The Premium Alternative

Technical Information
C2013

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WARRANTY

Any bearing, which if properly selected, installed and used, shows defect upon **KML** laboratory analysis, due to faulty workmanship and/or material, shall be replaced free of charge provided such defect occurs within one year of delivery date.
Claims for labour or incidental damage shall not be allowed.

This warranty is in lieu of all warranties of merchantability, fitness for purpose, or all other warranties, expressed or implied.

KML shall not be liable for any special, indirect, or consequential damages. The remedies set forth herein are exclusive, and the liability of **KML** with respect to any contract or sale or anything done in connection therewith,in contract, in tort, under any warranty, or otherwise, shall not exceed the price of the bearing on which such liability is based.

KML has always been adhering to the customer-centric philosophy since its establishment. With ˋGood quality, R&D,Global marketing, JIT service˝ as the core competitiveness, **KML** provided customers with one-stop service supported by effective management, strong technical force, advanced production facilities and constant quality control. The concept of the brand, **KML**, was incubated in Dortmund, Germany in 1980s. **KML** Company was officially established in 1981 in Hong Kong and gradually expanded into more than 70 countries and regions. **KML** now owns three subsidiaries in United States, Canada and China.

KML products are widely used in automobile, motorcycle, appliances, agricultural machinery, medicine, food and beverage processing, mining, energy, engineering, furniture industries etc.

To better meet customers' diverse needs, **KML** strives to integrate optimal resources from bearing manufacturers in China, India and other parts of the world to form a highly-performed supply chain.

KML makes all efforts to help its global distributors and users gain maximum benefits and sustainable development by selling and using **KML** bearings, which makes **KML** a trusted brand.

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◆ Technical Information

Bearing Tolerance

Comparison of tolerance classifications of national standards

National standard			Tolerance class				
China National Standard	GB/T 307.1		P0	P6	P5	P4	P2
International Organization for Standardization	ISO 492		Normal class Class 6X	Class 6	Class 5	Class 4	Class 2
Deutsches Institute for Normung	DIN 620		P0	P6	P5	P4	P2
Japanese Industrial Standard	JIS B1514		Normal class Class 6X	Class 6	Class 5	Class 4	Class 2
American National Standard Institus anti-friction bearing manufactures	ANSI	Tapered roller bearings Inch size	Class 4	Class 2	Class 3	Class 0	Class 00
	AFBMA	Ball bearings	ABEC-1	ABEC-3	ABEC-5	ABEC-7	ABEC-9
		Roller bearings	RBEC-1	RBEC-3	RBEC-5	-	-

Tolerance Symbols

d : Nominal bore diameter

△dmp : Deviation of mean bore diameter in a single plane

△ds : Deviation of single bore diameter

Vdp : Bore diameter variation in a single radial plane

Vdmp : Variation of mean bore diameter

Kia : Radial runout of inner ring of assembled bearing

Sia : Axial runout of inner ring of assembled bearing

Sd : Runout of inner ring face to the bore

△Bs : Deviation of a single inner ring width

VBs : Variation of inner ring width

D : Nominal outside diameter

△Dmp : Deviation of mean outside diameter in a single plane

△Ds : Deviation of a single outside diameter

VDp : Outside diameter variation in a single radial plane

VDmp : Variation of mean outside diameter

Kea : Radial runout of outer ring of assembled bearing

Sea : Axial runout of outer ring of assembled bearing

SD : Runout of outer ring outside surface generatrix to the face

△Cs : Deviation of a single outer ring width

VCs : Variation of outer ring width

Bearing Tolerance

Radial bearing tolerances (except tapered roller bearing)

Inner ring

Unit: μm

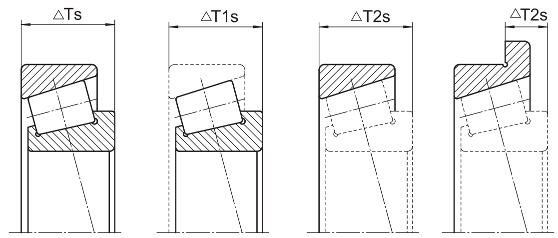
Nominal bore diameter d (mm)		△dmp						Vdp									Vdmp			Kia			Sd	Sia	△Bs								VBs		
								Diameter series 7, 8, 9			Diameter series 0, 1			Diameter series 2, 3, 4											Single Row				Double Row						
		class 0		class 6		class 5		class 0	class 6	class 5	class 0	class 6	class 5	class 0	class 6	class 5	class 0	class 6	class 5	class 0	class 6	class 5	class 5		class 0,6		class 5		class 0,6		class 5		class 0	class 6	class 5
over	Incl.	high	low	high	low	high	low	max			max			max			max			max			max		high	low	high	low	high	low	high	low	max		
2.5	10	0	-8	0	-7	0	-5	10	9	5	8	7	4	6	5	4	6	5	3	10	6	4	7	7	0	-120	0	-40	0	-250	0	-250	15	15	5
10	18	0	-8	0	-7	0	-5	10	9	5	8	7	4	6	5	4	6	5	3	10	7	4	7	7	0	-120	0	-80	0	-250	0	-250	20	20	5
18	30	0	-10	0	-8	0	-6	13	10	6	10	8	5	8	6	5	8	6	3	13	8	4	8	8	0	-120	0	-120	0	-250	0	-250	20	20	5
30	50	0	-12	0	-10	0	-8	15	13	8	12	10	6	9	8	6	9	8	4	15	10	5	8	8	0	-120	0	-120	0	-250	0	-250	20	20	5
50	80	0	-15	0	-12	0	-9	19	15	9	19	15	7	11	9	7	11	9	5	20	10	5	8	8	0	-150	0	-150	0	-380	0	-250	25	25	6
80	120	0	-20	0	-15	0	-10	25	19	10	25	19	8	15	11	8	15	11	5	25	13	6	9	9	0	-200	0	-200	0	-380	0	-380	25	25	7
120	180	0	-25	0	-18	0	-13	31	23	13	31	23	10	19	14	10	19	14	7	30	18	8	10	10	0	-250	0	-250	0	-500	0	-380	30	30	8
180	250	0	-30	0	-22	0	-15	38	28	15	38	28	12	23	17	12	23	17	8	40	20	10	10	10	0	-300	0	-300	0	-500	0	-500	30	30	8

Outer ring

Unit: μm

Nominal outside diameter D Mm		△Dmp						VDp											VDmp			Kea			S_D	Sea	△Cs		VCs	
								Open									Seals													
								Diameter series 7, 8, 9			Diameter series 0, 1			Diameter series 2, 3, 4			Diameter series 2,3,4	Diameter series 0,1,2,3,4												
		class 0		class 6		class 5		class 0	class 6	class 5	class 0	class 6	class 5	class 0	class 6	class 5	class 0	class 6	class 0	class 6	class 5	class 0	class 6	class 5	class 5	lass 5	classes 0,6,5		classes 0,6	class 5
over	Incl.	high	low	high	low	high	low	Max.			Max.			max.			max.		Max.			max.			max	max	upper	lower	max	
18	30	0	-9	0	-8	0	-6	12	10	6	9	8	5	7	6	5	12	10	7	6	3	15	9	6	8	8	Shall conform to the tolerance △Bs on d fo the same bearing		Shall conform to the tolerance VBs on d of the same bearing	5
30	50	0	-11	0	-9	0	-7	14	11	7	11	9	5	8	7	5	16	13	8	7	4	20	10	7	8	8				5
50	80	0	-13	0	-11	0	-9	16	14	9	13	11	7	10	8	7	20	16	10	8	5	25	13	8	8	10				6
80	120	0	-15	0	-13	0	-10	19	16	10	19	16	8	11	10	8	26	20	11	10	5	35	18	10	9	11				8
120	150	0	-18	0	-15	0	-11	23	19	11	23	19	8	14	11	8	30	25	14	11	6	40	20	11	10	13				8
150	180	0	-25	0	-18	0	-13	31	23	13	31	23	10	19	14	10	38	30	19	14	7	45	23	13	10	14				8
180	250	0	-30	0	-20	0	-15	38	25	15	38	25	11	23	15	11	-	-	23	15	8	50	25	15	11	15				10
250	315	0	-35	0	-25	0	-18	44	31	18	44	31	14	26	19	14	-	-	26	19	9	60	30	18	13	18				11

Bearing Tolerance



Class 0 tolerances for tapered roller bearings(Metric Size)

Inner ring and bearing width

Unit: μm

Nominal bore dia. d mm		△dmp		Vdp	Vdmp	△Bs		Kia	△Ts		△T1s		△T2s	
over	Incl.	high	low	max.	max.	high	low	max.	high	low	high	low	high	low
18	30	0	-12	12	9	0	-120	18	+200	0	+100	0	+100	0
30	50	0	-12	12	9	0	-120	20	+200	0	+100	0	+100	0
50	80	0	-15	15	11	0	-150	25	+200	0	+100	0	+100	0
80	120	0	-20	20	15	0	-200	30	+200	-200	+100	-100	+100	-100
120	180	0	-25	25	19	0	-250	35	+350	-250	+150	-150	+200	-100
180	250	0	-30	30	23	0	-300	50	+350	-250	+150	-150	+200	-100
250	315	0	-35	35	26	0	-350	60	+350	-250	+150	-150	+200	-100

Outer ring and bearing width

Unit: μm

Nominal outside diameter D mm		△Dmp		VDp	VDmp	△Cs	Kea
over	Incl.	high	low	max.	max.		max.
30	50	0	-14	14	11	Values are identical to those for inner ring of same bearing (△Bs)	20
50	80	0	-16	16	12		25
80	120	0	-18	18	14		35
120	150	0	-20	20	15		40
150	180	0	-25	25	19		45
180	250	0	-30	30	23		50
250	315	0	-35	35	26		60
315	400	0	-40	40	30		70

Class 4 tolerances for tapered roller bearings(Inch Size)

Inner ring and bearing width

Unit: μm

Nominal bore dia. d mm		△ds		△TS	
over	Incl.	high	low	high	low
-	76.2	+13	0	+203	0
76.2	101.6	+25	0	+356	-254
101.6	266.7	+25	0	+356	-254
266.7	304.8	+25	0	+356	-254
304.8	609.6	+51	0	+381	-381

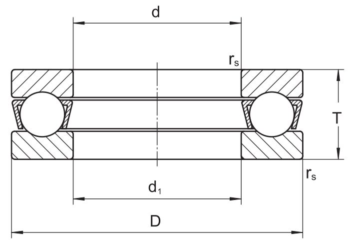
Outer ring and bearing width

Unit: μm

Nominal outside dia. D mm		△Ds		Kia Ksa Sia Sea
over	Incl.	high	low	max.
-	266.7	+25	0	51
266.7	304.8	+25	0	51
304.8	609.6	+51	0	51
609.6	914.4	+76	0	76
914.4	1219.2	+102	0	76

Bearing Tolerance

Tolerances for thrust ball bearings



Shaft washer

Unit: μm

Nominal bore diameter of shaft or central washer d mm		△dmp		Vdp	Si			△Ts	
		Class 6,5		Class 6,5	Class 0	Class 6	Class 5		
over	Incl.	high	low	max.	max.	max.	max.	high	low
-	18	0	-8	6	10	5	3	+20	-250
18	30	0	-10	8	10	5	3	+20	-250
30	50	0	-12	9	10	6	3	+20	-300
50	80	0	-15	11	10	7	4	+20	-300
80	120	0	-20	15	15	8	4	+25	-400
120	180	0	-25	19	15	9	5	+25	-500
180	250	0	-30	23	20	10	5	+30	-500
250	315	0	-35	26	25	13	7	+40	-700
315	400	0	-40	30	30	15	7	+40	-700

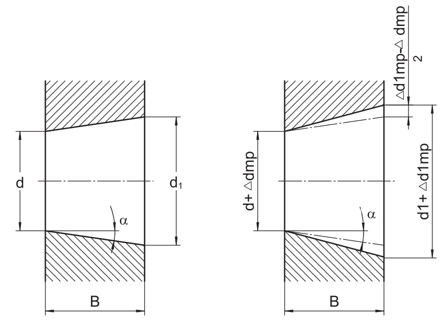
Housing washer

Unit: μm

Nominal outside dia. D mm		△Dmp		Vdp	Se
		Class 6.5		Class 6.5	Class 6.5
over	Incl.	high	low	max.	max.
18	30	0	-13	10	Values are identical to those for shaft washer of same bearing(Si)
30	50	0	-16	12	
50	80	0	-19	14	
80	120	0	-22	17	
120	180	0	-25	19	
180	250	0	-30	23	

Bearing Tolerance

Class 0 tolerance and allowable values of tapered bores of radial bearings



Half angle of taper α :
α =2° 23'9,4" (taper 1:12)
α =0° 57'17,4" (taper 1:30)

Largest theoretical diameter d1:
d1=d+1/12B(taper 1:12)
d1=d+1/30B(taper 1:30)

Tolerance for tapered bores
taper 1:12

Unit: μm

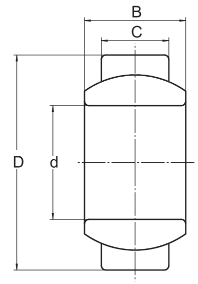
Nominal bore diameter d mm		△dmp		△d1mp~△dmp		Vdsp
over	Incl.	high	low	high	low	max.
-	10	+22	0	+15	0	9
10	18	+27	0	+18	0	11
18	30	+33	0	+21	0	13
30	50	+39	0	+25	0	16
50	80	+46	0	+30	0	19
80	120	+54	0	+35	0	22
120	180	+63	0	+40	0	40
180	250	+72	0	+46	0	46
250	315	+81	0	+52	0	52

Tolerance for tapered bores
taper 1:30

Nominal bore diameter d mm		△dmp		△d1mp-△dmp		Vdsp
over	Incl.	high	low	high	low	max.
-	80	+15	0	+30	0	19
80	120	+20	0	+35	0	22
120	180	+25	0	+40	0	40
180	250	+30	0	+46	0	46
250	315	+35	0	+52	0	52
315	400	+40	0	+57	0	57
400	500	+45	0	+63	0	63
500	630	+50	0	+70	0	70

Bearing Tolerance

Tolerances For Spherical Plain Bearings



Inner ring (GE, GEZ) bearings

Bore diameter d				Single mean bore diameter △dmp				Width △B			
Inch.		mm		Inch.		mm		Inch.		mm	
over	Incl.	over	Incl.	high	low	high	low	high	low	high	low
0.4375	2	11.112	50.8	+0	-0.0005	+0	-0.013	+0	-0.005	+0	-0.13
2	3	50.8	76.2	+0	-0.0006	+0	-0.015	+0	-0.005	+0	-0.13
3	4.75	76.2	120.65	+0	-0.0008	+0	-0.020	+0	-0.005	+0	-0.13
4.75	6	120.65	152.4	+0	-0.0010	+0	-0.025	+0	-0.005	+0	-0.13

Outer ring (GE, GEZ) bearings

Outerside diameter D				Single mean outerside diameter △Dmp				Width △C			
Inch.		mm		Inch.		mm		Inch.		mm	
over	Incl.	over	Incl.	high	low	high	low	high	low	high	low
0.8125	2	20.638	50.8	+0	-0.0005	+0	-0.013	+0	-0.005	+0	-0.13
2	3.1875	50.8	80.962	+0	-0.0006	+0	-0.015	+0	-0.005	+0	-0.13
3.1875	4.75	80.962	120.65	+0	-0.0008	+0	-0.020	+0	-0.005	+0	-0.13
4.75	7	120.65	177.8	+0	-0.0010	+0	-0.025	+0	-0.005	+0	-0.13
7	8.75	177.8	222.25	+0	-0.0012	+0	-0.030	+0	-0.005	+0	-0.13

Tolerances apply before coating GE with MoS2 and fracturing GE outer ring.

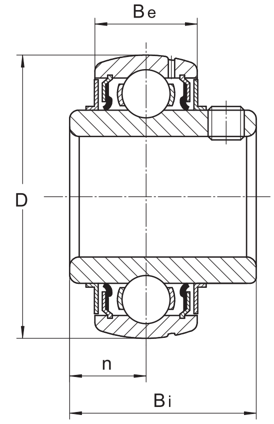
Bearing Tolerance

Tolerance of ball bearings for mounted units

Outer ring

unit: μm/0.0001 inch

Nominal outside diameter D				Mean outside diameter deviation △Dmp		Radial runout Kea max.
over		Incl.				
mm	Inch.	mm	Inch.	high	low	
18	0.7087	30	1.1811	0	-9	15
				0	-4	6
30	1.1811	50	1.9685	0	-11	20
				0	-4	8
50	1.9685	80	3.1496	0	-13	25
				0	-5	10
80	3.1496	120	4.7244	0	-15	35
				0	-6	14
120	4.7244	150	5.9055	0	-18	40
				0	-7	16
150	5.9055	180	7.0866	0	-25	45
				0	-10	18
180	7.0866	250	9.8425	0	-30	50
				0	-12	20
250	9.8425	315	12.4016	0	-35	60
				0	-14	24



Note:The low deviation of outside diameter △Dmp does not apply within the distance of 1/4 the width of the outer ring from the side.

Inner ring

Cylindrical bore(UC, SER, SB, CSB, HC, SA, CSA),Tapered bore(UK)

unit: μm/0.0001 inch

Nominal bore diameter d				Cylindrical bore					Tapered bore					Radial runout Kia
				Bore diameter			Width		Bore diameter					
over		Incl.		△dmp Deviations		Vdp Variations	△Bs, △Cs Devistions		△dmp Deviations		△d1mp-△dmp		Vdp[1]	
mm	Inch.	mm	Inch.	high	low	max.	high	low	high	low	max.	min.	max.	max.
10	0.3937	18	0.7087	+15	0	10	0	-120	-	-	-	-	-	15
				+6	0	4	0	-47	-	-	-	-	-	6
18	0.7087	30	1.1811	+18	0	12	0	-120	+33	0	+21	0	13	18
				+7	0	5	0	-47	+13	0	+8	0	5	7
30	1.1811	50	1.9685	+21	0	14	0	-120	+39	0	+25	0	16	20
				+8	0	6	0	-47	+15	0	+10	0	6	8
50	1.9685	80	3.1496	+24	0	16	0	-150	+46	0	+30	0	19	25
				+9	0	6	0	-59	+18	0	+12	0	7	10
80	3.1496	120	4.7244	+28	0	19	0	-200	+54	0	+35	0	22	30
				+11	0	7	0	-79	+21	0	+14	0	9	12
120	4.7244	180	7.0866	+33	0	22	0	-250	+63	0	+40	0	40	35
				+13	0	9	0	-98	+25	0	+16	0	16	14

1) Applies to all radial flat planes of inner ring tapered bore.

Note:1.To be applied for tapered bore of 1/12.

2.Symbols of ssquantity or values

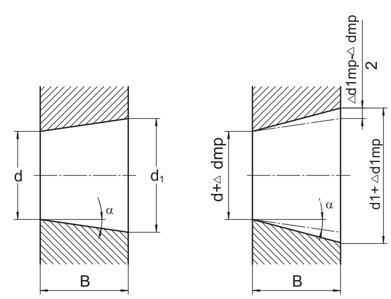
d1:Basic diameter at the theoretical large end of the tapered bore.d1=d+1/12B

△dmp:Dimensional difference of the average bore diameter within the flat surface at the theoretical small-end of the tapered bore.

△d1mp:Dimensional difference of the average bore diameter within the flat surface at the theoretical large- end of the tapered bore.

Vdp: Unevenness of the bore diameter with the flat surface.

B:Nominal width of inner ring



Bearing Tolerance
Tolerances of housings

Spherical bore diameter of housings

unit: μm/0.0001 inch

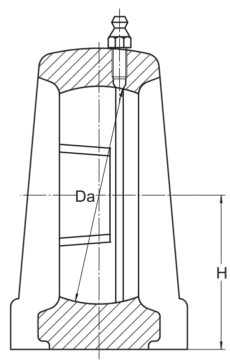
Nominal spherical bore diameter Da				Tolerance class H7				Tolerance class J7			
over		Incl.		△Damp Deviations		△Das Deviations		△Damp Deviations		△Das Deviations	
mm	Inch.	mm	Inch.	high	low	high	low	high	low	high	low
30	1.1811	50	1.9685	+25	0	+30	-5	+14	-11	+19	-16
				+10	0	+12	-2	+6	-4	+7	-6
50	1.9685	80	3.1496	+30	0	+36	-6	+18	-12	+24	-18
				+12	0	+14	-2	+7	-5	+9	-7
80	3.1496	120	4.7244	+35	0	+42	-7	+22	-13	+29	-20
				+14	0	+17	-3	+9	-5	+11	-8
120	4.7244	180	7.0866	+40	0	+48	-8	+26	-14	+34	-22
				+16	0	+19	-3	+10	-6	+13	-9
180	7.0866	250	9.8425	+46	0	+55	-9	+30	-16	+39	-25
				+18	0	+22	-4	+12	-6	+15	-10
250	9.8425	315	12.4016	+52	0	+62	-10	+36	-16	+46	-26
				+20	0	+24	-4	+14	-6	+18	-10

Note: 1)Dimensional tolerances for spherical bore diameter of housing are classified as H7 for clearance fit, and J7 for internediate fit.

Pillow block housings (PE,P,AK,PX,LP,CP,PA,TB,)

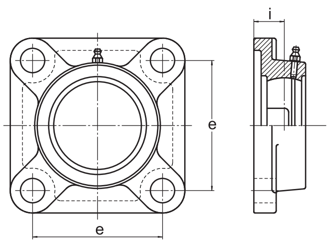
unit: μm/0.0001 inch

Housing numbers				H Deviations △Hs
PE,P,AK, PX,LP,CP	PA,TB	P,PA	PX	
203	-	-	-	±150 ±59
204	204	-	-	
205	205	305	X05	
206	206	306	X06	
207	207	307	X07	
208	208	308	X08	
209	209	309	X09	
210	210	310	X10	
211	-	311	X11	±200 ±79
212	-	312	X12	
213	-	313	X13	
214	-	314	X14	
215	-	315	X15	
216	-	316	X16	
217	-	317	X17	
218	-	318	X18	
-	-	319	-	±300 ±120
-	-	320	X20	
-	-	321	X21	

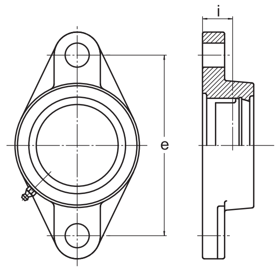


H is height of the shaft center line.

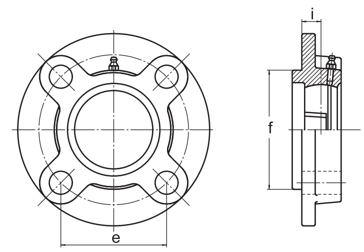
Bearing Tolerance
Tolerances of housings



F, FX, FS



FLU, FT, FL, FD, LF, FLX



FC, FCX, FCS, FCSX

Flange unit housings

unit: μm/0.0001 inch

<table>
<tr><th colspan="5">Housing numbers</th><th rowspan="3">e
Deviations
△es</th><th rowspan="3">i
Deviations
△is</th><th colspan="6">f Deviations △fs</th><th rowspan="3">Radial runout of spigot joint
△is
max</th></tr>
<tr><th rowspan="2">F,FS,FLU,
FT,FL,FC,</th><th rowspan="2">FCS</th><th rowspan="2">FD,LF</th><th rowspan="2">F,FS,FL</th><th rowspan="2">FX,FLX,
FCX,FCSX</th><th colspan="2">FC2,FCS2</th><th colspan="2">FS3</th><th colspan="2">FCX</th></tr>
<tr><th>High</th><th>low</th><th>high</th><th>low</th><th>high</th><th>low</th></tr>
<tr><td>203</td><td>-</td><td>203</td><td>-</td><td>-</td><td rowspan="4">±700
±276</td><td rowspan="4">±500
±197</td><td rowspan="4">0
0</td><td rowspan="4">-46
-18</td><td rowspan="2">-
-</td><td rowspan="2">-
-</td><td rowspan="2">-
-</td><td rowspan="2">-
-</td><td rowspan="4">200
79</td></tr>
<tr><td>204</td><td>-</td><td>204</td><td>-</td><td>-</td></tr>
<tr><td>205</td><td>-</td><td>205</td><td>305</td><td>X05</td><td>0
0</td><td>-46
-18</td><td>0
0</td><td>-46
-18</td></tr>
<tr><td>206</td><td>206</td><td>206</td><td>306</td><td>X06</td><td rowspan="4">0
0</td><td rowspan="4">-54
-21</td><td rowspan="5">0
0</td><td rowspan="5">-54
-21</td></tr>
<tr><td>207</td><td>207</td><td>207</td><td>307</td><td>X07</td><td rowspan="4">±700
±276</td><td rowspan="4">±500
±197</td><td rowspan="4">0
0</td><td rowspan="4">-54
-21</td><td rowspan="4">200
79</td></tr>
<tr><td>208</td><td>208</td><td>-</td><td>308</td><td>X08</td></tr>
<tr><td>209</td><td>209</td><td>-</td><td>309</td><td>X09</td></tr>
<tr><td>210</td><td>210</td><td>-</td><td>310</td><td>X10</td><td rowspan="5">0
0</td><td rowspan="5">-63
-25</td></tr>
<tr><td>211</td><td>211</td><td>-</td><td>311</td><td>X11</td><td rowspan="15">±1000
±394</td><td rowspan="15">±800
±315</td><td rowspan="7">0
0
0</td><td rowspan="7">-63
-25</td><td rowspan="6">0
0</td><td rowspan="6">-63
-25</td><td rowspan="8">300
118</td></tr>
<tr><td>212</td><td>212</td><td>-</td><td>312</td><td>X12</td></tr>
<tr><td>213</td><td>213</td><td>-</td><td>313</td><td>X13</td></tr>
<tr><td>214</td><td>-</td><td>-</td><td>314</td><td>X14</td></tr>
<tr><td>215</td><td>-</td><td>-</td><td>315</td><td>X15</td><td rowspan="6">0
0</td><td rowspan="6">-72
-28"</td></tr>
<tr><td>216</td><td>-</td><td>-</td><td>316</td><td>X16</td></tr>
<tr><td>217</td><td>-</td><td>-</td><td>317</td><td>X17</td><td rowspan="5">0
0</td><td rowspan="5">-72
-28
-</td></tr>
<tr><td>218</td><td>-</td><td>-</td><td>318</td><td>X18</td><td>0
0</td><td>-72
-28</td></tr>
<tr><td>-</td><td>-</td><td>-</td><td>319</td><td>-</td><td rowspan="7">-
-
-
-
-
-</td><td rowspan="7">-
-
-
-
-
-
-</td><td rowspan="7">400
160</td></tr>
<tr><td>-</td><td>-</td><td>-</td><td>320</td><td>X20</td></tr>
<tr><td>-</td><td>-</td><td>-</td><td>321</td><td></td><td rowspan="3">0
0</td><td rowspan="3">-81
-32</td></tr>
<tr><td>-</td><td>-</td><td>-</td><td>322</td><td></td><td rowspan="4">-
-
-
-</td><td rowspan="4">-
-
-
-</td></tr>
<tr><td>-</td><td>-</td><td>-</td><td>324</td><td></td></tr>
<tr><td>-</td><td>-</td><td>-</td><td>326</td><td></td><td rowspan="2">0
0</td><td rowspan="2">-89
-35</td></tr>
<tr><td>-</td><td>-</td><td>-</td><td>328</td><td></td></tr>
</table>

F = FS
FL = FT
1) **e** is the bolt hole's center line dimension. **i** is distance between the center line of spherical bore diameter of the housing and mounting surfaces, and **f** is outside diameter of the spigot joint.
2) Radial runout of spigot joint is applied for flange units with spigot joints.
3) For FS and FT types, tolerances for F shall be applied.

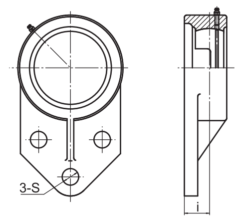
Bearing Tolerance
Tolerance of housings

Flange unit housings (FB, FK, FA,PF,PFL)

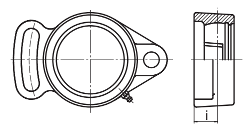
unit: μm/0.0001 inch

Housing numbers	i Deviations △is	Housing numbers	e Deviations △es
-		PF203	
FB, FK, FA204		PF204	
FB, FK, FA205		PF205	
FB, FK, FA206		PF206	
	±500 ±197		
FB, FK, FA207		PF207	
FB, FK, FA208		PF208	
FB, FK, FA209		PFL203	±400 ±160
		PFL204	
FB, FK, FA210		PFL205	
FA211	±800 ±315	PFL206	
		PFL207	

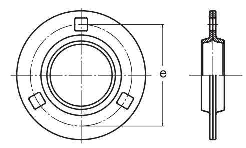
1) **i** is distance between the center line of spherical bore diameter of housings.
2) **e** is the bolt hole's center line dimension.



FB,FK



FA

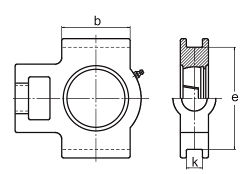


PF,PFL

Take-Up unit housings (T,ST,TX)

unit: μm/0.0001 inch

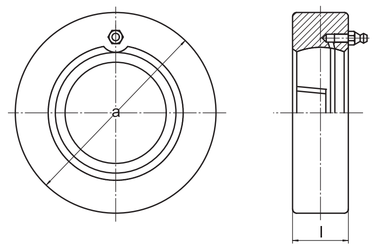
Housing numbers			k Deviations △ks		e Deviations △es		Parallelism of guide max
T,ST	T,ST	TX	high	low	high	low	
204	-	-					
205	305	X05					
206	306	X06					
207	307	X07	+200 +79	0 0	0 0	-500 -197	500 197
208	308	X08					
209	309	X09					
210	310	X10					
211	311	X11					
212	312	X12					
213	313	X13					
214	314	X14					600 236
215	315	X15					
216	316	X16					
217	317	X17	+300 +118	0 0	0 0	-800 -315	
-	318	-					
-	319	-					
-	320	-					700 280
-	321	-					
-	322	-					
-	324	-					800 320
-	326	-					
-	328	-					



T、ST、TX

1) **k** is the width of guide rail grooves.
2) **e** is the maximum span of guide rail grooves.
3)This table can be applied for bearing units with dust covers.

Bearing Tolerance
Tolerance of housings



C、CX

Cartridge Unit Housings (C,CX)

unit: μm/0.0001 inch

<table>
<tr><th colspan="3" rowspan="3">Housing numbers</th><th colspan="6">a Deviations △as</th><th rowspan="3">Radial runout of outside surface max</th><th rowspan="3">l Deviations △ls</th></tr>
<tr><th colspan="2">C2</th><th colspan="2">C3</th><th colspan="2">CX</th></tr>
<tr><th>high</th><th>low</th><th>high</th><th>low</th><th>high</th><th>low</th></tr>
<tr><td>C204</td><td>-</td><td>-</td><td rowspan="2">0
0</td><td rowspan="2">-30
-12</td><td>-</td><td>-</td><td>-</td><td>-</td><td rowspan="2">200
79</td><td rowspan="2">±200
±79</td></tr>
<tr><td>C205</td><td>C305</td><td>CX05</td><td rowspan="4">0
0</td><td rowspan="4">-35
-14</td><td rowspan="4">0
0</td><td rowspan="4">-35
-14</td></tr>
<tr><td>C206</td><td>C306</td><td>CX06</td><td rowspan="5">0
0</td><td rowspan="5">-35
-14</td><td rowspan="5">200
79</td><td rowspan="5">±200
±79</td></tr>
<tr><td>C207</td><td>C307</td><td>CX07</td></tr>
<tr><td>C208</td><td>C308</td><td>CX08</td></tr>
<tr><td>C209</td><td>C309</td><td>CX09</td><td rowspan="6">0
0</td><td rowspan="6">-40
-16</td><td rowspan="4">0
0</td><td rowspan="4">-40
-16</td></tr>
<tr><td>C210</td><td>C310</td><td>CX10</td></tr>
<tr><td>C211</td><td>C311</td><td>CX11</td><td rowspan="3">0
0</td><td rowspan="3">-40
-16</td><td rowspan="6">300
118</td><td rowspan="15">±300
±118</td></tr>
<tr><td>C212</td><td>C312</td><td>CX12</td></tr>
<tr><td>C213</td><td>C313</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>-</td><td>C314</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>-</td><td>C315</td><td>-</td><td>-</td><td>-</td><td rowspan="5">0
0</td><td rowspan="5">-46
-18</td><td>-</td><td>-</td></tr>
<tr><td>-</td><td>C316</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>-</td><td>C317</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td rowspan="9">400
160</td></tr>
<tr><td>-</td><td>C318</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>-</td><td>C319</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>-</td><td>C320</td><td>-</td><td>-</td><td>-</td><td rowspan="3">0
0</td><td rowspan="3">-52
-20</td><td>-</td><td>-</td></tr>
<tr><td>-</td><td>C321</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>-</td><td>C322</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>-</td><td>C324</td><td>-</td><td>-</td><td>-</td><td rowspan="3">0
0</td><td rowspan="3">-57
-22</td><td>-</td><td>-</td></tr>
<tr><td>-</td><td>C326</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>-</td><td>C328</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
</table>

Note: 1) a is the outside diameter of cartridge housings.
2) l is width of cartridge housings.

Bearing Internal Clearance

Radial internal clearance of deep groove ball bearings

Unit: μm

Bore diameter d mm		Clearance									
		C2		CN		C3		C4		C5	
over	Incl.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
2.5	10	0	7	2	13	8	23	14	29	20	37
10	18	0	9	3	18	11	25	18	33	25	45
18	24	0	10	5	20	13	28	20	36	28	48
24	30	1	11	5	20	13	28	23	41	30	53
30	40	1	11	6	20	15	33	28	46	40	64
40	50	1	11	6	23	18	36	30	51	45	73
50	65	1	15	8	28	23	43	38	61	55	90
65	80	1	15	10	30	25	51	46	71	65	105
80	100	1	18	12	36	30	58	53	84	75	120
100	120	2	20	15	41	36	66	61	97	90	140
120	140	2	23	18	48	41	81	71	114	105	160
140	160	2	23	18	53	46	91	81	130	120	180
160	180	2	25	20	61	53	102	91	147	135	200
180	200	2	30	25	71	63	117	107	163	150	230
200	225	2	35	25	85	75	140	125	195	175	265

Radial internal clearance of self-aligning ball bearings

Unit: μm

Bore diameter d mm		cylindrical bore bearing clearanle								tapered bore bearing clearanle							
		C2		CN		C3		C4		C2		CN		C3		C4	
over	Incl.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
2.5	6	1	8	5	15	10	20	15	25	-	-	-	-	-	-	-	-
6	10	2	9	6	17	12	25	19	33	-	-	-	-	-	-	-	-
10	14	2	10	6	19	13	26	21	35	-	-	-	-	-	-	-	-
14	18	3	12	8	21	15	28	23	37	-	-	-	-	-	-	-	-
18	24	4	14	10	23	17	30	25	39	7	17	13	26	20	33	28	42
24	30	5	16	11	24	19	35	29	46	9	20	15	28	23	39	33	50
30	40	6	18	13	29	23	40	34	53	12	24	19	35	29	46	40	59
40	50	6	19	14	31	25	44	37	57	14	27	22	39	33	52	45	65
50	65	7	21	16	36	30	50	45	69	18	32	27	47	41	61	56	80
65	80	8	24	18	40	35	60	54	83	23	39	35	57	50	75	69	98
80	100	9	27	22	48	42	70	64	96	29	47	42	68	62	90	84	116

Bearing Internal Clearance

Radial internal clearance of cylindrical roller bearings and machined ring needle roller bearings

Cylindrical bore

Unit: μm

Nominal bore diameter d mm		Clearance									
		C2		CN		C3		C4		C5	
over	Incl.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
-	10	0	25	20	45	35	60	50	75	-	-
10	24	0	25	20	45	35	60	50	75	65	90
24	30	0	25	20	45	35	60	50	75	70	95
30	40	5	30	25	50	45	70	60	85	80	105
40	50	5	35	30	60	50	80	70	100	95	125
50	65	10	40	40	70	60	90	80	110	110	140
65	80	10	45	40	75	65	100	90	125	130	165
80	100	15	50	50	85	75	110	105	140	155	190
100	120	15	55	50	90	85	125	125	165	180	220
120	140	15	60	60	105	100	145	145	190	200	245
140	160	20	70	70	120	115	165	165	215	225	275
160	180	25	75	75	125	120	170	170	220	250	300
180	200	35	90	90	145	140	195	195	250	275	330
200	225	45	105	105	165	160	220	220	280	305	365
225	250	45	110	110	175	170	235	235	300	330	395
250	280	55	125	125	195	190	260	260	330	370	440
280	315	55	130	130	205	200	275	275	350	410	485

Radial internal clearance of Double/four - row and matched pair tapered roller bearings

cylindrical bore

Unit: μm

Nominal bore diameter d mm		Clearance							
		C2		CN		C3		C4	
over	Incl.	min.	max.	min.	max.	min.	max.	min.	max.
	30	10	20	20	30	40	50	50	60
30	40	12	25	25	40	45	60	60	75
40	50	15	30	30	45	50	65	65	80
50	65	15	30	30	50	50	70	70	90
65	80	20	40	40	60	60	80	80	110
80	100	20	45	45	70	70	100	100	130
100	120	25	50	50	80	80	110	110	150
120	140	30	60	60	90	90	120	120	170
140	160	30	65	65	100	100	140	140	190
160	180	35	70	70	110	110	150	150	210
180	200	40	80	80	120	120	170	170	230
200	225	40	90	90	140	140	190	190	260
225	250	50	100	100	150	150	210	210	290
250	280	50	110	110	170	170	230	230	320
280	315	60	120	120	180	180	250	250	350
315	355	70	140	140	210	210	280	280	390
355	400	70	150	150	230	230	310	310	440
400	450	80	170	170	260	260	350	350	490
450	500	90	190	190	290	290	390	390	540
500	560	100	210	210	320	320	430	430	590
560	630	110	230	230	350	350	480	480	660
630	710	130	260	260	400	400	540	540	740
710	800	140	290	290	450	450	610	610	830
800	900	160	330	330	500	500	670	670	920
900	1000	180	360	360	540	540	720	720	980
1000	1120	200	400	400	600	600	820	-	-
1120	1250	220	450	450	670	670	900	-	-

Bearing internal clearance

Axial internal clearance of Double-row and metric size tapered roller bearings

Unit: μm

Nominal bore diameter d mm		Contact angle α ≦27° (e≦0.76)								Contact angle α >27° (e>0.76)							
		C2		CN		C3		C4		C3		CN		C3		C4	
over	Incl.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
18	24	25	75	75	125	125	170	170	220	10	30	30	50	50	70	70	90
24	30	25	75	75	125	145	195	195	245	10	30	30	50	60	80	80	100
30	40	25	95	95	165	165	235	210	280	10	40	40	70	70	100	90	120
40	50	20	85	85	150	175	240	240	305	10	40	40	70	80	110	110	140
50	65	20	85	110	175	195	260	280	350	10	40	50	80	90	120	130	160
65	80	20	110	130	220	240	325	325	410	10	50	60	100	110	150	150	190
80	100	45	150	150	260	280	390	390	500	20	70	70	120	130	180	180	230
100	120	45	175	175	305	350	480	455	585	20	70	70	120	150	200	210	260
120	140	45	175	175	305	390	520	500	630	20	70	70	120	160	210	210	260
140	160	60	200	200	340	400	540	520	660	30	100	100	160	180	240	240	300
160	180	80	220	240	380	440	580	600	740	-	-	-	-	-	-	-	-
180	200	100	260	260	420	500	660	660	820	-	-	-	-	-	-	-	-
200	225	120	300	300	480	560	740	720	900	-	-	-	-	-	-	-	-
225	250	160	360	360	560	620	820	820	1020	-	-	-	-	-	-	-	-
250	280	180	400	400	620	700	920	920	1140	-	-	-	-	-	-	-	-
280	315	200	440	440	680	780	1020	1020	1260	-	-	-	-	-	-	-	-
315	355	220	480	500	760	860	1120	1120	1380	-	-	-	-	-	-	-	-
355	400	260	560	560	860	980	1280	1280	1580	-	-	-	-	-	-	-	-

Bearing Internal Clearance

Radial internal clearance of spherical roller bearings

(1) Cylindrical bore

Unit: μm

Nominal bore diameter d mm		Clearance									
		C2		CN		C3		C4		C5	
over	Incl.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
18	24	10	20	20	35	35	45	45	60	60	75
24	30	15	25	25	40	40	55	55	75	75	95
30	40	15	30	30	45	45	60	60	80	80	100
40	50	20	35	35	55	55	75	75	100	100	125
50	65	20	40	40	65	65	90	90	120	120	150
65	80	30	50	50	80	80	110	110	145	145	180
80	100	35	60	60	100	100	135	135	180	180	225
100	120	40	75	75	120	120	160	160	210	210	260
120	140	50	95	95	145	145	190	190	240	240	300
140	160	60	110	110	170	170	220	220	280	280	350
160	180	65	120	120	180	180	240	240	310	310	390
180	200	70	130	130	200	200	260	260	340	340	430
200	225	80	140	140	220	220	290	290	380	380	470
225	250	90	150	150	240	240	320	320	420	420	520
250	280	100	170	170	260	260	350	350	460	460	570
280	315	110	190	190	280	280	370	370	500	500	630
315	355	120	200	200	310	310	410	410	550	550	690
355	400	130	220	220	340	340	450	450	600	600	750
400	450	140	240	240	370	370	500	500	660	660	820
450	500	140	260	260	410	410	550	550	720	720	900

(2) Tapered bore

Unit: μm

Nominal bore diameter d mm		Clearance									
		C2		CN		C3		C4		C5	
over	Incl.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
18	24	15	25	25	35	35	45	45	60	60	75
24	30	20	30	30	40	40	55	55	75	75	95
30	40	25	35	35	50	50	65	65	85	85	105
40	50	30	45	45	60	60	80	80	100	100	130
50	65	40	55	55	75	75	95	95	120	120	160
65	80	50	70	70	95	95	120	120	150	150	200
80	100	55	80	80	110	110	140	140	180	180	230
100	120	65	100	100	135	135	170	170	220	220	280
120	140	80	120	120	160	160	200	200	260	260	330
140	160	90	130	130	180	180	230	230	300	300	380
160	180	100	140	140	200	200	260	260	340	340	430
180	200	110	160	160	220	220	290	290	370	370	470
200	225	120	180	180	250	250	320	320	410	410	520
225	250	140	200	200	270	270	350	350	450	450	570
250	280	150	220	220	300	300	390	390	490	490	620
280	315	170	240	240	330	330	430	430	540	540	680
315	355	190	270	270	360	360	470	470	590	590	740
355	400	210	300	300	400	400	520	520	650	650	820
400	450	230	330	330	440	440	570	570	720	720	910
450	500	260	370	370	490	490	630	630	790	790	1000

Bearing internal clearance

Clearance for insert bearing

Cylindrical Bore Bearing (UC, HC, SA, SB, SER Series)

Unit: μm

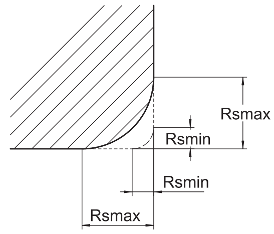
Nominal bore diameter d mm		Clearance							
		C2		Normal		C3		C4	
over	Incl.	min.	max.	min.	max.	min.	max.	min.	max.
10	18	0	9	3	18	11	25	18	33
18	24	0	10	5	20	13	28	20	36
24	30	1	11	5	20	13	28	23	41
30	40	1	11	6	20	15	33	28	46
40	50	1	11	6	23	18	36	30	51
50	65	1	15	8	28	23	43	38	61
65	80	1	15	10	30	25	51	46	71
80	100	1	18	12	36	30	58	53	84
100	120	2	20	15	41	36	66	61	97
120	140	2	23	18	48	41	81	71	114

Tapered Bore Bearing (UK Series)

Unit: μm

Nominal bore diameter d mm		Clearance							
		C2		Normal		C3		C4	
over	Incl.	min.	max.	min.	max.	min.	max.	min.	max.
24	30	5	20	13	28	23	41	30	53
30	40	6	20	15	33	28	46	40	54
40	50	6	23	18	36	30	51	45	73
50	65	8	28	23	43	38	61	55	90
65	80	10	30	25	51	46	71	65	105
80	100	12	36	30	58	53	84	75	120
100	120	15	41	36	66	61	97	90	140
120	140	18	48	41	81	71	114	105	160

Allowable Critical-value of Bearing Chamfer

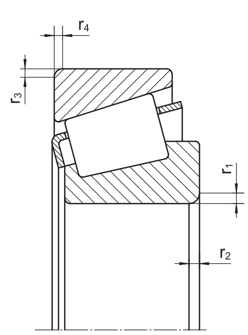


Radial bearing (except tapered roller bearing) Unit: mm

Rs min	Nominal bore diameter d		Rs max	
	over	upto	Radial direction	Axial direction
0.05	-	-	0.1	0.2
0.08	-	-	0.16	0.3
0.10	-	-	0.2	0.4
0.15	-	-	0.3	0.6
0.20	-	-	0.5	0.8
0.30	-	40	0.6	1
0.30	40	-	0.8	1
0.60	-	40	1	2
0.60	40	-	1.3	2
1.00	-	50	1.5	3
1.00	50	-	1.9	3
1.10	-	120	2	3.5
1.10	120	-	2.5	4
1.50	-	120	2.3	4
1.50	120	-	3	5
2.00	-	80	3	4.5
2.00	80	220	3.5	5
2.00	220	-	3.8	6
2.10	-	280	4	6.5
2.10	280	-	4.5	7
2.50	-	100	3.8	6
2.50	100	280	4.5	6
2.50	280	-	5	7
3.00	-	280	5	8
3.00	280	-	5.5	8
4.00	-	-	6.5	9
5.00	-	-	8	10

Metric series tapered roller bearing. Unit: mm

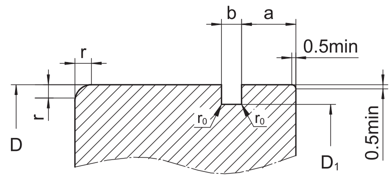
rs min or ris max	No minsl bore dia.or namtnal outsrde dia d or D mm		Rs max or ris max	
	over	incl	Radial direction	Axial direction
0.6	-	40	1.1	1.7
0.6	40	-	1.3	2
1	-	50	1.6	2.5
1	50	-	1.9	3
1.5	-	120	2.3	3
1.5	120	250	2.8	3.5
1.5	250	-	3.5	4
2	-	120	2.8	4
2	120	250	3.5	4.5
2	250	-	4	5
2.5	-	120	3.5	5
2.5	120	250	4	5.5
2.5	250	-	4.5	6
3	-	120	4	5.5
3	120	250	4.5	6.5
3	250	400	5	7
3	400	-	5.5	7.5
4	-	120	5	7
4	120	250	5.5	7.5
4	250	400	6	8
4	400	-	6.5	8.5
5	-	180	6.5	8
5	180	-	7.5	9
6	-	180	7.5	10
6	180	-	9	11



Tapered radial Bearing (Inch Size) Unit: mm

Nominal bearing bore diameter d		Maximum values	
over	incl.	r1 max	r2 max
-	50.8	rs min + 0.4	rs min + 0.9
50.8	101.6	rs min + 0.5	rs min + 1.3
101.6	254	rs min + 0.6	rs min + 1.6
Nominal bearing outside diameter D		**Maximum values**	
over	incl.	r3 max	r4 max
-	101.6	rs min + 0.6	rs min + 1.1
101.6	168.3	rs min + 0.6	rs min + 1.2
168.3	266.7	rs min + 0.8	rs min + 1.4

Snap Ring Groove on Outer Ring

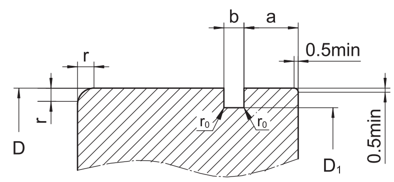


Snap ring geoove on outer ring of 6000,6200,6300 series bearings

Unit: mm

D	D1	Permissible deviation	a diameter series		Permissible deviation	b	Permissible deviation	r_0
			60	62、63、64				
22	21.11	-0.15	1.73	1.73	-0.15	0.80	+0.25	0.2
24	23.00		1.73	1.73		0.80		0.2
26	25.15		1.73	1.73		0.80		0.2
28	26.7		1.73	1.73		0.80		0.25
30	28.17	-0.25	-	2.06	-0.15	1.35	+0.30	0.4
32	30.15		2.06	2.06		1.35		0.4
35	33.17		2.06	2.06		1.35		0.4
37	34.77		-	2.06		1.35		0.4
40	38.10		-	2.06		1.35		0.4
42	39.75		2.06	2.06		1.35		0.4
47	44.60		2.06	2.46		1.35		0.4
50	47.60		-	2.46		1.35		0.4
52	49.73		2.06	2.46		1.35		0.4
55	52.60		2.08	-		1.35		0.4
56	53.60		-	2.46		1.35		0.4
58	55.60		2.08	2.46		1.35		0.4
62	59.61	-0.50	2.08	3.28	-0.20	1.9		0.6
65	62.60		-	3.28		1.9		0.6
68	64.82		2.49	3.28		1.9		0.6
72	68.81		-	3.28		1.9		0.6
75	71.83		2.49	3.28		1.9		0.6
80	76.81		2.49	3.28		1.9		0.6
85	81.81		-	3.28		1.9		0.6
90	86.79		2.87	3.28		2.7		0.6
95	91.82		2.87	-		2.7		0.6
100	96.80		2.87	3.28		2.7		0.6
110	106.81		2.87	3.28		2.7		0.6
115	111.81		2.87	-		2.7		0.6
120	115.21		-	4.06		3.1		0.6
125	120.22		2.87	4.06	-0.25	3.1		0.6
130	125.22		2.87	4.06		3.1		0.6
140	135.23		3.71	4.90		3.1		0.6
145	140.23		3.71	-		3.1		0.6
150	145.24		3.71	4.90		3.1		0.6

Snap Ring Groove on Outer Ring



Snap ring geoove on outer ring of 69,68 series bearings

Unit: mm

D	D1	Permissible deviation	a diameter series		Permissible deviation	b	Permissible deviation	r_0
			69	68				
22	20.8		-	1.05		0.8		0.2
24	22.8		-	1.05		0.8		0.2
28	26.7		-	1.3		0.95		0.25
30	28.7		-	1.3		0.95		0.25
32	30.7		1.3	-		0.95		0.25
34	32.7		1.3	-		0.95		0.25
37	35.7		1.3	1.7		0.95		0.25
39	37.7	-0.3	-	1.7		0.95		0.25
40	38.7		1.3	-		0.95		0.25
42	40.7		1.3	1.7	-0.15	0.95	+0.25	0.25
44	42.7		1.3	-		0.95		0.25
45	43.7		-	1.7		0.95		0.25
47	45.7		1.3	1.7		0.95		0.25
52	50.7		1.3	1.7		0.95		0.25
55	53.7		-	1.7		0.95		0.25
58	56.7		1.3	-		0.95		0.25
62	60.7		-	1.7		0.95		0.25
65	63.7		1.3	-		0.95		0.25
68	66.7		-	1.7		0.95		0.25
72	70.7		1.7	1.7		0.95		0.25
78	76.2		1.7	-		1.3		0.4
80	77.9	-0.4	-	2.1		1.3		0.4
85	82.9		1.7	2.1		1.3		0.4
90	87.9		1.7	2.1		1.3		0.4
95	92.9		1.7	-		1.3		0.4
100	97.9		1.7	2.5		1.3		0.4
105	102.6		-	2.5		1.3		0.4
110	107.6		2.1	2.5		1.3		0.4
115	112.6		2.1	-		1.3		0.4
120	117.6		2.1	3.3		1.3		0.4
125	122.6		2.1	3.3	-0.2	1.3	0.3	0.4
130	127.6		2.1	3.3		1.3		0.4
140	137.6	-0.5	2.5	3.3		1.9		0.6
145	142.6		-	3.3		1.9		0.6
150	147.6		2.5	3.3		1.9		0.6
165	161.8		3.3	3.7		1.9		0.6
175	171.8		3.3	-		1.9		0.6
180	176.8		-	3.7		1.9		0.6
190	186.8		3.3	3.7		1.9		0.6

Bearing Material

The KML bearing rings rollers and balls are made of high carbon chromium steel Gcr15, which has a chemical composition equivalent to SAE 52100.
The hardness for bearing rings is HRC 59-64 and HRC 60-65 for balls and rollers.

Apply stainless steel ball bearings in a vaiety of vaiety of services where they may be subjected to moisture. corrosive and abrasive atmospheres. The KML stainless steel ball bearings are made of stainless steel 9Cr18 equivalent to AISI 440C.
The harness for stainlass steel bearing rings are HRC 59-64 and HRC 60-65 for steel balls.

Steel No.	C	Cr	Si	Mn	S	P	Mo	Ni
GCr15	0.95~1.05	1.30~1.65	0.15~0.35	0.20~0.40	≤0.020	≤0.027	-	-
SAE52100	0.98~1.10	1.30~1.60	0.15~0.30	0.25~0.45	≤0.025	≤0.025	-	-
9Cr18	0.90~1.00	17.0~19.0	≤0.80	≤0.80	≤0.030	≤0.035	-	≤0.30
AISI440C	0.95~1.10	1.60~1.80	≤1.00	≤1.00	≤0.025	≤0.025	0.40~0.65	≤0.75

Lubricant- Grease

Brand name	Manufacturer	Soap type	Base oil	NLGI No.	Penetration	Dropping Point ℃	Operating Temperature rang ℃	Code No.
BBEACON 325	ESSO	Lithium	Diester	2	290	193	-60-+120	L06
ANDOK B	ESSO	Sodium-complex	Mineral	2	280	260	-40-+120	L01
ANDOK C	ESSO	Sodium-complex	Mineral	4	205	≥260	-20-+120	L02
ANDOK 260	ESSO	Natrium	Mineral	3	250	200	-30-+150	L07
POLYREX EM	ESSO	POLY urea		2	284	288	-40-+180	
UNIREX N2	ESSO	lithium-complex		2	280	304	-40-+200	L05
CHEVRON SR1-2	CHEVRON	Poly-UREA	Mineral	2	265	243	-30-+150	L19
MULTEMP PS2	KOYODO YUSHI	Lithium	Diester	2	280	189	-50-+110	L20
MULTEMP SRL	KOYODO YUSHI	Lithium	Ester	3	245	191	-40-+150	L21
MULTEMP LRL	KOYODO YUSHI	Lithium		3	227	208	-35-+150	
ALVANIA NO.2	SHELL	Lithium	Mineral	2	272	182	-25-+120	L15
ALVANIA NO.3	SHELL	Lithium	Mineral	3	233	183	-20-+135	L16
ALVANIA EP.2	SHELL	Lithium	Mineral	2	276	185	-10-+110	L71
DOLIUN R	SHELL		Mineral	2	281	238	-20-+140	L31
KRYTOR 240AC	Dupont	Fluorote lomer	Fluorinated		282		-35-+290	L76
MOBIL 22	MOBIL OIL	Lithium	Diester mineral	2	274	192	-50-+140	L09
MOBIL 28	MOBIL OIL	Bentonite	Synthetic hydrocarbon	2	280	≥260	-60-+180	L60
ISO LEX LDS18	KIUBER	Lithium		2			-60-+130	L13
MULTEMP ET-K	KOYODO YUSHI	Diurea	Synthetic oil/Ester		300	230	-40-+200	
Chevron FM Grease EP	CHEVRON	Polyurea Complex		1-2	325	266	-40-+160	
Mobilgrease FM 102	MOBIL	aluminum Complex		2	280	216		

Inch-Millimetre Conversion Table

Inch		0"	1"	2"	3"	4"	5"	6"	7"	8"	9"
fraction	decimal										
			25.400	50.800	76.200	101.600	127.000	152.400	177.800	203.200	228.600
1/64	0.015625	0.397	25.797	51.197	76.597	101.997	127.397	152.797	178.197	203.597	228.997
1/32	0.031250	0.794	26.194	51.594	76.994	102.394	127.794	153.194	178.594	203.994	229.394
3/64	0.046875	1.191	26.591	51.991	77.391	102.791	128.191	153.591	178.991	204.391	229.791
1/16	0.062500	1.588	26.988	52.388	77.788	103.188	128.588	153.988	179.388	204.788	230.188
5/64	0.078125	1.984	27.384	52.784	78.184	103.584	128.984	154.384	179.784	205.184	230.584
3/32	0.093750	2.381	27.781	53.181	78.581	103.981	129.381	154.781	180.181	205.581	230.981
7/64	0.109375	2.778	28.178	53.578	78.978	104.378	129.778	155.178	180.578	205.978	231.378
1/8	0.125000	3.175	28.575	53.975	79.375	104.775	130.175	155.575	180.975	206.375	231.775
9/64	0.140625	3.572	28.972	54.372	79.772	105.172	130.572	155.972	181.372	206.772	232.172
5/32	0.156250	3.969	29.369	54.769	80.169	105.569	130.969	156.369	181.769	207.169	232.569
11/64	0.171875	4.366	29.766	55.166	80.566	105.966	131.366	156.766	182.166	207.566	232.966
3/16	0.187500	4.762	30.162	55.562	80.962	106.362	131.762	157.162	182.562	207.962	233.362
13/64	0.203125	5.159	30.559	55.969	81.359	106.759	132.159	157.559	182.959	208.359	233.759
7/32	0.218750	5.556	30.958	56.356	81.756	107.156	132.556	157.956	183.356	208.756	234.156
15/64	0.234375	5.953	31.353	56.753	82.153	107.553	132.953	158.353	183.753	209.153	234.553
1/4	0.250000	6.350	31.750	57.150	82.550	107.950	133.350	158.720	184.150	209.550	234.950
17/64	0.265625	6.747	32.147	57.547	82.947	108.347	133.747	159.147	184.547	209.947	235.347
9/32	0.281250	7.144	32.544	57.944	83.344	108.744	134.144	159.544	184.944	210.344	235.744
19/64	0.296875	7.541	32.941	58.341	83.741	109.141	134.541	159.941	185.341	210.741	236.141
5/16	0.312500	7.938	33.338	58.738	84.138	109.538	134.938	160.338	185.738	211.138	236.538
21/64	0.328125	8.334	33.734	59.134	84.534	109.934	135.334	160.734	186.134	211.534	236.934
11/32	0.343750	8.731	34.131	59.531	84.931	110.331	135.731	161.131	186.531	211.931	237.331
23/64	0.359375	9.128	34.528	59.928	85.328	110.728	136.128	161.527	186.928	212.328	237.728
3/8	0.375000	9.525	34.925	60.325	85.725	111.128	136.525	161.925	187.325	323.725	238.125
25/64	0.390625	9.922	35.322	60.722	86.122	111.522	136.922	162.322	187.722	231.122	238.522
13/32	0.406250	10.319	35.719	61.119	86.519	111.919	137.319	162.719	188.119	213.519	238.919
27/64	0.421875	10.716	36.116	61.516	86.916	112.316	137.716	163.116	188.516	231.916	239.316
7/16	0.437500	11.112	36.512	61.912	87.312	112.712	138.112	163.512	188.912	214.312	239.712
29/64	0.453125	11.509	36.909	62.309	87.709	113.109	138.509	163.909	189.309	214.709	240.109
15/32	0.438750	11.906	37.306	62.706	88.106	113.506	138.906	164.306	189.706	215.106	240.506
31/64	0.484375	12.303	37.703	63.103	88.503	113.903	139.303	164.703	190.103	215.503	240.903
1/2	0.500000	12.700	38.100	63.500	88.900	114.300	139.700	165.100	190.500	215.900	241.300
33/64	0.515625	13.097	38.497	63.897	89.297	114.697	140.097	165.497	190.897	216.297	241.697
17/32	0.531250	13.494	38.894	64.294	89.694	115.094	140.494	165.894	191.294	216.694	242.094
35/64	0.546875	13.891	39.291	64.691	90.091	115.491	140.891	166.291	191.691	217.091	242.491
9/16	0.562500	14.288	39.688	65.088	90.488	115.888	141.283	166.688	192.088	217.488	242.888
37/64	0.578125	14.684	40.084	65.484	90.884	116.284	141.684	167.084	192.484	217.884	243.284
19/32	0.593750	15.081	40.481	65.881	91.281	116.681	142.081	167.481	192.881	218.281	243.681
39/64	0.609375	15.478	40.878	66.278	91.678	117.078	142.478	167.878	193.278	218.678	244.078
5/8	0.625000	15.875	41.275	66.675	92.075	117.475	142.875	168.275	193.675	219.075	244.475

Inch-Millimetre Conversion Table

Inch		0"	1"	2"	3"	4"	5"	6"	7"	8"	9"
fraction	decimal										
41/64	0.640625	16.272	41.672	67.072	92.472	117.872	143.272	168.672	194.072	219.472	244.872
21/32	0.656250	16.669	42.069	67.469	92.869	118.269	143.669	169.069	194.469	219.869	245.269
43/64	0.671875	17.066	42.466	67.868	93.266	118.666	144.066	169.466	194.866	220.266	247.253
11/16	0.687500	17.462	42.862	68.262	93.662	119.062	144.462	169.862	195.262	220.662	247.650
45/64	0.703125	17.859	43.259	68.659	94.059	119.459	144.859	170.259	195.659	221.059	246.459
23/32	0.718750	18.256	43.656	69.056	94.456	119.856	145.256	170.656	196.056	221.456	246.856
47/64	0.734375	18.653	44.053	69.453	94.853	120.253	145.653	171.053	196.453	221.853	247.253
3/4	0.750000	19.050	44.450	69.850	95.250	120.650	146.050	171.450	196.850	222.250	247.650
49/64	0.765625	19.477	44.847	70.247	95.647	121.047	146.447	171.847	197.247	222.647	248.047
25/32	0.781250	19.844	45.244	70.644	96.044	121.444	146.844	172.244	197.644	223.044	248.444
51/64	0.796875	20.241	45.641	71.041	96.441	121.841	147.241	172.641	198.041	223.441	248.841
13/16	0.812500	20.638	46.038	71.438	96.838	122.238	147.638	173.038	198.438	223.838	249.238
53/64	0.828125	21.034	46.434	71.834	97.234	122.634	148.034	173.434	198.834	224.234	249.634
27/32	0.843750	21.431	46.831	72.231	97.631	123.031	148.431	173.831	199.231	224.631	250.031
55/64	0.859375	21.828	47.228	72.628	98.028	123.428	148.828	174.228	199.628	225.028	250.428
7/8	0.875000	22.225	47.625	72.025	98.425	123.825	149.255	174.625	200.025	225.425	250.825
57/64	0.890625	22.622	48.022	73.422	98.822	124.222	149.622	175.022	200.422	225.822	251.222
29/32	0.906250	23.019	48.419	73.819	99.219	124.619	150.019	175.419	200.819	226.219	251.619
59/64	0.921875	23.416	48.816	74.216	99.616	125.016	150.416	175.816	201.216	226.616	252.016
15/16	0.937500	23.812	49.212	74.612	100.120	125.412	150.812	176.212	201.612	227.012	252.412
61/64	0.953125	24.209	49.609	75.009	100.409	125.809	151.209	176.609	202.009	227.409	252.809
31/32	0.968750	24.606	50.006	75.406	100.806	126.206	151.606	177.006	202.416	227.806	253.206
63/64	0.984375	25.003	50.403	75.803	101.203	126.603	152.003	177.403	202.803	228.203	253.603

Hardness Corvension Table

Rockwell		Vickers	Brinell
HRC	HRA	HV	$HB30D^2$
70	86.6	1037	-
69.5	86.3	1017	-
69	86.1	997	-
68.5	85.8	978	-
68	85.5	959	-
67.5	85.2	941	-
67	85	923	-
66.5	84.7	906	-
66	84.4	889	-
65.5	84.1	872	-
65	83.9	856	-
64.5	83.6	840	-
64	83.3	825	-
63.5	83.1	810	-
63	82.8	795	-
62.5	82.5	780	-
62	82.2	766	-
61.5	82	752	-
61	81.7	739	-
60.5	81.4	726	-
60	81.2	713	-
59.5	80.9	700	-
59	80.6	688	-
58.5	80.3	676	-
58	80.1	664	-
57.5	79.8	653	-
57	79.5	642	-
56.5	79.3	631	-
56	79	620	-
55.5	78.7	609	-
55	78.5	599	-
54.5	78.2	589	-
54	77.9	579	-
53.5	77.7	570	-
53	77.4	561	-
52.5	77.1	551	-
52	76.9	543	-
51.5	76.6	534	-
-	-	-	-

Rockwell		Vickers	Brinell
HRC	HRA	HV	$HB30D^2$
51.0	76.3	525	(501)
50.5	76.1	517	494
50	75.8	509	488
49.5	75.5	501	481
49	75.3	493	474
48.5	75	485	468
48	74.7	478	461
47.5	74.5	470	455
47	74.2	463	449
46.5	73.9	456	442
46	73.7	449	436
45.5	73.4	443	430
45	73.2	436	424
44.5	72.9	429	418
44	72.6	423	413
43.5	72.4	417	407
43	72.1	411	401
42.5	71.8	405	396
42	71.6	399	391
41.5	71.3	393	385
41	71.1	388	380
40.5	70.8	382	375
40	70.5	377	370
39.5	70.3	372	365
39	-	367	360
38.5	-	362	355
38	-	357	350
37.5	-	352	345
37	-	347	341
36.5	-	342	336
36	-	338	332
35.5	-	333	327
35	-	329	323
34.5	-	324	318
34	-	320	314
33.5	-	316	310
33	-	312	306
32.5	-	308	302

Rockwell		Vickers	Brinell
HRC	HRA	HV	$HB30D^2$
32	-	304	298
31.5	-	300	294
31	-	296	291
30.5	-	292	287
30	-	289	283
29.5	-	285	280
29	-	281	276
28.5	-	278	273
28	-	274	269
27.5	-	271	266
27	-	268	263
26.5	-	264	260
26	-	261	257
25.5	-	258	254
25	-	255	251
24.5	-	252	248
24	-	249	245
23.5	-	246	242
23	-	243	240
22.5	-	240	237
22	-	237	234
21.5	-	234	232
21	-	231	229
20.5	-	229	227
20	-	226	225
19.5	-	223	222
19	-	221	220
18.5	-	218	218
18	-	216	216
17.5	-	214	214
17	-	211	211
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

$HB30D^2$ measuring load:100kg
HRA measuring load:60kg
HRC measuring load:150kg
HV measuring load:10kg;1kg;50N;10N;2N

Celsius-Fahrenheit Conversion Table

℃	℉
-50	-58.
-45	-49.
-40	-40.
-35	-31.
-30	-22.
-25	-13.
-20	-4.
-15	5.
-10	14.
-5	23.
0	32.
1	33.8
2	35.6
3	37.4
4	39.2
5	41.
16	42.8
6	44.6
7	46.4
8	48.2
9	50.
10	51.8
11	53.6
12	55.4
13	57.2
14	59.
15	60.8
17	62.6
18	64.4
19	66.2
20	68.
21	69.8
22	71.6
23	73.4
24	75.2
25	77.
26	78.8
27	80.6
28	82.4
29	84.2
30	86.
31	87.8
32	89.6
33	91.4
34	93.2
35	95.

℃	℉
36	96.8
37	98.6
38	100.4
39	102.2
40	104.
41	105.8
42	107.6
43	109.4
44	111.2
45	113.
46	114.5
47	116.6
48	118.4
49	120.2
50	122.
55	131.
60	140.
65	149.
70	158.
75	167.
80	176.
85	185.
90	194.
95	203.
100	212.
110	230.
120	248.
130	266.
140	284.
150	302.
160	320.
170	338.
180	356.
190	374.
200	392.
220	428.
240	464.
260	500.
280	536.
300	572.
320	608.
340	644.
360	680.
380	716.
400	752.
450	842.

℃	℉
500	932.
550	1022.
600	1112.
650	1202.
700	1292.
750	1382.
800	1472.
850	1562.
900	1652.
950	1742.
1000	1832.
1050	1922.
1100	2012.
1200	2192.
1300	2372.
1400	2552.
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