page **B-86** through page **B-87** for bearing dimensions, basic rated loads, and mass.
2. Adapters for bearing series **12** can also be used with series **H2** and **H3**. Caution: the B_1 dimension of series **H3** is longer than that of series **H2**.
3. Adapter numbers which are appended with the code "**X**" indicate narrow slit type adapters which use washers with straight inner tabs.
4. Refer to page **D-2** through page **D-7** and page **D-12** through page **D-14** for adapter locknut and washer dimensions.

Adapters
NTN