

## Deep Groove Ball Bearings



### 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**

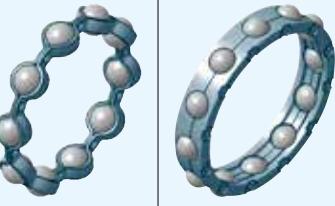
Types and codes	Shielded type	Sealed type		
	Non-contact type ZZ	Non-contact type LLB	Contact type LLU	Low torque type LLH
Construction				
	<ul style="list-style-type: none"> <li>Metal shield plate is affixed to the outside ring; the inner ring incorporates a V-groove and labyrinth clearance.</li> </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	<b>Torque</b> Small <b>Dust proofing</b> Good <b>Water proofing</b> Poor <b>High speed capacity</b> Same as open type <b>Allowable temp. range<sup>1)</sup></b> Depends on lubricant	Small Better than ZZ-type Poor Same as open type -25 to 120°C	Higher Excellent Very good Limited by contact seals -25 to 110°C	Medium Much better than LLB-type Good Much better than LLU-type -25 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 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

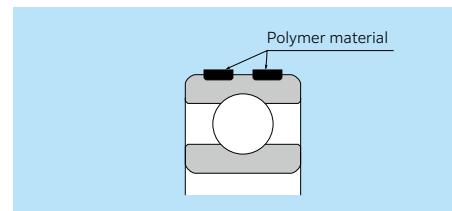
**Table 3** shows the recommended fits for bearings with light metal alloy housings. In cases where the bearing is going to be interference fit with the housing, it is very important not to damage the polymer material. Therefore, it is essential that the lip of the housing diameter be given a 10-15°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

### 3.3 AC bearings (creep prevention bearings)

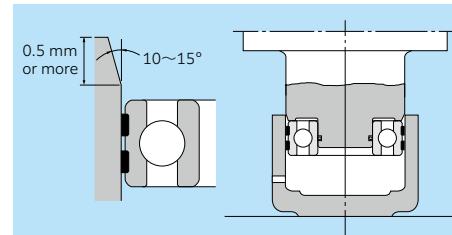
**NTN** Offers the AC type bearing which performs a similar function to the EC bearing. AC bearings have the same outer diameter dimensions as standard bearings with the addition of two O-rings located in circumferential grooves on the outside diameter of the outer ring. (**Fig. 3**) While the EC bearing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

**Table 3** Recommended fits for outer ring and housing bore

Condition	Housing material	Suitable bearing	Housing bore tolerance class
			H6
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	
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



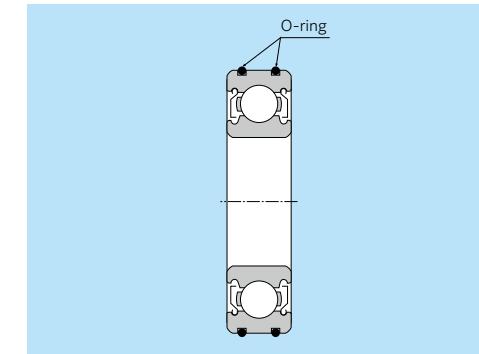
**Fig. 2.** Fitting method and housing inner diameter chamfer

#### (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



**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.

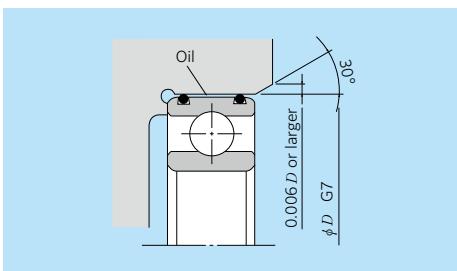


Fig. 4. Design of housing

Table 4 Dimensions and design

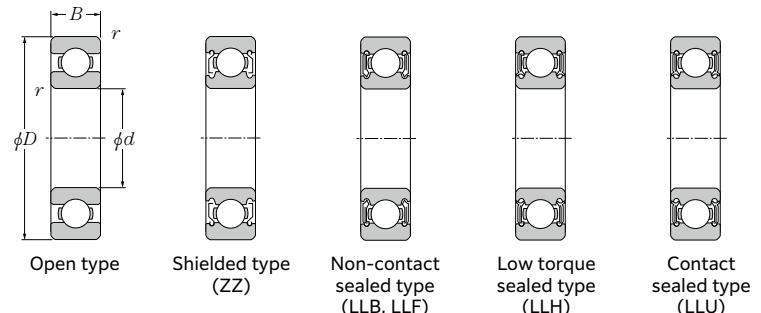
Housing bore tolerance	G7
Housing bore entrance chamfer	Max. 30°C
Housing bore chamfer undercut	0.006D or larger
Housing bore surface roughness $R_a$	2.5
Housing bore roundness	1/2 of bearing housing dimension tolerance

### (3) Allowable temperature range

-25 to 120°C

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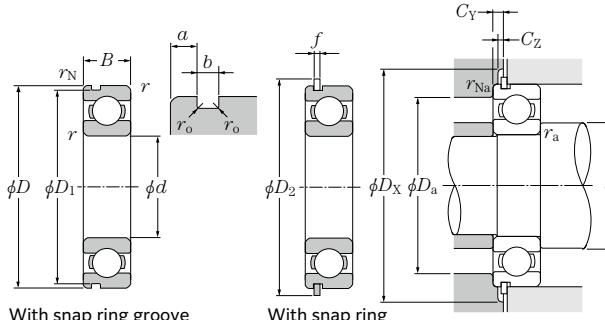
d 10 ~ 20mm

Boundary dimensions mm	Basic load rating				Fatigue Factor load limit	Allowable speed min <sup>-1</sup>				Bearing number			
	dynamic		static	Grease	Oil	Open type, Z, Z <sub>1</sub> , LB, LLF	Open type, Z, LB, LF	LLH	LLU	Open type	Shielded or sealed type <sup>2)</sup> (See drawings)		
	d	D	B	r <sub>s min<sup>1</sup></sub> <sup>1)</sup>	C <sub>r</sub>	C <sub>0r</sub>	C <sub>u</sub>	f <sub>0</sub>					
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
	22	6	0.3	0.3	2.99	1.27	0.099	14.0	30 000	36 000	25 000	21 000	6900
	26	8	0.3	—	5.05	1.96	0.138	12.4	29 000	34 000	25 000	21 000	6000
	30	9	0.6	0.5	5.65	2.39	0.182	13.2	25 000	30 000	21 000	18 000	6200
12	35	11	0.6	0.5	9.10	3.50	0.273	11.4	23 000	27 000	20 000	16 000	6300
	18	4	0.2	—	1.03	0.530	0.021	16.2	8 300	9 500	—	—	6701
	21	5	0.3	—	2.12	1.04	0.080	15.3	29 000	35 000	—	20 000	6801
	24	6	0.3	0.3	3.20	1.46	0.115	14.5	27 000	32 000	22 000	19 000	6901
	28	7	0.3	—	5.65	2.39	0.187	13.2	26 000	30 000	—	—	16001JRX
15	28	8	0.3	—	5.65	2.39	0.182	13.2	26 000	30 000	21 000	18 000	6001JRX
	32	10	0.6	0.5	6.75	2.75	0.214	12.7	22 000	26 000	20 000	16 000	6201
	37	12	1	0.5	10.8	4.20	0.325	11.1	20 000	24 000	19 000	15 000	6301
	21	4	0.2	—	1.04	0.585	0.024	16.5	6 600	7 600	—	—	6702
	24	5	0.3	—	2.30	1.26	0.091	15.8	26 000	31 000	—	17 000	6802
17	28	7	0.3	0.3	4.05	2.00	0.157	14.8	24 000	28 000	—	16 000	6902
	32	8	0.3	—	6.20	2.84	0.222	13.9	22 000	26 000	—	—	16002
	39	9	0.3	0.3	6.20	2.84	0.199	13.9	22 000	26 000	18 000	15 000	6002
	35	11	0.6	0.5	8.60	3.60	0.279	12.7	19 000	23 000	18 000	15 000	6202
	42	13	1	0.5	12.7	5.45	0.425	12.3	17 000	21 000	15 000	12 000	6302
17	23	4	0.2	—	1.11	0.660	0.027	16.3	5 000	6 700	—	—	6703
	26	5	0.3	—	2.47	1.46	0.102	16.1	24 000	28 000	—	15 000	6803
	30	7	0.3	0.3	5.15	2.58	0.202	14.7	22 000	26 000	—	14 000	6903JRX
	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
20	40	12	0.6	0.5	10.6	4.60	0.355	12.8	18 000	21 000	15 000	12 000	6203
	47	14	1	0.5	15.0	6.55	0.510	12.2	16 000	19 000	14 000	11 000	6303
	62	17	1.1	—	25.2	10.8	0.840	11.1	14 000	16 000	—	—	6403
	27	4	0.2	—	1.15	0.730	0.031	16.1	5 000	5 700	—	—	6704
	32	7	0.3	0.3	4.45	2.47	0.185	15.5	21 000	25 000	—	13 000	6804JR
20	37	9	0.3	0.3	7.05	3.70	0.288	14.7	19 000	23 000	—	12 000	6904
	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
	47	14	1	0.5	14.2	6.65	0.505	13.2	16 000	18 000	12 000	10 000	6204
	52	15	1.1	0.5	17.6	7.90	0.615	12.4	14 000	17 000	12 000	10 000	6304

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.

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

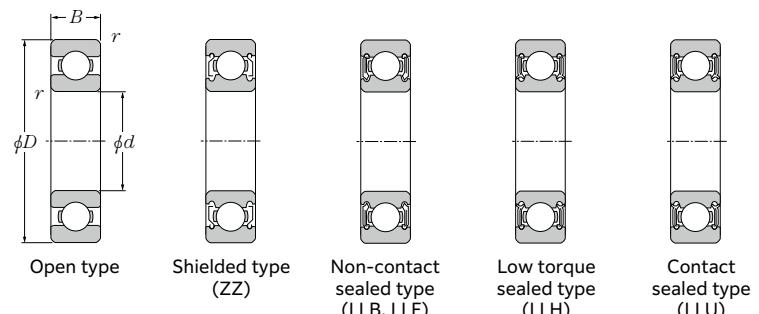
$f_0 \cdot F_a$ $C_{0r}$	$e$	$\frac{F_a}{F_r} \leq e$	$\frac{F_a}{F_r} > e$
X	Y	X	Y
0.172	0.19		2.30
0.345	0.22		1.99
0.689	0.26		1.71
1.03	0.28	1	1.55
1.38	0.30	0	1.45
2.07	0.34	0.56	1.31
3.45	0.38		1.15
5.17	0.42		1.04
6.89	0.44		1.00

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 (Groove / Snap ring) (See drawings)	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. Max. <sup>4)</sup>	$D_a$ 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
N NR	20.8	1.05	0.8	0.2	—	—	—	12	12.5	17	—	—	0.3	—	0.005
— <sup>6)</sup>	— <sup>6)</sup>	—	—	—	—	—	—	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
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
N NR	26.7	1.3	0.95	0.25	30.8	0.85	17	17.5	22	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
N NR	28.7	1.3	0.95	0.25	32.8	0.85	19	19.5	24	—	—	—	0.3	—	0.008
N NR	33.17	2.06	1.35	0.4	39.7	1.12	19	21	33	—	—	—	0.3	—	0.018
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</									

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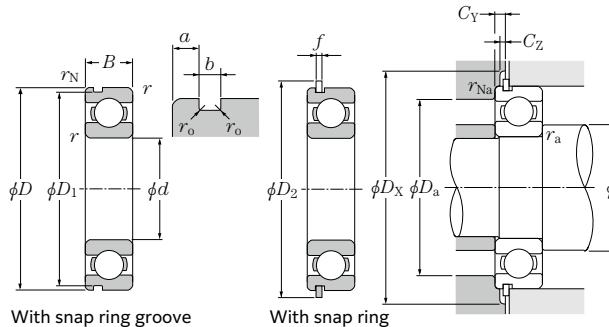
d 20 ~ 35mm

Boundary dimensions mm	Basic load rating				Fatigue Factor load limit	Allowable speed min <sup>-1</sup>				Bearing number							
	dynamic		static	Grease	Oil	Open type,	Open type,	LLH	LLU	Open type	Shielded or sealed type <sup>2)</sup> (See drawings)						
	d	D	B	$r_s$ <sup>min<sup>1</sup></sup>	$r_{NS}$ Min.	$C_r$	$C_{0r}$	$C_u$	$f_0$	Z, LB, LLF	Z, LB, LF	LH	LU				
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	—	—	—
	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	—	—
30	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	—	—	—
	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
32	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	—	—	—	—
	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.

# ●Deep Groove Ball Bearings

NTN



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

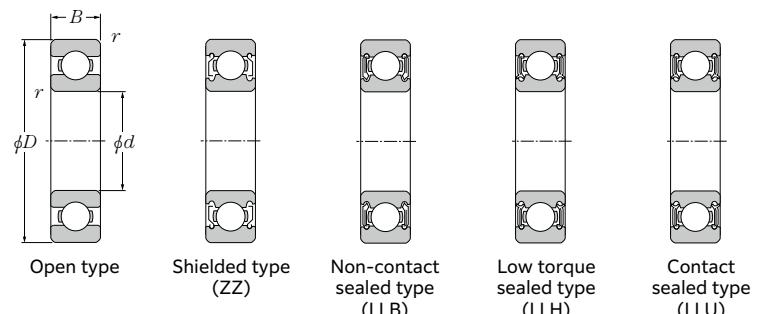
$f_0 \cdot F_a$ $C_{0r}$	$e$	$F_a \leq e$ $X$	$F_a > e$ $Y$
0.172	0.19		2.30
0.345	0.22		1.99
0.689	0.26		1.71
1.03	0.28	1	1.55
1.38	0.30	0	1.45
2.07	0.34	0.56	1.31
3.45	0.38		1.15
5.17	0.42		1.04
6.89	0.44		1.00

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 (Groove / Snap ring) (See drawings)	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. Max. <sup>4)</sup>	$D_a$ Max.	$D_X$ (approx.)	$C_Y$ Max.	$C_Z$ Min.	$r_{as}$ Max.	$r_{Nas}$ Max. (approx.)		
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
—	—	—	—	—	—	—	26.5	35.5	65.5	—	—	—	1	—	0.4
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
—	—	—	—	—	—	—	32	—	53	—	—	0.3	—	0.091	
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</			

# ●Deep Groove Ball Bearings

NTN



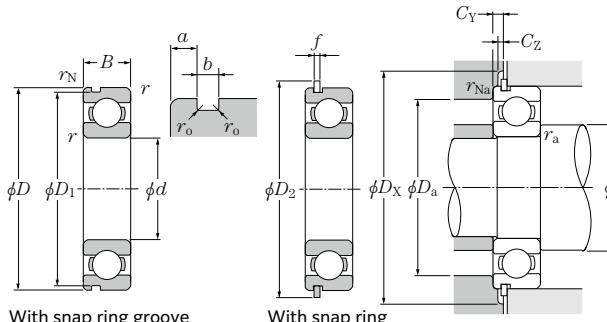
d 40 ~ 60mm

Boundary dimensions mm	Basic load rating			Fatigue Factor load limit	Allowable speed min <sup>-1</sup>			Bearing number					
	dynamic static			kN	Grease Open type, ZZ, LLB	Oil Open type, Z, LB	LH	LLH	LH	LU			
	d	D	B	$r_s$ <sup>min<sup>1</sup></sup>	$r_{NS}$ Min.	$C_r$	$C_{0r}$	$f_0$	Open type (See drawings)	Shielded or sealed type <sup>2)</sup> (See drawings)			
40	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 ZZ LLB LLH LLU
	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
45	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 ZZ — — —
	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
50	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 ZZ — — —
	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
55	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 ZZ — — —
60	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
60	95	11	0.6	—	22.1	17.5	1.20	16.3	7 000	8 300	—	—	16012 ZZ — — —
	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.

# ●Deep Groove Ball Bearings

NTN



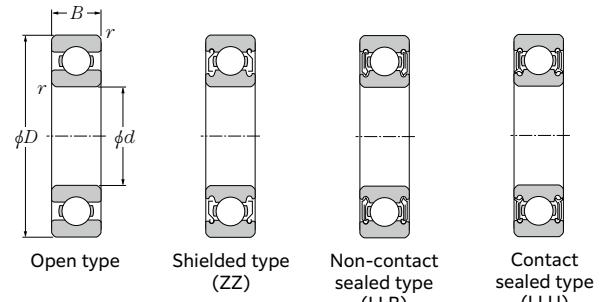
Dynamic equivalent radial load $P_r = X F_r + Y F_a$											
$f_0 \cdot F_a$ $C_{0r}$	$e$	$X$	$Y$	$F_a \leq e$ $F_r$	$X$	$Y$	$F_a > e$ $F_r$	$X$	$Y$	$F_r$	
0.172	0.19										2.30
0.345	0.22										1.99
0.689	0.26										1.71
1.03	0.28										1.55
1.38	0.30	1	0	0.56							1.45
2.07	0.34										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 (Groove / Snap ring) (See drawings)	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. (approx.)			
	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
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	
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	
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	
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	
NR	—	—	—	—	—	—	—	49	61.5	101	—	—	2.0	—	1.23	
NR	NR	56.7	1.3	0.95	0.25	60.8	0.85	47	48	56	61.5	1.9	0.9	0.3	0.04	
NR	NR	66.7	1.7	0.95	0.25	70.8	0.85	49	51	64	72	2.3	0.9	0.6	0.128	
NR	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
NR	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
NR	NR	96.8	3.28	2.7	0.6	106.5	2.46	53	61.5	92	108	5.4	2.5	1	0.5	0.814
NR	NR	—	—	—	—	—	—	54	66.5	111	—	—	2	—	1.53	
NR	NR	63.7	1.3	0.95	0.25	67.8	0.85	52	54	63	68.5	1.9	0.9	0.3	0.052	
NR	NR	70.7	1.7	0.95	0.25	74.8	0.85	54	55	68	76	2.3	0.9	0.6	0.132	
NR	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
NR	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
NR	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
NR	NR	—	—	—	—	—	—	61	73.5	119	—	—	2	—	1.88	
NR	NR	70.7	1.7	0.95	0.25	74.8	0.85	57	59	70	76	2.3	0.9	0.3	0.083	
NR	NR	77.9	2.1	1.3	0.4	84.4	1.12	60	61.5	75						

# ●Deep Groove Ball Bearings

NTN



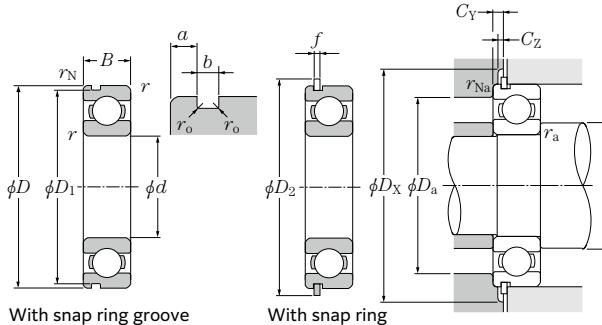
d 65 ~ 85mm

Boundary dimensions				Basic load rating		Fatigue load limit	Factor	Allowable speed		Bearing number					
				dynamic kN		static kN		Grease min <sup>-1</sup>	Oil min <sup>-1</sup>	Open type	Shielded or sealed type <sup>2)</sup>				
		mm	mm	$r_{NS}$	$r_s$ min <sup>1)</sup>	$C_r$	$C_{0r}$	$f_0$	ZZ, LLB	Z, LB	LLU LU	Open type	Shielded or sealed type <sup>2)</sup>	(See drawings)	
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
70	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	—	—	—
	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
75	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	—	—	—
	115	20	1.1	0.5	44.0	33.5	2.44	15.8	5 700	6 700	3 300	6015	ZZ	LLB	LLU
80	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	—	—	—
85	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
85	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.

# ●Deep Groove Ball Bearings

NTN



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

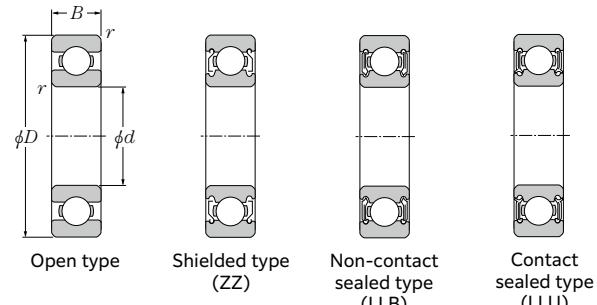
$f_0 \cdot F_a$ $C_{0r}$	$e$	$\frac{F_a}{F_r} \leq e$	$\frac{F_a}{F_r} > e$
X	Y	X	Y
0.172	0.19		2.30
0.345	0.22		1.99
0.689	0.26		1.71
1.03	0.28		1.55
1.38	0.30	1	0.56
2.07	0.34	0	1.31
3.45	0.38		1.15
5.17	0.42		1.04
6.89	0.44		1.00

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 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.	$D_X$ (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			

# ● Deep Groove Ball Bearings

NTN



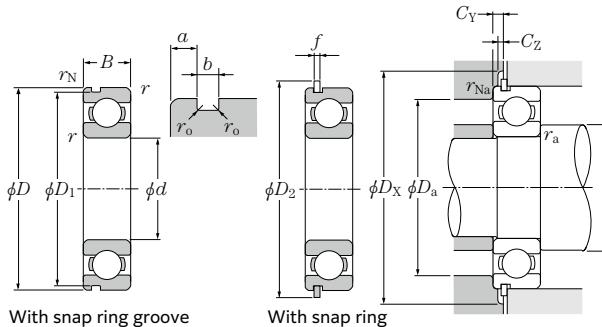
d 90 ~ 120mm

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

# ● Deep Groove Ball Bearings

NTN



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

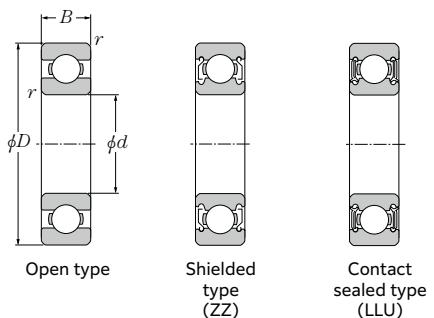
$f_0 \cdot F_a$ $C_{0r}$	$e$	$F_a \leq e$ $X$	$F_a > e$ $Y$
0.172	0.19		2.30
0.345	0.22		1.99
0.689	0.26		1.71
1.03	0.28	1	1.55
1.38	0.30	0	1.45
2.07	0.34	0.56	1.31
3.45	0.38		1.15
5.17	0.42		1.04
6.89	0.44		1.00

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 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. Max. <sup>4)</sup>	$D_a$ Max.	$D_X$ (approx.)	$C_Y$ Max.	$C_Z$ Min. Max.	$r_{as}$ Max. 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	179	205	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
— — —	—	—	—											

## ●Deep Groove Ball Bearings

NTN



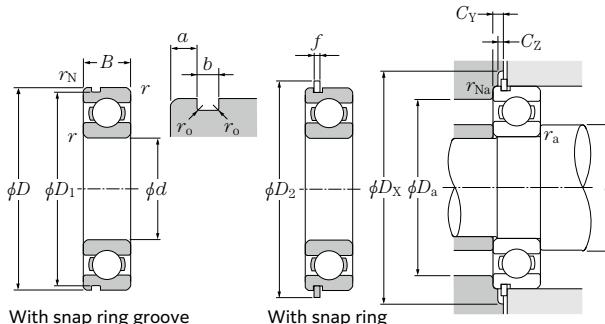
d 120 ~ 170mm

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

## ●Deep Groove Ball Bearings

NTN



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

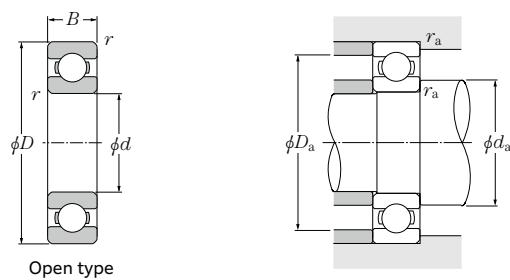
$f_0 \cdot F_a$ $C_{0r}$	$e$	$X$	$Y$	$F_a \leq e$ $X$	$F_a > e$ $Y$
0.172	0.19				2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28	1	0	0.56	1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

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

Bearing number (Groove / Snap ring <sup>3)</sup> (See drawings)	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. Max. <sup>4)</sup>	$D_a$ Max.	$D_X$ (approx.)	$C_Y$ Max.	$C_Z$ Min.	$r_{as}$ Max.	$r_{Nas}$ Max. (approx.)		
<b>N NR 217.0</b>	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
<b>N NR 161.8</b>	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
<b>N NR 176.8</b>	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
<b>N NR 193.65</b>	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
<b>N NR 222.0</b>	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
<b>N NR 171.8</b>	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
<b>N NR 186.8</b>	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
<b>N NR 242.0</b>	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
<b>N NR 186.8</b>	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
<b>N NR 196.8</b>	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	—	—	1.63
— —															

## ●Deep Groove Ball Bearings

NTN



d 180 ~ 260mm

Boundary dimensions			Basic load rating		Fatigue load limit	Factor	Allowable speed		Bearing number
	mm	mm	dynamic kN	static kN	C <sub>u</sub>	f <sub>0</sub>	Grease lubrication min <sup>-1</sup>	Oil lubrication min <sup>-1</sup>	
d	D	B	r <sub>s</sub> min <sup>1)</sup>	C <sub>r</sub>	C <sub>0r</sub>				Open type
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.

## ●Deep Groove Ball Bearings

NTN

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  $P_{0r} = F_r$ .

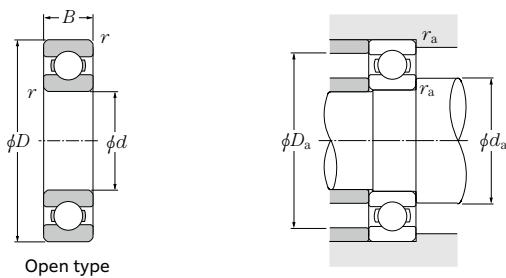
### Installation-related dimensions

### Mass

$d_a$ Min.	$D_a$ Max.	$r_{as}$ Max.	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

## ●Deep Groove Ball Bearings

NTN



*d* 280 ~ 440mm

Boundary dimensions			Basic load rating		Fatigue load limit	Factor	Allowable speed		Bearing number	
	mm	mm	dynamic kN	static kN	C <sub>u</sub>	f <sub>0</sub>	Grease lubrication min <sup>-1</sup>	Oil lubrication min <sup>-1</sup>		
d	D	B	r <sub>s min<sup>1)</sup></sub>	C <sub>r</sub>	C <sub>0r</sub>				Open type	
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*.

## ●Deep Groove Ball Bearings

NTN

Dynamic equivalent radial load  
 $P_{Tr} = X F_r + Y F_a$

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

<i>d<sub>a</sub></i> mm Min.	<i>D<sub>a</sub></i> mm Max.	<i>r<sub>as</sub></i> mm Max.	kg (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

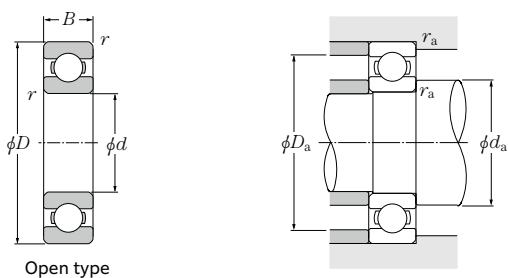
440 600 4 91.1

451 529 2 22.5

456 584 3 60

## ●Deep Groove Ball Bearings

NTN



*d* 460 ~ 600mm

Boundary dimensions mm	Basic load rating			Fatigue load limit kN	Factor <i>f</i> <sub>0</sub>	Allowable speed		Bearing number
	<i>d</i>	<i>D</i>	<i>B</i>			dynamic kN	static kN	
<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*.

## ●Deep Groove Ball Bearings

NTN

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

$\frac{f_0 \cdot F_a}{C_{0r}}$	<i>e</i>		$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
	X	Y	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

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

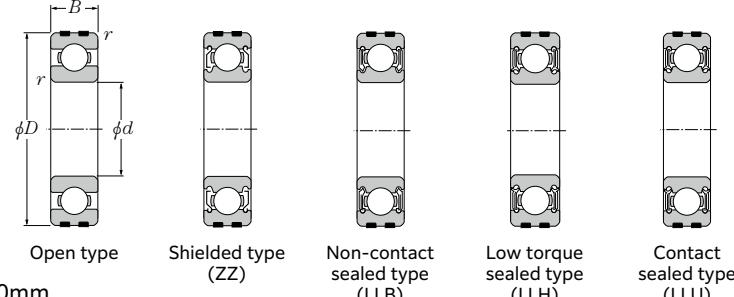
When  $P_{0r} < F_r$  use  $P_{0r} = F_r$ .

### Installation-related dimensions

<i>d</i> <sub>a</sub> Min.	<i>D</i> <sub>a</sub> Max.	<i>r</i> <sub>as</sub> Max.	kg (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

NTN



d 10 ~ 50mm

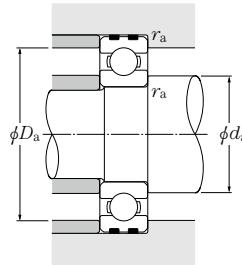
d	D	B	$r_s \text{ min}^{(1)}$	Boundary dimensions		Basic load rating		Fatigue load limit	Allowable Factor load	Allowable speed $\text{min}^{-1}$		Bearing number	
				mm	mm	dynamic static kN	static kN	Grease Z, ZZ	Oil Z, LB	Open type, LLB	Open type, LLH	Open type, LU	Shielded or sealed type <sup>(2)</sup>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

NTN



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

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

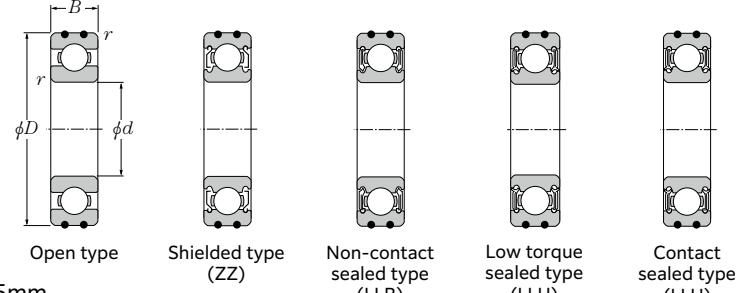
When  $P_{0r} < F_r$ , use  $P_{0r} = F_r$ .

Installation-related dimensions		Mass	
mm		kg	
$d_a$	$D_a$	$r_{as}$	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

NTN



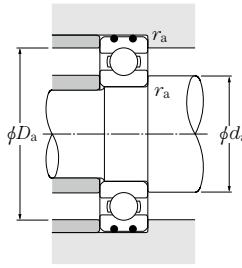
d 10 ~ 45mm

d	D	B	$r_s$ min <sup>1)</sup>	$C_r$	$C_{or}$	$C_u$	$C_p$	$f_0$	Boundary dimensions			Basic load rating dynamic static kN	Fatigue load limit kN	Allowable Factor load load kN	Allowable speed min <sup>-1</sup>			Bearing number	
															Grease Open type, Open type, ZZ, LLB Z, LB			Shielded or sealed type <sup>2)</sup> (See drawings)	
									mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
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		
	100	25	1.5	58.5	32.0	2.50	21.8	13.1	7 000	8 200	5 600	4 700	AC-6209	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-6309	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.

## ●AC Bearings

NTN



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
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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  $P_{0r} = F_r$ .

3) This dimension applies to sealed and shielded bearings.