

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

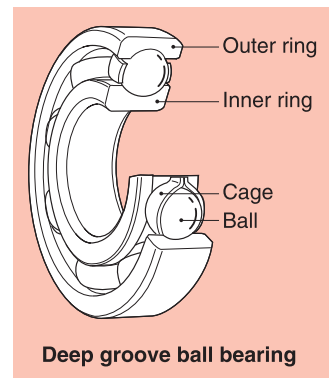
Rolling bearings divide into two main classifications: ball bearings and roller bearings. Ball bearings are classified according to their bearing ring configurations: deep groove type and angular contact type. Roller bearings on the other hand are classified according to the shape of the rollers: cylindrical, 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

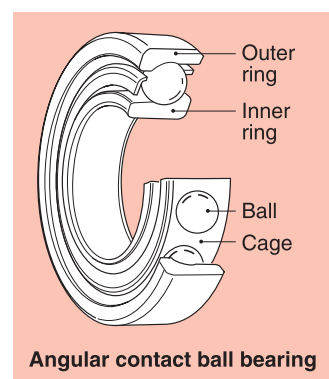
Deep groove ball bearings

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.



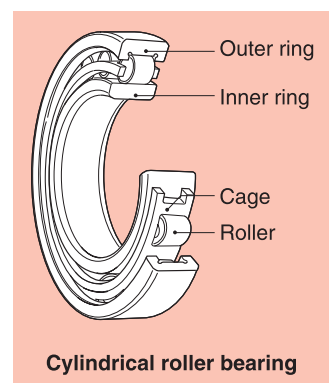
Angular contact ball bearings

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.



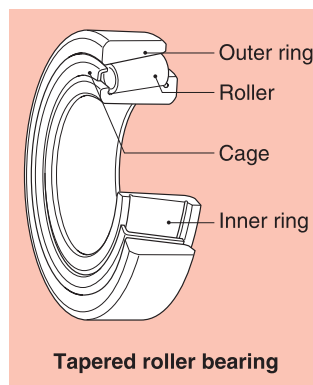
Cylindrical roller bearings

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.



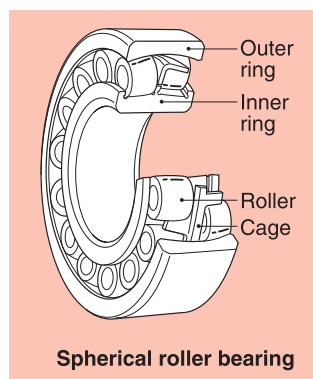
Tapered roller bearings

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

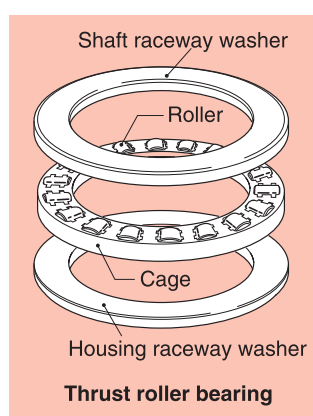
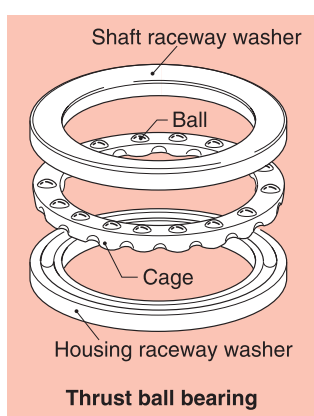
Spherical roller bearings are equipped with an outer ring with a spherical raceway surface and an inner ring which holds two rows of barrel shaped rolling elements, spherical roller bearings are able to adjust center alignment to handle inclination of the axle or shaft. There are varieties of bearing 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

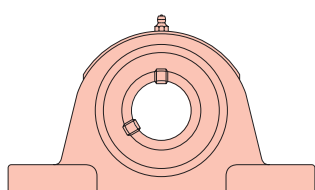
Thrust bearings are classified in accordance to the rolling elements they contain and generally the allowable rotational speed is very low.

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.

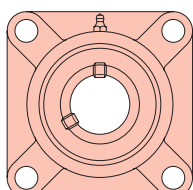


Ball Bearing unit

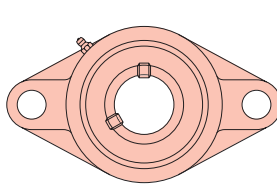
A ball bearing unit is comprised of a ball bearing inserted into various types of housings. The housing can be bolted onto machinery and the inner ring can be easily mounted on the shaft with a set screw. This means the bearing unit can support rotating equipment without special design to allow for mounting. 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



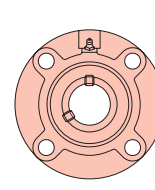
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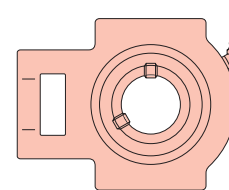
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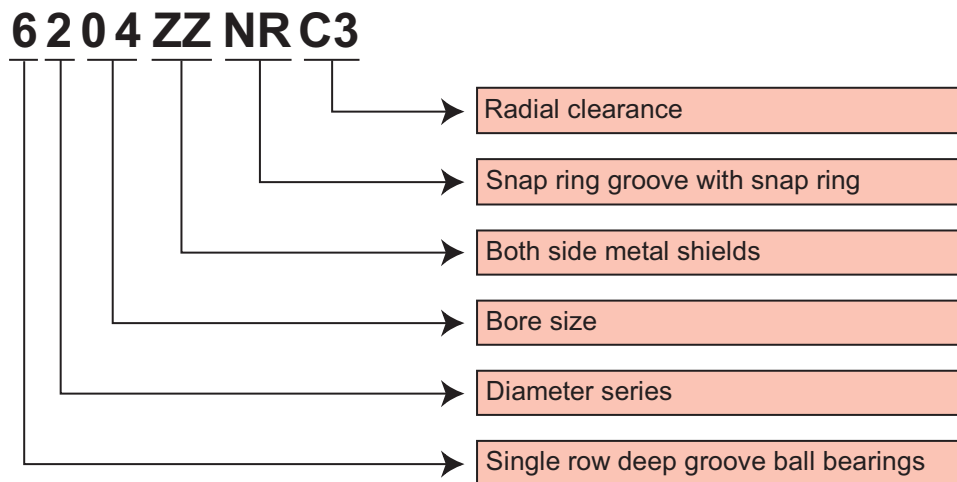


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Bearing Designation, prefix and suffix

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

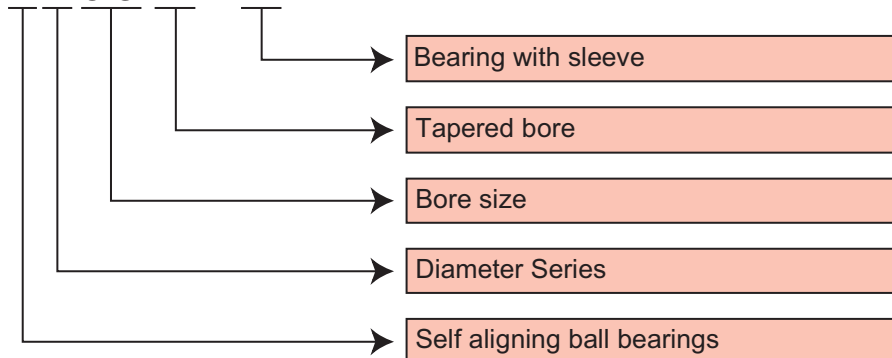


Bearing type	Bearing series	Diameter series
Single row ball bearings	68,69,160,60,62,63,64,622,623	8,9,0,0,2,3,4,2,3
Double row ball bearings	42,43	2,3

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

1 2 0 9 K + H

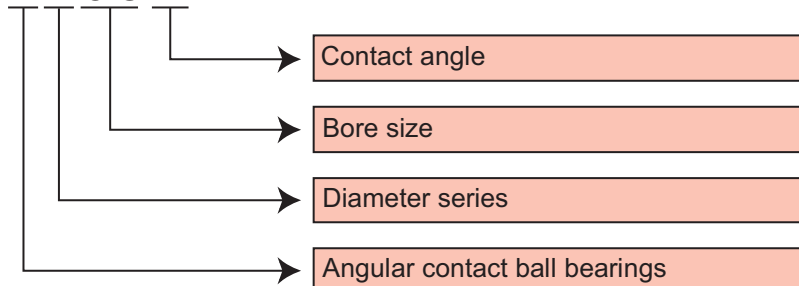


Bearing type	Bearing Series	Diameter series
Self aligning ball bearings	12,22,13,23	2,2,3,3

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

Angular Contact ball bearings

7 2 0 5 B

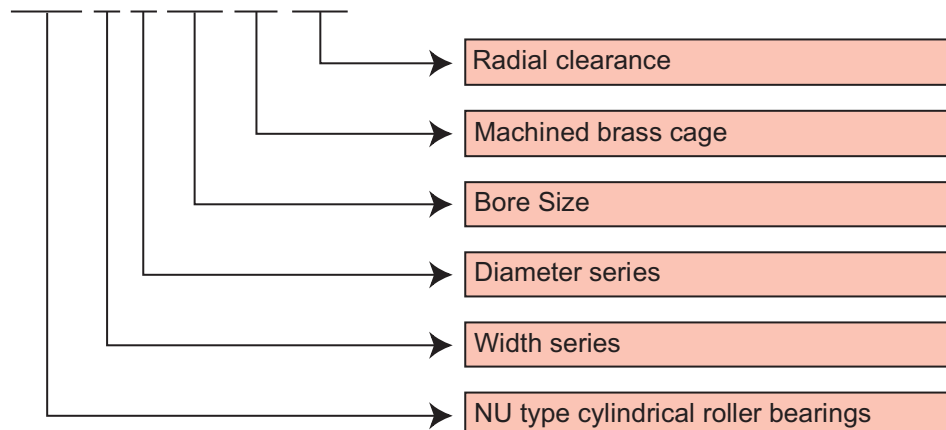


Bearing type	Bearing Series	Diameter series
Angular contact ball bearings	72,73	2,3
Double row angular contact ball bearing with filling slot (maximum capacity)	32,33	2,3
Double row angular contact ball bearing without filling slot	52,53	2,3

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

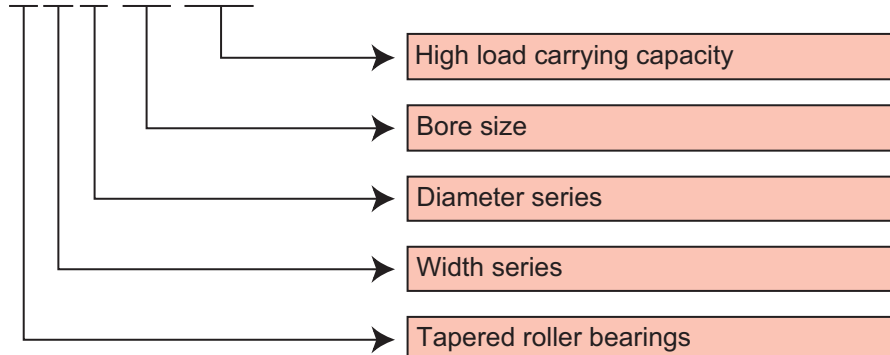


Bearing type	Bearing series	Diameter series
Cylindrical roller bearing	2,22,3,32	2,2,3,3

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

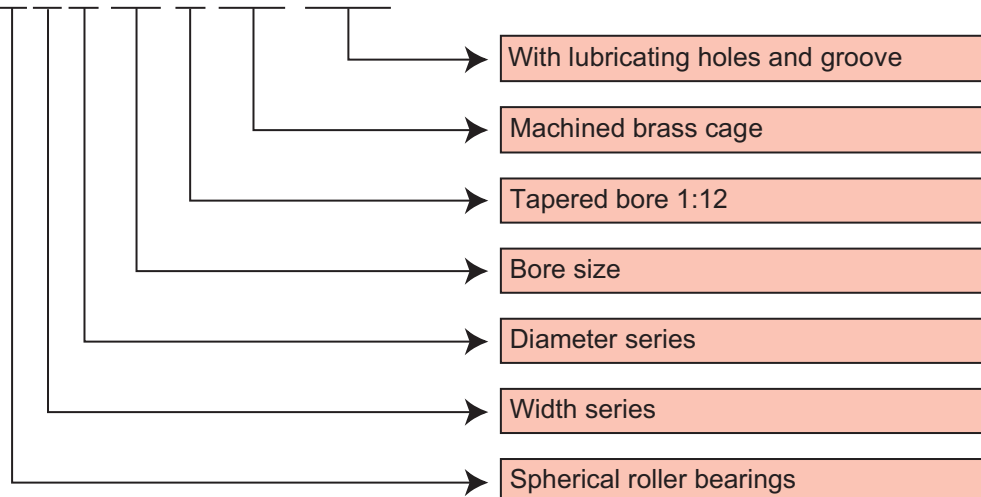


Bearing type	Bearing Series	Diameter series
Taper roller bearing	320,330,331,302,322,332,303,313,323	0,0,1,2,2,2,3,3,3

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

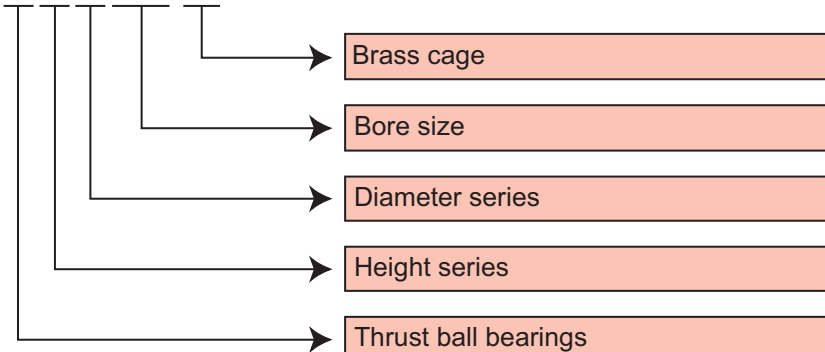


Bearing type	Bearing Series	Diameter series
Spherical roller bearings	239,230,240,231,241,222,232,213,223,	9,0,0,1,1,2,2,3,3

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}				
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	normal				modified				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	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_b			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
max		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	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	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	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	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	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	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	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	2.5
—	—	23	15	8	6	4	50	25	15	10	7	11	7	4	15	10	7			10	7	4	4
—	—	26	19	9	7	4	60	30	18	11	7	13	8	5	18	10	7			11	7	5	5
—	—	30	21	10	8	5	70	35	20	13	8	13	10	7	20	13	8			13	8	7	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 Δ_{dmp}								Bore diameter variation V_{dp}				Mean bore diameter variation V_{dmp}				Inner ring radial runout K_{ia}				Side runout with bore S_d	
over	incl.	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 0,6X	class 6	class 5	class 4
		high	low	high	low	high	low																
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 Δ_{Dmp}								Outside diameter variation V_{Dp}				Mean bore diameter variation V_{Dmp}				Outer ring radial runout K_{ea}				Outside surface inclination S_D	
over	incl.	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 0,6X	class 6	class 5	class 4
		high	low	high	low	high	low																
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 Δ_{T1s}				Tapered roller bearing outer ring effective width deviation Δ_{T2s}			
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

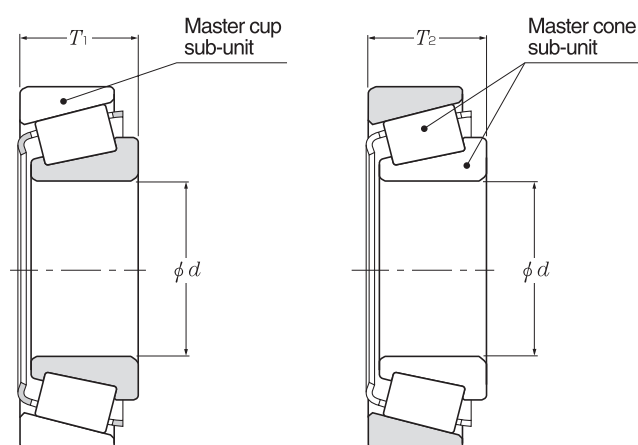


Table c Tolerance of tapered roller bearings (Inch series)

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 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"

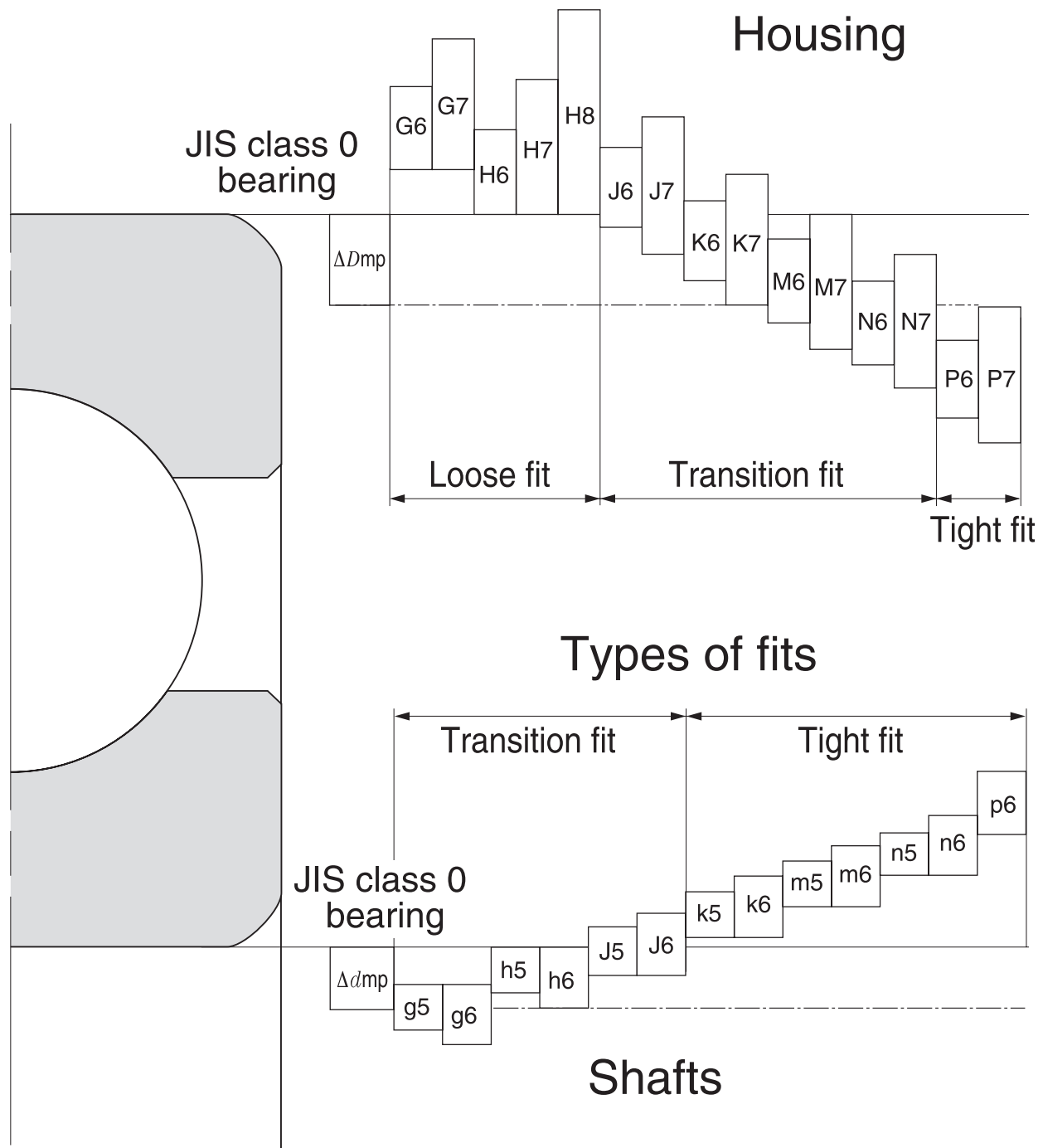
- (1) For raceways under rotating loads, a tight fit is necessary. "Raceways under rotating loads" refers to raceways receiving loads rotating relative to their radial direction. For raceways under static loads, on the other hand, a loose fit is sufficient.
- (2) For non-separable bearings, such as deep 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 65 100 100 140 280	— 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		When greater accuracy is required use g5. For large bearings, f6 will suffice for to facilitate movement.
					Overall shaft diameter							h6		
	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

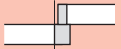
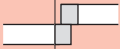
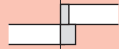
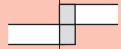
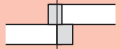
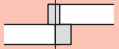
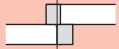
Bearing type	Load conditions	Fit	Tolerance class	Remarks
All thrust bearings	Centered axial load only	Loose fit		Select a tolerance class that will provide clearance between outer ring and housing.
			H8	Greater accuracy required with thrust ball bearings
Spherical roller thrust bearings	Combined load	Outer ring static load	H7	—
		Indeterminate load or outer ring rotating load	Transition fit	
			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.

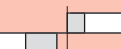
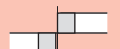
Fits for electric motor bearings

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 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															
355 400	0 -40	22T ~ 43L		22T ~ 54L		40T ~ 25L		40T ~ 36L		47T ~ 18L		52.5T ~ 12.5L		58T ~ 18L	
400 450															
450 500															
400 450	0 -45	25T ~ 47L		25T ~ 60L		45T ~ 27L		45T ~ 40L		52T ~ 20L		58.5T ~ 13.5L		65T ~ 20L	
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 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		120 140
														115T~ 65T		140 160
														118T~ 68T		160 180
44.5T~14.5L		54T~4T		63T~4T		67T~17T		76T~17T		90T~31T		109T~50T		136T~ 77T		180 200
														139T~ 80T		200 225
														143T~ 84T		225 250
51T ~16L		62T~4T		71T~4T		78T~20T		87T~20T		101T~34T		123T~56T		161T~ 94T		250 280
														165T~ 98T		280 315
58T ~18L		69T~4T		80T~4T		86T~21T		97T~21T		113T~37T		138T~62T		184T~108T		315 355
														190T~114T		355 400
65T ~20L		77T~5T		90T~4T		95T~23T		108T~23T		125T~40T		153T~68T		211T~126T		400 450
														217T~132T		450 500

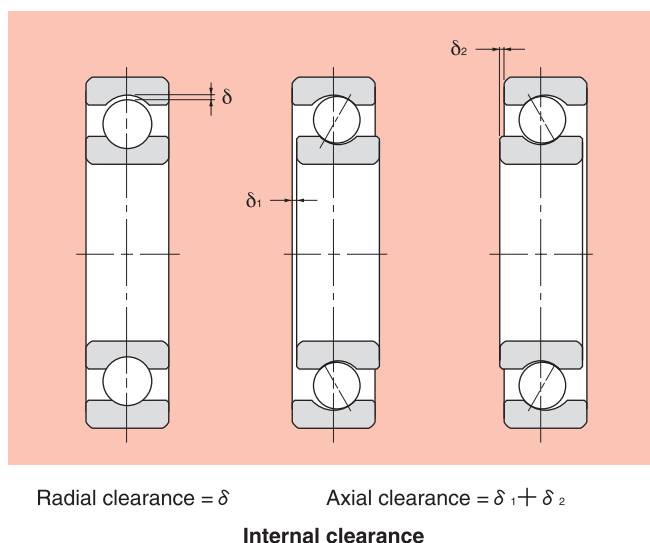
Unit μm

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 d 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 d 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

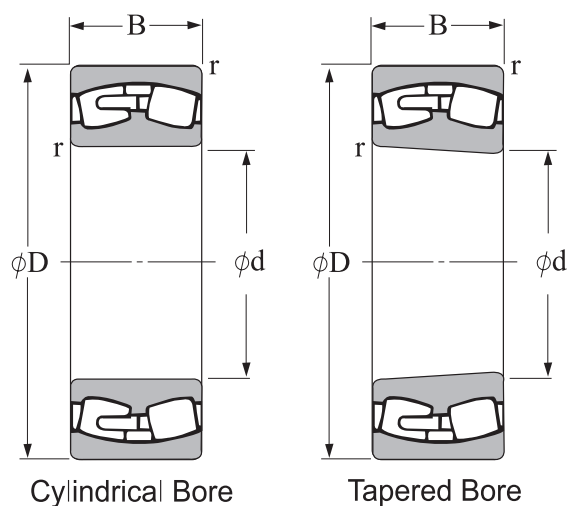
μm/s

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

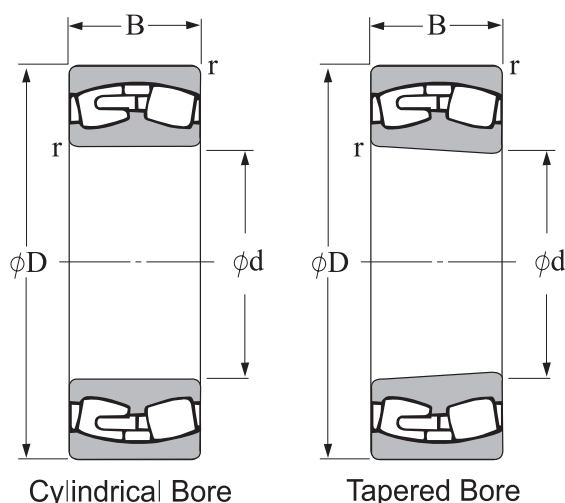
dB

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 25~40mm

Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers	Adapter sleeve	Mass kg (approx.)
mm				dynamic	static	dynamic	static	min ⁻¹				
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_{s min}</i>	<i>C_r</i> kN	<i>C_{or}</i>	<i>C_r</i> kgf	<i>C_{or}</i>	grease	oil			
25	52	18	1.0	35.80	34.70	3,652	3,539	7500	10000	22205CC		0.175
	52	18	1.0	35.80	34.70	3,652	3,539	7500	10000	22205CK	H305	0.175
	52	18	1.0	35.80	34.70	3,652	3,539	7000	9800	22205KMBW33	H305	0.176
	52	18	1.0	35.80	34.70	3,652	3,539	7000	9800	22205MBW33		0.177
30	72	19	1.1	51.50	49.40	5,253	5,039	5800	7800	21306CC		0.420
	72	19	1.1	51.50	49.40	5,253	5,039	5800	7800	21306CK	H306	0.420
	72	19	1.1	51.50	49.40	5,253	5,039	5200	7400	21306KMBW33	H306	0.420
	72	19	1.1	51.50	49.40	5,253	5,039	5200	7400	21306MBW33		0.420
	62	20	1.0	49.40	48.70	5,039	4,967	6300	8500	22206CC		0.280
	62	20	1.0	49.40	48.70	5,039	4,967	6300	8500	22206CK	H306	0.280
	62	20	1.0	49.40	48.70	5,039	4,967	6000	8000	22206KMBW33	H306	0.280
	62	20	1.0	49.40	48.70	5,039	4,967	6000	8000	22206MBW33		0.290
35	80	21	1.5	63.10	61.30	6,436	6,253	5000	6700	21307CC		0.560
	80	21	1.5	63.10	61.30	6,436	6,253	5000	6700	21307CK	H307	0.560
	80	21	1.5	63.10	61.30	6,436	6,253	5000	6700	21307KMBW33	H307	0.560
	80	21	1.5	63.10	61.30	6,436	6,253	4500	6000	21307MBW33		0.560
	72	23	1.1	68.70	70.30	7,007	7,171	5300	7000	22207CC		0.430
	72	23	1.1	68.70	70.30	7,007	7,171	5300	7000	22207CK	H307	0.430
	72	23	1.1	68.70	70.30	7,007	7,171	5000	6600	22207KMBW33	H307	0.450
	72	23	1.1	68.70	70.30	7,007	7,171	5000	6600	22207MBW33		0.450
	80	31	1.5	105.00	107.00	10,710	10,914	5100	6700	22307CC		0.733
	80	31	1.5	105.00	107.00	10,710	10,914	5100	6700	22307CK	H2307	0.733
	80	31	1.5	105.00	107.00	10,710	10,914	5100	6700	22307KMBW33	H2307	0.733
	80	31	1.5	105.00	107.00	10,710	10,914	5100	6000	22307MBW33		0.733
40	90	23	1.5	82.80	82.20	8,446	8,384	4500	6000	21308CC		0.710
	90	23	1.5	82.80	82.20	8,446	8,384	4500	6000	21308CK	H308	0.700
	90	23	1.5	82.80	82.20	8,446	8,384	4200	5600	21308KMBW33	H308	0.750
	90	23	1.5	82.80	82.20	8,446	8,384	4200	5800	21308MBW33		0.750
	80	23	1.1	77.50	81.50	7,905	8,313	4800	6300	22208CC		0.520
	80	23	1.1	77.50	81.50	7,905	8,313	4800	6300	22208CK	H308	0.510
	80	23	1.1	77.50	81.50	7,905	8,313	4800	6000	22208KMBW33	H308	0.550
	80	23	1.1	77.50	81.50	7,905	8,313	4500	6000	22208MBW33		0.550
	90	33	1.5	125.00	134.00	12,750	13,668	4300	5600	22308CC		1.100
	90	33	1.5	125.00	134.00	12,750	13,668	4300	5600	22308CK	H2308	1.000

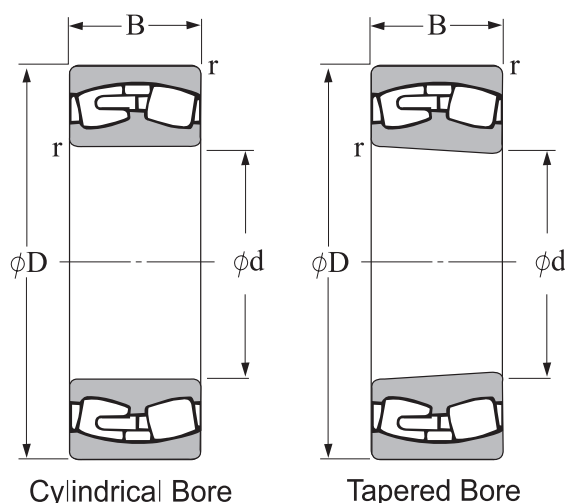


Cylindrical Bore

Tapered Bore

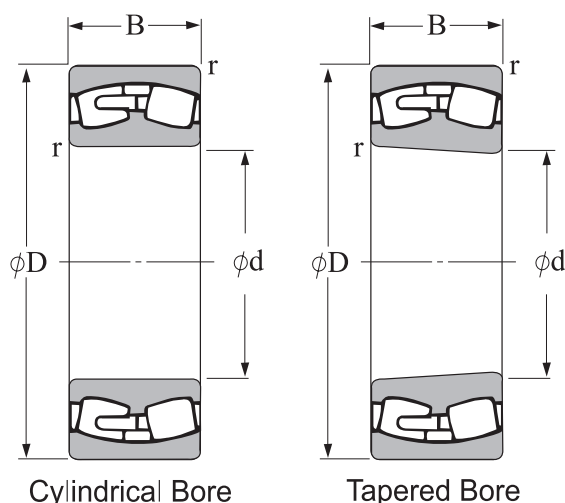
d 40~55mm

Boundary dimensions				Basic load ratings			Limiting speeds			Bearing numbers	Adapter sleeve	Mass kg (approx.)
mm				dynamic	static	dynamic	static	min ⁻¹				
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_{s min}</i>	<i>C_r</i> kN	<i>C_{or}</i>	<i>C_r</i> kgf	<i>C_{or}</i>	grease	oil			
40	90	33	1.5	125.00	134.00	12,750	13,668	3800	5000	22308KMBW33	H2308	1.200
	90	33	1.5	125.00	134.00	12,750	13,668	3800	5000	22308MBW33		1.200
45	100	25	1.5	102.00	103.00	10,404	10,506	4000	5300	21309CC	H309	0.950
	100	25	1.5	102.00	103.00	10,404	10,506	4000	5300	21309CK		0.940
	100	25	1.5	102.00	103.00	10,404	10,506	3800	5000	21309KMBW33		1.020
	100	25	1.5	102.00	103.00	10,404	10,506	3800	5000	21309MBW33		1.020
	85	23	1.1	82.30	85.90	8,395	8,762	4500	6000	22209CC	H309	0.560
	85	23	1.1	82.30	85.90	8,395	8,762	4500	6000	22209CK		0.550
	85	23	1.1	82.30	85.90	8,395	8,762	4300	5800	22209KMBW33		0.550
	85	23	1.1	82.30	85.90	8,395	8,762	4300	5800	22209MBW33		0.590
	100	36	1.5	150.00	156.00	15,300	15,912	3800	5000	22309CC	H2309	1.350
	100	36	1.5	150.00	156.00	15,300	15,912	3800	5000	22309CK		1.300
	100	36	1.5	150.00	156.00	15,300	15,912	3400	4500	22309KMBW33		1.360
	100	36	1.5	150.00	156.00	15,300	15,912	3400	4500	22309MBW33		1.360
50	110	27	2.0	121.00	124.00	12,342	12,648	3600	4800	21310CC	H310	1.250
	110	27	2.0	121.00	124.00	12,342	12,648	3600	4800	21310CK		1.200
	110	27	2.0	121.00	124.00	12,342	12,648	3200	4500	21310KMBW33		1.300
	110	27	2.0	121.00	124.00	12,342	12,648	3200	4500	21310MBW33		1.300
	90	23	1.1	87.40	93.90	8,915	9,578	4000	5300	22210CC	H310	0.610
	90	23	1.1	87.40	93.90	8,915	9,578	4000	5300	22210CK		0.600
	90	23	1.1	87.40	93.90	8,915	9,578	3700	5000	22210KMBW33		0.870
	90	23	1.1	87.40	93.90	8,915	9,578	3700	5000	22210MBW33		0.870
	110	40	2.0	184.00	203.00	18,768	20,706	3400	4500	22310CC	H2310	1.850
	110	40	2.0	184.00	203.00	18,768	20,706	3400	4500	22310CK		1.800
	110	40	2.0	184.00	203.00	18,768	20,706	3000	4000	22310KMBW33		1.840
	110	40	2.0	184.00	203.00	18,768	20,706	3000	4000	22310MBW33		1.840
55	120	29	2.0	158.00	191.00	16,116	19,482	3200	4300	21311CC	H311	1.650
	120	29	2.0	158.00	191.00	16,116	19,482	3200	4300	21311CK		1.600
	120	29	2.0	158.00	191.00	16,116	19,482	3000	4000	21311KMBW33		1.650
	120	29	2.0	158.00	191.00	16,116	19,482	2800	3600	21311MBW33		2.430
	100	25	1.5	109.00	118.00	11,118	12,036	3800	5000	22211CC	H311	0.820
	100	25	1.5	109.00	118.00	11,118	12,036	3800	500	22211CK		0.800
	100	25	1.5	109.00	118.00	11,118	12,036	3500	4700	22211KMBW33		0.860
	100	25	1.5	109.00	118.00	11,118	12,036	3500	4700	22211MBW33		0.860



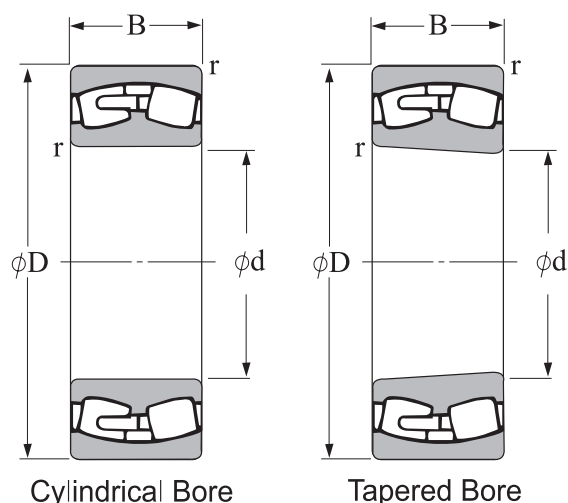
d 55~70mm

Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers	Adapter sleeve	Mass kg (approx.)
mm				dynamic	static	dynamic	static	min ⁻¹				
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_{s min}</i>	<i>C_r</i> kN	<i>C_{or}</i>	<i>C_r</i> kgf	<i>C_{or}</i>	grease	oil			
55	120	43	2.0	205.00	241.00	20,910	24,582	3000	4000	22311CC		2.350
	120	43	2.0	205.00	241.00	20,910	24,582	3000	4000	22311CK	H2311	2.300
	120	43	2.0	205.00	241.00	20,910	24,582	2800	3600	22311KMBW33	H2311	2.430
	120	43	2.0	205.00	241.00	20,910	24,582	2800	3600	22311MBW33		2.430
60	130	31	2.1	173.00	204.00	17,646	20,808	3400	4500	21312CC		1.950
	130	31	2.1	173.00	204.00	17,646	20,808	3000	4000	21312CK	H312	1.900
	130	31	2.1	173.00	204.00	17,646	20,808	3100	4100	21312KMBW33	H312	2.100
	130	31	2.1	173.00	204.00	17,646	20,808	3100	4100	21312MBW33		2.100
	110	28	1.5	130.00	144.00	13,260	14,688	3400	4500	22212CC		1.160
	110	28	1.5	130.00	144.00	13,260	14,688	3400	4500	22212CK	H312	1.100
	110	28	1.5	130.00	144.00	13,260	14,688	3100	4200	22212KMBW33	H312	1.220
	110	28	1.5	130.00	144.00	13,260	14,688	3100	4200	22212MBW33		1.220
	130	46	2.1	239.00	279.00	24,378	28,458	2800	3800	22312CC		2.950
	130	46	2.1	239.00	279.00	24,378	28,458	2800	3800	22312CK	H2312	2.850
	130	46	2.1	239.00	279.00	24,378	28,458	2600	3400	22312KMBW33	H2312	2.980
	130	46	2.1	239.00	279.00	24,378	28,458	2600	3400	22312MBW33		2.980
65	140	33	2.1	198.00	239.00	20,196	24,378	2800	3800	21313CC		2.450
	140	33	2.1	198.00	239.00	20,196	24,378	2800	3800	21313CK	H313	2.400
	140	33	2.1	198.00	239.00	20,196	24,378	2300	3500	21313KMBW33	H313	2.570
	140	33	2.1	198.00	239.00	20,196	24,378	2300	3500	21313MBW33		2.570
	120	31	1.5	149.00	190.00	15,198	19,380	3000	4000	22213CC		1.450
	120	31	1.5	149.00	190.00	15,198	19,380	3000	4000	22213CK	H313	1.400
	120	31	1.5	149.00	190.00	15,198	19,380	2800	3600	22213KMBW33	H313	1.730
	120	31	1.5	149.00	190.00	15,198	19,380	2800	3600	22213MBW33		1.730
	140	48	2.1	262.00	309.00	26,724	31,518	2800	3600	22313CC		3.550
	140	48	2.1	262.00	309.00	26,724	31,518	2800	3600	22313CK	H2313	3.450
	140	48	2.1	262.00	309.00	26,724	31,518	2400	3200	22313KMBW33	H2313	3.510
	140	48	2.1	262.00	309.00	26,724	31,518	2400	3200	22313MBW33		3.510
70	150	35	2.1	231.00	286.00	23,562	29,172	2600	3400	21314CC		3.100
	150	35	2.1	231.00	286.00	23,562	29,172	2600	3400	21314CK	H314	3.000
	150	35	2.1	231.00	286.00	23,562	29,172	2200	3000	21314KMBW33	H314	3.110
	150	35	2.1	231.00	286.00	23,562	29,172	2200	3000	21314MBW33		3.110
	125	31	1.5	161.00	208.00	16,422	21,216	2800	3800	22214CC		1.550
	125	31	1.5	161.00	208.00	16,422	21,216	2800	3800	22214CK	H314	1.500



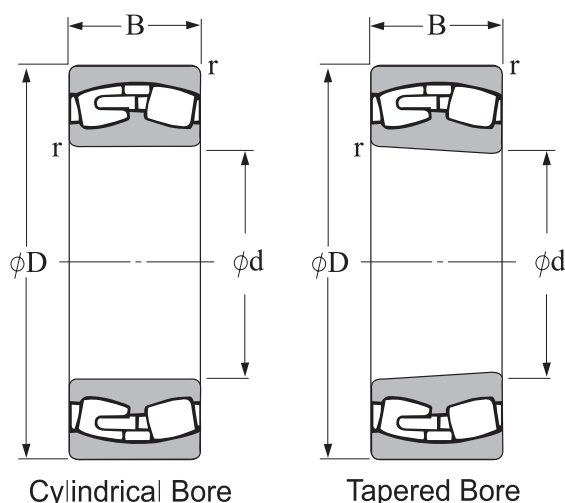
d 70~85mm

Boundary dimensions				Basic load ratings			Limiting speeds			Bearing numbers	Adapter sleeve	Mass kg (approx.)
mm				dynamic	static	dynamic	static	min ⁻¹				
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_{s min}</i>	<i>C_r</i> kN	<i>C_{or}</i>	<i>C_r</i> kgf	<i>C_{or}</i>	grease	oil			
70	125	31	1.5	161.00	208.00	16,422	21,216	2200	3300	22214KMBW33	H314	1.660
	125	31	1.5	161.00	208.00	16,422	21,216	2200	3300	22214MBW33		1.660
	150	51	2.1	311.00	364.00	31,722	37,128	2400	3200	22314CC	H2314	4.350
	150	51	2.1	311.00	364.00	31,722	37,128	2400	3200	22314CK		4.300
	150	51	2.1	311.00	364.00	31,722	37,128	2200	2800	22314KMBW33	H2314	4.300
	150	51	2.1	311.00	364.00	31,722	37,128	2200	2800	22314MBW33		4.300
75	160	37	2.1	250.00	312.00	25,500	31,824	2400	3200	21315CC	H315	3.550
	160	37	2.1	250.00	312.00	25,500	31,824	2400	3200	21315CK		3.500
	160	37	2.1	250.00	312.00	25,500	31,824	2100	2900	21315KMBW33	H315	3.760
	160	37	2.1	250.00	312.00	25,500	31,824	2100	2900	21315MBW33		3.760
	130	31	1.5	167.00	221.00	17,034	22,542	2800	3800	22215CC	H315	1.650
	130	31	1.5	167.00	221.00	17,034	22,542	2800	3800	22215CK		1.600
	130	31	1.5	167.00	221.00	17,034	22,542	2600	3400	22215KMBW33	H315	1.720
	130	31	1.5	167.00	221.00	17,034	22,542	2600	3400	22215MBW33		1.720
	160	55	2.1	342.00	412.00	34,884	42,024	2200	3000	22315CC	H2315	5.250
	160	55	2.1	342.00	412.00	34,884	42,024	2200	3000	22315CK		5.150
	160	55	2.1	342.00	412.00	34,884	42,024	2200	2800	22315KMBW33	H2315	5.260
	160	55	2.1	342.00	412.00	34,884	42,024	2200	2800	22315MBW33		5.260
80	170	39	2.1	256.00	316.00	26,112	32,232	2200	3000	21316CC	H316	4.250
	170	39	2.1	256.00	316.00	26,112	32,232	2200	3000	21316CK		4.200
	170	39	2.1	256.00	316.00	26,112	32,232	1800	2400	21316KMBW33	H316	6.200
	170	39	2.1	256.00	316.00	26,112	32,232	1800	2400	21316MBW33		6.200
	140	33	2.0	201.00	249.00	20,502	25,398	2600	3400	22216CC	H316	2.050
	140	33	2.0	201.00	249.00	20,502	25,398	2600	3400	22216CK		2.050
	140	33	2.0	201.00	249.00	20,502	25,398	2200	3000	22216KMBW33	H316	2.140
	140	33	2.0	201.00	249.00	20,502	25,398	2200	3000	22216MBW33		2.140
	170	58	2.1	392.00	480.00	39,984	48,960	2000	2600	22316CC	H2316	6.290
	170	58	2.1	392.00	480.00	39,984	48,960	2000	2600	22316CK		6.290
	170	58	2.1	392.00	480.00	39,984	48,960	1800	2400	22316KMBW33	H2316	6.100
	170	58	2.1	392.00	480.00	39,984	48,960	1800	2400	22316MBW33		6.200
85	180	41	3.0	304.00	387.00	31,008	39,474	2200	2800	21317CC	H317	5.100
	180	41	3.0	304.00	387.00	31,008	39,474	2200	2800	21317CK		5.000
	180	41	3.0	304.00	387.00	31,008	39,474	1900	2400	21317KMBW33	H317	5.230
	180	41	3.0	304.00	387.00	31,008	39,474	1900	2400	21317MBW33		5.230



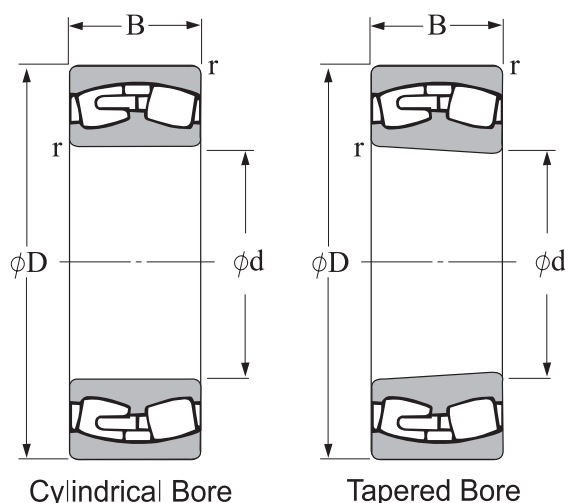
d 85~95mm

Boundary dimensions				Basic load ratings			Limiting speeds			Bearing numbers	Adapter sleeve	Mass kg (approx.)
mm				dynamic	static	dynamic	static	min ⁻¹				
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_{s min}</i>	<i>C_r</i> kN	<i>C_{or}</i> kgf	<i>C_r</i> kgf	<i>C_{or}</i> kgf	grease	oil			
85	150	36	2.0	224.00	285.00	22,848	29,070	2400	3200	22217CC		2.570
	150	36	2.0	224.00	285.00	22,848	29,070	2400	3200	22217CK	H317	2.500
	150	36	2.0	224.00	285.00	22,848	29,070	2200	2800	22217KMBW33	H317	2.780
	150	36	2.0	224.00	285.00	22,848	29,070	2200	2800	22217MBW33		2.780
	180	60	3.0	397.00	481.00	40,494	49,062	1800	2400	22317CC		8.590
	180	60	3.0	397.00	481.00	40,494	49,062	1800	2400	22317CK	H2317	8.590
	180	60	3.0	397.00	481.00	40,494	49,062	1700	2200	22317KMBW33	H2317	7.200
	180	60	3.0	397.00	481.00	40,494	49,062	1700	2200	22317MBW33		7.220
90	190	43	3.0	347.00	443.00	35,394	45,186	2200	2800	21318CC		5.800
	190	43	3.0	347.00	443.00	35,394	45,186	2200	2800	21318CK	H318	5.700
	190	43	3.0	347.00	443.00	35,394	45,186	1800	2500	21318KMBW33	H318	6.170
	190	43	3.0	347.00	443.00	35,394	45,186	1800	2500	21318MBW33		6.170
	160	40	2.0	246.00	330.00	25,092	33,660	2200	3000	22218CC		3.400
	160	40	2.0	246.00	330.00	25,092	33,660	2200	300	22218CK	H318	3.200
	160	40	2.0	246.00	330.00	25,092	33,660	2200	2800	22218KMBW33	H318	3.570
	160	40	2.0	246.00	330.00	25,092	33,660	2200	2800	22218MBW33		3.570
	190	64	3.0	458.00	556.00	46,716	56,712	1800	2400	22318CC		8.700
	190	64	3.0	458.00	556.00	46,716	56,712	1800	2400	22318CK	H2318	8.500
	190	64	3.0	458.00	556.00	46,716	56,712	1700	2200	22318KMBW33	H2318	8.690
	190	64	3.0	458.00	556.00	46,716	56,712	1700	2200	22318MBW33		8.690
	160	52.4	2.0	317.00	459.00	32,334	46,818	2200	3000	23218CC		4.400
	160	52.4	2.0	317.00	459.00	32,334	46,818	2200	3000	23218CK	H2318	4.700
	160	52.4	2.0	317.00	459.00	32,334	46,818	1500	2000	23218KMBW33	H2318	4.600
	160	52.4	2.0	317.00	459.00	32,334	46,818	1500	2000	23218MBW33		4.600
95	200	45	3.0	373.00	480.00	38,046	48,960	1900	2600	21319CC		7.150
	200	45	3.0	373.00	480.00	38,046	48,960	1900	2600	21319CK	H319	7.150
	200	45	3.0	373.00	480.00	38,046	48,960	1800	2400	21319KMBW33	H319	7.000
	200	45	3.0	373.00	480.00	38,046	48,960	1800	2400	21319MBW33		7.150
	170	43	2.1	296.00	386.00	30,192	39,372	2200	2800	22219CC		4.260
	170	43	2.1	296.00	386.00	30,192	39,372	2200	2800	22219CK	H319	4.260
	170	43	2.1	296.00	386.00	30,192	39,372	2000	2600	22219KMBW33	H319	4.000
	170	43	2.1	296.00	386.00	30,192	39,372	2000	2600	22219MBW33		4.240
	200	67	3.0	504.00	623.00	51,408	63,546	1700	2200	22319CC		11.300
	200	67	3.0	504.00	623.00	51,408	63,546	1700	2200	22319CK	H2319	11.300
	200	67	3.0	504.00	623.00	51,408	63,546	1500	2000	22319KMBW33	H2319	10.000



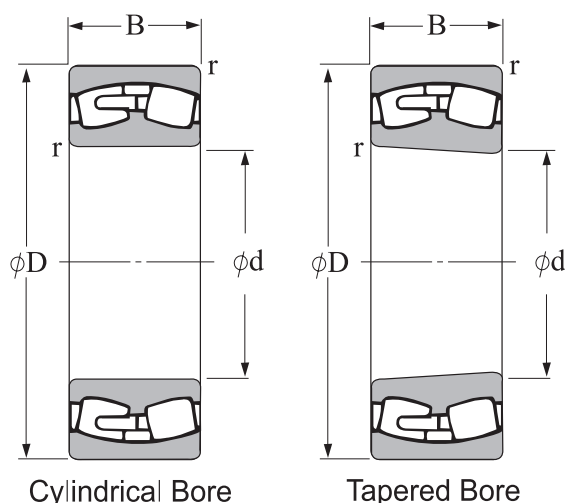
d 95~110mm

Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers	Adapter sleeve	Mass
mm				dynamic	static	dynamic	static	min ⁻¹				
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_{s min}</i>	<i>C_r</i>	<i>C_{or}</i>	<i>C_r</i>	<i>C_{or}</i>	grease	oil			kg
					kN	kgf						(approx.)
95	200	67	3.0	504.00	623.00	51,408	63,546	1500	2000	22319MBW33		10.100
	215	47	3.0	414.00	528.00	42,228	53,856	1800	2400	21320CC		8.810
	215	47	3.0	414.00	528.00	42,228	53,856	1800	2400	21320CK	H320	8.810
	215	47	3.0	414.00	528.00	42,228	53,856	1700	2200	21320KMBW33	H320	8.300
	215	47	3.0	414.00	528.00	42,228	53,856	1700	2200	21320MBW33		8.800
	180	46	2.1	335.00	453.00	34,170	46,206	2200	2800	22220CC		5.240
	180	46	2.1	335.00	453.00	34,170	46,206	2200	2800	22220CK	H320	5.240
	180	46	2.1	335.00	453.00	34,170	46,206	2000	2600	22220KMBW33	H320	4.800
	180	46	2.1	335.00	453.00	34,170	46,206	2000	2600	22220MBW33		4.850
	215	73	3.0	579.00	713.00	59,058	72,726	1500	2000	22320CC		13.200
	215	73	3.0	579.00	713.00	59,058	72,726	1500	2000	22320CK	H2320	13.000
	215	73	3.0	579.00	713.00	59,058	72,726	1400	1800	22320KMBW33	H2320	12.700
	215	73	3.0	579.00	713.00	59,058	72,726	1400	1800	22320MBW33		12.700
	165	52	2.0	297.00	493.00	30,294	50,286	2200	3000	23120CC		4.310
	165	52	2.0	297.00	493.00	30,294	50,286	2200	3000	23120CK	H3120	4.310
	165	52	2.0	297.00	493.00	30,294	50,286	2000	2600	23120KMBW33	H3120	4.400
	165	52	2.0	297.00	493.00	30,294	50,286	2000	2600	23120MBW33		4.500
100	180	60.3	2.1	415.00	599.00	42,330	61,098	1700	2200	23220CC		7.340
	180	60.3	2.1	415.00	599.00	42,330	61,098	1700	2200	23220CK	H2320	7.340
	180	60.3	2.1	415.00	599.00	42,330	61,098	1500	2000	23220KMBW33	H2320	6.500
	180	60.3	2.1	415.00	599.00	42,330	61,098	1500	2000	23220MBW33		6.700
	150	50	1.5	251.00	448.00	25,602	45,696	1600	2100	24020CC		3.035
	150	50	1.5	251.00	448.00	25,602	45,696	1600	2100	24020CK		3.035
	150	50	1.5	251.00	448.00	25,602	45,696	1600	2100	24020K30MBW33		3.035
	150	50	1.5	251.00	448.00	25,602	45,696	1600	2100	24020MBW33		3.035
	200	53	2.1	411.00	553.00	41,922	56,406	1900	2500	22222CC		7.250
	200	53	2.1	411.00	553.00	41,922	56,406	1900	2500	22222CK	H322	7.250
	200	53	2.1	411.00	553.00	41,922	56,406	1700	2200	22222KMBW33	H322	7.000
	200	53	2.1	411.00	553.00	41,922	56,406	1700	2200	22222MBW33		7.100
	240	80	3.0	713.00	884.00	72,726	90,168	1400	1900	22322CC		18.000
	240	80	3.0	713.00	884.00	72,726	90,168	1400	1900	22322CK	H2322	17.500
	240	80	3.0	713.00	884.00	72,726	90,168	1300	1700	22322KMBW33	H2322	17.700
	240	80	3.0	713.00	884.00	72,726	90,168	1300	1700	22322MBW33		17.700
	110	170	45	2.0	286.00	478.00	29,172	48,756	2100	2800	23022CC	
170		45	2.0	286.00	478.00	29,172	48,756	2100	2800	23022CK	H3022	3.680



d 110~120mm

Boundary dimensions				Basic load ratings			Limiting speeds			Bearing numbers	Adapter sleeve	Mass kg (approx.)
mm				dynamic	static	dynamic	static	min ⁻¹				
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_{s min}</i>	<i>C_r</i> kN	<i>C_{or}</i>	<i>C_r</i> kgf	<i>C_{or}</i>	grease	oil			
110	170	45	2.0	286.00	478.00	29,172	48,756	2000	2600	23022KMBW33	H3022	3.750
	170	45	2.0	286.00	478.00	29,172	48,756	2000	2600	23022MBW33		3.750
	180	56	2.0	346.00	591.00	35,292	60,282	2000	2600	23122CC	H3122	6.260
	180	56	2.0	346.00	591.00	35,292	60,282	2000	2600	23122CK		6.260
	180	56	2.0	346.00	591.00	35,292	60,282	1800	2400	23122KMBW33	H3122	5.500
	180	56	2.0	346.00	591.00	35,292	60,282	1800	2400	23122MBW33		5.550
	200	69.8	2.1	525.00	786.00	53,550	80,172	1400	1800	23222CC	H2322	10.800
	200	69.8	2.1	525.00	786.00	53,550	80,172	1400	1800	23222CK		10.800
	200	69.8	2.1	525.00	786.00	53,550	80,172	1200	1600	23222KMBW33	H2322	9.500
	200	69.8	2.1	525.00	786.00	53,550	80,172	1200	1600	23222MBW33		9.700
	180	69	2.0	472.00	798.00	48,144	81,396	1600	2000	24122CC		6.630
	180	69	2.0	472.00	798.00	48,144	81,396	1600	2000	24122CK		6.630
	180	69	2.0	472.00	798.00	48,144	81,396	1600	2000	24122K30MBW33		6.630
	180	69	2.0	472.00	798.00	48,144	81,396	1600	2000	24122MBW33		6.630
120	215	58	2.1	492.00	673.00	50,184	68,646	1700	2200	22224CC	H3124	8.700
	215	58	2.1	492.00	673.00	50,184	68,646	1700	2200	22224CK		8.600
	215	58	2.1	492.00	673.00	50,184	68,646	1500	2000	22224KMBW33	H3124	9.040
	215	58	2.1	492.00	673.00	50,184	68,646	1500	2000	22224MBW33		9.040
	260	86	3.0	812.00	1,050.00	82,824	107,100	1300	1700	22324CC	H2324	24.500
	260	86	3.0	812.00	1,050.00	82,824	107,100	1300	1700	22324CK		24.500
	260	86	3.0	812.00	1,050.00	82,824	107,100	1100	1500	22324KMBW33	H2324	21.800
	260	86	3.0	812.00	1,050.00	82,824	107,100	1100	1500	22324MBW33		22.000
	180	46	2.0	299.00	517.00	30,498	52,734	2000	2600	23024CC	H3024	4.250
	180	46	2.0	299.00	517.00	30,498	52,734	2000	2600	23024CK		4.250
	180	46	2.0	299.00	517.00	30,498	52,734	1800	2400	23024KMBW33	H3024	4.100
	180	46	2.0	299.00	517.00	30,498	52,734	1800	2400	23024MBW33		4.200
	200	62	2.0	447.00	760.00	45,594	77,520	1800	2400	23124CC	H3124	7.670
	200	62	2.0	447.00	760.00	45,594	77,520	1800	2400	23124CK		7.670
	200	62	2.0	447.00	760.00	45,594	77,520	1700	2200	23124KMBW33	H3124	7.600
	200	62	2.0	447.00	760.00	45,594	77,520	1700	2200	23124MBW33		7.800
	215	76	2.1	583.00	894.00	59,466	91,188	1300	1700	23224CC	H2324	13.100
	215	76	2.1	583.00	894.00	59,466	91,188	1300	1700	23224CK		13.100
	215	76	2.1	583.00	894.00	59,466	91,188	1100	1500	23224KMBW33	H2324	11.800
	215	76	2.1	583.00	894.00	59,466	91,188	1100	1500	23224MBW33		12.000
	180	60	2.0	391.00	695.00	39,882	70,890	1500	2000	24024CC		5.050
	180	60	2.0	391.00	695.00	39,882	70,890	1500	2000	24024CK		5.050
	180	60	2.0	391.00	695.00	39,882	70,890	1500	2000	24024K30MBW33		5.300

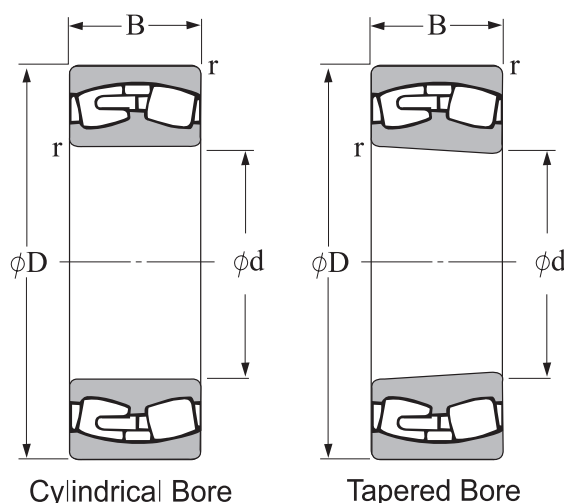


Cylindrical Bore

Tapered Bore

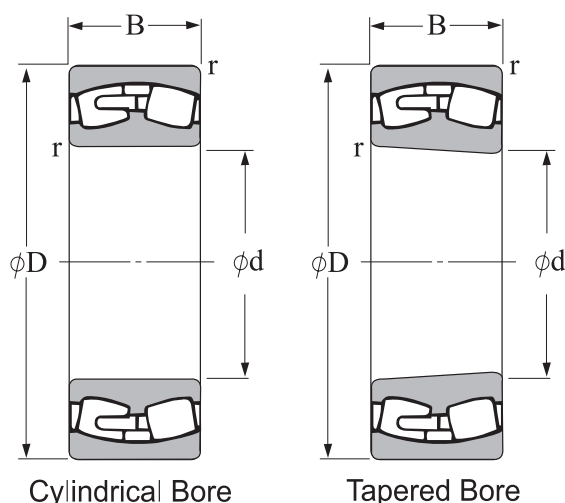
d 120~140mm

Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers	Adapter sleeve	Mass kg (approx.)
mm				dynamic	static	dynamic	static	min ⁻¹				
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_{s min}</i>	<i>C_r</i> kN	<i>C_{or}</i> kgf	<i>C_r</i> kgf	<i>C_{or}</i> kgf	grease	oil			
120	180	60	2.0	391.00	695.00	39,882	70,890	1400	1800	24024MBW33		5.120
	200	80	2.0	592.00	1,028.00	60,384	104,856	1400	1800	24124CC		9.650
	200	80	2.0	592.00	1,028.00	60,384	104,856	1400	1800	24124CK		9.650
	200	80	2.0	592.00	1,028.00	60,384	104,856	1000	1300	24124K30MBW33		10.000
	200	80	2.0	592.00	1,028.00	60,384	104,856	1000	1300	24124MBW33		10.200
130	230	64	3.0	569.00	789.00	58,038	80,478	1700	2200	22226CC		14.000
	230	64	3.0	569.00	789.00	58,038	80,478	1700	2200	22226CK	H3126	14.000
	230	64	3.0	569.00	789.00	58,038	80,478	1500	2000	22226KMBW33	H3126	11.200
	230	64	3.0	569.00	789.00	58,038	80,478	1500	2000	22226MBW33		11.200
	280	93	4.0	948.00	1,200.00	96,696	122,400	1200	1600	22326CC		34.200
	280	93	4.0	948.00	1,200.00	96,696	122,400	1200	1600	22326CK	H2326	34.200
	280	93	4.0	948.00	1,200.00	96,696	122,400	1100	1400	22326KMBW33	H2326	28.300
	280	93	4.0	948.00	1,200.00	96,696	122,400	1100	1400	22326MBW33		28.500
	200	52	2.0	377.00	654.00	38,454	66,708	1800	2400	23026CC		4.590
	200	52	2.0	377.00	654.00	38,454	66,708	1400	1800	23026CK	H3026	7.550
	200	52	2.0	377.00	654.00	38,454	66,708	1700	2200	23026KMBW33	H3026	6.000
	200	52	2.0	377.00	654.00	38,454	66,708	1700	2200	23026MBW33		6.100
	210	64	2.0	506.00	826.00	51,612	84,252	1700	2200	23126CC		9.700
	210	64	2.0	506.00	826.00	51,612	84,252	1700	2200	23126CK	H3126	9.700
	210	64	2.0	506.00	826.00	51,612	84,252	1500	2000	23126KMBW33	H3126	8.300
	210	64	2.0	506.00	826.00	51,612	84,252	1500	2000	23126MBW33		8.550
	230	80	3.0	668.00	1,030.00	68,136	105,060	1300	1700	23226CC		15.800
	230	80	3.0	668.00	1,030.00	68,136	105,060	1300	1700	23226CK	H2326	15.800
	230	80	3.0	668.00	1,030.00	68,136	105,060	1100	1500	23226KMBW33	H2326	13.800
	230	80	3.0	668.00	1,030.00	68,136	105,060	1100	1500	23226MBW33		14.000
	200	69	2.0	486.00	878.00	49,572	89,556	1400	1800	24026CC		7.550
	200	69	2.0	486.00	878.00	49,572	89,556	1400	1800	24026CK		7.550
	200	69	2.0	486.00	878.00	49,572	89,556	1200	1600	24026K30MBW33		7.850
	200	69	2.0	486.00	878.00	49,572	89,556	1200	1600	24026MBW33		7.950
210	80	2.0	603.00	1,061.00	61,506	108,222	1300	1700	24126CC		10.300	
210	80	2.0	603.00	1,061.00	61,506	108,222	1300	1700	24126CK		10.300	
210	80	2.0	603.00	1,061.00	61,506	108,222	900	1200	24126K30MBW33		10.800	
210	80	2.0	603.00	1,061.00	61,506	108,222	900	1200	24126MBW33		11.000	
140	250	68	3.0	658.00	928.00	67,116	94,656	1400	1900	22228CC		14.400
	250	68	3.0	658.00	928.00	67,116	94,656	1400	1900	22228CK	H3128	20.800
	250	68	3.0	658.00	928.00	67,116	94,656	1300	1700	22228KMBW33	H3128	13.800



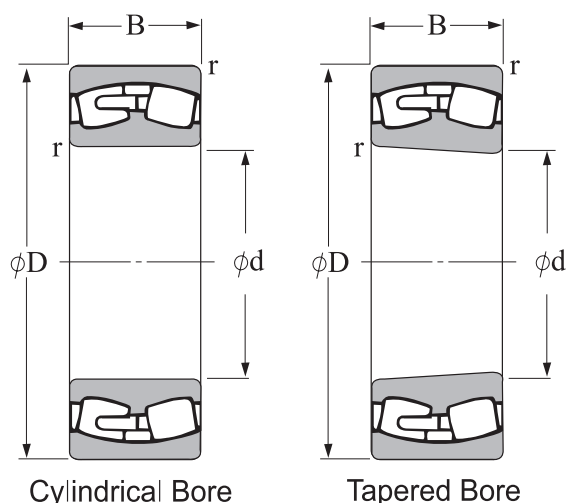
d 140~150mm

Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers	Adapter sleeve	Mass kg (approx.)
mm				dynamic	static	dynamic	static	min ⁻¹				
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_{s min}</i>	<i>C_r</i> kN	<i>C_{or}</i> kN	<i>C_r</i> kgf	<i>C_{or}</i> kgf	grease	oil			
140	250	68	3.0	658.00	928.00	67,116	94,656	1300	1700	22228MBW33		14.000
	300	102	4.0	1,100.00	1,410.00	112,200	143,820	1100	1400	22328CC		45.700
	300	102	4.0	1,100.00	1,410.00	112,200	143,820	1100	1400	22328CK	H2328	45.700
	300	102	4.0	1,100.00	1,410.00	112,200	143,820	1000	1300	22328KMBW33	H2328	34.100
	300	102	4.0	1,100.00	1,410.00	112,200	143,820	1000	1300	22328MBW33		34.500
	210	53	2.0	428.00	737.00	43,656	75,174	1700	2200	23028CC		7.200
	210	53	2.0	428.00	737.00	43,656	75,174	1700	2200	23028CK	H3028	7.200
	210	53	2.0	428.00	737.00	43,656	75,174	1500	2000	23028KMBW33	H3028	6.000
	210	53	2.0	428.00	737.00	43,656	75,174	1500	2000	23028MBW33		6.550
	225	68	2.1	561.00	934.00	57,222	95,268	1500	2000	23128CC		11.800
	225	68	2.1	561.00	934.00	57,222	95,268	1200	1600	23128CK	H3128	12.500
	225	68	2.1	561.00	934.00	57,222	95,268	1400	1800	23128KMBW33	H3128	10.200
	225	68	2.1	561.00	934.00	57,222	95,268	1400	1800	23128MBW33		10.500
	250	88	3.0	787.00	1,230.00	80,274	125,460	1100	1400	23228CC		20.800
	250	88	3.0	787.00	1,230.00	80,274	125,460	1100	1400	23228CK	H2328	20.800
	250	88	3.0	787.00	1,230.00	80,274	125,460	1000	1300	23228KMBW33	H2328	18.200
	250	88	3.0	787.00	1,230.00	80,274	125,460	1000	1300	23228MBW33		18.500
	210	69	2.0	503.00	922.00	51,306	94,044	1300	1700	24028CC		8.010
	210	69	2.0	503.00	922.00	51,306	94,044	1300	1700	24028CK		8.010
	210	69	2.0	503.00	922.00	51,306	94,044	1100	1500	24028K30MBW33		8.350
	210	69	2.0	503.00	922.00	51,306	94,044	1100	1500	24028MBW33		8.450
	225	85	2.1	690.00	1,236.00	70,380	126,072	1200	1600	24128CC		12.500
	225	85	2.1	690.00	1,236.00	70,380	126,072	1200	1600	24128CK		12.500
	225	85	2.1	690.00	1,236.00	70,380	126,072	850	1100	24128K30MBW33		13.000
	225	85	2.1	690.00	1,236.00	70,380	126,072	850	1100	24128MBW33		13.200
150	270	73	3.0	720.00	1,020.00	73,440	104,040	1200	1600	22230KMBW33	H3130	17.710
	270	73	3.0	720.00	1,020.00	73,440	104,040	1200	1600	22230MBW33		18.000
	320	108	4.0	1,230.00	1,600.00	125,460	163,200	1000	1300	22330KMBW33	H2330	43.100
	320	108	4.0	1,230.00	1,600.00	125,460	163,200	1000	1300	22330MBW33		43.500
	225	56	2.1	467.00	812.00	47,634	82,824	1500	2000	23030CC		8.570
	225	56	2.1	467.00	812.00	47,634	82,824	1500	2000	23030CK	H3030	8.570
	225	56	2.1	467.00	812.00	47,634	82,824	1400	1800	23030KMBW33	H3030	7.800
	225	56	2.1	467.00	812.00	47,634	82,824	1400	1800	23030MBW33		7.950
	250	80	2.1	689.00	1,230.00	70,278	125,460	1400	1900	23130CC		15.700
	250	80	2.1	689.00	1,230.00	70,278	125,460	1400	1900	23130CK	H3130	15.700
	250	80	2.1	689.00	1,230.00	70,278	125,460	1300	1700	23130KMBW33	H3130	16.000
	250	80	2.1	689.00	1,230.00	70,278	125,460	1300	1700	23130MBW33		16.300



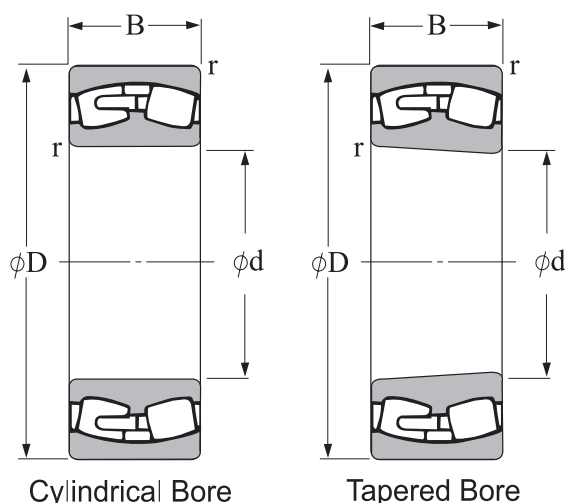
d 150~170mm

Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers	Adapter sleeve	Mass kg (approx.)
mm				dynamic	static	dynamic	static	min ⁻¹				
				kN		kgf						
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_{s min}</i>	<i>C_r</i>	<i>C_{or}</i>	<i>C_r</i>	<i>C_{or}</i>	grease	oil			
150	270	96	3.0	924.00	1,470.00	94,248	149,940	1000	1300	23230KMBW33	H2330	24.000
	270	96	3.0	924.00	1,470.00	94,248	149,940	1000	1300	23230MBW33		24.500
	225	75	2.1	587.00	1,100.00	59,874	112,200	1200	1500	24030CC		10.100
	225	75	2.1	587.00	1,100.00	59,874	112,200	1200	1500	24030CK		10.100
	225	75	2.1	587.00	1,100.00	59,874	112,200	1100	1400	24030K30MBW33		10.500
	225	75	2.1	587.00	1,100.00	59,874	112,200	1100	1400	24030MBW33		10.500
	250	100	2.1	910.00	1,650.00	92,820	168,300	1100	1400	24130CC		19.000
	250	100	2.1	910.00	1,650.00	92,820	168,300	1100	1400	24130CK		19.000
	250	100	2.1	910.00	1,650.00	92,820	168,300	850	1100	24130K30MBW33		19.100
	250	100	2.1	910.00	1,650.00	92,820	168,300	850	1100	24130MBW33		19.500
160	290	80	3.0	885.00	1,270.00	90,270	129,540	1100	1500	22232KMBW33	H3132	22.900
	290	80	3.0	885.00	1,270.00	90,270	129,540	1100	1500	22232MBW33		23.300
	340	114	4.0	1,380.00	1,790.00	140,760	182,580	1000	1200	22332KMBW33	H2332	50.000
	340	114	4.0	1,380.00	1,790.00	140,760	182,580	1000	1200	22332MBW33		50.800
	240	60	2.1	539.00	944.00	54,978	96,288	900	1100	23032KMBW33	H3032	9.500
	240	60	2.1	539.00	944.00	54,978	96,288	900	1100	23032MBW33		9.700
	270	86	2.1	796.00	1,380.00	81,192	140,760	840	1000	23132KMBW33	H3132	20.100
	270	86	2.1	796.00	1,380.00	81,192	140,760	840	1000	23132MBW33		20.500
	290	104	3.0	1,030.00	1,650.00	105,060	168,300	800	950	23232KMBW33	H2332	31.100
	290	104	3.0	1,030.00	1,650.00	105,060	168,300	800	950	23232MBW33		31.700
	240	80	2.1	670.00	1,260.00	68,340	128,520	725	900	24032K30MBW33		13.000
	240	80	2.1	670.00	1,260.00	68,340	128,520	725	900	24032MBW33		13.300
270	109	2.1	1,070.00	1,930.00	109,140	196,860	725	900	24132K30MBW33		24.600	
270	109	2.1	1,070.00	1,930.00	109,140	196,860	725	900	24132MBW33		24.600	
170	310	86	4.0	952.00	1,390.00	97,104	141,780	1100	1400	22234KMBW33	H3134	28.400
	310	86	4.0	952.00	1,390.00	97,104	141,780	1100	1400	22234MBW33		28.900
	360	120	4.0	1,460.00	1,920.00	148,920	195,840	1000	1100	22334KMBW33	H2334	60.200
	360	120	4.0	1,460.00	1,920.00	148,920	195,840	1000	1100	22334MBW33		62.200
	260	67	2.1	609.00	1,110.00	62,118	113,220	900	1000	23034KMBW33	H3034	13.300
	260	67	2.1	609.00	1,110.00	62,118	113,220	900	1000	23034MBW33		13.400
	280	88	2.1	888.00	1,490.00	90,576	151,980	850	950	23134KMBW33	H3134	22.000
	280	88	2.1	888.00	1,490.00	90,576	151,980	850	950	23134MBW33		22.300
	310	110	4.0	1,150.00	1,870.00	117,300	190,740	850	950	23234KMBW33	H2334	37.200
	310	110	4.0	1,150.00	1,870.00	117,300	190,740	850	950	23234MBW33		37.800
	260	90	2.1	816.00	1,565.00	83,232	159,630	750	900	24034K30MBW33		17.200



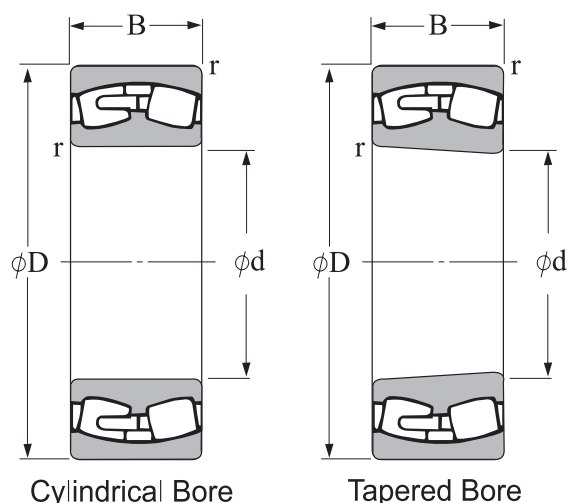
d 170~200mm

Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers	Adapter sleeve	Mass kg (approx.)
mm				dynamic	static	dynamic	static	min ⁻¹				
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_{s,min}</i>	<i>C_r</i> kN	<i>C_{or}</i> kN	<i>C_r</i> kgf	<i>C_{or}</i> kgf	grease	oil			
170	260	90	2.1	816.00	1,565.00	83,232	159,630	750	900	24034MBW33		17.700
	280	109	2.1	1,100.00	1,980.00	112,200	201,960	750	900	24134K30MBW33		26.000
	280	109	2.1	1,100.00	1,980.00	112,200	201,960	750	900	24134MBW33		26.400
180	320	86	4.0	978.00	1,450.00	99,756	147,900	1100	1400	22236KMBW33	H3136	29.400
	320	86	4.0	978.00	1,450.00	99,756	147,900	1100	1400	22236MBW33		30.400
	380	126	4.0	1,740.00	2,360.00	177,480	240,720	1000	1300	22336KMBW33	H2336	68.200
	380	126	4.0	1,740.00	2,360.00	177,480	240,720	1000	1300	22336MBW33		69.000
	280	74	2.1	710.00	1,290.00	72,420	131,580	1050	1200	23036KMBW33	H3036	17.000
	280	74	2.1	710.00	1,290.00	72,420	131,580	1050	1200	23036MBW33		17.600
	300	96	3.0	1,000.00	1,800.00	102,000	183,600	1000	1100	23136KMBW33	H3136	28.000
	300	96	3.0	1,000.00	1,800.00	102,000	183,600	1000	1100	23136MBW33		28.400
	320	112	4.0	1,190.00	1,980.00	121,380	201,960	950	1000	23236KMBW33	H2336	40.100
	320	112	4.0	1,190.00	1,980.00	121,380	201,960	950	1000	23236MBW33		40.800
	280	100	2.1	955.00	1,870.00	97,410	190,740	900	1200	24036K30MBW33		23.000
	280	100	2.1	955.00	1,870.00	97,410	190,740	900	1200	24036MBW33		23.200
	300	118	3.0	1,240.00	2,280.00	126,480	232,560	900	1200	24136K30MBW33		32.000
	300	118	3.0	1,240.00	2,280.00	126,480	232,560	900	1200	24136MBW33		32.000
190	340	92	4.0	1,110.00	1,730.00	113,220	176,460	1000	1300	22238KMBW33	H3138	37.200
	340	92	4.0	1,110.00	1,730.00	113,220	176,460	1000	1300	22238MBW33		37.700
	400	132	5.0	1,900.00	2,610.00	193,800	266,220	1000	1200	22338KMBW33	H2338	83.000
	400	132	5.0	1,900.00	2,610.00	193,800	266,220	1000	1200	22338MBW33		84.800
	290	75	2.1	736.00	1,370.00	75,072	139,740	850	1100	23038KMBW33	H3038	18.000
	290	75	2.1	736.00	1,370.00	75,072	139,740	850	1100	23038MBW33		18.600
	320	104	3.0	1,090.00	2,000.00	111,180	204,000	850	1100	23138KMBW33	H3138	35.000
	320	104	3.0	1,090.00	2,000.00	111,180	204,000	850	1100	23138MBW33		35.600
	340	120	4.0	1,410.00	2,210.00	143,820	225,420	750	1000	23238KMBW33	H2338	48.100
	340	120	4.0	1,410.00	2,210.00	143,820	225,420	750	1000	23238MBW33		48.900
	290	100	2.1	1,004.00	1,960.00	102,408	199,920	700	900	24038K30MBW33		24.000
	290	100	2.1	1,004.00	1,960.00	102,408	199,920	700	900	24038MBW33		24.300
	320	128	3.0	1,450.00	2,660.00	147,900	271,320	600	800	24138K30MBW33		41.200
	320	128	3.0	1,450.00	2,660.00	147,900	271,320	600	800	24138MBW33		41.800
200	360	98	4.0	1,230.00	1,930.00	125,460	196,860	930	1200	22240KMBW33	H3140	47.700
	360	98	4.0	1,230.00	1,930.00	125,460	196,860	930	1200	22240MBW33		47.700
	420	138	5.0	2,010.00	2,750.00	205,020	280,500	700	1000	22340KMBW33	H2340	95.000



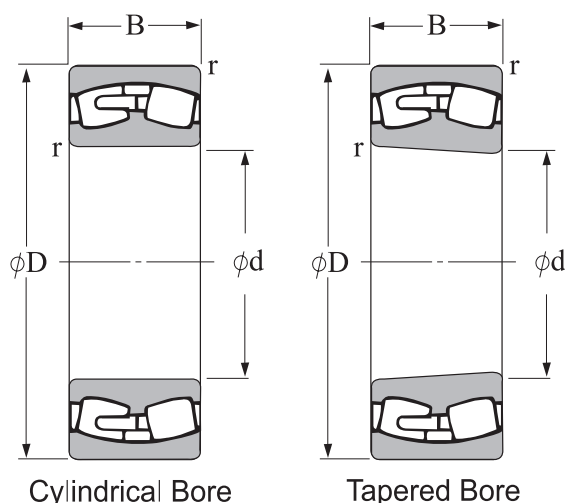
d 200~240mm

Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers	Adapter sleeve	Mass kg (approx.)
mm				dynamic	static	dynamic	static	min ⁻¹				
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_{s min}</i>	<i>C_r</i> kN	<i>C_{or}</i> kN	<i>C_r</i> kgf	<i>C_{or}</i> kgf	grease	oil			
200	420	138	5.0	2,010.00	2,750.00	205,020	280,500	700	1000	22340MBW33		95.000
	310	82	2.1	890.00	1,670.00	90,780	170,340	850	1000	23040KMBW33	H3040	23.500
	310	82	2.1	890.00	1,670.00	90,780	170,340	850	1000	23040MBW33		23.500
	340	112	3.0	1,240.00	2,250.00	126,480	229,500	850	1000	23140KMBW33	H3140	43.500
	340	112	3.0	1,240.00	2,250.00	126,480	229,500	850	1000	23140MBW33		43.500
	360	128	4.0	1,550.00	2,610.00	158,100	266,220	750	900	23240KMBW33	H2340	58.500
	360	128	4.0	1,550.00	2,610.00	158,100	266,220	750	900	23240MBW33		58.500
	310	109	2.1	1,150.00	2,280.00	117,300	232,560	700	800	24040K30MBW33		30.500
	310	109	2.1	1,150.00	2,280.00	117,300	232,560	700	800	24040MBW33		30.500
	340	140	3.0	1,620.00	3,030.00	165,240	309,060	560	750	24140K30MBW33		51.500
340	140	3.0	1,620.00	3,030.00	165,240	309,060	560	750	24140MBW33		51.500	
220	400	108	4.0	1,630.00	2,450.00	166,260	249,900	850	1100	22244KMBW33	H3144	63.000
	400	108	4.0	1,630.00	2,450.00	166,260	249,900	850	1100	22244MBW33		63.000
	460	145	5.0	2,380.00	3,380.00	242,760	344,760	720	960	22344KMBW33	H2344	120.000
	460	145	5.0	2,380.00	3,380.00	242,760	344,760	720	960	22344MBW33		120.000
	340	90	3.0	984.00	1,890.00	100,368	192,780	720	920	23044KMBW33	H3044	31.500
	340	90	3.0	984.00	1,890.00	100,368	192,780	720	920	23044MBW33		31.500
	370	120	4.0	1,440.00	2,700.00	146,880	275,400	720	920	23144KMBW33	H3144	54.500
	370	120	4.0	1,440.00	2,700.00	146,880	275,400	720	920	23144MBW33		54.500
	400	144	4.0	1,880.00	3,200.00	191,760	326,400	600	800	23244KMBW33	H2344	82.500
	400	144	4.0	1,880.00	3,200.00	191,760	326,400	600	800	23244MBW33		82.500
	340	118	3.0	1,370.00	2,760.00	139,740	281,520	550	750	24044K30MBW33		39.500
	340	118	3.0	1,370.00	2,760.00	139,740	281,520	550	750	24044MBW33		39.500
	370	150	4.0	1,900.00	3,580.00	193,800	365,160	530	700	24144K30MBW33		65.000
	370	150	4.0	1,900.00	3,580.00	193,800	365,160	530	700	24144MBW33		65.000
240	440	120	4.0	1,960.00	3,050.00	199,920	311,100	750	1000	22248KMBW33	H3148	85.500
	440	120	4.0	1,960.00	3,050.00	199,920	311,100	750	1000	22248MBW33		85.500
	500	155	5.0	2,610.00	4,020.00	266,220	410,040	700	900	22348KMBW33	H2348	151.000
	500	155	5.0	2,610.00	4,020.00	266,220	410,040	700	900	22348MBW33		151.000
	360	92	3.0	1,100.00	2,170.00	112,200	221,340	860	840	23048KMBW33	H3048	34.500
	360	92	3.0	1,100.00	2,170.00	112,200	221,340	860	840	23048MBW33		34.500
	400	128	4.0	1,630.00	3,080.00	166,260	314,160	600	800	23148KMBW33	H3148	67.500
	400	128	4.0	1,630.00	3,080.00	166,260	314,160	600	800	23148MBW33		67.500
	440	160	4.0	2,340.00	3,990.00	238,680	406,980	560	750	23248KMBW33	H2348	110.000
	440	160	4.0	2,340.00	3,990.00	238,680	406,980	560	750	23248MBW33		110.000



d 240~300mm

Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers	Adapter sleeve	Mass kg (approx.)
mm				dynamic	static	dynamic	static	min ⁻¹				
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_{s min}</i>	C _r kN	C _{or} kN	C _r kgf	C _{or} kgf	grease	oil			
240	360	118	3.0	1,440.00	2,930.00	146,880	298,860	500	700	24048K30MBW33		42.500
	360	118	3.0	1,440.00	2,930.00	146,880	298,860	500	700	24048MBW33		42.500
	400	160	4.0	2,160.00	4,090.00	220,320	417,180	480	630	24148K30MBW33		80.500
	400	160	4.0	2,160.00	4,090.00	220,320	417,180	480	630	24148MBW33		80.500
260	480	130	5.0	2,240.00	3,450.00	228,480	351,900	670	900	22252KMBW33	H3152	111.000
	480	130	5.0	2,240.00	3,450.00	228,480	351,900	670	900	22252MBW33		111.000
	540	165	6.0	2,830.00	4,380.00	288,660	446,760	620	780	22352KMBW33	H2352	95.300
	540	165	6.0	2,830.00	4,380.00	288,660	446,760	620	780	22352MBW33		95.300
	400	104	4.0	1,330.00	2,570.00	135,660	262,140	600	720	23052KMBW33	H3052	50.500
	400	104	4.0	1,330.00	2,570.00	135,660	262,140	600	720	23052MBW33		50.500
	440	144	4.0	2,100.00	3,860.00	214,200	393,720	550	690	23152KMBW33	H3152	93.500
	440	144	4.0	2,100.00	3,860.00	214,200	393,720	550	690	23152MBW33		93.500
	480	174	5.0	2,750.00	4,640.00	280,500	473,280	500	670	23252KMBW33	H2352	142.000
	480	174	5.0	2,750.00	4,640.00	280,500	473,280	500	670	23252MBW33		142.000
	400	140	4.0	1,840.00	3,850.00	187,680	392,700	600	800	24052K30MBW33		66.000
	400	140	4.0	1,840.00	3,850.00	187,680	392,700	600	800	24052MBW33		66.000
	440	180	4.0	2,730.00	5,330.00	278,460	543,660	500	670	24152K30MBW33		114.000
	440	180	4.0	2,730.00	5,330.00	278,460	543,660	500	670	24152MBW33		114.000
280	500	130	5.0	2,360.00	3,650.00	240,720	372,300	630	850	22256KMBW33	H3156	116.000
	500	130	5.0	2,360.00	3,650.00	240,720	372,300	630	850	22256MBW33		116.000
	580	175	6.0	3,150.00	4,910.00	321,300	500,820	530	710	22356KMBW33	H2356	238.000
	580	175	6.0	3,150.00	4,910.00	321,300	500,820	530	710	22356MBW33		238.000
	420	106	4.0	1,430.00	2,860.00	145,860	291,720	750	1000	23056KMBW33	H3056	53.000
	420	106	4.0	1,430.00	2,860.00	145,860	291,720	750	1000	23056MBW33		53.000
	460	146	5.0	2,140.00	4,280.00	218,280	436,560	670	900	23156KMBW33	H3156	100.000
	460	146	5.0	2,140.00	4,280.00	218,280	436,560	670	900	23156MBW33		100.000
	500	176	5.0	2,690.00	4,910.00	274,380	500,820	480	630	23256KMBW33	H2356	153.000
	500	176	5.0	2,690.00	4,910.00	274,380	500,820	480	630	23256MBW33		153.000
	420	140	4.0	1,960.00	4,100.00	199,920	418,200	560	750	24056K30MBW33		68.500
	420	140	4.0	1,960.00	4,100.00	199,920	418,200	560	750	24056MBW33		68.500
	460	180	5.0	2,810.00	5,480.00	286,620	558,960	400	530	24156K30MBW33		118.000
	460	180	5.0	2,810.00	5,480.00	286,620	558,960	400	530	24156MBW33		118.000
300	460	118	4.0	1,750.00	3,480.00	178,500	354,960	670	900	23060KMBW33	H3060	73.500
	460	118	4.0	1,750.00	3,480.00	178,500	354,960	670	900	23060MBW33		73.500

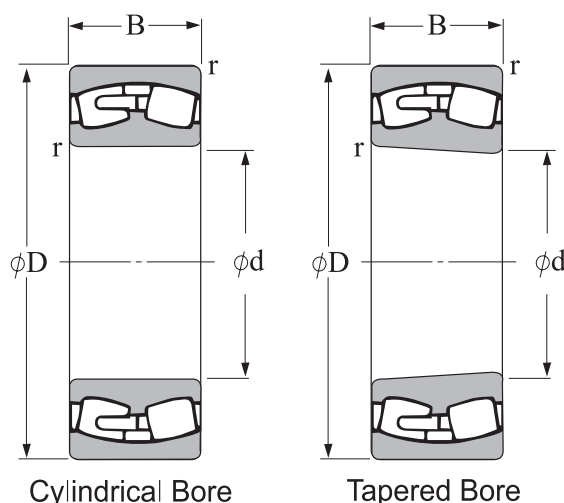


Cylindrical Bore

Tapered Bore

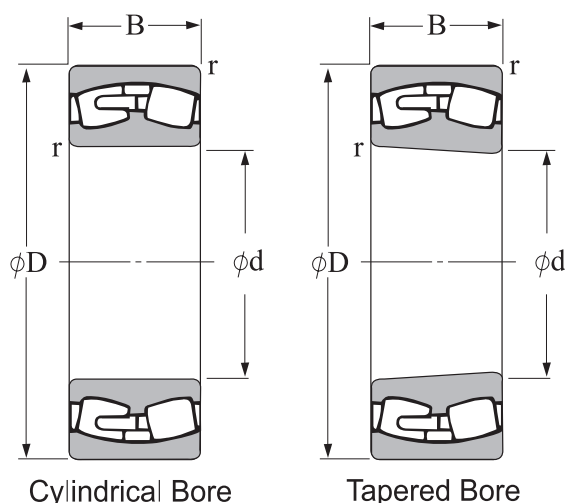
d 300~360mm

Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers	Adapter sleeve	Mass kg (approx.)
mm				dynamic	static	dynamic	static	min ⁻¹				
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_{s min}</i>	<i>C_r</i> kN	<i>C_{or}</i> kN	<i>C_r</i> kgf	<i>C_{or}</i> kgf	grease	oil			
300	500	160	5.0	2,490.00	4,850.00	253,980	494,700	630	850	23160KMBW33	H3160	130.000
	500	160	5.0	2,490.00	4,850.00	253,980	494,700	630	850	23160MBW33		130.000
	540	192	5.0	3,430.00	5,910.00	349,860	602,820	450	600	23260KMBW33	H2360	195.000
	540	192	5.0	3,430.00	5,910.00	349,860	602,820	450	600	23260MBW33		195.000
	460	160	4.0	2,430.00	5,160.00	247,860	526,320	560	750	24060K30MBW33		97.000
	460	160	4.0	2,430.00	5,160.00	247,860	526,320	560	750	24060MBW33		97.000
	500	200	5.0	3,213.00	6,011.00	327,726	613,122	430	560	24160K30MBW33		159.000
	500	200	5.0	3,213.00	6,011.00	327,726	613,122	430	560	24160MBW33		159.000
320	580	150	5.0	3,050.00	4,900.00	311,100	499,800	560	750	22264KMBW33	H3164	181.000
	580	150	5.0	3,050.00	4,900.00	311,100	499,800	560	750	22264MBW33		181.000
	480	121	4.0	1,830.00	3,740.00	186,660	381,480	630	850	23064KMBW33	H3064	79.500
	480	121	4.0	1,830.00	3,740.00	186,660	381,480	630	850	23064MBW33		79.500
	540	176	5.0	3,200.00	6,000.00	326,400	612,000	670	900	23164KMBW33	H3164	165.000
	540	176	5.0	3,200.00	6,000.00	326,400	612,000	600	800	23164MBW33		171.000
	580	208	5.0	3,900.00	6,950.00	397,800	708,900	430	560	23264KMBW33	H3164	247.000
	580	208	5.0	3,900.00	6,950.00	397,800	708,900	430	560	23264MBW33		247.000
	480	160	4.0	2,480.00	5,100.00	252,960	520,200	530	700	24064K30MBW33		106.000
	480	160	4.0	2,480.00	5,100.00	252,960	520,200	530	700	24064MBW33		106.000
	540	218	5.0	3,800.00	7,350.00	387,600	749,700	400	530	24164K30MBW33		215.000
	540	218	5.0	3,800.00	7,350.00	387,600	749,700	400	530	24164MBW33		215.000
340	520	133	5.0	2,360.00	4,550.00	240,720	464,100	600	800	23068KMBW33	H3064	108.000
	520	133	5.0	2,360.00	4,550.00	240,720	464,100	600	800	23068MBW33		108.000
	580	190	5.0	3,650.00	6,950.00	372,300	708,900	560	750	23168KMBW33	H3168	216.000
	580	190	5.0	3,650.00	6,950.00	372,300	708,900	560	750	23168MBW33		216.000
	620	224	6.0	4,500.00	8,150.00	459,000	831,300	450	600	23268KMBW33	H3268	305.000
	620	224	6.0	4,500.00	8,150.00	459,000	831,300	450	600	23268MBW33		305.000
	520	180	5.0	3,100.00	6,550.00	316,200	668,100	500	670	24068K30MBW33		143.000
	520	180	5.0	3,100.00	6,550.00	316,200	668,100	500	670	24068MBW33		143.000
	580	243	5.0	4,400.00	8,500.00	448,800	867,000	340	450	24168K30MBW33		283.000
	580	243	5.0	4,400.00	8,500.00	448,800	867,000	340	450	24168MBW33		283.000
360	540	134	5.0	2,450.00	4,800.00	249,900	489,600	560	750	23072KMBW33	H3072	111.000
	540	134	5.0	2,450.00	4,800.00	249,900	489,600	560	750	23072MBW33		111.000
	600	192	5.0	3,800.00	7,350.00	387,600	749,700	530	700	23172KMBW33	H3172	228.000
	600	192	5.0	3,800.00	7,350.00	387,600	749,700	530	700	23172MBW33		228.000



d 360~420mm

Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers	Adapter sleeve	Mass kg (approx.)
mm				dynamic	static	dynamic	static	min ⁻¹				
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_{s min}</i>	<i>C_r</i> kN	<i>C_{or}</i> kN	<i>C_r</i> kgf	<i>C_{or}</i> kgf	grease	oil			
360	650	232	6.0	4,900.00	9,150.00	499,800	933,300	430	800	23272KMBW33	H3272	341.000
	650	232	6.0	4,900.00	9,150.00	499,800	933,300	430	800	23272MBW33		341.000
	540	180	5.0	3,250.00	6,800.00	331,500	693,600	480	630	24072K30MBW33		145.000
	540	180	5.0	3,250.00	6,800.00	331,500	693,600	480	630	24072MBW33		145.000
	600	243	5.0	4,500.00	9,000.00	459,000	918,000	360	480	24172K30MBW33		279.000
	600	243	5.0	4,500.00	9,000.00	459,000	918,000	360	480	24172MBW33		279.000
380	560	135	5.0	2,550.00	5,300.00	260,100	540,600	530	700	23076KMBW33	H3076	117.000
	560	135	5.0	2,550.00	5,300.00	260,100	540,600	530	700	23076MBW33		117.000
	620	194	5.0	4,050.00	8,150.00	413,100	831,300	500	670	23176KMBW33	H3176	242.000
	620	194	5.0	4,050.00	8,150.00	413,100	831,300	500	670	23176MBW33		242.000
	680	240	6.0	5,300.00	9,800.00	540,600	999,600	360	480	23276KMBW33	H3276	390.000
	680	240	6.0	5,300.00	9,800.00	540,600	999,600	360	480	23276MBW33		390.000
	560	180	5.0	3,350.00	7,200.00	341,700	734,400	450	600	24076K30MBW33		152.000
	560	180	5.0	3,350.00	7,200.00	341,700	734,400	450	600	24076MBW33		152.000
	620	243	5.0	4,650.00	9,500.00	474,300	969,000	340	450	24176K30MBW33		300.000
	620	243	5.0	4,650.00	9,500.00	474,300	969,000	340	450	24176MBW33		300.000
400	600	148	5.0	3,050.00	6,200.00	311,100	632,400	500	670	23080KMBW33	H3080	152.000
	600	148	5.0	3,050.00	6,200.00	311,100	632,400	500	670	23080MBW33		152.000
	650	200	6.0	4,250.00	8,500.00	433,500	867,000	480	630	23180KMBW33	H3180	270.000
	650	200	6.0	4,250.00	8,500.00	433,500	867,000	480	630	23180MBW33		270.000
	720	256	6.0	5,700.00	10,800.00	581,400	1,101,600	380	700	23280KMBW33	H3280	468.000
	720	256	6.0	5,700.00	10,800.00	581,400	1,101,600	380	700	23280MBW33		468.000
	600	200	5.0	3,900.00	8,500.00	397,800	867,000	430	560	24080K30MBW33		205.000
	600	200	5.0	3,900.00	8,500.00	397,800	867,000	430	560	24080MBW33		205.000
	650	250	6.0	5,100.00	10,400.00	520,200	1,060,800	320	430	24180K30MBW33		340.000
	650	250	6.0	5,100.00	10,400.00	520,200	1,060,800	320	430	24180MBW33		340.000
420	620	150	5.0	3,150.00	6,550.00	321,300	668,100	500	670	23084KMBW33	H3084	160.000
	620	150	5.0	3,150.00	6,550.00	321,300	668,100	500	670	23084MBW33		160.000
	700	224	6.0	5,000.00	9,650.00	510,000	984,300	500	670	23184KMBW33	H3184	363.000
	700	224	6.0	5,000.00	9,650.00	510,000	984,300	500	670	23184MBW33		363.000
	760	272	7.5	6,550.00	12,200.00	668,100	1,244,400	320	430	23284KMBW33	H3284	553.000
	760	272	7.5	6,550.00	12,200.00	668,100	1,244,400	320	430	23284MBW33		553.000
	620	200	5.0	4,000.00	8,800.00	408,000	897,600	430	560	24084K30MBW33		210.000
	620	200	5.0	4,000.00	8,800.00	408,000	897,600	430	560	24084MBW33		210.000



d 420~460mm

Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers	Adapter sleeve	Mass kg (approx.)
mm				dynamic	static	dynamic	static	min ⁻¹				
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_{s min}</i>	<i>C_r</i>	<i>C_{or}</i>	<i>C_r</i>	<i>C_{or}</i>	grease	oil			
420	700	280	6.0	6,200.00	12,700.00	632,400	1,295,400	300	400	24184K30MBW33		445.000
	700	280	6.0	6,200.00	12,700.00	632,400	1,295,400	300	400	24184MBW33		445.000
440	650	157	6.0	3,400.00	7,100.00	346,800	724,200	530	700	23088KMBW33	H3088	180.000
	650	157	6.0	3,400.00	7,100.00	346,800	724,200	530	700	23088MBW33		180.000
	720	226	6.0	5,200.00	10,400.00	530,400	1,060,800	500	670	23188KMBW33	H3188	360.000
	720	226	6.0	5,200.00	10,400.00	530,400	1,060,800	500	670	23188MBW33		360.000
	790	280	7.5	7,100.00	13,400.00	724,200	1,366,800	360	480	23288KMBW33	H3288	595.000
	790	280	7.5	7,100.00	13,400.00	724,200	1,366,800	360	480	23288MBW33		595.000
	650	212	6.0	4,300.00	9,650.00	438,600	984,300	400	530	24088K30MBW33		245.000
	650	212	6.0	4,300.00	9,650.00	438,600	984,300	400	530	24088MBW33		245.000
	720	280	6.0	6,400.00	13,200.00	652,800	1,346,400	300	400	24188K30MBW33		460.000
	720	280	6.0	6,400.00	13,200.00	652,800	1,346,400	300	400	24188MBW33		460.000
460	680	163	6.0	3,650.00	7,650.00	372,300	780,300	450	600	23092KMBW33	H3092	209.000
	680	163	6.0	3,650.00	7,650.00	372,300	780,300	450	600	23092MBW33		209.000
	760	240	7.5	5,850.00	11,600.00	596,700	1,183,200	480	630	23192KMBW33	H3192	441.000
	760	240	7.5	5,850.00	11,600.00	596,700	1,183,200	480	630	23192MBW33		441.000
	830	296	7.5	7,800.00	15,000.00	795,600	1,530,000	340	450	23292KMBW33	H3292	695.000
	830	296	7.5	7,800.00	15,000.00	795,600	1,530,000	340	450	23292MBW33		695.000
	680	218	6.0	4,750.00	10,600.00	484,500	1,081,200	380	500	24092K30MBW33		280.000
	680	218	6.0	4,750.00	10,600.00	484,500	1,081,200	380	500	24092MBW33		280.000
	760	300	7.5	7,500.00	15,600.00	765,000	1,591,200	280	380	24192K30MBW33		560.000
	760	300	7.5	7,500.00	15,600.00	765,000	1,591,200	280	380	24192MBW33		560.000