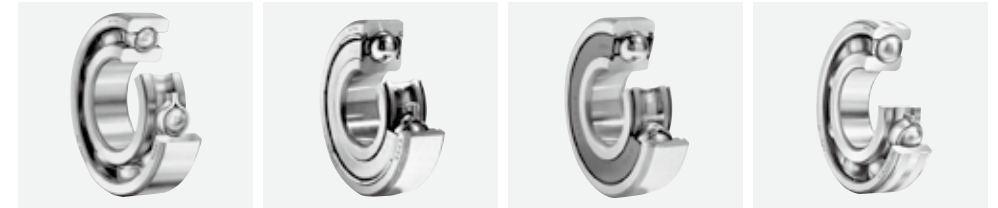


Deep Groove Ball Bearings



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.

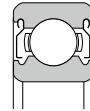
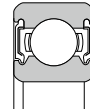
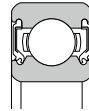
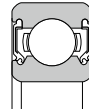
When two or more deep groove ball bearings are used in combination and mounted adjacent to each other a duplex set (D2) should be used. Duplex bearings (D2) utilize controlled tolerances

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"> • Metal shield plate is affixed to the outside ring; the inner ring incorporates a V-groove and labyrinth clearance. 	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • The outer ring incorporates synthetic rubber molded to a steel plate; seal edge contacts V-groove along inner ring surface. 	<ul style="list-style-type: none"> • Basic construction is the same as LLU type, but a specially designed lip on the edge of the seal prevents foreign matter penetration; low torque construction. 	
Performance comparison	Torque	Small	Small	Higher	Medium
	Dust proofing	Good	Better than ZZ-type	Excellent	Much better than LLB-type
	Water proofing	Poor	Poor	Very good	Good
	High speed capacity	Same as open type	Same as open type	Limited by contact seals	Much better than LLU-type
	Allowable temp. range ¹⁾	Depends on lubricant	-25 to 120°C	-25 to 110°C	-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.

Table 3 Recommended fits for outer ring and housing bore

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

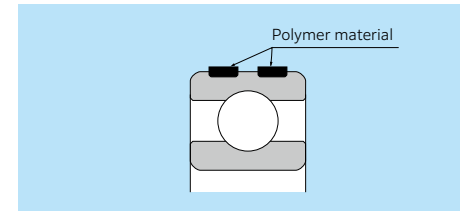


Fig. 1. Expansion compensating bearings

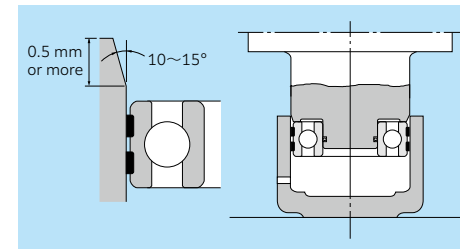


Fig. 2. Fitting method and housing inner diameter chamfer

(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 mm²/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.

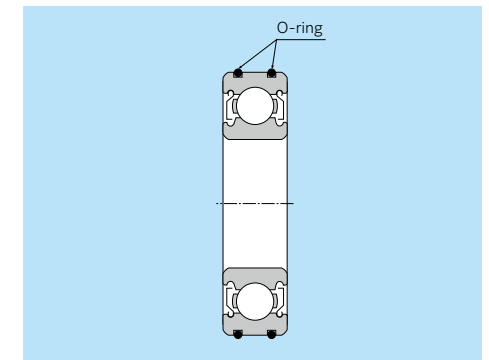


Fig. 3. AC bearing



(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.

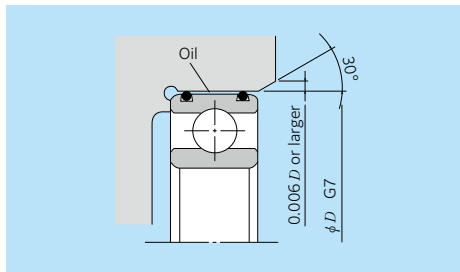


Fig. 4. Design of housing

Table 4 Dimensions and design

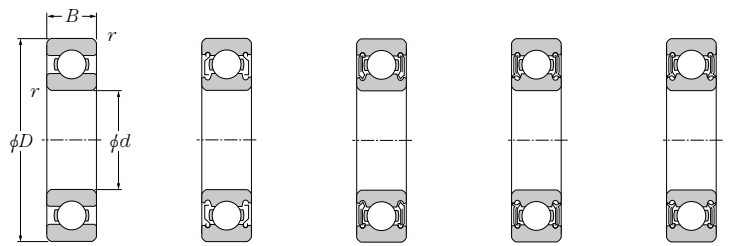
Housing bore tolerance	G7
Housing bore entrance chamfer	Max. 30°C
Housing bore chamfer undercut	0.006D or larger
Housing bore surface roughness R_a	2.5
Housing bore roundness	1/2 of bearing housing dimension tolerance

(3) Allowable temperature range

-25 to 120°C



Deep Groove Ball Bearings



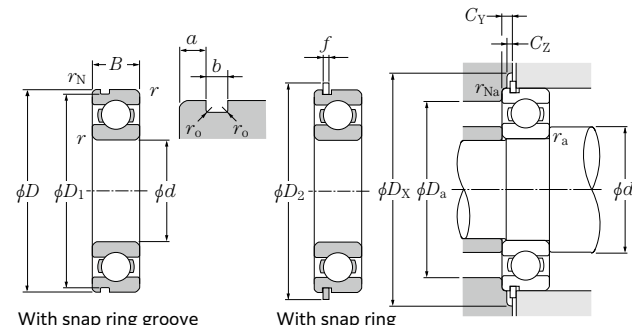
Open type Shielded type (ZZ) Non-contact sealed type (LLB) Low torque sealed type (LLH) Contact sealed type (LLU)

d 40 ~ 60mm

Boundary dimensions	Basic load rating		Fatigue load limit	Factor	Allowable speed				Bearing number								
	dynamic static				Grease	Oil		Open type	Shielded or sealed type ²⁾	Open type	Shielded or sealed type ²⁾	Open type	Shielded or sealed type ²⁾				
	mm	kN	kN	Open type, ZZ, LLB		Open type, Z, LB	LLH							LLU			
d	D	B	r _s min ¹⁾	r _{NS} Min.	C _r	C _{0r}	C _u	f ₀	12 000	14 000	8 000	6 700	6808JR	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-26

Deep Groove Ball Bearings



With snap ring groove With snap ring

Dynamic equivalent radial load $P_r = XF_r + YF_a$

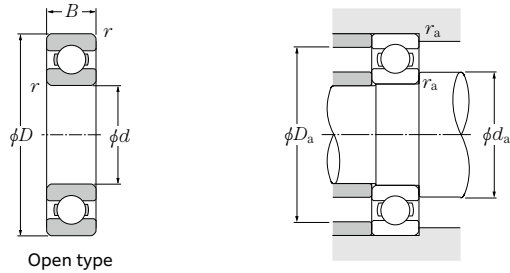
$f_0 \cdot F_a / C_{0r}$	e	$F_a / F_r \leq e$		$F_a / F_r > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

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

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

Bearing number	Snap ring groove dimensions			Snap ring dimensions			Installation-related dimensions							Mass ⁵⁾		
	mm			mm			mm									
Groove / Snap ring ³⁾ (See drawings)	D ₁ Max.	a Max.	b Min.	r _o Max.	D ₂ Max.	f Max.	d _a Min.	D _a Max. ⁴⁾	D _X (approx.)	C _Y Max.	C _Z Min.	r _{as} Max.	r _{Nas} Max. (approx.)	(approx.)		
N	NR	50.7	1.3	0.95	0.25	54.8	0.85	42	43	50	55.5	1.9	0.9	0.3	0.3	0.033

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-27



Open type

d 180 ~ 260mm

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

1) Smallest allowable dimension for chamfer dimension r.

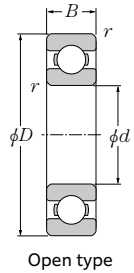
Dynamic equivalent radial load
 $P_r = X F_r + Y F_a$

$\frac{f_0 \cdot F_a}{C_{0r}}$	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

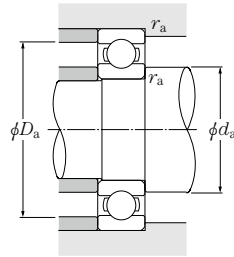
Static equivalent radial load
 $P_{0r} = 0.6 F_r + 0.5 F_a$

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

1) Smallest allowable dimension for chamfer dimension r.

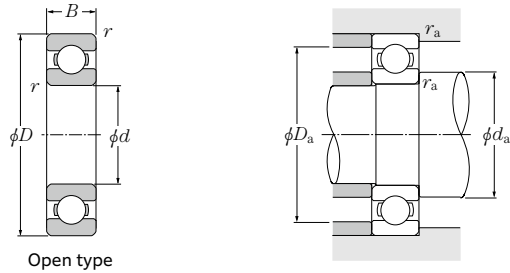
Dynamic equivalent radial load
 $P_r = X F_r + Y F_a$

$\frac{f_0 \cdot F_a}{C_{0r}}$	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.)
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 ⁻¹		
<i>d</i> <i>D</i> <i>B</i> <i>r_{s min}</i> ¹⁾	<i>C_r</i>	dynamic kN	static kN	<i>f₀</i>	Grease lubrication	Oil lubrication	Open type
460 580 56 3	350	515	15.1	16.2	900	1 100	6892
620 74 4	415	645	18.5	16.4	850	1 000	6992
480 600 56 3	355	540	15.4	16.1	860	1 000	6896
650 78 5	480	770	21.5	16.5	810	950	6996
500 620 56 3	360	560	15.7	16.1	820	970	68/500
670 78 5	490	805	22.2	16.5	770	910	69/500
530 650 56 3	365	580	15.9	16.0	770	900	68/530
560 680 56 3	370	600	16.1	16.0	710	840	68/560
600 730 60 3	415	705	18.2	16.0	660	780	68/600

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

Dynamic equivalent radial load

$$P_r = X F_r + Y F_a$$

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

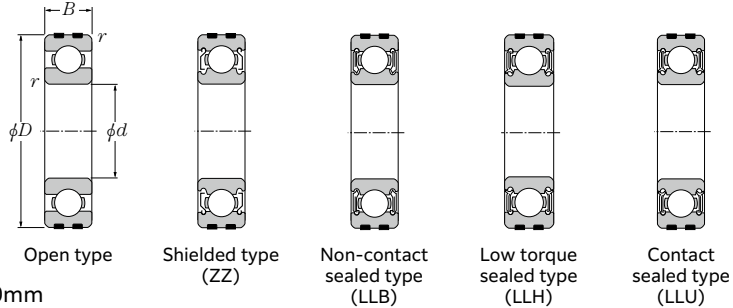
$$P_{0r} = 0.6 F_r + 0.5 F_a$$

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

Installation-related dimensions			Mass
<i>d_a</i>	mm	<i>r_{as}</i>	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

NTN



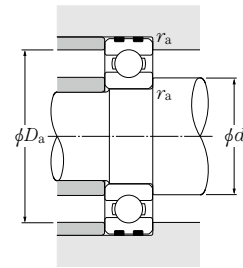
d 10 ~ 50mm

Boundary dimensions mm	Basic load rating		Fatigue load limit kN	Allowable Factor load kN	Factor f ₀	Allowable speed min ⁻¹				Bearing number							
	d _r ¹⁾	C _r				C _{0r}	C _u	C _p	Grease Open type, ZZ, LLB Z, LB	Oil Open type, Z, LB	LLH LH	LLU LU	Open type	Shielded or sealed type ²⁾ (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

NTN



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

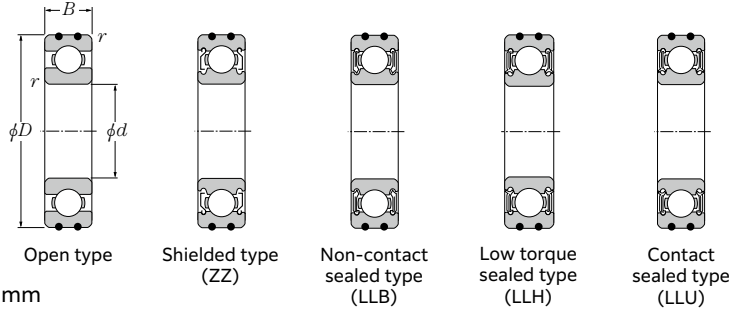
$$P_{0r} = 0.6F_r + 0.5F_a$$

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

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

3) This dimension applies to sealed and shielded bearings.

AC Bearings

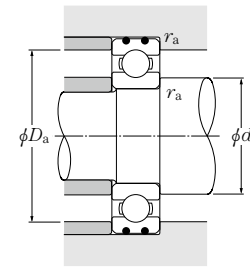


d 10 ~ 45mm

Boundary dimensions mm	Basic load rating		Fatigue load limit kN	Allowable load kN	Factor f_0	Allowable speed 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 ²⁾ (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	D_a	r_a	Open type (approx.)	
Min.	Max. ³⁾	Max.	Max.	
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.