

Rolling bearing construction

Most rolling bearings consist of rings with raceway (inner ring and outer ring), rolling elements (either balls or rollers) and cage. The cage separates the rolling elements at regular intervals, holds them in place within the inner and outer raceways, and allows them to rotate freely.

Classification of rolling bearings

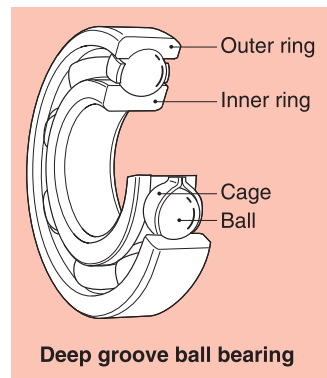
Rolling bearings divide into two main classifications: ball bearings and roller bearings. Ball bearings are classified according to their bearing ring configurations: deep groove type and angular contact type. Roller bearings on the other hand are classified according to the shape of the rollers: cylindrical, needle, tapered and spherical. Rolling bearings can be further classified according to the direction in which the load is applied; radial bearings carry radial loads and thrust bearings carry axial loads.

Other classifications

- 1) Number of rolling rows (single, double, or 4-row),
- 2) Separable and non-separable, in which either the inner ring or the outer ring can be detached.
- 3) There are also bearings designed for special purposes, such as Automotive and other applications

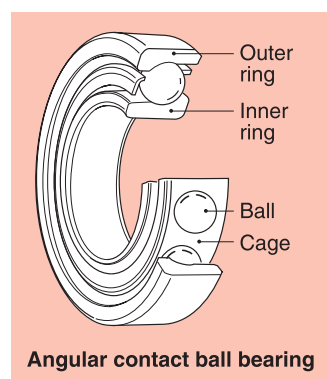
Deep groove ball bearings

The most common type of bearing, deep groove ball bearings are widely used in a variety of fields. Deep groove ball bearings include shield bearings and sealed bearings with grease enabling easier usage. Deep groove ball bearings also include bearings with a locating snap-ring to facilitate positioning when mounting the outer ring. These type of bearings supports radial load on both directions. Deep groove ball bearings are also classified into Thin series, Light series, Medium series and Heavy series ball bearings.



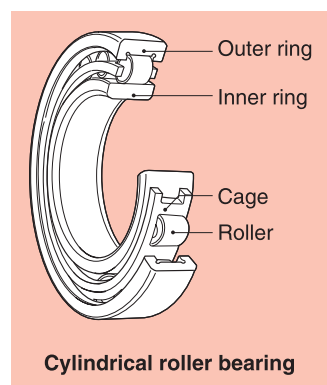
Angular contact ball bearings

Angular contact ball bearings unite point of contact of the inner ring, ball and the outer ring runs at a certain angle (contact angle) in the radial direction. Bearings are generally designed with three contact angles. Angular contact ball bearings can support an axial load, but cannot be used as single bearing because of the contact angle. They must instead be used in pairs or in combinations. Angular contact ball bearings include double row angular contact ball bearings for which the inner and outer rings are combined as a single unit. The contact angle of double row angular contact ball bearings is 25° . These type support certain amount of combined loads.



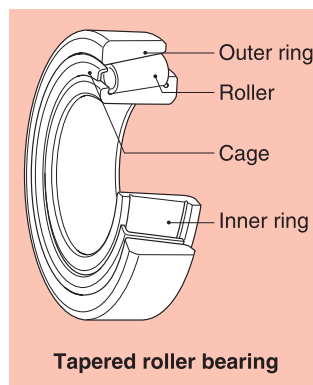
Cylindrical roller bearings

Cylindrical roller bearings use rollers for rolling elements, and therefore has a high load capacity. The rollers are guided by the ribs of the inner or outer ring. The inner and outer rings can be separated to facilitate assembly, and both can be fitted with shaft or housing tightly. If there are no ribs, either the inner or the outer ring can move freely in the axial direction. Cylindrical roller bearings are of different types, like N, NU, NJ, NUP, NF depending upon the construction of inner and outer rings. Cylindrical roller bearings are designed with multiple row rollers and full compliment rollers without cage depending on the applications. These bearings are suitable for heavy radial and impact loading and are appropriate for high speed applications.



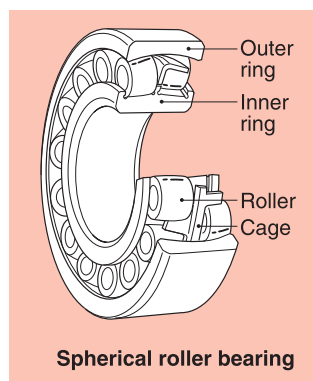
Tapered roller bearings

Taper roller bearings are designed such that the outer ring, inner ring and the rollers have tapered surfaces whose apexes converge at a common point on the bearing axis. Taper rollers are available in metric as well as inch dimensions most commonly called as metric series and inch series. Taper rollers are available in Single, Double and four row, these type of bearings are suitable for Heavy and Impact load application and can take both radial and axial load simultaneously.



Spherical roller bearings

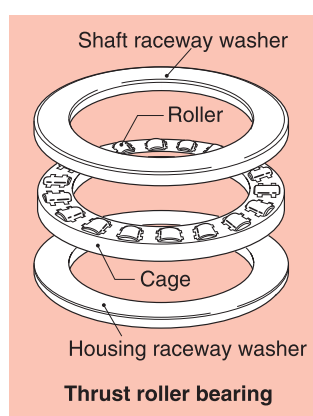
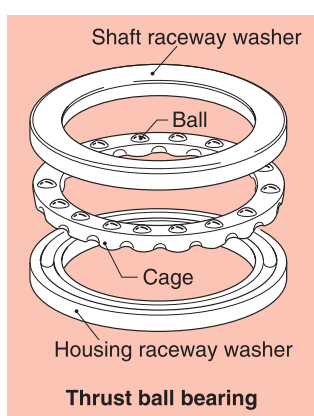
Spherical roller bearings are equipped with an outer ring with a spherical raceway surface and an inner ring which holds two rows of barrel shaped rolling elements, spherical roller bearings are able to adjust center alignment to handle inclination of the axle or shaft. There are varieties of bearing types that differ according to internal design. Spherical roller bearings include as type equipped with an inner ring with a tapered bore. The bearing can easily be mounted on a shaft by means of an adapter or withdrawal sleeve. The bearing is capable of supporting heavy loads, and is therefore often used in industrial machinery. Gages for these bearings are of both steel and brass depending on the applications.



Thrust bearings

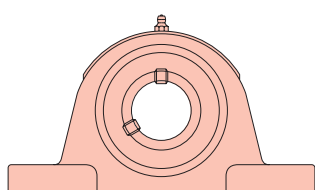
Thrust bearings are classified in accordance to the rolling elements they contain and generally the allowable rotational speed is very low.

Thrust ball bearing with single row is called as single direction Thrust ball bearings and can take axial load in one direction, whereas Thrust ball bearing with double row is called as double direction Thrust ball bearings and can take axial load from both directions. Thrust bearings with rollers as rolling element can accommodate a certain amount of radial load along with axial loads.

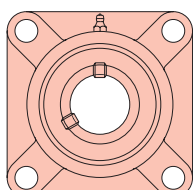


Ball Bearing unit

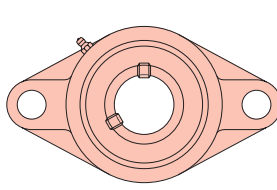
A ball bearing unit is comprised of a ball bearing inserted into various types of housings. The housing can be bolted onto machinery and the inner ring can be easily mounted on the shaft with a set screw. This means the bearing unit can support rotating equipment without special design to allow for mounting. A variety of standardized housing shapes is available, including pillow and flange types. The outer diameter of the bearing is spherical just like the inner diameter of the housing, so it is capable of aligning itself on the shaft. For lubrication, grease is sealed inside the bearing, and particle penetration is prevented by a double seal with 3 lip



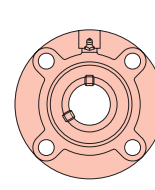
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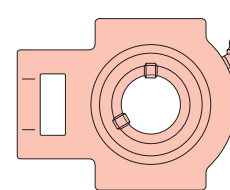
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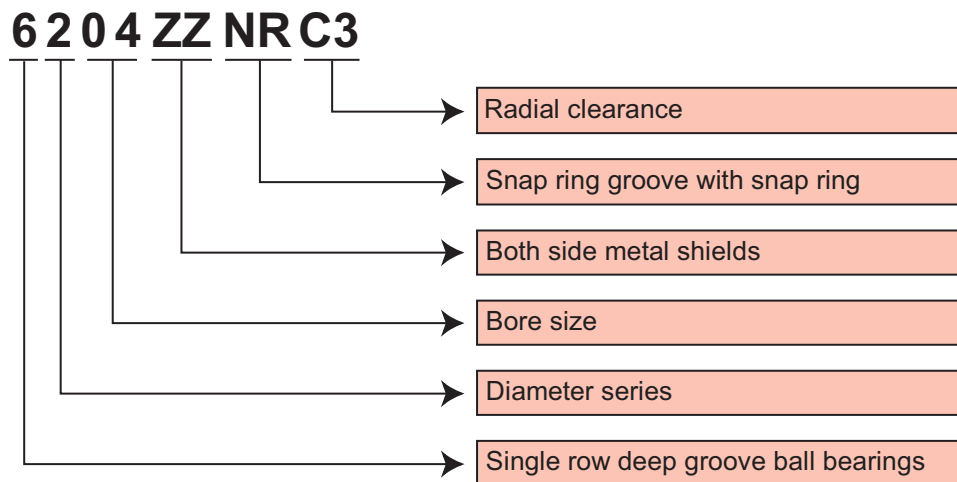


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Bearing Designation, prefix and suffix

Rolling bearing part numbers indicate bearing type, dimensions, tolerances, internal construction, and other related specifications. Bearing numbers are comprised of a “basic number” followed by “supplementary codes.” The basic number indicates general information about a bearing, such as its fundamental type, boundary dimensions, series number, bore diameter code and contact angle. The supplementary codes derive from prefixes and suffixes which indicate a bearing’s tolerance, internal clearance, and related specifications.

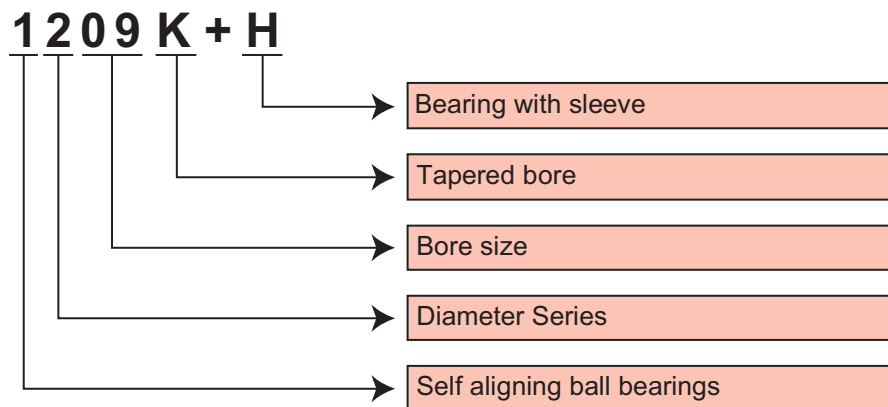
Ball bearings



Bearing type	Bearing series	Diameter series
Single row ball bearings	68,69,160,60,62,63,64,622,623	8,9,0,0,2,3,4,2,3
Double row ball bearings	42,43	2,3

Prefix	Description	Suffix	Description
F	Flanged outer ring	CM	Electric motor clearance
RLS	Inch type ball bearing	C2	Radial clearance lesser than normal
RMS	Inch type ball bearing	C3	Radial clearance higher than normal
		C4	Radial clearance higher than C3
		DDU	Bearings with non contact type rubber seals
		LLU	Bearings with contact type rubber seals
		M	Machined brass cage
		N	With snap ring groove
		NR	Snap ring groove with snap ring
		P6	Precision class 6
		Z	With one side metal shield
		ZZ	With both side metal shield
		ZNR	With one side metal shield and snap ring groove with snap ring

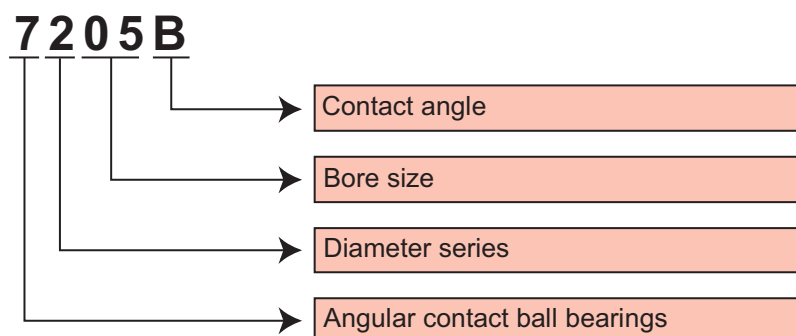
Self Aligning ball bearings



Bearing type	Bearing Series	Diameter series
Self aligning ball bearings	12,22,13,23	2,2,3,3

Prefix	Description	Suffix	Description
		K	With tapered bore
		+H	With adapter sleeve

Angular Contact ball bearings

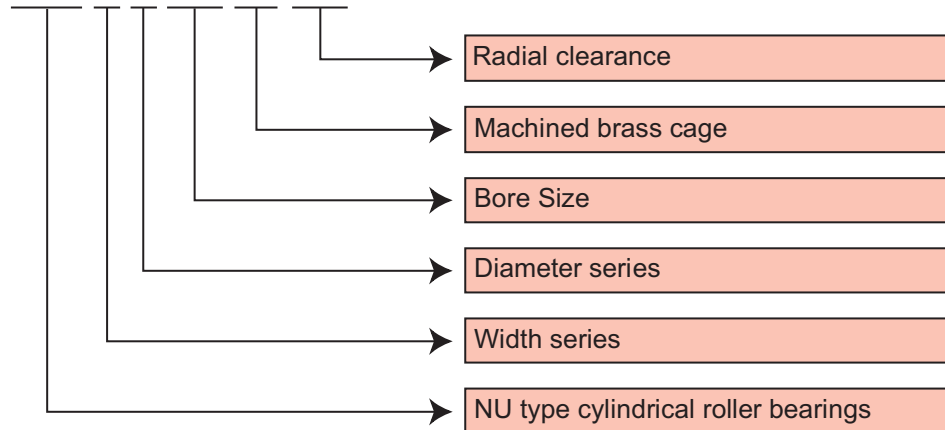


Bearing type	Bearing Series	Diameter series
Angular contact ball bearings	72,73	2,3
Double row angular contact ball bearing with filling slot (maximum capacity)	32,33	2,3
Double row angular contact ball bearing without filling slot	52,53	2,3

Prefix	Description	Suffix	Description
		A	30 degree contact angle
		B	40 degree contact angle
		TVP	With reinforced polyamide cage
		C	15 degree contact angle
		M	Brass cage

Cylindrical roller bearings

NU 2208 M C3

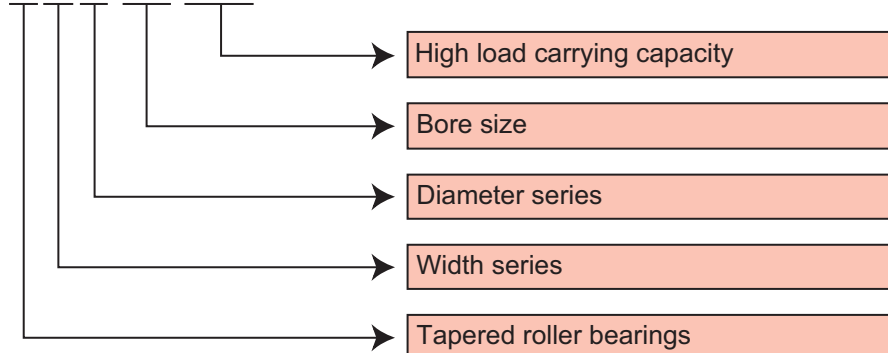


Bearing type	Bearing series	Diameter series
Cylindrical roller bearing	2,22,3,32	2,2,3,3

Prefix	Description	Suffix	Description
N	Bearings with both side sliding outer ring	N	With snap ring groove
NJ	Bearings with one side sliding inner ring	NR	Snap ring groove and snap ring
NU	Bearings with both side sliding inner ring	V	Full compliment bearings
NUP	Bearing with fixed inner and outer ring		

Tapered Roller bearings

32217JR

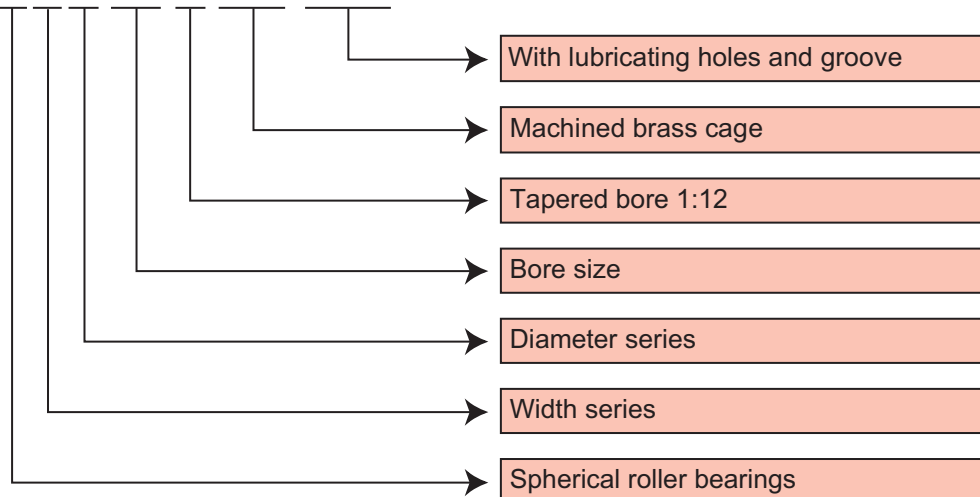


Bearing type	Bearing Series	Diameter series
Taper roller bearing	320,330,331,302,322,332,303,313,323	0,0,1,2,2,2,3,3,3

Prefix	Description	Suffix	Description
HC	Hi-cap	D	Steep contact angel (24°~32°) metric series
HM	Heavy medium duty inch series	JR	High load carrying capacity
JL	J series taper roller bearings		
JLM	J series light medium duty inch series		
L	Light duty inch series		
LM	Light medium duty inch series		
M	Medium duty inch series		

Spherical Roller bearings

2 2 3 0 8 K MB W33

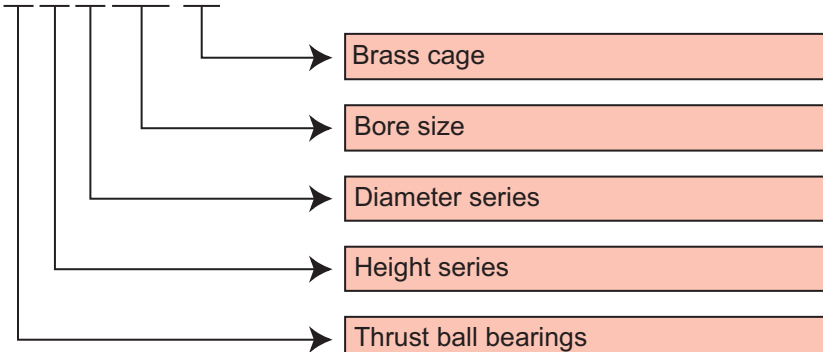


Bearing type	Bearing Series	Diameter series
Spherical roller bearings	239,230,240,231,241,222,232,213,223,	9,0,0,1,1,2,2,3,3

Prefix	Description	Suffix	Description
		CC	Steel cage
		CA	Machined single brass cage
		K	Tapered bore 1:12
		K30	Tapered bore 1:30
		M	Machined brass cage
		MA	Machined brass cage outer ring guided
		MB	Machined brass cage inner ring guided
		W33	Lubricating holes and groove on outer ring

Thrust ball bearings

5 1 1 2 0 M



Bearing type	Bearing Series	Diameter series
Thrust ball bearing	511,512,513	1,2,3

Prefix	Description	Suffix	Description
		M	Machined brass cage

Tolerances for bearings

Bearing tolerances and permissible values for the boundary dimensions and running accuracy of bearings are specified. These values are prescribed in JIS B 1514 "tolerances for rolling bearings." (These JIS standards are based on ISO standards.)

Bearing tolerances are standardized by classifying bearings into the following six classes (accuracy in tolerances becomes higher in the order described): 0, 6X, 6, 5, 4 and 2.

Dimensional accuracy

Dimensional accuracy constitutes the acceptable values for bore diameter, outer diameter, assembled bearing width, and bore diameter uniformity as seen in chamfer dimensions, allowable inner ring tapered bore deviation and shape error. Also included are, average bore diameter variation, outer diameter variation, average outer diameter unevenness, as well as raceway width and height variation (for thrust bearings).

Running accuracy

Running accuracy constitutes the acceptable values for inner and outer ring radial runout and axial runout, inner ring side runout, and outer ring outer diameter runout. Allowable rolling bearing tolerances have been established according to precision classes. Bearing precision is stipulated as JIS class 6, class 5, class 4, or class 2, with precision rising from ordinary precision indicated by class 0.

Bearing types and applicable tolerance

Bearing type		Applicable standard	Tolerance class					Tolerance table
Deep groove ball bearings		JIS B 1514 (ISO492)	class 0	class 6	class 5	class 4	class 2	Table a
Angular contact ball bearings			class 0	class 6	class 5	class 4	class 2	
Self-aligning ball bearings			class 0	—	—	—	—	
Cylindrical roller bearings			class 0	class 6	class 5	class 4	class 2	
Spherical roller bearings			class 0	—	—	—	—	
Tapered roller bearings	metric	JIS B 1514	class 0,6X	class 6	class 5	class 4	—	Table b
	Inch	ANSI/ABMA Std.19	class 4	class 2	class 3	class 0	class 00	Table c
Thrust ball bearings		JIS B 1514	class 0	class 6	class 5	class 4	—	Table d
Spherical roller thrust bearings		(ISO199)	class 0	—	—	—	—	Table e

Comparison of tolerance classifications of national standards

Standard	Applicable standard	Tolerance Class					Bearing Types
Japanese industrial standard (JIS)	JIS B 1514	Class 0,6X	Class 6	Class 5	Class 4	Class 2	All type
International Organization for Standardization (ISO)	ISO 492	Normal class Class 6X	Class 6	Class 5	Class 4	Class 2	Radial bearings
	ISO 199	Normal Class	Class 6	Class 5	Class 4	—	Thrust ball bearings
	ISO 578	Class 4	—	Class 3	Class 0	Class 00	Tapered roller bearings (Inch series)
	ISO 1224	—	—	Class 5A	Class 4A	—	Precision instrument bearings
Deutsches Institut für Normung (DIN)	DIN 620	P0	P6	P5	P4	P2	All type
American National Standards Institute (ANSI) American Bearing Manufacturer's Association (ABMA)	ANSI/ABMA Std.20	ABEC-1 RBEC-1	ABEC-3 RBEC-3	ABEC-5 RBEC-5	ABEC-7	ABEC-9	Radial bearings (Except tapered roller bearings)
	ANSI/ABMA Std.19.1	Class K	Class N	Class C	Class B	Class A	Tapered roller bearings (Metric series)
	ANSI/ABMA Std.19	Class 4	Class 2	Class 3	Class 0	Class 00	Tapered roller bearings (Inch series)

Table a Tolerance of radial bearings (Except tapered roller bearings)
Table a.1 Inner rings

Nominal bore diameter d mm		Dimensional tolerance of mean bore diameter within plane Δd_{mp}										Bore diameter variation V_{dp}														
		class 0		class 6		class 5		class 4		class 2		diameter series 9					diameter series 0.1					diameter series 2.3.4				
		high	low	high	low	high	low	high	low	high	low	class 0	class 6	class 5	class 4	class 2	class 0	class 6	class 5	class 4	class 2	class 0	class 6	class 5	class 4	class 2
over	incl.											max					max					max				
0.6	2.5	0	-8	0	-7	0	-5	0	-4	0	-2.5	10	9	5	4	2.5	8	7	4	3	2.5	6	5	4	3	2.5
2.5	10	0	-8	0	-7	0	-5	0	-4	0	-2.5	10	9	5	4	2.5	8	7	4	3	2.5	6	5	4	3	2.5
10	18	0	-8	0	-7	0	-5	0	-4	0	-2.5	10	9	5	4	2.5	8	7	4	3	2.5	6	5	4	3	2.5
18	30	0	-10	0	-8	0	-6	0	-5	0	-2.5	13	10	6	5	2.5	10	8	5	4	2.5	8	6	5	4	2.5
30	50	0	-12	0	-10	0	-8	0	-6	0	-2.5	15	13	8	6	2.5	12	10	6	5	2.5	9	8	6	5	2.5
50	80	0	-15	0	-12	0	-9	0	-7	0	-4	19	15	9	7	4	19	15	7	5	4	11	9	7	5	4
80	120	0	-20	0	-15	0	-10	0	-8	0	-5	25	19	10	8	5	25	19	8	6	5	15	11	8	6	5
120	150	0	-25	0	-18	0	-13	0	-10	0	-7	31	23	13	10	7	31	23	10	8	7	19	14	10	8	7
150	180	0	-25	0	-18	0	-13	0	-10	0	-7	31	23	13	10	7	31	23	10	8	7	19	14	10	8	7
180	250	0	-30	0	-22	0	-15	0	-12	0	-8	38	28	15	12	8	38	28	12	9	8	23	17	12	9	8
250	315	0	-35	0	-25	0	-18	—	—	—	—	44	31	18	—	—	44	31	14	—	—	26	19	14	—	—
315	400	0	-40	0	-30	0	-23	—	—	—	—	50	38	23	—	—	50	38	18	—	—	30	23	18	—	—
400	500	0	-45	0	-35	—	—	—	—	—	—	56	44	—	—	—	56	44	—	—	—	34	26	—	—	—
500	630	0	-50	0	-40	—	—	—	—	—	—	63	50	—	—	—	63	50	—	—	—	38	30	—	—	—

Table a.2 Outer rings

Nominal outside diameter D mm		Dimensional tolerance of mean outside diameter within plane ΔD_{mp}										Outside diameter variation V_{Dp}														
		class 0		class 6		class 5		class 4		class 2		diameter series 9					open type diameter series 0.1					diameter series 2.3.4				
		high	low	high	low	high	low	high	low	high	low	class 0	class 6	class 5	class 4	class 2	class 0	class 6	class 5	class 4	class 2	class 0	class 6	class 5	class 4	class 2
over	incl.											max					max					max				
2.5	6	0	-8	0	-7	0	-5	0	-4	0	-2.5	10	9	5	4	2.5	8	7	4	3	2.5	6	5	4	3	2.5
6	18	0	-8	0	-7	0	-5	0	-4	0	-2.5	10	9	5	4	2.5	8	7	4	3	2.5	6	5	4	3	2.5
18	30	0	-9	0	-8	0	-6	0	-5	0	-4	12	10	6	5	4	9	8	5	4	4	7	6	5	4	4
30	50	0	-11	0	-9	0	-7	0	-6	0	-4	14	11	7	6	4	11	9	5	5	4	8	7	5	5	4
50	80	0	-13	0	-11	0	-9	0	-7	0	-4	16	14	9	7	4	13	11	7	5	4	10	8	7	5	4
80	120	0	-15	0	-13	0	-10	0	-8	0	-5	19	16	10	8	5	19	16	8	6	5	11	10	8	6	5
120	150	0	-18	0	-15	0	-11	0	-9	0	-5	23	19	11	9	5	23	19	8	7	5	14	11	8	7	5
150	180	0	-25	0	-18	0	-13	0	-10	0	-7	31	23	13	10	7	31	23	10	8	7	19	14	10	8	7
180	250	0	-30	0	-20	0	-15	0	-11	0	-8	38	25	15	11	8	38	25	11	8	8	23	15	11	8	8
250	315	0	-35	0	-25	0	-18	0	-13	0	-8	44	31	18	13	8	44	31	14	10	8	26	19	14	10	8
315	400	0	-40	0	-28	0	-20	0	-15	0	-10	50	35	20	15	10	50	35	15	11	10	30	21	15	11	10
400	500	0	-45	0	-33	0	-23	—	—	—	—	56	41	23	—	—	56	41	17	—	—	34	25	17	—	—
500	630	0	-50	0	-38	0	-28	—	—	—	—	63	48	28	—	—	63	48	21	—	—	38	29	21	—	—
630	800	0	-75	0	-45	0	-35	—	—	—	—	94	56	35	—	—	94	56	26	—	—	55	34	26	—	—

Unit μm

Mean bore diameter variation V_{dmp}					Inner ring radial runout K_{ia}					Side runout with bore S_d			Inner ring axial runout S_{ia}			Inner ring width deviation ΔB_s								Inner ring width variation V_{Bs}						
V_{dmp}					K_{ia}					S_d			S_{ia}			ΔB_s								V_{Bs}						
																normal				modified										
class 0	class 6	class 5	class 4	class 2	class 0	class 6	class 5	class 4	class 2	class 5	class 4	class 2	class 5	class 4	class 2	class 0,6	class 5,4	class 2	class 0,6	class 5,4	class 0	class 6	class 5	class 4	class 2					
max					max					max			max			high	low	high	low	high	low	high	low	max						
6	5	3	2	1.5	10	5	4	2.5	1.5	7	3	1.5	7	3	1.5	0	-40	0	-40	0	-40	—	—	0	-250	12	12	5	2.5	1.5
6	5	3	2	1.5	10	6	4	2.5	1.5	7	3	1.5	7	3	1.5	0	-120	0	-40	0	-40	0	-250	0	-250	15	15	5	2.5	1.5
6	5	3	2	1.5	10	7	4	2.5	1.5	7	3	1.5	7	3	1.5	0	-120	0	-80	0	-80	0	-250	0	-250	20	20	5	2.5	1.5
8	6	3	2.5	1.5	13	8	4	3	2.5	8	4	1.5	8	4	2.5	0	-120	0	-120	0	-120	0	-250	0	-250	20	20	5	2.5	1.5
9	8	4	3	1.5	15	10	5	4	2.5	8	4	1.5	8	4	2.5	0	-120	0	-120	0	-120	0	-250	0	-250	20	20	5	3	1.5
11	9	5	3.5	2	20	10	5	4	2.5	8	5	1.5	8	5	2.5	0	-150	0	-150	0	-150	0	-380	0	-250	25	25	6	4	1.5
15	11	5	4	2.5	25	13	6	5	2.5	9	5	2.5	9	5	2.5	0	-200	0	-200	0	-200	0	-380	0	-380	25	25	7	4	2.5
19	14	7	5	3.5	30	18	8	6	2.5	10	6	2.5	10	7	2.5	0	-250	0	-250	0	-250	0	-500	0	-380	30	30	8	5	2.5
19	14	7	5	3.5	30	18	8	6	5	10	6	4	10	7	5	0	-250	0	-250	0	-250	0	-500	0	-380	30	30	8	5	4
23	17	8	6	4	40	20	10	8	5	11	7	5	13	8	5	0	-300	0	-300	0	-300	0	-500	0	-500	30	30	10	6	5
26	19	9	—	—	50	25	13	—	—	13	—	—	15	—	—	0	-350	0	—	—	—	0	-500	0	—	35	35	13	—	—
30	23	12	—	—	60	30	15	—	—	15	—	—	20	—	—	0	-400	0	—	—	—	0	-630	0	—	40	40	15	—	—
34	26	—	—	—	65	35	—	—	—	—	—	—	—	—	—	0	-450	—	—	—	—	—	—	—	—	50	45	—	—	—
38	30	—	—	—	70	40	—	—	—	—	—	—	—	—	—	0	-500	—	—	—	—	—	—	—	—	60	50	—	—	—

Unit μm

Outside diameter variation V_{DP} Sealed/shield bearings diameter series		Mean bore diameter variation V_{Dmp}					Outer ring radial runout K_{ea}					Outside surface inclination S_D			Outside ring axial runout S_{ea}			Outer ring width deviation ΔC_s	Outer ring width variation V_{Cs}			
2,3,4	0,1,2,3,4	class 0	class 6	class 5	class 4	class 2	class 0	class 6	class 5	class 4	class 2	class 5	class 4	class 2	class 5	class 4	class 2	all type	class 0,6	class 5	class 4	class 2
class 0	class 6	max					max					max			max				max			
10	9	6	5	3	2	1.5	15	8	5	3	1.5	8	4	1.5	8	5	1.5	Depends on tolerance of ΔB_s in relation to d of same bearing	Depends on tolerance of ΔB_s in relation to d of same bearing	5	2.5	1.5
10	9	6	5	3	2	1.5	15	8	5	3	1.5	8	4	1.5	8	5	1.5			5	2.5	1.5
12	10	7	6	3	2.5	2	15	9	6	4	2.5	8	4	1.5	8	5	2.5			5	2.5	1.5
16	13	8	7	4	3	2	20	10	7	5	2.5	8	4	1.5	8	5	2.5			5	2.5	1.5
20	16	10	8	5	3.5	2	25	13	8	5	4	8	4	1.5	10	5	4			6	3	1.5
26	20	11	10	5	4	2.5	35	18	10	6	5	9	5	2.5	11	6	5			8	4	2.5
30	25	14	11	6	5	2.5	40	20	11	7	5	10	5	2.5	13	7	5			8	5	2.5
38	30	19	14	7	5	3.5	45	23	13	8	5	10	5	2.5	14	8	5			8	5	2.5
—	—	23	15	8	6	4	50	25	15	10	7	11	7	4	15	10	7			10	7	4
—	—	26	19	9	7	4	60	30	18	11	7	13	8	5	18	10	7			11	7	5
—	—	30	21	10	8	5	70	35	20	13	8	13	10	7	20	13	8			13	8	7
—	—	34	25	12	—	—	80	40	23	—	—	15	—	—	23	—	—			15	—	—
—	—	38	29	14	—	—	100	50	25	—	—	18	—	—	25	—	—			18	—	—
—	—	55	34	18	—	—	120	60	30	—	—	20	—	—	30	—	—			20	—	—

Table b Tolerance of tapered roller bearings (Metric series)

Table b.1 Inner rings

Nominal bore diameter d mm		Dimensional tolerance of mean bore diameter within plane Δd_{mp}						Bore diameter variation V_{dp}				Mean bore diameter variation V_{dmp}				Inner ring radial runout K_{ia}				Side runout with bore S_d	
		class 0,6X		class 5,6		class 4		class 0,6X	class 6	class 5	class 4	class 0,6X	class 6	class 5	class 4	class 0,6X	class 6	class 5	class 4	class 5	class 4
		high	low	high	low	high	low	max				max				max				max	
10	18	0	-12	0	-7	0	-5	12	7	5	4	9	5	5	4	15	7	5	3	7	3
18	30	0	-12	0	-8	0	-6	12	8	6	5	9	6	5	4	18	8	5	3	8	4
30	50	0	-12	0	-10	0	-8	12	10	8	6	9	8	5	5	20	10	6	4	8	4
50	80	0	-15	0	-12	0	-9	15	12	9	7	11	9	6	5	25	10	7	4	8	5
80	120	0	-20	0	-15	0	-10	20	15	11	8	15	11	8	5	30	13	8	5	9	5
120	180	0	-25	0	-18	0	-13	25	18	14	10	19	14	9	7	35	18	11	6	10	6
180	250	0	-30	0	-22	0	-15	30	22	17	11	23	16	11	8	50	20	13	8	11	7
250	315	0	-35	—	—	—	—	35	—	—	—	26	—	—	—	60	—	—	—	—	—
315	400	0	-40	—	—	—	—	40	—	—	—	30	—	—	—	70	—	—	—	—	—

Table b.2 Outer rings

Nominal outside diameter D mm		Dimensional tolerance of mean outside diameter within plane ΔD_{mp}						Outside diameter variation V_{Dp}				Mean bore diameter variation V_{Dmp}				K_{ea}				Outside surface inclination S_D			
		class 0,6X		class 5,6		class 4		class 0,6X	class 6	class 5	class 4	class 0,6X	class 6	class 5	class 4	class 0,6X	class 6	class 5	class 4	class 5	class 4		
		high	low	high	low	high	low	max				max				max				max			
		over	incl.																				
18	30	0	-12	0	-8	0	-6	12	8	6	5	9	6	5	4	18	9	6	4	8	4		
30	50	0	-14	0	-9	0	-7	14	9	7	5	11	7	5	5	20	10	7	5	8	4		
50	80	0	-16	0	-11	0	-9	16	11	8	7	12	8	6	5	25	13	8	5	8	4		
80	120	0	-18	0	-13	0	-10	18	13	10	8	14	10	7	5	35	18	10	6	9	5		
120	150	0	-20	0	-15	0	-11	20	15	11	8	15	11	8	6	40	20	11	7	10	5		
150	180	0	-25	0	-18	0	-13	25	18	14	10	19	14	9	7	45	23	13	8	10	5		
180	250	0	-30	0	-20	0	-15	30	20	15	11	23	15	10	8	50	25	15	10	11	7		
250	315	0	-35	0	-25	0	-18	35	25	19	14	26	19	13	9	60	30	18	11	13	8		
315	400	0	-40	0	-28	0	-20	40	28	22	15	30	21	14	10	70	35	20	13	13	10		

Table b.3 Effective width of outer and inner rings with roller Unit μm

Nominal bore diameter d mm		Effective width deviation of roller and inner ring assembly of tapered roller bearing ΔT_{1s}				Tapered roller bearing outer ring effective width deviation ΔT_{2s}			
over	incl.	class 0		class 6X		class 0		class 6X	
		high	low	high	low	high	low	high	low
10	18	+100	0	+50	0	+100	0	+50	0
18	30	+100	0	+50	0	+100	0	+50	0
30	50	+100	0	+50	0	+100	0	+50	0
50	80	+100	0	+50	0	+100	0	+50	0
80	120	+100	-100	+50	0	+100	-100	+50	0
120	180	+150	-150	+50	0	+200	-100	+100	0
180	250	+150	-150	+50	0	+200	-100	+100	0
250	315	+150	-150	+100	0	+200	-100	+100	0
315	400	+200	-200	+100	0	+200	-200	+100	0

Unit μm

Inner ring axial runout S_{ia}	Inner ring width deviation Δ_{Bs}						Assembly width deviation of single-row tapered roller bearings Δ_{Ts}						Combination width deviation of double row bearings $\Delta_{B1s}, \Delta_{C1s}$		Combination width deviation of 4-row bearings $\Delta_{B2s}, \Delta_{C2s}$	
	class 0,6		class 6X		class 4,5		class 0,6		class 6X		class 4,5		class 0,6,5		class 0,6,5	
	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low
3	0	-120	0	-50	0	-200	+200	0	+100	0	+200	-200	—	—	—	—
4	0	-120	0	-50	0	-200	+200	0	+100	0	+200	-200	—	—	—	—
4	0	-120	0	-50	0	-240	+200	0	+100	0	+200	-200	+240	-240	—	—
4	0	-150	0	-50	0	-300	+200	0	+100	0	+200	-200	+300	-300	—	—
5	0	-200	0	-50	0	-400	+200	-200	+100	0	+200	-200	+400	-400	+500	-500
7	0	-250	0	-50	0	-500	+350	-250	+150	0	+350	-250	+500	-500	+600	-600
8	0	-300	0	-50	0	-600	+350	-250	+150	0	+350	-250	+600	-600	+750	-750
—	0	-350	0	-50	—	—	+350	-250	+200	0	—	—	+700	-700	+900	-900
—	0	-400	0	-50	—	—	+400	-400	+200	0	—	—	+800	-800	+1 000	-1 000

Unit μm

Outer ring axial runout S_{ea}	Outer ring width deviation Δ_{Cs}			
class 4 max	class 0,6,5,4		class 6X	
	sup.	inf.	sup.	inf.
5			0	-100
5	Depends on tolerance of Δ_{Bs} in relation to d of same bearing		0	-100
5			0	-100
6			0	-100
7			0	-100
8			0	-100
10			0	-100
10			0	-100
13			0	-100

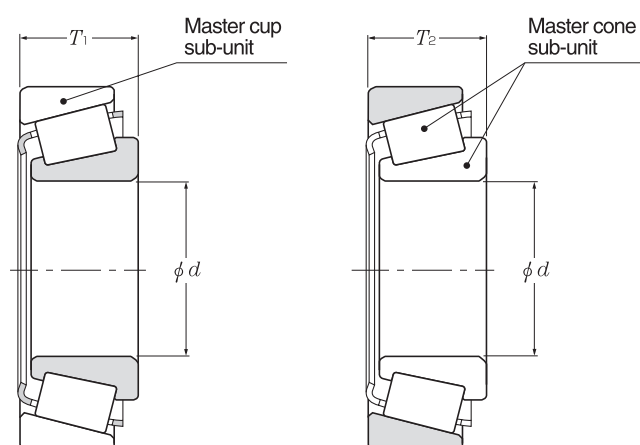


Table c Tolerance of tapered roller bearings (Inch series)

Table c.1 Inner rings

Unit μm

Nominal bore diameter d		Single bore diameter deviation Δ_{ds}									
mm (inch)		Class 4		Class 2		Class 3		Class 0		Class 00	
over	incl.	high	low	high	low	high	low	high	low	high	low
—	76.2 (3)	+13	0	+13	0	+13	0	+13	0	+8	0
76.2 (3)	266.7 (10.5)	+25	0	+25	0	+13	0	+13	0	+8	0
266.7 (10.5)	304.8 (12)	+25	0	+25	0	+13	0	+13	0	—	—
304.8 (12)	609.6 (24)	+51	0	+51	0	+25	0	—	—	—	—
609.6 (24)	914.4 (36)	+76	0	—	—	+38	0	—	—	—	—
914.4 (36)	1 219.2 (48)	+102	0	—	—	+51	0	—	—	—	—
1 219.2 (48)	—	+127	0	—	—	+76	0	—	—	—	—

Table c.2 Outer rings

Unit μm

Nominal outside diameter D		Single outside diameter deviation Δ_{Ds}									
mm (inch)		Class 4		Class 2		Class 3		Class 0		Class 00	
over	incl.	high	low	high	low	high	low	high	low	high	low
—	266.7 (10.5)	+25	0	+25	0	+13	0	+13	0	+8	0
266.7 (10.5)	304.8 (12)	+25	0	+25	0	+13	0	+13	0	—	—
304.8 (12)	609.6 (24)	+51	0	+51	0	+25	0	—	—	—	—
609.6 (24)	914.4 (36)	+76	0	+76	0	+38	0	—	—	—	—
914.4 (36)	1 219.2 (48)	+102	0	—	—	+51	0	—	—	—	—
1 219.2 (48)	—	+127	0	—	—	+76	0	—	—	—	—

Table d Tolerance of thrust ball bearings

Table d.1 Shaft raceway washer

Unit μm

Nominal bore diameter d		Mean bore diameter deviation Δ_{dmp}				Bore diameter variation V_{dp}		Raceway thickness variation S_i			
mm		Class 0,6,5		Class 4		Class 0,6,5	Class 4	Class 0	Class 6	Class 5	Class 4
over	incl.	high	low	high	low	max		max			
—	18	0	-8	0	-7	6	5	10	5	3	2
18	30	0	-10	0	-8	8	6	10	5	3	2
30	50	0	-12	0	-10	9	8	10	6	3	2
50	80	0	-15	0	-12	11	9	10	7	4	3
80	120	0	-20	0	-15	15	11	15	8	4	3
120	180	0	-25	0	-18	19	14	15	9	5	4
180	250	0	-30	0	-22	23	17	20	10	5	4
250	315	0	-35	0	-25	26	19	25	13	7	5
315	400	0	-40	0	-30	30	23	30	15	7	5
400	500	0	-45	0	-35	34	26	30	18	9	6
500	630	0	-50	0	-40	38	30	35	21	11	7

Table d.2 Housing raceway washer

Unit μm

Nominal outside diameter D mm		Mean outside diameter deviation ΔD_{mp}				Outside diameter variation V_{Dp}		Raceway thickness variation S_e			
		Class 0,6,5		Class 4		Class 0,6,5	Class 4	Class 0	Class 6	Class 5	Class 4
over	incl.	high	low	high	low	max		max			
10	18	0	-11	0	-7	8	5	According to the tolerance of S_1 against "d" of the same bearings			
18	30	0	-13	0	-8	10	6				
30	50	0	-16	0	-9	12	7				
50	80	0	-19	0	-11	14	8				
80	120	0	-22	0	-13	17	10				
120	180	0	-25	0	-15	19	11				
180	250	0	-30	0	-20	23	15				
250	315	0	-35	0	-25	26	19				
315	400	0	-40	0	-28	30	21				
400	500	0	-45	0	-33	34	25				
500	630	0	-50	0	-38	38	29				
630	800	0	-75	0	-45	55	34				

Table d.3 Bearing height

Unit μm

Nominal bore diameter d mm		Single direction Bearing height deviation ΔT_s	
over	incl.	high	low
—	30	0	-75
30	50	0	-100
50	80	0	-125
80	120	0	-150
120	180	0	-175
180	250	0	-200
250	315	0	-225
315	400	0	-300
400	500	0	-350
500	630	0	-400

Table e Tolerance of spherical thrust roller bearing

Table e.1 Shaft raceway washer

Unit μm

Nominal bore diameter d mm		Mean bore diameter deviation Δd_{mp}		Bore diameter variation V_{dp}	Side runout with bore S_d	Bearing height deviation ΔT_s	
over	incl.	high	low	max	max	high	low
50	80	0	-15	11	25	+150	-150
80	120	0	-20	15	25	+200	-200
120	180	0	-25	19	30	+250	-250
180	250	0	-30	23	30	+300	-300
250	315	0	-35	26	35	+350	-350
315	400	0	-40	30	40	+400	-400
400	500	0	-45	34	45	+450	-450

Table e.2 Housing raceway washer

Unit μm

Nominal outside diameter D mm		Single plane mean outside diameter deviation ΔD_{mp}	
over	incl.	high	low
120	180	0	-25
180	250	0	-30
250	315	0	-35
315	400	0	-40
400	500	0	-45
500	630	0	-50
630	800	0	-75
800	1,000	0	-100

Interference

For rolling bearings, inner and outer rings are fixed on the shaft or in the housing so that relative movement does not occur between fitting surfaces during operation or under load. This relative movement between the fitting surfaces of the bearing and the shaft or housing can occur in a radial direction, an axial direction, or in the direction of rotation. Types of fitting include tight, transition and loose fitting, which may be selected depending on whether or not there is interference.

The most effective way to fix the fitting surfaces between a bearing's raceway and shaft or housing is to apply a "tight fit." The advantage of this tight fit for thin walled bearings is that it provides uniform load support over the entire ring circumference without any loss of load carrying capacity. However, with a tight fit, ease of installation and disassembly is lost; and when using a non-separable bearing as the floating-side bearing, axial displacement is not possible. For this reason, a tight fit cannot be recommended in all cases.

The necessity of a proper fit

In some cases, improper fit may lead to damage and shorten bearing life, therefore it is necessary to make a careful investigation in selecting a proper fit. Some of the bearing failure caused by improper fit are listed below.

- Raceway cracking, early flaking and displacement of raceway
- Raceway and shaft or housing abrasion caused by creeping and fretting corrosion
- Seizing caused by negative internal clearances
- Increased noise and deteriorated rotational accuracy due to raceway groove deformation

Fit selection

Selection of a proper fit is dependent upon thorough analysis of bearing operating conditions, including consideration of:

- Shaft and housing material, wall thickness, finished surface accuracy, etc.
- Machinery operating conditions (nature and magnitude of load, rotational speed, temperature, etc.)

"Tight fit" or "Loose fit"

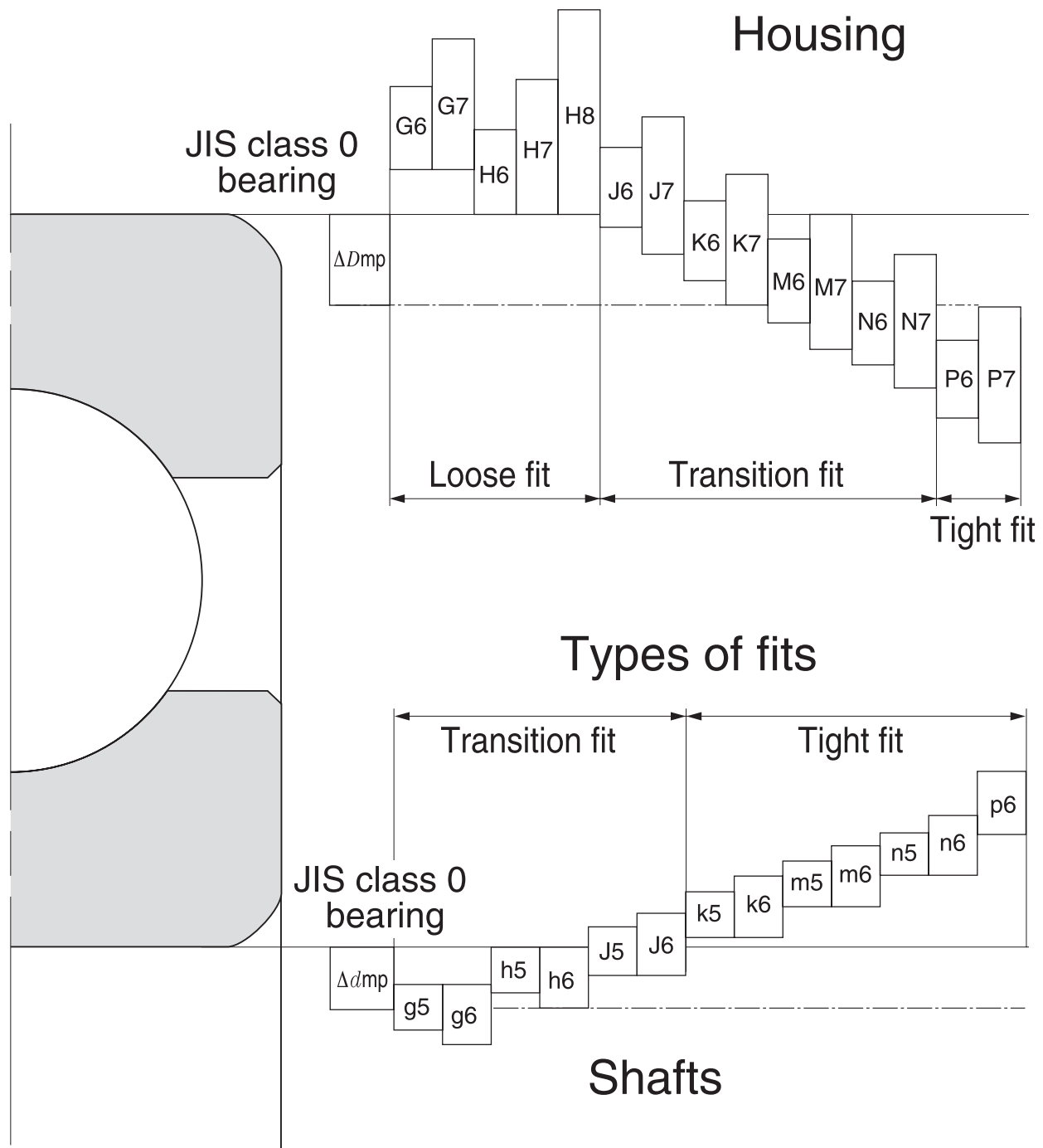
- (1) For raceways under rotating loads, a tight fit is necessary. "Raceways under rotating loads" refers to raceways receiving loads rotating relative to their radial direction. For raceways under static loads, on the other hand, a loose fit is sufficient.
- (2) For non-separable bearings, such as deep groove ball bearings, it is generally recommended that either the inner ring or outer ring be given a loose fit.

Radial load and bearing fit

Illustration	Bearing rotation	Ring load	Fit
Static load 	Inner ring: Rotating Outer ring: Stationary 	Rotating inner ring load	Inner ring : Tight fit
Unbalanced load 	Inner ring: Stationary Outer ring: Rotating 	Static outer ring load	Outer ring : Loose fit
Static load 	Inner ring: Stationary Outer ring: Rotating 	Static inner ring load	Inner ring : Loose fit
Unbalanced load 	Inner ring: Rotating Outer ring: Stationary 	Rotating outer ring load	Outer ring : Tight fit

Recommended Fits

Bearing fit is governed by the selection tolerances for bearing shaft diameters and housing bore diameters. Widely used fits for 0 Class tolerance bearings and various shaft and housing bore diameter tolerances are shown below.



Interference minimum and maximum values

The following points should be considered when it is necessary to calculate the interference for an application:

- In calculating the minimum required amount of interference keep in mind that:
 - interference is reduced by radial loads
 - interference is reduced by differences between bearing temperature and ambient temperature
 - interference is reduced by variation of fitting surfaces
- The upper limit value should not exceed 1/1000 of the shaft diameter.

General standards for radial bearing fits (JIS Class 0, 6X, 6)

Tolerance class of shafts commonly used for radial bearings (classes 0, 6X and 6)

Conditions		Ball bearings		Cylindrical roller bearing Tapered roller bearing		Spherical roller bearing		Shaft tolerance class	Remarks
		Shaft diameter (mm)							
		Over	Under	Over	Under	Over	Under		
Cylindrical bore bearing (Classes 0, 6X and 6)									
Inner ring rotational load or load of undetermined direction	Light load or fluctuating load	— 18 100 —	18 100 200 —	— — 40 140	— 40 140 200	— — — —	— — — —	h5 js6 k6 m6	When greater accuracy is required js5, k5, and m5 may be substituted for js6, k6, and m6.
	Ordinary load	— 18 100 140 200 — —	18 100 140 200 280 — —	— — 40 100 140 200 —	— 40 100 140 200 400 —	— — 40 65 65 100 140 280	— 40 65 100 140 280 500	js5 k5 m5 m6 n6 p6 r6	Alteration of inner clearances to accommodate fit is not a consideration with single-row angular contact bearings and tapered roller bearings. Therefore, k5 and m5 may be substituted for k6 and m6.
	Heavy load or impact load	— — —	— — —	50 140 200	140 200 —	50 100 140	100 140 200	n6 p6 r6	Use bearings with larger internal clearances than CN clearance bearings.
	Inner ring static load	Inner ring must move easily over shaft	Overall shaft diameter						g6
Inner does not have to move easily over shaft		Overall shaft diameter						h6	When greater accuracy is required use h5.
Center axial load		Overall shaft diameter						js6	Generally, shaft and inner rings are not fixed using interference.
Tapered bore bearing (class 0) (with adapter or withdrawal sleeve)									
Overall load		Overall shaft diameter						h9/IT5	h10/IT7 will suffice for power transmitting shafts.

Tolerance class of housing bore commonly used for radial bearings (classes 0, 6X and 6)

Conditions				Toleration class of housing bore	Remarks
Housing	Types of load		Outer ring axial direction movement		
Single housing or divided housing	Outer ring static load	All types of loads	Able to move.	H7	G7 will suffice for large bearings or bearings with large temperature differential between the outer ring and housing.
		Light load or ordinary load	Able to move.	H8	—
		Shaft and inner ring become hot.	Able to move easily.	G7	F7 will suffice for large bearings or bearings with large temperature differential between the outer ring and housing.
Single housing	Indeterminate load	Requires precision rotation with light or ordinary loads.	As a rule, cannot move.	K6	Primarily applies to roller bearings.
			Able to move.	JS6	Primarily applies to ball bearings.
		Requires quiet operation.	Able to move.	H6	—
	Indeterminate load	Light or ordinary load	Able to move.	JS7	If precision is required, JS6 and K6 are used in place of JS7 and K7.
		Ordinary load or heavy load	As a rule, cannot move.	K7	
		Large impact load	Cannot move.	M7	
	Outer ring rotational load	Light or fluctuating load	Cannot move.	M7	—
		Ordinary or heavy load	Cannot move.	N7	Primarily applies to ball bearings.
		Heavy load or large impact load with thin housing	Cannot move.	P7	Primarily applies to roller bearings.

Standard fits for thrust bearings (JIS Class 0 and 6)

Shaft fits

Bearing type	Load conditions	Fit	Shaft diameter mm over incl.	Tolerance class
All thrust bearings	Centered axial load only	Transition fit	All sizes	js6 or h6
Spherical roller thrust bearings	Combined load	Inner ring static load	Transition fit	All sizes
		Inner ring rotating load or Indeterminate load	Transition fit	js6
			— ~ 200 200 ~ 400 400 ~	k6 or js6 m6 or k6 n6 or m6

Housing fits

Bearing type	Load conditions	Fit	Tolerance class	Remarks
All thrust bearings	Centered axial load only	Loose fit		Select a tolerance class that will provide clearance between outer ring and housing.
			H8	Greater accuracy required with thrust ball bearings
Spherical roller thrust bearings	Combined load	Transition fit	H7	—
			K7	Normal operating conditions
			M7	For relatively large radial loads

Note: All values and fits listed in the above tables are for cast iron or steel housings.

Fits for electric motor bearings

Bearing type	Shaft fits		Housing fits	
	Shaft diameter mm over incl.	Tolerance class	Housing bore diameter	Tolerance class
Deep groove ball bearings	~ 18 18 ~ 100 100 ~ 160	j5 k5 m5	All sizes	H6 or J6
Cylindrical roller bearings	~ 40 40 ~ 160 160 ~ 200	k5 m5 n6	All sizes	H6 or J6

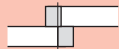
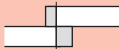
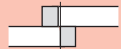
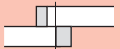
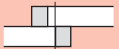
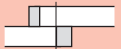
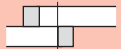
Fitting against shaft - class 0

Nominal bore diameter of bearing	Mean bore diameter deviation	g5		g6		h5		h6		j5		js5		j6	
		bearing	shaft	bearing	shaft	bearing	shaft	bearing	shaft	bearing	shaft	bearing	shaft	bearing	shaft
d mm	Δ_{dmp}														
over incl.	high low														
3 6	0 -8	4T~ 9L		4T~ 12L		8T~ 5L		8T~ 8L		11T~ 2L		10.5T~ 2.5L		14T~ 2L	
6 10	0 -8	3T~ 11L		3T~ 14L		8T~ 6L		8T~ 9L		12T~ 2L		11T ~ 3L		15T~ 2L	
10 18	0 -8	2T~ 14L		2T~ 17L		8T~ 8L		8T~ 11L		13T~ 3L		12T ~ 4L		16T~ 3L	
18 30	0 -10	3T~ 16L		3T~ 20L		10T~ 9L		10T~ 13L		15T~ 4L		14.5T~ 4.5L		19T~ 4L	
30 50	0 -12	3T~ 20L		3T~ 25L		12T~ 11L		12T~ 16L		18T~ 5L		17.5T~ 5.5L		23T~ 5L	
50 80	0 -15	5T~ 23L		5T~ 29L		15T~ 13L		15T~ 19L		21T~ 7L		21.5T~ 6.5L		27T~ 7L	
80 120	0 -20	8T~ 27L		8T~ 34L		20T~ 15L		20T~ 22L		26T~ 9L		27.5T~ 7.5L		33T~ 9L	
120 140	0 -25	11T~ 32L		11T~ 39L		25T~ 18L		25T~ 25L		32T~ 11L		34T ~ 9L		39T~ 11L	
140 160															
160 180															
180 200	0 -30	15T~ 35L		15T~ 44L		30T~ 20L		30T~ 29L		37T~ 13L		40T ~ 10L		46T~ 13L	
200 225															
225 250															
250 280	0 -35	18T~ 40L		18T~ 49L		35T~ 23L		35T~ 32L		42T~ 16L		46.5T~ 11.5L		51T~ 16L	
280 315															
315 355															
315 355	0 -40	22T~ 43L		22T~ 54L		40T~ 25L		40T~ 36L		47T~ 18L		52.5T~ 12.5L		58T~ 18L	
355 400															
400 450															
400 450	0 -45	25T~ 47L		25T~ 60L		45T~ 27L		45T~ 40L		52T~ 20L		58.5T~ 13.5L		65T~ 20L	
450 500															
450 500															

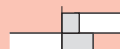
Fitting against housing - class 0

Nominal outside diameter of bearing	Mean outside diameter deviation	G7		H6		H7		J6		J7		Js7		K6	
		housing	bearing	housing	bearing	housing	bearing	housing	bearing	housing	bearing	housing	bearing	housing	bearing
D mm	Δ_{Dmp}														
over incl.	high low														
6 10	0 -8	5L~ 28L		0~ 17L		0~ 23L		4T~ 13L		7T~ 16L		7.5T~ 15.5L		7T~ 10L	
10 18	0 -8	6L~ 32L		0~ 19L		0~ 26L		5T~ 14L		8T~ 18L		9T ~ 17L		9T~ 10L	
18 30	0 -9	7L~ 37L		0~ 22L		0~ 30L		5T~ 17L		9T~ 21L		10.5T~ 19.5L		11T~ 11L	
30 50	0 -11	9L~ 45L		0~ 27L		0~ 36L		6T~ 21L		11T~ 25L		12.5T~ 23.5L		13T~ 14L	
50 80	0 -13	10L~ 53L		0~ 32L		0~ 43L		6T~ 26L		12T~ 31L		15T ~ 28L		15T~ 17L	
80 120	0 -15	12L~ 62L		0~ 37L		0~ 50L		6T~ 31L		13T~ 37L		17.5T~ 32.5L		18T~ 19L	
120 150	0 -18	14L~ 72L		0~ 43L		0~ 58L		7T~ 36L		14T~ 44L		20T ~ 38L		21T~ 22L	
150 180	0 -25	14L~ 79L		0~ 50L		0~ 65L		7T~ 43L		14T~ 51L		20T ~ 45L		21T~ 29L	
180 250	0 -30	15L~ 91L		0~ 59L		0~ 76L		7T~ 52L		16T~ 60L		23T ~ 53L		24T~ 35L	
250 315	0 -35	17L~ 104L		0~ 67L		0~ 87L		7T~ 60L		16T~ 71L		26T ~ 61L		27T~ 40L	
315 400	0 -40	18L~ 115L		0~ 76L		0~ 97L		7T~ 69L		18T~ 79L		28.5T~ 68.5L		29T~ 47L	
400 500	0 -45	20L~ 128L		0~ 85L		0~ 108L		7T~ 78L		20T~ 88L		31.5T~ 76.5L		32T~ 53L	

Unit μm

js6		k5		k6		m5		m6		n6		p6		r6		Nominal bore diameter of bearing d mm over incl.
bearing	shaft	bearing	shaft	bearing	shaft	bearing	shaft	bearing	shaft	bearing	shaft	bearing	shaft	bearing	shaft	
																
12T ~ 4L		14T~1T		17T~1T		17T~ 4T		20T~ 4T		24T~ 8T		28T~12T		— —		3 6
12.5T~ 4.5L		15T~1T		18T~1T		20T~ 6T		23T~ 6T		27T~10T		32T~15T		— —		6 10
13.5T~ 5.5L		17T~1T		20T~1T		23T~ 7T		26T~ 7T		31T~12T		37T~18T		— —		10 18
16.5T~ 6.5L		21T~2T		25T~2T		27T~ 8T		31T~ 8T		38T~15T		45T~22T		— —		18 30
20T ~ 8L		25T~2T		30T~2T		32T~ 9T		37T~ 9T		45T~17T		54T~26T		— —		30 50
24.5T~ 9.5L		30T~2T		36T~2T		39T~11T		45T~11T		54T~20T		66T~32T		— —		50 80
31T ~11L		38T~3T		45T~2T		48T~13T		55T~13T		65T~23T		79T~37T		— —		80 120
37.5T~12.5L		46T~3T		53T~3T		58T~15T		65T~15T		77T~27T		93T~43T	113T~ 63T 115T~ 65T 118T~ 68T	120 140 160	140 160 180	
44.5T~14.5L		54T~4T		63T~4T		67T~17T		76T~17T		90T~31T		109T~50T	136T~ 77T 139T~ 80T 143T~ 84T	180 200 225	200 225 250	
51T ~16L		62T~4T		71T~4T		78T~20T		87T~20T		101T~34T		123T~56T	161T~ 94T 165T~ 98T	250 280	280 315	
58T ~18L		69T~4T		80T~4T		86T~21T		97T~21T		113T~37T		138T~62T	184T~108T 190T~114T	315 355	355 400	
65T ~20L		77T~5T		90T~4T		95T~23T		108T~23T		125T~40T		153T~68T	211T~126T 217T~132T	400 450	450 500	

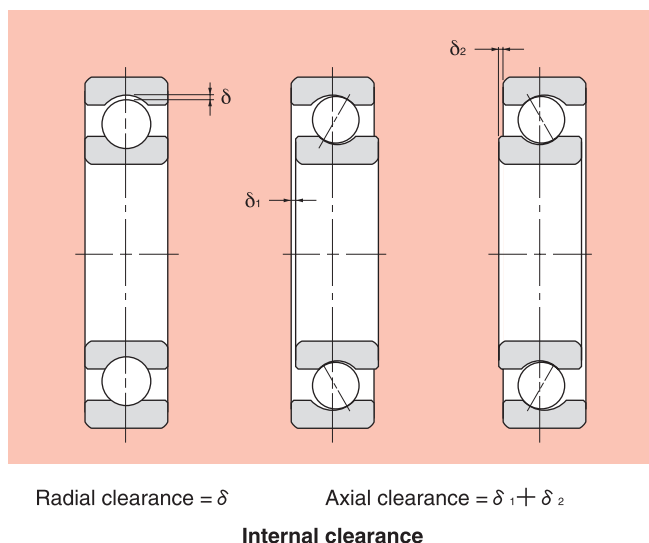
Unit μm

K7		M7		N7		P7		Nominal outside diameter of bearing D mm over incl.
housing	bearing	housing	bearing	housing	bearing	housing	bearing	
								
10T~13L		15T~ 8L		19T~ 4L		24T~ 1T		6 10
12T~14L		18T~ 8L		23T~ 3L		29T~ 3T		10 18
15T~15L		21T~ 9L		28T~ 2L		35T~ 5T		18 30
18T~18L		25T~11L		33T~ 3L		42T~ 6T		30 50
21T~22L		30T~13L		39T~ 4L		51T~ 8T		50 80
25T~25L		35T~15L		45T~ 5L		59T~ 9T		80 120
28T~30L		40T~18L		52T~ 6L		68T~10T		120 150
28T~37L		40T~25L		52T~13L		68T~ 3T		150 180
33T~43L		46T~30L		60T~16L		79T~ 3T		180 250
36T~51L		52T~35L		66T~21L		88T~ 1T		250 315
40T~57L		57T~40L		73T~24L		98T~ 1T		315 400
45T~63L		63T~45L		80T~28L		108T~ 0		400 500

Bearing internal clearance

Bearing internal clearance is the amount of internal free movement before mounting.

As shown below, when either the inner ring or the outer ring is fixed and the other ring is free to move, displacement can take place in either an axial or radial direction. This amount of displacement (radially or axially) is termed the internal clearance and, depending on the direction, is called the radial internal clearance or the axial internal clearance.



When the internal clearance of a bearing is measured, a slight measurement load is applied to the raceway so the internal clearance may be measured accurately. However, at this time, a slight amount of elastic deformation of the bearing occurs under the measurement load, and the clearance measurement value (measured clearance) is slightly larger than the true clearance. This difference between the true bearing clearance and the increased amount due to the elastic deformation must be compensated for. These compensation values are given in Table below.

Adjustment of radial internal clearance based on measured load (deep groove ball bearing)								Unit μm
Nominal Bore Diameter d mm		Measuring Load N (kgf)		Internal clearance adjustment				
over	incl.			C2	CN	C3	C4	C5
10	18	24.5	{2.5}	3~4	4	4	4	4
18	50	49	{5}	4~5	5	6	6	6
50	200	147	{15}	6~8	8	9	9	9

Internal clearance selection

The internal clearance of a bearing under operating conditions (effective clearance) is usually smaller than the same bearing's initial clearance before being installed and operated. This is due to several factors including bearing fit, the difference in temperature between the inner and outer rings, etc. As a bearing's operating clearance has an effect on bearing life, heat generation, vibration, noise, etc.; care must be taken in selecting the most suitable operating clearance.

Criteria for selecting bearing internal clearance

A bearing's life is theoretically maximum when operating clearance is slightly negative at steady operation. In reality it is however difficult to constantly maintain this optimal condition. If the negative clearance becomes enlarged by fluctuating operating conditions, heat will be produced and life will decrease dramatically. Under ordinary circumstances you should therefore select an initial internal clearance where the operating clearance is slightly larger than zero.

For ordinary operating conditions, use fitting for ordinary loads. If rotational speed and operating temperature are ordinary, selecting normal clearance enables you to obtain the proper operating clearance. Table below gives examples applying internal clearances other than CN (normal) clearance.

Examples of applications where bearing clearances other than CN (normal) clearance are used

Operating conditions	Applications	Selected clearance
With heavy or shock load, clearance is large.	Railway vehicle axles	C3
	Vibration screens	C3, C4
With indeterminate load, both inner and outer rings are tight-fitted.	Railway vehicle traction motors	C4
	Tractors and final speed regulators	C4
Shaft or inner ring is heated.	Paper making machines and driers	C3, C4
	Rolling mill table rollers	C3
Reduction of noise and vibration when rotating.	Micromotors	C2, CM
Adjustment of clearance to minimize shaft runout.	Main spindles of lathes (Double-row cylindrical roller bearings)	C9NA, C0NA
Loose fitting for both inner and outer rings.	Compressor roll neck	C2

Radial internal clearance of deep groove ball bearings

Unit μm

Nominal bore diameter d mm		C2		CN		C3		C4		C5	
over	incl.	min	max	min	max	min	max	min	max	min	max
—	2.5	0	6	4	11	10	20	—	—	—	—
2.5	6	0	7	2	13	8	23	—	—	—	—
6	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
225	250	2	40	30	95	85	160	145	225	205	300
250	280	2	45	35	105	90	170	155	245	225	340
280	315	2	55	40	115	100	190	175	270	245	370
315	355	3	60	45	125	110	210	195	300	275	410
355	400	3	70	55	145	130	240	225	340	315	460
400	450	3	80	60	170	150	270	250	380	350	510
450	500	3	90	70	190	170	300	280	420	390	570
500	560	10	100	80	210	190	330	310	470	440	630
560	630	10	110	90	230	210	360	340	520	490	690

Radial internal clearance of self-aligning ball bearings

Unit μm

Nominal bore diameter		Bearing with cylindrical bore									
d mm		C2		CN		C3		C4		C5	
over	incl.	min	max	min	max	min	max	min	max	min	max
2.5	6	1	8	5	15	10	20	15	25	21	33
6	10	2	9	6	17	12	25	19	33	27	42
10	14	2	10	6	19	13	26	21	35	30	48
14	18	3	12	8	21	15	28	23	37	32	50
18	24	4	14	10	23	17	30	25	39	34	52
24	30	5	16	11	24	19	35	29	46	40	58
30	40	6	18	13	29	23	40	34	53	46	66
40	50	6	19	14	31	25	44	37	57	50	71
50	65	7	21	16	36	30	50	45	69	62	88
65	80	8	24	18	40	35	60	54	83	76	108
80	100	9	27	22	48	42	70	64	96	89	124
100	120	10	31	25	56	50	83	75	114	105	145
120	140	10	38	30	68	60	100	90	135	125	175
140	160	15	44	35	80	70	120	110	161	150	210

Radial internal clearance of self-aligning ball bearings - Bearing with tapered bore

Unit μm

Nominal bore diameter		Bearing with tapered bore									
d mm		C2		CN		C3		C4		C5	
over	incl.	min	max	min	max	min	max	min	max	min	max
2.5	6	—	—	—	—	—	—	—	—	—	—
6	10	—	—	—	—	—	—	—	—	—	—
10	14	—	—	—	—	—	—	—	—	—	—
14	18	—	—	—	—	—	—	—	—	—	—
18	24	7	17	13	26	20	33	28	42	37	55
24	30	9	20	15	28	23	39	33	50	44	62
30	40	12	24	19	35	29	46	40	59	52	72
40	50	14	27	22	39	33	52	45	65	58	79
50	65	18	32	27	47	41	61	56	80	73	99
65	80	23	39	35	57	50	75	69	98	91	123
80	100	29	47	42	68	62	90	84	116	109	144
100	120	35	56	50	81	75	108	100	139	130	170
120	140	40	68	60	98	90	130	120	165	155	205
140	160	45	74	65	110	100	150	140	191	180	240

Radial internal clearance for duplex angular contact ball bearings

Unit μm

Nominal bore diameter		C1		C2		CN		C3		C4	
d mm		min max		min max		min max		min max		min max	
over	incl.	min	max	min	max	min	max	min	max	min	max
—	10	3	8	6	12	8	15	15	22	22	30
10	18	3	8	6	12	8	15	15	24	30	40
18	30	3	10	6	12	10	20	20	32	40	55
30	50	3	10	8	14	14	25	25	40	55	75
50	80	3	11	11	17	17	32	32	50	75	95
80	100	3	13	13	22	22	40	40	60	95	120
100	120	3	15	15	30	30	50	50	75	110	140
120	150	3	16	16	33	35	55	55	80	130	170
150	180	3	18	18	35	35	60	60	90	150	200
180	200	3	20	20	40	40	65	65	100	180	240

Radial internal clearance of double row angular contact ball bearings

Unit μm

Nominal bore diameter d mm over incl.	C2		CN		C3		C4		C5	
	min	max	min	max	min	max	min	max	min	max
10 only	0	10	5	15	10	21	16	28	24	36
10 18	1	11	6	16	12	23	19	31	28	40
18 24	1	11	6	16	13	24	21	33	31	43
24 30	1	13	6	19	13	26	21	35	31	45
30 40	2	15	7	22	15	30	24	39	35	50
40 50	2	15	9	24	17	32	28	45	40	57
50 65	0	15	7	24	16	33	28	48	41	61
65 80	1	17	11	31	21	42	34	56	50	74
80 100	3	20	13	36	25	49	40	65	58	67

Radial internal clearance of bearings for electric motor

Unit μm

Nominal bore diameter d mm over incl.		Radial internal clearance CM			
		Deep groove ball bearings		Cylindrical roller bearings	
		min	max	min	max
10 (incl.)	18	4	11	—	—
18	24	5	12	—	—
24	30	5	12	15	30
30	40	9	17	15	30
40	50	9	17	20	35
50	65	12	22	25	40
65	80	12	22	30	45
80	100	18	30	35	55
100	120	18	30	35	60
120	140	24	38	40	65
140	160	24	38	50	80
160	180	—	—	60	90
180	200	—	—	65	100

Interchangeable radial internal clearance for cylindrical roller bearing (cylindrical bore)

Unit μm

Nominal bore diameter d mm over incl.		C2		CN		C3		C4		C5	
		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
315	355	65	145	145	225	225	305	305	385	455	535
355	400	100	190	190	280	280	370	370	460	510	600
400	450	110	210	210	310	310	410	410	510	565	665
450	500	110	220	220	330	330	440	440	550	625	735

Radial internal clearance of spherical roller bearings

Unit μm

Nominal bore diameter <i>d</i> mm		Bearing with cylindrical bore									
		C2		CN		C3		C4		C5	
over	incl.	min	max	min	max	min	max	min	max	min	max
14	18	10	20	20	35	35	45	45	60	60	75
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

Radial internal clearance of spherical roller bearings - Bearing with tapered bore

Unit μm

Nominal bore diameter <i>d</i> mm		Bearing with tapered bore									
		C2		CN		C3		C4		C5	
over	incl.	min	max	min	max	min	max	min	max	min	max
14	18	—	—	—	—	—	—	—	—	—	—
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	1,000

Bearing Lubrication

Proper lubrication for rolling element bearings is critical for reliable bearing operation and prevention of premature damage and a reduction in fatigue life. The proper bearing lubricant must provide a separating film between the rolling elements, raceways, and cage to prevent metal-to-metal contact. The lubricant film must be thick enough under operating conditions to prevent contact of rolling element and raceway asperities.

If the asperities of rolling elements and races of an anti-friction bearing come into contact with each other, a certain amount of molecular adhesion or micro-welding or shearing of these asperities as a result of the relative motion between them can be expected. The result is an undesirable surface change of the rolling surfaces. Ideal lubrication requires that an oil film be continually present to prevent contact of the surface asperities and metal to metal contact.

In addition to preventing metal-to-metal contact, proper bearing lubricants help perform the following function:

- Reduce friction, heat generation, torque, and power consumption
- Provide a heat transfer medium
- Prevent corrosion
- Aid in providing proper sealing and preventing contamination

Bearing lubrication is broadly categorized as being either grease or oil lubrication. The decision to use grease or oil and what type of lubricant system to use, are dependent on the bearing type and application operating conditions.

Bearing greasing methods and amounts

There are two methods of providing bearing grease lubrication. One is the closed lubrication, in which grease is filed in advance into a shielded or sealed bearing; the other is the feeding method in which the bearing and housing are greased at assembly with the proper amount and designed to allow re-greasing and replacement at specified intervals. The dosed method using a pre-lubricated shielded or sealed bearing is well suited for applications where cost and space limitations preclude the use of grease filled housing or where relubrication is not possible or necessary. Conversely, the use of the feeding method has the advantage of allowing the replacement on periodic intervals in those applications where operating conditions require grease replacement.

For bearing applications utilizing the feeding method, there should be a grease fitting and a vent at opposite ends of the housing near the top. Also, a drain plug should be located near the bottom of the housing to allow purging of the old grease during relubrication. A bearing should be initially greased at assembly by packing it in on both sides and making sure the grease is between the rolling elements and cage. Regreasing should always occur while the bearing is in motion at the normal operating temperature.

Grease amount

The amount of grease needed to effectively lubricate a bearing is normally very small. In general, grease fill should be one-third to one-half of the space around the bearing; however, this may vary according to the housing design and application requirements. In applications with high speed and low torque requirements, the bearings can be lubricated with very small quantities of greases. Similarly, in low speed applications where the bearing may be exposed to dirt or moisture, the space around the bearing can be filled from two-thirds to nearly full to prevent contamination. If an excessive amount of grease is used when not required, additional heat will be generated from the churning, resulting in a softening and deterioration of the grease, and a reduction in bearing life. The grease weight required for a bearing can be calculated in grams.

$$\text{Grease quantity} = 0.05 \times D \times B \text{ gms.}$$

Regreasing intervals and grease life

With grease lubricated bearings, periodic relubrication is normally required to ensure efficient operation. Over a period of time, most grease will eventually start to harden due to oxidation. The exception to this is in presealed bearings where relubrication is usually not required.

When regreasing bearings, it is necessary to be sure that the grease fitting is clean prior to injecting the grease. A hand operated grease gun should be used for relubrication, but the use of high pressure needs to be avoided. High pressure may blow out seals. When using a grease gun, it should be calibrated for the

proper amount of grease, and confirmed that the grease in the gun is the same as what was initially applied to the bearings.

The main considerations for determining a relubrication cycle are operating speed, bearing size, operating temperature, and sealing efficiency. Seals are very critical with grease lubrication because of the importance to keep the grease free from contamination. Contamination that reaches the grease is trapped and will cause bearing damage and wear problems.

As the chart below shows leading grease available in the market with their specifications

Manufacturer	Product	BaseOil/thickener	Working temperature range °C	0.1mm Worked Penetration °C	Dropping Point °C	Remark
Kyodo Yushi	Multemp SRL	Polyol ester+Diester/ Lithium hydroxy Stearate	-50~150	250	190	Low noise Long life, High temperature
	Multemp PS	Diester+Refined mineral oil Lithium Stearate	-60~130	NO.2	190	Low torque, Outstanding noise Suppressant property
	Multemp SB-M	Synthetic hydrocarban/Diurea	-40~200	220	>260	High temperature, High speed operation, low noise property
	Raremax Super N	Polyol ester+Diester/ Lithium hydroxy Stearate	-40~180	260	120	Low noise Long life, High temperature
Shell	Alvania RLQ 2	Mineral oil / Lithium	-25~120	266	195	Wide applications available
	Alvania RL2	Mineral oil/ Lithium	-30~120	310	185	Wide applications available
	Alvania RL3	Mineral oil/ Lithium	-30~120	220	185	Not good for transmission
	Alvania EP 2	Mineral oil/ Lithium	-20~110	265	185	Long service life under heavy load water, resistance, Corrosian resistance
Kluber	Asonic GL Y 32	PAO, Ester oil/ Lithium	-50~140	265~295	>190	Low noise Long life, High temperature
	Asonic Q 74-73	PAO, Ester oil / Polyurea	-40~160	220~250	>250	Low noise, Long life, High temperature
	Klueberquiet BQH72-102	Ester oil / Polyurea	-40~180	250~280	>250	Low noise, Long life, High temperature
	Klueberquiet BEP72-82	Ester oil / Polyurea	-40~180	250~280	>250	High temperature, Available for auto generator bearings
	Petamo GHY 133 N	Mineral oil, PAO/ Polyurea	-30~160	265~295	>250	High temperature, Available for auto generator bearings
	Lsoflex LDS 18 Special A	Ester oil, Mineral oil / Li	-50~120	265~295	>190	Avaiable for pump bearings, Motor and its accessory
Exxon Mobil	Beacon 325	Diester / Lithium	-54~120	280	193	High Speed, Low noise Corrosian resistance
	Polyrex EM	Mineral / Diurea	-29~177	318	288	Low temperature
	Mobilgrease 28	Diester/ Microgel	-62~177	310	>260	Water resistance, High temperature
Chevron	SRI-2	ISOSYN/ Polyurea	-30~150	280	243	Water resistance, Corrosian resistance High temperature
Dupont	Krytox 240	Fluoinated / PTFE	-34~288	285		High temperature

Vibration of single bearing

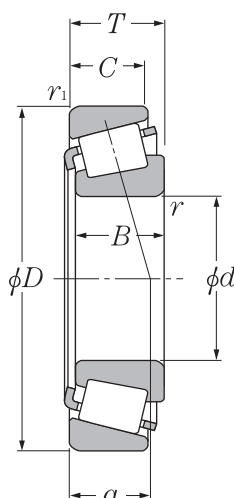
μm/s

Bore dia (mm)	V 0			V 1			V 2			V 3			V 4		
	LB	MB	HB	LB	MB	HB	LB	MB	HB	LB	MB	HB	LB	MB	HB
Miniature Ball Bearings															
3-4	80	44	44	60	35	32	48	26	22	31	16	15	28	10	10
5-6	110	72	60	74	48	40	58	36	30	35	21	18	32	11	11
7-9	130	96	80	92	66	54	72	48	40	44	28	24	38	12	12
Deep Groove Ball Bearings															
10-12	160	120	100	120	80	70	90	60	50	55	35	30	45	14	15
15-17	210	150	120	150	100	85	110	78	60	65	46	35	52	18	18
20-25	260	190	150	180	125	100	130	100	75	80	60	45	60	25	25
30-35	300	240	190	200	150	130	150	120	100	90	75	60	70	35	40
40-45	360	300	260	240	180	160	180	150	130	110	90	80	82	50	50
50-55	420	320	320	280	200	200	210	160	160	125	100	100	95	70	70
60	480	360	440	320	220	240	240	180	200	145	110	130	100	80	80

Maximum acceleration of single bearing

dB

Bore dia (mm)	For dia series 0				For dia series 2					For dia series 3				
	Z	Z1	Z2	Z3	Z	Z1	Z2	Z3	Z4	Z	Z1	Z2	Z3	Z4
Miniature Ball Bearings														
3-4	35	34	32	28	36	35	32	30		37	36	33	31	
5-6	37	36	34	30	38	37	34	32		39	37	35	33	
7-8	39	38	35	31	40	38	36	34						
9	41	40	36	32	42	40	37	35						
Deep Groove Ball Bearings														
10	43	42	38	33	44	42	39	35	30	46	44	40	37	32
12	44	43	39	34	45	43	39	35	30	47	45	40	37	32
15	45	44	40	35	46	44	41	36	31	48	46	42	38	33
17	45	44	40	35	46	45	41	36	31	48	46	42	38	33
20	47	45	41	36	48	46	42	38	33	50	48	43	39	34
25	48	46	42	38	49	47	43	40	36	51	49	44	41	37
30	49	47	43	39	50	48	44	41	37	52	50	45	42	38
35	41	49	45	41	52	50	46	43	39	54	52	47	44	40
40	53	51	46	42	54	52	47	44	40	56	54	49	45	41
45	55	53	48	45	56	54	49	46	43	58	56	51	47	44
50	57	54	50	47	58	55	51	48	45	60	57	53	49	46
55	59	56	52	49	60	57	53	50	47	62	59	54	51	48
60	61	58	54	51	62	59	54	51	48	61	61	56	53	50
65	49	48	46		50	49	47	42		51	50	48	43	
70	50	49	47		51	50	48	43		52	51	49	44	
75	51	50	48		52	51	49	44		53	52	50	45	
80	52	51	49		53	52	50	45		54	53	51	46	
85	53	52	50		54	53	51	46		56	55	52	47	
90	54	53	52		56	55	53	48		58	57	54	49	
95	56	55	54		58	57	55	50		60	59	56	51	
100	58	57	56		60	59	57	52		62	61	58	53	
105	60	59	58		62	61	59	54		64	63	60	55	
110	62	61	60		64	63	61	56		66	65	62	57	
115-120	64	63	62		66	65	63	58		68	67	64	59	



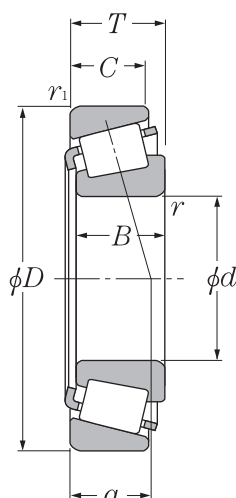
d 15~32mm

d	Boundary dimensions						Basic load ratings				Limiting speeds		Bearing numbers	Mass kg (approx.)
	D	T	B	C	$r_{s\ min}$	$r_{1s\ min}$	dynamic kN	static kN	dynamic kgf	static kgf	grease	oil		
15	42	14.25	13	11	1.0	1.0	23.2	20.8	2 370	2 120	9 900	13 000	30302JR	0.098
17	40	13.25	12	11	1.0	1.0	20.5	20.3	2 090	2 070	9 900	13 000	30203JR	0.080
	40	17.25	16	14	1.0	1.0	27.3	28.3	2 790	2 880	9 900	13 000	32203JR	0.102
	47	15.25	14	12	1.0	1.0	28.9	26.3	2 940	2 680	9 000	12 000	30303JR	0.134
20	42	15.00	15	12	0.6	0.6	24.9	27.9	2 540	2 840	9 500	13 000	32004JR	0.097
	47	15.25	14	12	1.0	1.0	28.2	28.7	2 870	2 930	8 800	12 000	30204JR	0.127
	47	19.25	18	15	1.0	1.0	36.5	39.5	3 700	4 000	8 800	12 000	32204JR	0.160
	52	16.25	16	13	1.5	1.5	35.5	34.0	3 600	3 450	8 000	11 000	30304JR	0.176
	52	22.25	21	18	1.5	1.5	46.5	48.5	4 750	4 950	8 000	11 000	32304JR	0.245
22	44	15.00	15	11.5	0.6	0.6	27.0	31.5	2 760	3 250	8 900	12 000	320/22JR	0.106
25	47	15.00	15	11.5	0.6	0.6	27.8	33.5	2 830	3 450	7 900	11 000	32005JR	0.114
	47	17.00	17	14	0.6	0.6	32.5	40.5	3 300	4 150	8 000	11 000	33005JR	0.130
	52	16.25	15	13	1.0	1.0	31.5	34.0	3 200	3 450	7 300	9 800	30205JR	0.154
	52	19.25	18	16	1.0	1.0	42.0	47.0	4 300	4 800	7 300	9 800	32205JR	0.187
	52	22.00	22	18	1.0	1.0	47.5	57.5	4 850	5 850	7 300	9 800	33205JR	0.217
	62	18.25	17	15	1.5	1.5	48.5	47.5	4 950	4 850	6 700	8 900	30305JR	0.272
	62	18.25	17	13	1.5	1.5	40.5	43.5	4 150	4 450	5 900	7 800	30305DJR	0.284
	62	25.25	24	20	1.5	1.5	61.5	64.5	6 250	6 600	6 700	8 900	32305JR	0.381
28	52	16.00	16	12	1.0	1.0	33.0	40.5	3 400	4 150	7 300	9 700	320/28JR	0.146
30	55	17.00	17	13	1.0	1.0	37.5	46.0	3 800	4 700	6 900	9 200	32006JR	0.166
	55	20.00	20	16	1.0	1.0	42.5	54.0	4 300	5 500	6 900	9 200	33006JR	0.201
	62	17.25	16	14	1.0	1.0	43.5	48.0	4 450	4 900	6 300	8 400	30206JR	0.241
	62	21.25	20	17	1.0	1.0	54.5	64.0	5 600	6 550	6 300	8 400	32206JR	0.301
	62	25.00	25	19.5	1.0	1.0	65.0	77.0	6 600	7 850	6 300	8 400	33206JR	0.344
	72	20.75	19	16	1.5	1.5	60.0	61.0	6 100	6 200	5 700	7 600	30306JR	0.408
	72	20.75	19	14	1.5	1.5	48.5	51.5	4 950	5 250	5 000	6 700	30306DJR	0.398
	72	28.75	27	23	1.5	1.5	81.0	90.0	8 250	9 150	5 700	7 600	32306JR	0.583
32	58	17.00	17	13	1.0	1.0	37.0	46.5	3 750	4 750	6 600	8 700	320/32JR	0.181

Tapered Roller Bearings

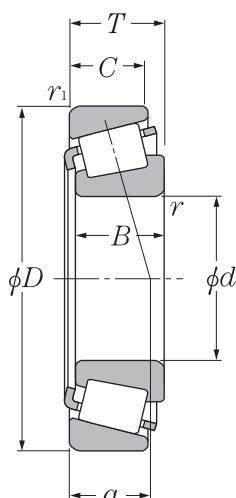
KYK

Metric Series



d 35~50mm

Boundary dimensions							Basic load ratings				Limiting speeds		Bearing numbers	Mass
mm							dynamic	static	dynamic	static	min ⁻¹			kg
							kN		kgf					
<i>d</i>	<i>D</i>	<i>T</i>	<i>B</i>	<i>C</i>	<i>r_{s min}</i>	<i>r_{1s min}</i>	<i>C_r</i>	<i>C_{or}</i>	<i>C_r</i>	<i>C_{or}</i>	grease	oil		(approx.)
35	62	18.00	18	14	1.0	1.0	41.5	52.5	4 250	5 350	6 100	8 100	32007JR	0.224
	62	21.00	21	17	1.0	1.0	50.5	66.5	5 150	6 800	6 100	8 100	33007JR	0.263
	72	18.25	17	15	1.5	1.5	55.5	61.5	5 650	6 250	5 500	7 400	30207JR	0.344
	72	24.25	23	19	1.5	1.5	72.5	87.0	7 400	8 900	5 500	7 400	32207JR	0.457
	72	28.00	28	22	1.5	1.5	87.5	109	8 900	11 200	5 500	7 400	33207JR	0.531
	80	22.75	21	18	2.0	1.5	75.0	77.0	7 650	7 900	5 000	6 600	30307JR	0.540
	80	22.75	21	15	2.0	1.5	63.5	70.0	6 450	7 100	4 400	5 800	30307DJR	0.530
	80	32.75	31	25	2.0	1.5	101	115	10 300	11 700	5 000	6 600	32307JR	0.787
40	68	19.00	19	14.5	1.0	1.0	50.0	65.5	5 100	6 650	5 300	7 100	32008JR	0.273
	68	22.00	22	18	1.0	1.0	59.5	82.5	6 050	8 400	5 300	7 100	33008JR	0.312
	75	26.00	26	20.5	1.5	1.5	79.5	103	8 100	10 500	5 200	6 900	33108JR	0.494
	80	19.75	18	16	1.5	1.5	61.0	67.0	6 250	6 850	4 900	6 600	30208JR	0.435
	80	24.75	23	19	1.5	1.5	79.5	93.5	8 100	9 550	4 900	6 600	32208JR	0.558
	80	32.00	32	25	1.5	1.5	103	132	10 500	13 400	4 900	6 600	33208JR	0.728
	90	25.25	23	20	2.0	1.5	91.5	102	9 350	10 400	4 400	5 900	30308JR	0.769
	90	25.25	23	17	2.0	1.5	77.0	85.5	7 850	8 700	3 900	5 200	30308DJR	0.738
90	35.25	33	27	2.0	1.5	110	140	11 300	14 300	4 200	5 600	32308JR	1.100	
45	75	20.00	20	15.5	1.0	1.0	57.5	76.5	5 850	7 800	4 800	6 400	32009JR	0.346
	75	24.00	24	19	1.0	1.0	66.0	93.5	6 750	9 550	4 800	6 400	33009JR	0.398
	80	26.00	26	20.5	1.5	1.5	84.5	115	8 650	11 700	4 700	6 200	33109JR	0.542
	85	20.75	19	16	1.5	1.5	67.5	78.5	6 900	8 000	4 400	5 900	30209JR	0.495
	85	24.75	23	19	1.5	1.5	82.0	100	8 350	10 200	4 400	5 900	32209JR	0.607
	85	32.00	32	25	1.5	1.5	107	141	10 900	14 400	4 400	5 900	33209JR	0.783
	100	27.25	25	22	2.0	1.5	111	126	11 300	12 800	4 000	5 300	30309JR	1.010
	100	27.25	25	18	2.0	1.5	96.0	109	9 800	11 100	3 500	4 600	30309DJR	0.958
100	38.25	36	30	2.0	1.5	154	191	15 700	19 500	4 000	5 300	32309JR	1.460	
50	80	20.00	20	15.5	1.0	1.0	62.5	88.0	6 400	9 000	4 400	5 800	32010JR	0.366
	80	24.00	24	19	1.0	1.0	69.5	103	7 100	10 500	4 400	5 800	33010JR	0.433
	85	26.00	26	20	1.5	1.5	86.5	121	8 850	12 400	4 200	5 600	33110JR	0.580
	90	21.75	20	17	1.5	1.5	77.0	93.0	7 850	9 450	4 000	5 300	30210JR	0.563
	90	24.75	23	19	1.5	1.5	87.5	109	8 900	11 100	4 000	5 300	32210JR	0.648
	90	32.00	32	24.5	1.5	1.5	115	158	11 700	16 100	4 000	5 300	33210JR	0.852
	110	29.25	27	23	2.5	2.0	133	152	13 500	15 500	3 600	4 800	30310JR	1.310
	110	29.25	27	19	2.5	2.0	113	130	11 600	13 300	3 200	4 200	30310DJR	1.250
110	42.25	40	33	2.5	2.0	184	232	18 700	23 600	3 600	4 800	32310JR	1.920	



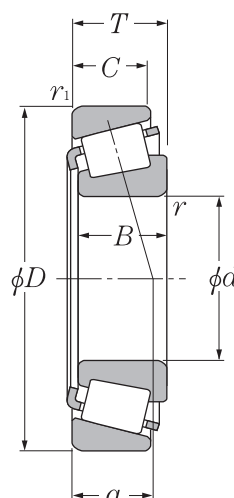
d 55~70mm

Boundary dimensions							Basic load ratings				Limiting speeds		Bearing numbers	Mass
mm							dynamic	static	dynamic	static	min ⁻¹			kg
							kN		kgf					
<i>d</i>	<i>D</i>	<i>T</i>	<i>B</i>	<i>C</i>	<i>r_{s min}</i>	<i>r_{1s min}</i>	<i>C_r</i>	<i>C_{or}</i>	<i>C_r</i>	<i>C_{or}</i>	grease	oil		(approx.)
55	90	23.00	23	17.5	1.5	1.5	80.5	118	8 200	12 000	4 000	5 400	32011JR	0.563
	90	27.00	27	21	1.5	1.5	91.5	138	9 350	14 100	4 000	5 400	33011JR	0.643
	95	30.00	30	23	1.5	1.5	111	155	11 300	15 800	3 900	5 200	33111JR	0.846
	100	22.75	21	18	2.0	1.5	93.0	111	9 500	11 300	3 600	4 900	30211JR	0.740
	100	26.75	25	21	2.0	1.5	108	134	11 000	13 700	3 600	4 900	32211JR	0.876
	100	35.00	35	27	2.0	1.5	138	188	14 100	19 100	3 600	4 900	33211JR	1.150
	120	31.50	29	25	2.5	2.0	155	179	15 800	18 300	3 300	4 400	30311JR	1.660
	120	31.50	29	21	2.5	2.0	132	154	13 500	15 700	2 900	3 800	30311DJR	1.590
	120	45.50	43	35	2.5	2.0	215	275	21 900	28 000	3 300	4 400	32311JR	2.440
60	95	23.00	23	17.5	1.5	1.5	82.0	123	8 350	12 500	3 700	4 900	32012JR	0.576
	95	27.00	27	21	1.5	1.5	93.5	145	9 550	14 700	3 700	4 900	33012JR	0.684
	100	30.00	30	23	1.5	1.5	113	164	11 600	16 700	3 600	4 700	33112JR	0.912
	110	23.75	22	19	2.0	1.5	105	125	10 700	12 700	3 400	4 500	30212JR	0.949
	110	29.75	28	24	2.0	1.5	130	164	13 200	16 800	3 400	4 500	32212JR	1.180
	110	38.00	38	29	2.0	1.5	161	223	16 400	22 700	3 400	4 500	33212JR	1.550
	130	33.50	31	26	3.0	2.5	180	210	18 300	21 400	3 000	4 000	30312JR	2.060
	130	33.50	31	22	3.0	2.5	150	176	15 300	17 900	2 700	3 600	30312DJR	1.970
	130	48.50	46	37	3.0	2.5	244	315	24 900	32 000	3 000	4 000	32312JR	3.020
65	100	23.00	23	17.5	1.5	1.5	83.0	128	8 450	13 000	3 400	4 600	32013JR	0.630
	100	27.00	27	21	1.5	1.5	97.5	156	9 950	16 000	3 400	4 600	33013JR	0.732
	110	34.00	34	26.5	1.5	1.5	144	211	14 700	21 500	3 300	4 400	33113JR	1.280
	120	24.75	23	20	2.0	1.5	123	148	12 500	15 000	3 100	4 200	30213JR	1.180
	120	32.75	31	27	2.0	1.5	159	206	16 200	21 000	3 100	4 200	32213JR	1.580
	120	41.00	41	32	2.0	1.5	195	265	19 900	27 100	3 100	4 200	33213JR	1.980
	140	36.00	33	28	3.0	2.5	203	238	20 700	24 300	2 800	3 700	30313JR	2.550
	140	36.00	33	23	3.0	2.5	173	204	17 700	20 900	2 500	3 300	30313DJR	2.420
	140	51.00	48	39	3.0	2.5	273	350	27 800	36 000	2 800	3 700	32313JR	3.660
70	110	25.00	25	19	1.5	1.5	105	160	10 700	16 400	3 200	4 200	32014JR	0.630
	110	31.00	31	25.5	1.5	1.5	127	204	12 900	20 800	3 200	4 200	33014JR	0.732
	125	26.25	24	21	2.0	1.5	131	162	13 400	16 500	2 900	3 900	30214JR	1.280
	125	33.25	31	27	2.0	1.5	166	220	16 900	22 400	2 900	3 900	32214JR	1.180
	125	41.00	41	32	2.0	1.5	201	282	20 500	28 700	2 900	3 900	33214JR	1.580
	150	38.00	35	30	3.0	2.5	230	272	23 400	27 800	2 600	3 500	30314JR	2.550
	150	38.00	35	25	3.0	2.5	193	229	19 600	23 300	2 300	3 000	30314DJR	2.420
	150	54.00	51	42	3.0	2.5	310	405	31 500	41 000	2 600	3 500	32314JR	3.660

Tapered Roller Bearings

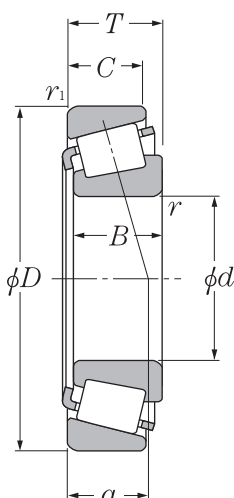
KYK

Metric Series



d 75~90mm

Boundary dimensions							Basic load ratings				Limiting speeds		Bearing numbers	Mass
mm							dynamic	static	dynamic	static	min ⁻¹			kg
							kN		kgf					
<i>d</i>	<i>D</i>	<i>T</i>	<i>B</i>	<i>C</i>	<i>r_{s min}</i>	<i>r_{1s min}</i>	<i>C_r</i>	<i>C_{or}</i>	<i>C_r</i>	<i>C_{or}</i>	grease	oil		(approx.)
75	115	25.00	25	19	1.5	1.5	106	167	10 800	17 000	3 000	4 000	32015JR	0.909
	115	31.00	31	25.5	1.5	1.5	111	186	11 300	19 000	3 000	4 000	33015JR	1.110
	130	27.25	25	22	2.0	1.5	139	175	14 200	17 900	2 700	3 600	30215JR	1.410
	130	33.25	31	27	2.0	1.5	168	224	17 100	22 800	2 700	3 600	32215JR	1.740
	130	41.00	41	31	2.0	1.5	208	298	21 200	30 500	2 700	3 600	33215JR	2.200
	160	40.00	37	31	3.0	2.5	255	305	26 000	31 000	2 400	3 200	30315JR	3.570
	160	40.00	37	26	3.0	2.5	215	256	21 900	26 100	2 100	2 800	30315DJR	3.470
	160	58.00	55	45	3.0	2.5	355	470	36 000	47 500	2 400	3 200	32315JR	5.350
80	125	29.00	29	22	1.5	1.5	139	216	14 200	22 000	2 800	3 700	32016JR	1.280
	125	36.00	36	29.5	1.5	1.5	173	284	17 600	29 000	2 800	3 700	33016JR	1.600
	140	28.25	26	22	2.5	2.0	160	200	16 300	20 400	2 500	3 400	30216JR	1.720
	140	35.25	33	28	2.5	2.0	199	265	20 300	27 000	2 500	3 400	32216JR	2.180
	140	46.00	46	35	2.5	2.0	250	365	25 500	37 500	2 500	3 400	33216JR	2.920
	170	42.50	39	33	3.0	2.5	291	350	29 700	36 000	2 300	3 000	30316JR	4.410
	170	42.50	39	27	3.0	2.5	236	283	24 100	28 900	2 000	2 700	30316DJR	4.110
	170	61.50	58	48	3.0	2.5	395	525	40 500	53 500	2 300	3 000	32316JR	6.410
85	130	29.00	29	22	1.5	1.5	142	224	14 400	22 900	2 600	3 500	32017JR	1.350
	130	36.00	36	29.5	1.5	1.5	176	296	18 000	30 000	2 600	3 500	33017JR	1.700
	150	30.50	28	24	2.5	2.0	183	232	18 600	23 600	2 400	3 200	30217JR	2.140
	150	38.50	36	30	2.5	2.0	224	300	22 900	30 500	2 400	3 200	32217JR	2.750
	150	49.00	49	37	2.5	2.0	284	420	29 000	43 000	2 400	3 200	33217JR	3.580
	180	44.50	41	34	4.0	3.0	305	365	31 000	37 000	2 100	2 900	30317JR	5.200
	180	44.50	41	28	4.0	3.0	247	293	25 200	29 900	1 900	2 500	30317DJR	4.850
	180	63.50	60	49	4.0	3.0	405	525	41 000	53 500	2 100	2 900	32317JR	7.150
90	140	32.00	32	24	2.0	1.5	168	270	17 200	27 600	2 500	3 300	32018JR	1.790
	140	39.00	39	32.5	2.0	1.5	215	360	21 900	36 500	2 500	3 300	33018JR	2.180
	160	32.50	30	26	2.5	2.0	208	267	21 200	27 200	2 200	3 000	30218JR	2.660
	160	42.50	40	34	2.5	2.0	262	360	26 700	36 500	2 200	3 000	32218JR	3.490
	190	46.50	43	36	4.0	3.0	335	405	34 500	41 500	2 000	2 700	30318JR	6.030
	190	46.50	43	30	4.0	3.0	270	320	27 600	33 000	1 800	2 400	30318DJR	5.660
	190	67.50	64	53	4.0	3.0	450	595	46 000	60 500	2 000	2 700	32318JR	8.570



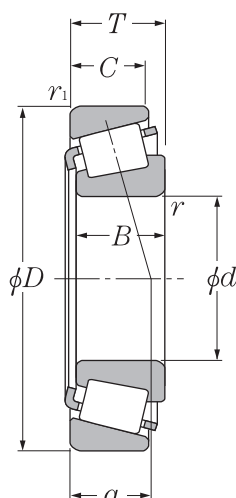
d 95~120mm

Boundary dimensions							Basic load ratings				Limiting speeds		Bearing numbers	Mass
mm							dynamic	static	dynamic	static	min ⁻¹			kg
<i>d</i>	<i>D</i>	<i>T</i>	<i>B</i>	<i>C</i>	<i>r_{s min}</i>	<i>r_{1s min}</i>	<i>C_r</i> kN	<i>C_{or}</i> kgf	<i>C_r</i> kgf	<i>C_{or}</i> kgf	grease	oil		(approx.)
95	145	32.00	32	24	2.0	1.5	171	280	17 500	28 600	2 300	3 100	32019JR	1.830
	145	39.00	39	32.5	2.0	1.5	219	375	22 400	38 000	2 300	3 100	33019JR	2.270
	170	34.50	32	27	3.0	2.5	226	290	23 000	29 600	2 100	2 800	30219JR	3.070
	170	45.50	43	37	3.0	2.5	299	415	30 500	42 500	2 100	2 800	32219JR	4.300
	200	49.50	45	38	4.0	3.0	365	445	37 500	45 500	1 900	2 500	30319JR	6.980
	200	49.50	45	32	4.0	3.0	296	355	30 000	36 500	1 700	2 200	30319DJR	6.470
	200	71.50	67	55	4.0	3.0	505	670	51 500	68 500	1 900	2 500	32319JR	10.100
100	150	32.00	32	24	2.0	1.5	170	281	17 300	28 600	2 200	3 000	32020JR	1.910
	150	39.00	39	32.5	2.0	1.5	224	390	22 800	39 500	2 200	3 000	33020JR	2.370
	180	37.00	34	29	3.0	2.5	258	335	26 300	34 500	2 000	2 700	30220JR	3.780
	180	49.00	46	39	3.0	2.5	330	465	33 500	47 500	2 000	2 700	32220JR	5.120
	215	51.50	47	39	4.0	3.0	410	500	41 500	51 000	1 800	2 400	30320JR	8.560
	215	56.50	51	35	4.0	3.0	355	435	36 000	44 000	1 800	2 400	31320JR	8.670
	215	77.50	73	60	4.0	3.0	570	770	58 500	78 500	1 800	2 400	32320JR	12.700
105	160	35.00	35	26	2.5	2.0	201	335	20 500	34 000	2 100	2 800	32021JR	2.420
	160	43.00	43	34	2.5	2.0	245	420	25 000	43 000	2 100	2 800	33021JR	3.000
	190	39.00	36	30	3.0	2.5	287	380	29 300	38 500	1 900	2 500	30221JR	4.390
	190	53.00	50	43	3.0	2.5	380	540	38 500	55 500	1 900	2 500	32221JR	6.250
	225	53.50	49	41	4.0	3.0	435	530	44 500	54 500	1 700	2 300	30321JR	9.790
	225	58.00	53	36	4.0	3.0	380	470	39 000	47 500	1 700	2 300	31321JR	9.680
	225	81.50	77	63	4.0	3.0	610	825	62 500	84 500	1 700	2 300	32321JR	14.500
110	170	38.00	38	29	2.5	2.0	236	390	24 000	39 500	2 000	2 700	32022JR	3.070
	170	47.00	47	37	2.5	2.0	288	500	29 400	51 000	2 000	2 700	33022JR	3.800
	200	41.00	38	32	3.0	2.5	325	435	33 000	44 000	1 800	2 400	30222JR	5.180
	200	56.00	53	46	3.0	2.5	420	605	43 000	62 000	1 800	2 400	32222JR	7.430
	240	54.50	50	42	4.0	3.0	480	590	49 000	60 000	1 600	2 200	30322JR	11.400
	240	63.00	57	38	4.0	3.0	430	535	44 000	54 500	1 600	2 200	31322JR	11.900
	240	84.50	80	65	4.0	3.0	705	970	72 000	98 500	1 600	2 200	32322JR	18.000
120	180	38.00	38	29	2.5	2.0	245	420	25 000	43 000	1 800	2 500	32024JR	3.250
	215	43.50	40	34	3.0	2.5	345	470	35 500	48 000	1 700	2 200	30224JR	6.230
	215	61.50	58	50	3.0	2.5	460	680	47 000	69 500	1 700	2 200	32224JR	9.080
	260	59.50	55	46	4.0	3.0	560	695	57 000	71 000	1 500	2 000	30324JR	14.200
	260	68.00	62	42	4.0	3.0	515	655	52 500	67 000	1 500	2 000	31324JR	15.400
	260	90.50	86	69	4.0	3.0	815	1 130	83 000	116 000	1 500	2 000	32324JR	22.400

Tapered Roller Bearings

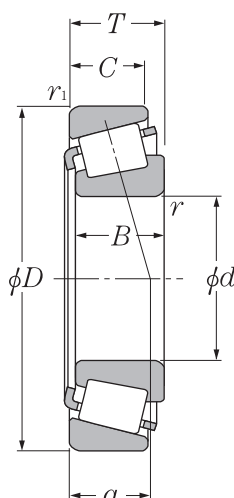
KYK

Metric Series



d 130~150mm

Boundary dimensions							Basic load ratings				Limiting speeds		Bearing numbers	Mass kg (approx.)
mm							dynamic kN	static	dynamic kgf	static	min ⁻¹			
<i>d</i>	<i>D</i>	<i>T</i>	<i>B</i>	<i>C</i>	<i>r_{s min}</i>	<i>r_{1s min}</i>	<i>C_r</i>	<i>C_{or}</i>	<i>C_r</i>	<i>C_{or}</i>	grease	oil		
130	200	45.00	45	34	2.5	2.0	320	545	32 500	55 500	1 700	2 200	32026JR	4.960
	230	43.75	40	34	4.0	3.0	375	505	38 000	51 500	1 500	2 000	30226JR	7.250
	230	67.75	64	54	4.0	3.0	530	815	54 000	83 000	1 500	2 000	32226JR	11.200
	280	63.75	58	49	5.0	4.0	650	830	66 000	84 500	1 400	1 800	30326JR	17.400
	280	72.00	66	44	5.0	4.0	600	780	61 500	79 500	1 400	1 800	31326JR	19.000
140	210	45.00	45	34	2.5	2.0	330	580	33 500	59 500	1 600	2 100	32028JR	5.280
	250	45.75	42	36	4.0	3.0	420	570	43 000	58 500	1 400	1 900	30228JR	9.260
	250	71.75	68	58	4.0	3.0	610	920	62 500	94 000	1 400	1 900	32228JR	8.370
	300	67.75	62	53	5.0	4.0	735	950	75 000	97 000	1 300	1 700	30328JR	21.200
	300	77.00	70	47	5.0	4.0	685	905	70 000	92 500	1 300	1 700	31328JR	23.000
150	225	48.00	48	36	3.0	2.5	370	655	37 500	67 000	1 400	1 900	32030JR	6.370
	270	49.00	45	38	4.0	3.0	450	605	46 000	61 500	1 300	1 700	30230JR	11.200
	270	77.00	73	60	4.0	3.0	700	1070	71 500	109 000	1 300	1 700	32230JR	18.200
	320	72.00	65	55	5.0	4.0	825	1070	84 000	109 000	1 200	1 600	30330JR	25.500
	320	82.00	75	50	5.0	4.0	775	1030	79 000	105 000	1 200	1 600	31330JR	27.700



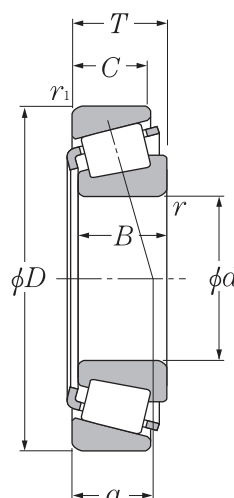
d 15.875~34.925mm

Boundary dimensions							Basic load ratings		Limiting speeds		Bearing numbers	Mass
mm							dynamic	static	min ⁻¹			kg
<i>d</i>	<i>D</i>	<i>T</i>	<i>B</i>	<i>C</i>	<i>r_{s min}</i>	<i>r_{1s min}</i>	<i>C_r</i>	<i>C_{or}</i>	grease	oil		(approx.)
15.875	42.862	14.288	14.287	9.525	0.8	0.8	17.600	18.000	8700	12000	11590/20	0.103
17.462	39.878	13.843	14.605	10.668	1.2	1.2	25.400	26.000	11000	14000	LM11749/10	0.085
19.050	45.237	15.494	16.637	12.065	1.2	1.2	29.400	30.100	9400	13000	LM11949/10	0.124
	49.225	18.034	19.050	14.228	0.6	0.6	38.500	39.000	8500	11000	09067/195	0.179
21.430	45.237	15.494	16.637	12.065	1.3	1.3	27.500	31.000	8000	11000	LM12748/10	0.123
	50.005	17.526	18.288	13.970	1.2	1.2	39.100	40.700	8500	11000	M12649/10	0.177
21.986	45.974	15.494	16.637	12.065	1.2	1.2	30.100	34.600	8900	12000	LM12749/11	0.121
	45.237	15.494	16.637	12.065	1.3	1.3	27.500	31.000	8000	11000	LM12749/10	0.115
22.225	57.150	22.225	22.225	17.462	0.8	1.6	52.600	55.700	7600	10000	1280/20	0.293
25.400	57.150	19.431	19.431	14.732	1.5	1.5	38.000	49.000	7500	10000	M84548/10	0.237
25.987	57.150	17.462	17.462	13.495	3.5	1.5	37.800	42.700	7450	8430	HC15579X/20	0.210
26.988	50.292	14.224	14.732	10.668	3.6	1.2	31.200	37.000	7800	10000	L44649/10	0.122
28.575	57.150	19.845	19.355	15.875	3.6	1.6	48.800	57.100	7000	9300	1988/22	0.227
	68.262	22.225	22.225	17.462	0.8	1.6	51.000	61.100	6000	8000	02474/20	0.408
29.000	50.292	14.224	14.732	10.668	3.6	1.2	28.900	37.200	7600	10000	L45449/10	0.115
30.162	64.292	21.432	21.433	16.670	1.6	1.6	55.200	70.700	6400	8500	M86649/10	0.340
31.750	59.131	15.875	16.764	11.811	1.2	1.2	35.800	43.100	6600	8800	LM67048/10	0.182
	62.000	19.050	19.050	14.288	1.2	1.2	44.600	50.700	6400	8600	15123/245	0.238
33.338	68.262	22.225	22.225	17.462	1.5	0.8	50.900	70.400	6300	7500	M88048/10	0.382
34.925	65.088	18.034	18.288	13.970	1.3	1.2	48.000	58.500	6000	8000	LM48548/10	0.249
	69.012	19.845	19.583	15.875	1.3	1.2	53.900	67.000	5600	7500	14138A/14276	0.330
	72.233	25.400	25.400	19.842	2.4	2.4	66.900	87.400	5700	7600	HM88649/10	0.487

Taper Roller Bearings

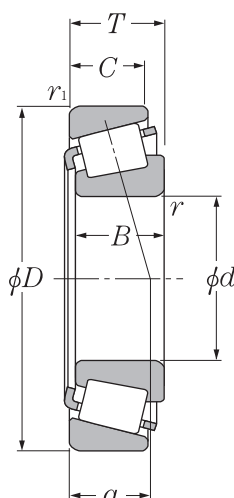
KYK

Inch Series



d 34.925~45.242mm

Boundary dimensions							Basic load ratings		Limiting speeds		Bearing numbers	Mass
mm							dynamic	static	min ⁻¹			kg
							kN					
<i>d</i>	<i>D</i>	<i>T</i>	<i>B</i>	<i>C</i>	<i>r_{s min}</i>	<i>r_{1s min}</i>	<i>C_r</i>	<i>C_{or}</i>	grease	oil		(approx.)
34.925	73.025	23.813	24.608	19.050	1.6	0.8	72.200	87.300	5600	7400	25877/21	0.474
	76.200	29.369	28.575	23.020	1.6	1.0	78.100	106.000	4800	6300	HM89446/10	0.660
34.988	59.131	15.875	16.764	11.938	3.6	1.2	35.700	48.500	6400	8500	L68149/10	0.168
	59.974	15.875	16.764	11.938	3.6	1.2	35.700	48.500	6400	8500	L68149/11	0.175
38.000	63.000	17.000	17.000	13.500	1.8	1.3	38.500	52.500	5700	7600	JL69349/10	0.198
38.100	65.088	18.034	18.288	13.970	1.9	1.2	42.900	56.500	5800	7800	LM29748/10	0.233
	65.088	18.034	18.288	13.970	2.3	1.3	40.000	57.000	5000	7000	LM29749/10	0.237
	65.088	19.812	18.288	15.748	2.4	1.2	42.900	56.500	5800	7800	LM29749/11	0.251
	76.200	23.775	25.654	19.050	2.0	1.5	730.000	905.000	5100	6800	2788/20	0.499
	88.500	26.988	29.083	22.225	3.5	1.5	95.500	107.000	4600	6100	418/414	0.840
40.988	67.975	17.500	18.000	13.500	2.6	1.5	46.000	62.500	5300	7000	57414/LM300811	0.239
	67.975	17.500	18.000	13.500	2.6	1.5	46.000	62.500	5300	7000	LM300849/LM300811	0.239
41.275	73.025	16.667	17.462	12.700	3.6	1.6	45.900	55.800	5200	6900	18590/20	0.283
	73.431	19.558	19.812	14.732	3.6	0.8	57.800	73.000	5200	7000	LM501349/10	0.334
	76.200	18.009	17.384	14.288	1.6	1.6	51.600	63.300	5200	6900	11162R/300	0.348
	87.312	30.163	30.886	23.812	1.5	1.5	102.000	1.320	4500	6000	3577/3525	0.850
	88.900	30.162	29.370	23.020	3.6	3.2	99.600	125.000	4600	6100	HM803146/10	0.892
42.862	87.312	30.163	30.886	23.812	3.6	3.0	94.000	117.000	4500	5900	3579/3525	0.805
44.450	82.931	23.813	25.400	19.050	3.6	1.6	760.000	980.000	4500	6000	25580/20	0.560
	83.058	23.813	25.400	19.050	3.5	3.3	760.000	980.000	4500	6000	25580/21	0.540
	93.264	30.163	30.302	23.812	3.5	3.3	102.000	134.000	4000	5300	3782/20	0.961
	88.900	30.162	29.370	23.020	3.6	3.2	99.600	125.000	4600	6100	HM803149/10	0.843
	92.075	30.162	29.370	23.020	3.8	3.3	95.200	127.000	4500	6000	HM803149/12	0.850
	95.250	30.958	28.575	22.225	3.6	0.8	99.700	12.000	3700	5100	HM903249/10	0.989
	111.125	38.100	36.957	33.338	3.6	3.2	138.000	172.000	3800	5100	535/532	1.830
45.230	79.985	30.559	20.638	15.080	2.0	1.3	55.100	70.800	4800	6300	17887/31	0.402
45.242	73.431	19.558	19.812	15.748	3.6	0.8	55.600	78.100	5100	6700	LM102949/10	0.307
	77.788	19.842	19.842	15.080	3.6	0.8	57.100	73.500	4900	6500	LM603049/11	0.363



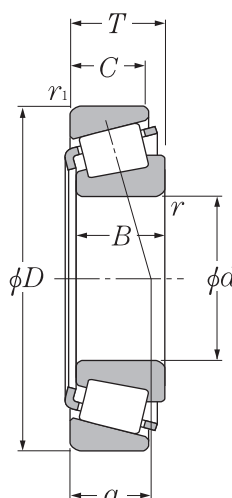
d 45.987~65.088mm

Boundary dimensions							Basic load ratings		Limiting speeds		Bearing numbers	Mass
mm							dynamic	static	min ⁻¹			kg
<i>d</i>	<i>D</i>	<i>T</i>	<i>B</i>	<i>C</i>	<i>r_{s min}</i>	<i>r_{1s min}</i>	<i>C_r</i>	<i>C_{or}</i>	grease	oil		(approx.)
45.987	74.976	18.000	18.000	14.000	2.8	1.0	50.100	71.000	4800	6300	LM503349/10	0.310
45.618	82.931	23.813	25.400	19.050	3.5	0.8	53.900	69.500	4500	6000	25590/20	0.554
46.038	85.000	20.638	21.692	17.462	2.4	1.2	71.800	81.700	4600	6200	359S/354A	0.483
47.625	90.000	20.000	22.225	15.875	3.6	1.2	74.300	87.300	4400	5800	369S/362	0.537
	95.250	30.163	29.370	23.020	3.6	3.2	104.000	140.000	3300	4400	HM804846/10	0.968
50.000	82.000	21.500	21.500	17.000	3.0	0.5	71.700	97.900	4500	6000	JLM104948/10	0.431
	93.264	30.162	30.302	23.812	2.4	0.8	110.000	146.000	4000	4300	50KW01/3720L	0.870
50.800	82.550	21.160	22.225	16.510	3.6	1.2	61.200	84.300	4500	6000	JLM104949/11	0.131
	88.900	20.637	22.225	16.513	3.6	1.2	74.300	87.300	4400	5800	368A/362A	0.494
	92.075	24.607	25.400	19.845	3.6	0.8	84.800	119.000	4200	5600	28580R/21	0.700
	93.264	30.163	30.302	23.812	3.6	3.2	103.000	137.000	4200	5500	3780/20	0.835
52.388	92.075	24.607	25.400	19.845	3.6	0.8	84.800	119.000	4200	5600	28584R/21	0.682
53.975	95.250	27.783	28.575	22.225	2.4	1.0	105.000	137.000	4000	5300	33895/33822	0.820
	111.125	38.100	36.957	33.338	3.6	3.2	138.000	172.000	3800	5100	539/532	1.460
	123.825	36.512	32.791	25.400	2.8	1.2	154.000	188.000	2900	3900	72212/72487	2.030
57.150	96.838	21.000	21.946	15.875	3.6	0.8	80.400	101.000	3900	5200	387A/382A	0.603
	98.425	21.000	21.946	17.826	2.4	0.8	80.400	101.000	3900	5200	387/382	0.652
	104.775	30.162	29.317	24.605	2.4	3.2	109.000	144.000	3700	4900	462/453X	1.060
	104.775	30.162	29.317	24.605	3.6	3.2	109.000	144.000	3700	4900	469/453X	1.050
	112.712	30.163	30.162	23.812	3.2	2.4	142.000	204.000	3200	4300	39581/39520	1.400
63.500	110.000	22.000	21.996	18.824	3.2	2.2	88.000	118.000	3200	4300	395/394A	0.840
	112.712	30.163	30.048	23.812	3.5	3.3	119.000	174.000	3200	4300	3982/20	1.260
	122.238	38.100	38.354	29.718	7.0	3.3	159.000	146.000	3400	4300	HM212047/11	1.930
	130.048	36.512	36.170	28.575	3.5	0.8	146.000	216.000	3000	4000	565/562	0.620
65.088	135.755	53.975	56.007	44.450	3.6	3.2	266.000	357.000	3000	4000	6379/6320	3.710

Taper Roller Bearings

KYK

Inch Series



d 66.675~107.950mm

Boundary dimensions							Basic load ratings		Limiting speeds		Bearing numbers	Mass
mm							dynamic	static	min ⁻¹			kg
<i>d</i>	<i>D</i>	<i>T</i>	<i>B</i>	<i>C</i>	<i>r_{s min}</i>	<i>r_{1s min}</i>	<i>C_r</i>	<i>C_{or}</i>	grease	oil		(approx.)
66.675	112.712	30.163	30.048	23.812	3.6	3.3	119.000	174.000	3200	4300	3984/20	1.180
	122.238	38.100	38.354	29.718	3.6	1.6	191.000	249.000	3200	4300	HM212049/10	1.860
	122.348	38.100	38.354	29.718	3.5	3.3	159.000	146.000	3400	4200	HM212049/11	1.850
69.850	117.475	30.162	30.162	23.812	3.6	3.2	118.000	179.000	3200	4200	33275/462	1.270
	120.000	32.545	32.545	26.195	3.6	3.2	150.000	218.000	3100	4200	47487/20	1.480
	120.000	29.794	29.007	24.237	3.6	2.0	118.000	161.000	3200	4200	482/472	1.280
	127.000	36.512	36.170	28.575	3.6	3.2	156.000	226.000	3000	4000	566/563	1.890
70.000	130.000	57.000	56.000	35.000	3.2	2.8	209.000	300.000	2400	3400	534565/528983	2.775
73.025	112.712	25.400	25.400	19.050	3.6	3.2	97.000	155.000	3200	4300	29685/20	0.872
76.200	133.350	33.337	33.338	26.195	3.6	3.3	153.000	235.000	2600	3500	47679/20	1.920
	139.992	36.513	36.098	28.575	3.6	3.2	175.000	262.000	2700	3600	575/572	2.410
82.550	125.412	25.400	25.400	19.845	3.6	1.6	101.000	162.000	2900	3800	27687/20	1.050
	139.992	36.513	36.098	28.575	3.6	3.2	175.000	262.000	2700	3600	580/572	2.190
85.026	150.089	44.450	46.672	36.512	3.6	3.2	264.000	368.000	2500	3400	749/742	3.180
85.725	133.350	30.163	29.769	22.225	3.6	3.2	133.000	198.000	2700	3600	497/492A	1.410
	146.050	41.275	41.275	31.750	3.6	3.2	220.000	320.000	2200	3200	665/653	2.600
88.900	152.400	39.688	36.322	33.338	3.5	3.3	180.000	279.000	2300	3100	593/592	2.780
	161.925	47.625	48.260	38.100	3.6	3.2	273.000	391.000	2400	3200	759/752	4.100
	161.925	53.974	55.100	42.862	2.8	2.2	330.000	510.000	2000	3000	6580/6535	4.800
89.974	146.975	40.000	40.000	32.500	7.1	3.6	206.000	310.000	2500	3300	HM218248/10	2.440
92.075	152.400	39.688	36.322	30.162	6.4	3.3	211.000	315.000	1900	2800	598A/592A	2.670
95.250	152.400	39.688	36.322	30.162	5.2	0.8	183.000	287.000	2400	3300	594A/592A	2.070
	168.275	41.275	41.275	30.162	3.6	3.2	224.000	349.000	2200	3000	683/672	3.680
107.950	158.750	23.020	21.438	15.875	3.6	3.2	104.000	169.000	2200	3000	37425/625	1.380