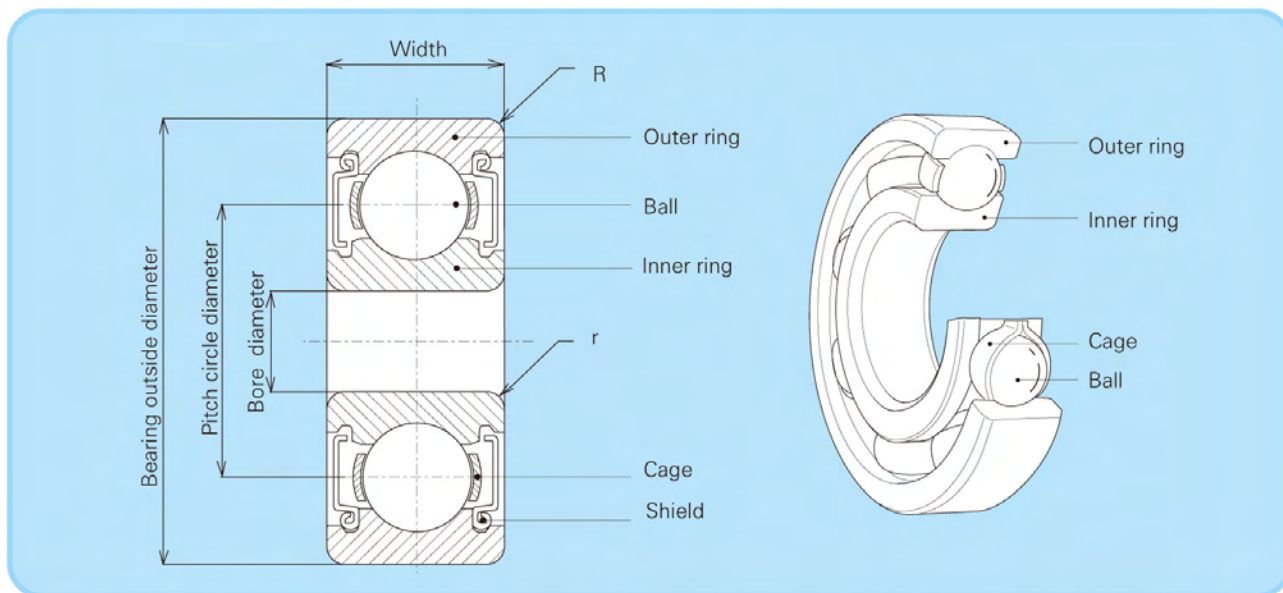


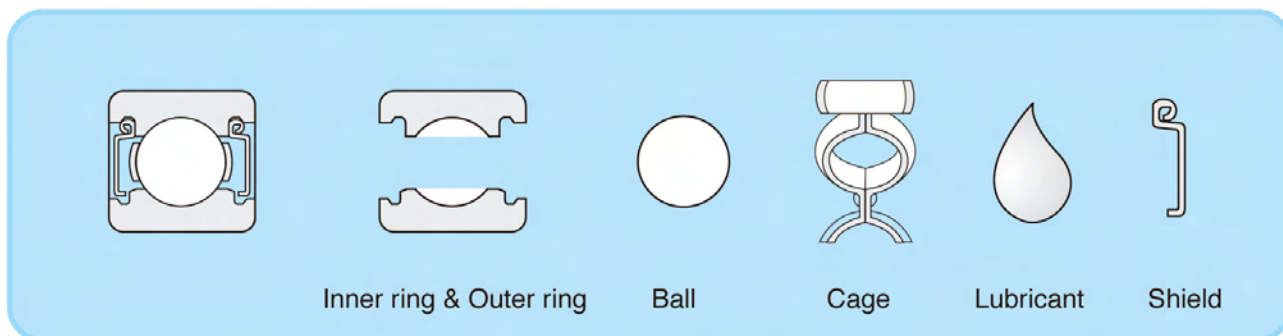
CONSTRUCTION & COMPONENTS

Deep groove ball bearing



HCH rolling bearing basically consists of two rings, rolling elements and a cage, which keeps the rolling elements at equal intervals. Seals and shields are applied to prevent the bearing from outside affect such as dust or oil invasion. The main purpose of lubricants in rolling bearing is to reduce friction and wear of each element.

● Deep groove ball bearing components (ZZ type)



Notes:

The above bearing construction drawing only lists one type of inner ring construction (V-groove), which is applied usually in sealed bearings. But there are other two types of inner ring constructions applied as below chart.

Inner ring seal groove types

V-groove	L-groove	Plain

Notes:

- 1) V-groove type are usually applied for small and medium size HCH deep groove ball bearings with seals or shields.
- 2) L-groove type are usually applied for miniature size HCH deep groove ball bearings with seals or shields.
- 3) Plain type are usually applied for HCH open type deep groove ball bearings.

● Dimensions

A rolling bearing's major dimensions, is known as "boundary dimensions". To facilitate international bearing interchangeability and economical bearing production, bearing boundary dimensions have been standardized by the International Standards Organization (ISO). Those boundary dimensions which have been standardized include: bearing bore diameter, outside diameter, width/height, and chamfer dimensions-all important dimensions.

Outer diameter dimensions (D) for radial bearings with standardized bore diameter dimensions (d) are covered in the "diameter series"; their corresponding width dimensions (B) are covered in the "width series". The ISO General Plans for boundary dimensions of deep groove ball bearings contain a progressive series of standardized outside diameters for every standard bore diameter arranged in Diameter series 8, 9, 0, 2, 3, 4 (in order of increasing outside diameter).

Diameter series numbers

Metric deep groove ball bearing	Diameter series (outer diameter dimensions)		
	number		8, 9, 0, 2, 3, 4
	dimensions		small ← → large

● Cage

Cages are mechanically stressed by frictional, strain and inertia forces and they may also be subjected to the chemical action of certain lubricants, lubricant additives or products of their ageing, organic solvents or coolants. Therefore the design and material are of paramount importance for the performance of the cage as well as for the operational reliability of the bearing itself.

Following three types of cage are widely applied in HCH deep groove ball bearings.

Rivet-type cage	Tongue-type cage	Polyamide cage
Made from high precision strip steel, pressed and formed with spherical ball pockets. The retainer halves are fixed together with rivets. HCH small size deep groove ball bearings widely use steel Rivet-type cages.	Made from high precision strip steel, pressed and formed with spherical ball pocket and tongue shape. The male and female retainer halves are caulked together for HCH miniature ball bearings application.	Polyamide cage are offered a range of materials, such as Nylon 6/6 with glass fiber, and has an advantage in self-lubricating property and lower acoustic noise. They are usually used in HCH ultra-low noise bearings.

● Internal sealing arrangements

The performance of sealing is vital to the cleanliness of the lubricant and the overall service life of the bearing arrangement. Integral bearing seals must be able to keep contaminants out and lubricant in the bearing cavity. Sealed bearings are generally used for arrangements where a sufficiently effective external seal cannot be provided because there is inadequate space.

When selecting a seal, the following factors need to be taken into consideration: the type of lubricant (oil or grease), seal peripheral speed, shaft fitting errors, space limitations, seal friction, resultant heat increase, as well as the cost.

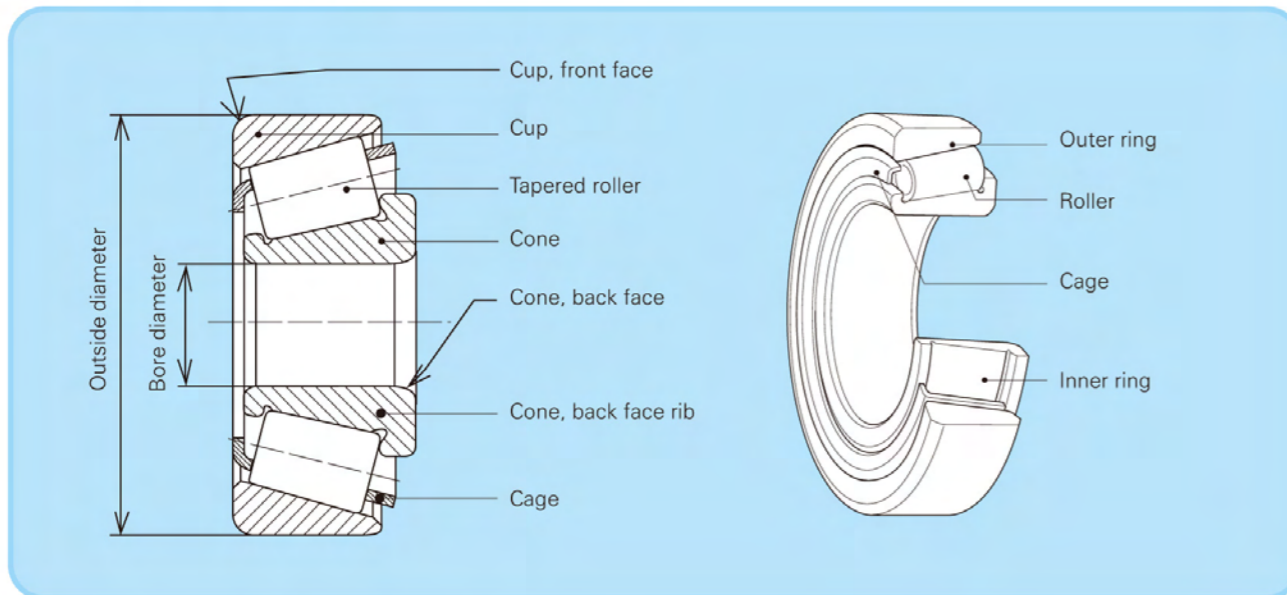
Shields and seals

"V" sealing groove (inner ring)	"L" sealing groove (inner ring)	No sealing groove (inner ring)
<p>Metal shields (ZZ) Non-contact High temperature Very high speed For small and medium size bearings</p>	<p>Metal shields (ZZ) Non-contact High temperature Very high speed For miniature size bearings</p>	<p>Metal shields (ZZ) Non-contact High temperature Very high speed Applicable due to assembly requirement</p>
<p>Rubber seals (2RS) Contact Very good dust and water proofing For small and medium size bearings</p>	<p>Rubber seals (2RS) Contact Very good dust and water proofing For miniature size bearings</p>	<p>Rubber seals (2RS) Contact Very good dust and water proofing Applicable due to assembly requirement</p>
<p>Rubber seals (2RZ) Non-contact Very high speed Good dust proofing For small and medium size ball bearings</p>	<p>Rubber seals (2RZ) Non-contact Very high speed Good dust proofing For miniature size bearings</p>	<p>Rubber seals (2RZ) Non-contact Very high speed Good dust proofing Applicable due to assembly requirement</p>
<p>Rubber seals (2RS1) Contact High speed Excellent dust and water proofing For small and medium size bearings</p>	<p>Rubber seals (2RS1) Contact High speed Excellent dust and water proofing For miniature size bearings</p>	

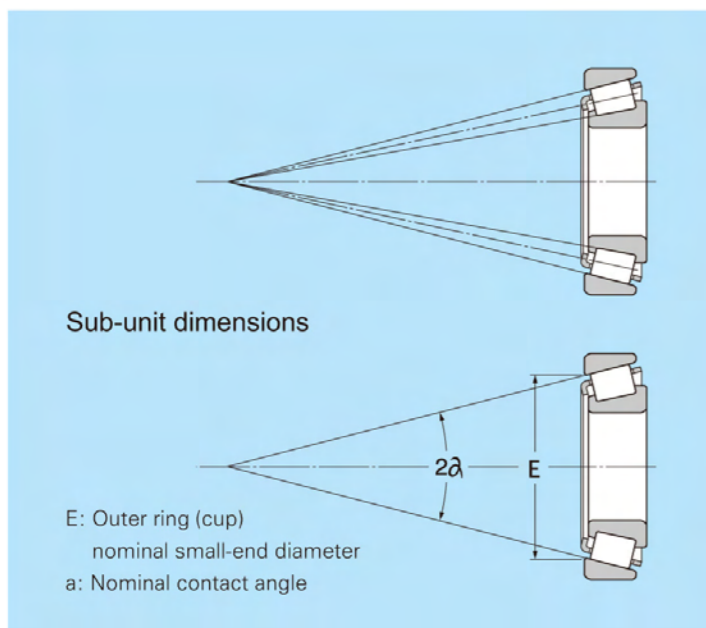
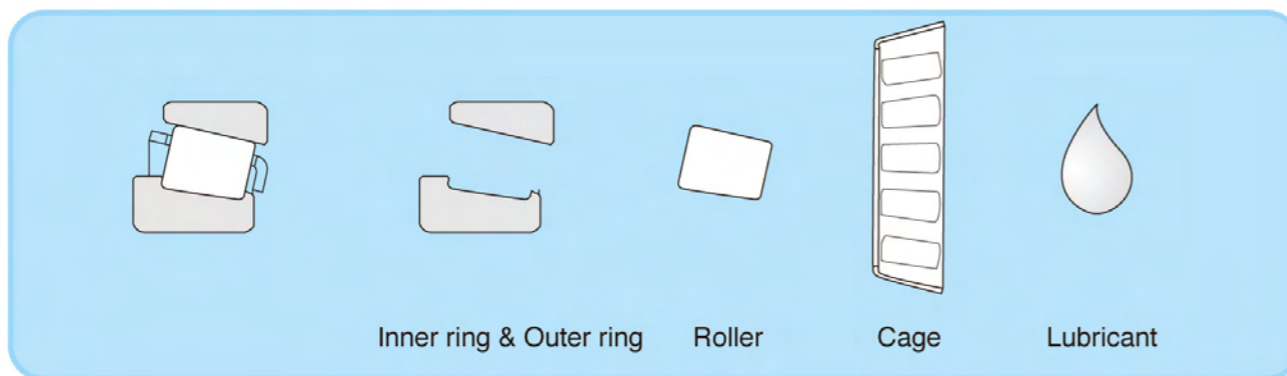
Notes:

- 1) This chart lists double shielded and double sealed bearings, but single shielded (Z) and single sealed (RZ, RS, RS1) are also available.
- 2) The above sealing structures are only for reference. We reserve the right to change specifications and other information included in this catalogue without notice.
- 3) HCH also could provide bearings with other sealing designs including customized sealing design. Please consult HCH engineers for more information.

Tapered roller bearing



● Tapered roller bearing components



Notes:

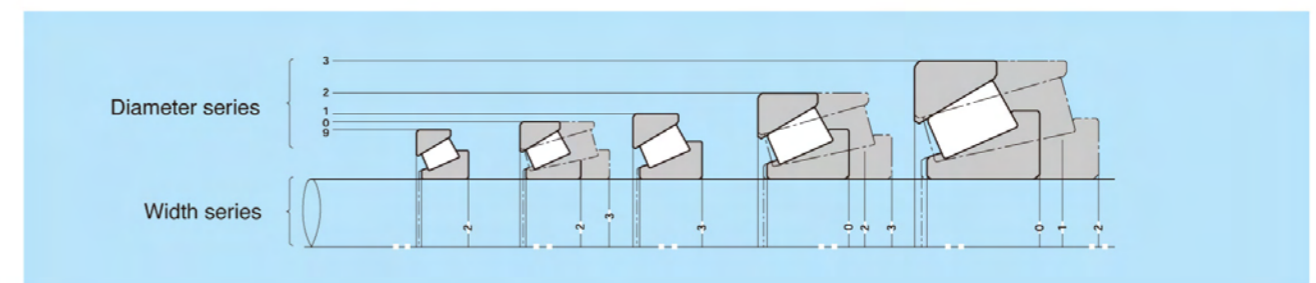
Tapered roller bearings are designed so that the center lines of the raceways and rollers all converge at a single point as shown in the right diagram. Due to this design feature, rollers move along the center of the raceway surfaces.

Aside from any cautionary notes that may appear, the single row tapered roller bearings have sub-units standardized for both metric and inch systems (including J series).

● Dimension series for metric tapered roller bearings

In the ISO general plan for single row metric tapered roller bearings, the boundary dimensions are grouped for certain ranges of the contact angle, known as the angle series (angle series 2, 3, 4, 5, 6 and 7 in order of increasing angle). Based on the relationship between the outside and bore diameters, and between the total bearing width and the cross-sectional height, diameter and width series have also been established. Here, a dimension series is obtained by combining the angle series with a diameter and a width series. These dimension series consist of one figure for the angle series and two letters, where the first letter identifies the diameter series and the second the width series.

Metric tapered roller bearings	Dimension series	
	Diameter series (outer diameter dimensions)	Width series (width dimensions)
	number	9, 0, 1, 2, 3
dimensions	small ← → large	small ← → large



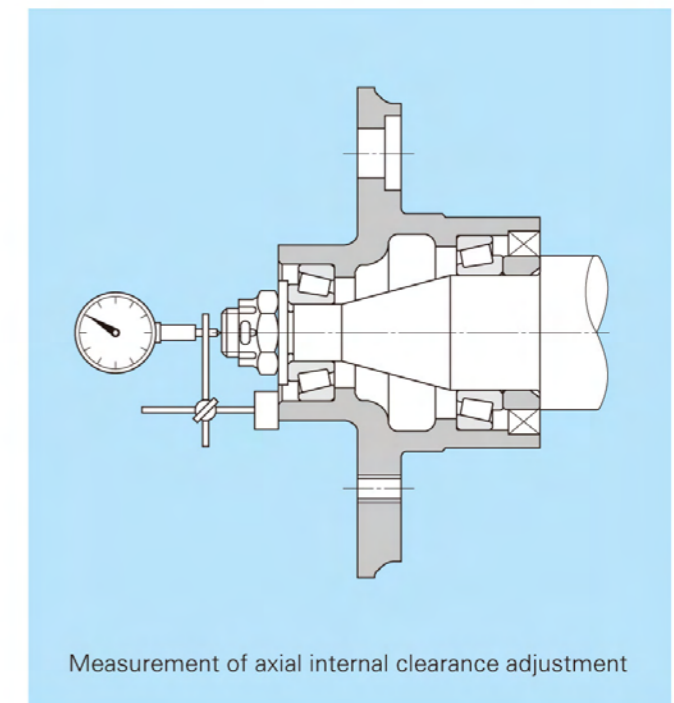
● Dimensions for inch tapered roller bearings

Experience has shown that the requirements of the vast majority of bearing applications can be met using bearings with these standardized dimensions. However, inch sized bearings are still popular nowadays. A large group of bearings in inch sizes are inch tapered roller bearings. The dimensions of these bearings conform to AFBMA Standard 19-1974 (ANSI B3.19-1975). ANSI/ABIVIA Standard 19.2-1994 has subsequently replaced this standard, but this later standard no longer includes dimensions.

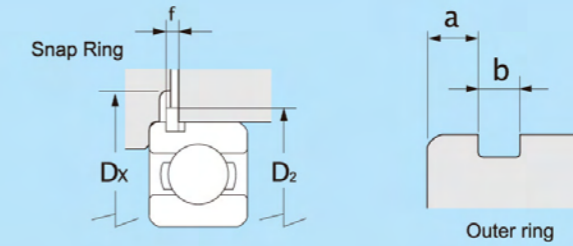
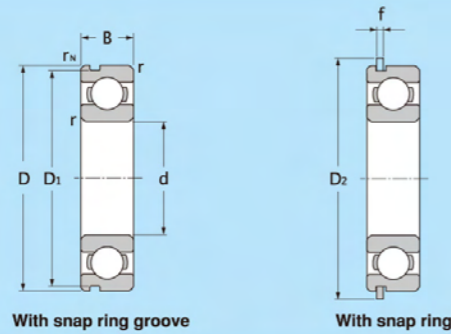
● Design of bearing arrangements

When designing bearing arrangements incorporating single row tapered roller bearings, it is necessary to consider the special characteristics of these bearings. Because of their internal design, they cannot be used singly and a second bearing is required; alternatively a paired set may be used. When the arrangement comprises two single row bearings they must be adjusted against each other as described under "Internal clearance and preload".

A correctly dimensioned operational clearance or preload is vital to the correct performance of single row tapered roller bearings and also to the operational reliability of the arrangement. If the operational clearance is too large, the full load carrying capacity of the bearing will not be exploited. If the preload is too great, then frictional losses will increase, as will operating temperature. In both cases the bearing service life could be substantially reduced.



Snap ring and groove dimensions

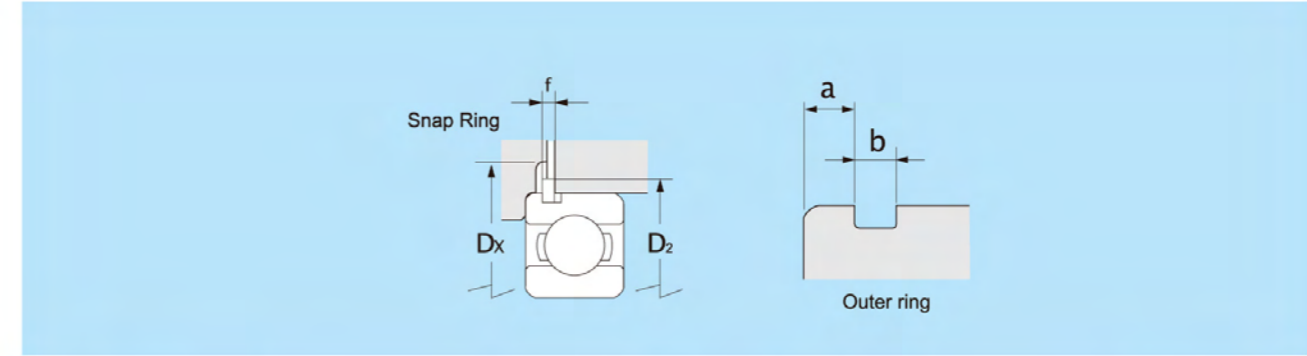
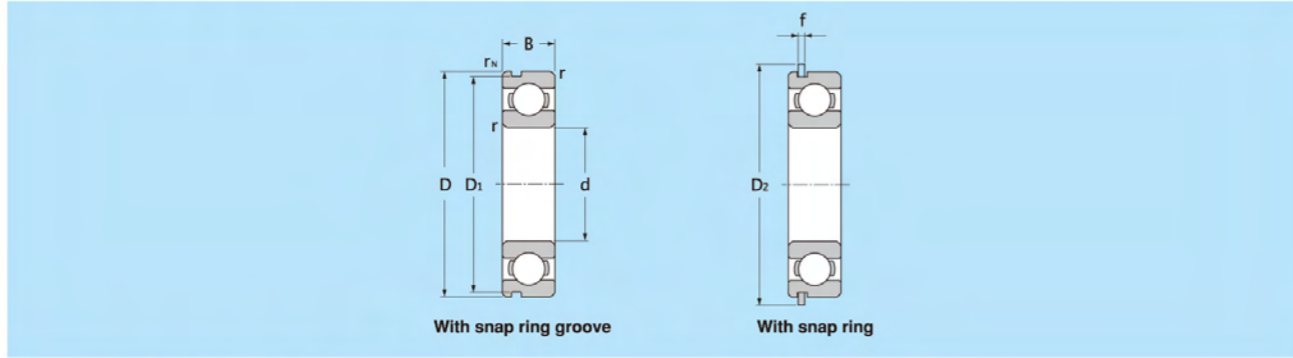


Applicable Bearings		Snap Ring Groove								
d	D	Snap Ring Groove Diameter D_1		Snap Ring Groove Position a				Snap Ring Groove Width b		
				Bearing Diameter Series						
				18		19				
18	19	max.	min.	max.	min.	max.	min.	max.	min.	
-	10	22	20.8	20.5	-	-	1.05	0.9	1.05	0.8
-	12	24	22.8	22.5	-	-	1.05	0.9	1.05	0.8
-	15	28	26.7	26.4	-	-	1.3	1.15	1.2	0.95
-	17	30	28.7	28.4	-	-	1.3	1.15	1.2	0.95
20	-	32	30.7	30.4	1.3	1.15	-	-	1.2	0.95
22	-	34	32.7	32.4	1.3	1.15	-	-	1.2	0.95
25	20	37	37.5	35.4	1.3	1.15	1.7	1.55	1.2	0.95
-	22	39	37.7	37.4	-	-	1.7	1.55	1.2	0.95
28	-	40	38.7	38.4	1.3	1.15	-	-	1.2	0.95
30	25	42	40.7	40.4	1.3	1.15	1.7	1.55	1.2	0.95
32	-	44	42.7	42.4	1.3	1.15	-	-	1.2	0.95
-	28	45	43.7	43.4	-	-	1.7	1.55	1.2	0.95
35	30	47	45.5	45.4	1.3	1.15	1.7	1.55	1.2	0.95
40	32	52	50.7	50.4	1.3	1.15	1.7	1.55	1.2	0.95
-	35	55	53.7	53.4	-	-	1.7	1.55	1.2	0.95
45	-	58	56.7	56.4	1.3	1.15	-	-	1.2	0.95
-	40	62	60.7	60.3	-	-	1.7	1.55	1.2	0.95
50	-	65	63.7	63.3	1.3	1.15	-	-	1.2	0.95
-	45	68	66.7	66.3	-	-	1.7	1.55	1.2	0.95
55	50	72	70.7	70.3	1.7	1.55	1.7	1.55	1.2	0.95
60	-	78	76.2	75.8	1.7	1.55	-	-	1.6	1.3
-	55	80	77.9	77.5	-	-	2.1	1.9	1.6	1.3
65	60	85	82.9	82.5	1.7	1.55	2.1	1.9	1.6	1.3
70	65	90	87.9	87.5	1.7	1.55	2.1	1.9	1.6	1.3
75	-	95	92.9	92.5	1.7	1.55	-	-	1.6	1.3
80	70	100	97.9	97.5	1.7	1.55	2.5	2.3	1.6	1.3
-	75	105	102.6	102.1	-	-	2.5	2.3	1.6	1.3
85	80	110	107.6	107.1	2.1	1.9	2.5	2.3	1.6	1.3
90	-	115	112.6	112.1	2.1	1.9	-	-	1.6	1.3
95	85	120	117.6	117.1	2.1	1.9	3.3	3.1	1.6	1.3
100	90	125	122.6	122.1	2.1	1.9	3.3	3.1	1.6	1.3
105	95	130	127.6	127.1	2.1	1.9	3.3	3.1	1.6	1.3
110	100	140	137.6	137.1	2.5	2.3	3.3	3.1	2.2	1.9
-	105	145	142.6	142.1	-	-	3.3	3.1	2.2	1.9
120	110	150	147.6	147.1	2.5	2.3	3.3	3.1	2.2	1.9
130	120	165	161.8	161.3	3.3	3.1	3.7	3.5	2.2	1.9
140	-	175	171.8	171.3	3.3	3.1	-	-	2.2	1.9
-	130	180	176.8	176.3	-	-	3.7	3.5	2.2	1.9
150	140	190	186.8	186.3	3.3	3.1	3.7	3.5	2.2	1.9
160	-	200	196.8	196.3	3.3	3.1	-	-	2.2	1.9

Remarks The minimum permissible chamfer dimensions r_N on the snap-ring-groove side of the outer rings are as follows:
 Dimension series 18 : For outside diameters of 78mm and less, use 0.3mm chamfer. For all others exceeding 78mm, use 0.5mm chamfer.
 Dimension series 19 : For outside diameters of 24mm and less, use 0.2mm chamfer. For 47mm and less, use 0.3mm chamfer. For all others exceeding 47mm, use 0.5mm chamfer.

Snap Ring Groove Radius of Bottom Corners r_0	Locating Snap Ring						Side Cover Stepped Bore Diameter (Reference) D_x	
	Locating Snap Ring Number	Cross Sectional Height e		Thickness f		Geometry of Snap Ring fitted in groove (Reference)		
max.		max.	min.	max.	min.	Slit Width g approx.	Snap Ring Outside Diameter D_2 max.	min.
0.2	NR 1022	2.0	1.85	0.7	0.6	2	24.8	25.5
0.2	NR 1024	2.0	1.85	0.7	0.6	2	26.8	27.5
0.25	NR 1028	2.05	1.9	0.85	0.75	3	30.8	31.5
0.25	NR 1030	2.05	1.9	0.85	0.75	3	32.8	33.5
0.25	NR 1032	2.05	1.9	0.85	0.75	3	34.8	35.5
0.25	NR 1034	2.05	1.9	0.85	0.75	3	36.8	37.5
0.25	NR 1037	2.05	1.9	0.85	0.75	3	39.8	40.5
0.25	NR 1039	2.05	1.9	0.85	0.75	3	41.8	42.5
0.25	NR 1040	2.05	1.9	0.85	0.75	3	42.8	43.5
0.25	NR 1042	2.05	1.9	0.85	0.75	3	44.8	45.5
0.25	NR 1044	2.05	1.9	0.85	0.75	4	46.8	47.5
0.25	NR 1045	2.05	1.9	0.85	0.75	4	47.8	48.5
0.25	NR 1047	2.05	1.9	0.85	0.75	4	49.8	50.5
0.25	NR 1052	2.05	1.9	0.85	0.75	4	54.8	55.5
0.25	NR 1055	2.05	1.9	0.85	0.75	4	57.8	58.5
0.25	NR 1058	2.05	1.9	0.85	0.75	4	60.8	61.5
0.25	NR 1062	2.05	1.9	0.85	0.75	4	64.8	65.5
0.25	NR 1065	2.05	1.9	0.85	0.75	4	67.8	68.5
0.25	NR 1068	2.05	1.9	0.85	0.75	5	70.8	72
0.25	NR 1072	2.05	1.9	0.85	0.75	5	74.8	76
0.4	NR 1078	3.25	3.1	1.12	1.02	5	82.7	84
0.4	NR 1080	3.25	3.1	1.12	1.02	5	84.4	86
0.4	NR 1085	3.25	3.1	1.12	1.02	5	89.4	91
0.4	NR 1090	3.25	3.1	1.12	1.02	5	94.4	96
0.4	NR 1095	3.25	3.1	1.12	1.02	5	99.4	101
0.4	NR 1100	3.25	3.1	1.12	1.02	5	104.4	106
0.4	NR 1105	4.04	3.89	1.12	1.02	5	110.7	112
0.4	NR 1110	4.04	3.89	1.12	1.02	5	115.7	117
0.4	NR 1115	4.04	3.89	1.12	1.02	5	120.7	122
0.4	NR 1120	4.04	3.89	1.12	1.02	7	125.7	127
0.4	NR 1125	4.04	3.89	1.12	1.02	7	130.7	132
0.4	NR 1130	4.04	3.89	1.12	1.02	7	135.7	137
0.6	NR 1140	4.04	3.89	1.7	1.6	7	145.7	147
0.6	NR 1145	4.04	3.89	1.7	1.6	7	150.7	152
0.6	NR 1150	4.04	3.89	1.7	1.6	7	155.7	157
0.6	NR 1165	4.85	4.7	1.7	1.6	7	171.5	173
0.6	NR 1175	4.85	4.7	1.7	1.6	10	181.5	183
0.6	NR 1180	4.85	4.7	1.7	1.6	10	186.5	188
0.6	NR 1190	4.85	4.7	1.7	1.6	10	196.5	198
0.6	NR 1200	4.85	4.7	1.7	1.6	10	206.5	208

Snap ring and groove dimensions



Applicable Bearings				Snap Ring Groove								
d				D	Snap Ring Groove Diameter D ₁		Snap Ring Groove Position a				Snap Ring Groove Width b	
							Bearing Diameter Series					
Diameter Series				max.	min.	0		2, 3, 4		max.	min.	
0	2	3	4			max.	min.	max.	min.			
10	-	-	-	26	24.5	24.25	1.35	1.19	-	-	1.17	0.87
12	-	-	-	28	26.5	26.25	1.35	1.19	-	-	1.17	0.87
-	10	9	8	30	28.17	27.91	-	-	2.06	1.9	1.65	1.35
15	12	-	9	32	30.15	29.9	2.06	1.9	2.06	1.9	1.65	1.35
17	15	10	-	35	33.17	32.92	2.06	1.9	2.06	1.9	1.65	1.35
-	-	12	10	37	34.77	34.52	-	-	2.06	1.9	1.65	1.35
-	17	-	-	40	38.1	37.85	-	-	2.06	1.9	1.65	1.35
20	-	15	12	42	39.75	39.5	2.06	1.9	2.06	1.9	1.65	1.35
22	-	-	-	44	41.75	41.5	2.06	1.9	-	-	1.65	1.35
25	20	17	-	47	44.6	44.35	2.06	1.9	2.46	2.31	1.65	1.35
-	22	-	-	50	47.6	47.35	-	-	2.46	2.31	1.65	1.35
28	25	20	15	52	49.73	49.48	2.06	1.9	2.46	2.31	1.65	1.35
30	-	-	-	55	52.6	52.35	2.08	1.88	-	-	1.65	1.35
-	-	22	-	56	53.6	53.35	-	-	2.46	2.31	1.65	1.35
32	28	-	-	58	55.6	55.35	2.08	1.88	2.46	2.31	1.65	1.35
35	30	25	17	62	59.61	59.11	2.08	1.88	3.28	3.07	2.2	1.9
-	32	-	-	65	62.6	62.1	-	-	3.28	3.07	2.2	1.9
40	-	28	-	68	64.82	64.31	2.49	2.29	3.28	3.07	2.2	1.9
-	35	30	20	72	68.81	68.3	-	-	3.28	3.07	2.2	1.9
45	-	32	-	75	71.83	71.32	2.49	2.29	3.28	3.07	2.2	1.9
50	40	35	25	80	76.81	76.3	2.49	2.29	3.28	3.07	2.2	1.9
-	45	-	-	85	81.81	81.31	-	-	3.28	3.07	2.2	1.9
55	50	40	30	90	86.79	86.28	2.87	2.67	3.28	3.07	3	2.7
60	-	-	-	95	91.82	91.31	2.87	2.67	-	-	3	2.7
65	55	45	35	100	96.8	96.29	2.87	2.67	3.28	3.07	3	2.7
70	60	50	40	110	106.81	106.3	2.87	2.67	3.28	3.07	3	2.7
75	-	-	-	115	111.81	111.3	2.87	2.67	-	-	3	2.7
-	65	55	45	120	115.21	114.71	-	-	4.06	3.86	3.4	3.1
80	70	-	-	125	120.22	119.71	2.87	2.67	4.06	3.86	3.4	3.1
85	75	60	50	130	125.22	124.71	2.87	2.67	4.06	3.86	3.4	3.1
90	80	65	55	140	135.23	134.72	3.71	3.45	4.9	4.65	3.4	3.1
95	-	-	-	145	140.23	139.73	3.71	3.45	-	-	3.4	3.1
100	85	70	60	150	145.24	144.73	3.71	3.45	4.9	4.65	3.4	3.1
105	90	75	65	160	155.22	154.71	3.71	3.45	4.9	4.65	3.4	3.1
110	95	80	-	170	163.65	163.14	3.71	3.45	5.69	5.44	3.8	3.5
120	100	85	70	180	173.66	173.15	3.71	3.45	5.69	5.44	3.8	3.5
-	105	90	75	190	183.64	183.13	-	-	5.69	5.44	3.8	3.5
130	110	95	80	200	193.65	193.14	5.69	5.44	5.69	5.44	3.8	3.5

Note: The locating snap rings and snap ring grooves of these bearings are not specified by ISO.

Remarks: The minimum permissible chamfer dimension rN on the snap-ring side of outer rings is 0.5mm. However, for bearings of diameter series 0 having outside diameters 35mm and below, it is 0.3mm.

Snap Ring Groove Radius of Bottom Corners r ₀ max.	Locating Snap Ring						Side Cover Stepped Bore Diameter (Reference) D _x min.
	Locating Snap Ring Number	Cross Sectional Height e		Thickness f		Geometry of Snap Ring fitted in groove (Reference) Slit Width g approx. Snap Ring Outside Diameter D ₂ max.	
0.2	NR 26 (1)	2.06	1.91	0.84	0.74	3	28.7
0.4	NR 28(1)	2.06	1.91	0.84	0.74	3	30.7
0.4	NR 30	3.25	3.1	1.12	1.02	3	34.7
0.4	NR 32	3.25	3.1	1.12	1.02	3	36.7
0.4	NR 35	3.25	3.1	1.12	1.02	3	39.7
0.4	NR 37	3.25	3.1	1.12	1.02	3	41.3
0.4	NR 40	3.25	3.1	1.12	1.02	03	44.6
0.4	NR 42	3.25	3.1	1.12	1.02	3	46.3
0.4	NR 44	3.25	3.1	1.12	1.02	3	48.3
0.4	NR 47	4.04	3.89	1.12	1.02	4	52.7
0.4	NR 50	4.04	3.89	1.12	1.02	4	55.7
0.4	NR 52	4.04	3.89	1.12	1.02	4	57.9
0.4	NR 55	4.04	3.89	1.12	1.02	4	60.7
0.4	NR 56	4.04	3.89	1.12	1.02	4	61.7
0.4	NR 58	4.04	3.89	1.12	1.02	4	63.7
0.6	NR 62	4.04	3.89	1.7	1.6	4	67.7
0.6	NR 65	4.04	3.89	1.7	1.6	4	70.7
0.6	NR 68	4.85	4.7	1.7	1.6	5	74.6
0.6	NR 72	4.85	4.7	1.7	1.6	5	78.6
0.6	NR 75	4.85	4.7	1.7	1.6	5	81.6
0.6	NR 80	4.85	4.7	1.7	1.6	5	86.6
0.6	NR 85	4.85	4.7	1.7	1.6	5	91.6
0.6	NR 90	4.85	4.7	2.46	2.36	5	96.5
0.6	NR 95	4.85	4.7	2.46	2.36	5	101.6
0.6	NR 100	4.85	4.7	2.46	2.36	5	106.5
0.6	NR 110	4.85	4.7	2.46	2.36	5	116.6
0.6	NR 115	4.85	4.7	2.46	2.36	5	121.6
0.6	NR 120	7.21	7.06	2.82	2.72	7	129.7
0.6	NR 125	7.21	7.06	2.82	2.72	7	134.7
0.6	NR 130	7.21	7.06	2.82	2.72	7	139.7
0.6	NR 140	7.21	7.06	2.82	2.72	7	149.7
0.6	NR 145	7.21	7.06	2.82	2.72	7	154.7
0.6	NR 150	7.21	7.06	2.82	2.72	7	159.7
0.6	NR 160	7.21	7.06	2.82	2.72	7	169.7
0.6	NR 170	9.6	9.45	3.1	3	10	182.9
0.6	NR 180	9.6	9.45	3.1	3	10	192.9
0.6	NR 190	9.6	9.45	3.1	3	10	202.9
0.6	NR 200	9.6	9.45	3.1	3	10	212.9