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BALL BEARINGS CATALOGUE



In January 1958 Our Company
MINAMIGUCHI BEARING MFG.CO.,LTD.
In Osaka Japan, established by HIROMU MINAMIGUCHI.

Afterwards its production activities has been developed, enlarged and ball bearings commenced to be produced. It has always been our motto "HIGHER QUALITY & LOWER COST" as it is at present, through working hard constantly so as to enable us contribute to the industrial worked as well as to meet with the patronage of our customers.



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KSM[®]



Technical Information



1. Bearing materials

1.1 Raceway and rolling element materials

1.1.1 High/mid carbon alloy steel

In general, steel varieties which can be hardened not just on the surface but also deep hardened by the so-called "through hardening method" are used for the raceways and rolling elements of bearings. Foremost among these is high carbon chromium bearing steel, which is widely used.

1.1.2 Mid-carbon chromium steel

Mid-carbon chromium steel incorporating silicon and manganese, which gives it hardening properties comparable to high carbon chromium steel.

1.1.3 Stainless steel

SUS 440 C

1.2 Cage materials

Bearing cage materials must have the strength to withstand rotational vibrations and shock loads. These materials must also have a low friction coefficient, be light weight, and be able to withstand bearing operation temperatures.

1.2.1 Pressed cages

For small and medium sized bearings, pressed cages of cold or hot rolled steel with a low carbon content of approx. 0.1% are used. However, depending on the application, austenitic stainless steel is also used.

1.2.2 Plastic cages

Injection molded plastic cages are now widely used: most are made from fiber glass reinforced heat resistant polyamide resin. Plastic cages are light weight, corrosion resistant and have excellent dampening and sliding properties. Heat resistant polyamide resins now enable the production of cages that perform well in applications ranging between -40 °C - 120 °C. However, they are not recommended for use at temperatures exceeding 120 °C.

2. External bearing sealing devices

External seals have two main functions: to prevent lubricating oil from leaking out, and, to prevent dust, water, and other contaminants from entering the bearing. When selecting a seal, the following factors need to be taken into consideration: the type of lubricant (oil or grease), seal peripheral speed, shaft fitting errors, space limitations, seal friction and resultant heat increase, and cost.

Sealing devices for rolling bearings fall into two main classifications:
non-contact seals and contact seals.

2.1 Non-contact seals:

Non-contact seals utilize a small clearance between the shaft and the housing cover. Therefore friction is negligible, making them suitable for high speed applications. In order to improve sealing capability, clearance spaces are often filled with lubricant.

2.2 Contact seals:

Contact seals accomplish their sealing action through the contact pressure of a resilient seal (the lip is often made of synthetic rubber) the sealing surface. Contact seals are generally far superior to noncontact seals in sealing efficiency, although their friction torque and temperature rise coefficients are higher. Furthermore, because the portion of a contact seal rotates while in contact with the shaft, the allowable seal peripheral speed varies depending on seal type.



3. Ball bearing tolerances

3.1 Standard of tolerances

Ball bearing "tolerances" or dimensional accuracy and running accuracy, are regulated by ISO and JIS standards (rolling bearing tolerances). For dimensional accuracy, these standards prescribe the tolerances necessary when installing bearings on shafts or in housings. Running accuracy is defined as the allowable limits for bearing runout during operation.

Table 3.1 Comparison of tolerance classifications of national standards

Standard		Tolerance class				
Japanese industrial Standard (JIS)	JIS	class 0	class 6	class 5	class 4	class 2
International Organization for Standardization (ISO)	ISO	Normal class Class 6X	Class 6	Class 5	Class 4	Class 2
Deutsches Institut für Normung (ISO)	DIN	P0	P6	P5	P4	P2
American National Standards Institute (ANSI)	ANSI/ABMA	ABEC-1	ABEC-3	ABEC-5	ABEC-7	ABEC-9

3.2 Tolerances for radial bearings

Table 3.2 Inner rings

(Unit : μm)

Nominal bore diameter d mm over incl.		Single plane mean bore diameter deviation Δd_{mp}										Single radial plane bore diameter variation V_{dp}									
		class 0		class 6		class 5		class 4 ①		class 2 ①		diameter series 9					maxdiameter series 0.1				
		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
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
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
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
50	80	0	-15	0	-12	0	-9	0	-7	0	-4.0	19	15	9	7	4.0	19	15	7	5	4.0
80	120	0	-20	0	-15	0	-10	0	-8	0	-5.0	25	19	10	8	5.0	25	19	8	6	5.0

Table 3.3 Inner rings

(Unit : μm)

Nominal bore diameter d mm over incl.		Single radial plane bore diameter variation V_{dp}					Mean single plane bore diameter variation V_{dmp}					Inner ring radial runout K_{ia}					Face runout with bore S_d		
		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	class 5	class 4	class 2
10	18	6	5	4	3	2.5	6	5	3	2.0	1.5	10	7	4	2.5	1.5	7.0	3.0	1.5
18	30	8	6	5	4	2.5	8	6	3	2.5	1.5	13	8	4	3.0	2.5	8.0	4.0	1.5
30	50	9	8	6	5	2.5	9	8	4	3.0	1.5	15	10	5	4.0	2.5	8.0	4.0	1.5
50	80	11	9	7	5	4.0	11	9	5	3.5	2.0	20	10	5	4.0	2.5	8.0	5.0	1.5
80	120	15	11	8	6	5.0	15	11	5	4.0	2.5	25	13	6	5.0	2.5	9.0	5.0	2.5

Table 3.4 Inner rings

(Unit : μm)

Nominal bore diameter d		Inner ring axial runout (with side) $S_{ia}^{②}$			Inner ring width deviation ΔB_s										Inner ring width variation V_{B_s}				
mm		class 5	class 4	class 2	class 0,6		normal class 5,4		class 2		class 0,6		modified ^③ class 5,4		class 0	class 6	class 5 max.	class 4	class 2
over	incl.	5	4	2	high	low	high	low	high	low	high	low	high	low	0	6	5 max.	4	2
10	18	7	3	1.5	0	-120	0	- 80	0	- 80	0	- 250	0	- 250	20	20	5	2.5	1.5
18	30	8	4	2.5	0	-120	0	-120	0	-120	0	-250	0	-250	20	20	5	2.5	1.5
30	50	8	4	2.5	0	-120	0	-120	0	-120	0	-380	0	-250	20	20	5	3.0	1.5
50	80	8	5	2.5	0	-150	0	-150	0	-150	0	-380	0	-250	25	25	6	4.0	1.5
80	120	9	5	2.5	0	-200	0	-200	0	-200	0	-380	0	-380	25	25	7	4.0	2.5

Note: ① The dimensional difference Δd_s of bore diameter to applied for class 4 and 2 is the same as the tolerance of dimensional difference Δd_{mp} of average bore diameter. However, the dimensional difference is applied to diameter series 0, 1, 2, 3 and 4 against Class 4, and to all the diameter series against Class 2.

② To be applied for deep groove ball bearing and angular contact ball bearings.

③ To be applied for individual raceway rings manufactured for combined bearing use.

Table 3.5 Outer rings

(Unit : μm)

Nominal Outside diameter D mm		Single plane mean outside diameter deviation ΔD_{mp}										Single radial plane outside diameter variation V_{Dp}									
over	incl.	class 0		class 6		class 5		class 4 ^⑤		class 2 ^⑤		diameter series 9					maxdiameter series 0.1				
		high	low	high	low	high	low	high	low	high	low	class 0	class 6	class 5 max.	class 4	class 2	class 0	class 6	class 5 max.	class 4	class 2
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
18	30	0	-9	0	-8	0	-6	0	-5	0	-4.0	12	10	6	5	4.0	9	8	5	4	4.0
30	50	0	-11	0	-9	0	-7	0	-6	0	-4.0	14	11	7	6	4.0	11	9	5	5	4.0
50	80	0	-13	0	-11	0	-9	0	-7	0	-4.0	16	14	9	7	4.0	13	11	7	5	4.0
80	120	0	-15	0	-13	0	-10	0	-8	0	-5.0	19	16	10	8	5.0	19	16	8	6	5.0
120	150	0	-18	0	-15	0	-11	0	-9	0	-5.0	23	19	11	9	5.0	23	19	8	7	5.0
150	180	0	-25	0	-18	0	-13	0	-10	0	-7.0	31	23	13	10	7.0	31	23	10	8	7.0
180	250	0	-30	0	-20	0	-15	0	-11	0	-8.0	38	25	15	11	8.0	38	25	11	8	8.0

Table 3.6 Outer rings

(Unit : μm)

Nominal Outside diameter D mm		Single radial plane outside diameter variation V_{Dp}					Single radial plane outside diameter variation V_{Dp} ^⑥		Mean single plane outside diameter variation V_{Dmp}				
over	incl.	class 0	class 6	class 5 max.	class 4	class 2	class 0	class 6	class 0	class 6	class 5 max.	class 4	class 2
6	18	6	5	4	3	2.5	10	9	6	5	3	2.0	1.5
18	30	7	6	5	4	4.0	12	10	7	6	3	2.5	2.0
30	50	8	7	5	5	4.0	16	13	8	7	4	3.0	2.0
50	80	10	8	7	5	4.0	20	16	10	8	5	3.5	2.0
80	120	11	10	8	6	5.0	26	20	11	10	5	4.0	2.5
120	150	14	11	8	7	5.0	30	25	14	11	6	5.0	2.5
150	180	19	14	10	8	7.0	38	30	19	14	7	5.0	3.5
180	250	23	15	11	8	8.0	—	—	23	15	8	6.0	4.0

Table 3.7 Outer rings

(Unit : μm)

Nominal Outside diameter D		Outer ring radial runout K_{ea}					Outside surface inclination SD			Outside ring axial runout S_{ea} ^⑦			Outer ring width deviation ΔC_s	Outer ring width variation V_{cs}			
mm		class 0	class 6	class 5 max.	class 4	class 2	class 5	class 4 max.	class 2	class 5	class 4 max.	class 2	all type	class 0,6	class 5	class 4 max.	class 2
over	incl.																
6	18	15	8	5	3	1.5	8	4	1.5	8	5	1.5	Identical to ΔB_s of inner ring of same bearing	Identical to ΔB_s and V_{bs} of inner ring of same bearing	5	2.5	1.5
18	30	15	9	6	4	2.5	8	4	1.5	8	5	2.5			5	2.5	1.5
30	50	20	10	7	5	2.5	8	4	1.5	8	5	2.5			5	2.5	1.5
50	80	25	13	8	5	4.0	8	4	1.5	10	5	4.0			6	3.0	1.5
80	120	35	18	10	6	5.0	9	5	2.5	11	6	5.0			8	4.0	2.5
120	150	40	20	11	7	5.0	10	5	2.5	13	7	5.0			8	5.0	2.5
150	180	45	23	13	8	5.0	10	5	2.5	14	8	5.0			8	5.0	2.5
180	250	50	25	15	10	7.0	11	7	4.0	15	10	7.0			10	7.0	4.0

Note: ⑤ The dimensional difference ΔD_s of outer diameter to be applied for classes 4 and 2 is the same as the tolerance of dimensional difference ΔD_{mp} of average outer diameter. However, the dimensional difference is applied to diameter series 0,1,2,3 and 4 against Class 4, and also to all the diameter series against Class 2.

⑥ To be applied in case snap rings are not installed on the bearings.

⑦ To be applied for Deep Groove Ball Bearings and Angular Contact Ball Bearings.

4. Bearing fits

4.1 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 fitted surfaces during operation or under load. This relative movement (referred to as "creep") between the fitted surfaces of the bearing and the shaft or housing can occur in a radial direction, an axial direction, or in the direction of rotation. To help prevent this creeping movement, bearing rings and the shaft or housing are installed with one of three interference fits, a "tight fit" (also called shrink fit), "transition fit," or "loose fit" (also called clearance fit), and the degree of interference between their fitted surfaces varies.

The most effective way to fix the fitted 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.

4.2 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 analysis in selecting a proper fit. Some of the negative conditions caused by improper fit are listed below.

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



4.3 Fit selection

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

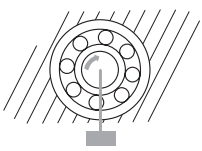
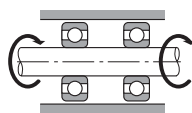
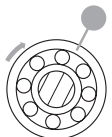
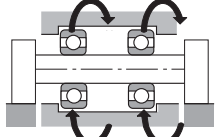
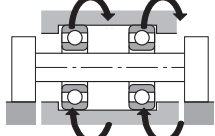
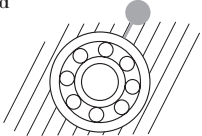
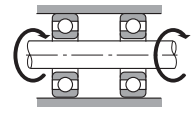
- Shaft and housing material, wall thickness, finished surface accuracy, etc.
- Machinery operating conditions (nature and magnitude of load, rotational speed, temperature, etc.)

4.3.1 "Tight fit," "transition fit," or "loose fit"

For raceways under rotating loads, a tight fit is necessary. (Refer to Table 4.1) "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. (Example) Rotating inner ring load the direction of the radial load on the inner ring is rotating relatively.

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.

Table 4.1 Radial load and bearing

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

5. Ball bearing internal clearance

Ball bearing internal clearance (initial clearance) is the amount of internal clearance a bearing has before being installed on a shaft or in a housing. The internal clearance values for **KSM** ball bearing classes are shown in tables 5.1 to 5.5

Table 5.1 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.
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

Table 5.2 Radial internal clearance for Self-aligning Ball Bearings (for bearing with cylindrical bore)

(Unit : μm)

Nominal bore diameter d (mm)		Bearing with cylindrical bore							
over	incl.	C2		Normal		C3		C4	
		min.	max.	min.	max.	min.	max.	min.	max.
6	10	2	9	6	17	12	25	19	33
10	14	2	10	6	19	13	26	21	35
14	18	3	12	8	21	15	28	23	37
18	24	4	14	10	23	17	30	25	39
24	30	5	16	11	24	19	35	29	46
30	40	6	18	13	29	23	40	34	53
40	50	6	19	14	31	25	44	37	57
50	65	7	21	16	36	30	50	45	69
65	80	8	24	18	40	35	60	54	83



Table 5.3 Radial internal clearance for Self-aligning Ball Bearings (for bearing with tapered bore)

(Unit : μm)

Nominal bore diameter d (mm)		Bearing with tapered bore							
		C2		Normal		C3		C4	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
6	10	—	—	—	—	—	—	—	—
10	14	—	—	—	—	—	—	—	—
14	18	—	—	—	—	—	—	—	—
18	24	7	17	13	26	20	33	28	42
24	30	9	20	15	28	23	39	33	50
30	40	12	24	19	35	29	46	40	59
40	50	14	27	22	39	33	52	45	65
50	65	18	32	27	47	41	61	56	80
65	80	23	39	35	57	50	75	69	98

Table 5.4 Radial internal clearance of double row Angular Contact Ball Bearings

(Unit : μm)

Nominal bore diameter d (mm)		C2		Normal		C3		C4	
		min.	max.	min.	max.	min.	max.	min.	max.
-	10	6	12	8	15	15	22	22	30
10	18	6	12	8	15	15	24	30	40
18	30	6	12	10	20	20	32	40	55
30	50	8	14	14	25	25	40	55	75

Table 5.5 Radial internal clearance of bearings for electric motor

(Unit : μm)

Nominal bore diameter d (mm)		Radial internal clearance CM	
		Deep groove ball bearings	
over	incl.	min.	max.
10 (incl.)	18	4	11
18	24	5	12
24	30	5	12
30	40	9	17
40	50	9	17
50	65	12	22
65	80	12	22

6. Lubrication

6.1 Lubrication of rolling bearings

The purpose of bearing lubrication is to prevent direct metallic contact between the various rolling and sliding elements. This is accomplished through the formation of a thin oil (or grease) film on the contact surfaces. However, for rolling bearings, lubrication has the following advantages:



- (1) Friction and wear reduction
- (2) Friction heat dissipation
- (3) Prolonged bearing life
- (4) Prevention of rust
- (5) Protection against harmful elements

In order to achieve the above effects, the most effective lubrication method for the operating conditions must be selected. Also a good quality, reliable lubricant must be selected. In addition, an effectively designed sealing system that prevents the intrusion of dam aging elements (dust, water, etc.) into the bearing interior, removes other impurities from the lubricant, and prevents lubricant from leaking to the outside, is also a requirement.

Almost all rolling bearings use either grease or oil lubrication methods, but in some special applicatic solid lubricant such as molybdenum disulfide or graphite may be used.

6.2 Grease lubrication

Grease type lubricants are relatively easy to handle require only the simplest sealing devices for these reasons, grease is the most widely used lubricant rolling bearings.

6.2.1 Types and characteristics of grease

Lubricating grease are composed of either a mineral base or a synthetic oil base. To this base a thicks other additives are added. The properties of all greases are mainly determined by the kind of base oil use the combination of thickening agent and various additives.

Standard greases and their characteristics are Table 6.2. As performance characteristics of even same type of grease will vary widely from brand, it is best to check the manufacturers' data when selecting a grease.

Table 6.1 Grease varieties and characteristics

Grease name	Lithium grease			Sodium grease (Fiber grease)	Calcium compound base grease
Thickener	Li soap			Na soap	Ca+Na soap Ca+Li soap
Base oil	Mineral oil	Diester oil	Silicone oil	Mineral oil	Mineral oil
Dropping poin °C	170 ~ 190	170 ~ 190	200 ~ 250	150 ~ 180	150 ~ 180
Operating temperature range °C	-30 ~ +130	-50 ~ +130	-50 ~ +160	-20 ~ +130	-20 ~ +120
Mechanical stability	Excellent	Good	Good	Excellent ~ Good	Excellent ~ Good
Pressure resistance	Good	Good	poor	Good	Excellent ~ Good
Water resistance	Good	Good	Good	Good ~ poor	Good ~ poor
Applications	Widest range of applications. Grease used in all types of rolling bearings.	Excellent low temperature and wear characteristics. Suitable for small sized and miniature bearings.	Suitable for high and low temperatures. Unsuitable for heavy load applications due to low oil film strength.	Some emulsification when water is introduced. Excellent characteristics at relatively high temperatures.	Excellent pressure resistance and mechanical stability. Suitable for bearings receiving shock loads.



Grease name	Aluminum grease	Non-soap base grease Thickener	
Thickener	Al soap	Bentone, silica gel, urea, carbon black, fluorine compounds, etc.	
Base oil	Mineral oil	Mineral oil	Synthetic oil
Dropping point °C	70 ~ 90	250 or above	250 or above
Operating temperature range °C	-10 ~ +80	-10 ~ +130	-50 ~ +200
Mechanical stability	Good ~ poor	Good	Good
Pressure resistance	Good	Good	Good
Water resistance	Good	Good	Good
Applications	Excellent viscosity characteristics. Suitable for bearings subjected to vibrations.	Can be used in a wide range of low to high temperatures. Shows excellent heat resistance, cold resistance, chemical resistance, and other characteristics when matched with a suitable base oil and thickener. Grease used in all types of rolling bearings.	

7. Load rating and life

7.1 Bearing life

Even in bearings operating under normal conditions, the surfaces of the raceway and rolling elements are constantly being subjected to repeated compressive stresses which causes flaking of these surfaces to occur. This flaking is due to material fatigue and will eventually cause the bearings to fail. The effective life of a bearing is usually defined in terms of the total number of revolutions a bearing can undergo before flaking of either the raceway surface or the rolling element surfaces occurs.

Other causes of bearing failure are often attributed to problems such as seizing, abrasions, cracking, chipping, gnawing, rust, etc. However, these so called "causes" of bearing failure are usually themselves caused by improper installation, insufficient or improper lubrication, faulty sealing or inaccurate bearing selection. Since the above mentioned "causes" of bearing failure can be avoided by taking the proper precautions, and are not simply caused by material fatigue, they are considered separately from the flaking aspect.

7.2 Basic rating life and basic dynamic load rating

A group of seemingly identical bearings when subjected to identical load and operating conditions will exhibit a wide diversity in their durability.

This "life" disparity can be accounted for by the difference in the fatigue of the bearing material itself. This disparity is considered statistically when calculating bearing life, and the basic rating life is defined as follows.

The basic rating life is based on a 90% statistical model which is expressed as the total number of revolutions 90% of the bearings in an identical group of bearings subjected to identical operating conditions will attain or surpass before flaking due to material fatigue occurs. For bearings operating at fixed constant speeds, the basic rating life (90% reliability) is expressed in the total number of hours of operation.

The basic dynamic load rating is an expression of the load capacity of a bearing based on a constant load which the bearing can sustain for one million revolutions (the basic life rating). For radial bearings this rating applies to pure radial loads, and for thrust bearings it refers to pure axial loads. The basic dynamic load ratings given in the bearing tables of this catalogue are for bearings constructed of **KSM** standard bearing materials, using standard manufacturing techniques. Please consult **KSM** engineering for basic load ratings of bearings constructed of special materials or using special manufacturing techniques.

The relationship between the basic rating life, the basic dynamic load rating and the bearing load is given in formula (7.1).

$$L_{10} = \left(\frac{C}{P}\right)^P \dots\dots\dots(7.1)$$

where,

$P = 3$ For ball bearings

L_{10} : Basic rating life 106 revolutions

C : Basic dynamic rating load, n
(C_r : radial bearings)

P : Equivalent dynamic load, n
(P_r : radial bearings)

The basic rating life can also be expressed in terms of hours of operation (revolution), and is calculated as shown in formula (7.2).

$$L_{10h} = 500 f_h^P \dots\dots\dots(7.2)$$

$$f_h = f_n \frac{C}{P} \dots\dots\dots(7.3)$$

$$f_n = \left(\frac{33.3}{n}\right)^{1/P} \dots\dots\dots(7.4)$$

where,

L_{10} : Basic rating life, h

f_h : Life factor

f_n : Speed factor

n : Rotational speed, r/min

Formula (7.2) can also be expressed as shown in formula (7.5).

$$L_{10h} = \frac{10^6}{60n} \left(\frac{C}{P}\right)^P \dots\dots\dots(7.5)$$

The relationship between rotational speed n and speed factor f_n as well as the relation between the basic rating life L_{10h} and the life factor f_h is shown in Fig. 7.1. When several bearings are incorporated in machines or equipment as complete units, all the bearings in the unit are considered as a whole when computing bearing life (see formula 7.6). The total bearing life of the unit is a life rating based on the viable lifetime of the unit before even one of the bearings fails due to rolling contact fatigue.

$$L = \frac{1}{\left(\frac{1}{L_1^e} + \frac{1}{L_2^e} + \dots \frac{1}{L_n^e}\right)^{1/e}} \dots\dots\dots(7.6)$$

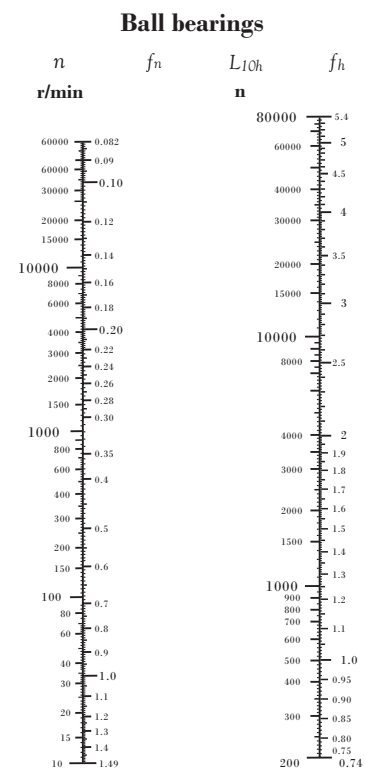


Fig.7.1 Bearing life rating scale



where,

$e = 10/9$For ball bearings

L = Total basic rating life or entire unit, h

$L_1, L_2...L_n$: Basic rating life or individual bearings, 1, 2,...n, h

When the load conditions vary at regular intervals, the life can be given by formula (7.7).

$$L_m = (\sum \phi_j / L_j)^{-1} \dots \dots \dots (7.7)$$

where,

ϕ_j : Frequency of individual load conditions

L_j : Life under individual conditions

7.3 Machine applications and requisite life

When selecting a bearing, it is essential that the requisite life of the bearing be established in relation to the operating conditions. The requisite life of the bearing is usually determined by the type of machine in which the bearing will be used, and duration of service and operational reliability requirements. When determining bearing size, the fatigue life of the bearing is an important factor; however, besides bearing life, the strength and rigidity of the shaft and housing must also be taken into consideration.

7.4 Adjusted life rating factor

The basic bearing life rating (90% reliability factor) can be calculated through the formulas mentioned earlier in Section 7.2. However, in some applications a bearing life factor of over 90% reliability may be required. To meet these requirements, bearing life can be lengthened by the use of specially improved bearing materials or special construction techniques. Moreover, according to elastohydrodynamic lubrication theory, it is clear that the bearing operating conditions (lubrication, temperature, speed, etc.) all exert an effect on bearing life. All these adjustment factors are taken into consideration when calculating bearing life, the adjusted bearing life can be determined.

$$L_{na} = a_1 \cdot a_2 \cdot a_3 \cdot (C/P)^P \dots \dots \dots (7.8)$$

where,

L_{na} : Adjusted life rating in millions of revolutions (10^6)(adjusted for reliability, material and operating conditions)

a_1 : Reliability adjustment factor

a_2 : Material adjustment factor

a_3 : Operating condition adjustment factor

7.4.1 Life adjustment factor for reliability a_1

The values for the reliability adjustment factor a_i (for a reliability factor higher than 90%) can be found in Table 7.1

Table 7.1 Reliability adjustment factor values a_1

Reliability %	L_n	Reliability factor a_1
90	L_{10}	1.00
95	L_5	0.62
96	L_4	0.53
97	L_3	0.44
98	L_2	0.33
99	L_1	0.21



7.4.2 Life adjustment factor for material a_2

The life of a bearing is affected by the material type and quality as well as the manufacturing process. In this regard, the life is adjusted by the use of an a_2 factor.

The basic dynamic load ratings listed in the catalogue are based on **KSM**'s standard material and process, therefore, the adjustment factor $a_2 = 1$. When special materials or processes are used the adjustment factor can be larger than 1.

KSM bearings can generally be used up to 120°C. If bearings are operated at a higher temperature, the bearing must be specially heat treated (stabilized) so that inadmissible dimensional change does not occur due to changes in the microstructure. This special heat treatment might cause the reduction of bearing life because of a hardness change.

7.4.3 Life adjustment factor a_3 for operating conditions

The operating conditions life adjustment factor a_3 is used to adjust for such conditions as lubrication, operating temperature, and other operation factors which have an effect on bearing life.

Generally speaking, when lubricating conditions are satisfactory, the a_3 factor has a value of one; and when lubricating conditions are exceptionally favorable, and all other operating conditions are normal, as can have a value greater than one.

However, when lubricating conditions are particularly unfavorable and the oil film formation on the contact surfaces of the raceway and rolling elements is insufficient, the value of a_3 becomes less than one. This Insufficient oil film formation can be caused, for example, by the lubricating oil viscosity being too low for the operating temperature (below 13 mm²/s for ball bearings or by exceptionally low rotational speed (nr/min x dpm less than 10,000). For bearings used under special operating conditions, please consult **KSM** engineering.

As the operating temperature of the bearing increases, the hardness of the bearing material decreases. Thus, the bearing life correspondingly decreases. The operating temperature adjustment values are shown in Fig.7.2.

7.5 Basic static load rating

When stationary rolling bearings are subjected to static loads, they suffer from partial permanent deformation of the contact surfaces at the contact point between the rolling elements and the raceway. The amount of deformity increases as the load increases, and if this increase in load exceeds certain limits, the subsequent smooth operation of the bearings is impaired.

It has been found through experience that a permanent deformity of 0.0001 times the diameter of the rolling element, occurring at the most heavily stressed contact point between the raceway and the rolling elements, can be tolerated without any impairment in running efficiency.

The basic rating static load refers to a fixed static load limit at which a specified amount of permanent deformation occurs. It applies to pure radial loads for radial bearings and to pure axial loads for thrust bearings. The maximum applied load values for contact stress occurring at the rolling element and raceway contact points are given below.

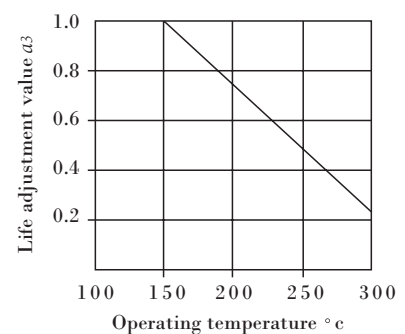


Fig. 7.2 Life adjustment value for operating temperature



For ball bearings 4,200 Mpa
(except Self-aligning Ball Bearings)
For Self-aligning Ball Bearings 4,600 Mpa

7.6 Allowable static equivalent load

Generally the static equivalent load which can be permitted is limited by the basic static load rating. However, depending on requirements regarding friction and smooth operation, these limits may be greater or lesser than the basic static rating load in the following formula (3.9) and Table 7.3 the safety factor S_o can be determined considering the maximum static equivalent load.

$$S_o = C_o/P_o \dots\dots\dots (3.9)$$

where,

S_o : Safety factor

C_o : Basic static rating load, N (radial bearings: C_{or})

$P_o \max$: Maximum static equivalent load, N (radial: $P_{or \max}$)

Table 7.3 Minimum safety factor values S_o

Operating conditions	Ball Bearings
High rotational accuracy demand	2
Normal rotating accuracy demand (Universal application)	1
Slight rotational accuracy deterioration permitted (Low speed, heavy loading, etc.)	0.5

8. Bearing handling

Bearing storage

Most rolling bearings are coated with a rust preventative before being packed and shipped, and they should be stored at room temperature with a relative humidity of less than 60%.

9. Allowable speed

As bearing speed increases, the temperature of the bearing also increases due to friction heat generated in the bearing interior. If the temperature continues to rise and exceeds certain limits, the efficiency of the lubricant starts to fail down drastically, and the bearing can no longer continue to operate in a stable manner. Therefore, the maximum speed at which it is possible for the bearing to continuously operate without the generation of excessive heat beyond specified limits, is called the allowable speed (r/min). The allowable speed of a bearing depends on the type of bearing, bearing dimensions, type of cage, load, lubricating conditions, and cooling conditions.

The allowable speeds listed in the bearing tables for grease and oil lubrication are for standard KSM bearings under normal operating conditions, correctly installed, using the suitable lubricants with adequate supply and proper maintenance. Moreover, these values are based on normal load conditions ($P \leq 0.09C$, $F_a/F_r \leq 0.3$). For ball bearings with contact seals (LLU type), the allowable speed is determined by the peripheral lip speed of the seal.

For bearings to be used under heavier than normal load conditions, the allowable speed values listed in the bearing tables must be multiplied by an adjustment factor. The adjustment factors f_L and f_c are given in Figs. 9.1 and 9.2.



Also, when radial bearings are mounted on vertical shafts, lubricant retentions and cage guidance are not favorable compared to horizontal shaft mounting.

Therefore, the allowable speed should be reduced to approximately 80% of the listed speed.

It is possible to operate precision bearings with high speed specification cages at speeds higher than those listed in the bearing tables, if special precautions are taken. These precautions should include the use of forced oil circulation methods such as oil jet or oil mist lubrication.

Under such high speed operating conditions, when special care is taken, the standard allowable speeds given in the bearing tables can be adjusted upward. The maximum speed adjustment values, f_B , by which the bearing table speeds can be multiplied, are shown in Table 9.1. However, for any application requiring speeds in excess of the standard allowable speed, please consult **KSM** Engineering.

Fig.9.1 Value of adjustment factor F_L depends on bearing load

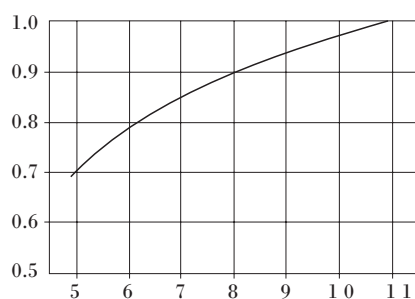


Fig.9.2 Value of adjustment factor F_C depends on combined load

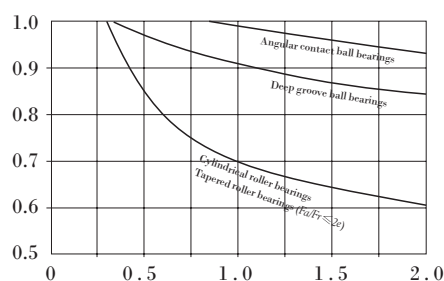


Table 9.1 Adjustment factor, f_B , for allowable number of revolutions

Type of bearing	Adjustment factor f_B
Deep groove ball bearings	3.0
Angular contact ball bearings	2.0



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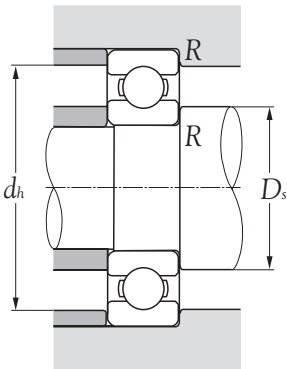
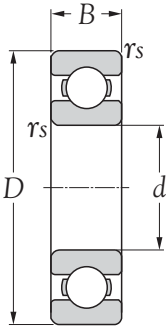
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Product Information



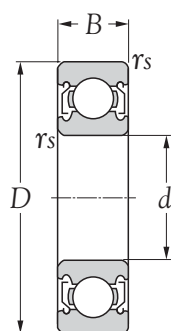
Ball Bearings
series 60..



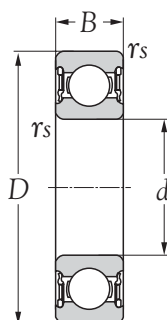
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Abutment and fillet dimensions			Mass
mm				dynamic	static	grease	oil		mm			kg
<i>d</i>	<i>D</i>	<i>B</i>	<i>r</i> _{s min} ¹⁾	<i>C</i> _r	<i>C</i> _{or}	rpm			<i>D</i> _{s min}	<i>d</i> _{h max}	<i>R</i> _{max}	(approx.)
10	26	8	0.3	4550	1960	29000	34000	6000	12.5	23.5	0.3	0.019
12	28	8	0.3	5100	2390	26000	30000	6001	14.5	25.5	0.3	0.021
15	32	9	0.3	5600	2840	22000	26000	6002	17.5	29.5	0.3	0.030
17	35	10	0.3	6800	3350	20000	24000	6003	19.5	32.5	0.3	0.039
20	42	12	0.6	9400	5050	18000	21000	6004	25.0	37.0	0.6	0.069
25	47	12	0.6	10100	5850	15000	18000	6005	30.0	42.0	0.6	0.080
30	55	13	1.0	13200	8300	13000	15000	6006	36.0	49.0	1.0	0.116
35	62	14	1.0	16000	10300	12000	14000	6007	41.0	56.0	1.0	0.155
40	68	15	1.0	16800	11500	10000	12000	6008	46.0	62.0	1.0	0.190
45	75	16	1.0	21000	15100	9200	11000	6009	51.0	69.0	1.0	0.237
50	80	16	1.0	21800	16600	8400	9800	6010	56.0	74.0	1.0	0.261
55	90	18	1.1	28300	21200	7700	9000	6011	62.0	83.0	1.0	0.388
60	95	18	1.1	29500	23200	7000	8300	6012	67.0	88.0	1.0	0.414
65	100	18	1.1	30500	25200	6500	7700	6013	72.0	93.0	1.0	0.421
70	110	20	1.1	38000	31000	6100	7100	6014	77.0	103.0	1.0	0.604
75	115	20	1.1	39500	33500	5700	6700	6015	82.0	108.0	1.0	0.649
80	125	22	1.1	47500	40000	5300	6200	6016	87.0	118.0	1.0	0.854
85	130	22	1.1	49500	43000	5000	5900	6017	92.0	123.0	1.0	0.890
90	140	24	1.5	58000	49500	4700	5600	6018	98.5	131.5	1.5	1.020
95	145	24	1.5	60500	54000	4500	5300	6019	103.5	136.5	1.5	1.080
100	150	24	1.5	60000	54000	4200	5000	6020	108.5	141.5	1.5	1.150
105	160	26	2.0	72500	65500	4000	4700	6021	115.0	150.0	2.0	1.590
110	170	28	2.0	82000	73000	3800	4500	6022	120.0	160.0	2.0	1.960

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

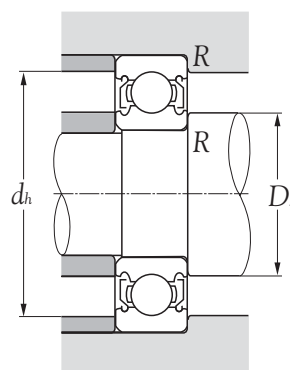
Ball Bearings series 60..ZZ, 60..2RS



Shielded type
(ZZ)



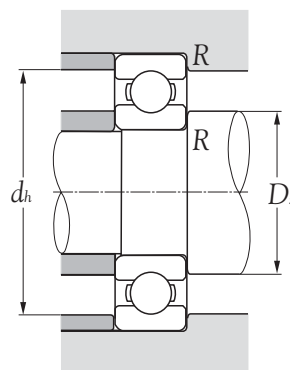
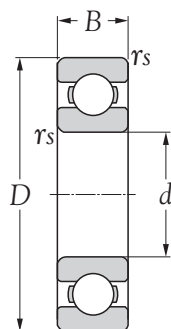
Sealed type
(2RS)



Boundary dimensions mm				Basic load ratings dynamic static N		Limiting speeds grease rpm	Bearing numbers		Abutment and fillet dimensions mm				Mass kg (approx.)
d	D	B	rs min ¹⁾	Cr	Cor				Ds min	max	dh max	R max	
10	26	8	0.3	4550	1960	29000	6000 ZZ	6000 2RS	12.5	13.5	23.5	0.3	0.019
12	28	8	0.3	5100	2390	26000	6001 ZZ	6001 2RS	14.5	16.0	25.5	0.3	0.021
15	32	9	0.3	5600	2840	22000	6002 ZZ	6002 2RS	17.5	19.0	29.5	0.3	0.030
17	35	10	0.3	6800	3350	20000	6003 ZZ	6003 2RS	19.5	21.0	32.5	0.3	0.039
20	42	12	0.6	9400	5050	18000	6004 ZZ	6004 2RS	25.0	26.0	37.0	0.6	0.069
25	47	12	0.6	10100	5850	15000	6005 ZZ	6005 2RS	30.0	30.5	42.0	0.6	0.080
30	55	13	1.0	13200	8300	13000	6006 ZZ	6006 2RS	36.0	37.0	49.0	1.0	0.116
35	62	14	1.0	16000	10300	12000	6007 ZZ	6007 2RS	41.0	42.0	56.0	1.0	0.155
40	68	15	1.0	16800	11500	10000	6008 ZZ	6008 2RS	46.0	47.0	62.0	1.0	0.190
45	75	16	1.0	21000	15100	9200	6009 ZZ	6009 2RS	51.0	52.5	69.0	1.0	0.237
50	80	16	1.0	21800	16600	8400	6010 ZZ	6010 2RS	56.0	57.5	74.0	1.0	0.261
55	90	18	1.1	28300	21200	7700	6011 ZZ	6011 2RS	62.0	64.0	83.0	1.0	0.388
60	95	18	1.1	29500	23200	7000	6012 ZZ	6012 2RS	67.0	69.0	88.0	1.0	0.414
65	100	18	1.1	30500	25200	6500	6013 ZZ	6013 2RS	72.0	73.0	93.0	1.0	0.421
70	110	20	1.1	38000	31000	6100	6014 ZZ	6014 2RS	77.0	80.5	103.0	1.0	0.604
75	115	20	1.1	39500	33500	5700	6015 ZZ	6015 2RS	82.0	85.5	108.0	1.0	0.649
80	125	22	1.1	47500	40000	5300	6016 ZZ	6016 2RS	87.0	91.5	118.0	1.0	0.854
85	130	22	1.1	49500	43000	5000	6017 ZZ	6017 2RS	92.0	97.0	123.0	1.0	0.890
90	140	24	1.5	58000	49500	4700	6018 ZZ	6018 2RS	98.5	102.0	131.5	1.5	1.020
95	145	24	1.5	60500	54000	4500	6019 ZZ	6019 2RS	103.5	109.0	136.5	1.5	1.080
100	150	24	1.5	60000	54000	4200	6020 ZZ	6020 2RS	108.5	110.0	141.5	1.5	1.150
105	160	26	2.0	72500	65500	4000	6021 ZZ	6021 2RS	115.0	119.0	150.0	2.0	1.590
110	170	28	2.0	82000	73000	3800	6022 ZZ	6022 2RS	120.0	126.0	160.0	2.0	1.960

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

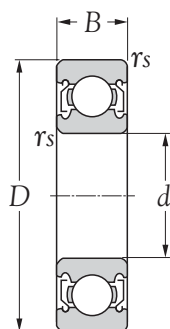
Ball Bearings series 62..



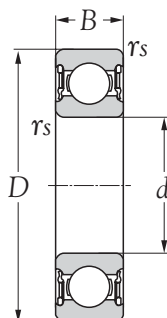
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Abutment and fillet dimensions			Mass
mm				dynamic	static	grease	oil		mm			
d	D	B	$r_{s\min}^{1)}$	C_r	C_{or}	rpm			$D_{s\min}$	$d_{h\max}$	$R_{\max}$	(approx.)
10	30	9	0.6	5100	2390	25000	30000	6200	15.0	25.0	0.6	0.032
12	32	10	0.6	6100	2750	22000	26000	6201	17.0	27.0	0.6	0.037
15	35	11	0.6	7750	3600	19000	23000	6202	20.0	30.0	0.6	0.045
17	40	12	0.6	9600	4600	18000	21000	6203	22.0	35.0	0.6	0.066
20	47	14	1.0	12800	6650	16000	18000	6204	26.0	41.0	1.0	0.106
25	52	15	1.0	14000	7850	13000	15000	6205	31.0	46.0	1.0	0.128
30	62	16	1.0	19500	11300	11000	13000	6206	36.0	56.0	1.0	0.199
35	72	17	1.1	25700	15300	9800	11000	6207	42.0	65.0	1.0	0.288
40	80	18	1.1	29100	17800	8700	10000	6208	47.0	73.0	1.0	0.366
45	85	19	1.1	32500	20400	7800	9200	6209	52.0	78.0	1.0	0.398
50	90	20	1.1	35000	23200	7100	8300	6210	57.0	83.0	1.0	0.454
55	100	21	1.5	43500	29200	6400	7600	6211	63.5	91.5	1.5	0.601
60	110	22	1.5	52500	36000	6000	7000	6212	68.5	101.5	1.5	0.783
65	120	23	1.5	57500	40000	5500	6500	6213	73.5	111.5	1.5	0.990
70	125	24	1.5	62000	44000	5100	6000	6214	78.5	116.5	1.5	1.070
75	130	25	1.5	66000	49500	4800	5600	6215	83.5	121.5	1.5	1.180
80	140	26	2.0	72500	53000	4500	5300	6216	90.0	130.0	2.0	1.400
85	150	28	2.0	83500	64000	4200	5000	6217	95.0	140.0	2.0	1.790
90	160	30	2.0	96000	71500	4000	4700	6218	100.0	150.0	2.0	2.150
95	170	32	2.1	109000	82000	3700	4400	6219	107.0	158.0	2.0	2.620
100	180	34	2.1	122000	93000	3500	4200	6220	112.0	168.0	2.0	3.140
105	190	36	2.1	133000	105000	3400	4000	6221	117.0	178.0	2.0	3.700
110	200	38	2.1	144000	117000	3200	3800	6222	122.0	188.0	2.0	4.360

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension *r*.

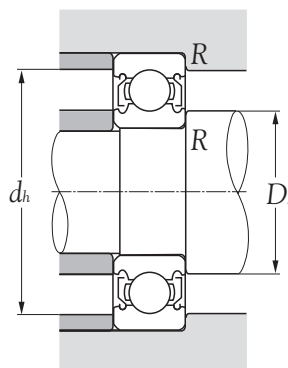
Ball Bearings series 62..ZZ, 62..2RS



Shielded type
(ZZ)



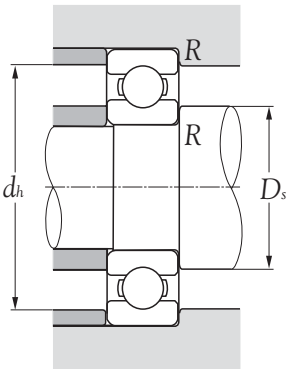
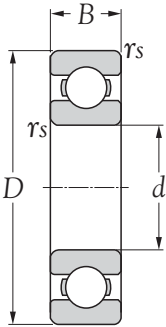
Sealed type
(2RS)



Boundary dimensions mm				Basic load ratings dynamic static N		Limiting speeds grease rpm	Bearing numbers		Abutment and fillet dimensions mm				Mass kg (approx.)
d	D	B	rs min ¹⁾	Cr	Cor				min	max	dh max	R max	
10	30	9	0.6	5100	2390	25000	6200 ZZ	6200 2RS	15.0	16.0	25.0	0.6	0.032
12	32	10	0.6	6100	2750	22000	6201 ZZ	6201 2RS	17.0	17.5	27.0	0.6	0.037
15	35	11	0.6	7750	3600	19000	6202 ZZ	6202 2RS	20.0	20.5	30.0	0.6	0.045
17	40	12	0.6	9600	4600	18000	6203 ZZ	6203 2RS	22.0	23.0	35.0	0.6	0.066
20	47	14	1.0	12800	6650	16000	6204 ZZ	6204 2RS	26.0	28.0	41.0	1.0	0.106
25	52	15	1.0	14000	7850	13000	6205 ZZ	6205 2RS	31.0	32.0	46.0	1.0	0.128
30	62	16	1.0	19500	11300	11000	6206 ZZ	6206 2RS	36.0	39.0	56.0	1.0	0.199
35	72	17	1.1	25700	15300	9800	6207 ZZ	6207 2RS	42.0	45.0	65.0	1.0	0.288
40	80	18	1.1	29100	17800	8700	6208 ZZ	6208 2RS	47.0	51.0	73.0	1.0	0.366
45	85	19	1.1	32500	20400	7800	6209 ZZ	6209 2RS	52.0	55.5	78.0	1.0	0.398
50	90	20	1.1	35000	23200	7100	6210 ZZ	6210 2RS	57.0	60.0	83.0	1.0	0.454
55	100	21	1.5	43500	29200	6400	6211 ZZ	6211 2RS	63.5	67.0	91.5	1.5	0.601
60	110	22	1.5	52500	36000	6000	6212 ZZ	6212 2RS	68.5	75.0	101.5	1.5	0.783
65	120	23	1.5	57500	40000	5500	6213 ZZ	6213 2RS	73.5	80.5	111.5	1.5	0.990
70	125	24	1.5	62000	44000	5100	6214 ZZ	6214 2RS	78.5	85.0	116.5	1.5	1.070
75	130	25	1.5	66000	49500	4800	6215 ZZ	6215 2RS	83.5	90.5	121.5	1.5	1.180
80	140	26	2.0	72500	53000	4500	6216 ZZ	6216 2RS	90.0	95.5	130.0	2.0	1.400
85	150	28	2.0	83500	64000	4200	6217 ZZ	6217 2RS	95.0	103.0	140.0	2.0	1.790
90	160	30	2.0	96000	71500	4000	6218 ZZ	6218 2RS	100.0	109.0	150.0	2.0	2.150
95	170	32	2.1	109000	82000	3700	6219 ZZ	6219 2RS	107.0	116.0	158.0	2.0	2.620
100	180	34	2.1	122000	93000	3500	6220 ZZ	6220 2RS	112.0	122.0	168.0	2.0	3.140
105	190	36	2.1	133000	105000	3400	6221 ZZ	6221 2RS	117.0	125.0	178.0	2.0	3.700
110	200	38	2.1	144000	117000	3200	6222 ZZ	6222 2RS	122.0	132.0	188.0	2.0	4.360

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

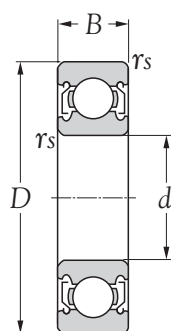
Ball Bearings
series 63..



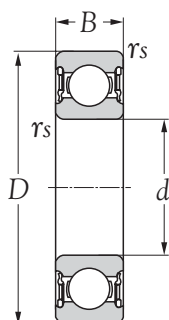
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Abutment and fillet dimensions			Mass
mm				dynamic	static	grease	oil		mm			kg
d	D	B	$r_s \text{ min}^{1)}$	C_r	C_{or}	rpm			D_s $_{min}$	d_h $_{max}$	R $_{max}$	(approx.)
10	35	11	0.6	8200	3500	23000	27000	6300	15.0	30.0	0.6	0.053
12	37	12	1.0	9700	4200	20000	24000	6301	18.0	31.0	1.0	0.060
15	42	13	1.0	11400	5450	17000	21000	6302	21.0	36.0	1.0	0.082
17	47	14	1.0	13500	6550	16000	19000	6303	23.0	41.0	1.0	0.115
20	52	15	1.1	15900	7900	14000	17000	6304	27.0	45.0	1.0	0.144
25	62	17	1.1	21200	10900	12000	14000	6305	32.0	55.0	1.0	0.232
30	72	19	1.1	26700	15000	10000	12000	6306	37.0	65.0	1.0	0.360
35	80	21	1.5	33500	19100	8800	10000	6307	43.5	71.5	1.5	0.457
40	90	23	1.5	40500	24000	7800	9200	6308	48.5	81.5	1.5	0.630
45	100	25	1.5	53000	32000	7000	8200	6309	53.5	91.5	1.5	0.814
50	110	27	2.0	62000	38500	6400	7500	6310	60.0	100.0	2.0	1.070
55	120	29	2.0	71500	45000	5800	6800	6311	65.0	110.0	2.0	1.370
60	130	31	2.1	82000	52000	5400	6300	6312	72.0	118.0	2.0	1.730
65	140	33	2.1	92500	60000	4900	5800	6313	77.0	128.0	2.0	2.080
70	150	35	2.1	104000	68000	4600	5400	6314	82.0	138.0	2.0	2.520
75	160	37	2.1	113000	77000	4300	5000	6315	87.0	148.0	2.0	3.020
80	170	39	2.1	123000	86500	4000	4700	6316	92.0	158.0	2.0	3.590

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

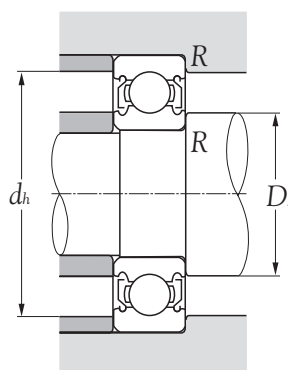
Ball Bearings series 63..ZZ, 63..2RS



Shielded type
(ZZ)



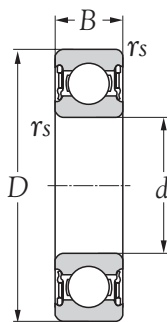
Sealed type
(2RS)



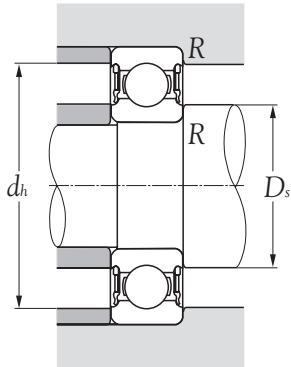
Boundary dimensions mm				Basic load ratings dynamic static N		Limiting speeds grease rpm	Bearing numbers		Abutment and fillet dimensions mm				Mass kg (approx.)
d	D	B	rs min ¹⁾	Cr	Cor				Ds min	Ds max	dh max	R max	
10	35	11	0.6	8200	3500	23000	6300 ZZ	6300 2RS	15.0	17.0	30.0	0.6	0.053
12	37	12	1.0	9700	4200	20000	6301 ZZ	6301 2RS	18.0	18.5	31.0	1.0	0.060
15	42	13	1.0	11400	5450	17000	6302 ZZ	6302 2RS	21.0	23.0	36.0	1.0	0.082
17	47	14	1.0	13500	6550	16000	6303 ZZ	6303 2RS	23.0	25.0	41.0	1.0	0.115
20	52	15	1.1	15900	7900	14000	6304 ZZ	6304 2RS	27.0	28.5	45.0	1.0	0.144
25	62	17	1.1	21200	10900	12000	6305 ZZ	6305 2RS	32.0	35.0	55.0	1.0	0.232
30	72	19	1.1	26700	15000	10000	6306 ZZ	6306 2RS	37.0	43.0	65.0	1.0	0.360
35	80	21	1.5	33500	19100	8800	6307 ZZ	6307 2RS	43.5	47.0	71.5	1.5	0.457
40	90	23	1.5	40500	24000	7800	6308 ZZ	6308 2RS	48.5	54.0	81.5	1.5	0.630
45	100	25	1.5	53000	32000	7000	6309 ZZ	6309 2RS	53.5	61.5	91.5	1.5	0.814
50	110	27	2.0	62000	38500	6400	6310 ZZ	6310 2RS	60.0	68.5	100.0	2.0	1.070
55	120	29	2.0	71500	45000	5800	6311 ZZ	6311 2RS	65.0	74.0	110.0	2.0	1.370
60	130	31	2.1	82000	52000	5400	6312 ZZ	6312 2RS	72.0	80.5	118.0	2.0	1.730
65	140	33	2.1	92500	60000	4900	6313 ZZ	6313 2RS	77.0	86.0	128.0	2.0	2.080
70	150	35	2.1	104000	68000	4600	6314 ZZ	6314 2RS	82.0	92.5	138.0	2.0	2.520
75	160	37	2.1	113000	77000	4300	6315 ZZ	6315 2RS	87.0	99.0	148.0	2.0	3.020
80	170	39	2.1	123000	86500	4000	6316 ZZ	6316 2RS	92.0	105.0	158.0	2.0	3.590

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

Ball Bearings
series 622..2RS



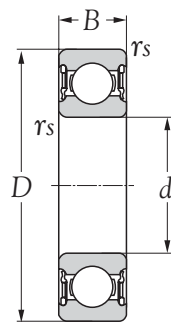
Sealed type
(2RS)



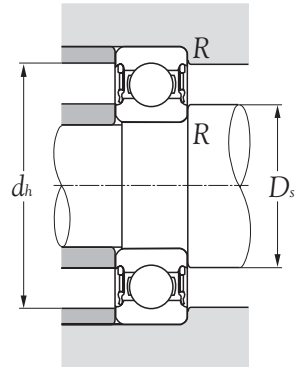
Boundary dimensions				Basic load ratings		Speed rating grease rpm	Bearing numbers	Abutment and fillet dimensions				Mass kg (approx.)
mm				dynamic	static			mm				
<i>d</i>	<i>D</i>	<i>B</i>	<i>r</i> s min ¹⁾	<i>C</i> _o	<i>C</i> _{or}			<i>D</i> _s <i>min</i>	<i>max</i>	<i>d</i> _h <i>max</i>	<i>R</i> <i>max</i>	
10	30	14	0.6	5070	2360	17000	62200 2RS	14.0	14.5	26.0	0.6	0.040
12	32	14	0.6	6890	3100	15000	62201 2RS	16.0	16.0	28.0	0.6	0.045
15	35	14	0.6	7800	3750	13000	62202 2RS	19.0	19.0	31.0	0.6	0.054
17	40	16	0.6	9560	4750	12000	62203 2RS	21.0	21.0	36.0	0.6	0.083
20	47	18	1.0	12700	6550	10000	62204 2RS	25.0	25.5	42.0	1.0	0.130
25	52	18	1.0	14000	7800	8500	62205 2RS	30.0	31.0	47.0	1.0	0.150
30	62	20	1.0	19500	11200	7500	62206 2RS	35.0	37.0	57.0	1.0	0.240
35	72	23	1.1	25500	15300	6300	62207 2RS	41.5	43.5	65.5	1.0	0.370
40	80	23	1.1	30700	19000	5600	62208 2RS	46.5	49.5	73.5	1.0	0.440
45	85	23	1.1	33200	21600	5000	62209 2RS	51.5	54.0	78.5	1.0	0.480
50	90	23	1.1	35100	23200	4800	62210 2RS	56.5	58.0	83.5	1.0	0.520
55	100	25	1.5	43600	29000	4300	62211 2RS	63.0	65.0	92.0	1.5	0.700
60	110	28	1.5	47500	32500	4000	62212 2RS	68.0	71.0	102.0	1.5	0.970

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

Ball Bearings
series 623..2RS



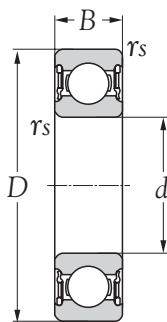
Sealed type
(2RS)



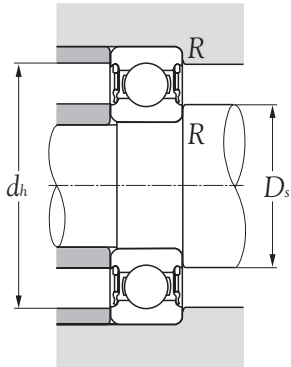
Boundary dimensions				Basic load ratings		Speed rating grease rpm	Bearing numbers	Abutment and fillet dimensions				Mass kg (approx.)
d	D	B	rs min ¹⁾	dynamic Co	static Cor			min	Ds max	dh max	R max	
10	35	17	0.6	8060	3400	15000	62300 2RS	14.0	15.0	31.0	0.6	0.060
12	37	17	1.0	9750	4150	14000	62301 2RS	17.0	17.0	32.0	1.0	0.070
15	42	17	1.0	11400	5400	12000	62302 2RS	20.0	20.5	37.0	1.0	0.110
17	47	19	1.0	13500	6550	11000	62303 2RS	22.0	23.5	42.0	1.0	0.150
20	52	21	1.1	15900	7800	9500	62304 2RS	26.5	27.0	45.5	1.0	0.200
25	62	24	1.1	22500	11600	7500	62305 2RS	31.5	33.5	55.5	1.0	0.320
30	72	27	1.1	28100	16000	6300	62306 2RS	36.5	41.5	65.5	1.0	0.480
35	80	31	1.5	33200	19000	6000	62307 2RS	43.0	44.0	72.0	1.5	0.660
40	90	33	1.5	41000	24000	5000	62308 2RS	48.0	50.5	82.0	1.5	0.890
45	100	36	1.5	52700	31500	4500	62309 2RS	53.0	56.5	92.0	1.5	1.150
50	110	40	2.0	61800	38000	4300	62310 2RS	59.0	63.0	101.0	2.0	1.550

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

Ball Bearings
series 630..2RS



Scaled type
(2RS)



Boundary dimensions				Basic load ratings		Speed rating grease rpm	Bearing numbers	Abutment and fillet dimensions				Mass kg (approx.)
mm				dynamic	static			mm				
d	D	B	$r_s \text{ min}^{1)}$	C_o	C_{or}			D_s $_{min}$	$_{max}$	dh $_{max}$	R $_{max}$	
10	26	12	0.3	4620	1960	19000	63000 2RS	12	12.5	24	0.3	0.025
12	28	12	0.3	5070	2360	17000	63001 2RS	14	14.5	26	0.3	0.029
15	32	13	0.3	5590	2850	14000	63002 2RS	17	18.0	30	0.3	0.039
17	35	14	0.3	6050	3250	13000	63003 2RS	19	20.0	33	0.3	0.052
20	42	16	0.6	9360	5000	11000	63004 2RS	24	24.5	38	0.6	0.086
25	47	16	0.6	11200	6550	9500	63005 2RS	29	29.0	43	0.6	0.100
30	55	19	1.0	13300	8300	8000	63006 2RS	35	35.5	50	1.0	0.160
35	62	20	1.0	15900	10200	7000	63007 2RS	40	40.5	57	1.0	0.210
40	68	21	1.0	16800	11600	6300	63008 2RS	45	46.0	63	1.0	0.260
45	75	23	1.0	20800	14600	5600	63009 2RS	50	51.0	70	1.0	0.340
50	80	23	1.0	21600	16000	5000	63010 2RS	55	56.0	75	1.0	0.370

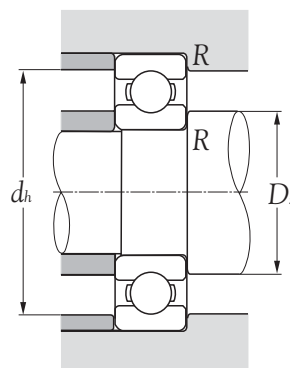
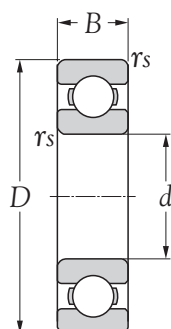
Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

KSM[®] NOTE

Handwriting practice lines consisting of 20 horizontal dashed lines.



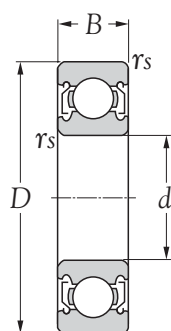
Ball Bearings series 68..



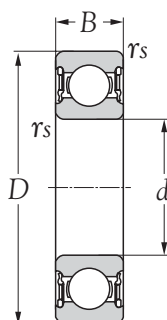
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Abutment and fillet dimensions			Mass
mm				dynamic	static	grease	oil		mm			
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_{s min}¹⁾</i>	<i>C_r</i>	<i>C_{0r}</i>		rpm		<i>D_{s min}</i>	<i>d_{h max}</i>	<i>R_{max}</i>	(approx.)
10	19	5	0.3	1830	925	32000	38000	6800	12	17	0.3	0.005
12	21	5	0.3	1920	1040	29000	35000	6801	14	19	0.3	0.006
15	24	5	0.3	2080	1260	26000	31000	6802	17	22	0.3	0.007
17	26	5	0.3	2810	1720	24000	28000	6803	19	24	0.3	0.008
20	32	7	0.3	4000	2470	21000	25000	6804	22	30	0.3	0.019
25	37	7	0.3	4300	2950	18000	21000	6805	27	35	0.3	0.022
30	42	7	0.3	4700	3650	15000	18000	6806	32	40	0.3	0.026
35	47	7	0.3	4900	4050	13000	16000	6807	37	45	0.3	0.029
40	52	7	0.3	5100	4400	12000	14000	6808	42	50	0.3	0.033
45	58	7	0.3	6400	5650	11000	12000	6809	47	56	0.3	0.040
50	65	7	0.3	6600	6100	9600	11000	6810	52	63	0.3	0.052
55	72	9	0.3	8800	8100	8700	10000	6811	57	70	0.3	0.083
60	78	10	0.3	11500	10600	8000	9400	6812	62	76	0.3	0.106
65	85	10	0.6	11600	11000	7400	8700	6813	69	81	0.6	0.128
70	90	10	0.6	12100	11900	6900	8100	6814	74	86	0.6	0.137
75	95	10	0.6	12500	12900	6400	7600	6815	79	91	0.6	0.145
80	100	10	0.6	12700	13300	6000	7100	6816	84	96	0.6	0.154
85	110	13	1.0	18700	19000	5700	6700	6817	90	105	1.0	0.270
90	115	13	1.0	19000	19700	5400	6300	6818	95	110	1.0	0.285
95	120	13	1.0	19300	20500	5000	5900	6819	100	115	1.0	0.300
100	125	13	1.0	19600	21200	4800	5600	6820	105	120	1.0	0.313
105	130	13	1.0	19800	22000	4600	5400	6821	110	125	1.0	0.330
110	140	16	1.0	28800	32000	4300	5100	6822	115	135	1.0	0.515
120	150	16	1.0	28900	33000	4000	4700	6824	125	145	1.0	0.555

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension *r*.

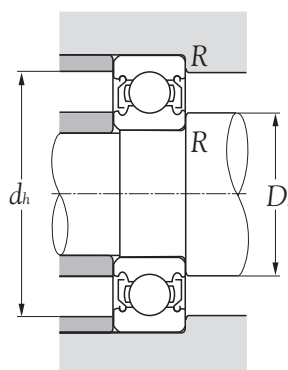
Ball Bearings series 68..ZZ, 68..2RS



Shielded type
(ZZ)



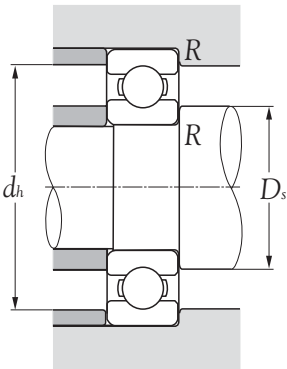
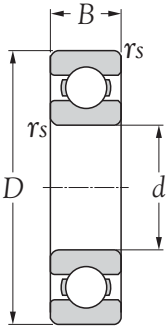
Sealed type
(2RS)



Boundary dimensions mm				Basic load ratings dynamic static N		Limiting speeds grease rpm	Bearing numbers		Abutment and fillet dimensions mm				Mass kg (approx.)
d	D	B	r _s min ¹⁾	C _r	C _{or}				D _s min	D _s max	d _h max	R max	
10	19	5	0.3	1830	925	32000	6800 ZZ	6800 2RS	12	12.5	17	0.3	0.005
12	21	5	0.3	1920	1040	29000	6801 ZZ	6801 2RS	14	14.5	19	0.3	0.006
15	24	5	0.3	2080	1260	26000	6802 ZZ	6802 2RS	17	17.5	22	0.3	0.007
17	26	5	0.3	2810	1720	24000	6803 ZZ	6803 2RS	19	19.5	24	0.3	0.008
20	32	7	0.3	4000	2470	21000	6804 ZZ	6804 2RS	22	23.0	30	0.3	0.019
25	37	7	0.3	4300	2950	18000	6805 ZZ	6805 2RS	27	28.0	35	0.3	0.022
30	42	7	0.3	4700	3650	15000	6806 ZZ	6806 2RS	32	33.0	40	0.3	0.026
35	47	7	0.3	4900	4050	13000	6807 ZZ	6807 2RS	37	38.0	45	0.3	0.029
40	52	7	0.3	5100	4400	12000	6808 ZZ	6808 2RS	42	43.0	50	0.3	0.033
45	58	7	0.3	6400	5650	11000	6809 ZZ	6809 2RS	47	48.0	56	0.3	0.040
50	65	7	0.3	6600	6100	9600	6810 ZZ	6810 2RS	52	54.0	63	0.3	0.052
55	72	9	0.3	8800	8100	8700	6811 ZZ	6811 2RS	57	59.0	70	0.3	0.083
60	78	10	0.3	11500	10600	8000	6812 ZZ	6812 2RS	62	64.5	76	0.3	0.106
65	85	10	0.6	11600	11000	7400	6813 ZZ	6813 2RS	69	70.0	81	0.6	0.128
70	90	10	0.6	12100	11900	6900	6814 ZZ	6814 2RS	74	75.5	86	0.6	0.137
75	95	10	0.6	12500	12900	6400	6815 ZZ	6815 2RS	79	80.0	91	0.6	0.145
80	100	10	0.6	12700	13300	6000	6816 ZZ	6816 2RS	84	85.0	96	0.6	0.154
85	110	13	1.0	18700	19000	5700	6817 ZZ	6817 2RS	90	91.0	105	1.0	0.270
90	115	13	1.0	19000	19700	5400	6818 ZZ	6818 2RS	95	96.0	110	1.0	0.285
95	120	13	1.0	19300	20500	5000	6819 ZZ	6819 2RS	100	101.0	115	1.0	0.300
100	125	13	1.0	19600	21200	4800	6820 ZZ	6820 2RS	105	106.0	120	1.0	0.313

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

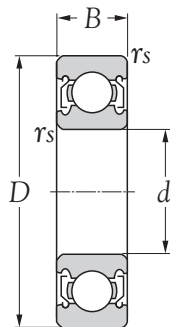
Ball Bearings
series 69..



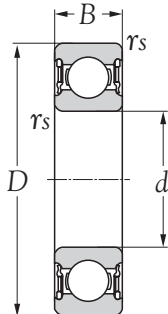
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Abutment and fillet dimensions			Mass
mm				dynamic	static	grease	oil		mm			kg
<i>d</i>	<i>D</i>	<i>B</i>	<i>r</i> _{s min} ¹⁾	<i>C</i> _r	<i>C</i> _{0r}	rpm	rpm		<i>D</i> _{s min}	<i>d</i> _{h max}	<i>R</i> _{max}	(approx.)
10	22	6	0.3	2700	1270	30000	36000	6900	12.0	20.0	0.3	0.009
12	24	6	0.3	2890	1460	27000	32000	6901	14.0	22.0	0.3	0.011
15	28	7	0.3	4100	2060	24000	28000	6902	17.0	26.0	0.3	0.016
17	30	7	0.3	4650	2580	22000	26000	6903	19.0	28.0	0.3	0.018
20	37	9	0.3	6400	3700	19000	23000	6904	22.0	35.0	0.3	0.036
25	42	9	0.3	7050	4550	16000	19000	6905	27.0	40.0	0.3	0.042
30	47	9	0.3	7250	5000	14000	17000	6906	32.0	45.0	0.3	0.048
35	55	10	0.6	11200	7450	12000	15000	6907	39.0	51.0	0.6	0.074
40	62	12	0.6	14600	10200	11000	13000	6908	44.0	58.0	0.6	0.110
45	68	12	0.6	15100	11200	9800	12000	6909	49.0	64.0	0.6	0.128
50	72	12	0.6	15600	12200	8900	11000	6910	54.0	68.0	0.6	0.132
55	80	13	1.0	16000	13300	8200	9600	6911	60.0	75.0	1.0	0.180
60	85	13	1.0	16400	14300	7600	8900	6912	65.0	80.0	1.0	0.193
65	90	13	1.0	17400	16100	7000	8200	6913	70.0	85.0	1.0	0.206
70	100	16	1.0	23700	21200	6500	7700	6914	75.0	95.0	1.0	0.334
75	105	16	1.0	24400	22600	6100	7200	6915	80.0	100.0	1.0	0.353
80	110	16	1.0	24900	24000	5700	6700	6916	85.0	105.0	1.0	0.373
85	120	18	1.1	32000	29600	5400	6300	6917	91.5	113.5	1.0	0.536
90	125	18	1.1	33000	31500	5100	6000	6918	96.5	118.5	1.0	0.554

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

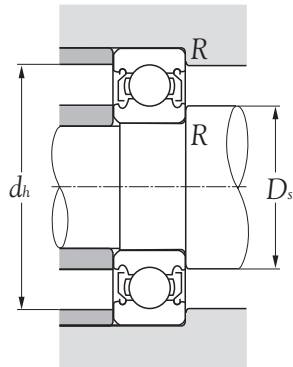
Ball Bearings
series 69..ZZ, 69..2RS



Shielded type
(ZZ)



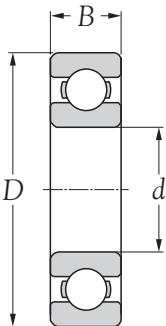
Sealed type
(2RS)



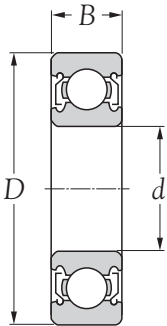
Boundary dimensions				Basic load ratings		Limiting speeds grease rpm	Bearing numbers		Abutment and fillet dimensions				Mass
mm				dynamic N	static N				mm				kg
<i>d</i>	<i>D</i>	<i>B</i>	<i>r</i> _{s min} ¹⁾	<i>C</i> _r	<i>C</i> _{or}				<i>D</i> _s <i>min</i>	<i>max</i>	<i>d</i> _h <i>max</i>	<i>R</i> <i>max</i>	(approx.)
10	22	6	0.3	2700	1270	30000	6900 ZZ	6900 2RS	12.0	13.0	20.0	0.3	0.009
12	24	6	0.3	2890	1460	27000	6901 ZZ	6901 2RS	14.0	15.0	22.0	0.3	0.011
15	28	7	0.3	4100	2060	24000	6902 ZZ	6902 2RS	17.0	18.0	26.0	0.3	0.016
17	30	7	0.3	4650	2580	22000	6903 ZZ	6903 2RS	19.0	20.0	28.0	0.3	0.018
20	37	9	0.3	6400	3700	19000	6904 ZZ	6904 2RS	22.0	24.0	35.0	0.3	0.036
25	42	9	0.3	7050	4550	16000	6905 ZZ	6905 2RS	27.0	29.0	40.0	0.3	0.042
30	47	9	0.3	7250	5000	14000	6906 ZZ	6906 2RS	32.0	34.0	45.0	0.3	0.048
35	55	10	0.6	11200	7450	12000	6907 ZZ	6907 2RS	39.0	40.0	51.0	0.6	0.074
40	62	12	0.6	14600	10200	11000	6908 ZZ	6908 2RS	44.0	45.0	58.0	0.6	0.110
45	68	12	0.6	15100	11200	9800	6909 ZZ	6909 2RS	49.0	51.0	64.0	0.6	0.128
50	72	12	0.6	15600	12200	8900	6910 ZZ	6910 2RS	54.0	55.5	68.0	0.6	0.132
55	80	13	1.0	16000	13300	8200	6911 ZZ	6911 2RS	60.0	61.5	75.0	1.0	0.180
60	85	13	1.0	16400	14300	7600	6912 ZZ	6912 2RS	65.0	66.5	80.0	1.0	0.193
65	90	13	1.0	17400	16100	7000	6913 ZZ	6913 2RS	70.0	71.5	85.0	1.0	0.206
70	100	16	1.0	23700	21200	6500	6914 ZZ	6914 2RS	75.0	77.5	95.0	1.0	0.334
75	105	16	1.0	24400	22600	6100	6915 ZZ	6915 2RS	80.0	82.5	100.0	1.0	0.353
80	110	16	1.0	24900	24000	5700	6916 ZZ	6916 2RS	85.0	88.0	105.0	1.0	0.373
85	120	18	1.1	32000	29600	5400	6917 ZZ	6917 2RS	91.5	94.0	113.5	1.0	0.536
90	125	18	1.1	33000	31500	5100	6918 ZZ	6918 2RS	96.5	99.0	118.5	1.0	0.554

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

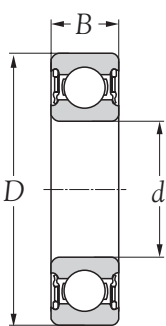
Ball Bearings (Inch sizes)
series **RLS...**, **RLS..ZZ**, **RLS..2RS**



Open



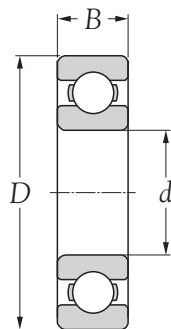
Shielded type
(ZZ)



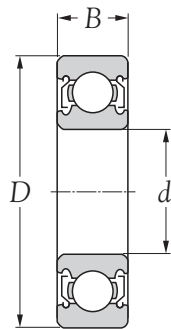
Sealed type
(2RS)

Boundary dimensions			Basic load ratings		Limiting speeds		Bearing numbers			Mass
mm			dynamic	static	grease	oil				kg
d	D	B	C _r	C _{or}	rpm					(approx.)
12.700	33.338	9.525	4360	2510	21000	24000	RLS - 4	RLS - 4 ZZ	RLS - 4 2RS	0.038
15.875	39.688	11.113	8620	4510	17000	20000	RLS - 5	RLS - 5 ZZ	RLS - 5 2RS	0.067
19.050	47.625	14.288	9080	6200	14000	16000	RLS - 6	RLS - 6 ZZ	RLS - 6 2RS	0.120
22.225	50.800	14.288	8720	5190	13100	15100	RLS - 7	RLS - 7 ZZ	RLS - 7 2RS	0.142
25.400	57.180	15.875	10780	6980	11500	13500	RLS - 8	RLS - 8 ZZ	RLS - 8 2RS	0.190
28.575	63.500	15.875	12800	8400	10500	12000	RLS - 9	RLS - 9 ZZ	RLS - 9 2RS	0.185
31.750	69.850	17.436	20770	15190	9500	11000	RLS-10	RLS-10 ZZ	RLS-10 2RS	0.285
34.925	76.200	17.436	19750	15300	8600	10000	RLS-11	RLS-11 ZZ	RLS-11 2RS	0.362
38.100	82.550	19.050	22710	18140	8000	9200	RLS-12	RLS-12 ZZ	RLS-12 2RS	0.402
41.275	88.900	19.050	24360	20680	7400	8500	RLS-13	RLS-13 ZZ	RLS-13 2RS	0.580
44.450	95.250	20.640	26980	23180	6900	7900	RLS-14	RLS-14 ZZ	RLS-14 2RS	0.640
47.635	101.600	20.640	43350	29400	6400	7400	RLS-15	RLS-15 ZZ	RLS-15 2RS	0.750
50.800	101.600	20.640	33370	29220	6300	7200	RLS-16	RLS-16 ZZ	RLS-16 2RS	0.653
57.150	114.300	22.230	36740	32930	5600	6400	RLS-18	RLS-18 ZZ	RLS-18 2RS	1.100
63.500	127.000	23.810	46830	45440	5050	5800	RLS-20	RLS-20 ZZ	RLS-20 2RS	1.600
69.850	133.400	23.810	46830	45440	4700	5400	RLS-22	RLS-22 ZZ	RLS-22 2RS	1.800

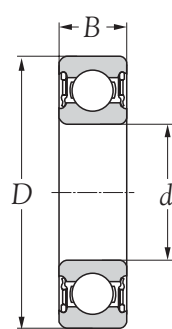
Ball Bearings (Inch sizes)
series **RMS.., RMS..ZZ, RMS..2RS**



Open



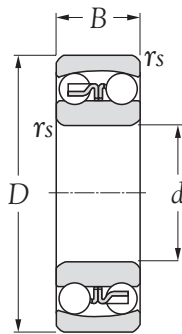
Shielded type
(ZZ)



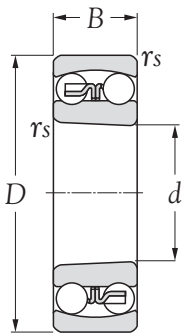
Sealed type
(2RS)

Boundary dimensions			Basic load ratings		Limiting speeds		Bearing numbers			Mass
mm			dynamic	static	grease	oil				kg
d	D	B	C _r	C _{or}	rpm					(approx.)
12.700	41.275	15.875	9570	4790	17700	20500	RMS - 4	RMS - 4 ZZ	RMS - 4 2RS	0.107
15.875	46.038	15.875	10540	6560	15500	17800	RMS - 5	RMS - 5 ZZ	RMS - 5 2RS	0.117
19.050	50.800	17.463	9880	6200	13700	15800	RMS - 6	RMS - 6 ZZ	RMS - 6 2RS	0.120
22.225	57.150	17.463	10780	6980	12000	13900	RMS - 7	RMS - 7 ZZ	RMS - 7 2RS	0.230
25.400	63.500	19.050	17020	11390	10800	12400	RMS - 8	RMS - 8 ZZ	RMS - 8 2RS	0.310
28.575	71.440	20.640	17000	15190	9600	11000	RMS - 9	RMS - 9 ZZ	RMS - 9 2RS	0.375
31.750	79.370	22.225	19750	15300	8600	9900	RMS-10	RMS-10 ZZ	RMS-10 2RS	0.540
34.930	88.900	22.225	19750	15300	7750	8900	RMS-11	RMS-11 ZZ	RMS-11 2RS	0.580
38.100	95.250	23.810	36350	24040	7200	8300	RMS-12	RMS-12 ZZ	RMS-12 2RS	0.800
41.275	101.600	23.810	40660	31830	6700	7700	RMS-13	RMS-13 ZZ	RMS-13 2RS	0.860
44.450	108.000	26.990	47580	37940	6300	7250	RMS-14	RMS-14 ZZ	RMS-14 2RS	1.200
47.630	114.300	26.990	47580	37940	5900	6800	RMS-15	RMS-15 ZZ	RMS-15 2RS	1.500
50.800	114.300	26.990	47580	37940	5800	6700	RMS-16	RMS-16 ZZ	RMS-16 2RS	1.480
57.150	127.000	31.750	62880	51850	5200	6000	RMS-18	RMS-18 ZZ	RMS-18 2RS	1.800
63.500	139.700	31.750	72270	60440	4700	5450	RMS-20	RMS-20 ZZ	RMS-20 2RS	2.000

Self-aligning Ball Bearings
series 12..E, 12.., 12..K



Cylindrical bore



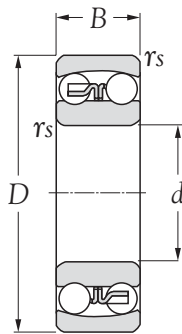
Tapered bore
taper 1:12

Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers		Mass	
mm				dynamic	static	grease	oil			kg	
d	D	B	r _{s min} ¹⁾	C _r	C _{0r}	rpm				cylindrical bore	tapered bore
				N						(approx.)	
10	30	9	0.6	5500	1190	21000	24000	1200 E	-	0.033	-
12	32	10	0.6	5600	1270	18000	22000	1201 E	-	0.040	-
15	35	11	0.6	7450	1750	16000	19000	1202 E	-	0.049	-
17	40	12	0.6	7900	2010	14000	17000	1203 E	-	0.072	-
20	47	14	1.0	9900	2610	13000	15000	1204	-	0.116	-
25	52	15	1.0	12100	3300	11000	13000	1205	1205 K	0.138	0.135
30	62	16	1.0	15600	4650	9200	11000	1206	1206 K	0.217	0.213
35	72	17	1.1	15800	5100	8000	9400	1207	1207 K	0.317	0.312
40	80	18	1.1	19300	6550	7100	8400	1208	1208 K	0.414	0.407
45	85	19	1.1	21900	7350	6400	7500	1209	1209 K	0.457	0.448
50	90	20	1.1	22700	8100	5800	6800	1210	1210 K	0.515	0.504
55	100	21	1.5	26800	10000	5300	6200	1211	1211 K	0.692	0.679
60	110	22	1.5	30000	11500	4900	5800	1212	1212 K	0.879	0.864
65	120	23	1.5	31000	12500	4500	5300	1213	1213 K	1.130	1.110
70	125	24	1.5	34500	13800	4200	4900	1214	-	1.240	-
75	130	25	1.5	39000	15700	3900	4600	1215	1215 K	1.330	1.310
80	140	26	2.0	40000	17000	3700	4300	1216	1216 K	1.650	1.620

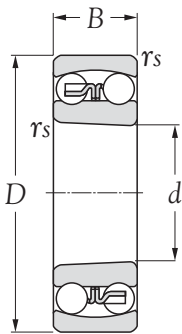
Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

Remark: All KSM products of 12, 13, 22 and 23 series mainly come with steel cages, exceptional for small dimension sizes come with polyimid 6.6, suffix "E" stand for.

Self-aligning Ball Bearings
series 13..E, 13.., 13..K



Cylindrical bore



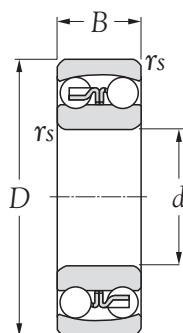
Tapered bore
taper 1:12

Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers		Mass	
mm				dynamic	static	grease	oil			kg	
d	D	B	rs min ¹⁾	Cr	Cor	rpm				cylindrical bore	tapered bore
10	35	11	0.6	7250	1620	18000	21000	1300 E	-	0.058	-
12	37	12	1.0	9450	2160	16000	18000	1301 E	-	0.066	-
15	42	13	1.0	9550	2300	13000	16000	1302 E	-	0.092	-
17	47	14	1.0	12500	3200	12000	14000	1303 E	-	0.128	-
20	52	15	1.1	12400	3350	11000	13000	1304	-	0.160	-
25	62	17	1.1	18000	5000	9100	11000	1305	1305 K	0.255	0.251
30	72	19	1.1	21300	6300	7700	9100	1306	1306 K	0.383	0.377
35	80	21	1.5	25100	7850	6800	8000	1307	1307 K	0.500	0.492
40	90	23	1.5	29600	9700	6000	7000	1308	1308 K	0.709	0.698
45	100	25	1.5	38000	12700	5400	6300	1309	1309 K	0.953	0.938
50	110	27	2.0	43500	14100	4900	5800	1310	1310 K	1.200	1.180
55	120	29	2.0	51500	17900	4500	5200	1311	1311 K	1.580	1.560
60	130	31	2.1	57000	20800	4100	4800	1312	1312 K	1.960	1.930

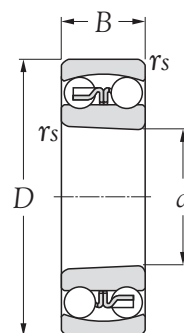
Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

Remark: All KSM products of 12, 13, 22 and 23 series mainly come with steel cages, exceptional for small dimension sizes come with polymid 6.6, suffix "E" stand for.

Self-aligning Ball Bearings series 22..E, 22..., 22..K



Cylindrical bore



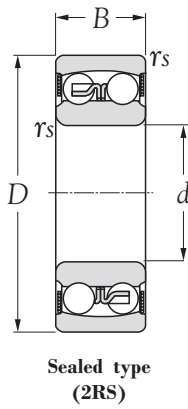
Tapered bore
taper 1:12

Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers		Mass	
d	mm			dynamic C _r	static C _{0r}	grease rpm	oil rpm			kg cylindrical bore (approx.)	tapered bore (approx.)
	D	B	r _s min ¹⁾								
10	30	14	0.6	7300	1590	19000	23000	2200 E	-	0.047	-
12	32	14	0.6	7600	1730	17000	20000	2201 E	-	0.051	-
15	35	14	0.6	7700	1850	15000	18000	2202	-	0.060	-
17	40	16	0.6	9800	2410	13000	16000	2203	-	0.088	-
20	47	18	1.0	12600	3300	12000	14000	2204	-	0.140	-
25	52	18	1.0	12300	3450	10000	12000	2205	2205 K	0.157	0.153
30	62	20	1.0	15200	4500	8600	10000	2206	2206 K	0.256	0.250
35	72	23	1.1	21500	6600	7500	8800	2207	2207 K	0.392	0.382
40	80	23	1.1	22300	7350	6700	7900	2208	2208 K	0.493	0.482
45	85	23	1.1	23200	8150	6000	7100	2209	2209 K	0.540	0.528
50	90	23	1.1	23200	8450	5500	6400	2210	2210 K	0.583	0.569
55	100	25	1.5	26500	9900	5000	5800	2211	2211 K	0.787	0.769
60	110	28	1.5	34000	12600	4600	5400	2212	2212 K	1.080	1.060

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

Remark: All **KSM** products of 12, 13, 22 and 23 series mainly come with steel cages, exceptional for small dimension sizes come with polymid 6.6, suffix "E" stand for.

Self-aligning Ball Bearings
series 22..E 2RS, 22..2RS



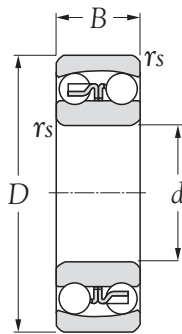
Scaled type
(2RS)

Boundary dimensions				Basic load ratings		Limiting speeds grease rpm	Bearing numbers	Mass kg (approx.)
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_s min¹⁾</i>	dynamic <i>C_r</i>	static <i>C_{0r}</i>			
10	30	14	0.6	5530	1180	17000	2200 E 2RS	0.048
12	32	14	0.6	6240	1430	16000	2201 E 2RS	0.053
15	35	14	0.6	7410	1760	14000	2202 2RS	0.058
17	40	16	0.6	8840	2200	12000	2203 2RS	0.089
20	47	18	1.0	12700	3400	10000	2204 2RS	0.140
25	52	18	1.0	14300	4000	9000	2205 2RS	0.160
30	62	20	1.0	15600	4650	7500	2206 2RS	0.260
35	72	23	1.1	19000	6000	6300	2207 2RS	0.410
40	80	23	1.1	19900	6950	5600	2208 2RS	0.500
45	85	23	1.1	22900	7800	5300	2209 2RS	0.530
50	90	23	1.1	22900	8150	4800	2210 2RS	0.570
55	100	25	1.5	27600	10600	4300	2211 2RS	0.790
60	110	28	1.5	31200	12200	3800	2212 2RS	1.050

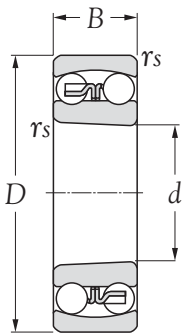
Note: 1) These values are the allowable minimum dimensions of the chamfer dimension *r*.

Remark: All **KSM** products of 12, 13, 22 and 23 series mainly come with steel cages, exceptional for small dimension sizes come with polymid 6.6, suffix "E" stand for.

Self-aligning Ball Bearings
series 23..E, 23..., 23..K



Cylindrical bore

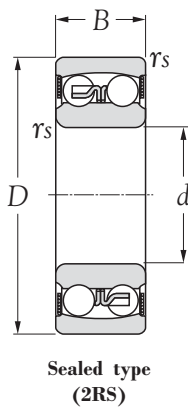


Tapered bore
taper 1:12

Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers		Mass	
mm				dynamic	static	grease	oil			kg	
d	D	B	rs min ¹⁾	Cr	Cor	rpm				cylindrical bore	tapered bore
10	35	17	0.6	10100	2150	17000	20000	2300 E	-	0.083	-
12	37	17	1.0	11800	2710	15000	17000	2301 E	-	0.091	-
15	42	17	1.0	12000	2900	13000	15000	2302	-	0.114	-
17	47	19	1.0	14400	3550	11000	14000	2303	-	0.156	-
20	52	21	1.1	18100	4700	10000	12000	2304	-	0.206	-
25	62	24	1.1	24400	6600	8500	10000	2305	2305 K	0.334	0.326
30	72	27	1.1	31500	8750	7200	8500	2306	2306 K	0.496	0.485
35	80	31	1.5	39500	11300	6300	7400	2307	2307 K	0.671	0.653
40	90	33	1.5	45000	13500	5600	6600	2308	2308 K	0.918	0.895
45	100	36	1.5	54000	16700	5000	5900	2309	2309 K	1.230	1.200
50	110	40	2.0	64500	20200	4600	5400	2310	2310 K	1.630	1.590
55	120	43	2.0	75500	24000	4200	4900	2311	2311 K	2.100	2.050
60	130	46	2.1	87000	28200	3800	4500	2312	2312 K	2.590	2.520

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

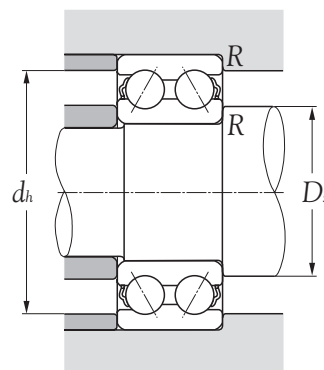
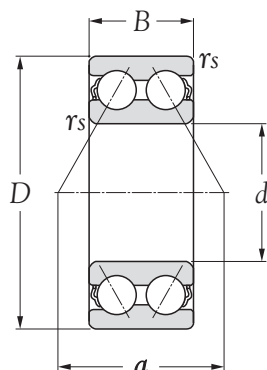
Self-aligning Ball Bearings
series 23..2RS



Boundary dimensions				Basic load ratings		Limiting speeds grease rpm	Bearing numbers	Mass kg (approx.)
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_s min¹⁾</i>	dynamic <i>C_r</i>	static <i>C_{0r}</i>			
15	42	17	1.0	10800	2600	12000	2302 2RS	0.110
17	47	19	1.0	12700	3400	11000	2303 2RS	0.160
20	52	21	1.1	14300	4000	9500	2304 2RS	0.210
25	62	24	1.1	19000	5400	7500	2305 2RS	0.340
30	72	27	1.1	22500	6800	6700	2306 2RS	0.510
35	80	31	1.5	26500	8500	5600	2307 2RS	0.700
40	90	33	1.5	33800	11200	5000	2308 2RS	0.960
45	100	36	1.5	39000	13400	4500	2309 2RS	1.300
50	110	40	2.0	43600	14000	4000	2310 2RS	1.650

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension *r*.

Double-row Angular Contact Ball Bearings series 52..

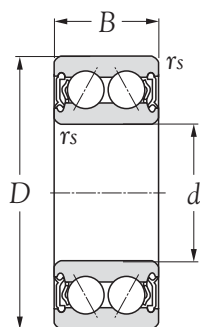


Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Abutment and fillet dimensions				Mass kg (approx.)
d	D	B	$r_s \min^{1)}$	dynamic N	static N	grease rpm	oil rpm		D_s $\min$	d_h $\max$	R $\max$	a	
10	30	14.3	0.6	6950	3800	16000	22000	5200	15.0	25.0	0.6	17.5	0.049
12	32	15.9	0.6	9150	5050	15000	20000	5201	17.0	27.0	0.6	19.0	0.057
15	35	15.9	0.6	10000	6050	12000	17000	5202	20.0	30.0	0.6	21.0	0.064
17	40	17.5	0.6	12800	7900	10000	15000	5203	22.0	35.0	0.6	24.0	0.096
20	47	20.6	1.0	19000	12100	9000	13000	5204	26.0	41.0	1.0	28.0	0.153
25	52	20.6	1.0	20600	14300	8000	11000	5205	31.0	46.0	1.0	31.5	0.175
30	62	23.8	1.0	28600	20400	7000	9500	5206	36.0	56.0	1.0	36.5	0.286
35	72	27.0	1.1	38000	27800	6000	8000	5207	42.0	65.0	1.0	42.5	0.436
40	80	30.2	1.1	42500	32500	5600	7500	5208	47.0	73.0	1.0	47.5	0.590
45	85	30.2	1.1	48000	37000	5000	6700	5209	52.0	78.0	1.0	50.5	0.640
50	90	30.2	1.1	51000	42000	4000	5300	5210	57.0	83.0	1.0	54.0	0.689
55	100	33.3	1.5	63000	53000	3600	4900	5211	63.5	91.5	1.5	60.5	0.986
60	110	36.5	1.5	71500	58500	3400	4500	5212	68.5	101.5	1.5	65.5	1.270
65	120	38.1	1.5	83500	72500	3100	4200	5213	73.5	111.5	1.5	71.0	1.570
70	125	39.7	1.5	90500	79500	2900	3900	5214	78.5	116.5	1.5	74.5	1.800
75	130	41.3	1.5	90000	80500	2700	3600	5215	83.5	121.5	1.5	78.0	1.900
80	140	44.4	2.0	106000	95500	2500	3400	5216	90.0	130.0	2.0	83.5	2.390
85	150	49.2	2.0	112000	106000	2400	3200	5217	95.0	140.0	2.0	91.0	3.060
90	160	52.4	2.0	140000	129000	2200	3000	5218	100.0	150.0	2.0	95.5	3.730

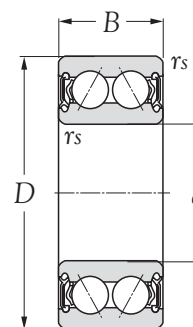
Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r .

Remark: All KSM products of 52 and 53 series come with polyimide 6.6 cages, classified as standard production. Steel cages are classified as non-standard production with suffix "S", i.e. 5204 S, it is subject on request.

Double-row Angular Contact Ball Bearings series 52..ZZ, 52..2RS



Shielded type
(ZZ)



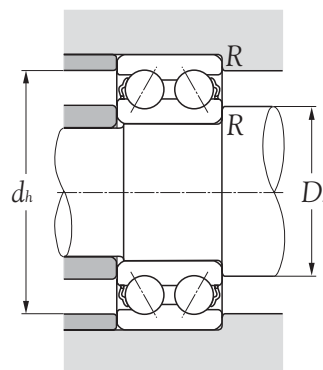
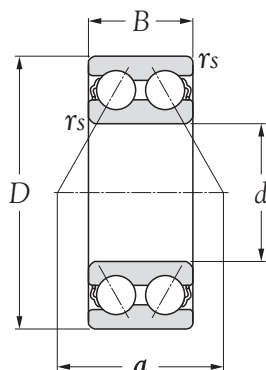
Sealed type
(2RS)

Boundary dimensions				Basic load ratings		Limiting speeds grease rpm	Bearing numbers		Mass kg (approx.)
d	D	B	r _s min ¹⁾	dynamic C _r	static C _{0r}				
10	30	14.3	0.6	6950	3800	16000	5200 ZZ	5200 2RS	0.045
12	32	15.9	0.6	9150	5050	15000	5201 ZZ	5201 2RS	0.050
15	35	15.9	0.6	10000	6050	12000	5202 ZZ	5202 2RS	0.068
17	40	17.5	0.6	12800	7900	10000	5203 ZZ	5203 2RS	0.090
20	47	20.6	1.0	19000	12100	9000	5204 ZZ	5204 2RS	0.140
25	52	20.6	1.0	20600	14300	8000	5205 ZZ	5205 2RS	0.160
30	62	23.8	1.0	28600	20400	7000	5206 ZZ	5206 2RS	0.260
35	72	27.0	1.1	38000	27800	6000	5207 ZZ	5207 2RS	0.400
40	80	30.2	1.1	42500	32500	5600	5208 ZZ	5208 2RS	0.530
45	85	30.2	1.1	48000	37000	5000	5209 ZZ	5209 2RS	0.570
50	90	30.2	1.1	51000	42000	5000	5210 ZZ	5210 2RS	0.670
55	100	33.3	1.5	63000	53000	4000	5211 ZZ	5211 2RS	0.960
60	110	36.5	1.5	71500	58500	3800	5212 ZZ	5212 2RS	1.360
65	120	38.1	1.5	83500	72500	3400	5213 ZZ	5213 2RS	1.660
70	125	39.7	1.5	90500	79500	3200	5214 ZZ	5214 2RS	1.820
75	130	41.3	1.5	90000	80500	3200	5215 ZZ	5215 2RS	1.910
80	140	44.4	2.0	106000	95500	2800	5216 ZZ	5216 2RS	2.480
85	150	49.2	2.0	112000	106000	2600	5217 ZZ	5217 2RS	3.400
90	160	52.4	2.0	140000	129000	2500	5218 ZZ	5218 2RS	4.280

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

Remark: All KSM products of 52 and 53 series come with polyimide 6.6 cages, classified as standard production. Steel cages are classified as non-standard production with suffix "S", i.e. 5204 ZZS, it is subject on request.

Double-row Angular Contact Ball Bearings series 53..

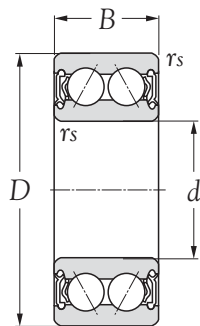


Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Abutment and fillet dimensions				Mass kg (approx.)
d	D	B	$r_s \min^{1)}$	dynamic N	static N	grease rpm	oil rpm		D_s min	d_h max	R max	a	
10	35	19.0	1.0	11700	7000	18000	24000	5300	16.0	30.0	0.6	20.6	0.050
12	37	19.0	1.0	11700	7000	17000	22000	5301	18.0	32.0	0.6	21.3	0.058
15	42	19.0	1.0	17200	10100	9900	13000	5302	21.0	36.0	1.0	26.0	0.132
17	47	22.2	1.0	20400	12100	9000	12000	5303	23.0	41.0	1.0	28.5	0.181
20	52	22.2	1.1	20600	12700	8000	11000	5304	27.0	45.0	1.0	30.5	0.217
25	62	25.4	1.1	30500	20500	6700	8900	5305	32.0	55.0	1.0	36.5	0.362
30	72	30.2	1.1	39500	27500	5700	7600	5306	37.0	65.0	1.0	43.0	0.553
35	80	34.9	1.5	49500	35000	5000	6600	5307	43.5	71.5	1.5	48.5	0.766
40	90	36.5	1.5	60500	44000	4400	5900	5308	48.5	81.5	1.5	53.5	1.010
45	100	39.7	1.5	72500	54000	4000	5300	5309	53.5	91.5	1.5	60.0	1.340
50	110	44.4	2.0	85500	64500	3600	4800	5310	60.0	100.0	2.0	65.5	1.810
55	120	49.2	2.0	106000	82000	3300	4400	5311	65.0	110.0	2.0	73.0	2.320
60	130	54.0	2.1	122000	95500	3000	4000	5312	72.0	118.0	2.0	79.5	3.050
65	140	58.7	2.1	138000	109000	2800	3700	5313	77.0	128.0	2.0	84.5	3.960
70	150	63.5	2.1	155000	125000	2600	3500	5314	82.0	138.0	2.0	93.0	4.740
75	160	68.3	2.1	168000	141000	2400	3200	5315	87.0	148.0	2.0	98.0	5.650
80	170	68.3	2.1	182000	156000	2400	3400	5316	92.0	158.0	2.0	112.0	6.950
85	180	73.0	3.0	195000	176000	2200	3200	5317	99.0	166.0	2.5	119.0	8.300
90	190	73.0	3.0	195000	180000	2000	3000	5318	104.0	176.0	2.5	125.0	9.250

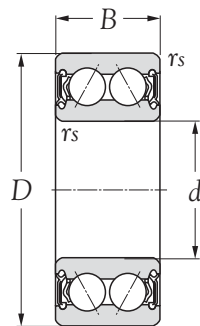
Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r .

Remark: All **KSM** products of 52 and 53 series come with polymid 6.6 cages, classified as standard production. Steel cages are classified as non-standard production with suffix "S", i.e. 5304 S, it is subject on request.

Double-row Angular Contact Ball Bearings
series 53..ZZ, 53..2RS



Shielded type
(ZZ)

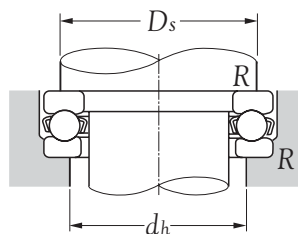
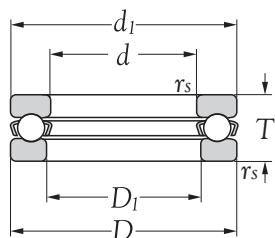


Sealed type
(2RS)

Boundary dimensions				Basic load ratings		Limiting speeds grease rpm	Bearing numbers		Mass kg (approx.)
d	D	B	rs min ¹⁾	dynamic Cr	static Cor				
10	35	19.0	1.0	11700	7000	18000	5300 ZZ	5300 2RS	0.050
12	37	19.0	1.0	11700	7000	17000	5301 ZZ	5301 2RS	0.058
15	42	19.0	1.0	17200	10100	9900	5302 ZZ	5302 2RS	0.132
17	47	22.2	1.0	20400	12100	9000	5303 ZZ	5303 2RS	0.181
20	52	22.2	1.1	20600	12700	8500	5304 ZZ	5304 2RS	0.200
25	62	25.4	1.1	30500	20500	7500	5305 ZZ	5305 2RS	0.320
30	72	30.2	1.1	39500	27500	6300	5306 ZZ	5306 2RS	0.480
35	80	34.9	1.5	49500	35000	5000	5307 ZZ	5307 2RS	0.766
40	90	36.5	1.5	60500	44000	4700	5308 ZZ	5308 2RS	1.010
45	100	39.7	1.5	72500	54000	4500	5309 ZZ	5309 2RS	1.150
50	110	44.4	1.1	85500	64500	4500	5310 ZZ	5310 2RS	0.670
55	120	49.2	1.5	106000	82000	4000	5311 ZZ	5311 2RS	0.960
60	130	54.0	2.1	122000	95500	2720	5312 ZZ	5312 2RS	3.250
65	140	58.7	2.1	138000	109000	2560	5313 ZZ	5313 2RS	4.100
70	150	63.5	2.1	155000	125000	2240	5314 ZZ	5314 2RS	5.050
75	160	68.3	2.1	168000	141000	2080	5315 ZZ	5315 2RS	6.150
80	170	68.3	2.1	182000	156000	1920	5316 ZZ	5316 2RS	6.950
85	180	73.0	3.0	195000	176000	1760	5317 ZZ	5317 2RS	8.300
90	190	73.0	3.0	195000	180000	1600	5318 ZZ	5318 2RS	9.250

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.
Remark: All KSM products of 52 and 53 series come with polymid 6.6 cages, classified as standard production. Steel cages are classified as non-standard production with suffix "S", i.e. 5304 ZZS, it is subject on request.

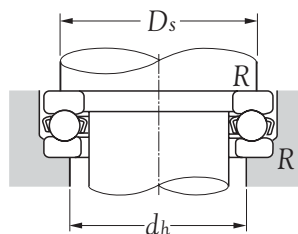
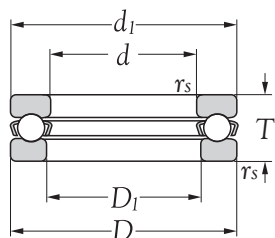
Thrust Ball Bearings series 511..



Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Dimensions		Abutment and fillet dimensions			Mass
mm				dynamic	static	grease	oil		mm		mm			kg
d	D	T	$r_s \min^{1)}$	C_a	C_{0a}	rpm			$d_{1s} \max^{2)}$	$D_{1s} \min^{3)}$	$D_s \min$	$d_h \max$	$R \max$	(approx.)
10	24	9	0.3	10000	14000	6700	9500	51100	24	11	18	16	0.3	0.021
12	26	9	0.3	10300	15400	6400	9200	51101	26	13	20	18	0.3	0.023
15	28	9	0.3	10500	16800	6200	8800	51102	28	16	23	20	0.3	0.024
17	30	9	0.3	10800	18200	6000	8500	51103	30	18	25	22	0.3	0.026
20	35	10	0.3	14200	24700	5200	7500	51104	35	21	29	26	0.3	0.040
25	42	11	0.6	19600	37000	4600	6500	51105	42	26	35	32	0.6	0.060
30	47	11	0.6	20400	42000	4300	6200	51106	47	32	40	37	0.6	0.069
35	52	12	0.6	20400	44500	3900	5600	51107	52	37	45	42	0.6	0.085
40	60	13	0.6	26900	63000	3500	5000	51108	60	42	52	48	0.6	0.125
45	65	14	0.6	27900	69000	3200	4600	51109	65	47	57	53	0.6	0.148
50	70	14	0.6	28800	75500	3100	4500	51110	70	52	62	58	0.6	0.161
55	78	16	0.6	35000	93000	2800	4000	51111	78	57	69	64	0.6	0.226
60	85	17	1.0	41500	113000	2600	3700	51112	85	62	75	70	1.0	0.296
65	90	18	1.0	41500	117000	2400	3500	51113	90	67	80	75	1.0	0.338
70	95	18	1.0	43000	127000	2400	3400	51114	95	72	85	80	1.0	0.356
75	100	19	1.0	44500	136000	2200	3200	51115	100	77	90	85	1.0	0.399
80	105	19	1.0	44500	141000	2200	3100	51116	105	82	95	90	1.0	0.422
85	110	19	1.0	46000	150000	2100	3000	51117	110	87	100	95	1.0	0.444
90	120	22	1.0	59500	190000	1900	2700	51118	120	92	108	102	1.0	0.687
100	135	25	1.0	85000	268000	1700	2400	51120	135	102	121	114	1.0	0.987
110	145	25	1.0	87000	288000	1600	2300	51122	145	112	131	124	1.0	1.070
120	155	25	1.0	89000	310000	1500	2200	51124	155	122	141	134	1.0	1.110

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r .

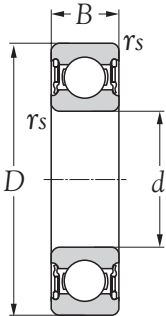
Thrust Ball Bearings series 512..



Boundary dimensions mm				Basic load ratings dynamic static N		Limiting speeds grease oil rpm		Bearing numbers	Dimensions mm		Abutment and fillet dimensions mm			Mass kg (approx.)
d	D	T	$r_s \min^{1)}$	C_a	C_{0a}				$d_{1s} \max^{2)}$	$D_{1s} \min^{3)}$	$D_s \min$	$d_h \max$	$R \max$	
10	26	11	0.6	12700	17100	5800	8300	51200	26	12	20	16	0.6	0.030
12	28	11	0.6	13200	19000	5600	8000	51201	28	14	22	18	0.6	0.034
15	32	12	0.6	16600	24800	5000	7100	51202	32	17	25	22	0.6	0.046
17	35	12	0.6	17200	27300	4800	6800	51203	35	19	28	24	0.6	0.054
20	40	14	0.6	22300	37500	4100	5900	51204	40	22	32	28	0.6	0.081
25	47	15	0.6	27800	50500	3700	5300	51205	47	27	38	34	0.6	0.111
30	52	16	0.6	29300	58000	3400	4900	51206	52	32	43	39	0.6	0.139
35	62	18	1.0	39000	78000	2900	4200	51207	62	37	51	46	1.0	0.215
40	68	19	1.0	47000	98500	2700	3900	51208	68	42	57	51	1.0	0.276
45	73	20	1.0	48000	105000	2600	3700	51209	73	47	62	56	1.0	0.317
50	78	22	1.0	48500	111000	2400	3400	51210	78	52	67	61	1.0	0.378
55	90	25	1.0	69500	159000	2100	3000	51211	90	57	76	69	1.0	0.608
60	95	26	1.0	73500	179000	2000	2800	51212	95	62	81	74	1.0	0.676
65	100	27	1.0	75000	189000	1900	2700	51213	100	67	86	79	1.0	0.767
70	105	27	1.0	76000	199000	1800	2600	51214	105	72	91	84	1.0	0.793
75	110	27	1.0	77500	209000	1800	2600	51215	110	77	96	89	1.0	0.874
80	115	28	1.0	78500	218000	1700	2400	51216	115	82	101	94	1.0	0.916
85	125	31	1.0	95500	264000	1600	2200	51217	125	88	109	101	1.0	1.250
90	135	35	1.1	117000	325000	1400	2000	51218	135	93	117	108	1.0	1.700
100	150	38	1.1	147000	410000	1300	1800	51220	150	103	130	120	1.0	2.290
110	160	38	1.1	153000	450000	1200	1800	51222	160	113	140	130	1.0	2.460
120	170	39	1.1	154000	470000	1200	1700	51224	170	123	150	140	1.0	2.710
130	190	45	1.5	191000	565000	1000	1500	51226	187	133	166	154	1.5	4.220
140	200	46	1.5	193000	595000	980	1400	51228	197	143	176	164	1.5	4.770

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r .

Deep Groove Ball Bearings
series 16..2RS

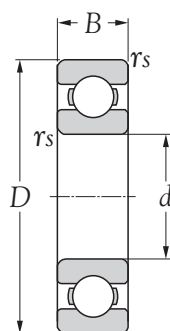


Scaled type
(2RS)

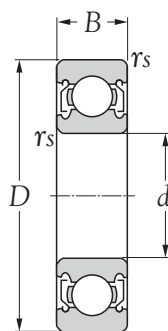
Boundary dimensions				Basic load ratings		Limiting speeds			Bearing numbers	Mass kg (approx.)
mm				dynamic	static	grease	oil			
d	D	B	r _s min ¹⁾	C _r	C _{0r}	rpm				
						2RS				
4.763	17.463	7.925	0.3	1280	578	36000	28000	43000	1601 2RS	0.004
6.350	17.463	7.925	0.3	1280	578	36000	28000	43000	1602 2RS	0.006
7.938	22.225	8.738	0.3	1925	916	31000	22000	36000	1603 2RS	0.010
9.525	22.225	8.738	0.3	1925	916	31000	22000	36000	1604 2RS	0.009
7.938	23.017	7.925	0.3	1556	845	28000	18000	33000	1605 2RS	0.017
9.525	23.017	7.925	0.3	1556	845	28000	18000	33000	1606 2RS	0.022
11.113	23.018	7.938	0.3	3560	1950	27000	17000	32000	1607 2RS	0.022
9.525	28.575	9.525	0.6	3920	2250	25000	15000	28000	1614 2RS	0.035
11.113	28.575	9.525	0.6	3920	2250	25000	15000	28000	1615 2RS	0.034
12.700	28.575	9.525	0.6	3920	2250	25000	15000	28000	1616 2RS	0.030
11.113	34.925	11.113	0.6	5900	3500	22000	12000	26000	1620 2RS	0.050
12.700	34.925	11.113	0.6	5900	3500	22000	12000	26000	1621 2RS	0.048
14.288	34.925	11.113	0.6	5900	3500	22000	12000	26000	1622 2RS	0.046
15.875	34.925	11.113	0.6	5900	3500	22000	12000	26000	1623 2RS	0.040
15.875	41.275	12.700	0.6	7250	4450	17000	10000	20000	1628 2RS	0.072
19.050	41.275	12.700	0.6	7250	4450	17000	10000	20000	1630 2RS	0.065
15.875	44.450	12.700	0.6	7250	4450	14000	9000	16000	1633 2RS	0.092
19.050	44.450	12.700	0.6	7250	4450	14000	9000	16000	1635 2RS	0.085
19.050	50.800	14.288	1.0	10800	6950	12000	7500	13000	1638 2RS	0.120
22.225	50.800	14.288	1.0	10800	6950	12000	7500	13000	1640 2RS	0.112
25.400	50.800	14.288	1.0	10800	6950	12000	7500	13000	1641 2RS	0.100
28.575	63.500	15.875	1.0	12800	8400	9000	5500	10000	1652 2RS	0.210
31.750	63.500	15.875	1.0	12800	8400	9000	5500	10000	1654 2RS	0.190

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

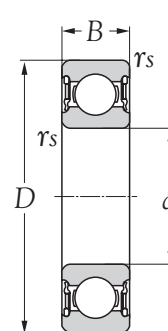
Deep Groove Ball Bearings series R..., R..ZZ, R..2RS



Open



Shielded type
(ZZ)

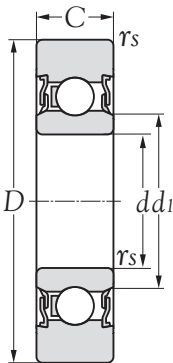


Sealed type
(2RS)

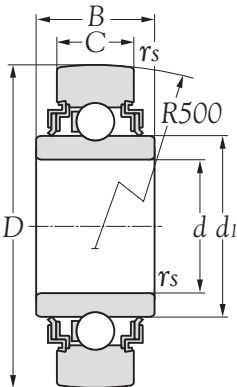
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers			Mass
mm				dynamic	static	grease	oil	open	with shields	with seals	kg
d	D	B	$r_s \min^{1)}$	C_r	C_{or}	rpm					(approx.)
3.175	9.525	3.968 3.968	0.3	630	218	56000	67000	R2			0.0012 0.0014
4.762	12.700	3.968 4.978	0.3	1310	490	41000	48000	R3			0.0022 0.0024
6.350	15.875	4.978 4.978	0.4	1480	615	36000	43000	R4			0.0040 0.0044
9.525	22.225	5.556 7.144	1.0	3300	1400	31000	37000	R6			0.0136 0.0140
12.700	28.575	6.350 7.938	1.0	3950	2250	26000	31000	R8			0.0165 0.0180
15.875	34.925	7.140 8.730	1.0	4600	2800	21000	25000	R10			0.0340 0.0370
19.050	41.275	7.938 11.112	1.0	7250	4450	16000	21000	R12			0.0440 0.0470
22.225	47.625	9.525 12.700	1.0	7250	4950	12000	16000	R14			0.0700 0.0720
25.400	50.800	9.525 12.700	1.0	8250	5450	11000	15000	R16			0.0810 0.0850
28.575	53.975	9.525 12.700	1.0	9600	6260	10000	13000	R18			0.0860 0.0900
31.750	57.150	9.525 12.700	1.0	10800	7520	9000	11000	R20			0.0900 0.0950
34.925	63.500	11.113 14.288	1.0	12280	8500	7000	8500	R22			0.1010 0.1050
38.100	66.675	11.113 14.288	1.0	13150	9450	6000	7500	R24			0.1360 0.1400

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r .

Track Roller Bearings
series LR 20..NPP, LR 20..RRU



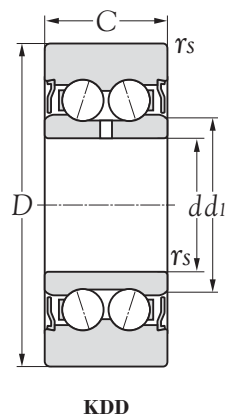
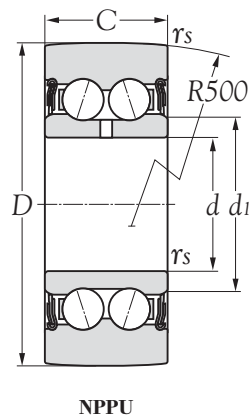
NPP



RRU

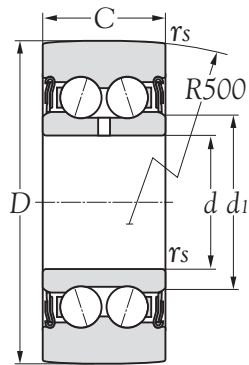
Boundary dimensions						Basic load ratings		Limiting speeds		Bearing number	Mass kg (approx.)
d	D	C	rs	d1	B	dynamic N	static Co	grease rpm	oil		
10	32	9	0.6	15.4	-	4200	2050	4100	4100	LR 200 NPP	0.050
12	35	10	0.6	17.1	-	5500	2600	4300	5200	LR 201 NPP	0.050
15	40	11	0.6	20.0	-	6700	3150	6300	6300	LR 202 NPP	0.070
17	47	12	0.6	22.5	-	9100	4200	8400	8400	LR 203 NPP	0.110
20	52	14	1.0	26.5	-	11800	5400	10200	10700	LR 204 NPP	0.150
25	62	15	1.0	30.3	-	14900	6800	13500	13500	LR 205 NPP	0.230
30	72	16	1.0	37.4	-	20800	9200	18300	18300	LR 206 NPP	0.330
35	80	17	1.1	42.4	-	26100	11400	18600	22700	LR 207 NPP	0.400
45	90	19	1.1	53.2	-	30300	13100	12700	21700	LR 209 NPP	0.450
12	35	10	0.6	18.5	15.0	5500	3000	4300	5200	LR 201 RRU	0.070
15	40	11	0.6	21.5	14.4	6700	3500	6300	6300	LR 202 RRU	0.080

Track Roller Bearings
series LR 52..NPPU, LR 52..KDD



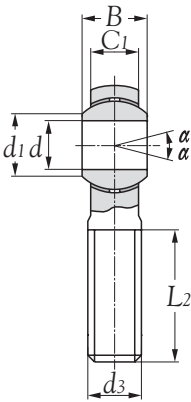
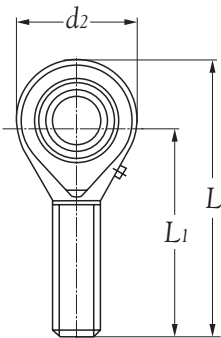
Boundary dimensions					Basic load ratings		Limiting speeds		Bearing numbers		Mass
mm					dynamic	static	grease	oil			kg
d	D	C	rs	d1	C	Co	rpm				(approx.)
10	32	14.0	0.6	15.4	6500	3900	7400	7700	LR 5200 NPPU	LR 5200 KDD	0.070
12	35	15.9	0.6	17.1	8500	4900	6400	9700	LR 5201 NPPU	LR 5201 KDD	0.080
15	40	15.9	0.6	20.0	10100	5900	10100	11800	LR 5202 NPPU	LR 5202 KDD	0.110
17	47	17.5	0.6	22.5	13700	7800	15200	15600	LR 5203 NPPU	LR 5203 KDD	0.170
20	52	20.6	1.0	26.5	17700	10000	13900	20000	LR 5204 NPPU	LR 5204 KDD	0.230
25	62	20.6	1.0	30.3	22000	12400	23800	24700	LR 5205 NPPU	LR 5205 KDD	0.340
30	72	23.8	1.0	37.4	30700	20400	28100	50800	LR 5206 NPPU	LR 5206 KDD	0.510
35	80	27.0	1.1	42.4	39400	21300	27100	42600	LR 5207 NPPU	LR 5207 KDD	0.660
40	85	30.2	1.1	48.4	45500	24300	19800	34200	LR 5208 NPPU	LR 5208 KDD	0.750

Track Roller Bearings
series LR 53..NPPU



Boundary dimensions					Basic load ratings		Limiting speeds		Bearing numbers	Mass kg (approx.)
<i>d</i>	<i>D</i>	mm <i>C</i>	<i>rs</i>	<i>d</i> ₁	dynamic <i>N</i>	static <i>C</i> ₀	grease rpm	oil rpm		
17	52	22.2	1.0	23.5	19300	10600	14800	21100	LR 5303 NPPU	0.210
20	62	22.2	1.1	29.0	25100	13800	25700	27600	LR 5304 NPPU	0.340
25	72	25.4	1.1	34.4	34300	18600	32800	37100	LR 5305 NPPU	0.500
30	80	30.2	1.1	41.4	47200	25200	41400	50400	LR 5306 NPPU	0.670
35	90	34.9	1.5	47.7	59800	31400	37600	62700	LR 5307 NPPU	0.970
40	100	36.5	1.5	52.4	78000	39900	66500	79800	LR 5308 NPPU	1.200

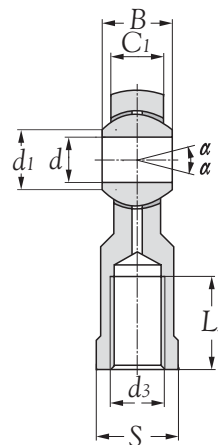
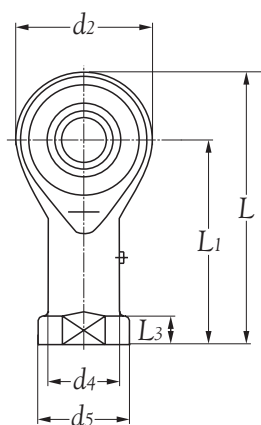
Rod Ends (Lubricant Type)
series REM.., REML..



Boundary dimensions			Nominal dimensions						α° $\approx$	Load ratings		Bearing numbers	Mass kg (approx.)
mm			mm							dynamic	static		
d	d_2	B	C_1	d_3	L_1	L_2	L	d_1		C_d	C_s		
5	16	8	6.00	M5 x 0.8	33	20	41	7.7	13	3300	3900	REM 5	0.0125
6	18	9	6.75	M6 x 1	36	22	45	9.0	13	4300	5300	REM 6	0.0190
8	22	12	9.00	M8 x 1.25	42	25	53	10.4	13	6800	8500	REM 8	0.0320
10	26	14	10.50	M10 x 1.5	48	29	61	12.9	13	10000	11000	REM 10	0.0540
12	30	16	12.00	M12 x 1.75	54	33	69	15.4	13	13000	14000	REM 12	0.0850
14	34	19	13.50	M14 x 2	60	36	77	16.9	13	17000	20000	REM 14	0.1260
16	38	21	15.00	M16 x 2	66	40	85	19.4	13	21000	25000	REM 16	0.1850
18	42	23	16.50	M18 x 1.5	72	44	93	21.9	13	26000	30000	REM 18	0.2600
20	46	25	18.00	M20 x 1.5	78	47	101	24.4	13	31000	35000	REM 20	0.3400
22	50	28	20.00	M22 x 1.5	84	51	109	25.8	13	38000	43000	REM 22	0.4350
25	60	31	22.00	M24 x 2	94	57	124	29.6	13	47000	65000	REM 25	0.6500
30	70	37	25.00	M30 x 2	110	66	145	34.8	13	63000	86000	REM 30	1.0700

Note: 1) Suffix "L" means with left hand thread.
2) We could supply the above models in two sorts, one is produced by forging, the another by machining. So, please let us know which of them is what you needed before you ordering.
3) We supply this series of rod end bearings strictly in accordance with the above specifications, any changes are on special order.

Rod Ends (Lubricant Type) series REF.., REFL..

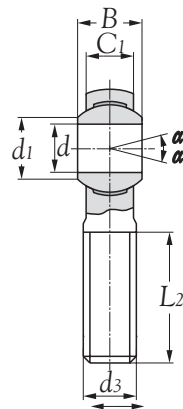
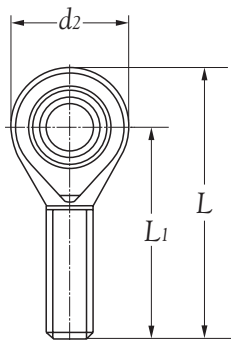


Boundary dimensions mm			Nominal dimensions												Load ratings		Bearing numbers	Mass kg (approx.)
			mm												α°	dynamic		
d	d ₂	B	C ₁	S	d ₃	d ₄	d ₅	L ₁	L ₂	L	L ₃	d ₁		C _d		C _s		
5	16	8	6.00	9	M5 x 0.8	9.0	11	27	14	35	4.0	7.7	13	3300	3900	REF 5	0.016	
6	18	9	6.75	11	M6 x 1	10.0	13	30	14	39	5.0	9.0	13	4300	5300	REF 6	0.026	
8	22	12	9.00	14	M8 x 1.25	12.5	16	36	17	47	5.0	10.4	13	6800	8500	REF 8	0.044	
10	26	14	10.50	17	M10 x 1.5	15.0	19	43	21	56	6.5	12.9	13	10000	11000	REF 10	0.072	
10	26	14	10.50	17	M10 x 1.25	15.0	19	43	21	56	6.5	12.9	13	10000	11000	REF 10.1	0.072	
12	30	16	12.00	19	M12 x 1.75	17.5	22	50	24	65	6.5	15.4	13	13000	14000	REF 12	0.108	
12	30	16	12.00	19	M12 x 1.25	17.5	22	50	24	65	6.5	15.4	13	13000	14000	REF 12.1	0.108	
14	34	19	13.50	22	M14 x 2	20.0	25	57	27	74	8.0	16.9	13	17000	20000	REF 14	0.161	
16	38	21	15.00	22	M16 x 2	22.0	27	64	33	83	8.0	19.4	13	21000	25000	REF 16	0.225	
16	38	21	15.00	22	M16 x 1.5	22.0	27	64	33	83	8.0	19.4	13	21000	25000	REF 16.1	0.225	
18	42	23	16.50	27	M18 x 1.5	25.0	31	71	36	92	10.0	21.9	13	26000	30000	REF 18	0.295	
20	46	25	18.00	30	M20 x 1.5	27.5	34	77	40	100	10.0	24.4	13	31000	35000	REF 20	0.382	
22	50	28	20.00	32	M22 x 1.5	30.0	37	84	43	109	12.0	25.8	13	38000	43000	REF 22	0.488	
25	60	31	22.00	36	M24 x 2	33.5	42	94	48	124	12.0	29.6	13	47000	65000	REF 25	0.749	
30	70	37	25.00	41	M30 x 2	40.0	50	110	56	145	15.0	34.8	13	63000	86000	REF 30	1.130	
30	70	37	25.00	41	M27 x 2	40.0	50	110	56	145	15.0	34.8	13	63000	86000	REF 30.1	1.130	

Note: 1) Suffix "L" means with left hand thread.

- 2) We could supply the above models in two sorts, one is produced by forging, the another by machining. So, please let us know which of them is what you needed before you ordering.
- 3) We supply this series of rod end bearings strictly in accordance with the above specifications, any changes are on special order.

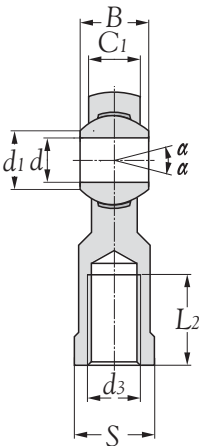
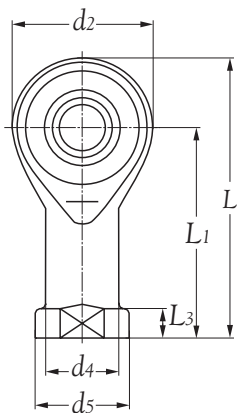
Rod Ends (Maintenance-Free)
series RETM..., RETML..



Boundary dimensions			Nominal dimensions								Load ratings dynamic static N		Bearing numbers	Mass
<i>d</i>	<i>d</i> ₂	<i>B</i>	<i>C</i> ₁	<i>d</i> ₃	<i>L</i> ₁	<i>L</i> ₂	<i>L</i>	<i>d</i> ₁	<i>α</i> ° ≈	<i>C</i> _d	<i>C</i> _s		kg (approx.)	
5	16	8	6.00	M5 x 0.8	33	20	41	7.7	13	3300	3900	RETM 5	0.013	
6	18	9	6.75	M6 x 1	36	22	45	9.0	13	4300	5300	RETM 6	0.019	
8	22	12	9.00	M8 x 1.25	42	25	53	10.4	13	6800	8500	RETM 8	0.032	
10	26	14	10.50	M10 x 1.5	48	29	61	12.9	13	10000	11000	RETM 10	0.054	
12	30	16	12.00	M12 x 1.75	54	33	69	15.4	13	13000	14000	RETM 12	0.085	
14	34	19	13.50	M14 x 2	60	36	77	16.9	13	17000	20000	RETM 14	0.126	
16	38	21	15.00	M16 x 2	66	40	85	19.4	13	21000	25000	RETM 16	0.185	
18	42	23	16.50	M18 x 1.5	72	44	93	21.9	13	26000	30000	RETM 18	0.260	
20	46	25	18.00	M20 x 1.5	78	47	101	24.4	13	31000	35000	RETM 20	0.340	
22	50	28	20.00	M22 x 1.5	84	51	109	25.8	13	38000	43000	RETM 22	0.435	
25	60	31	22.00	M24 x 2	94	57	124	29.6	13	47000	65000	RETM 25	0.650	
30	70	37	25.00	M30 x 2	110	66	145	34.8	13	63000	86000	RETM 30	1.070	

Note: 1) Suffix "L" means with left hand thread.
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3) We supply this series of rod end bearings strictly in accordance with the above specifications, any changes are on special order.

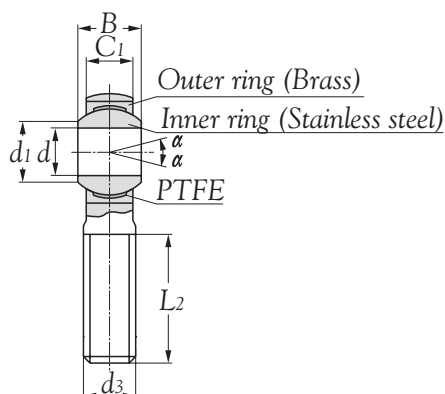
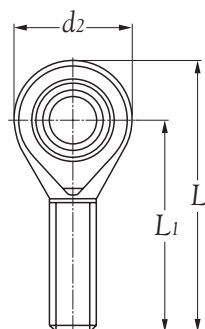
Rod Ends (Maintenance-Free)
series RETF.., RETFL..



Boundary dimensions mm			Nominal dimensions												Load ratings		Bearing numbers	Mass
			mm												dynamic	static		kg
d	d ₂	B	C ₁	S	d ₃	d ₄	d ₅	L ₁	L ₂	L	L ₃	d ₁	α° ≈	C _d	C _s		(approx.)	
5	16	8	6.00	9	M5 x 0.8	9.0	11	27	14	35	4.0	7.7	13	3300	3900	RETF 5	0.016	
6	18	9	6.75	11	M6 x 1	10.0	13	30	14	39	5.0	9.0	13	4300	5300	RETF 6	0.026	
8	22	12	9.00	14	M8 x 1.25	12.5	16	36	17	47	5.0	10.4	13	6800	8500	RETF 8	0.044	
10	26	14	10.50	17	M10 x 1.5	15.0	19	43	21	56	6.5	12.9	13	10000	11000	RETF 10	0.072	
10	26	14	10.50	17	M10 x 1.25	15.0	19	43	21	56	6.5	12.9	13	10000	11000	RETF 10.1	0.072	
12	30	16	12.00	19	M12 x 1.75	17.5	22	50	24	65	6.5	15.4	13	13000	14000	RETF 12	0.108	
12	30	16	12.00	19	M12 x 1.25	17.5	22	50	24	65	6.5	15.4	13	13000	14000	RETF 12.1	0.108	
14	34	19	13.50	22	M14 x 2	20.0	25	57	27	74	8.0	16.9	13	17000	20000	RETF 14	0.161	
16	38	21	15.00	22	M16 x 2	22.0	27	64	33	83	8.0	19.4	13	21000	25000	RETF 16	0.225	
16	38	21	15.00	22	M16 x 1.5	22.0	27	64	33	83	8.0	19.4	13	21000	25000	RETF 16.1	0.225	
18	42	23	16.50	27	M18 x 1.5	25.0	31	71	36	92	10.0	21.9	13	26000	30000	RETF 18	0.295	
20	46	25	18.00	30	M20 x 1.5	27.5	34	77	40	100	10.0	24.4	13	31000	35000	RETF 20	0.382	
22	50	28	20.00	32	M22 x 1.5	30.0	37	84	43	109	12.0	25.8	13	38000	43000	RETF 22	0.488	
25	60	31	22.00	36	M24 x 2	33.5	42	94	48	124	12.0	29.6	13	47000	65000	RETF 25	0.749	
30	70	37	25.00	41	M30 x 2	40.0	50	110	56	145	15.0	34.8	13	63000	86000	RETF 30	1.130	

Note: 1) Suffix "L" means with left hand thread.
2) We could supply the above models in two sorts, one is produced by forging, the another by machining. So, please let us know which of them is what you needed before you ordering.
3) We supply this series of rod end bearings strictly in accordance with the above specifications, any changes are on special order.

Rod Ends (Stainless Steel) series SSRETM..., SSRETML...



Boundary dimensions			Nominal dimensions							Load ratings		Bearing numbers	Mass kg (approx.)
d	d_2	B	C_1	d_3	L_1	L_2	L	d_1	α°	dynamic N	static N		
5	16	8	6.00	M5 x 0.8	33	20	41	7.7	13	3300	3900	SSRETM 5	0.013
6	18	9	6.75	M6 x 1	36	22	45	9.0	13	4300	5300	SSRETM 6	0.019
8	22	12	9.00	M8 x 1.25	42	25	53	10.4	13	6800	8500	SSRETM 8	0.032
10	26	14	10.50	M10 x 1.5	48	29	61	12.9	13	10000	11000	SSRETM 10	0.054
12	30	16	12.00	M12 x 1.75	54	33	69	15.4	13	13000	14000	SSRETM 12	0.085
14	34	19	13.50	M14 x 2	60	36	77	16.9	13	17000	20000	SSRETM 14	0.126
16	38	21	15.00	M16 x 2	66	40	85	19.4	13	21000	25000	SSRETM 16	0.185
18	42	23	16.50	M18 x 1.5	72	44	93	21.9	13	26000	30000	SSRETM 18	0.260
20	46	25	18.00	M20 x 1.5	78	47	101	24.4	13	31000	35000	SSRETM 20	0.340
22	50	28	20.00	M22 x 1.5	84	51	109	25.8	13	38000	43000	SSRETM 22	0.435
25	60	31	22.00	M24 x 2	94	57	124	29.6	13	47000	65000	SSRETM 25	0.650
30	70	37	25.00	M30 x 2	110	66	145	34.8	13	63000	86000	SSRETM 30	1.070

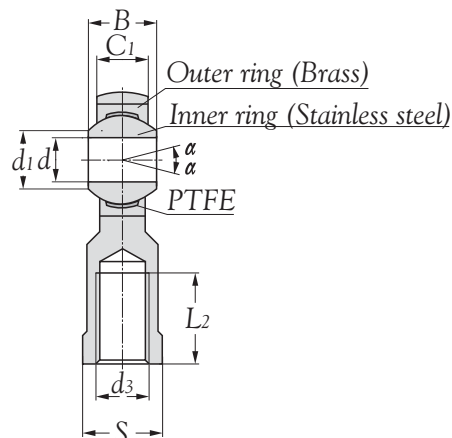
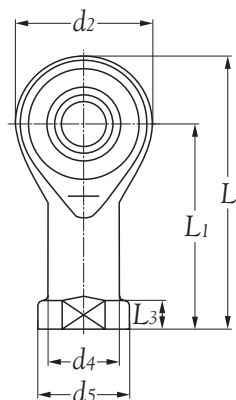
Note: 1) Suffix "L" means with left hand thread.

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Rod Ends (Stainless Steel)

series **SSRETF.., SSRETFL..**



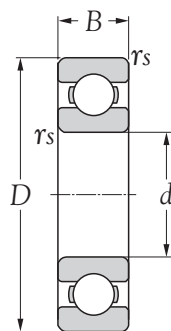
Boundary dimensions mm			Nominal dimensions mm												Load ratings dynamic static N		Bearing numbers	Mass kg (approx.)
d	d_2	B	C_1	S	d_3	d_4	d_5	L_1	L_2	L	L_3	d_1	α°		C_d	C_s		
5	16	8	6.00	9	M5 x 0.8	9.0	11	27	14	35	4.0	7.7	13		3300	3900	SSRETF 5	0.016
6	18	9	6.75	11	M6 x 1	10.0	13	30	14	39	5.0	9.0	13		4300	5300	SSRETF 6	0.026
8	22	12	9.00	14	M8 x 1.25	12.5	16	36	17	47	5.0	10.4	13		6800	8500	SSRETF 8	0.044
10	26	14	10.50	17	M10 x 1.5	15.0	19	43	21	56	6.5	12.9	13		10000	11000	SSRETF 10	0.072
10	26	14	10.50	17	M10 x 1.25	15.0	19	43	21	56	6.5	12.9	13		10000	11000	SSRETF 10.1	0.072
12	30	16	12.00	19	M12 x 1.75	17.5	22	50	24	65	6.5	15.4	13		13000	14000	SSRETF 12	0.108
12	30	16	12.00	19	M12 x 1.25	17.5	22	50	24	65	6.5	15.4	13		13000	14000	SSRETF 12.1	0.108
14	34	19	13.50	22	M14 x 2	20.0	25	57	27	74	8.0	16.9	13		17000	20000	SSRETF 14	0.161
16	38	21	15.00	22	M16 x 2	22.0	27	64	33	83	8.0	19.4	13		21000	25000	SSRETF 16	0.225
16	38	21	15.00	22	M16 x 1.5	22.0	27	64	33	83	8.0	19.4	13		21000	25000	SSRETF 16.1	0.225
18	42	23	16.50	27	M18 x 1.5	25.0	31	71	36	92	10.0	21.9	13		26000	30000	SSRETF 18	0.295
20	46	25	18.00	30	M20 x 1.5	27.5	34	77	40	100	10.0	24.4	13		31000	35000	SSRETF 20	0.382
22	50	28	20.00	32	M22 x 1.5	30.0	37	84	43	109	12.0	25.8	13		38000	43000	SSRETF 22	0.488
25	60	31	22.00	36	M24 x 2	33.5	42	94	48	124	12.0	29.6	13		47000	65000	SSRETF 25	0.749
30	70	37	25.00	41	M30 x 2	40.0	50	110	56	145	15.0	34.8	13		63000	86000	SSRETF 30	1.130

Note: 1) Suffix "L" means with left hand thread.

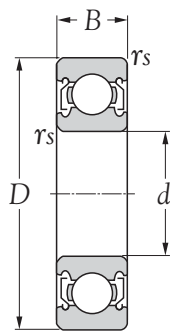
2) We could supply the above models in two sorts, one is produced by forging, the another by machining. So, please let us know which of them is what you needed before you ordering.

3) We supply this series of rod end bearings strictly in accordance with the above specifications, any changes are on special order.

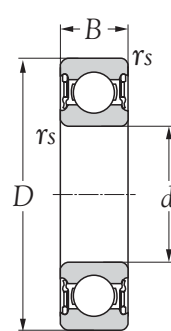
Stainless Steel Ball Bearings
series SS 60..



Shielded type
(Open)



Shielded type
(ZZ)



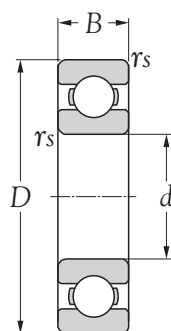
Sealed type
(2RS)

Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers			Mass
mm				dynamic	static	grease	oil				kg
d	D	B	rs min ¹⁾	Cr	Cor	rpm	rpm				(approx.)
7	19	6	0.3	2240	910	39000	33000	SS 607	SS 607 ZZ	SS 607 2RS	0.008
8	22	7	0.3	3350	1400	36000	31000	SS 608	SS 608 ZZ	SS 608 2RS	0.012
9	24	7	0.3	3400	1450	33000	29000	SS 609	SS 609 ZZ	SS 609 2RS	0.014
10	26	8	0.3	4580	1980	28000	20000	SS 6000	SS 6000 ZZ	SS 6000 2RS	0.019
12	28	8	0.3	5100	2380	26000	19000	SS 6001	SS 6001 ZZ	SS 6001 2RS	0.022
15	32	9	0.3	5600	2840	24000	18000	SS 6002	SS 6002 ZZ	SS 6002 2RS	0.031
17	35	10	0.3	6800	3350	22000	17000	SS 6003	SS 6003 ZZ	SS 6003 2RS	0.040
20	42	12	0.6	9400	5050	19000	15000	SS 6004	SS 6004 ZZ	SS 6004 2RS	0.071
25	47	12	0.6	10100	5850	17000	13000	SS 6005	SS 6005 ZZ	SS 6005 2RS	0.084
30	55	13	1.0	13200	8300	14000	10000	SS 6006	SS 6006 ZZ	SS 6006 2RS	0.110
35	62	14	1.0	16000	10300	12000	9000	SS 6007	SS 6007 ZZ	SS 6007 2RS	0.162
40	68	15	1.0	16800	11500	11000	8500	SS 6008	SS 6008 ZZ	SS 6008 2RS	0.199
45	75	16	1.0	21000	15100	10000	8000	SS 6009	SS 6009 ZZ	SS 6009 2RS	0.230
50	80	16	1.0	21800	16600	9000	7000	SS 6010	SS 6010 ZZ	SS 6010 2RS	0.272

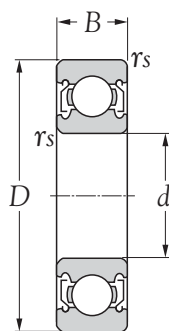
Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.



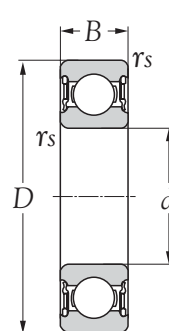
Stainless Steel Ball Bearings series SS 62..



Shielded type
(Open)



Shielded type
(ZZ)



Sealed type
(2RS)

Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers			Mass
mm				dynamic	static	grease	oil				kg
d	D	B	$r_s \text{ min}^{1)}$	C_r	C_{or}	rpm	rpm				(approx.)
6	19	6	0.3	2340	885	39000	33000	SS 626	SS 626 ZZ	SS 626 2RS	0.008
7	22	7	0.3	3350	1400	36000	31000	SS 627	SS 627 ZZ	SS 627 2RS	0.014
9	26	8	0.3	4550	1960	31000	27000	SS 629	SS 629 ZZ	SS 629 2RS	0.019
10	30	9	0.6	5100	2380	26000	19000	SS 6200	SS 6200 ZZ	SS 6200 2RS	0.032
12	32	10	0.6	6100	2750	24000	18000	SS 6201	SS 6201 ZZ	SS 6201 2RS	0.035
15	35	11	0.6	7750	3600	22000	17000	SS 6202	SS 6202 ZZ	SS 6202 2RS	0.045
17	40	12	0.6	9600	4600	20000	16000	SS 6203	SS 6203 ZZ	SS 6203 2RS	0.064
20	47	14	1.0	12800	6650	18000	14000	SS 6204	SS 6204 ZZ	SS 6204 2RS	0.103
25	52	15	1.0	14000	7880	16000	12000	SS 6205	SS 6205 ZZ	SS 6205 2RS	0.127
30	62	16	1.0	19500	11500	13000	9500	SS 6206	SS 6206 ZZ	SS 6206 2RS	0.200
35	72	17	1.1	25500	15200	11000	8500	SS 6207	SS 6207 ZZ	SS 6207 2RS	0.298
40	80	18	1.1	29100	17800	10000	8000	SS 6208	SS 6208 ZZ	SS 6208 2RS	0.368
45	85	19	1.1	32500	20400	9000	7000	SS 6209	SS 6209 ZZ	SS 6209 2RS	0.416
50	90	20	1.1	35000	23200	8500	6700	SS 6210	SS 6210 ZZ	SS 6210 2RS	0.463

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r .

KSM[®] NOTE

Handwriting practice lines consisting of 20 horizontal dashed lines.



KSM[®] NOTE

Handwriting practice lines consisting of 20 horizontal dashed lines.





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