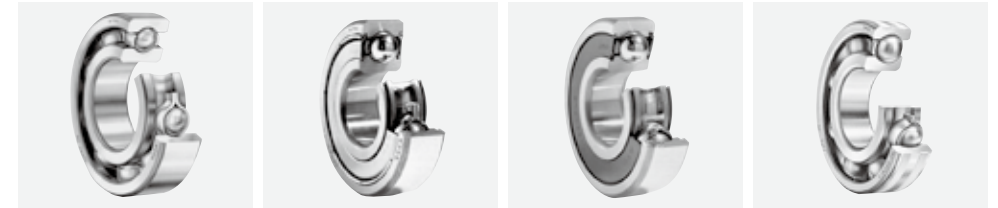


# Deep Groove Ball Bearings



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					
	<ul style="list-style-type: none"> <li>• Metal shield plate is affixed to the outside ring; the inner ring incorporates a V-groove and labyrinth clearance.</li> </ul>	<ul style="list-style-type: none"> <li>• 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.</li> </ul>	<ul style="list-style-type: none"> <li>• The outer ring incorporates synthetic rubber molded to a steel plate; seal edge contacts V-groove along inner ring surface.</li> </ul>	<ul style="list-style-type: none"> <li>• 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.</li> </ul>	
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 <sup>1)</sup>	Depends on lubricant	-25 to 120°C	-25 to 110°C	-25 to 120°C

<sup>1)</sup> 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 steel 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 metallic cage.

**Table 2 Standard cage for deep groove ball bearings**

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

## 3. Other deep groove ball bearing enhancements

### 3.1 Bearings with snap rings

A snap ring groove or snap ring groove with snap ring combination are optional enhancements for the outer 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 outer 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

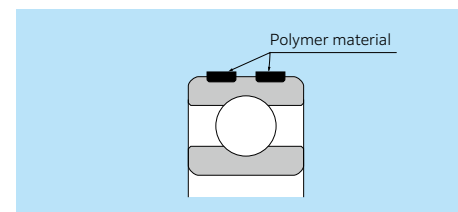
As a result of having grooves machined in the outer diameter, the ring strength is lower compared with a standard bearing. Thus, in order to prevent outer ring fracture, it is necessary to limit the maximum load applied to the bearing to be equal to or less than the allowable load  $C_p$  (see dimension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

#### (2) Fit with housing

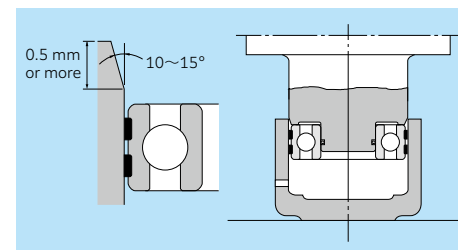
Table 3 shows the recommended fits for bearings with light metal alloy housings. In cases where the bearing is going to be interference fit with the housing, it is very important not to damage the polymer material. Therefore, it is essential that the lip of the housing diameter be given a 10-15° chamfer 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		Suitable bearing	Housing bore tolerance class
Load type, etc.	Housing material		
Rotating outer ring load Rotating inner ring load Indeterminate load	Light load Normal load	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 inner diameter chamfer**

#### (3) Radial internal clearance

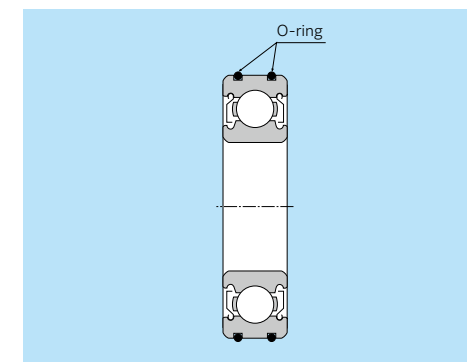
Radial internal clearance are the same as those for standard deep groove ball bearings. With standard fit and application conditions, a C3 clearance is used. For more detailed information concerning this bearing and the availability of roller bearings contact NTN Engineering.

#### (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 outer diameter dimensions as standard bearings with the addition of two O-rings located in circumferential grooves on the outside diameter of the outer ring. (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<sup>2</sup>/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.

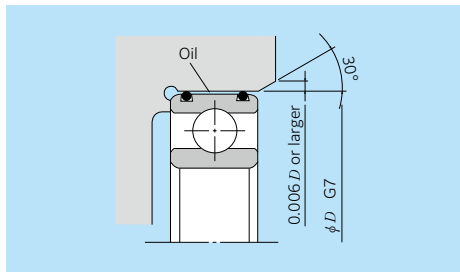


Fig. 4. Design of housing

Table 4 Dimensions and design

Housing bore tolerance	G7
Housing bore entrance chamfer	Max. 30°C
Housing bore chamfer undercut	0.006D or larger
Housing bore surface roughness $R_a$	2.5
Housing bore roundness	1/2 of bearing housing dimension tolerance

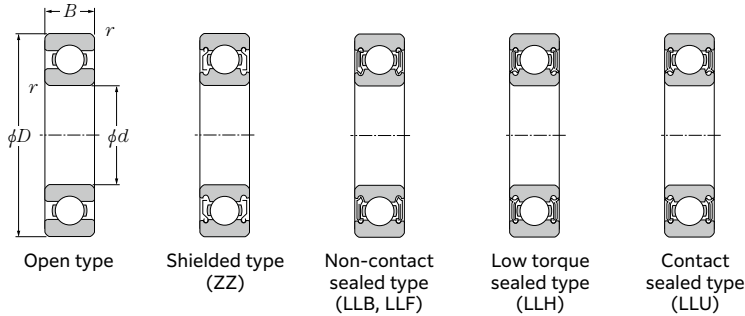
## (3) Allowable temperature range

-25 to 120°C





# Deep Groove Ball Bearings

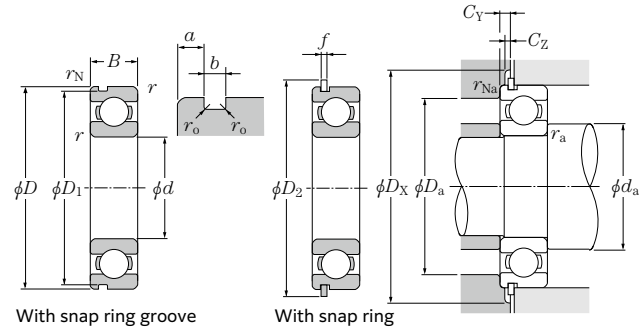


a 20 ~ 35mm

Boundary dimensions	Basic load rating		Fatigue load limit	Factor	Allowable speed				Bearing number								
	mm	dynamic kN			static kN	Grease	Oil	Open type	Shielded or sealed type <sup>2)</sup>	Open type	Shielded or sealed type <sup>2)</sup>						
d	D	B	r <sub>s min</sub> <sup>1)</sup>	r <sub>NS</sub> Min.	C <sub>r</sub>	C <sub>0r</sub>	C <sub>u</sub>	f <sub>0</sub>	12 000	14 000	—	—	6404	ZZ	LLB	LLH	LLU
20	72	19	1.1	—	31.5	13.9	1.09	11.4	12 000	14 000	—	—	6404	ZZ	—	—	—
22	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
	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
25	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
	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	—	—	—
28	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
	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
30	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
	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	—	—	—
32	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
	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
35	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	—	—	—	—
	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. B-24

# Deep Groove Ball Bearings



With snap ring groove

With snap ring

Dynamic equivalent radial load

$$P_r = X F_r + Y F_a$$

f <sub>0</sub> ·F <sub>a</sub> /C <sub>0r</sub>	e	F <sub>a</sub> /F <sub>r</sub> ≤ e		F <sub>a</sub> /F <sub>r</sub> > 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

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

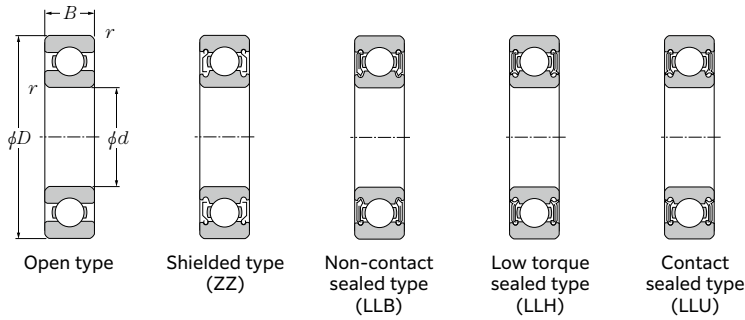
When  $P_{0r} < F_r$  use  $P_{0r} = F_r$ .

Bearing number	Snap ring groove dimensions				Snap ring dimensions		Installation-related dimensions							Mass <sup>5)</sup>	
	mm				mm		mm								
Groove / Snap ring <sup>3)</sup> (See drawings)	D <sub>1</sub> Max.	a Max.	b Min.	r <sub>o</sub> Max.	D <sub>2</sub> Max.	f Max.	d <sub>a</sub> Min.	D <sub>a</sub> Max. <sup>4)</sup>	D <sub>X</sub> (approx.)	C <sub>Y</sub> Max.	C <sub>Z</sub> Min.	r <sub>as</sub> Max.	r <sub>Nas</sub> 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. B-25



# Deep Groove Ball Bearings

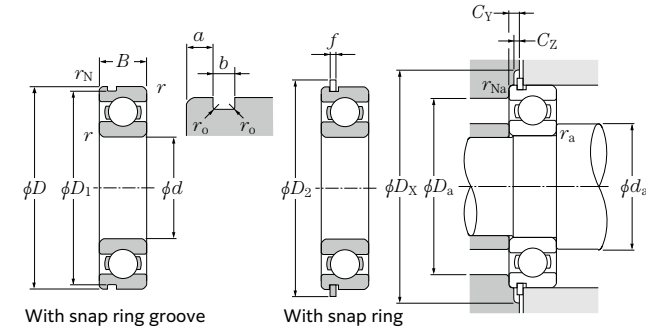


$d$  40 ~ 60mm

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

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. B-26

# Deep Groove Ball Bearings



With snap ring groove

With snap ring

Dynamic equivalent radial load  $P_r = XF_r + YF_a$

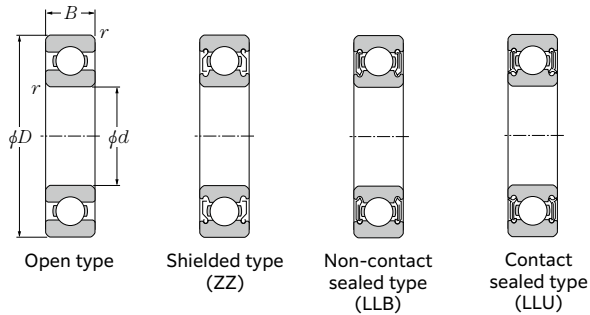
$\frac{f_0 \cdot F_a}{C_{0r}}$	$e$	$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19				2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44	1	0	0.56	1.00

Static equivalent radial load

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

Bearing number	Snap ring groove dimensions			Snap ring dimensions			Installation-related dimensions								Mass <sup>5)</sup>	
	mm		mm	mm		mm	mm									kg
Groove / Snap ring <sup>3)</sup> (See drawings)	$D_1$	$a$	$b$	$r_o$	$D_2$	$f$	$d_a$	$D_a$	$D_X$	$C_Y$	$C_Z$	$r_{as}$	$r_{Nas}$	(approx.)		
	Max.	Max.	Min.	Max.	Max.	Max.	Min.	Max. <sup>4)</sup>	Max.	(approx.)	Max.	Min.	Max.		Max.	(approx.)
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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

# Deep Groove Ball Bearings

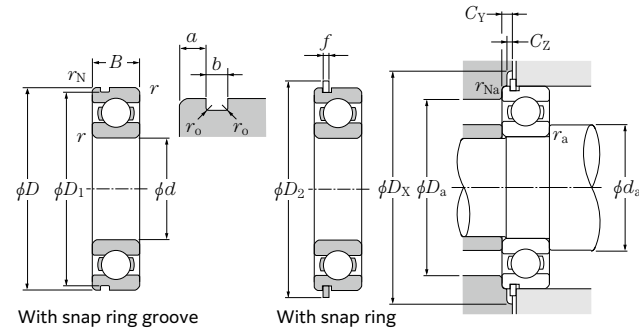


d 65 ~ 85mm

	Boundary dimensions				Basic load rating		Fatigue load limit kN	Factor $f_0$	Allowable speed $\text{min}^{-1}$			Bearing number			
	mm				dynamic kN	static kN			Grease Open type, ZZ, LLB Z, LB	Oil Open type, LLU	LLU	Open type		Shielded or sealed type <sup>2)</sup> (See drawings)	
	d	D	B	$r_{s \text{ min}}^{1)}$	$r_{NS}$ Min.	$C_r$	$C_{0r}$	$C_u$				$f_0$	7 400	8 700	4 100
65	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	—	—	—
	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	—	—	—	
70	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	—	—	—
	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	—	—	—	
75	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	—	—	—
	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	—	—	—	
80	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	—	—	—
	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	—	—	—	
85	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	—	—	—
	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. B-28

# Deep Groove Ball Bearings



Dynamic equivalent radial load

$$P_r = X F_r + Y F_a$$

$\frac{f_0 \cdot F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
		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

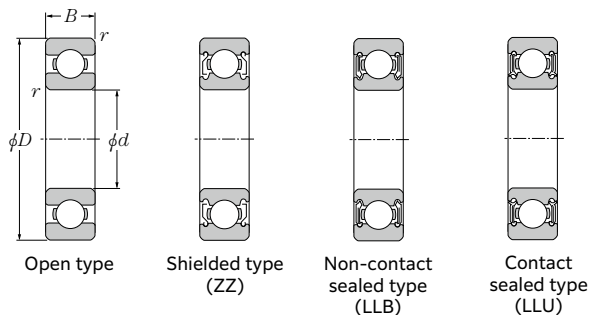
Static equivalent radial load

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

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

Bearing number	Snap ring groove dimensions		Snap ring dimensions		Installation-related dimensions										Mass <sup>5)</sup> kg	
	mm		mm		mm											
	Groove / Snap ring <sup>3)</sup> (See drawings)	$D_1$ Max.	a Max.	b Min.	$r_o$ Max.	$D_2$ Max.	f Max.	$d_a$ Min.	$D_a$ Max. <sup>4)</sup>	$D_x$ (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

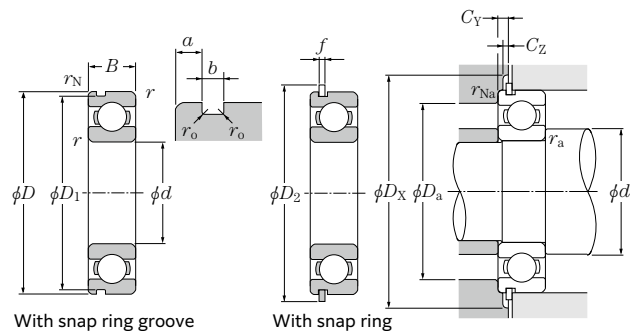
3) Sealed and shielded bearings are also available. 4) This dimension applies to sealed and shielded bearings. 5) Does not include bearings with snap rings. B-29



d 90 ~ 120mm

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

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. B-30



With snap ring groove

With snap ring

Dynamic equivalent radial load  
 $P_r = X F_r + Y F_a$

$f_0 \cdot F_a / C_{0r}$	e	$F_a / F_r \leq e$		$F_a / F_r > e$	
		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

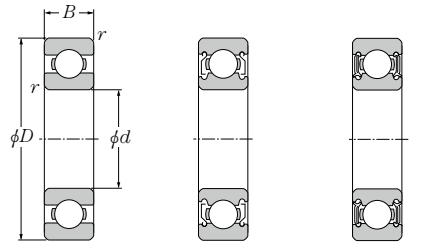
$P_{0r} = 0.6 F_r + 0.5 F_a$

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

Bearing number	Snap ring groove dimensions			Snap ring dimensions		Installation-related dimensions										Mass <sup>5)</sup> kg
	mm			mm		mm										
Groove / Snap ring <sup>3)</sup> (See drawings)	D <sub>1</sub> Max.	a Max.	b Min.	r <sub>o</sub> Max.	D <sub>2</sub> Max.	f Max.	d <sub>a</sub> Min.	D <sub>a</sub> Max. <sup>4)</sup>	D <sub>X</sub> (approx.)	C <sub>Y</sub> Max.	C <sub>Z</sub> Min.	r <sub>as</sub> Max.	r <sub>Nas</sub> Max.	(approx.)		
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	208.6	5.69	3.5	1	227.8	3.1	113	133	202	230	8.4	3.1	2.5	0.5	7
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	217.0	6.5	4.5	1	237	3.5	118	134	212	239	9.6	3.5	2.5	0.5	8.05
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	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
<b>N</b>	<b>NR</b>	232.0	6.5	4.5	1	252	3.5	123	149	227	254	9.6				



# Deep Groove Ball Bearings



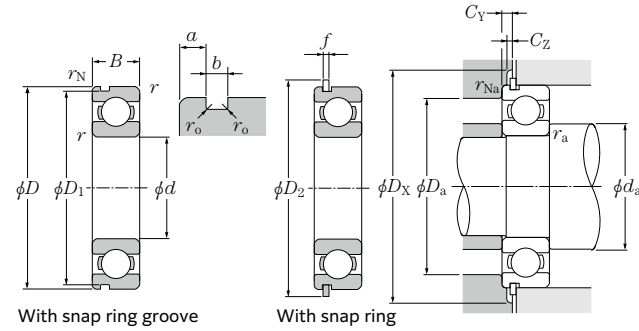
Open type      Shielded type (ZZ)      Contact sealed type (LLU)

d 120 ~ 170mm

Boundary dimensions	Basic load rating		Factor	Fatigue load limit kN	Grease Open type, ZZ, Z	Allowable speed min <sup>-1</sup>			Bearing number				
	dynamic kN					Oil Open type, Z	LLU LU	Open type	Shielded or sealed type <sup>2)</sup> (See drawings)				
	$C_r$	$C_{0r}$								$C_u$	$f_0$		
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
$d$	$D$	$B$	$r_{s \min}^{(1)}$	$r_{NS \min}^{(1)}$	$C_r$	$C_{0r}$	$C_u$	$f_0$	Open type, ZZ, Z	Oil Open type, Z	LLU LU	Open type	Shielded or sealed type <sup>2)</sup> (See drawings)
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	—	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. B-32

# Deep Groove Ball Bearings



With snap ring groove

With snap ring

Dynamic equivalent radial load  $P_r = XF_r + YF_a$

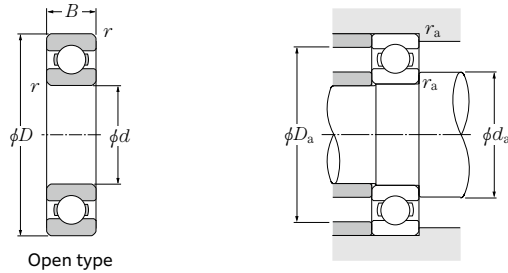
$\frac{f_0 \cdot F_a}{C_{0r}}$	$e$	$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19				2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

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

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

Bearing number	Snap ring groove dimensions mm			Snap ring dimensions mm			Installation-related dimensions mm							Mass <sup>5)</sup> kg		
	$D_1$ Max.	$a$ Max.	$b$ Min.	$r_o$ Max.	$D_2$ Max.	$f$ Max.	$d_a$ Min.	$D_a$ Max. <sup>4)</sup>	$D_X$ (approx.)	$C_Y$ Max.	$C_Z$ Min.	$r_{as}$ Max.	$r_{Nas}$ Max.			
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. B-33



Open type

d 180 ~ 260mm

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

1) Smallest allowable dimension for chamfer dimension r.

Dynamic equivalent radial load

$$P_r = X F_r + Y F_a$$

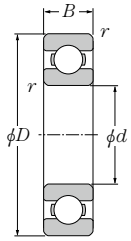
$\frac{f_0 \cdot F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19				2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30	1	0	0.56	1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

Static equivalent radial load

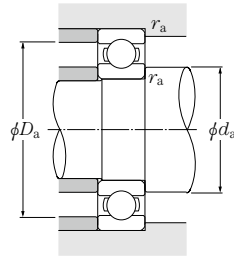
$$P_{0r} = 0.6 F_r + 0.5 F_a$$

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

Installation-related dimensions			Mass
$d_a$	mm	$r_{as}$	kg
Min.	Max.	Max.	(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 ~ 440mm

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

1) Smallest allowable dimension for chamfer dimension r.

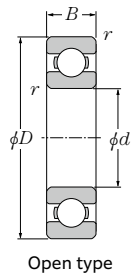
Dynamic equivalent radial load  
 $P_r = XF_r + YF_a$

$\frac{f_0 \cdot F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
		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

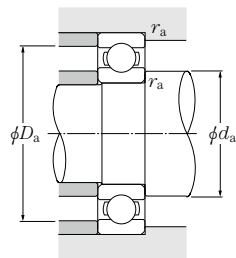
Static equivalent radial load  
 $P_{0r} = 0.6F_r + 0.5F_a$

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

Installation-related dimensions			Mass
$d_a$	mm	$r_{as}$	kg
Min.	Max.	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 ~ 600mm

Boundary dimensions	Basic load rating			Factor	Allowable speed		Bearing number			
	mm				min <sup>-1</sup>	Open type				
d	D	B	r <sub>s min</sub> <sup>1)</sup>	C <sub>r</sub>	C <sub>0r</sub>	C <sub>u</sub>	f <sub>0</sub>	Grease lubrication	Oil lubrication	
<b>460</b>	580	56	3	350	515	15.1	16.2	900	1 100	<b>6892</b>
	620	74	4	415	645	18.5	16.4	850	1 000	<b>6992</b>
<b>480</b>	600	56	3	355	540	15.4	16.1	860	1 000	<b>6896</b>
	650	78	5	480	770	21.5	16.5	810	950	<b>6996</b>
<b>500</b>	620	56	3	360	560	15.7	16.1	820	970	<b>68/500</b>
	670	78	5	490	805	22.2	16.5	770	910	<b>69/500</b>
<b>530</b>	650	56	3	365	580	15.9	16.0	770	900	<b>68/530</b>
<b>560</b>	680	56	3	370	600	16.1	16.0	710	840	<b>68/560</b>
<b>600</b>	730	60	3	415	705	18.2	16.0	660	780	<b>68/600</b>

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	$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
		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

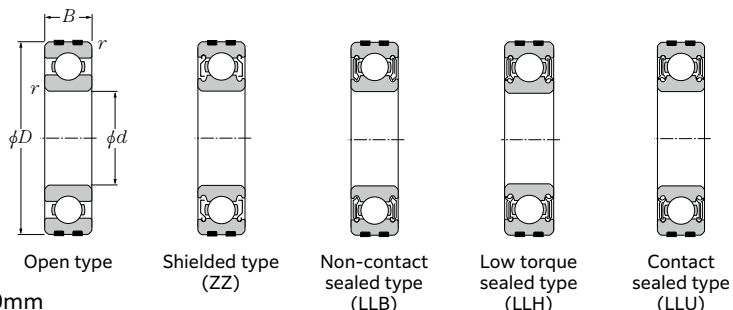
Static equivalent radial load

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

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

Installation-related dimensions			Mass
d <sub>a</sub>	mm	r <sub>as</sub>	kg
Min.	Max.	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

# Expansion Compensating Bearings

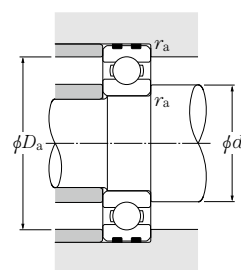


d 10 ~ 50mm

Boundary dimensions mm	Basic load rating		Fatigue load limit kN	Allowable Factor load kN	Factor f <sub>0</sub>	Allowable speed min <sup>-1</sup>				Bearing number							
	d <sub>r</sub> min <sup>1)</sup>	C <sub>r</sub>				C <sub>0r</sub>	C <sub>u</sub>	C <sub>p</sub>	Grease Open type, ZZ, LLB Z, LB	Oil Open type, Z, LB	LLH LH	LLU LU	Open type	Shielded or sealed type <sup>2)</sup> (See drawings)			
10	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
	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
12	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
	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
15	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
	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
17	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
	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
20	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
	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
25	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
	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
30	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
	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
35	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
	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
40	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
	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
45	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
	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
50	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
	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. B-40

# Expansion Compensating Bearings



Dynamic equivalent radial load

$$P_r = X F_r + Y F_a$$

$\frac{f_0 \cdot F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
		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

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

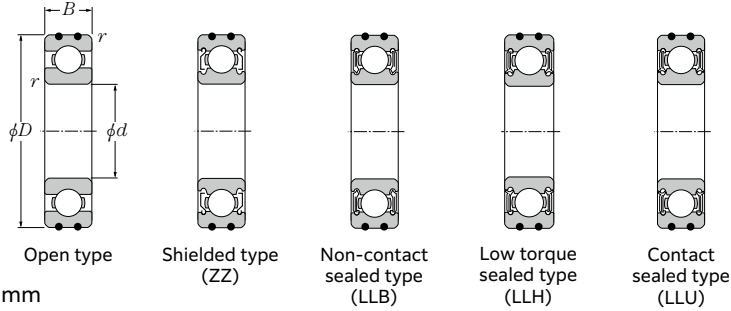
When  $P_{0r} < F_r$  use  $P_{0r} = F_r$ .

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

3) This dimension applies to sealed and shielded bearings.



# AC Bearings

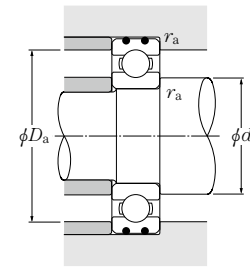


d 10 ~ 45mm

Boundary dimensions mm	Basic load rating		Fatigue load limit kN	Allowable load kN	Factor $f_0$	Allowable speed $\text{min}^{-1}$				Bearing number				
	dynamic	static				Grease Open type, ZZ, LLB Z, LB	Oil Open type, Z, LB	LLH LH	LLU LU	Open type	Shielded or sealed type <sup>2)</sup> (See drawings)			
d	D	B	$r_{s,\text{min}}^1$	$C_r$	$C_{0r}$	$C_u$	$C_p$	$f_0$						
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. B-42

# AC Bearings



Dynamic equivalent radial load

$$P_r = X F_r + Y F_a$$

$\frac{f_0 \cdot F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
		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

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

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

Installation-related dimensions mm			Mass kg	
$d_a$ Min.	$D_a$ Max. <sup>3)</sup>	$r_a$ 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.