



2013

Ball Bearings

Needle Roller Bearings

Mounted Units (Super)

Mounted Units (Normal)

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Bearings & Pillow Blocks
















BEARINGS & PILLOW BLOCKS










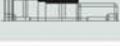


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


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KSM[®]

BEARINGS



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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		Single plane mean bore diameter deviation Δd_{mp}										Single radial plane bore diameter variation V_{dp}										
		class 0					class 6					diameter series 9					maxdiameter series 0.1					
		high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low	
over	incl.	0	-8	0	-7	0	-5	0	-4	0	-2.5	10	9	5	4	2.5	8	7	4	3	2.5	
10	18	0	-8	0	-7	0	-5	0	-4	0	-2.5	13	10	6	5	2.5	10	8	5	4	2.5	
18	30	0	-10	0	-8	0	-6	0	-5	0	-2.5	15	13	8	6	2.5	12	10	6	5	2.5	
30	50	0	-12	0	-10	0	-8	0	-6	0	-2.5	19	15	9	7	4.0	19	15	7	5	4.0	
50	80	0	-15	0	-12	0	-9	0	-7	0	-4.0	25	19	10	8	5.0	25	19	8	6	5.0	
80	120	0	-20	0	-15	0	-10	0	-8	0	-5.0											

Table 3.3 Inner rings

(Unit : μm)

Nominal bore diameter d mm		Single radial plane bore diameter variation V_{dp} maxdiameter series 2,3,4					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
over	incl.	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
10	18	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
18	30	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
30	50	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
50	80	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
80	120																		

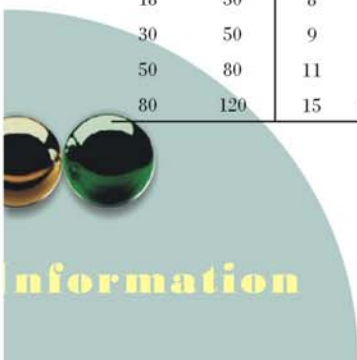


Table 3.4 Inner rings

(Unit : μm)

Nominal bore diameter d		Inner ring axial runout (with side) S_{ia}^{e}			Inner ring width deviation								Inner ring width variation						
mm		class 5	class 4	class 2	ΔB_s								$V B_s$						
over	incl.				normal				modified e				class 0	class 6	class 5 max.	class 4	class 2		
					class 0,6	class 5,4	class 2	class 0,6	class 5,4	high	low	high						low	
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: e 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.

- e To be applied for deep groove ball bearing and angular contact ball bearings.
- e To be applied for individual raceway rings manufactured for combined bearing use.

Table 3.5 Outer rings

(Unit : μm)

Nominal Outside diameter D		Single plane mean outside diameter deviation ΔD_{mp}										Single radial plane outside diameter variation $V D_p$									
mm		ΔD_{mp}										$V D_p$									
over	incl.	class 0		class 6		class 5		class 4 e		class 2 e		diameter series 9					max diameter series 0.1				
		high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low	high	low		
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		Single radial plane outside diameter variation $V D_p$					Single radial plane outside diameter variation $V D_p^{\text{e}}$		Mean single plane outside diameter variation $V D_{mp}$				
mm		$V D_p$					$V D_p^{\text{e}}$		$V D_{mp}$				
over	incl.	max diameter series 2.3.4					capped bearings diameter series 2.3.4		class 0,1,2,3,4				
		class 0	class 6	class 5 max.	class 4	class 2	class 0	max.	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 S_D			Outside ring axial runout $S_{ea}^{\text{⑦}}$			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 Cclass 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

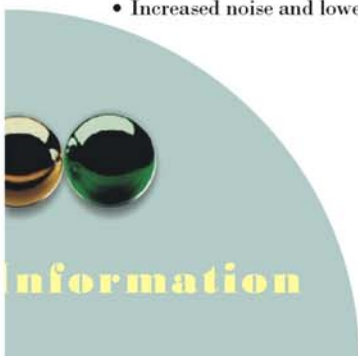
For rolling bearings, inner and outer rings are fixed on the shaft or in the housing so that relative movement does not occur between fitted surfaces during operation or under load. This relative movement (referred to as "creep") between the fitted surfaces of the bearing and the shaft or housing can 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:


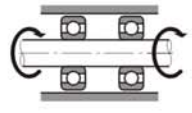

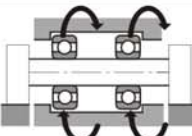

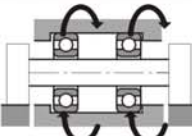

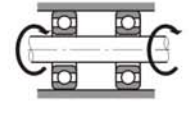
- Shaft and housing material, wall thickness, finished surface accuracy, etc.
- Machinery operating conditions (nature and magnitude of load, rotational speed, temperature, etc.)

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

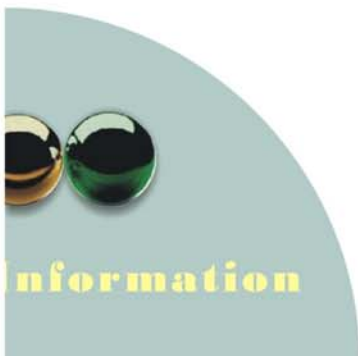


Table 5.3 Radial internal clearance for Self-aligning Ball Bearings (for bearing with tapered bore)

(Unit : μm)

Nominal bore diameter		Bearing with tapered bore							
d (mm)		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		C2		Normal		C3		C4	
d (mm)		min.	max.	min.	max.	min.	max.	min.	max.
over	incl.								
-	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		Radial internal clearance CM	
d (mm)		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 damaging 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 applications 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.

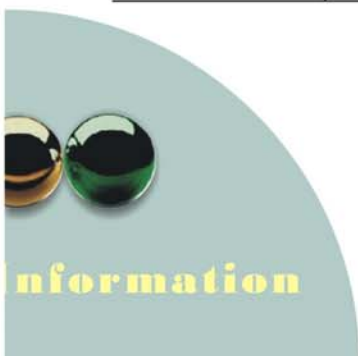
6.2.1 Types and characteristics of grease

Lubricating greases are composed of either a mineral base or a synthetic oil base. To this base a thickener and other additives are added. The properties of all greases are mainly determined by the kind of base oil used, 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 point °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	
		Mineral oil	Synthetic oil
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 roiling 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).

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

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

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

where,

- L_{10h} : 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.

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

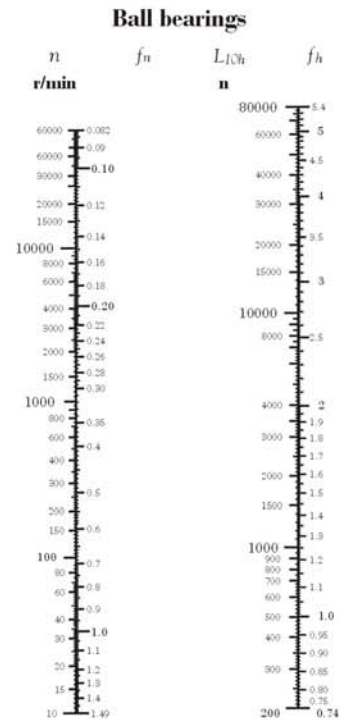
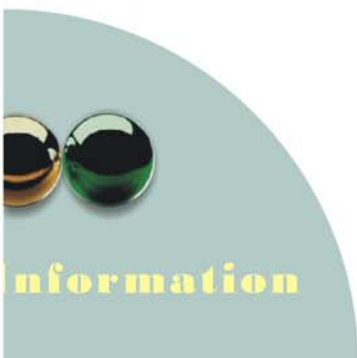


Fig.7.1 Bearing life rating scale



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_1 (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.

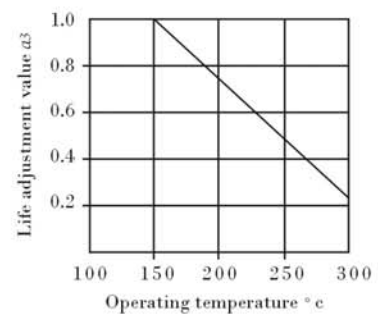


Fig. 7.2 Life adjustment value for operating temperature



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})

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

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

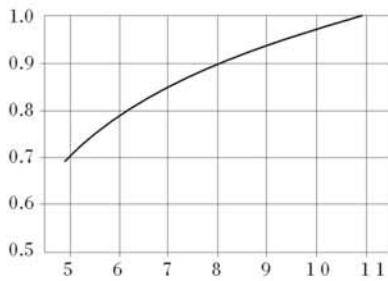


Fig.9.2 Value of adjustment factor f_C depends on combined load

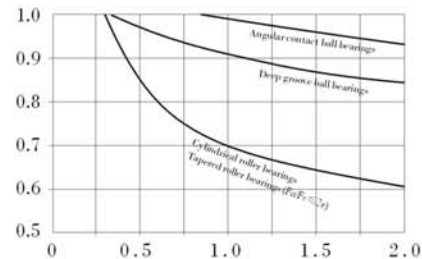


Table 9.1 Adjustment factor, f_B , for allowable number of revolutions

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



KSM[®] NOTE

Lined writing area with horizontal dashed lines.





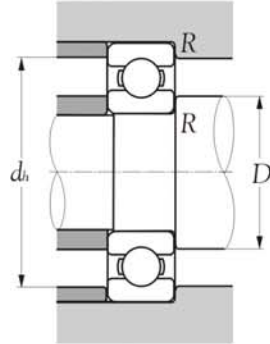
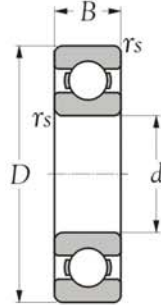
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BALL BEARINGS



Ball Bearings series 60..



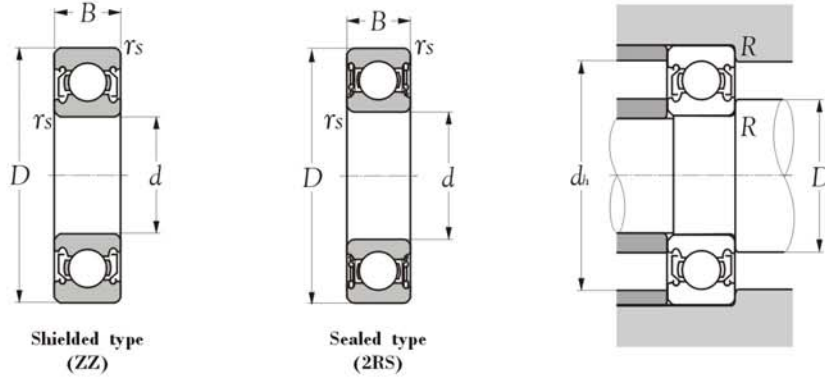
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Abutment and fillet dimensions			Mass kg (approx.)
mm				dynamic	static	grease	oil		D_s	d_h	R	
d	D	B	r_s min ¹⁾	C_r	C_{or}	rpm	rpm		min	max	max	
10	26	8	0.3	4550	1960	29000	34000	6000	12.5	23.5	0.3	0.019
12	28	8	0.3	5100	2390	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 .

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Technical supplement			
	Cages	Precision	Grease
	Steel -	<input checked="" type="checkbox"/>	Shell Alvania S2
	Polymid -	<input type="checkbox"/>	
	Brass -	<input type="checkbox"/>	
		Class 0 (JIS)	

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



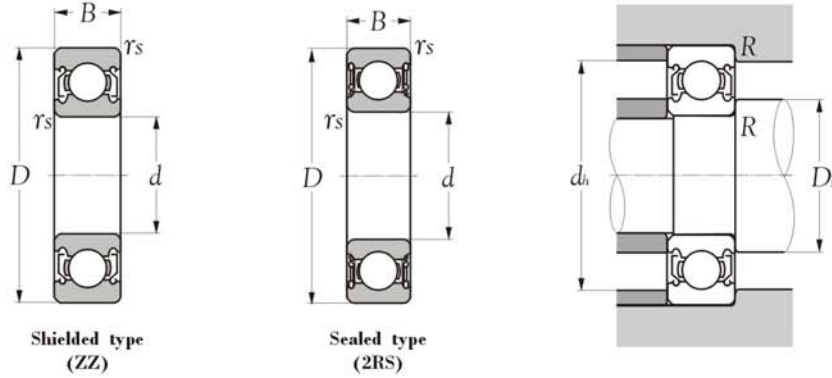
Boundary dimensions				Basic load ratings		Limiting speeds grease rpm	Bearing numbers		Abutment and fillet dimensions mm				Mass kg (approx.)
mm				dynamic N	static N		mm	mm	mm		mm		
d	D	B	r_s min ¹⁾	C_r	C_{or}	D_s			d_h	R	D_s	d_h	R
10	26	8	0.3	4550	1960	29000	6000 ZZ	6000 2RS	12.5	13.5	23.5	0.3	0.019
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.

Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			


Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Ball Bearings series 60..ZZ, 60..2RS (Inch)



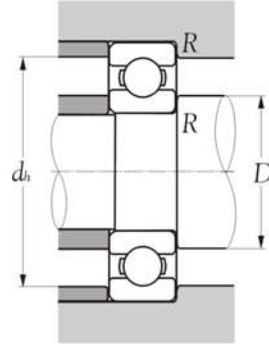
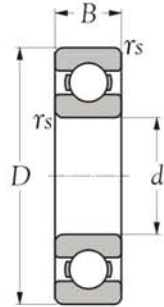
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Abutment and fillet dimensions			Mass
mm				dynamic	static	grease	oil		mm			
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_s</i> min ¹⁾	<i>C_r</i>	<i>C_{0r}</i>	rpm	rpm		<i>D_s</i> min	<i>d_h</i> max	<i>R</i> max	(approx.)
12.448	28	8	-	5100	2390	26000	30000	6001-31/64" ZZ 6001-31/64" 2RS	14.5	25.5	0.3	0.021
12.700	28	8	-	5100	2390	26000	30000	6001-1/2" ZZ 6001-1/2" 2RS	14.5	25.5	0.3	0.021
16.000	32	9	-	5600	2840	22000	26000	6002-16mm ZZ 6002-16mm 2RS	17.5	29.5	0.3	0.030
22.000	42	12	-	9400	5050	18000	21000	6004-22mm ZZ 6004-22mm 2RS	25.0	37.0	0.6	0.069

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

	Technical supplement		
	Cages	Precision	Grease
Steel -	✓	Class 0 (JIS)	Nil
Polymid -	X		
Brass -	X		


Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Ball Bearings series 62..



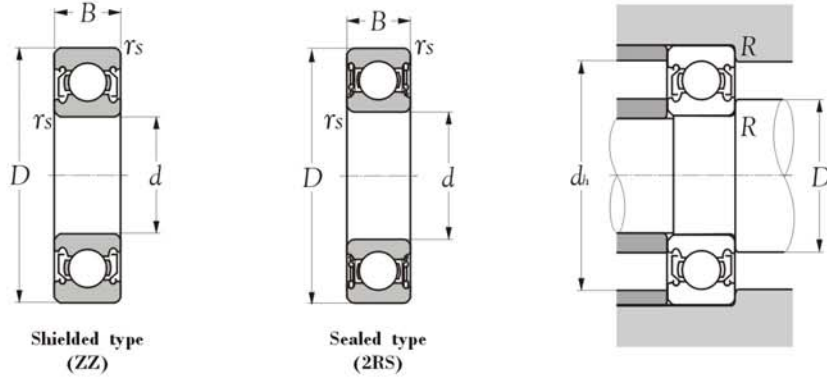
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Abutment and fillet dimensions			Mass kg (approx.)
mm				dynamic	static	grease	oil		D_s min	d_h max	R max	
d	D	B	r_s min ¹⁾	C_r	C_{or}	rpm	rpm					
10	30	9	0.6	5100	2390	25000	30000	6200	15.0	25.0	0.6	0.032
12	32	10	0.6	6100	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 .

	Technical supplement		
	Cages	Precision	Grease
Steel -	<input checked="" type="checkbox"/>		
Polymid -	<input type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2
Brass -	<input type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

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



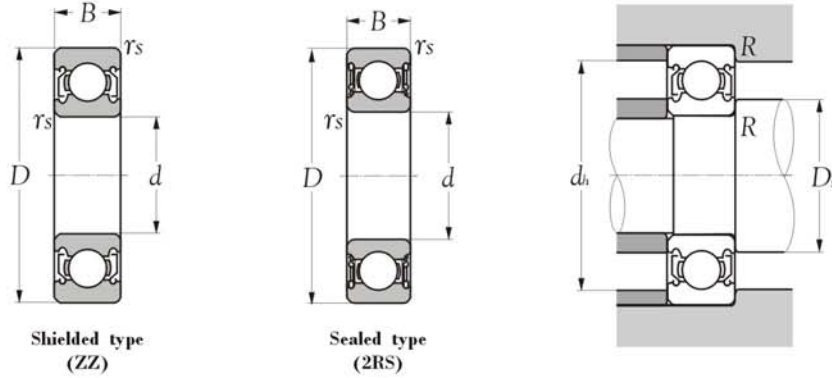
Boundary dimensions				Basic load ratings		Limiting speeds grease rpm	Bearing numbers		Abutment and fillet dimensions mm				Mass kg (approx.)
mm				dynamic N	static N		6200 ZZ	6200 2RS	D_s		d_h	R	
d	D	B	r_s min ¹⁾	C_r	C_{or}					mm	max	max	max
10	30	9	0.6	5100	2390	25000	6200 ZZ	6200 2RS	15.0	16.0	25.0	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 .

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)


Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2	
Polymid - <input type="checkbox"/>			
Brass - <input type="checkbox"/>			

Ball Bearings series 62..ZZ, 62..2RS (Inch)



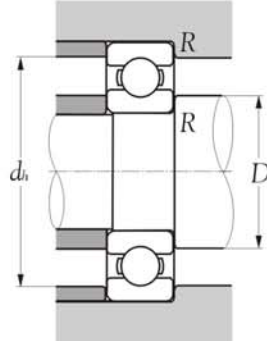
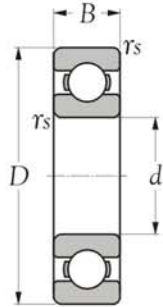
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers		Abutment and fillet dimensions			Mass
mm				dynamic	static	grease				mm			kg
d	D	B	r_s min ¹⁾	C_r	C_{or}	rpm				D_s	d_h	R	(approx.)
8.000	32	10	-	6100	2750	22000	26000	6201-8mm ZZ	6201-8mm 2RS	17	27	0.6	0.037
13.000	32	10	-	6100	2750	22000	26000	6201-13mm ZZ	6201-13mm 2RS	17	27	0.6	0.037
12.700	32	10	-	6100	2750	22000	26000	6201-1/2" ZZ	6201-1/2" 2RS	17	27	0.6	0.037
14.000	35	11	-	7750	3600	19000	23000	6202-14mm ZZ	6202-14mm 2RS	20	30	0.6	0.045
16.000	35	11	-	7750	3600	19000	23000	6202-16mm ZZ	6202-16mm 2RS	20	30	0.6	0.045
15.875	35	11	-	7750	3600	19000	23000	6202-5/8" ZZ	6202-5/8" 2RS	20	30	0.6	0.045
12.700	35	11	-	7750	3600	19000	23000	6202-1/2" ZZ	6202-1/2" 2RS	20	30	0.6	0.045
12.000	40	12	-	9600	4600	18000	21000	6203-12mm ZZ	6203-12mm 2RS	22	35	0.6	0.066
14.000	40	12	-	9600	4600	18000	21000	6203-14mm ZZ	6203-14mm 2RS	22	35	0.6	0.066
15.000	40	12	-	9600	4600	18000	21000	6203-15mm ZZ	6203-15mm 2RS	22	35	0.6	0.066
16.000	40	12	-	9600	4600	18000	21000	6203-16mm ZZ	6203-16mm 2RS	22	35	0.6	0.066
12.700	40	12	-	9600	4600	18000	21000	6203-1/2" ZZ	6203-1/2" 2RS	22	35	0.6	0.066
15.875	40	12	-	9600	4600	18000	21000	6203-5/8" ZZ	6203-5/8" 2RS	22	35	0.6	0.066
19.050	40	12	-	9600	4600	18000	21000	6203-3/4" ZZ	6203-3/4" 2RS	22	35	0.6	0.066
19.050	47	14	-	12800	6650	16000	18000	6204-3/4" ZZ	6204-3/4" 2RS	26	41	1.0	0.106
22.225	47	14	-	12800	6650	16000	18000	6204-7/8" ZZ	6204-7/8" 2RS	26	41	1.0	0.106
25.400	52	15	-	14000	7850	13000	15000	6205-1" ZZ	6205-1" 2RS	31	46	1.0	0.128

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

	Technical supplement		
	Cages	Precision	Grease
Steel -	<input checked="" type="checkbox"/>		
Polymid -	<input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2
Brass -	<input checked="" type="checkbox"/>		


Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Ball Bearings series 63..



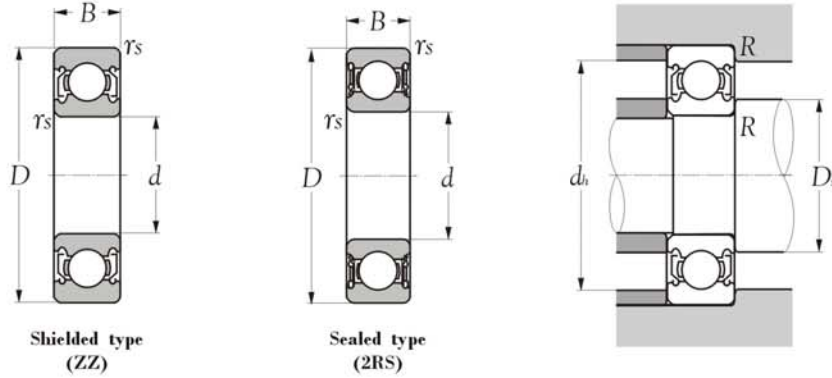
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Abutment and fillet dimensions			Mass
mm				dynamic	static	grease	oil		mm			
d	D	B	r_s min ¹⁾	C_r	C_{or}	rpm	rpm	$D_{s\ min}$	$d_{h\ max}$	$R_{\ max}$	(approx.)	
10	35	11	0.6	8200	3500	23000	27000	6300	15.0	30.0	0.6	0.053
12	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.

	Technical supplement		
	Cages	Precision	Grease
Steel -	<input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid -	<input checked="" type="checkbox"/>		
Brass -	<input checked="" type="checkbox"/>		


Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

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



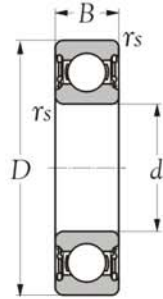
Boundary dimensions				Basic load ratings		Limiting speeds grease rpm	Bearing numbers		Abutment and fillet dimensions mm				Mass kg (approx.)
mm				dynamic N	static		mm	mm	mm	mm	mm	mm	
d	D	B	r_s min ¹⁾	C_r	C_{or}	D_s							d_h
10	35	11	0.6	8200	3500	23000	6300 ZZ	6300 2RS	15.0	17.0	30.0	0.6	0.053
12	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_s .

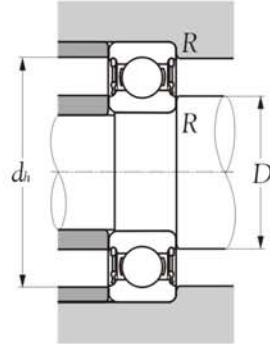
	Technical supplement		
	Cages	Precision	Grease
Steel -	<input checked="" type="checkbox"/>		
Polymid -	<input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2
Brass -	<input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Ball Bearings series 622..2RS




Sealed type
(2RS)



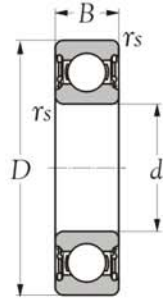
Boundary dimensions				Basic load ratings		Speed rating grease rpm	Bearing numbers	Abutment and fillet dimensions mm				Mass kg (approx.)
mm				dynamic N	static			D_s min	D_s max	d_h max	R max	
d	D	B	r_s mm ¹⁾	C_o	C_{or}							
10	30	14	0.6	5070	2360	17000	62200 2RS	14.0	14.5	26.0	0.6	0.040
12	32	14	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.

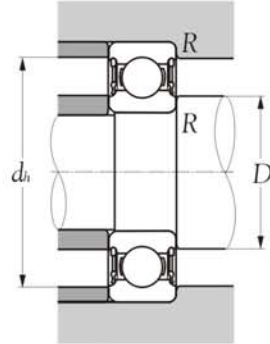
	Technical supplement		
	Cages	Precision	Grease
Steel -	✓		
Polymid -	X	Class 0 (JIS)	Shell Alvania S2
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Ball Bearings series 623..2RS




Sealed type
(2RS)



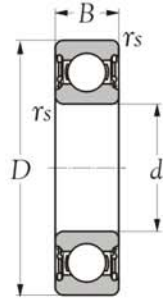
Boundary dimensions				Basic load ratings		Speed rating grease rpm	Bearing numbers	Abutment and fillet dimensions mm				Mass kg (approx.)
mm				dynamic	static			D_s	d_h	R		
d	D	B	r_s mm ¹⁾	C_o	C_{or}			min	max	max	max	
10	35	17	0.6	8060	3400	15000	62300 2RS	14.0	15.0	31.0	0.6	0.060
12	37	17	1.0	9750	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.

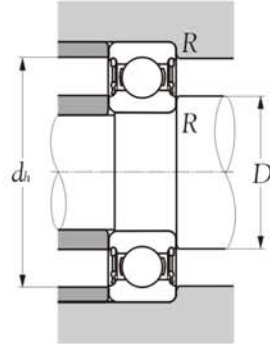
	Technical supplement		
	Cages	Precision	Grease
Steel -	✓		
Polymid -	X	Class 0 (JIS)	Shell Alvania S2
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Ball Bearings series 630..2RS




Sealed type
(2RS)



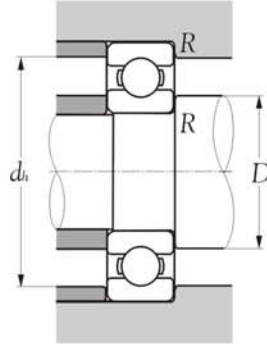
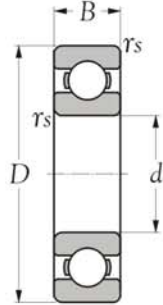
Boundary dimensions				Basic load ratings		Speed rating grease rpm	Bearing numbers	Abutment and fillet dimensions mm				Mass kg (approx.)
mm				dynamic	static			D_s		d_h		
d	D	B	r_s mm ¹⁾	C_o	C_{or}			min	max	min	max	
10	26	12	0.3	4620	1960	19000	63000 2RS	12	12.5	24	0.3	0.025
12	28	12	0.3	5070	2360	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_s .

	Technical supplement		
	Cages	Precision	Grease
Steel -	✓		
Polymid -	X	Class 0 (JIS)	Shell Alvania S2
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Ball Bearings series 68..



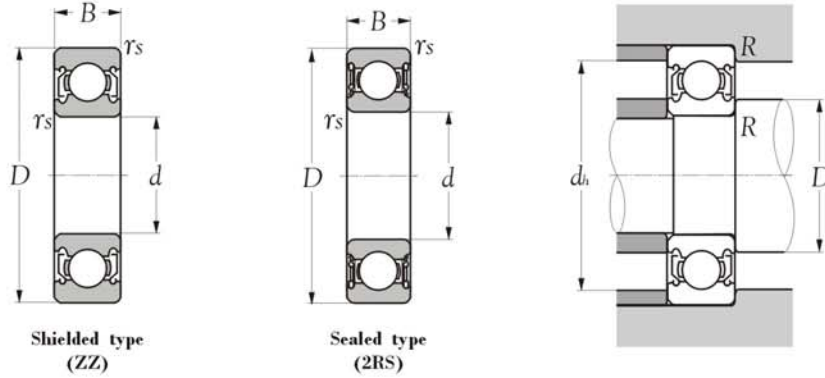
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Abutment and fillet dimensions			Mass kg (approx.)
mm				dynamic	static	grease	oil		D_s	d_h	R	
d	D	B	r_s min ¹⁾	C_r	C_{or}	rpm	rpm		min	max	max	
10	19	5	0.3	1830	925	32000	38000	6800	12	17	0.3	0.005
12	21	5	0.3	1920	1040	29000	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.

Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

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



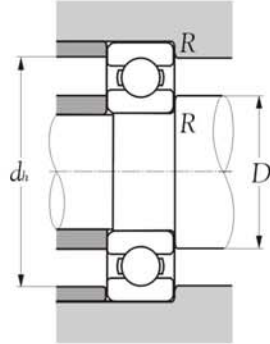
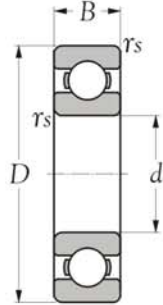
Boundary dimensions				Basic load ratings		Limiting speeds grease rpm	Bearing numbers		Abutment and fillet dimensions mm				Mass kg (approx.)
mm				dynamic N	static N		6800 ZZ	6800 2RS	D_s		d_h	R	
d	D	B	r_s	r_s	r_s	mm			max	max			max
10	19	5	0.3	1830	925	32000	6800 ZZ	6800 2RS	12	12.5	17	0.3	0.005
12	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.

Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2	
Polymid - <input type="checkbox"/>			
Brass - <input type="checkbox"/>			


Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Ball Bearings series 69..



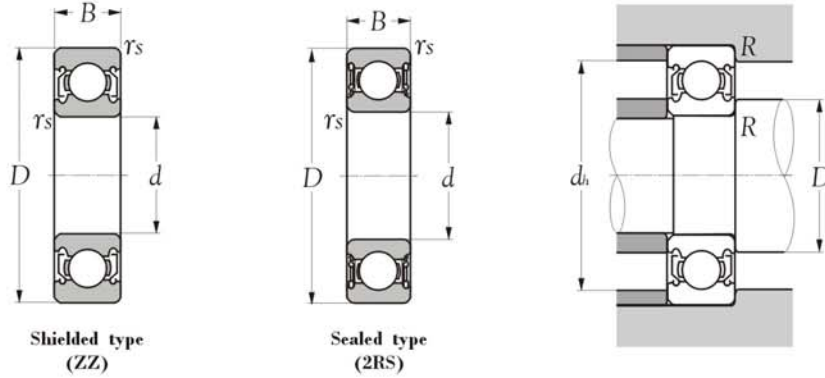
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Abutment and fillet dimensions			Mass kg (approx.)
mm				dynamic	static	grease	oil		D_s min	d_h max	R max	
d	D	B	r_s min ¹⁾	C_r	C_{or}	rpm	rpm					
10	22	6	0.3	2700	1270	30000	36000	6900	12.0	20.0	0.3	0.009
12	24	6	0.3	2890	1460	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 .

	Technical supplement		
	Cages	Precision	Grease
Steel -	<input checked="" type="checkbox"/>		
Polymid -	<input checked="" type="checkbox"/>	Class 0 (JIS)	
Brass -	<input checked="" type="checkbox"/>		Nil

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

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



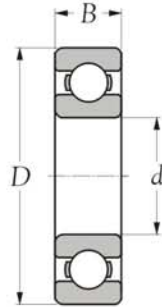
Boundary dimensions				Basic load ratings		Limiting speeds grease rpm	Bearing numbers		Abutment and fillet dimensions mm				Mass kg (approx.)
mm				dynamic	static		mm	mm	mm	mm	mm	mm	
d	D	B	r _s min ¹⁾	C _r	C _{or}	D _s							d _h
10	22	6	0.3	2700	1270	30000	6900 ZZ	6900 2RS	12.0	13.0	20.0	0.3	0.009
12	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.

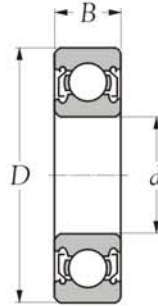
Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2	
Polymid - <input type="checkbox"/>			
Brass - <input type="checkbox"/>			

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

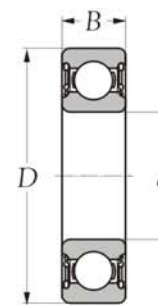
Ball Bearings (Inch sizes) series RLS..., RLS..ZZ, RLS..2RS



Open




Shielded type
(ZZ)



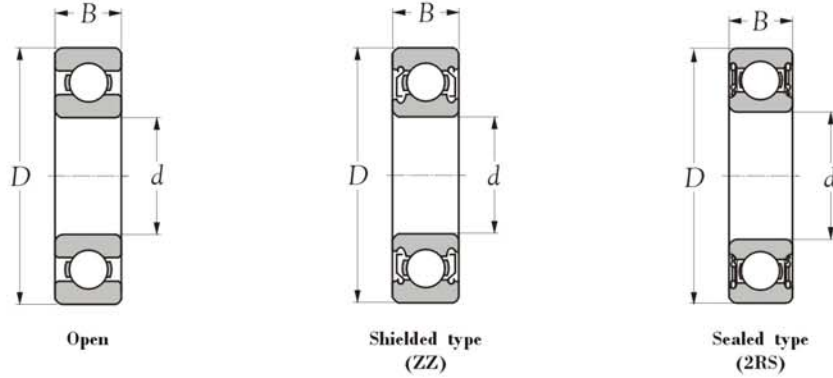
Sealed type
(2RS)

Boundary dimensions			Basic load ratings		Limiting speeds		Bearing numbers			Mass
<i>d</i>	<i>D</i>	<i>B</i>	dynamic <i>C_r</i>	static <i>C_{or}</i>	grease rpm	oil rpm				kg(s) (approx.)
12.700	33.338	9.525	5162	3026	21000	28500	RLS 4	RLS 4 ZZ	RLS 4 2RS	0.037
15.875	39.688	11.113	7387	4361	18000	24000	RLS 5	RLS 5 ZZ	RLS 5 2RS	0.059
19.050	47.625	14.288	10547	6542	15500	21000	RLS 6	RLS 6 ZZ	RLS 6 2RS	0.109
22.225	50.800	14.288	10725	6542	14300	19500	RLS 7	RLS 7 ZZ	RLS 7 2RS	0.116
25.400	57.150	15.875	13795	8900	12700	17000	RLS 8	RLS 8 ZZ	RLS 8 2RS	0.169
28.575	63.500	15.875	14997	10013	11700	15500	RLS 9	RLS 9 ZZ	RLS 9 2RS	0.220
31.750	69.850	17.463	20470	13929	10600	14400	RLS 10	RLS 10 ZZ	RLS 10 2RS	0.276
34.925	76.200	17.463	23051	15842	9800	13200	RLS 11	RLS 11 ZZ	RLS 11 2RS	0.333
38.100	82.550	19.050	25810	17889	9000	12200	RLS 12	RLS 12 ZZ	RLS 12 2RS	0.418
41.275	88.900	19.050	28658	20070	8400	11300	RLS 13	RLS 13 ZZ	RLS 13 2RS	0.481
44.450	95.250	20.638	31595	22339	7800	10600	RLS 14	RLS 14 ZZ	RLS 14 2RS	0.594
47.625	101.600	20.638	37380	27857	7200	9800	RLS 15	RLS 15 ZZ	RLS 15 2RS	0.708
50.800	101.600	20.638	37558	27857	7200	9800	RLS 16	RLS 16 ZZ	RLS 16 2RS	0.667
57.150	114.300	22.225	44500	32752	6400	8600	RLS 18	RLS 18 ZZ	RLS 18 2RS	0.885
63.500	127.000	23.813	48505	36846	5700	7700	RLS 20	RLS 20 ZZ	RLS 20 2RS	1.220
69.850	133.350	23.813	51620	40940	5300	7200	RLS 22	RLS 22 ZZ	RLS 22 2RS	1.334
76.200	146.050	26.988	60075	48505	4800	6500	RLS 24	RLS 24 ZZ	RLS 24 2RS	1.814

	Technical supplement		
	Cages	Precision	Grease
	Steel - <input checked="" type="checkbox"/>		
	Polymid - <input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2
Brass - <input checked="" type="checkbox"/>			

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

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

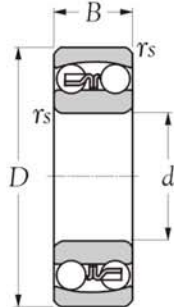


Boundary dimensions			Basic load ratings		Limiting speeds		Bearing numbers			Mass
<i>d</i>	<i>D</i>	<i>B</i>	dynamic <i>C_r</i>	static <i>C_{or}</i>	grease rpm	oil rpm				kg(s) (approx.)
12.700	41.275	15.875	9034	5607	18500	25000	RMS 4	RMS 4 ZZ	RMS 4 2RS	0.096
15.875	46.038	15.875	9345	5607	16500	22000	RMS 5	RMS 5 ZZ	RMS 5 2RS	0.117
19.050	50.800	17.463	12193	7788	14700	20000	RMS 6	RMS 6 ZZ	RMS 6 2RS	0.156
22.225	57.150	17.463	14196	9123	13300	18000	RMS 7	RMS 7 ZZ	RMS 7 2RS	0.197
25.400	63.500	19.050	16332	10547	12200	16500	RMS 8	RMS 8 ZZ	RMS 8 2RS	0.262
28.575	71.438	20.638	22695	15842	10800	14500	RMS 9	RMS 9 ZZ	RMS 9 2RS	0.347
31.750	79.375	22.225	27902	19536	9800	13200	RMS 10	RMS 10 ZZ	RMS 10 2RS	0.476
34.925	88.900	22.225	33598	23852	8800	11900	RMS 11	RMS 11 ZZ	RMS 11 2RS	0.608
38.100	95.250	23.813	36490	26211	8200	11000	RMS 12	RMS 12 ZZ	RMS 12 2RS	0.753
41.275	101.600	23.813	40495	30038	7700	10300	RMS 13	RMS 13 ZZ	RMS 13 2RS	0.857
44.450	107.950	26.988	43254	31195	7100	9600	RMS 14	RMS 14 ZZ	RMS 14 2RS	1.061
47.625	114.300	26.988	51175	38715	6600	8900	RMS 15	RMS 15 ZZ	RMS 15 2RS	1.220
50.800	114.300	26.988	51175	38715	5900	8000	RMS 16	RMS 16 ZZ	RMS 16 2RS	1.175
57.150	127.000	31.750	62745	48505	4600	6200	RMS 18	RMS 18 ZZ	RMS 18 2RS	1.601
63.500	139.700	31.750	71200	55625	4000	5400	RMS 20	RMS 20 ZZ	RMS 20 2RS	2.041
69.850	158.750	34.925	87220	71200	3800	5100	RMS 22	RMS 22 ZZ	RMS 22 2RS	2.894

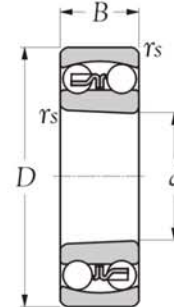
	Technical supplement		
	Cages	Precision	Grease
Steel -	<input checked="" type="checkbox"/>		
Polymid -	<input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2
Brass -	<input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

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			cylindrical	tapered
d	D	B	$r_s \text{ min}^{\circ}$	C_r	C_{or}	rpm	rpm			bore	bore
											(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

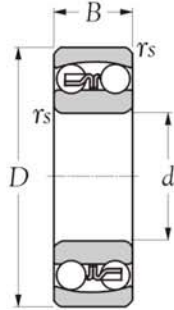
Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r_s .

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.

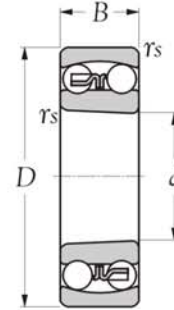
Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

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			cylindrical	tapered
d	D	B	$r_s \text{ mm}^{1/2}$	N	N	rpm	rpm			bore	bore
				C_r	C_{or}					(approx.)	(approx.)
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

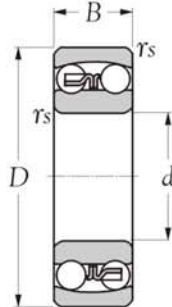
Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r_s .

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.

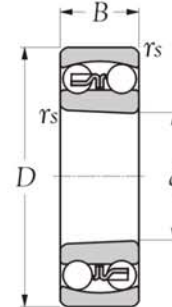
Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil	
Polymid - E			
Brass - <input checked="" type="checkbox"/>			

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

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	static	grease	oil			cylindrical bore (approx.)	tapered bore
	D	B	$r_{s\ min}^0$	N	C_{or}	rpm	rpm				
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

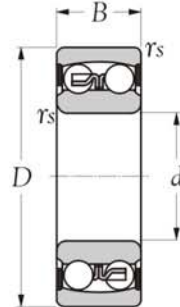
Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r .

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.

	Technical supplement		
	Cages	Precision	Grease
Steel -	✓		
Polymid -	E	Class 0 (JIS)	Nil
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

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




Sealed 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</i> min ⁰	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

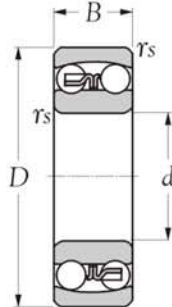
Note: 1) These values are the allowable minimum dimensions of the chamfer dimension *r*.

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.

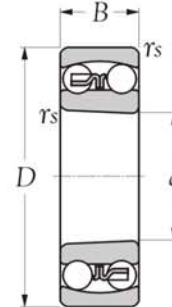
	Technical supplement		
	Cages	Precision	Grease
Steel -	✓		
Polymid -	E	Class 0 (JIS)	Shell Alvania S2
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

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




Cylindrical bore



Tapered bore
taper 1:12

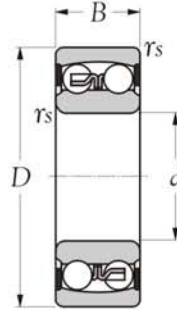
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers		Mass	
d	mm			dynamic	static	grease	oil			cylindrical bore (approx.)	tapered bore
	D	B	$r_{s\ min}^1$	N	C_{or}	rpm	rpm				
10	35	17	0.6	10100	2150	17000	20000	2300 E	-	0.083	-
12	37	17	1.0	11800	2710	15000	17000	2301 E	-	0.091	-
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 .

	Technical supplement		
	Cages	Precision	Grease
Steel -	✓	Class 0 (JIS)	Nil
Polymid -	E		
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)


Self-aligning Ball Bearings series 23..2RS



Sealed type
(2RS)

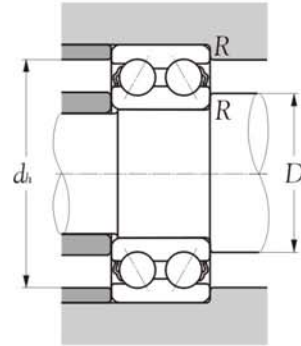
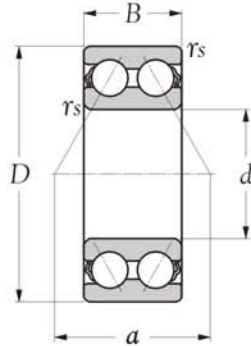
Boundary dimensions				Basic load ratings		Limiting speeds grease rpm	Bearing numbers	Mass kg (approx.)
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_s</i> min ⁰	dynamic <i>C_r</i>	static <i>C_{0r}</i>			
15	42	17	1.0	10800	2600	12000	2302 2RS	0.110
17	47	19	1.0	12700	3400	11000	2303 2RS	0.160
20	52	21	1.1	14300	4000	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*.

	Technical supplement		
	Cages	Precision	Grease
Steel -	✓		
Polymid -	E	Class 0 (JIS)	Shell Alvania S2
Brass -	X		


Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Double-row Angular Contact Ball Bearings series 30..



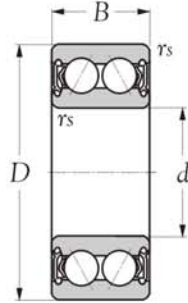
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Abutment and fillet dimensions				Mass
mm				dynamic	static	grease	oil		mm				
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_s</i> min ¹⁾	<i>C_r</i>	<i>C_{0r}</i>	rpm	rpm		<i>D_s</i> <i>min</i>	<i>d_h</i> <i>max</i>	<i>R</i> <i>max</i>	<i>a</i>	(approx.)
10	26	12	-	5700	3250	23300	21900	3000	12.0	24.0	0.3	-	0.022
12	28	12	-	6200	3750	21900	19300	3001	14.0	26.0	0.3	-	0.025
15	32	13	-	8600	5400	17800	16500	3002	17.0	30.0	0.3	-	0.036
17	35	14	-	9200	6200	16800	15300	3003	19.0	33.0	0.3	-	0.042
20	42	16	-	14500	9600	13500	13200	3004	23.2	38.8	0.6	-	0.080
25	47	16	-	15500	11100	11900	11100	3005	38.2	43.8	0.6	-	0.100
30	55	19	-	20300	15600	10100	10000	3006	34.6	50.4	1.0	-	0.160
35	62	20	-	24500	19400	8700	8800	3007	39.6	57.4	1.0	-	0.200
40	68	21	-	25500	21700	7900	8000	3008	44.6	63.4	1.0	-	0.250

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

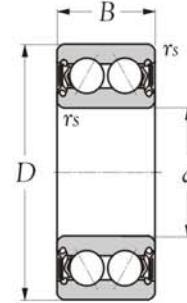
	Technical supplement		
	Cages	Precision	Grease
Steel -	X	Class 0 (JIS)	Nil
Polymid -	✓		
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Double-row Angular Contact Ball Bearings series 30..ZZ, 30..2RS



Shielded type
(ZZ)



Sealed type
(2RS)

Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Abutment and fillet dimensions				Mass	
mm				dynamic	static	grease	oil		mm					
d	D	B	$r_s \text{ min}^{1)}$	C_r	C_{or}	rpm	rpm	D_s mm	d_h max	R max	a	kg (approx.)		
10	26	12	-	5700	3250	23300	21900	3000 ZZ		12.0	24.0	0.3	-	0.022
10	26	12	-	5700	3250	14000	-	3000 2RS		12.0	24.0	0.3	-	0.022
12	28	12	-	6200	3750	21900	19300	3001 ZZ		14.0	26.0	0.3	-	0.025
12	28	12	-	6200	3750	13000	-	3001 2RS		14.0	26.0	0.3	-	0.025
15	32	13	-	8600	5400	17800	16500	3002 ZZ		17.0	30.0	0.3	-	0.036
15	32	13	-	8600	5400	12000	-	3002 2RS		17.0	30.0	0.3	-	0.036
17	35	14	-	9200	6200	16800	15300	3003 ZZ		19.0	33.0	0.3	-	0.042
17	35	14	-	9200	6200	11000	-	3003 2RS		19.0	33.0	0.3	-	0.042
20	42	16	-	14500	9600	13500	13200	3004 ZZ		23.2	38.8	0.6	-	0.080
20	42	16	-	14500	9600	9000	-	3004 2RS		23.2	38.8	0.6	-	0.080
25	47	16	-	15500	11100	11900	11100	3005 ZZ		38.2	43.8	0.6	-	0.100
25	47	16	-	15500	11100	8000	-	3005 2RS		38.2	43.8	0.6	-	0.100
30	55	19	-	20300	15600	10100	10000	3006 ZZ		34.6	50.4	1.0	-	0.160
30	55	19	-	20300	15600	6700	-	3006 2RS		34.6	50.4	1.0	-	0.160
35	62	20	-	24500	19400	8700	8800	3007 ZZ		39.6	57.4	1.0	-	0.200
35	62	20	-	24500	19400	5600	-	3007 2RS		39.6	57.4	1.0	-	0.200
40	68	21	-	25500	21700	7900	8000	3008 ZZ		44.6	63.4	1.0	-	0.250
40	68	21	-	25500	21700	5000	-	3008 2RS		44.6	63.4	1.0	-	0.250

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

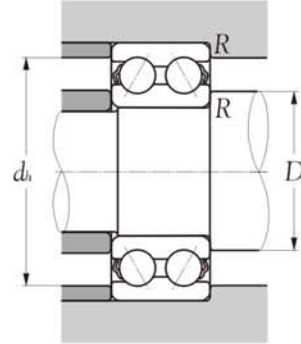
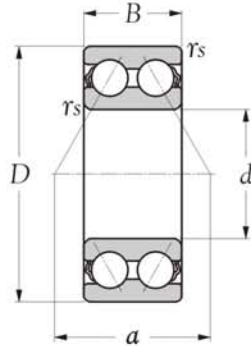


Technical supplement

Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)


Double-row Angular Contact Ball Bearings series 52..



Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Abutment and fillet dimensions				Mass
mm				dynamic	static	grease	oil		mm				
d	D	B	$r_s \text{ min}^1)$	C_r	C_{or}	rpm	rpm		D_s min	d_h max	R max	a	(approx.)
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
95	170	56.0	2.1	159000	148000	2800	2100	5219	107.0	158.0	2.0	111.0	4.860
100	180	60.0	2.1	178000	167000	2700	2000	5220	112.0	168.0	2.0	118.0	5.940
110	200	70.0	2.1	212000	212000	2800	2800	5222	122.0	188.0	2.0	132.0	8.800

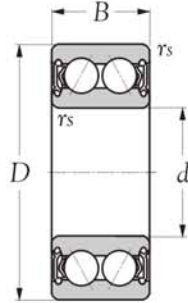
Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

Remark: All KSM products of 52 and 53 series come with polyamid 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.

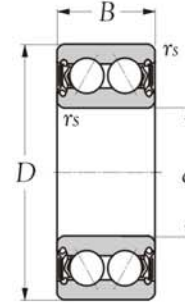
	Technical supplement		
	Cages	Precision	Grease
Steel -	S	Class 0 (JIS)	Nil
Polyamid -	✓		
Brass -	X		

Remark: If you have more inquiry of technical, please inquire KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

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	$r_s \text{ min}^0$	dynamic C_r	static N C_{or}				
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

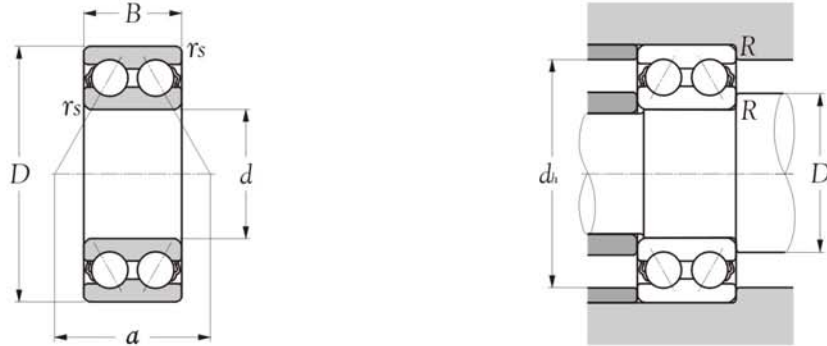
Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

Remark: All KSM products of 52 and 53 series come with polyamid 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.

Technical supplement		
Cages	Precision	Grease
Steel - S		
Polymid - ✓	Class 0 (JIS)	Shell Alvania S2
Brass - X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Double-row Angular Contact Ball Bearings series 53..



Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Abutment and fillet dimensions				Mass
d	D	B	$r_s \text{ min}^{(1)}$	dynamic N	static N	grease rpm	oil rpm		D_s mm	d_h mm	R mm	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

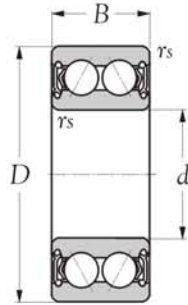
Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

Remark: All KSM products of 52 and 53 series come with polyamid 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.

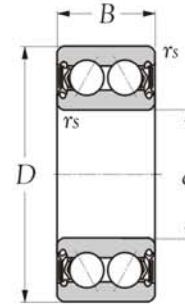
Technical supplement			
Cages	Precision	Grease	
Steel - S	Class 0 (JIS)	Nil	
Polyamid - ✓			
Brass - X			

Remark: If you have more inquiry of technical, please inquire KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

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	$r_{s\ min}^0$	dynamic C_r	static N C_{or}				
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

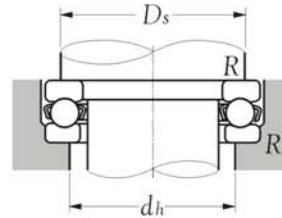
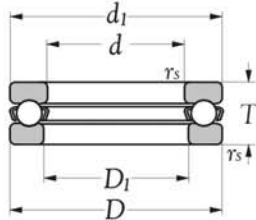
Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

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.

Technical supplement		
Cages	Precision	Grease
Steel - S		
Polymid - ✓	Class 0 (JIS)	Shell Alvania S2
Brass - X		


Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Thrust Ball Bearings series 511..



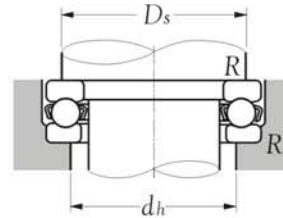
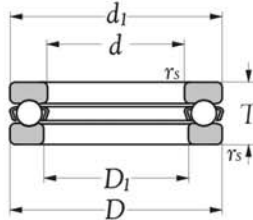
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Dimensions		Abutment and fillet dimensions			Mass kg (approx.)
mm				dynamic N	static	grease rpm	oil rpm		mm		mm			
d	D	T	$r_s \text{ min}^{(1)}$	C_a	C_{0a}			$d_{1s} \text{ max}^{(2)}$	$D_{1s} \text{ min}^{(2)}$	D_s mm	d_h max	R max		
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.

	Technical supplement		
	Cages	Precision	Grease
Steel -	<input checked="" type="checkbox"/>		
Polymid -	<input checked="" type="checkbox"/>	Class 6 (JIS)	
Brass -	<input checked="" type="checkbox"/>		Nil

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Thrust Ball Bearings series 512..



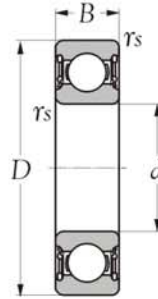
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Dimensions		Abutment and fillet dimensions			Mass kg (approx.)
d	D	T	$r_s \text{ min}^{(1)}$	C_a	C_{0a}	grease rpm	oil rpm		$d_{1s} \text{ max}^{(2)}$	$D_{1s} \text{ min}^{(2)}$	D_s mm	d_h max	R max	
10	26	11	0.6	12700	17100	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.

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 6 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		


Deep Groove Ball Bearings series 16..2RS



Sealed type
(2RS)

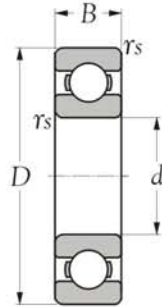
Boundary dimensions				Basic load ratings		Limiting speeds			Bearing numbers	Mass kg (approx.)
d	mm		$r_s \text{ min}^{-1}$	dynamic	static	grease	rpm	oil		
	D	B		C_r	C_{or}	2RS				
4.763	17.463	7.925	0.3	1280	578	36000	28000	43000	1601 2RS	0.004
6.350	17.463	7.925	0.3	1280	578	36000	28000	43000	1602 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 .

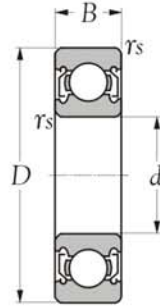
	Technical supplement		
	Cages	Precision	Grease
Steel -	<input checked="" type="checkbox"/>		
Polymid -	<input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2
Brass -	<input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

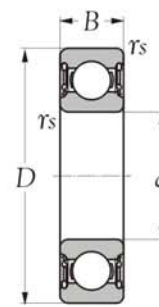
Deep Groove Ball Bearings series R..., R.ZZ, R.2RS



Open




Shielded type
(ZZ)



Sealed type
(2RS)

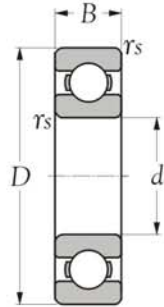
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers			Mass
mm				dynamic	static	grease	oil	open	with shields	with seals	kg
d	D	B	r_s min ¹⁾	C_r	C_{or}	rpm	rpm				(approx.)
3.175	9.525	3.967	0.3	630	218	56000	67000	R 2	R 2 ZZ	R 2 2RS	0.0012
		-					0.0014				
3.175	9.525	3.967	0.3	630	218	56000	6700	R 2 A	R 2 A ZZ	R 2 A 2RS	0.0010
		-					0.0010				
4.762	12.700	3.967	0.3	1310	490	41000	48000	R 3	R 3 ZZ	R 3 2RS	0.0022
		-					0.0024				
4.762	12.700	3.967	0.3	1310	490	41000	48000	R 3 A	R 3 A ZZ	R 3 A 2RS	0.0020
		-					0.0020				
6.350	15.875	4.978	0.4	1480	615	36000	43000	R 4	R 4 ZZ	R 4 2RS	0.0040
		-					0.0044				
6.350	15.875	4.978	0.4	1480	615	36000	43000	R 4 A	R 4 A ZZ	R 4 A 2RS	0.0040
		-					0.0040				
9.525	22.225	5.556	1.0	3300	1400	31000	37000	R 6	R 6 ZZ	R 6 2RS	0.0136
		-					0.0140				
12.700	28.575	6.350	1.0	3950	2250	26000	31000	R 8	R 8 ZZ	R 8 2RS	0.0165
		-					0.0180				
15.875	34.925	7.140	1.0	4600	2800	21000	25000	R 10	R 10 ZZ	R 10 2RS	0.0340
		-					0.0370				
19.050	41.275	7.938	1.0	7250	4450	16000	21000	R 12	R 12 ZZ	R 12 2RS	0.0440
		-					0.0470				
22.225	47.625	9.525	1.0	7250	4950	12000	16000	R 14	R 14 ZZ	R 14 2RS	0.0700
		-					0.0720				

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

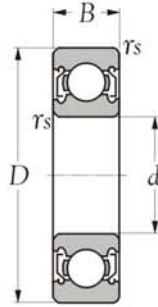
	Technical supplement		
	Cages	Precision	Grease
Steel -	✓	Class 0 (JIS)	Shell Alvania S2
Polymid -	X		
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

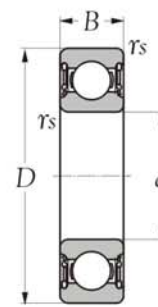
Deep Groove Ball Bearings series R., R.ZZ, R.2RS



Open




Shielded type
(ZZ)



Sealed type
(2RS)

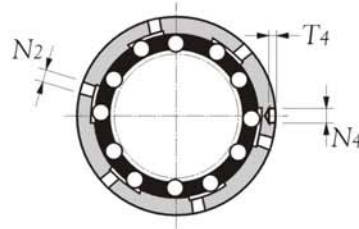
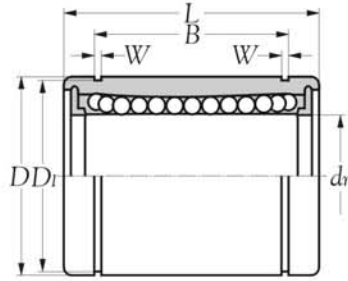
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers			Mass kg (approx.)
d	mm		$r_s \text{ min}^{-1}$	dynamic	static	grease	oil	open	with shields	with seals	
	D	B		C_r	C_{or}	rpm					
25.400	50.800	9.525	1.0	8250	5450	11000	15000	R 16			0.0810
		12.700								R 16 ZZ	
25.575	53.975	9.525	1.0	9600	6260	10000	13000	R 18			0.0860
		12.700								R 18 ZZ	
31.750	57.150	9.525	1.0	10800	7520	9000	11000	R 20			0.0900
		12.700								R 20 ZZ	
34.925	63.500	11.113	1.0	12280	8500	7000	8500	R 22			0.1010
		14.288								R 22 ZZ	
38.100	66.675	11.113	1.0	13150	9450	6000	7500	R 24			0.1360
		14.288								R 24 ZZ	

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


	Technical supplement		
	Cages	Precision	Grease
Steel -	✓	Class 0 (JIS)	Shell Alvania S2
Polymid -	X		
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Linear Ball Bearings series LME..

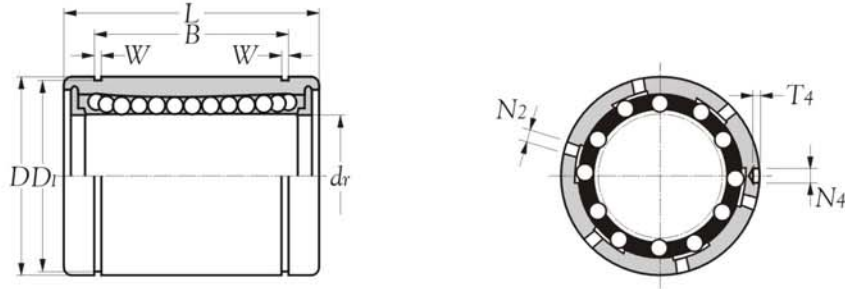


Boundary dimensions <i>d</i> mm	Bearing number				Number of ball tracks	Principal dimensions					
	standard steel retainer	standard resin retainer	with seals steel retainer	with seals resin retainer		<i>dr</i>		<i>D</i>		<i>L</i>	
	mm	mm	mm	mm		mm	0.001mm	mm	0.001mm	mm	mm
5	-	LME 5 AS	-	LME 5 UU AS	3	5	(+8/0)	12	(0/-8)	22	(0/-0.2)
8	LME 8 A AS	LME 8 AS	LME 8 A UU AS	LME 8 UU AS	4	8	(+8/0)	16	(0/-8)	25	(0/-0.2)
10	LME 10 A AS	-	LME 10 A UU AS	-	4	10	(+8/0)	19	(0/-9)	29	(0/-0.2)
12	LME 12 A AS	LME 12 AS	LME 12 A UU AS	LME 12 UU AS	4	12	(+8/0)	22	(0/-9)	32	(0/-0.2)
16	LME 16 A AS	LME 16 AS	LME 16 A UU AS	LME 16 UU AS	5	16	(+9/-1)	26	(0/-9)	36	(0/-0.2)
20	LME 20 A AS	LME 20 AS	LME 20 A UU AS	LME 20 UU AS	5	20	(+9/-1)	32	(0/-11)	45	(0/-0.2)
25	LME 25 A AS	LME 25 AS	LME 25 A UU AS	LME 25 UU AS	6	25	(+11/-1)	40	(0/-11)	58	(0/-0.3)
30	LME 30 A AS	LME 30 AS	LME 30 A UU AS	LME 30 UU AS	6	30	(+11/-1)	47	(0/-11)	68	(0/-0.3)
40	LME 40 A AS	LME 40 AS	LME 40 A UU AS	LME 40 UU AS	6	40	(+13/-2)	62	(0/-13)	80	(0/-0.3)
50	LME 50 A AS	LME 50 AS	LME 50 A UU AS	LME 50 UU AS	6	50	(+13/-2)	75	(0/-13)	100	(0/-0.3)
60	LME 60 A AS	LME 60 AS	LME 60 A UU AS	LME 60 UU AS	6	60	(+13/-2)	90	(0/-15)	125	(0/-0.4)

	Technical supplement		
	Cages	Precision	Grease
Steel -	X		
Polymid -	✓	Class 0 (JIS)	Shell Alvania S2
Brass -	X		

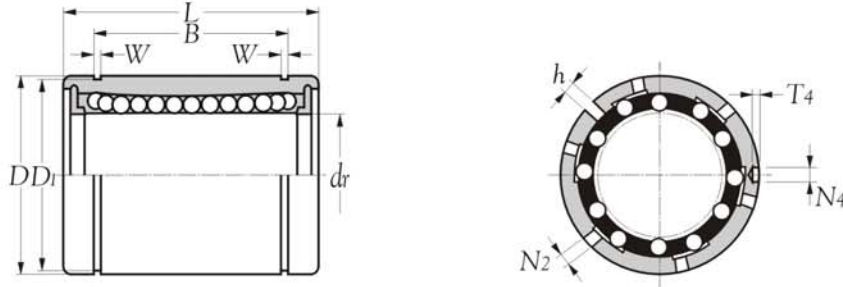
Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Linear Ball Bearings series LME..




B tolerance	Principal dimensions		D_1	Roundness 0.001mm	Steel retainer maximum radial clearance 0.001mm	Resin retainer maximum radial clearance 0.001mm	Load ratings		Mass	
	W mm						dynamic C N	static C_0	steel retainer kg(s).	resin retainer
14.5	(0/-0.2)	1.10	11.5	12	-	-5	206	265	-	0.011
16.5	(0/-0.2)	1.10	15.2	12	-3	-5	265	402	0.022	0.020
22.0	(0/-0.2)	1.30	18.0	12	-4	-	372	549	0.036	-
22.9	(0/-0.2)	1.30	21.0	12	-4	-7	510	784	0.045	0.041
24.9	(0/-0.2)	1.30	24.9	12	-4	-7	578	892	0.060	0.065
31.5	(0/-0.2)	1.60	30.3	15	-6	-9	862	1370	0.102	0.091
44.1	(0/-0.3)	1.85	37.5	15	-6	-9	980	1570	0.235	0.215
52.1	(0/-0.3)	1.85	44.5	15	-8	-9	1570	2740	0.360	0.325
60.6	(0/-0.3)	2.15	59.0	17	-8	-13	2160	4020	0.770	0.705
77.6	(0/-0.3)	2.65	72.0	17	-13	-13	3820	7940	1.250	1.130
101.7	(0/-0.4)	3.15	86.5	20	-13	-16	4700	9800	2.220	2.220

Linear Ball Bearings series LME..AJ AS

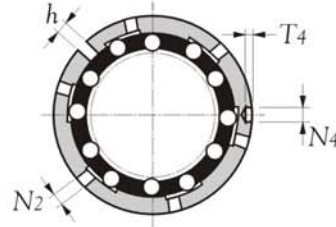
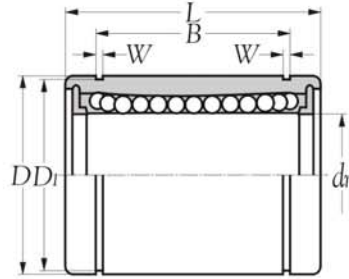


Boundary dimensions d mm	Bearing number				Number of ball tracks	Principal dimensions			
	standard steel retainer	standard resin retainer	with seals steel retainer	with seals resin retainer		d_r tolerance	D tolerance		
						mm	0.001mm	mm	0.001mm
5	-	LME 5 AJ AS	-	LME 5 UUAJ AS	3	5	(+8/0)	12	(0/-8)
8	-	LME 8 AJ AS	-	LME 8 UUAJ AS	4	8	(+8/0)	16	(0/-8)
12	LME 12 A-AJ AS	LME 12 AJ AS	LME 12 A-UUAJ AS	LME 12 UUAJ AS	4	12	(+8/0)	22	(0/-9)
16	LME 16 A-AJ AS	LME 16 AJ AS	LME 16 A-UUAJ AS	LME 16 UUAJ AS	5	16	(+9/-1)	26	(0/-9)
20	LME 20 A-AJ AS	LME 20 AJ AS	LME 20 A-UUAJ AS	LME 20 UUAJ AS	5	20	(+9/-1)	32	(0/-11)
25	LME 25 A-AJ AS	LME 25 AJ AS	LME 25 A-UUAJ AS	LME 25 UUAJ AS	6	25	(+11/-1)	40	(0/-11)
30	LME 30 A-AJ AS	LME 30 AJ AS	LME 30 A-UUAJ AS	LME 30 UUAJ AS	6	30	(+11/-1)	47	(0/-11)
40	LME 40 A-AJ AS	LME 40 AJ AS	LME 40 A-UUAJ AS	LME 40 UUAJ AS	6	40	(+13/-2)	62	(0/-13)
50	LME 50 A-AJ AS	LME 50 AJ AS	LME 50 A-UUAJ AS	LME 50 UUAJ AS	6	50	(+13/-2)	75	(0/-13)
60	LME 60 A-AJ AS	LME 60 AJ AS	LME 60 A-UUAJ AS	LME 60 UUAJ AS	6	60	(+13/-2)	90	(0/-15)

	Technical supplement		
	Cages	Precision	Grease
Steel -	X		
Polymid -	✓	Class 0 (JIS)	Shell Alvania S2
Brass -	X		

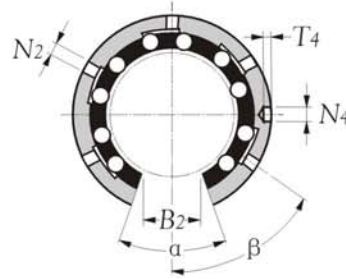
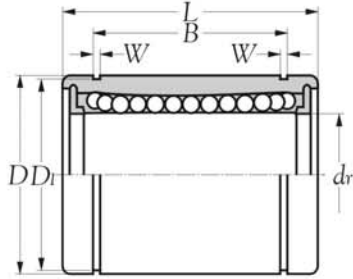
Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Linear Ball Bearings series LME..AJ AS



L	Principal dimensions					Roundness	Steel retainer maximum radial clearance	Resin retainer maximum radial clearance	Load ratings		Mass		
	tolerance	B	W	D_1	h				dynamic C	static C_0	steel retainer	resin retainer	
mm	mm	mm	mm	mm	mm	0.001mm	0.001mm	0.001mm	N	N	kg(s).	kg(s).	
22	(0/-0.2)	14.5	(0/-0.2)	1.10	11.5	1.0	12	-	-5	206	265	0.011	-
25	(0/-0.2)	16.5	(0/-0.2)	1.10	15.2	1.0	12	-3	-5	265	402	0.020	0.022
32	(0/-0.2)	22.9	(0/-0.2)	1.30	21.0	1.5	12	-4	-7	510	784	0.041	0.045
36	(0/-0.2)	24.9	(0/-0.2)	1.30	24.9	1.5	12	-4	-7	578	892	0.065	0.060
45	(0/-0.2)	31.5	(0/-0.2)	1.60	30.3	2.0	15	-6	-9	862	1370	0.091	0.102
58	(0/-0.3)	44.1	(0/-0.3)	1.85	37.5	2.0	15	-6	-9	980	1570	0.215	0.235
68	(0/-0.3)	52.1	(0/-0.3)	1.85	44.5	2.0	15	-8	-9	1570	2740	0.325	0.360
80	(0/-0.3)	60.6	(0/-0.3)	2.15	59.0	3.0	17	-8	-13	2160	4020	0.705	0.770
100	(0/-0.3)	77.6	(0/-0.3)	2.65	72.0	3.0	17	-13	-13	3820	7940	1.130	1.250
125	(0/-0.4)	101.7	(0/-0.4)	3.15	86.5	3.0	20	-13	-16	4700	9800	2.220	2.220

Linear Ball Bearings series LME..OP



Boundary dimensions <i>d</i> mm	Bearing number				Number of ball tracks	Principal dimensions			
	standard steel retainer	standard resin retainer	with seals steel retainer	with seals resin retainer		<i>d_r</i> tolerance		<i>D</i> tolerance	
					mm	0.001mm	mm	0.001mm	
12	LME 12 A OP	LME 12 OP AS	LME 12 A UUOP AS	LME 12 UUOP AS	3	12	(+8/0)	22	(0/-9)
16	LME 16 A OP	LME 16 OP AS	LME 16 A UUOP AS	LME 16 UUOP AS	4	16	(+9/-1)	26	(0/-9)
20	LME 20 A OP	LME 20 OP AS	LME 20 A UUOP AS	LME 20 UUOP AS	4	20	(+9/-1)	32	(0/-11)
25	LME 25 A OP	LME 25 OP AS	LME 25 A UUOP AS	LME 25 UUOP AS	5	25	(+11/-1)	40	(0/-11)
30	LME 30 A OP	LME 30 OP AS	LME 30 A UUOP AS	LME 30 UUOP AS	5	30	(+11/-1)	47	(0/-11)
40	LME 40 A OP	LME 40 OP AS	LME 40 A UUOP AS	LME 40 UUOP AS	5	40	(+13/-2)	62	(0/-13)
50	LME 50 A OP	LME 50 OP AS	LME 50 A UUOP AS	LME 50 UUOP AS	5	50	(+13/-2)	75	(0/-13)
60	LME 60 A OP	LME 60 OP AS	LME 60 A UUOP AS	LME 60 UUOP AS	5	60	(+13/-2)	90	(0/-15)

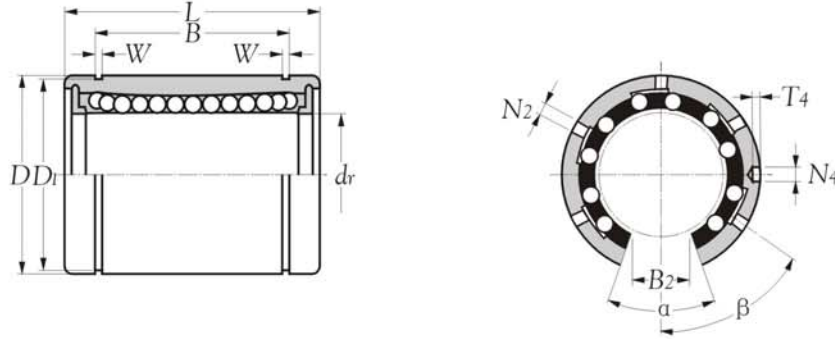


Technical supplement

	Cages	Precision	Grease
Steel -	X		
Polymid -	✓	Class 0 (JIS)	Shell Alvania S2
Brass -	X		

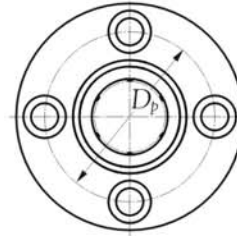
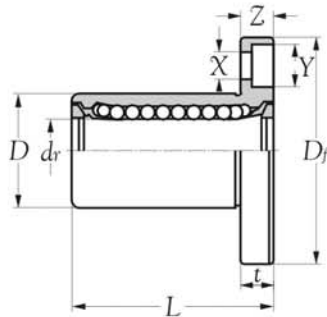
Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Linear Ball Bearings series LME..OP




L	Principal dimensions						Roundness	Steel retainer maximum radial clearance	Resin retainer maximum radial clearance	Load ratings		Mass		
	tolerance	B	W	D ₁	h ₁	θ				dynamic C	static C ₀	steel retainer	resin retainer	
mm	mm	mm	mm	mm	mm	°	0.001mm	0.001mm	0.001mm	N	N	kg(s)	kg(s)	
32	(0/-0.2)	22.9	(0/-0.2)	1.30	21.0	7.5	78°	12	-4	-7	510	784	0.045	0.041
36	(0/-0.2)	24.9	(0/-0.2)	1.30	24.9	10.0	78°	12	-4	-7	578	892	0.060	0.065
45	(0/-0.2)	31.5	(0/-0.2)	1.60	30.3	10.0	60°	15	-6	-9	862	1370	0.102	0.091
58	(0/-0.3)	44.1	(0/-0.3)	1.85	37.5	12.5	60°	15	-6	-9	980	1570	0.235	0.215
68	(0/-0.3)	52.1	(0/-0.3)	1.85	44.5	12.5	50°	15	-8	-9	1570	2740	0.360	0.325
80	(0/-0.3)	60.6	(0/-0.3)	2.15	59.0	16.8	50°	17	-8	-13	2160	4020	0.770	0.705
100	(0/-0.4)	77.6	(0/-0.4)	2.65	72.0	21.0	50°	17	-13	-13	3820	7940	1.250	1.130
125	(0/-0.4)	101.7	(0/-0.4)	3.15	86.5	27.2	54°	20	-13	-16	4700	9800	2.220	2.220

Linear Ball Bearings series LME..F

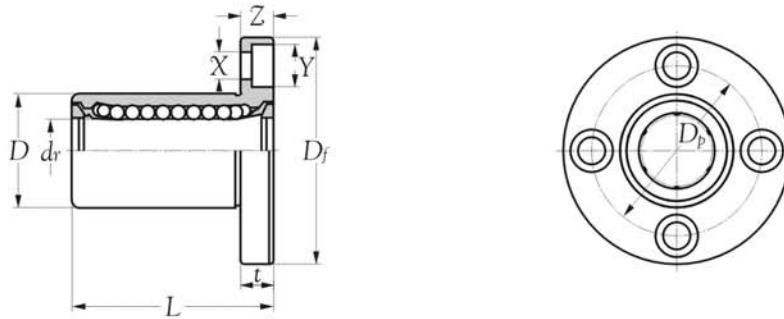


Boundary dimensions <i>d</i> mm	Bearing number		Number of ball tracks	Principal dimensions					
	standard resin retainer	with seals resin retainer		<i>d_r</i>		<i>D</i>		<i>L</i>	
				tolerance mm	0.001mm	tolerance mm	0.001mm	tolerance mm	mm
8	LMEF 8	LMEF 8 UU	4	8	(+8/0)	16	(0/-13)	25	(±0.3)
12	LMEF 12	LMEF 12 UU	4	12	(+8/0)	22	(0/-16)	32	(±0.3)
16	LMEF 16	LMEF 16 UU	5	16	(+9/-1)	26	(0/-16)	36	(±0.3)
20	LMEF 20	LMEF 20 UU	5	20	(+9/-1)	32	(0/-19)	45	(±0.3)
25	LMEF 25	LMEF 25 UU	6	25	(+11/-1)	40	(0/-19)	58	(±0.3)
30	LMEF 30	LMEF 30 UU	6	30	(+11/-1)	47	(0/-19)	68	(±0.3)
40	LMEF 40	LMEF 40 UU	6	40	(+13/-2)	62	(0/-22)	80	(±0.3)
50	LMEF 50	LMEF 50 UU	6	50	(+13/-2)	75	(0/-22)	100	(±0.3)
60	LMEF 60	LMEF 60 UU	6	60	(+13/-2)	90	(0/-25)	125	(±0.3)

	Technical supplement		
	Cages	Precision	Grease
Steel -	X		
Polymid -	✓	PO	Nil
Brass -	X		

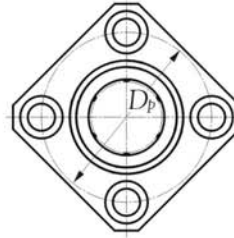
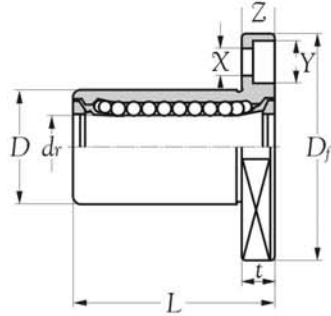
Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Linear Ball Bearings series LME..F




D_f	Principa dimensions flange			Roundness 0.001mm	Squareness 0.001mm	Load ratings		Mass kg(s). (approx.)
	t	D_p	$X \times Y \times Z$			dynamic C	static C_o	
	mm					N		
32	5	24	3.5 x 6.0 x 3.1	12	12	265	402	0.041
42	6	32	4.5 x 7.5 x 4.1	12	12	510	784	0.080
46	6	36	4.5 x 7.5 x 4.1	12	12	578	892	0.103
54	8	43	5.5 x 9.0 x 5.1	15	15	862	1370	0.182
62	8	51	5.5 x 9.0 x 5.1	15	15	980	1570	0.335
76	10	62	6.6 x 11 x 6.1	15	15	1570	2740	0.560
98	13	80	9.0 x 14 x 8.1	17	17	2160	4020	1.175
112	13	94	9.0 x 14 x 8.1	17	17	3820	7940	1.745
134	18	112	11 x 17 x 11.1	20	20	4700	9800	3.220

Linear Ball Bearings series LME..K

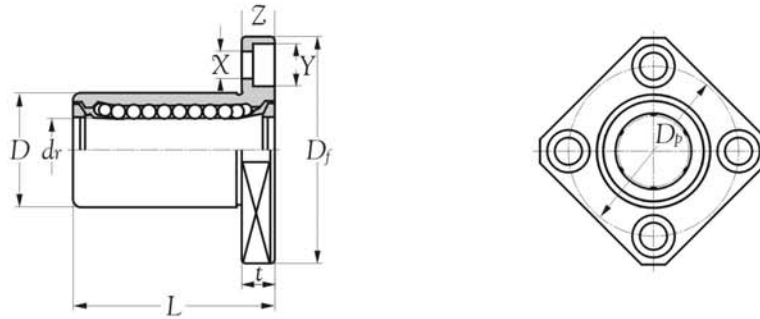


Boundary dimensions <i>d</i> mm	Bearing number		Number of ball tracks	Principal dimensions					
	standard resin retainer	with seals resin retainer		<i>d_r</i>		<i>D</i>		<i>L</i>	
				tolerance mm	0.001mm	tolerance mm	0.001mm	tolerance mm	mm
8	LMEK 8	LMEK 8 UU	4	8	(+8/0)	16	(0/-13)	25	(±0.3)
12	LMEK 12	LMEK 12 UU	4	12	(+8/0)	22	(0/-16)	32	(±0.3)
16	LMEK 16	LMEK 16 UU	5	16	(+9/-1)	26	(0/-16)	36	(±0.3)
20	LMEK 20	LMEK 20 UU	5	20	(+9/-1)	32	(0/-19)	45	(±0.3)
25	LMEK 25	LMEK 25 UU	6	25	(+11/-1)	40	(0/-19)	58	(±0.3)
30	LMEK 30	LMEK 30 UU	6	30	(+11/-1)	47	(0/-19)	68	(±0.3)
40	LMEK 40	LMEK 40 UU	6	40	(+13/-2)	62	(0/-22)	80	(±0.3)
50	LMEK 50	LMEK 50 UU	6	50	(+13/-2)	75	(0/-22)	100	(±0.3)
60	LMEK 60	LMEK 60 UU	6	60	(+13/-2)	90	(0/-25)	125	(±0.3)

	Technical supplement		
	Cages	Precision	Grease
Steel -	X		
Polymid -	✓	PO	Nil
Brass -	X		

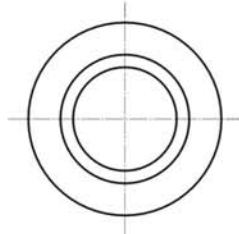
Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Linear Ball Bearings series LME..K

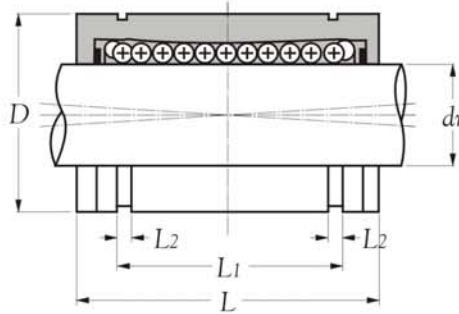


D_f	Principa dimensions flange			Roundness 0.001mm	Squareness 0.001mm	Load ratings		Mass kg(s). (approx.)
	t	D_p	$X \times Y \times Z$			dynamic C	static C_o	
	mm					N		
32	5	24	3.5 x 6.0 x 3.1	12	12	265	402	0.041
42	6	32	4.5 x 7.5 x 4.1	12	12	510	784	0.080
46	6	36	4.5 x 7.5 x 4.1	12	12	578	892	0.103
54	8	43	5.5 x 9.0 x 5.1	15	15	862	1370	0.182
62	8	51	5.5 x 9.0 x 5.1	15	15	980	1570	0.335
76	10	62	6.6 x 11 x 6.1	15	15	1570	2740	0.560
98	13	80	9.0 x 14 x 8.1	17	17	2160	4020	1.175
112	13	94	9.0 x 14 x 8.1	17	17	3820	7940	1.745
134	18	112	11.0 x 17 x 11.1	20	20	4700	9800	3.220


Linear Ball Bearings series LMES



LMES..close, UU

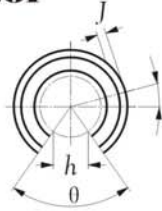


Boundary dimensions <i>d</i> mm	Bearing number		Number of ball tracks	Principal dimensions						Load ratings		Mass kg. (approx.)
				<i>dr</i> tolerance mm 0.001mm	<i>D</i> ±0.1	<i>L</i> ±0.2	<i>L</i> ₁ ±0.2	<i>L</i> ₂ min.	dynamic C	static C ₀ N		
10	LMES 10	LMES 10 UU	5	10	+8 ~ 0	19	29	21.7	1.35	750	550	0.017
12	LMES 12	LMES 12 UU	5	12	+8 ~ 0	22	32	22.7	1.35	1230	1100	0.023
16	LMES 16	LMES 16 UU	5	16	+9 ~ 1	26	36	24.7	1.35	1550	1250	0.028
20	LMES 20	LMES 20 UU	6	20	+9 ~ 1	32	45	31.3	1.65	2580	1670	0.061
25	LMES 25	LMES 25 UU	6	25	+11 ~ 1	40	58	43.8	1.90	3800	2750	0.122
30	LMES 30	LMES 30 UU	6	30	+11 ~ 1	47	68	51.8	1.90	4710	2800	0.185
40	LMES 40	LMES 40 UU	6	40	+13 ~ 2	62	80	60.4	2.20	6500	5720	0.360
50	LMES 50	LMES 50 UU	6	50	+13 ~ 2	75	100	77.4	2.70	11460	7940	0.580

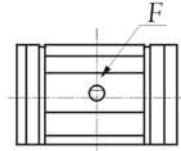
	Technical supplement		
	Cages	Precision	Grease
Steel -	X		
Polymid -	✓	PO	Nil
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

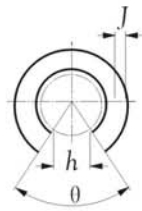
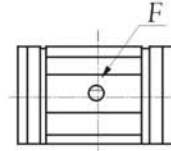
Linear Ball Bearings series LMES..OP



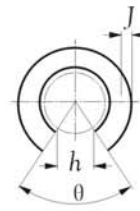
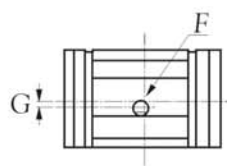
LMES 12 OP



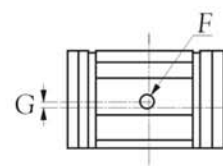
LMES 16 OP, LMES 20 OP




LMES 25 OP



LMES 30 OP, LMES 40 OP, LMES 50 OP



Boundary dimensions <i>d</i> mm	Bearing number		Number of ball tracks	Principal dimensions								Load ratings		Mass kg. (approx.)
	<i>D</i> ±0.1	<i>L</i> ±0.2		<i>L</i> ₂	<i>h</i>	θ°	<i>F</i>	<i>G</i>	<i>J</i>	dynamic <i>C</i>	static <i>C</i> ₀			
	mm													N
12	LMES 12OP	LMES 12UUOP	4	22	32	1.35	6.5	66	3.0	-	0.7	1290	1260	0.018
16	LMES 16OP	LMES 16UUOP	4	26	36	1.35	9.0	68	3.0	-	0.7	1640	1320	0.022
20	LMES 20OP	LMES 20UUOP	5	32	45	1.65	9.0	55	3.0	-	0.9	2630	1720	0.051
25	LMES 25OP	LMES 25UUOP	5	40	58	1.90	11.5	57	3.0	1.5	1.4	3910	2850	0.102
30	LMES 30OP	LMES 30UUOP	5	47	68	1.90	14.0	57	3.0	2.0	2.2	4850	2900	0.155
40	LMES 40OP	LMES 40UUOP	5	62	80	2.20	19.5	56	3.0	1.5	2.7	6700	5900	0.300
50	LMES 50OP	LMES 50UUOP	5	75	100	2.70	22.5	54	3.0	2.5	2.3	11700	8100	0.480

	Technical supplement		
	Cages	Precision	Grease
Steel -	X		
Polymid -	✓	PO	Nil
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Linear Ball Bearings series KH

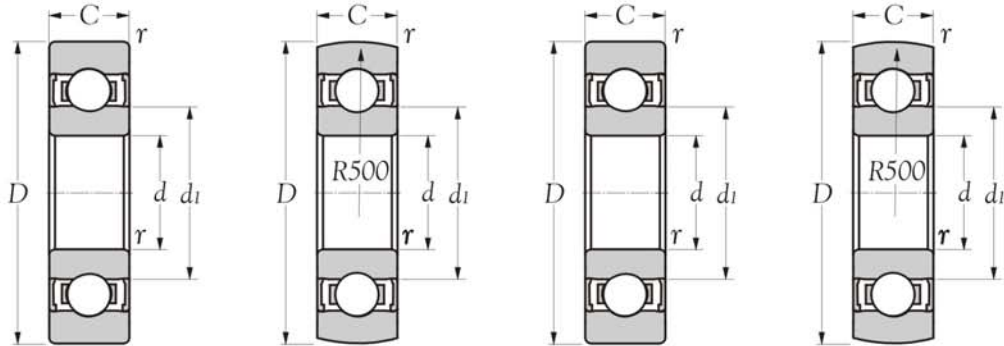


Boundary dimensions <i>d</i> mm	Bearing number	Number of ball tracks	Principal dimensions		Basic load ratings		Max runout speed		Mass kg. (approx.)
			<i>D</i> mm	<i>C</i> mm	dynamic <i>C</i> N	static <i>C₀</i> N	grease r/min	oil r/min	
6	KH 0622	4	12	22	400	239	41	24	0.0070
6	KH 0622 PP	4	12	22	400	239	41	24	0.0070
8	KH 0824	4	15	24	435	280	44	29	0.0120
8	KH 0824 PP	4	15	24	435	280	44	29	0.0120
10	KH 1026	4	17	26	500	370	51	38	0.0145
10	KH 1026 PP	4	17	26	500	370	51	38	0.0145
12	KH 1228	5	19	28	620	510	63	52	0.0185
12	KH 1228 PP	5	19	28	620	510	63	52	0.0185
14	KH 1428	5	21	28	620	520	63	53	0.0205
14	KH 1428 PP	5	21	28	620	520	63	53	0.0205
16	KH 1630	5	24	30	800	620	82	63	0.0275
16	KH 1630 PP	5	24	30	800	620	82	63	0.0275
20	KH 2030	6	28	30	950	790	97	81	0.0325
20	KH 2030 PP	6	28	30	950	790	97	81	0.0325
25	KH 2540	6	35	40	1990	1670	203	170	0.0660
25	KH 2540 PP	6	35	40	1990	1670	203	170	0.0660
30	KH 3050	7	40	50	2800	2700	285	275	0.0950
30	KH 3050 PP	7	40	50	2800	2700	285	275	0.0950
40	KH 4060	8	52	60	4400	4450	449	454	0.1820
40	KH 4060 PP	8	52	60	4400	4450	449	454	0.1820
50	KH 5070	9	62	70	5500	6300	561	642	0.2520
50	KH 5070 PP	9	62	70	5500	6300	561	642	0.2520

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>		
Polymid - <input checked="" type="checkbox"/>	INA Standard	Shell Alvania S2
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Track Roller Bearings Double Row series LR 2



Type LR 2..X-2RSR
(Contact, double seals)

Type LR 2..2RSR
(Contact, double seals)

Type LR 2..X-2RS
(Light-contact, double seals)


Type LR 2..2RS
(Light-contact, double seals)

Boundary dimensions					Basic load ratings		Limiting speeds		Bearing number		Mass kg (approx.)
<i>d</i>	<i>D</i>	<i>C</i>	<i>r_s</i>	<i>d₁</i>	dynamic <i>N</i>	static <i>C₀</i>	grease rpm	oil			
10	32	9	0.6	15.4	4200	2050	13000	-	LR 200 X-2RS	LR 200 2RS	0.05
12	35	10	0.6	17.1	5500	2600	15000	-	LR 201 X-2RSR	LR 201 2RSR	0.05
15	40	11	0.6	20.0	6700	3150	14000	-	LR 202 X-2RSR	LR 202 2RSR	0.07
17	47	12	0.6	22.5	9100	4200	11000	-	LR 203 X-2RSR	LR 203 2RSR	0.11
20	52	14	1.0	26.5	11800	5400	10000	-	LR 204 X-2RSR	LR 204 2RSR	0.15
25	62	15	1.0	30.3	14900	6800	9000	-	LR 205 X-2RSR	LR 205 2RSR	0.23
30	72	16	1.0	37.4	20800	9200	5500	-	LR 206 X-2RS	LR 206 2RS	0.33
35	80	17	1.1	42.4	26100	11400	4500	-	LR 207 X-2RS	LR 207 2RS	0.40
45	90	19	1.1	53.2	30300	13100	3600	-	LR 209 X-2RS	LR 209 2RS	0.45

Note: 1) X: Cylindrical outside surface.

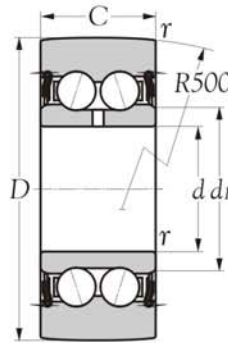
2) 2RS: Lip seals on both sides, giving axial sealing action.

3) 2RSR: Lip seals on both sides, giving radial sealing action.

	Technical supplement		
	Cages	Precision	Grease
Steel -	✓		
Polymid -	X	Class 0 (JIS)	Shell Alvania S2
Brass -	X		


Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Track Roller Bearings Double Row series LR 50



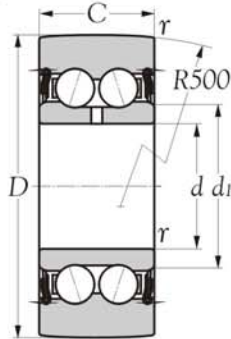
Type LR 50..2RS
(Light-contact, double seals)

Boundary dimensions					Basic load ratings		Limiting speeds		Bearing number	Mass kg (approx.)
d	D	C	rs	di	dynamic N	static Co	grease rpm	oil		
5	17	7	0.2	8.2	1960	940	12000	-	LR 50/5 2RSR	0.01
6	19	9	0.3	9.3	2700	1370	11000	-	LR 50/6 2RSR	0.02
7	22	10	0.3	10.5	3300	1700	10000	-	LR 50/7 2RSR	0.02
8	24	11	0.3	10.5	4300	2390	10000	-	LR 50/8 2RSR	0.03
10	28	12	0.3	13.5	4750	2850	9000	-	LR 5000 2RS	0.03
12	30	12	0.3	15.5	5100	3100	8500	-	LR 5001 2RS	0.03
15	35	13	0.3	20.4	6500	4150	7000	-	LR 5002 2RS	0.05
17	40	14	0.3	21.6	7800	5300	6000	-	LR 5003 2RS	0.07
20	47	16	0.6	25.2	11700	7700	5500	-	LR 5004 2RS	0.12
25	52	16	0.6	29.8	11800	8200	4700	-	LR 5005 2RS	0.15
30	62	19	1.0	35.5	16100	11900	4000	-	LR 5006 2RS	0.25
35	68	20	1.0	41.7	17800	13300	4300	-	LR 5007 2RS	0.30

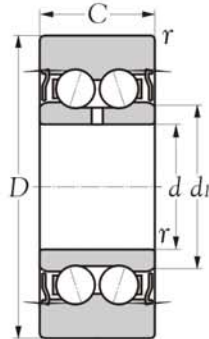
	Technical supplement		
	Cages	Precision	Grease
Steel -	X		
Polymid -	✓	Class 0 (JIS)	Shell Alvania S2
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

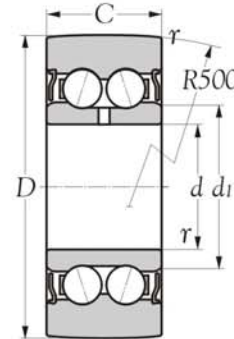
Track Roller Bearings Double Row series LR 52



Type LR 52..2RS
(Light-contact, double seals)




Type LR 52..X-2Z
(Double shields)



Type LR 52..ZZ
(Double shields)

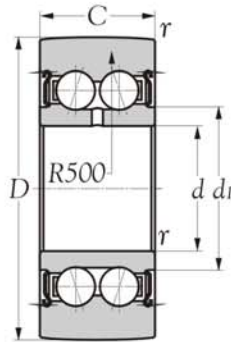
Boundary dimensions					Basic load ratings		Limiting speeds		Bearing number	Mass kg (approx.)
<i>d</i>	<i>D</i>	mm		dynamic	static	grease	oil			
		<i>C</i>	<i>r_s</i>	<i>d₁</i>	<i>C</i>	<i>C₀</i>	rpm			
10	32	14.0	0.6	15.4	6800	4100	8000	-	LR 5200 2RS -	0.07
12	35	15.9	0.6	17.1	8700	5200	7500	-	LR 5201 2RS -	0.08
15	40	15.9	0.6	20.0	10000	6300	7000	-	LR 5202 2RS -	0.11
17	47	17.5	0.6	22.5	12800	8400	5500	-	LR 5203 2RS -	0.17
20	52	20.6	1.0	26.5	16100	10700	5000	-	LR 5204 2RS -	0.23
25	62	20.6	1.0	30.3	18800	13200	4500	-	LR 5205 2RS -	0.34
30	72	23.8	1.0	37.4	25000	18000	3500	-	LR 5206 2RS -	0.51
35	80	27.0	1.1	42.4	31000	22800	2800	-	LR 5207 2RS -	0.66
40	85	30.2	1.1	48.4	35000	26000	2500	-	LR 5208 2RS -	0.75
10	32	14.0	0.6	15.4	6800	4100	11000	-	LR 5200 X-ZZ LR 5200 ZZ	0.07
12	35	15.9	0.6	17.1	8700	5200	10000	-	LR 5201 X-ZZ LR 5201 ZZ	0.08
15	40	15.9	0.6	20.0	10000	6300	10000	-	LR 5202 X-ZZ LR 5202 ZZ	0.11
17	47	17.5	0.6	22.5	12800	8400	7500	-	LR 5203 X-ZZ LR 5203 ZZ	0.17
20	52	20.6	1.0	26.5	16100	10700	7000	-	LR 5204 X-ZZ LR 5204 ZZ	0.23
25	62	20.6	1.0	30.3	18800	13200	6500	-	LR 5205 X-ZZ LR 5205 ZZ	0.34
30	72	23.8	1.0	37.4	25000	18000	5000	-	LR 5206 X-ZZ LR 5206 ZZ	0.51
35	80	27.0	1.1	42.4	31000	22800	3900	-	LR 5207 X-ZZ LR 5207 ZZ	0.66
40	85	30.2	1.1	48.4	35000	26000	3500	-	LR 5208 X-ZZ LR 5208 ZZ	0.75

Note: 1) X: Cylindrical outside surface.
 2) 2RS: Lip seals on both sides, giving axial sealing action.
 3) ZZ: Sealing shields on both sides

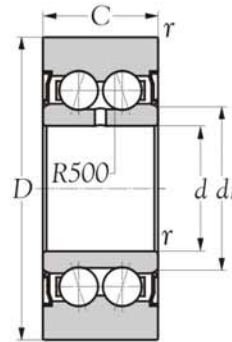
	Technical supplement		
	Cages	Precision	Grease
Steel -	X		
Polymid -	✓	Class 0 (JIS)	Shell Alvania S2
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
 KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Track Roller Bearings Double Row series LR 53




Type LR 53..2RS
(Light-contact, double seals)



Type LR 53..2Z
(Double shields)

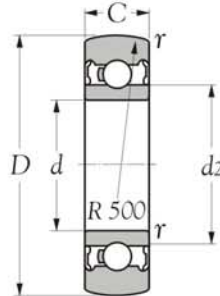
Boundary dimensions					Basic load ratings		Limiting speeds		Bearing number	Mass kg (approx.)
d	D	C	rs	di	dynamic N	static Co	grease rpm	oil rpm		
17	52	22.2	1.0	23.5	17500	11300	4700	-	LR 5303 2RS	0.21
20	62	22.2	1.1	29.0	21500	14800	4500	-	LR 5304 2RS	0.34
25	72	25.4	1.1	34.4	28000	19900	3900	-	LR 5305 2RS	0.50
30	80	30.2	1.1	41.4	35500	25500	3100	-	LR 5306 2RS	0.67
35	90	34.9	1.5	47.7	44000	32500	2500	-	LR 5307 2RS	0.97
40	100	36.5	1.5	52.4	54000	40500	2300	-	LR 5308 2RS	1.20
25	72	25.4	1.1	34.4	28000	19900	5500	-	LR 5305 ZZ	0.50
30	80	30.2	1.1	41.4	35500	25500	4300	-	LR 5306 ZZ	0.67
35	90	34.9	1.5	47.7	44000	32500	3600	-	LR 5307 ZZ	0.97
40	100	36.5	1.5	52.4	54000	40500	3300	-	LR 5308 ZZ	1.20

Note: 1) 2RS: Lip seals on both sides, giving axial sealing action.
2) 2Z: Sealing shields on both sides.


	Technical supplement		
	Cages	Precision	Grease
Steel -	X		
Polymid -	✓	Class 0 (JIS)	Shell Alvania S2
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Track Roller Bearings Double Row series LR 60..2RSR

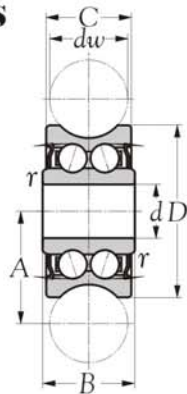


Boundary dimensions						Basic load ratings		Limiting speeds		Bearing number	Mass kg (approx.)
<i>d</i>	<i>D</i>	<i>C</i>	<i>r_s</i>	<i>d₁</i>	<i>B</i>	dynamic N	static <i>C₀</i>	grease rpm	oil		
6	19	6	0.3			1840	790	22000	-	LR 606 2RSR	0.01
7	22	6	0.3			2120	880	20000	-	LR 607 2RSR	0.01
8	24	7	0.3			2750	1240	19000	-	LR 608 2RSR	0.02
10	28	8	0.3			4550	2500	16000	-	LR 6000 2RSR	0.02
12	30	8	0.3			4750	2800	15000	-	LR 6001 2RSR	0.03

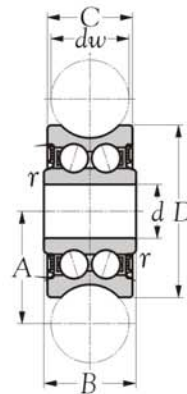
	Technical supplement		
	Cages	Precision	Grease
Steel -	X		
Polymid -	✓	Class 0 (JIS)	Shell Alvania S2
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Track Roller Bearings Double Row series LFR 53..2Z, 2RS



Type LFR..2Z
(Double shields)




Type LFR..2RS
(Light-contact, double seals)

Boundary dimensions							Basic load ratings		Limiting speeds		Bearing numbers		Mass kg (approx.)
mm							dynamic	static	grease	oil			
d	dw	D	C	B	A	rs	C	Co	rpm				
5	4	16	7.0	8.0	9.00	0.2	1200	860	1300	1780	LFR 50/5-4 ZZ	LFR 50/5-4 2RS	0.009
5	6	17	7.0	8.0	10.50	0.2	1270	820	1300	1780	LFR 50/5-6 ZZ	LFR 50/5-6 2RS	0.010
8	6	24	11.0	11.0	14.00	0.3	3670	2280	1300	4560	LFR 50/8-6 ZZ	LFR 50/8-6 2RS	0.020
12	10	35	15.9	15.9	20.65	0.3	8500	5100	5100	10200	LFR 5201-10 ZZ	LFR 5201-10 2RS	0.080
12	10	42	19.0	19.0	24.00	0.6	13000	7700	7500	14200	LFR 5301-10 ZZ	LFR 5301-10 2RS	0.100
15	10	47	19.0	19.0	26.65	1.0	16200	9200	6200	18400	LFR 5302-10 ZZ	LFR 5302-10 2RS	0.170
12	12	35	15.9	15.9	21.75	0.3	8400	5000	5100	10000	LFR 5201-12 ZZ	LFR 5201-12 2RS	0.085
20	16	52	20.6	22.6	31.50	0.6	16800	9500	12100	16600	LFR 5204-16 ZZ	LFR 5204-16 2RS	0.230
25	20	72	23.8	25.8	41.00	0.6	29500	16600	20700	33200	LFR 5206-20 ZZ	LFR 5206-20 2RS	0.250
25	25	72	23.8	25.8	43.50	0.6	29200	16400	23100	32800	LFR 5206-25 ZZ	LFR 5206-25 2RS	0.250
30	30	80	27.0	29.0	51.00	1.0	38000	20800	21400	36200	LFR 5207-30 ZZ	LFR 5207-30 2RS	0.660
40	40	98	36.0	38.0	62.50	1.0	54800	29000	55000	58000	LFR 5208-40 ZZ	LFR 5208-40 2RS	1.360
40	50	110	44.0	46.0	72.50	1.1	53000	39500	69000	79000	LFR 5308-50 ZZ	LFR 5308-50 2RS	1.400

Note: * Standard with lubrication hole on inner ring

1) 2Z: Sealing shields on both sides.

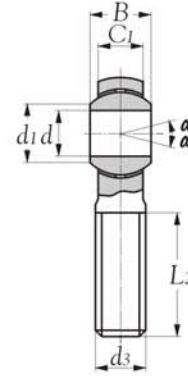
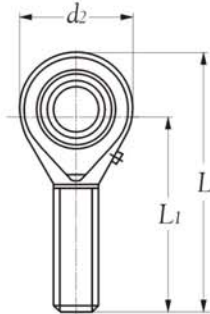
2) 2RS: Lip seals on both sides, giving axial sealing action.

	Technical supplement		
	Cages	Precision	Grease
Steel -	X		
Polymid -	✓	Class 0 (JIS)	Shell Alvania S2
Brass -	X		

Remark: If you have more inquiry of technical, please inquire

KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

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




Boundary dimensions			Nominal dimensions							α°	Load ratings		Bearing numbers	Mass kg (approx.)
d	d ₂	B	C ₁	d ₃	L ₁	L ₂	L	d ₁	dynamic N		static			
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.

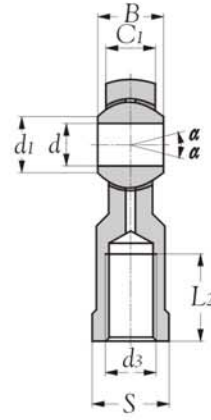
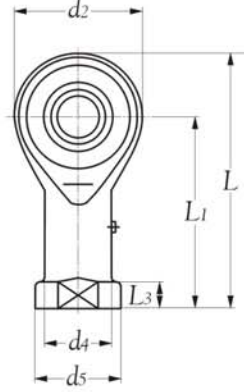
2) We could supply the above models in two sorts, one is produced by forging, the another by machining. So, please let us know which of them is what you needed before you ordering.

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

	Technical supplement		
	Cages	Precision	Grease
Steel -	X		
Polymid -	X	Nil	Nil
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

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



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	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.

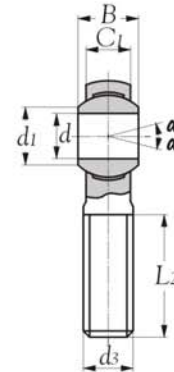
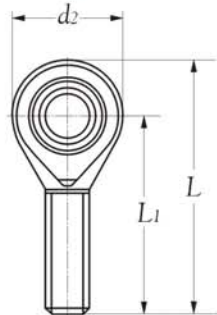
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3) We supply this series of rod end bearings strictly in accordance with the above specifications, any changes are on special order.

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>		
Polymid - <input checked="" type="checkbox"/>	Nil	Nil
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)


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



Boundary dimensions			Nominal dimensions							$\alpha \approx$	Load ratings		Bearing numbers	Mass kg (approx.)
d	d ₂	B	C ₁	d ₃	L ₁	L ₂	L	d ₁	dynamic N		static			
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	

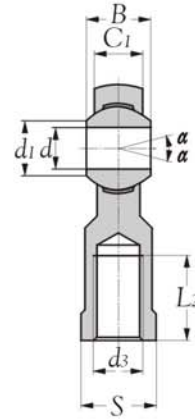
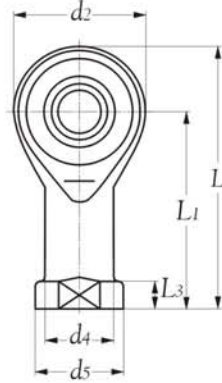
Note: 1) Suffix "L" means with left hand thread.

- 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.

	Technical supplement		
	Cages	Precision	Grease
Steel -	X		
Polymid -	X	Nil	Nil
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

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




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	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.

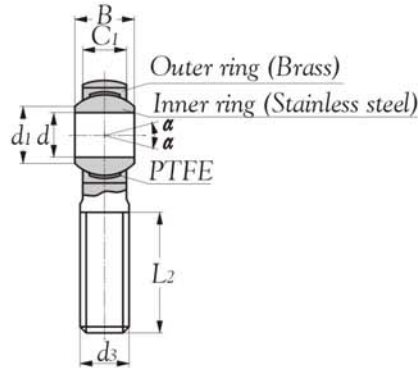
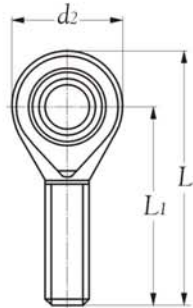
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3) We supply this series of rod end bearings strictly in accordance with the above specifications, any changes are on special order.

	Technical supplement		
	Cages	Precision	Grease
Steel -	<input checked="" type="checkbox"/>		
Polymid -	<input checked="" type="checkbox"/>	Nil	Nil
Brass -	<input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)


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

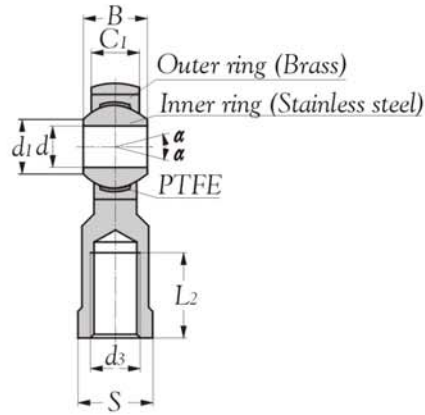
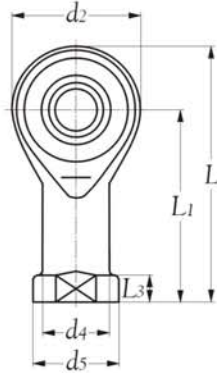
Note: 1) Suffix "L" means with left hand thread.

- 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.

	Technical supplement		
	Cages	Precision	Grease
Steel -	X		
Polymid -	X	Nil	Nil
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

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.

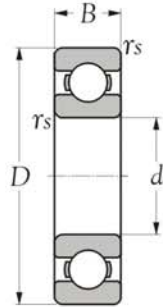
2) We could supply the above models in two sorts, one is produced by forging, the another by machining. So, please let us know which of them is what you needed before you ordering.

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

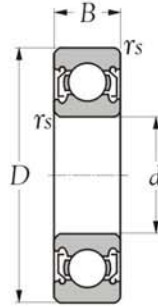
Technical supplement			
	Cages	Precision	Grease
	Steel - <input checked="" type="checkbox"/>		
	Polymid - <input checked="" type="checkbox"/>	Nil	Nil
	Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

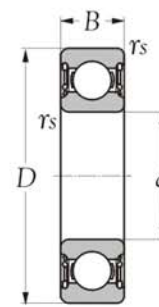
Stainless Steel Ball Bearings series SS 60..



Shielded type
(Open)



Shielded type
(ZZ)



Sealed type
(2RS)

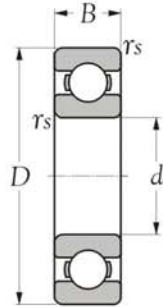
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers			Abutment and fillet dimensions			Mass
mm				dynamic	static	grease	oil				mm			kg
d	D	B	r _s min ¹⁾	C _r	C _{0r}	rpm	rpm				D _s mm	d _h max	R max	(approx.)
7	19	6	0.3	2240	910	39000	33000	SS 607	SS 607 ZZ	SS 607 2RS	9	17	0.3	0.008
8	22	7	0.3	3350	1400	36000	31000	SS 608	SS 608 ZZ	SS 608 2RS	10	20	0.3	0.012
9	24	7	0.3	3400	1450	33000	29000	SS 609	SS 609 ZZ	SS 609 2RS	11	22	0.3	0.014
10	26	8	0.3	4580	1980	28000	20000	SS 6000	SS 6000 ZZ	SS 6000 2RS	12	24	0.3	0.019
12	28	8	0.3	5100	2380	26000	19000	SS 6001	SS 6001 ZZ	SS 6001 2RS	14	26	0.3	0.022
15	32	9	0.3	5600	2840	24000	18000	SS 6002	SS 6002 ZZ	SS 6002 2RS	17	30	0.3	0.031
17	35	10	0.3	6800	3350	22000	17000	SS 6003	SS 6003 ZZ	SS 6003 2RS	19	33	0.3	0.040
20	42	12	0.6	9400	5050	19000	15000	SS 6004	SS 6004 ZZ	SS 6004 2RS	24	38	0.6	0.071
25	47	12	0.6	10100	5850	17000	13000	SS 6005	SS 6005 ZZ	SS 6005 2RS	29	43	0.6	0.084
30	55	13	1.0	13200	8300	14000	10000	SS 6006	SS 6006 ZZ	SS 6006 2RS	35	50	1.0	0.110
35	62	14	1.0	16000	10300	12000	9000	SS 6007	SS 6007 ZZ	SS 6007 2RS	40	57	1.0	0.162
40	68	15	1.0	16800	11500	11000	8500	SS 6008	SS 6008 ZZ	SS 6008 2RS	45	63	1.0	0.199
45	75	16	1.0	21000	15100	10000	8000	SS 6009	SS 6009 ZZ	SS 6009 2RS	50	70	1.0	0.230
50	80	16	1.0	21800	16600	9000	7000	SS 6010	SS 6010 ZZ	SS 6010 2RS	55	75	1.0	0.272
55	90	18	1.1	28300	21200	7700	8300	SS 6011	SS 6011 ZZ	SS 6011 2RS	62	83	1.0	0.388
60	95	18	1.1	29500	23200	7000	8300	SS 6012	SS 6012 ZZ	SS 6012 2RS	67	88	1.0	0.414
65	100	18	1.1	30500	25200	6500	7700	SS 6013	SS 6013 ZZ	SS 6013 2RS	72	93	1.0	0.421
70	110	20	1.1	38000	31000	6100	7100	SS 6014	SS 6014 ZZ	SS 6014 2RS	77	103	1.0	0.604
75	115	20	1.1	39500	33500	5700	6700	SS 6015	SS 6015 ZZ	SS 6015 2RS	82	108	1.0	0.649

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

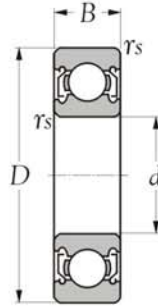
Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

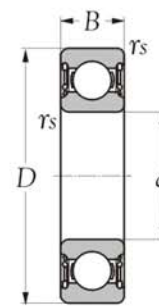
Stainless Steel Ball Bearings series SS 62..



Shielded type
(Open)



Shielded type
(ZZ)



Sealed type
(2RS)

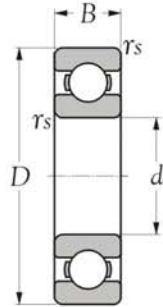
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers			Abutment and fillet dimensions			Mass
mm				dynamic	static	grease	oil				mm			kg
d	D	B	$r_s \text{ min}^{\text{①}}$	C_r	C_{or}	rpm	rpm				D_s mm	d_h max	R max	(approx.)
6	19	6	0.3	2340	885	39000	33000	SS 626	SS 626 ZZ	SS 626 2RS	8.0	17.0	0.3	0.008
7	22	7	0.3	3350	1400	36000	31000	SS 627	SS 627 ZZ	SS 627 2RS	9.0	20.0	0.3	0.014
9	26	8	0.3	4550	1960	31000	27000	SS 629	SS 629 ZZ	SS 629 2RS	11.0	24.0	0.3	0.019
10	30	9	0.6	5100	2380	26000	19000	SS 6200	SS 6200 ZZ	SS 6200 2RS	14.0	26.0	0.6	0.032
12	32	10	0.6	6100	2750	24000	18000	SS 6201	SS 6201 ZZ	SS 6201 2RS	16.0	28.0	0.6	0.035
15	35	11	0.6	7750	3600	22000	17000	SS 6202	SS 6202 ZZ	SS 6202 2RS	19.0	31.0	0.6	0.045
17	40	12	0.6	9600	4600	20000	16000	SS 6203	SS 6203 ZZ	SS 6203 2RS	21.0	36.0	0.6	0.064
20	47	14	1.0	12800	6650	18000	14000	SS 6204	SS 6204 ZZ	SS 6204 2RS	24.0	42.0	1.0	0.103
25	52	15	1.0	14000	7880	16000	12000	SS 6205	SS 6205 ZZ	SS 6205 2RS	30.0	47.0	1.0	0.127
30	62	16	1.0	19500	11500	13000	9500	SS 6206	SS 6206 ZZ	SS 6206 2RS	35.0	57.0	1.0	0.200
35	72	17	1.1	25500	15200	11000	8500	SS 6207	SS 6207 ZZ	SS 6207 2RS	41.5	65.5	1.0	0.298
40	80	18	1.1	29100	17800	10000	8000	SS 6208	SS 6208 ZZ	SS 6208 2RS	46.5	73.5	1.0	0.368
45	85	19	1.1	32500	20400	9000	7000	SS 6209	SS 6209 ZZ	SS 6209 2RS	51.5	78.5	1.0	0.416
50	90	20	1.1	35000	23200	8500	6700	SS 6210	SS 6210 ZZ	SS 6210 2RS	56.5	83.5	1.0	0.463
55	100	21	1.5	43500	29200	6400	7600	SS 6211	SS 6211 ZZ	SS 6211 2RS	63.0	92.0	1.5	0.601
60	110	22	1.5	52500	36000	6000	7000	SS 6212	SS 6212 ZZ	SS 6212 2RS	68.0	102.0	1.5	0.783

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

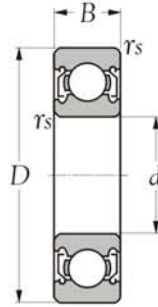
Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

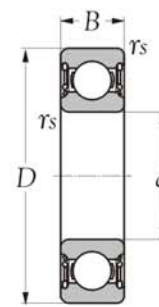
Stainless Steel Ball Bearings series SS 63..



Shielded type
(Open)




Shielded type
(ZZ)



Sealed type
(2RS)

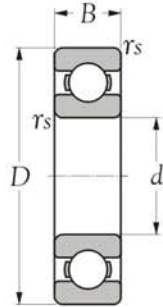
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers			Abutment and fillet dimensions			Mass
mm				dynamic	static	grease	oil				mm			kg
d	D	B	$r_s \text{ min}^1$	C_r	C_{or}	rpm	rpm				D_s	d_h	R	(approx.)
											mm	max	max	
10	35	11	0.6	8200	3500	23000	27000	SS 6300	SS 6300 ZZ	SS 6300 2RS	14.0	31.0	0.6	0.053
12	37	12	1.0	9700	4200	20000	24000	SS 6301	SS 6301 ZZ	SS 6301 2RS	18.0	31.0	1.0	0.060
15	42	13	1.0	11400	5450	17000	21000	SS 6302	SS 6302 ZZ	SS 6302 2RS	21.0	36.0	1.0	0.082
17	47	14	1.0	13500	6550	16000	19000	SS 6303	SS 6303 ZZ	SS 6303 2RS	23.0	41.0	1.0	0.115
20	52	15	1.0	15900	7900	14000	17000	SS 6304	SS 6304 ZZ	SS 6304 2RS	27.0	45.0	1.0	0.144
25	62	17	1.0	21200	10900	12000	14000	SS 6305	SS 6305 ZZ	SS 6305 2RS	32.0	55.0	1.0	0.232
30	72	19	1.0	26700	15000	10000	12000	SS 6306	SS 6306 ZZ	SS 6306 2RS	37.0	65.0	1.0	0.360
35	80	21	1.5	33500	19100	8800	10000	SS 6307	SS 6307 ZZ	SS 6307 2RS	43.5	71.5	1.5	0.457
40	90	23	1.5	40500	24000	7800	9200	SS 6308	SS 6308 ZZ	SS 6308 2RS	48.5	81.5	1.5	0.630
45	100	25	1.5	53000	32000	7000	8200	SS 6309	SS 6309 ZZ	SS 6309 2RS	53.5	91.5	1.5	0.814
50	110	27	2.0	62000	38500	6400	7500	SS 6310	SS 6310 ZZ	SS 6310 2RS	60.0	100.0	2.0	1.070

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

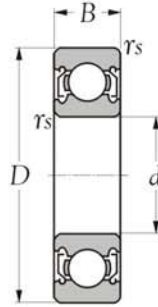
	Technical supplement		
	Cages	Precision	Grease
Steel -	✓		
Polymid -	X	Class 0 (JIS)	Shell Alvania S2
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

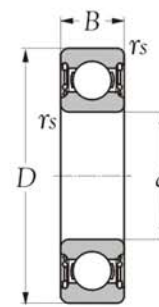
Stainless Steel Ball Bearings series SS 68..



Shielded type
(Open)



Shielded type
(ZZ)



Sealed type
(2RS)

Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers			Abutment and fillet dimensions			Mass
mm				dynamic	static	grease	oil				mm			kg
d	D	B	$r_s \text{ min}^{\text{①}}$	C_r	C_{or}	rpm	rpm				D_s	d_h	R	(approx.)
											mm	max	max	
10	19	5	0.3	1830	925	32000	38000	SS 6800	SS 6800 ZZ	SS 6800 2RS	12	17	0.3	0.005
12	21	5	0.3	1920	1040	29000	35000	SS 6801	SS 6801 ZZ	SS 6801 2RS	14	19	0.3	0.006
15	24	5	0.3	2080	1260	26000	31000	SS 6802	SS 6802 ZZ	SS 6802 2RS	17	22	0.3	0.007
17	26	5	0.3	2810	1720	24000	28000	SS 6803	SS 6803 ZZ	SS 6803 2RS	19	24	0.3	0.008
20	32	7	0.3	4000	2470	21000	25000	SS 6804	SS 6804 ZZ	SS 6804 2RS	22	30	0.3	0.019
25	37	7	0.3	4300	2950	18000	21000	SS 6805	SS 6805 ZZ	SS 6805 2RS	27	35	0.3	0.022
30	42	7	0.3	4700	3650	15000	18000	SS 6806	SS 6806 ZZ	SS 6806 2RS	32	40	0.3	0.026
35	47	7	0.3	4900	4050	13000	16000	SS 6807	SS 6807 ZZ	SS 6807 2RS	37	45	0.3	0.029
40	52	7	0.3	5100	4400	12000	14000	SS 6808	SS 6808 ZZ	SS 6808 2RS	42	50	0.3	0.033
45	58	7	0.3	6400	5650	11000	12000	SS 6809	SS 6809 ZZ	SS 6809 2RS	47	56	0.3	0.040
50	65	7	0.3	6600	6100	9600	11000	SS 6810	SS 6810 ZZ	SS 6810 2RS	52	63	0.3	0.052
55	72	9	0.3	8800	8100	8700	10000	SS 6811	SS 6811 ZZ	SS 6811 2RS	57	70	0.3	0.083
60	78	10	0.3	11500	10600	8000	9400	SS 6812	SS 6812 ZZ	SS 6812 2RS	62	76	0.3	0.106
65	85	10	0.6	11600	11000	7400	8700	SS 6813	SS 6813 ZZ	SS 6813 2RS	69	81	0.6	0.128
70	90	10	0.6	12100	11900	6900	8100	SS 6814	SS 6814 ZZ	SS 6814 2RS	74	86	0.6	0.137
75	95	10	0.6	12500	12900	6400	7600	SS 6815	SS 6815 ZZ	SS 6815 2RS	79	91	0.6	0.145
80	100	10	0.6	12700	13300	6000	7100	SS 6816	SS 6816 ZZ	SS 6816 2RS	84	96	0.6	0.154

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

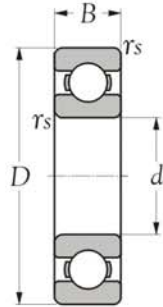


Technical supplement

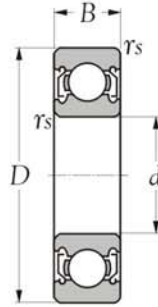
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

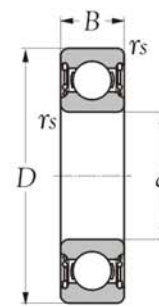
Stainless Steel Ball Bearings series SS 69..



Shielded type
(Open)




Shielded type
(ZZ)



Sealed type
(2RS)

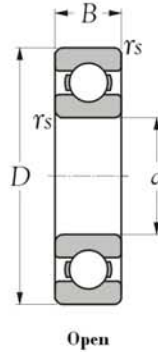
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers			Abutment and fillet dimensions			Mass
mm				dynamic	static	grease	oil				mm			kg
d	D	B	$r_s \text{ min}^{\text{①}}$	C_r	C_{or}	rpm	rpm				D_s mm	d_h max	R max	(approx.)
10	22	6	0.3	2700	1270	30000	36000	SS 6900	SS 6900 ZZ	SS 6900 2RS	12	20	0.3	0.009
12	24	6	0.3	2890	1460	27000	32000	SS 6901	SS 6901 ZZ	SS 6901 2RS	14	22	0.3	0.011
15	28	7	0.3	4100	2060	24000	28000	SS 6902	SS 6902 ZZ	SS 6902 2RS	17	26	0.3	0.016
17	30	7	0.3	4650	2580	22000	26000	SS 6903	SS 6903 ZZ	SS 6903 2RS	19	28	0.3	0.018
20	37	9	0.3	6400	3700	19000	23000	SS 6904	SS 6904 ZZ	SS 6904 2RS	22	35	0.3	0.036
25	42	9	0.3	7050	4550	16000	19000	SS 6905	SS 6905 ZZ	SS 6905 2RS	27	40	0.3	0.042
30	47	9	0.3	7250	5000	14000	17000	SS 6906	SS 6906 ZZ	SS 6906 2RS	32	45	0.3	0.048
35	55	10	0.3	11200	7450	12000	15000	SS 6907	SS 6907 ZZ	SS 6907 2RS	39	51	0.6	0.074
40	62	12	0.3	14600	10200	11000	13000	SS 6908	SS 6908 ZZ	SS 6908 2RS	44	58	0.6	0.11
45	68	12	0.3	15100	11200	9800	12000	SS 6909	SS 6909 ZZ	SS 6909 2RS	49	64	0.6	0.128
50	72	12	0.3	15600	12200	8900	11000	SS 6910	SS 6910 ZZ	SS 6910 2RS	54	68	0.6	0.132
55	80	13	0.3	16000	13300	8200	9600	SS 6911	SS 6911 ZZ	SS 6911 2RS	60	75	1.0	0.18
60	85	13	0.3	16400	14300	7600	8900	SS 6912	SS 6912 ZZ	SS 6912 2RS	65	80	1.0	0.193
65	90	13	0.6	17400	16100	7000	8200	SS 6913	SS 6913 ZZ	SS 6913 2RS	70	85	1.0	0.206
70	100	16	0.6	23700	21200	6500	7700	SS 6914	SS 6914 ZZ	SS 6914 2RS	75	95	1.0	0.334
75	105	16	0.6	24400	22600	6100	7200	SS 6915	SS 6915 ZZ	SS 6915 2RS	80	100	1.0	0.353
80	110	16	0.6	24900	24000	5700	6700	SS 6916	SS 6916 ZZ	SS 6916 2RS	85	105	1.0	0.373

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

	Technical supplement		
	Cages	Precision	Grease
Steel -	✓		
Polymid -	X	Class 0 (JIS)	Shell Alvania S2
Brass -	X		


Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Stainless Steel Deep Groove Ball Bearings series SS 16..



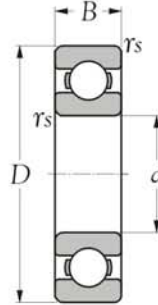
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Mass kg (approx.)
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_s</i> mm	dynamic <i>C_r</i>	static <i>C_{0r}</i>	grease rpm	oil rpm		
13	29	10	0.6	3920	2250	25000	28000	SS 1616	0.030
11	35	11	0.6	5900	3500	22000	26000	SS 1620	0.050
13	35	11	0.6	5900	3500	22000	26000	SS 1621	0.048
14	35	11	1.0	5900	3500	22000	26000	SS 1622	0.046
16	35	11	1.0	5900	3500	22000	26000	SS 1623	0.040
16	41	13	1.0	7250	4450	17000	20000	SS 1628	0.072
19	41	13	1.1	7250	4450	17000	20000	SS 1630	0.065
16	44	13	1.1	7250	4450	17000	20000	SS 1633	0.092
19	44	13	1.1	7250	4450	17000	20000	SS 1635	0.085
19	51	14	1.1	10800	6950	12000	13000	SS 1638	0.120
22	51	14	1.5	10800	6950	12000	13000	SS 1640	0.112
25	51	14	1.5	10800	6950	12000	13000	SS 1641	0.100
29	64	16	1.5	2800	8400	9000	10000	SS 1652	0.210
32	64	16	1.5	2800	8400	9000	10000	SS 1654	0.190

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

	Technical supplement		
	Cages	Precision	Grease
Steel -	✓	Class 0 (JIS)	Nil
Polymid -	X		
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)


Stainless Steel Ball Bearings series SS 160..



Shielded type
(Open)

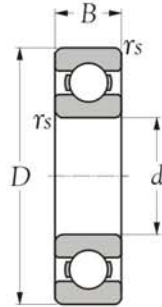
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers	Abutment and fillet dimensions			Mass kg (approx.)
<i>d</i>	<i>D</i>	<i>B</i>	<i>r_s</i> min ¹⁾	<i>C_r</i>	<i>C_{0r}</i>	grease rpm	oil rpm		<i>D_s</i> <i>min</i>	<i>d_h</i> <i>max</i>	<i>R</i> <i>max</i>	
12	28	7	0.3	5100	2390	26000	30000	SS 16001	14.5	25.5	0.3	0.019
15	32	8	0.3	5600	2840	22000	26000	SS 16002	17.5	29.5	0.3	0.025
17	35	8	0.3	6800	3350	20000	24000	SS 16003	19.5	32.5	0.3	0.032
20	42	8	0.3	7900	4500	18000	21000	SS 16004	22.5	39.5	0.3	0.051
25	47	8	0.3	8350	5100	15000	18000	SS 16005	27.5	44.5	0.3	0.060
30	55	9	0.3	11200	7350	13000	15000	SS 16006	32.5	52.5	0.3	0.091
35	62	9	0.3	11700	8200	12000	14000	SS 16007	37.5	59.5	0.3	0.110
40	68	9	0.3	12600	9650	10000	12000	SS 16008	42.5	65.5	0.3	0.125
45	75	10	0.6	12900	10500	9200	11000	SS 16009	50.0	70.0	0.6	0.171
50	80	10	0.6	13200	11300	8400	9800	SS 16010	55.0	75.0	0.6	0.180
55	90	11	0.6	18600	15300	7700	9000	SS 16011	60.0	85.0	0.6	0.258
60	95	11	0.6	20000	17500	7000	8300	SS 16012	65.0	90.0	0.6	0.283
65	100	11	0.6	20500	18700	6500	7700	SS 16013	70.0	95.0	0.6	0.307
70	110	13	0.6	24400	22600	6100	7100	SS 16014	75.0	105.0	0.6	0.441
75	115	13	0.6	25000	24000	5700	6700	SS 16015	80.0	110.0	0.6	0.464

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

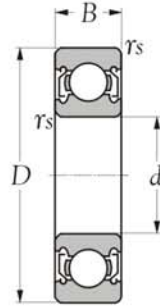
	Technical supplement		
	Cages	Precision	Grease
Steel -	✓	Class 0 (JIS)	Nil
Polymid -	X		
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

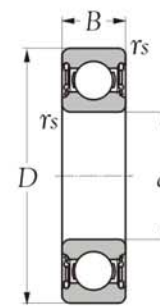
Stainless Steel Deep Groove Ball Bearings series SS R..., SS R..ZZ, SS R..2RS



Open



Shielded type (ZZ)



Sealed type (2RS)

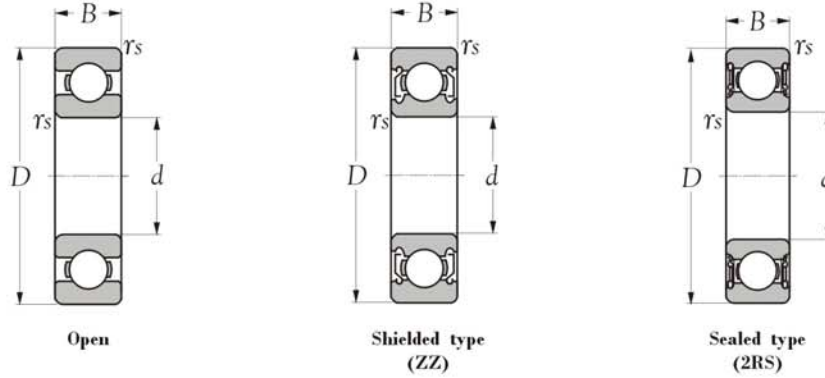
Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers			Mass kg (approx.)
d	mm		$r_s \text{ min}^{(1)}$	dynamic	static	grease	oil	open	with shields	with seals	
	D	B		C_r	C_{or}	rpm	rpm				
3	10	4	0.3	630	218	56000	67000	SS R 2			0.001
3	10	4	0.3	630	218	56000	-		SS R 2 ZZ	SS R 2 2RS	0.001
3	10	4	0.3	630	218	56000	67000	SS R 2 A			0.001
3	10	4	0.3	630	218	56000	-		SS R 2 A ZZ	SS R 2 A 2RS	0.001
5	13	4	0.3	1310	490	41000	48000	SS R 3			0.002
5	13	5	0.3	1310	490	41000	-		SS R 3 ZZ	SS R 3 2RS	0.002
5	13	4	0.3	1310	490	41000	48000	SS R 3 A			0.002
5	13	5	0.3	1310	490	41000	-		SS R 3 A ZZ	SS R 3 A 2RS	0.002
6	16	5	0.3	1480	615	36000	43000	SS R 4			0.004
6	16	5	0.3	1480	615	36000	-		SS R 4 ZZ	SS R 4 2RS	0.004
6	16	5	0.3	1480	615	36000	43000	SS R 4 A			0.004
6	16	5	0.3	1480	615	36000	-		SS R 4 A ZZ	SS R 4 A 2RS	0.004
10	22	6	0.3	3300	1400	31000	37000	SS R 6			0.013
10	22	7	0.3	3300	1400	31000	-		SS R 6 ZZ	SS R 6 2RS	0.014
13	29	6	0.3	3950	2250	26000	31000	SS R 8			0.016
13	29	8	0.3	3950	2250	26000	-		SS R 8 ZZ	SS R 8 2RS	0.018
16	35	7	0.3	4600	2800	21000	25000	SS R 10			0.034
16	35	9	0.3	4600	2800	21000	-		SS R 10 ZZ	SS R 10 2RS	0.037
19	41	8	0.3	7250	4450	16000	21000	SS R 12			0.044
19	41	11	0.3	7250	4450	16000	-		SS R 12 ZZ	SS R 12 2RS	0.047
22	48	10	0.3	7250	4950	12000	16000	SS R 14			0.070
22	48	13	0.3	7250	4950	12000	-		SS R 14 ZZ	SS R 14 2RS	0.072

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

Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>			
Polymid - <input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2	
Brass - <input checked="" type="checkbox"/>			


Remark: If you have more inquiry of technical, please inquire KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

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

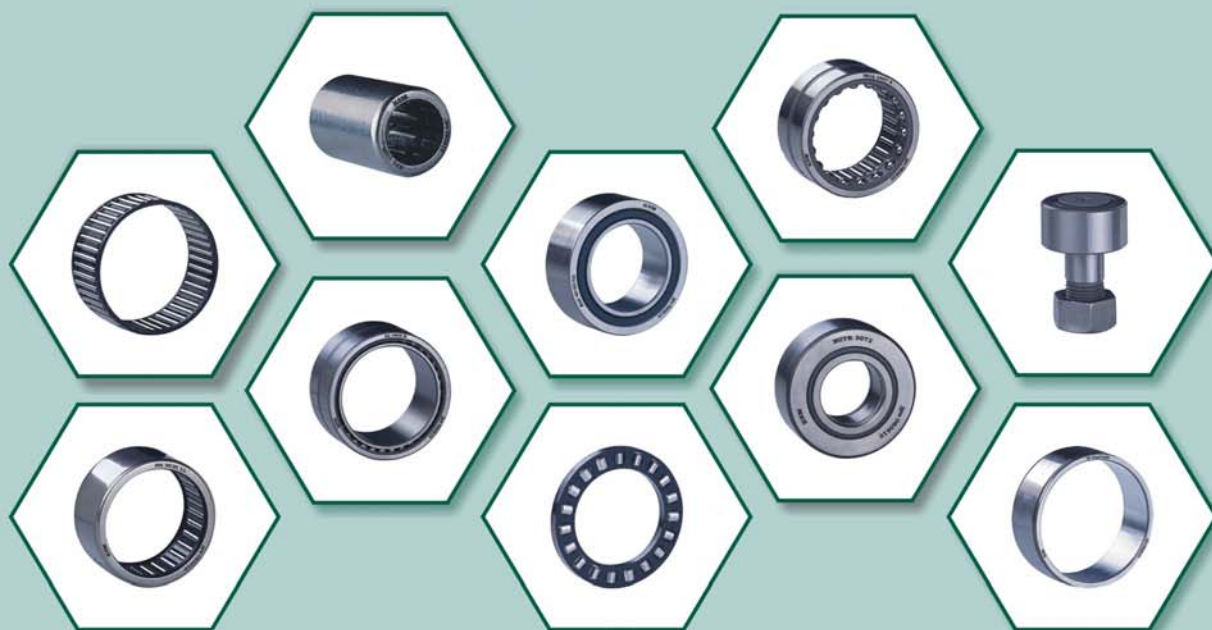


Boundary dimensions				Basic load ratings		Limiting speeds		Bearing numbers			Mass kg (approx.)
d	mm		$r_s \text{ min}^{-1}$	dynamic	static	grease	oil	open	with shields	with seals	
	D	B		C_r	C_{or}	rpm	rpm				
25	51	10	0.6	8250	5450	11000	15000	SS R 16			0.081
25	51	13	0.6	8250	5450	11000	-		SS R 16 ZZ	SS R 16 2RS	0.085
26	54	10	0.6	9600	6260	10000	13000	SS R 18			0.086
26	54	13	0.6	9600	6260	10000	-		SS R 18 ZZ	SS R 18 2RS	0.090
32	57	10	0.6	10800	7520	9000	11000	SS R 20			0.090
32	57	13	0.6	10800	7520	9000	-		SS R 20 ZZ	SS R 20 2RS	0.095
34.925	63.5	14.29	0.6	12280	8500	12000	14000	SS R 22			0.106
34.925	63.5	14.29	0.6	12280	8500	12000	-		SS R 22 ZZ	SS R 22 2RS	0.106
38.1	66.675	14.29	0.6	16800	11400	10000	12000	SS R 24			0.141
38.1	66.675	14.29	0.6	16800	11400	1000	-		SS R 24 ZZ	SS R 24 2RS	0.141

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

	Technical supplement		
	Cages	Precision	Grease
Steel -	✓		
Polymid -	X	Class 0 (JIS)	Shell Alvania S2
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)



KSM[®]



Needle Roller Bearings



Technical Information		Pages for refer
		100 ~ 123
1	Bearing materials	100
2	Bearing tolerances	100 ~ 103
3	Bearing fits	104 ~ 109
4	Bearing internal clearance	110
5	Lubrication	110 ~ 113
6	Load rating and life	114 ~ 120
7	Bearing handling	120 ~ 123

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 silicone and manganese, which gives it hardening properties comparable to high carbon chromium steel.

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. Bearing tolerances

2.1 Standard of tolerances

Ball bearing "tolerances" or dimensional accuracy and running accuracy, are regulated by ISO standard (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 2.1 Bearings types and applicable tolerance

Bearing type		Applicable standard	Applicable tolerance class				Applicable table
Needle roller bearing		ISO 492 (KSM standard)	class change	class 6	class 5	class 4	Table 3.2
Complex bearing	Radial bearing		class 0	class 6	class 5	—	Table 3.2
	Thrust bearing		KSM class 0	KSM class 6	KSM class 5	KSM class 4	Table 3.3
Needle roller bearing with double-direction thrust roller bearing	Radial bearing		—	—	class 5	class 4	Table 3.2
	Thrust bearing		—	—	KSM class 5	KSM class 4	Table 3.3
Thrust roller bearings			KSM class 0	KSM class 6	KSM class 5	KSM class 4	Table 3.3
Roller follower/cam follower		class 0	—	—	—	Table 3.2	

Table 2.2 Tolerance for radial bearings

Table 2.2.1 Inner rings

Nominal bore diameter		Single plane mean bore diameter deviation								Single radial plane bore diameter variation				Mean single plane bore diameter variation				Inner ring radial runout			
d mm		Δd_{mp}								V_{dp}				V_{dmp}				K_{ia}			
over	incl.	class 0		class 6		class 5		class 4 ^①		class 0	class 6	class 5	class 4	class 0	class 6	class 5	class 4	class 0	class 6	class 5	class 4
		high	low	high	low	high	low	high	low	max.				max.				max.			
2.5 ^②	10	0	-8	0	-7	0	-5	0	-4	10	9	5	4	6	5	3	2.0	10	6	4	2.5
10	18	0	-8	0	-7	0	-5	0	-4	10	9	5	4	6	5	3	2.0	10	7	4	2.5
18	30	0	-10	0	-8	0	-6	0	-5	13	10	6	5	8	6	3	2.5	13	8	4	3.0
30	50	0	-12	0	-10	0	-8	0	-6	15	13	8	6	9	8	4	3.0	15	10	5	4.0
50	80	0	-15	0	-12	0	-9	0	-7	19	15	9	7	11	9	5	3.5	20	10	5	4.0
80	120	0	-20	0	-15	0	-10	0	-8	25	19	10	8	15	11	5	4.0	25	13	6	5.0
120	150	0	-25	0	-18	0	-13	0	-10	31	23	13	10	19	14	7	5.0	30	18	8	6.0
150	180	0	-25	0	-18	0	-13	0	-10	31	23	13	10	19	14	7	5.0	30	18	8	6.0
180	250	0	-30	0	-22	0	-15	0	-12	38	28	15	12	23	17	8	6.0	40	20	10	8.0
250	315	0	-35	0	-25	0	-18	—	—	44	31	18	—	26	19	9	—	50	25	13	—
315	400	0	-40	0	-30	0	-23	—	—	50	38	23	—	30	23	12	—	60	30	15	—
400	500	0	-45	0	-35	—	—	—	—	56	44	—	—	34	26	—	—	65	35	—	—

Note: ^① The dimensional difference Δd of the bore diameter to be applied for class 4 is the same as the tolerance of dimensional difference Δd_{mp} of the average bore diameter

^② Nominal bore diameter of bearings of 2.5 mm is included in this dimensional division.

(Unit: μm)

Nominal bore diameter		Face runout with bore			Inner ring axial runout (with side)			Inner ring width deviation				Inner ring width variation					
D mm		S_d			S_{ia} ^③			ΔB_s				V_{Bs}					
over	incl.	class 0	class 6	class 5	class 0	class 6	class 5	class 0,6	class 5,4	high	low	high	low	class 0	class 6	class 5	class 4
		max.			max.			max.				max.					
2.5 ^②	10	7	3	1.5	7	3	1.5	0	-120	0	-40	15	15	5	2.5		
10	18	7	3	1.5	7	3	1.5	0	-120	0	-80	20	20	5	2.5		
18	30	8	4	1.5	8	4	2.5	0	-120	0	-120	20	20	5	2.5		
30	50	8	4	1.5	8	4	2.5	0	-120	0	-120	20	20	5	3.0		
50	80	8	5	1.5	8	5	2.5	0	-150	0	-150	25	25	6	4.0		
80	120	9	5	2.5	9	5	2.5	0	-200	0	-200	25	25	7	4.0		
120	150	10	6	2.5	10	7	2.5	0	-250	0	-250	30	30	8	5.0		
150	180	10	6	4.0	10	7	5.0	0	-250	0	-250	30	30	8	5.0		
180	250	11	7	5.0	13	8	5.0	0	-300	0	-300	30	30	10	6.0		
250	315	13	—	—	15	—	—	0	-350	0	-350	35	35	13	—		
315	400	15	—	—	20	—	—	0	-400	0	-400	40	40	15	—		
400	500	—	—	—	—	—	—	0	-450	—	—	50	45	—	—		

Note: ^③ To be applied for deep groove ball bearing.

Symbols: Δd_{mp} : deviation of the mean bore diameter from the nominal ($\Delta d_{mp} = d_{mp} - d$).

V_{dp} : bore diameter variation; difference between the largest and smallest single bore diameters in one plane.

V_{dmp} : mean bore diameter variation; difference between the largest and smallest mean bore diameters of one ring or washer.

K_{ia} : radial runout of assembled bearing inner ring and assembled bearing outer ring, respectively.

S_d : side face runout with reference to bore (of inner ring).

S_{ia} : side face runout of assembled bearing inner ring and assembled bearing outer ring, respectively.

ΔB_s : deviation of single inner ring width or single outer ring width from the nominal ($\Delta B_s = B_s - B$ etc.)

V_{Bs} : ring width variation; difference between the largest and smallest single widths of inner ring and of outer ring, respectively.



Table 2.2.2 Outer rings

Nominal outside diameter		Single plane mean outside diameter deviation								Single radial plane outside diameter variation				Mean single plane outside diameter variation				Outer ring radial runout			
D mm		ΔD_{mp}								V_{Dp}				V_{Dmp}				K_{ea}			
over	incl.	class 0		class 6		class 5		class 4 ^④		class 0	class 6	class 5	class 4	class 0	class 6	class 5	class 4	class 0	class 6	class 5	class 4
		high	low	high	low	high	low	high	low	max.				max.				max.			
6 ^⑤	18	0	-8	0	-7	0	-5	0	-4	10	9	5	4	6	5	3	2.0	15	8	5	3
18	30	0	-9	0	-8	0	-6	0	-5	12	10	6	5	7	6	3	2.5	15	9	6	4
30	50	0	-11	0	-9	0	-7	0	-6	14	11	7	6	8	7	4	3.0	20	10	7	5
50	80	0	-13	0	-11	0	-9	0	-7	16	14	9	7	10	8	5	3.5	25	13	8	5
80	120	0	-15	0	-13	0	-10	0	-8	19	16	10	8	11	10	5	4.0	35	18	10	6
120	150	0	-18	0	-15	0	-11	0	-9	23	19	11	9	14	11	6	5.0	40	20	11	7
150	180	0	-25	0	-18	0	-13	0	-10	31	23	13	10	19	14	7	5.0	45	23	13	8
180	250	0	-30	0	-20	0	-15	0	-11	38	25	15	11	23	15	8	6.0	50	25	15	10
250	315	0	-35	0	-25	0	-18	0	-13	44	31	18	13	26	19	9	7.0	60	30	18	11
315	400	0	-40	0	-28	0	-20	0	-15	50	35	20	15	30	21	10	8.0	70	35	20	13
400	500	0	-45	0	-33	0	-23	—	—	56	41	23	—	34	25	12	—	80	40	23	—
500	630	0	-50	0	-38	0	-28	—	—	63	48	28	—	38	29	14	—	100	50	25	—

Note: ④ The dimensional difference ΔD_s of the outer diameter to be applied for class 4 is the same as the tolerance of dimensional difference ΔD_{mp} of the average outer diameter.

⑤ Nominal outer diameter of bearings of 6 mm is included in this dimensional division.

(Unit: μm)

Nominal outside diameter		Outside surface inclination		Outside ring axial runout		Outer ring width deviation		Outer ring width variation		
D mm		S_d		S_{ia} ^⑥		ΔC_s		V_{Cs}		
over	incl.	class 5	class 4	class 5	class 4	all type		class 0.6	class 5	class 4
		max.		max.				max.		
6 ^⑥	18	8	4	8	5				5	2.5
18	30	8	4	8	5				5	2.5
30	50	8	4	8	5				5	2.5
50	80	8	4	10	5				6	3.0
80	120	9	5	11	6	Identical to		Identical to	8	4.0
120	150	10	5	13	7	ΔB_s of inner		ΔB_s and V_{bs}	8	5.0
150	180	10	5	14	8	ring of same		of inner	8	5.0
180	250	11	7	15	10	bearing		ring of same	10	7.0
250	315	13	8	18	10			bearing	11	7.0
315	400	13	10	20	13				13	8.0
400	500	15	—	23	—				15	—
500	630	18	—	25	—				18	—

Note: ⑥ To be applied for deep groove ball bearings.

Symbols: ΔD_{mp} : deviation of the mean outside diameter from the nominal ($\Delta D_{mp} = D_{mp} - D$).

V_{Dp} : outside diameter variation; difference between the largest and smallest single outside diameters in one plane.

V_{dmp} : mean bore diameter variation; difference between the largest and smallest mean bore diameters of one ring or washer.

K_{ea} : radial runout of assembled bearing inner ring and assembled bearing outer ring, respectively.

S_d : side face runout with reference to bore (of inner ring).

S_{ia} : side face runout of assembled bearing inner ring and assembled bearing outer ring, respectively.

ΔC_s : deviation of single inner ring width or single outer ring width from the nominal ($\Delta B_s = B_s - B$ etc.)

V_{Cs} : ring width variation; difference between the largest and smallest single widths of inner ring and of outer ring, resp.



Table 2.3 Tolerance of thrust roller bearings

Table 2.3.1 Inner rings

(Unit: μm)

Nominal outer diameter d mm		Single plane mean bore diameter deviation Δd_{mp}						Single radial plane bore diameter variation V_{dp}		Thrust bearing shaft washer raceway (or center washer raceway) thickness variation S_i			
over	incl.	class 0,6,5		class 4		class 0,6,5	class 4	class 0,6,5	class 4	class 0	class 6	class 5	class 4
		high	low	high	low	max.				max.			
—	18	0	-8	0	-7	6	5	10	5	3	2		
18	30	0	-10	0	-8	8	6	10	5	3	2		
30	50	0	-12	0	-10	9	8	10	6	3	2		
50	80	0	-15	0	-12	11	9	10	7	4	3		
80	120	0	-20	0	-15	15	11	15	8	4	3		
120	180	0	-25	0	-18	19	14	15	9	5	4		
180	250	0	-30	0	-22	23	17	20	10	5	4		
250	315	0	-35	0	-25	26	19	25	13	7	5		
315	400	0	-40	0	-30	30	23	30	15	7	5		
400	500	0	-45	0	-35	34	26	30	18	9	6		
500	630	0	-50	0	-40	38	30	35	21	11	7		

Table 2.3.2 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}		Thrust bearing housing washer raceway thickness variation S_e			
over	incl.	class 0,6,5		class 4		class 0,6,5	class 4	class 0,6,5	class 4	class 0	class 6	class 5	class 4
		high	low	high	low	max.				max.			
10	18	0	-11	0	-7	8	5						
18	30	0	-13	0	-8	10	6						
30	50	0	-16	0	-9	12	7						
50	80	0	-19	0	-11	14	8						
80	120	0	-22	0	-13	17	10						
120	180	0	-25	0	-15	19	11						
180	250	0	-30	0	-20	23	15						
250	315	0	-35	0	-25	26	19						
315	400	0	-40	0	-28	30	21						
400	500	0	-45	0	-33	34	25						
500	630	0	-50	0	-38	38	29						
630	800	0	-75	0	-45	55	34						

According to the tolerance of S_i against "d" or "d2" of the same bearings

Symbols: Δd_{mp} : deviation of the mean bore diameter from the nominal ($\Delta d_{mp} = d_{mp} - d$).

V_{dp} : bore diameter variation; difference between the largest and smallest single bore diameters in one plane.

S_i : thickness variation, measured from middle of raceway to back (seating) face of shaft washer and of housing washer, respectively (axial runout).

ΔD_{mp} : deviation of the mean outside diameter from the nominal ($\Delta D_{mp} = D_{mp} - D$).

V_{Dp} : outside diameter variation; difference between the largest and smallest single outside diameters in one plane.

S_e : thickness variation, measured from middle of raceway to back (seating) face of shaft washer and of housing washer, respectively (axial runout).



3. Bearing fits

3.1 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.

3.2 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

3.3 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.)


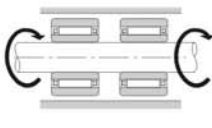

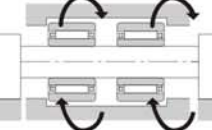

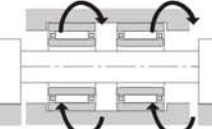

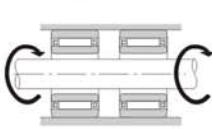
3.3.1 "Tight fit," "transition fit," or "loose fit"

For raceways under rotating loads, a tight fit is necessary. (Refer to Table 3.1)

"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 3.1 Radial load for bearing

Illustration	Bearing rotation	Ring load	Fit
 <p>Static load</p>	 <p>Inner ring: Rotating Outer ring: Stationary</p>	Rotating inner ring load	Inner ring: Tight fit
 <p>Imbalanced load</p>	 <p>Inner ring: Stationary Outer ring: Rotating</p>	Static outer ring load	Outer ring: Loose fit
 <p>Static load</p>	 <p>Inner ring: Stationary Outer ring: Rotating</p>	Static inner ring load	Inner ring: Loose fit
 <p>Imbalanced load</p>	 <p>Inner ring: Rotating Outer ring: Stationary</p>	Rotating outer ring load	Outer ring: Tight fit

3.3.2 Recommended Fits

The system of limits and fits define the tolerances of the outside diameter of the shaft or the bore diameter of a housing (the shaft or housing to which a metric bearing is installed). Bearing fit is governed by the selection of tolerances for the shaft outside diameter and housing bore diameter. Fig. 3.1 summarizes the interrelations between shaft outside diameter and bearing bore diameter, and between housing bore diameter and shaft outside diameter. Table 3.2 provides the recommended fits for common radial needle roller bearings (machined ring needle roller bearings with inner ring), relative to dimensions and loading conditions. Table 3.3 is a table of the numerical value of fits.

3.3.3 Interference minimum and maximum values

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

- In calculating the minimum required amount of interference keep in mind that:
 - 1) interference is reduced by radial loads
 - 2) interference is reduced by differences between bearing temperature and ambient temperature
 - 3) interference is reduced by variation of fitted surfaces
- Maximum interference should be no more than 1:1000 of the shaft diameter or outer diameter. Required interference calculations are shown below.

3.3.3.1 Fitted surface variation and required interference

Interference between fitted surfaces is reduced by roughness and other slight variations of these surfaces which are flattened in the fitting process. The degree of reduced interference depends upon the finish treatment of these surfaces, but in general it is necessary to assume the following interference reductions.

For ground shafts: 1.0 ~ 2.5 μm
 For lathed shafts : 5.0 ~ 7.0 μm



3.3.3.2 Maximum interference

When bearing rings are installed with an interference fit, tension or compression stress may occur along their raceways. If interference is too great, this may cause damage to the rings and reduce bearing life. For these reasons, maximum interference should not exceed the previously mentioned ratio of 1 : 1000 of the shaft or outside diameter.

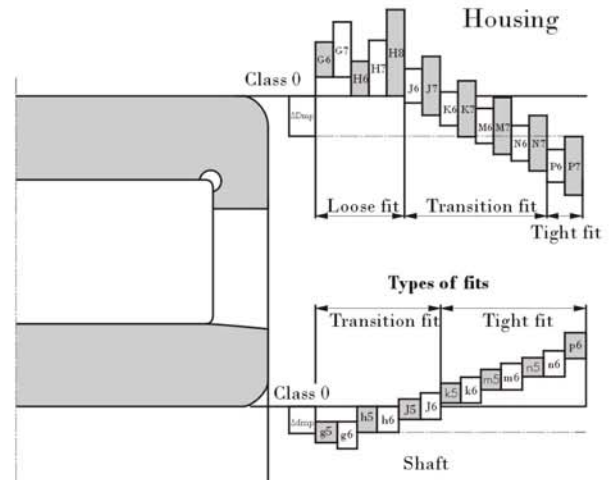


Fig. 4.1

Table 3.2 General standards for needle roller bearing fits

Table 3.2.1 Shaft fits

Nature of load	Fit	Load condition, magnitude	Shaft diameter		Tolerance class	Remarks
			mm over	incl		
Indeterminate direction load Rotating inner ring load	Tight fit/ Transition fit	Light load ❶	~ 50	js6	When greater accuracy is required m5 may be substituted for m6.	
			50 ~ 100	k6		
			100 ~ 200	m6		
		Normal load ❶	~ 50	k5		
			50 ~ 100	m5		
			100 ~ 150	n6		
			150 ~ 200	p6		
		Heavy load ❶ or shock load	~ 150	n6	When greater accuracy is required m5 may be substituted for m6.	
			150 ~	p6 r6		
Static inner ring load	Transition fit	Inner ring axial displacement possible	All shaft diameters	g6	When greater accuracy is required use g5. For large bearings, f6 may be used.	
		Inner ring axial displacement unnecessary		h6	When greater accuracy is required use h5.	
Centric axial load only	Transition fit	All loads	All shaft diameters	js6	General; depending on the fit, shaft and inner rings are not fixed.	

❶ Standards for light loads, normal loads, and heavy loads

Light loads : equivalent radial load $\leq 0.06 C_r$

Normal loads: $0.06 C_r < \text{equivalent radial load} \leq 0.12 C_r$

Heavy loads : $0.12 C_r < \text{equivalent radial load}$

Note: All values and fits listed in the above tables are for solid steel shafts.

Table 3.2.2 Housing fits (Housing of the drawn cup needle roller bearing.)

Nature of load	Housing	Fit	Load condition, magnitude	Tolerance class	Outer ring axial displacement ^②	Remarks
Rotating outer ring load or static outer ring load	Solid housing or split housing	Loose fit	All loads	J7	Displacement possible	G7 also acceptable for large type bearings as well as outer rings and housings with large temperature differences
			Light ^① to normal load	H7	Displacement possible	—
	Solid housing	Transition or loose fit	High rotation accuracy required with light to normal loads	K6	Displacement not possible(in principle)	Applies primarily to roller bearings
Tight to transition fit		Light to normal load	J7	Displacement possible	When greater accuracy is required substitute j6 for J7 and K6 for K7.	
		Normal to heavy load	K7	Displacement not possible(in principle)		
		Heavy shock load	M7	Displacement not possible	—	
Inner ring static load or outer ring rotating load		Tight fit	Light or variable load	M7	Displacement not possible	—
			Normal to heavy load	N7	Displacement not possible	—
			Heavy load (thin wall housing) or heavy shock load	P7	Displacement not possible	—
Centered axial load only - Loose fit	Loose fit	—	—	Select a tolerance class that will provide clearance between outer ring and housing.	—	

- ① Standards for light loads, normal loads, and heavy loads
 Light loads : equivalent radial load $\leq 0,06 C_r$
 Normal loads: $0,06 C_r < \text{equivalent radial load} \leq 0,12 C_r$
 Heavy loads : $0,12 C_r < \text{equivalent radial load}$
- ② Indicates whether or not outer ring axial displacement is possible with non-separable type bearings.

Note 1 : All values and fits listed in the above tables are for cast iron or steel housings.

2 : In cases where only a centered axial load acts on the bearing, select a tolerance class that will provide clearance in the axial direction for the outer ring.

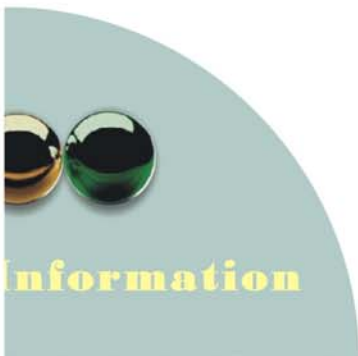


Table 3.3 Numeric value table of fitting for radial bearing of class 0

Table 3.3.1 Fitting against shaft

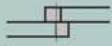
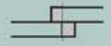
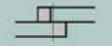
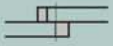
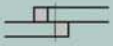
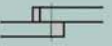
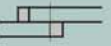
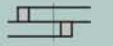
Nominal bore diameter of bearing		Single plane mean bore diameter deviation		g5	g6	h5	h6	j5	js5	j6
d mm		Δd_{mp}		bearing shaft	bearing shaft	bearing shaft	bearing shaft	bearing shaft	bearing shaft	bearing shaft
over	incl.	high	low							
3	6	0	-8	4T ~ 9L	4T ~ 12L	8T ~ 5L	8T ~ 8L	11T ~ 2L	10.5T ~ 2.5L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

Table 3.3.2 Fitting against housing

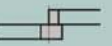
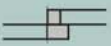
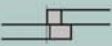
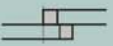
Nominal outside diameter of bearing		Single plane mean outside diameter deviation		G7	H6	H7	J6	J7	Js7	K6
d mm		ΔD_{mp}		housing bearing	housing bearing	housing bearing	housing bearing	housing bearing	housing bearing	housing bearing
over	incl.	high	low							
6	10	0	-8	5L ~ 28L	0 ~ 17L	0 ~ 23L	4T ~ 13L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

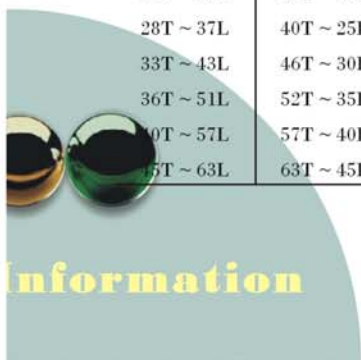
Note: T = tight, L = loose

(Unit: μm)

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

(Unit: μm)

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



4. Bearing internal clearance

Table 4.1 Radial internal clearance of needle roller bearings

(Unit: μm)

Nominal bore diameter d (mm)		C2		Normal		C3		C4	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
-	10	0	30	10	40	25	55	35	65
10	18	0	30	10	40	25	55	35	65
18	24	0	30	10	40	25	55	35	65
24	30	0	30	10	45	30	65	40	70
30	40	0	35	15	50	35	70	45	80
40	50	5	40	20	55	40	75	55	90
50	65	5	45	20	65	45	90	65	105
65	80	5	55	25	75	55	105	75	125
80	100	10	60	30	80	65	115	90	140
100	120	10	65	35	90	80	135	105	160
120	140	10	75	40	105	90	155	115	180
140	160	15	80	50	115	100	165	130	195
160	180	20	85	60	125	110	175	150	215
180	200	25	95	65	135	125	195	165	235
200	225	30	105	75	150	140	215	180	255
225	250	40	115	90	165	155	230	205	280
250	280	45	125	100	180	175	255	230	310
280	315	50	135	110	195	195	280	255	340
315	355	55	145	125	215	215	305	280	370
355	400	65	160	140	235	245	340	320	415
400	450	70	190	155	275	270	390	355	465

5. Lubrication

5.1 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 damaging elements (Dust, water, etc.) into the bearing interior, removes dust and other impurities from the lubricant, and prevents the 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 applications, a solid lubricant such as molybdenum disulfide or graphite may be used.



5.2 Lubrication methods and characteristics

The lubrication methods come in two general methods: grease or oil, each with their own characteristics. These characteristics are shown in table 5.1

Table 5.1 Comparison of grease lubrication and oil lubrication characteristics

Concern \ Method	Grease lubrication	Oil lubrication
Handling	Very good	Fair
Reliability	Good	Very good
Cooling effect	Poor	Good (circulation necessary)
Seal's structure	Good	Fair
Power loss	Good	Good
Environment contamination	Good	Fair
High speed rotation	Poor	Good

5.3 Grease lubrication

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

5.3.1 Types and characteristics of grease

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

Standard greases and their characteristics are listed in Table 5.2 as performance characteristics of even the same type of grease will vary widely from brand to brand, it is best to check the manufacturers' data when selecting a grease.

Also, greases of different brands should not be mixed because of the different additives they contain.

However, if different greases must be mixed, at least greases with the same base oil and thickening agent should be selected. But even when greases of the same base oil and thickening agent are mixed, the quality of U grease may still change due to the difference in additives. For this reason, changes in consistency and other qualities should be checked before being applied.



Table 5.2 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 point	170 °C ~ 190 °C	170 °C ~ 190 °C	200 °C ~ 250 °C	150 °C ~ 180 °C	150 °C ~ 180 °C
Operating temperature range °C	-30 °C ~ +130 °C	-50 °C ~ +130 °C	-50 °C ~ +160 °C	-20 °C ~ +130 °C	-20 °C ~ +120 °C
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.	Excellent low temperature and wear characteristics.	Suitable for high and low temperature.	Some emulsification when water is introduced.	Excellent pressure resistance and mechanical stability.
	Grease used in all types of rolling bearings.	Suitable for small sized and miniature bearings.	Unsuitable for heavy load applications due to low oil film strength.	Excellent characteristics at relatively high temperatures.	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	70 °C ~ 90 °C	250 °C or above	250 °C or above
Operating temperature range °C	-10 °C ~ +80 °C	-10 °C ~ +130 °C	-50 °C ~ +200 °C
Mechanical stability	Good ~ Poor	Good	Good
Pressure resistance	Good	Good	Good
Water resistance	Good	Good	Good
Applications	Excellent viscosity characteristics.	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.	
	Suitable for bearings subject to vibrations.	Grease used in all types of rolling bearings.	

Note: The figures given for operating temperature range are standard characteristic values, and are not guaranteed.



5.3.2 Amount of grease

The amount of grease used in any given situation will depend on many factors relating to the size and shaped the housing, space limitations, bearing's rotating speed and type of grease used.

As a general rule, housings and bearings should be only filled from 50% to 80% of their capacities.

Where speeds are high and temperature rises need to be kept to a minimum, a reduced amount of grease should be used. Excessive amounts of grease cause temperature rise which in turn causes the grease to soften and may allow leakage. With excessive grease fills oxidation and deterioration may cause lubricating efficiency to be lowered.

Moreover, the standard bearing space can be found by below formula (5.1)

$$V = K \cdot W \dots\dots\dots \text{Formula (5.1)}$$

where,

V : Quantity of bearing space open type (approx.) Cm³

K : Bearing space factor (Table 5.3)

W : Mass of bearing kg (See bearing tables)

Table 5.3 Bearings space ratio K

Bearing type	Retainer type	K
Needle roller bearings	Pressed or Machined retainer	35



6. Load rating and life

6.1 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.

6.2 Basic rated 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 rated life is defined as follows.

The basic rated 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 rated 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 rated life, the basic dynamic load rating and the bearing load is given in formula (6.1).

$$L_{10} = \left(\frac{C}{P}\right)^P \dots\dots\dots \text{Formula (6.1)}$$

where,

$P = 10/3$ For needle roller bearings

L_{10} : Basic rating life 10^6 revolutions

C : Basic dynamic rating load, N
(C_r : radial bearings, C_a : thrust bearings)

P : Equivalent dynamic load, N
(P_r : radial bearings, P_a : thrust bearings)

The basic rating life can also be expressed in terms of hours of operation (revolution), and is calculated as shown in formula (6.2).

$$L_{10h} = 500 f_h^P \dots\dots\dots \text{Formula (6.2)}$$

$$f_h = f_n \frac{C}{P} \dots\dots\dots \text{Formula (6.3)}$$

$$f_n = \left(\frac{33.3}{n} \right)^{1/P} \dots\dots\dots \text{Formula (6.4)}$$

where,

L_{10} : Basic rating life, h

f_h : Life factor

f_n : Speed factor

n : Rotational speed, r/min

Formula (6.2) can also be expressed as shown in formula (6.5).

$$L_{10h} = \frac{10^6}{60n} \left(\frac{C}{P} \right)^P \dots\dots\dots \text{Formula (6.5)}$$

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. 6.1. 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 6.6). 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.

$$L = \frac{1}{\left(\frac{1}{L_1^e} + \frac{1}{L_2^e} + \dots + \frac{1}{L_n^e} \right)^{1/e}} \dots\dots\dots \text{Formula (6.6)}$$

where,

$e = 9/8$For roller bearings

L = Total basic rating life or entire unit, h

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

6.3 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. A general guide to these requisite life criteria is shown in Table 6.1. 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.

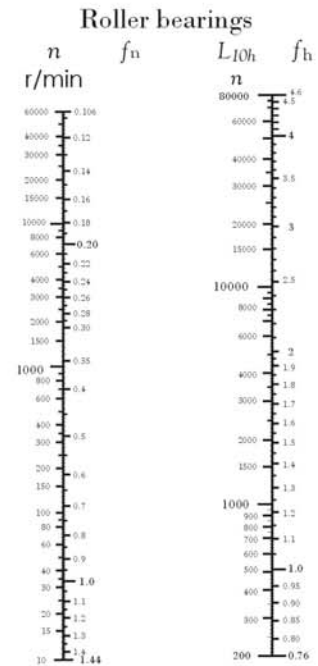
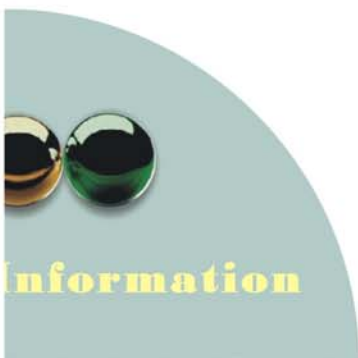


Fig. 6.1 Bearing life rating scale



6.4 Adjusted life rating factor

The basic bearing life rating (90% reliability factor) can be calculated through the formula mentioned earlier in Section 6.2. 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.

$$L_{na} = a_1 \cdot a_2 \cdot a_3 (C/P)^P \dots \dots \dots \text{Formula (6.7)}$$

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

6.4.1 Life adjustment factor for reliability a_1

The values for the reliability adjustment factor as (for a reliability factor higher than 90%) can be found in Table 6.1.

Table 6.1 Reliability adjustment factor values a_1

Reliability %	L_n	Reliability factor a_1
90	L10	1.00
95	L5	0.62
96	L4	0.53
97	L3	0.44
98	L2	0.33
99	L1	0.21



6.4.2 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 catalog 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 micro-structure. This special heat treatment might cause the reduction of bearing life because of a hardness change.

6.4.3 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, a_3 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; below 20mm²/s for roller bearings); or by exceptionally low rotational speed (nr/min x d_p mm 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. 6.2.

6.5 Life of bearing with oscillating motion

The life of a radial bearing with oscillating motion can be calculated according to formula (6.8).

$$L_{osc} = \Omega L_{Rot} \dots\dots\dots \text{Formula (6.8)}$$

where,

L_{osc} : life for oscillating bearing

L_{Rot} : rating life at assumed number of rotations same as oscillation cycles

Ω : oscillation factor (Fig.6.3 indicates the relationship between half oscillation angle β and Ω).

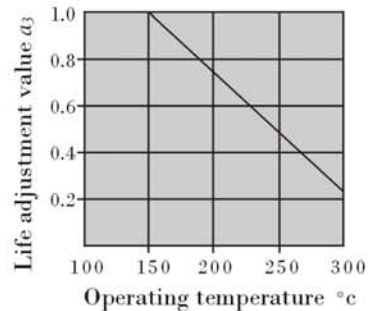


Fig. 6.2 Life adjustment value for operating temperature

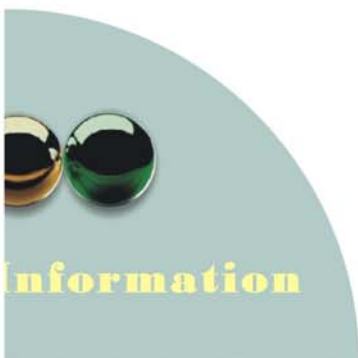


Fig. 6.3 is valid only when the amplitude exceeds a certain degree (critical angle $2\beta_c$). The critical angle is determined by the internal design of the bearing, in particular by the number of rolling elements in one row. Critical angle values are given in Table 6.3. When the magnitude of the oscillation is less than the critical angle, the life may be shorter than that calculated to be the value in Fig.6.3 it is safer to calculate life with the factor Ω corresponding to the critical angle. For the critical angle of an individual bearing, please consult **KSM Engineering**. Where the amplitude of the oscillation 2β is small, it is difficult for a complete lubricant film to form on the contact surfaces of the rings and rolling elements, and fretting corrosion may occur. Therefore it is necessary to exercise extreme care in the selection of bearing type, lubrication and lubricant.

Table 6.2 Critical angle

Number of rolling elements	Half critical angle β_c
10	10°
25	4°
40	2.6°

6.6 Life of bearing with linear motion

With a linear motion bearing such as a linear ball bearing or linear flat roller bearing, the relation among the axial travel distance, bearing load, and load rating is expressed by formulas (6.9).

When the rolling elements are rollers:

$$L = 100 \times \left(\frac{C_r}{P_r}\right)^{\frac{10}{3}} \dots\dots\dots(6.9)$$

where,

- L : Load rating km
- C_r : Basic dynamic load rating [kgf]
- P_r : Bearing load [kgf]

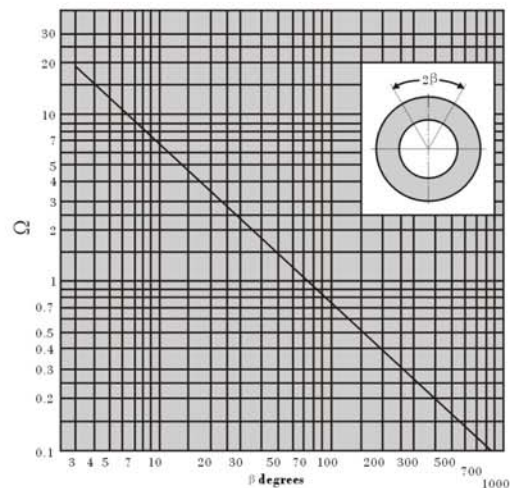


Fig. 6.3 Relationship between half angle β and factor Ω

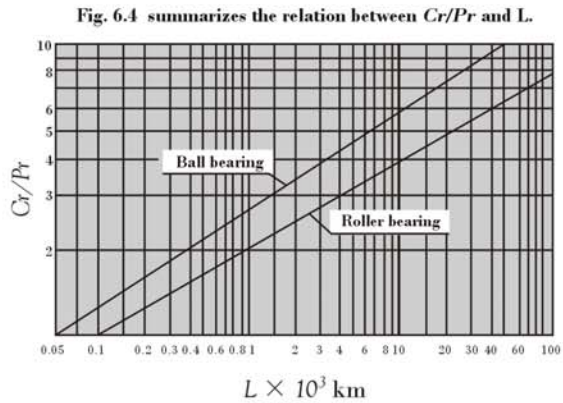


Fig. 6.4 summarizes the relation between C_r/P_r and L.

Fig. 6.4 Life of bearing with axial motion



If the cycle and travel distance within a particular travel motion remain constant, the rating life of the bearing can be determined by formulas (6.10).

$$Lh = \frac{50 \times 10^3}{10 \cdot S} \left(\frac{C_r}{P_r} \right)^{\frac{10}{3}} \dots \dots \dots \text{Formula (6.10)}$$

Where,

Lh : Travel life, h

S : Travel distance per minute, m/min .

$$S = 2 \cdot L \cdot N$$

L : Stroke length, m

n : Stroke cycle, N {kgf}

6.7 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 rated 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.

For roller bearings 4,000 Mpa

6.8 Allowable static equivalent load

Generally the static equivalent load which can be permitted is limited by the basic static rated load as stated in Section 6.7. However, depending on requirements regarding friction and smooth operation, these limits may be greater or lesser than the basic static rated load.

In the following formula (6.11) and Table 6.4 the safety factor S_0 can be determined considering the maximum static equivalent load.

$$S_0 = C_0 / P_0 \dots \dots \text{Formula (6.11)}$$

where,

S_0 : Safety factor

C_0 : Basic static rated load, N
(radial bearings: C_{0r} , thrust bearings: C_{0a})

$P_0 \text{ max}$: Maximum static equivalent load, N
(radial: $P_{0r \text{ max}}$, thrust: $C_{0a \text{ max}}$)



Table 6.3 Minimum safety factor values S_o

Operating conditions	Roller bearings
High rotational accuracy demand	3.0
Normal rotating accuracy demand (Universal application)	1.5
Slight rotational accuracy deterioration permitted (Low speed, heavy loading, etc.)	1.0

Note 1 : For drawn-cup needle roller bearings, min. S_o value=3.
 2 : When vibration and/or shock loads are present, a load factor based on the shock load needs to be included in the P_o max value.

7. Bearing handling

Bearings are precision parts and, in order to preserve their accuracy and reliability, care must be exercised in their handling. In particular, bearing cleanliness must be maintained, sharp impacts avoided, and rust prevented.

7.1 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%.

7.2 Installation

When bearings are being installed on shafts or in housings, the bearing rings should never be struck directly with a hammer or a drift, as shown in Fig. 7.1, because damage to the bearing may result. Any force applied to the bearing should always be evenly distributed over the entire bearing ring face.

7.2.1 Installation preparations

Bearings should be fitted in a clean, dry work area. Specially for small and miniature bearings, a "clean room" should be provided as any contamination particles in the bearing will greatly affect bearing efficiency. Before installation, all fitting tools, shafts, housings, and related parts should be cleaned and any burrs or cutting chips removed if necessary. Shaft and housing fitting surfaces should also be checked for roughness, dimensional and design accuracy, and to ensure that they are within allowable tolerance limits. Bearings should not be unwrapped until just prior to installation. Normally, bearings to be used with grease lubricant can be installed as is, without removing the rust preventative. However, for bearings which will use oil lubricant, or in cases where mixing the grease and rust preventative would result in loss of lubrication efficiency, the rust preventative should be removed by washing with benzene or petroleum solvent and dried before installation. Bearings should also be washed and dried before installation if the package has been damaged or there are other chances that the bearings have been contaminated. Double shielded bearings and sealed bearings, one way clutches should never be washed.

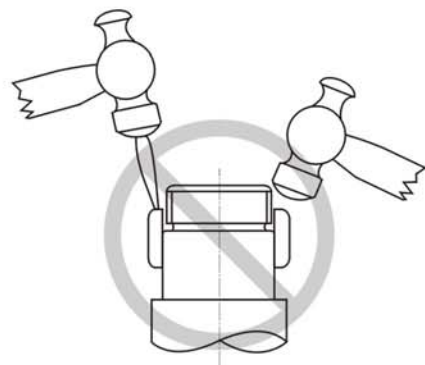


Fig. 7.1

7.2.2 Installing cylindrical bore bearings

Bearings with relatively small interference fits can be press fit at room temperature by using a sleeve against the inner ring face as shown in Fig. 7.2. Usually, bearings are installed by striking the sleeve with a hammer; however, when installing a large number of bearings, a mechanical or hydraulic press should be used.

When installing non-separable bearings on a shaft and in a housing simultaneously, a pad which distributes fitting pressure evenly over the inner and outer rings is used as shown in Fig. 7.3. When fitting bearings which have a large inner ring interference fit, or when fitting bearings on shafts that have a large diameter, a considerable amount of force is required to install the bearing at room temperature. Installation can be facilitated by heating and expanding the inner ring beforehand. The required relative temperature difference between the inner ring and the fitting surface depends on the amount of interference and the shaft fitting surface diameter. Fig. 7.4 shows the relation between the bearing inner bore diameter temperature differential and the amount of thermal expansion. In any event, bearing-s should never be heated above 120°C.

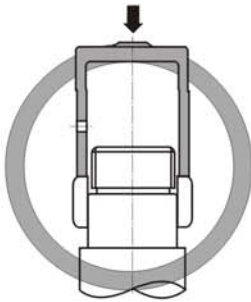


Fig. 7.2 Fitting sleeve pressure against inner ring

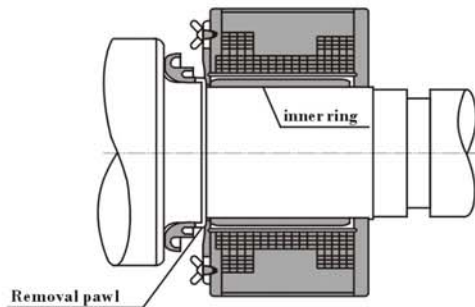


Fig. 7.4 Removal of inner ring using an induction heater

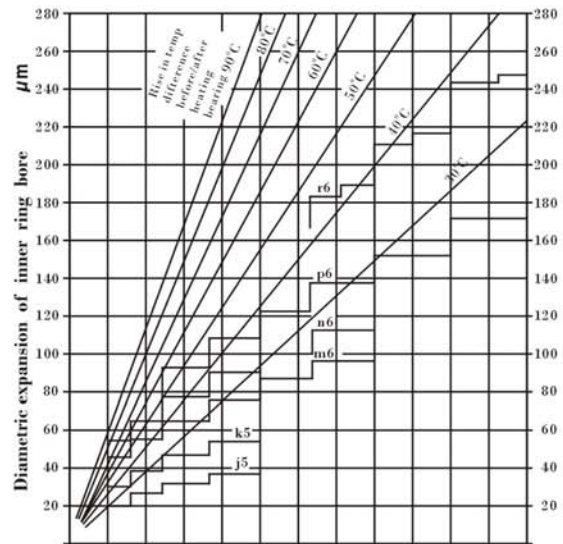


Fig. 7.3 Temperature differential required for shrinkage fit of inner ring



The most commonly used method of heating bearings is to immerse them in hot oil. However, this method should not be used for pre lubricated shielded and sealed bearings. To avoid overheating parts of the bearings they should never be brought into direct contact with the heat source, but instead should be suspended inside the heating tank or placed on a wire grid. If bearings are dry-heated with a heating cabinet or hot plate, they can be mounted without drying. An induction heater can be used to quickly heat bearings in a dry state (always demagnetize). When heated bearings are installed on shafts, the inner rings must be held against the shaft abutment until the bearing has been cooled in order to prevent gaps from occurring between the ring and the abutment face.

7.2.3 Installation of outer ring

Even for tight interference fits, the outer rings of small type bearings can be installed by driving them into housings at room temperature. For large type bearings, the housing can be heated before installing the bearing, or the bearing's outer ring can be cooled with dry ice, etc. Before installing, if dry ice or other cooling agent is used, atmospheric moisture will condense on bearing surfaces, and therefore appropriate rust preventative measures are necessary.

7.3 Post installation running test

To insure that the bearing has been properly installed, a running test is performed after installation is completed. The shaft or housing is first rotated by hand and if no problems are observed a low speed, no load power test is performed. If no abnormalities are observed, the load and speed are gradually increased to operating conditions. During the test if any unusual noise, vibration, or temperature rise is observed the test should be stopped and the equipment examined. If necessary, the bearing should be disassembled for inspection. To check bearing running noise, the sound can be amplified and the type of noise ascertained with a listening instrument placed against the housing. A clear, smooth and continuous running sound is normal. A high, metallic or irregular sound indicates some error in function. Vibration can be accurately checked with a vibration measuring instrument, and the amplitude and frequency characteristics measured against a fixed standard. Usually the bearing temperature can be estimated from the housing surface temperature. However, if the bearing outer ring is accessible through oil inlets, etc., the temperature can be more accurately measured. Under normal conditions, bearing temperature rises with rotation time and then reaches a stable operating temperature after a certain period of time. If the temperature does not level off and continues to rise, or if there is a sudden temperature rise, or if the temperature is unusually high, the bearing should be inspected.

7.4 Bearing disassembly

Bearings are often removed as part of periodic inspection procedures or during the replacement of other parts. However, the shaft and housing are almost always reinstalled, and in more than a few cases the bearings themselves are reused. These bearings, shafts, housings, and other related parts must be designed to prevent damage during disassembly procedures, and the proper disassembly tools must be employed. When removing inner and outer rings which have been installed with interference fits, the dismounting force should be applied to that ring only and not applied to other parts of the bearing, as this may cause internal damage to the bearing's raceway or rolling elements.

7.4.1 Disassembly of bearings with cylindrical bores

For small type bearings, the pullers shown in Fig. 7.5 or the press method shown in Fig. 7.6 can be used for disassembly. When used properly, these methods can improve disassembly efficiency and prevent damage to bearings. To facilitate disassembly procedures, attention should be given to planning the designs of shafts and housings, such as providing extraction grooves on the shaft and housing for puller claws as shown Figs. 7.7 and 7.8. Threaded bolt holes should also be provided in housings to facilitate the pressing out of outer rings as shown in Fig. 7.9.

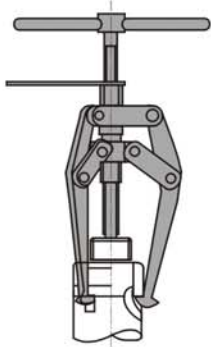


Fig. 7.5 Puller disassembly

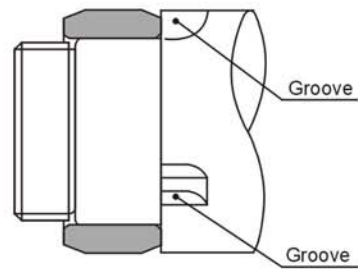


Fig. 7.7 Extracting grooves

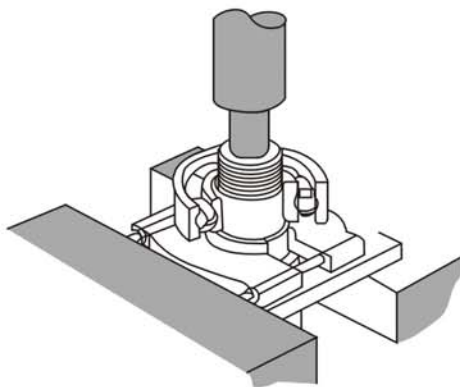


Fig. 7.6 press disassembly

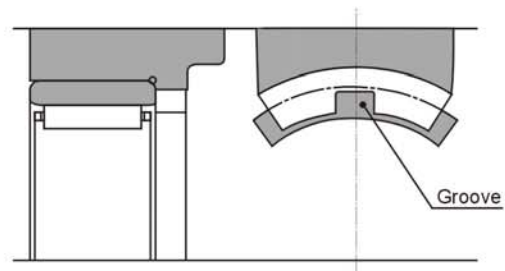


Fig. 7.8 Extraction groove for outer ring disassembly

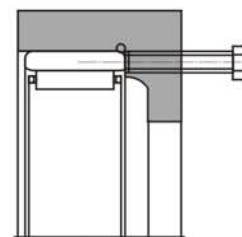


Fig. 7.9 Outer ring disassembly bolt



KSM[®] NOTE

A series of horizontal dashed lines for writing notes, spanning the width of the page.





Needle roller and cage assemblies



TECHNICAL SUPPLEMENT 126

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1. Types and designs

KSM Needle Roller and Cage Assemblies are supplied in single row Fig. 1. The single row cages are available in two configurations: machined ring (series K), and molded polyamide reinforced with glass or carbon fiber (series K - TV). The T2 cage features a maximum allowable operating temperature of 120° C and maximum allowable continuous operating temperature of 100° C .



Fig.1

2. Bearing numbers

As summarized in Fig. 2, the bearing numbers of KSM Needle Roller and Cage Assemblies comprise a series number, a dimension code (inscribed enveloping circle diameter × roller set outside diameter × cage width), and a suffix.

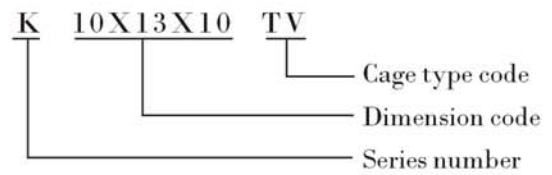


Fig. 2

3. Radial clearance

When the shaft and housing are used as the raceway, the radial clearance of the ball and cage assembly is governed by the shaft diameter and housing bore dimension. Usually, if the tolerance range of the needle rollers is one of the standard groups, the shaft diameter and housing bore diameter in Table 1 are used.

Table 1 Recommended fits

Shaft dia. mm		≥80	81~139	140≥
Radial clearance	Smaller than normal clearance	j5/G6	H5/G6	h5/G6
	Normal clearance	h5/G6	g5/G6	f5/H6
	Greater than normal clearance	g6/G6	f6/G6	f6/G6

4. Shaft and housing requirements

When used as a raceway, a shaft and housing must satisfy the requirements indicated in Table 2.

Table 2 Shaft and housing requirements

Characteristics	Shaft	Housing
Circularity (max.)	IT3	IT4
Cylindricity (max.)	IT3	IT4
Surface roughness (max.)	0.4a	0.4a
Surface roughness (max.)	HRC58~64	

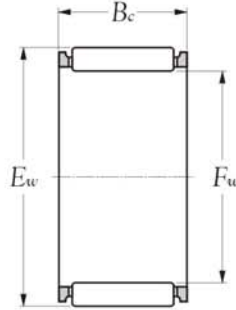
5. Mounting dimensions for bearings

Table 3 gives the recommended tolerance for the cage guide width *b* dimension relative to the nominal dimension " *B_c* ".

Table 3 Tolerance for guide width

Series classification	Tolerance for <i>b</i>
Metric	$B_c \begin{matrix} +0.2 \\ 0 \end{matrix}$

Cage and roller type needle roller bearings series K



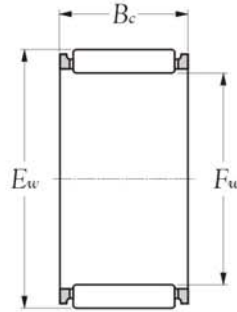
Inner bore Fw mm	Bearing number	Principal dimensions		Basic load ratings				Max runout speed		Mass kg (approx.)
		Ew mm	Bc mm	dynamic C N	static Co	dynamic C kgf	static Co	grease r/min	oil r/min	
3	K 3x6x7	6	7 ^{-0.2/-0.55}	1460	970	149	99	33000	50000	0.0004
4	K 4x7x7	7	7 ^{-0.2/-0.55}	1770	1270	180	129	30000	45000	0.0005
5	K 5x8x8	8	8 ^{-0.2/-0.55}	2640	2190	269	224	27000	40000	0.0007
5	K 5x8x10	8	10 ^{-0.2/-0.55}	2720	2250	277	230	27000	40000	0.0009
6	K 6x9x8	9	8 ^{-0.2/-0.55}	2660	2280	272	233	25000	37000	0.0009
6	K 6x9x10	9	10 ^{-0.2/-0.55}	3400	3150	345	320	25000	37000	0.0011
6	K 6x10x13	10	13 ^{-0.2/-0.55}	4400	3700	450	380	25000	37000	0.0019
7	K 7x10x8	10	8 ^{-0.2/-0.55}	2670	2350	272	239	23000	34000	0.0009
7	K 7x10x10	10	10 ^{-0.2/-0.55}	3400	3200	345	330	23000	34000	0.0011
8	K 8x11x8	11	8 ^{-0.2/-0.55}	3150	3000	320	305	21000	32000	0.0011
8	K 8x11x10	11	10 ^{-0.2/-0.55}	4000	4100	410	420	21000	32000	0.0013
8	K 8x11x13	11	13 ^{-0.2/-0.55}	4850	5200	495	535	21000	32000	0.0026
8	K 8x12x10	12	10 ^{-0.2/-0.55}	4650	4150	475	425	21000	32000	0.0020
8	K 8x12x12	12	12 ^{-0.2/-0.55}	5600	5300	570	540	21000	32000	0.0034
8	K 8x12x13	12	13 ^{-0.2/-0.55}	5600	5300	570	540	21000	32000	0.0036
9	K 9x12x10	12	10 ^{-0.2/-0.55}	4550	5000	465	510	20000	30000	0.0015
9	K 9x12x13	12	13 ^{-0.2/-0.55}	5500	6400	560	650	20000	30000	0.0021
10	K 10x13x10	13	10 ^{-0.2/-0.55}	4550	5100	460	520	19000	28000	0.0016
10	K 10x13x13	13	13 ^{-0.2/-0.55}	5450	6450	555	660	19000	28000	0.0031
10	K 10x14x8	14	8 ^{-0.2/-0.55}	4300	3950	435	405	19000	28000	0.0027
10	K 10x14x10	14	10 ^{-0.2/-0.55}	5500	5450	560	555	19000	28000	0.0034
10	K 10x14x13	14	13 ^{-0.2/-0.55}	6600	6900	675	705	19000	28000	0.0044
10	K 10x16x12	16	12 ^{-0.2/-0.55}	7100	5950	720	610	19000	28000	0.0066
11	K 11x14x10	14	10 ^{-0.2/-0.55}	5050	6000	515	615	18000	27000	0.0028
12	K 12x15x9	15	9 ^{-0.2/-0.55}	4450	5250	455	535	17000	26000	0.0027
12	K 12x15x13	15	13 ^{-0.2/-0.55}	6000	7700	615	785	17000	26000	0.0038

Technical supplement

Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>		
Polymid - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Brass - <input checked="" type="checkbox"/>		

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Cage and roller type needle roller bearings series K

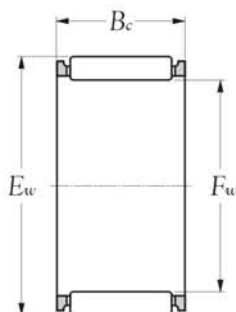


Inner bore F_w mm	Bearing number	Principal dimensions		Basic load ratings				Max runout speed		Mass kg (approx.)
		E_w mm	B_c mm	dynamic C N	static C_o kgf	dynamic C kgf	static C_o kgf	grease r/min	oil r/min	
12	K 12x16x8	16	8 ^{-0.2/-0.55}	4850	4900	495	500	17000	26000	0.0034
12	K 12x16x13	16	13 ^{-0.2/-0.55}	7500	8500	765	870	17000	26000	0.0055
12	K 12x17x13	17	13 ^{-0.2/-0.55}	9000	9400	920	960	17000	26000	0.0075
12	K 12x18x12	18	12 ^{-0.2/-0.55}	8650	8000	880	815	17000	26000	0.0084
14	K 14x17x10	17	10 ^{-0.2/-0.55}	5400	7050	550	720	16000	24000	0.0033
14	K 14x18x10	18	10 ^{-0.2/-0.55}	6900	8000	705	815	16000	24000	0.0046
14	K 14x18x11	18	11 ^{-0.2/-0.55}	7600	9050	775	925	16000	24000	0.0053
14	K 14x18x13	18	13 ^{-0.2/-0.55}	8300	10100	845	1030	16000	24000	0.0063
14	K 14x18x17	18	17 ^{-0.2/-0.55}	10900	14400	1120	1470	16000	24000	0.0081
14	K 14x19x13	19	13 ^{-0.2/-0.55}	8950	9650	915	985	16000	24000	0.0080
14	K 14x20x12	20	12 ^{-0.2/-0.55}	9350	9150	955	930	16000	24000	0.0095
14	K 14x20x17	20	17 ^{-0.2/-0.55}	13500	14600	1370	1490	16000	24000	0.0140
15	K 15x18x14	18	14 ^{-0.2/-0.55}	7850	11600	800	1190	15000	23000	0.0060
15	K 15x19x17	19	17 ^{-0.2/-0.55}	10900	14600	1110	1490	15000	23000	0.0090
15	K 15x20x13	20	13 ^{-0.2/-0.55}	10100	11500	1030	1170	15000	23000	0.0088
15	K 15x21x15	21	15 ^{-0.2/-0.55}	11900	12500	1210	1280	15000	23000	0.0130
15	K 15x21x21	21	21 ^{-0.2/-0.55}	16500	19100	1680	1950	15000	23000	0.0170
16	K 16x20x10	20	10 ^{-0.2/-0.55}	7500	9250	765	945	15000	23000	0.0057
16	K 16x20x11	20	11 ^{-0.2/-0.55}	8300	10500	845	1070	15000	23000	0.0061
16	K 16x20x13	20	13 ^{-0.2/-0.55}	9050	11800	925	1200	15000	23000	0.0071
16	K 16x22x12	22	12 ^{-0.2/-0.55}	11700	12500	1190	1280	15000	23000	0.0100
16	K 16x22x17	22	17 ^{-0.2/-0.55}	14400	16400	1470	1670	15000	23000	0.0150
16	K 16x22x20	22	20 ^{-0.2/-0.55}	16000	18800	1640	1920	15000	23000	0.0170
17	K 17x21x15	21	15 ^{-0.2/-0.55}	10400	14400	1060	1460	15000	22000	0.0089
17	K 17x21x17	21	17 ^{-0.2/-0.55}	11800	16900	1210	1720	15000	22000	0.0095
17	K 17x22x20	22	20 ^{-0.2/-0.55}	14700	19200	1500	1960	15000	22000	0.0150

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Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Cage and roller type needle roller bearings series K

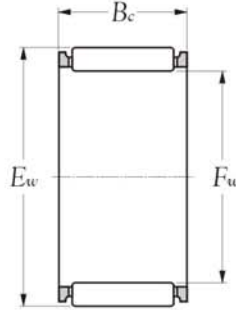


Inner bore Fw mm	Bearing number	Principal dimensions		Basic load ratings				Max runout speed		Mass kg (approx.)
		Ew mm	Bc mm	dynamic C N	static Co	dynamic C kgf	static Co	grease r/min	oil	
17	K 17x23x17	23	17 ^{-0.2} _{-0.55}	14400	16500	1460	1690	15000	22000	0.0160
18	K 18x22x10	22	10 ^{-0.2} _{-0.55}	7400	9400	755	955	14000	21000	0.0061
18	K 18x22x13	22	13 ^{-0.2} _{-0.55}	8900	11900	910	1210	14000	21000	0.0077
18	K 18x22x17	22	17 ^{-0.2} _{-0.55}	11700	17000	1200	1730	14000	21000	0.0110
18	K 18x24x12	24	12 ^{-0.2} _{-0.55}	12300	13800	1250	1410	14000	21000	0.0120
18	K 18x24x13	24	13 ^{-0.2} _{-0.55}	11600	12800	1180	1300	14000	21000	0.0130
18	K 18x24x20	24	20 ^{-0.2} _{-0.55}	17000	20900	1730	2130	14000	21000	0.0190
18	K 18x25x17	25	17 ^{-0.2} _{-0.55}	18000	20400	1830	2080	14000	21000	0.0190
18	K 18x25x22	25	22 ^{-0.2} _{-0.55}	22100	26600	2250	2710	14000	21000	0.0240
19	K 19x23x13	23	13 ^{-0.2} _{-0.55}	9650	13500	985	1370	14000	21000	0.0082
19	K 19x23x17	23	17 ^{-0.2} _{-0.55}	12700	19200	1300	1960	14000	21000	0.0110
20	K 20x24x11	24	11 ^{-0.2} _{-0.55}	9500	13400	970	1370	13000	20000	0.0072
20	K 20x26x12	26	12 ^{-0.2} _{-0.55}	12900	15100	1320	1540	13000	20000	0.0130
20	K 20x28x25	28	25 ^{-0.2} _{-0.55}	27100	32500	2760	3300	13000	20000	0.0370
21	K 21x25x13	25	13 ^{-0.2} _{-0.55}	10300	15100	1050	1540	13000	19000	0.0090
21	K 21x25x17	25	17 ^{-0.2} _{-0.55}	13600	21500	1380	2200	13000	19000	0.0120
22	K 22x26x13	26	13 ^{-0.2} _{-0.55}	10200	15200	1040	1550	12000	18000	0.0094
22	K 22x27x20	27	20 ^{-0.2} _{-0.55}	17500	25900	1780	2640	12000	18000	0.0200
22	K 22x28x17	28	17 ^{-0.2} _{-0.55}	17700	23300	1810	2380	12000	18000	0.0200
22	K 22x30x15	30	15 ^{-0.2} _{-0.55}	19300	21700	1970	2210	12000	18000	0.0220
23	K 23x28x24	28	24 ^{-0.2} _{-0.55}	19800	31000	2020	3150	11000	17000	0.0230
24	K 24x28x13	28	13 ^{-0.2} _{-0.55}	10800	16800	1100	1710	11000	17000	0.0100
24	K 24x28x17	28	17 ^{-0.2} _{-0.55}	14300	23900	1460	2440	11000	17000	0.0130
24	K 24x29x13	29	13 ^{-0.2} _{-0.55}	12300	16900	1250	1720	11000	17000	0.0120
24	K 24x30x17	30	17 ^{-0.2} _{-0.55}	18400	25200	1880	2570	11000	17000	0.0220
25	K 25x29x10	29	10 ^{-0.2} _{-0.55}	8950	13300	910	1350	11000	16000	0.0083

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

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Cage and roller type needle roller bearings series K

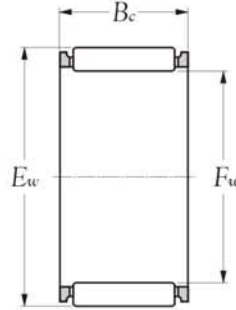


Inner bore F_w mm	Bearing number	Principal dimensions		Basic load ratings				Max runout speed		Mass kg (approx.)
		E_w mm	B_c mm	dynamic C N	static C_o kgf	dynamic C kgf	static C_o kgf	grease r/min	oil r/min	
25	K 25x29x13	29	13 ^{-0.2/-0.55}	10800	16900	1100	1720	11000	16000	0.0100
25	K 25x30x13	30	13 ^{-0.2/-0.55}	13200	18800	1350	1920	11000	16000	0.0130
25	K 25x31x13	31	13 ^{-0.2/-0.55}	15200	19900	1550	2030	11000	16000	0.0160
25	K 25x31x14	31	14 ^{-0.2/-0.55}	16500	22100	1680	2250	11000	16000	0.0180
25	K 25x31x17	31	17 ^{-0.2/-0.55}	18300	25300	1870	2580	11000	16000	0.0220
25	K 25x31x21	31	21 ^{-0.2/-0.55}	22500	33000	2290	3350	11000	16000	0.0260
26	K 26x30x13	30	13 ^{-0.2/-0.55}	11800	19200	1200	1960	10000	15000	0.0110
26	K 26x30x17	30	17 ^{-0.2/-0.55}	15500	27400	1580	2790	10000	15000	0.0150
26	K 26x34x22	34	22 ^{-0.2/-0.55}	24200	30000	2470	3050	10000	15000	0.0410
28	K 28x32x17	32	17 ^{-0.2/-0.55}	15300	27500	1560	2810	9500	14000	0.0170
28	K 28x32x21	32	21 ^{-0.2/-0.55}	18700	35500	1910	3650	9500	14000	0.0200
28	K 28x33x13	33	13 ^{-0.2/-0.55}	13900	20900	1420	2130	9500	14000	0.0150
28	K 28x33x27	33	27 ^{-0.2/-0.55}	28300	52000	2890	5300	9500	14000	0.0320
28	K 28x34x14	34	14 ^{-0.2/-0.55}	17500	24800	1790	2530	9500	14000	0.0200
28	K 28x34x17	34	17 ^{-0.2/-0.55}	18100	25800	1850	2630	9500	14000	0.0240
28	K 28x35x16	35	16 ^{-0.2/-0.55}	21200	28400	2160	2900	9500	14000	0.0290
28	K 28x35x18	35	18 ^{-0.2/-0.55}	21500	28900	2190	2950	9500	14000	0.0310
29	K 29x34x27	34	27 ^{-0.2/-0.55}	28100	52000	2870	5300	9500	14000	0.0330
30	K 30x37x16	37	16 ^{-0.2/-0.55}	21900	30500	2230	3100	8500	13000	0.029
30	K 30x37x18	37	18 ^{-0.2/-0.55}	23300	33000	2370	3350	8500	13000	0.034
30	K 30x38x18	38	18 ^{-0.2/-0.55}	25000	33000	2550	3350	8500	13000	0.036
32	K 32x37x13	37	13 ^{-0.2/-0.55}	14500	23000	1480	2350	8500	13000	0.018
32	K 32x38x26	38	26 ^{-0.2/-0.55}	31500	54000	3200	5550	8500	13000	0.041
32	K 32x39x16	39	16 ^{-0.2/-0.55}	22600	32000	2310	3300	8500	13000	0.034
32	K 32x39x18	39	18 ^{-0.2/-0.55}	24000	35000	2450	3550	8500	13000	0.037
35	K 35x40x13	40	13 ^{-0.2/-0.55}	15200	25100	1550	2560	7500	11000	0.019

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Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Cage and roller type needle roller bearings series K

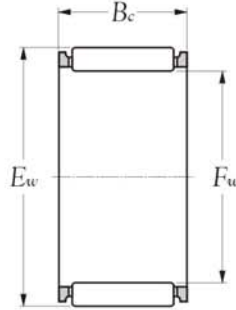


Inner bore Fw mm	Bearing number	Principal dimensions		Basic load ratings				Max runout speed		Mass kg (approx.)
		Ew mm	Bc	dynamic C N	static Co	dynamic C kgf	static Co	grease oil r/min		
35	K 35x40x17	40	17 ^{-0.2} _{-0.55}	20000	36000	2040	3650	7500	11000	0.025
35	K 35x41x14	41	14 ^{-0.2} _{-0.55}	19400	30500	1980	3100	7500	11000	0.026
35	K 35x41x15	41	15 ^{-0.2} _{-0.55}	20900	33500	2130	3400	7500	11000	0.027
35	K 35x42x16	42	16 ^{-0.2} _{-0.55}	24100	36000	2450	3650	7500	11000	0.035
35	K 35x42x18	42	18 ^{-0.2} _{-0.55}	24700	37000	2510	3750	7500	11000	0.039
35	K 35x42x20	42	20 ^{-0.2} _{-0.55}	28500	44500	2910	4550	7500	11000	0.041
35	K 35x42x30	42	30 ^{-0.2} _{-0.55}	39500	68000	4050	6950	7500	11000	0.062
37	K 37x42x13	42	13 ^{-0.2} _{-0.55}	15900	27100	1620	2770	7500	11000	0.021
37	K 37x44x18	44	18 ^{-0.2} _{-0.55}	26300	41000	2680	4150	7500	11000	0.042
38	K 38x43x17	43	17 ^{-0.2} _{-0.55}	20900	38500	2130	3950	7500	11000	0.026
38	K 38x43x27	43	27 ^{-0.2} _{-0.55}	32000	67500	3300	6900	7500	11000	0.043
38	K 38x46x32	46	32 ^{-0.2} _{-0.55}	54000	95500	5500	9700	7500	11000	0.073
40	K 40x45x13	45	13 ^{-0.2} _{-0.55}	16500	29200	1680	2980	6500	10000	0.022
40	K 40x45x17	45	17 ^{-0.2} _{-0.55}	21800	41500	2220	4250	6500	10000	0.027
40	K 40x45x21	45	21 ^{-0.2} _{-0.55}	26700	54000	2720	5500	6500	10000	0.037
40	K 40x45x27	45	27 ^{-0.2} _{-0.55}	33500	72500	3400	7400	6500	10000	0.044
40	K 40x46x17	46	17 ^{-0.2} _{-0.55}	24600	43000	2500	4350	6500	10000	0.030
40	K 40x47x18	47	18 ^{-0.2} _{-0.55}	27700	45000	2820	4550	6500	10000	0.045
40	K 40x47x20	47	20 ^{-0.2} _{-0.55}	31000	51500	3150	5250	6500	10000	0.048
40	K 40x48x20	48	20 ^{-0.2} _{-0.55}	33000	51000	3350	5200	6500	10000	0.052
40	K 40x48x25	48	25 ^{-0.2} _{-0.55}	42500	71000	4350	7250	6500	10000	0.065
42	K 42x47x17	47	17 ^{-0.2} _{-0.55}	22100	43000	2250	4400	6500	9500	0.028
42	K 42x47x27	47	27 ^{-0.2} _{-0.55}	34000	75500	3450	7700	6500	9500	0.047
42	K 42x48x17	48	17 ^{-0.2} _{-0.55}	25700	46000	2630	4700	6500	9500	0.036
42	K 42x50x20	50	20 ^{-0.2} _{-0.55}	34000	53500	3450	5500	6500	9500	0.054
43	K 43x48x17	48	17 ^{-0.2} _{-0.55}	22000	43000	2240	4400	6500	9500	0.029

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Cage and roller type needle roller bearings series K

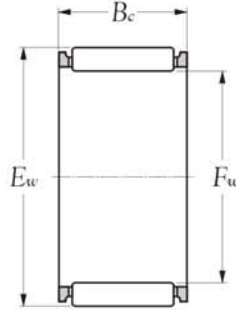


Inner bore F_w mm	Bearing number	Principal dimensions		Basic load ratings				Max runout speed		Mass kg (approx.)
		E_w mm	B_c mm	dynamic C N	static C_o kgf	dynamic C kgf	static C_o kgf	grease r/min	oil r/min	
43	K 43x48x27	48	27.0 ^{-0.2} _{-0.55}	34000	75500	3450	7700	6500	9500	0.046
43	K 43x50x18	50	18.0 ^{-0.2} _{-0.55}	29100	49000	2960	5000	6500	9500	0.049
45	K 45x49x19	49	19.0 ^{-0.2} _{-0.55}	22100	52000	2260	5300	6000	9000	0.027
45	K 45x50x27	50	27.0 ^{-0.2} _{-0.55}	34500	78000	3500	7950	6000	9000	0.050
45	K 45x52x18	52	18.0 ^{-0.2} _{-0.55}	29700	51000	3000	5200	6000	9000	0.051
45	K 45x52x21	52	21.0 ^{-0.2} _{-0.55}	32000	56500	3300	5750	6000	9000	0.061
45	K 45x53x20	53	20.0 ^{-0.2} _{-0.55}	36000	59000	3650	6000	6000	9000	0.062
45	K 45x53x25	53	25.0 ^{-0.2} _{-0.55}	46500	82000	4700	8400	6000	9000	0.077
47	K 47x52x17	52	17.0 ^{-0.2} _{-0.55}	23200	47500	2360	4850	5500	8500	0.033
47	K 47x52x27	52	27.0 ^{-0.2} _{-0.55}	35500	83000	3650	8450	5500	8500	0.051
48	K 48x54x19	54	19.0 ^{-0.2} _{-0.55}	31000	61000	3150	6250	5500	8500	0.044
50	K 50x55x13.5	55	13.5 ^{-0.2} _{-0.55}	18100	35500	1850	3600	5500	8000	0.023
50	K 50x55x20	55	20.0 ^{-0.2} _{-0.55}	27900	62000	2850	6300	5500	8000	0.042
50	K 50x55x27	55	27.0 ^{-0.2} _{-0.55}	37000	88500	3750	9000	5500	8000	0.053
50	K 50x55x30	55	30.0 ^{-0.2} _{-0.55}	39500	97000	4050	9900	5500	8000	0.059
50	K 50x57x18	57	18.0 ^{-0.2} _{-0.55}	31500	57000	3200	5800	5500	8000	0.053
50	K 50x58x20	58	20.0 ^{-0.2} _{-0.55}	38500	67500	3950	6850	5500	8000	0.065
50	K 50x58x25	58	25.0 ^{-0.2} _{-0.55}	48500	90000	4950	9150	5500	8000	0.081
52	K 52x58x19	58	19.0 ^{-0.2} _{-0.55}	32000	65500	3250	6650	5000	7500	0.048
55	K 55x60x17	60	17.0 ^{-0.2} _{-0.55}	25800	58000	2630	5900	5000	7500	0.043
55	K 55x60x20	60	20.0 ^{-0.2} _{-0.55}	28800	66500	2940	6750	5000	7500	0.045
55	K 55x60x30	60	30.0 ^{-0.2} _{-0.55}	42000	108000	4300	11000	5000	7500	0.069
55	K 55x61x19	61	19.0 ^{-0.2} _{-0.55}	33000	69500	3350	7100	5000	7500	0.051
55	K 55x61x20	61	20.0 ^{-0.2} _{-0.55}	33000	69500	3350	7100	5000	7500	0.054
55	K 55x61x30	61	30.0 ^{-0.2} _{-0.55}	48000	113000	4900	11500	5000	7500	0.081
55	K 55x62x18	62	18.0 ^{-0.2} _{-0.55}	33500	63000	3400	6450	5000	7500	0.054

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Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Cage and roller type needle roller bearings series K

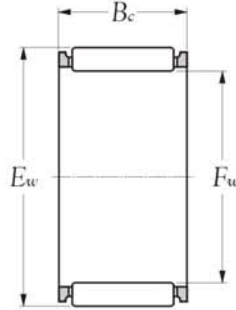


Inner bore F_w mm	Bearing number	Principal dimensions		Basic load ratings				Max runout speed		Mass kg (approx.)
		E_w mm	B_c mm	dynamic C N	static C_o	dynamic C kgf	static C_o	grease r/min	oil r/min	
55	K 55x63x20	63	20 ^{-0.2/-0.55}	39000	70000	3950	7100	5000	7500	0.073
55	K 55x63x25	63	25 ^{-0.2/-0.55}	50500	97500	5150	9950	5000	7500	0.088
55	K 55x63x32	63	32 ^{-0.2/-0.55}	61000	125000	6200	12700	5000	7500	0.117
58	K 58x64x19	64	19 ^{-0.2/-0.55}	34000	73500	3450	7500	4700	7000	0.052
60	K 60x65x20	65	20 ^{-0.2/-0.55}	29800	71500	3050	7300	4300	6500	0.051
60	K 60x65x30	65	30 ^{-0.2/-0.55}	43500	116000	4450	11800	4300	6500	0.071
60	K 60x66x19	66	19 ^{-0.2/-0.55}	33500	73500	3450	7500	4300	6500	0.053
60	K 60x66x20	66	20 ^{-0.2/-0.55}	33500	73500	3450	7500	4300	6500	0.056
60	K 60x66x30	66	30 ^{-0.2/-0.55}	49000	119000	5000	12200	4300	6500	0.084
60	K 60x68x15	68	15 ^{-0.2/-0.55}	27200	45500	2780	4650	4300	6500	0.058
60	K 60x68x20	68	20 ^{-0.2/-0.55}	40000	75000	4100	7650	4300	6500	0.077
60	K 60x68x23	68	23 ^{-0.2/-0.55}	44500	85000	4500	8700	4300	6500	0.092
60	K 60x68x25	68	25 ^{-0.2/-0.55}	52000	105000	5300	10700	4300	6500	0.097
60	K 60x68x27	68	27 ^{-0.2/-0.55}	52000	105000	5300	10700	4300	6500	0.098
61	K 61x66x20	66	20 ^{-0.2/-0.55}	29700	71500	3050	7300	4300	6500	0.054
61	K 61x66x30	66	30 ^{-0.2/-0.55}	43500	116000	4400	11900	4300	6500	0.073
63	K 63x70x21	70	21 ^{-0.2/-0.55}	44500	95500	4500	9700	4300	6500	0.075
64	K 64x70x16	70	16 ^{-0.2/-0.55}	28400	60500	2900	6150	4300	6500	0.053
65	K 65x70x20	70	20 ^{-0.2/-0.55}	30500	75000	3100	7650	4000	6000	0.055
65	K 65x70x30	70	30 ^{-0.2/-0.55}	45000	124000	4600	12700	4000	6000	0.083
65	K 65x73x23	73	23 ^{-0.2/-0.55}	47000	94000	4800	9600	4000	6000	0.100
65	K 65x73x30	73	30 ^{-0.2/-0.55}	61000	132000	6200	13400	4000	6000	0.126
68	K 68x74x20	74	20 ^{-0.2/-0.55}	36000	83500	3700	8550	4000	6000	0.065
68	K 68x74x30	74	30 ^{-0.2/-0.55}	51500	133000	5250	13500	4000	6000	0.097
68	K 68x75x21	75	21 ^{-0.2/-0.55}	45500	101000	4600	10300	4000	6000	0.077
70	K 70x76x20	76	20 ^{-0.2/-0.55}	36500	86000	3700	8750	3700	5500	0.070

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Cage and roller type needle roller bearings series K

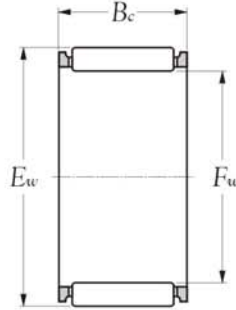


Inner bore F _w mm	Bearing number	Principal dimensions		Basic load ratings				Max runout speed		Mass kg (approx.)
		E _w mm	B _c mm	dynamic C N	static C ₀ kgf	dynamic C kgf	static C ₀	grease r/min	oil r/min	
70	K 70x76x30	76	30 ^{-0.2/-0.55}	53000	139000	5400	14200	3700	5500	0.100
70	K 70x77x21	77	21 ^{-0.2/-0.55}	45000	101000	4600	10300	3700	5500	0.080
70	K 70x78x23	78	23 ^{-0.2/-0.55}	49500	103000	5050	10500	3700	5500	0.107
70	K 70x78x30	78	30 ^{-0.2/-0.55}	65500	149000	6700	15200	3700	5500	0.136
72	K 72x79x21	79	21 ^{-0.2/-0.55}	46500	106000	4750	10800	3700	5500	0.085
73	K 73x79x30	79	30 ^{-0.2/-0.55}	54500	146000	5550	14900	3700	5500	0.106
75	K 75x81x30	81	30 ^{-0.2/-0.55}	56000	152000	5700	15500	3700	5500	0.108
75	K 75x82x21	82	21 ^{-0.2/-0.55}	46000	106000	4700	10800	3700	5500	0.088
75	K 75x83x23	83	23 ^{-0.2/-0.55}	50500	109000	5150	11100	3700	5500	0.113
75	K 75x83x30	83	30 ^{-0.2/-0.55}	67500	157000	6850	16100	3700	5500	0.147
80	K 80x86x20	86	20 ^{-0.2/-0.55}	39000	98000	4000	10000	3300	5000	0.077
80	K 80x86x30	86	30 ^{-0.2/-0.55}	57000	159000	5800	16200	3300	5000	0.110
80	K 80x88x23	88	23 ^{-0.2/-0.55}	53000	118000	5400	12100	3300	5000	0.125
80	K 80x88x26	88	26 ^{-0.2/-0.55}	61000	142000	6250	14500	3300	5000	0.131
80	K 80x88x30	88	30 ^{-0.2/-0.55}	69000	166000	7050	17000	3300	5000	0.157
85	K 85x92x30	92	30 ^{-0.2/-0.55}	66000	176000	6750	18000	3100	4700	0.142
85	K 85x93x27	93	27 ^{-0.2/-0.55}	64000	153000	6500	15600	3100	4700	0.145
85	K 85x93x30	93	30 ^{-0.2/-0.55}	71000	175000	7200	17900	3100	4700	0.160
90	K 90x97x20	97	20 ^{-0.2/-0.55}	46000	113000	4700	11500	2900	4400	0.103
90	K 90x97x30	97	30 ^{-0.2/-0.55}	67500	184000	6850	18700	2900	4400	0.151
90	K 90x98x26	98	26 ^{-0.2/-0.55}	64000	157000	6550	16000	2900	4400	0.148
90	K 90x98x27	98	27 ^{-0.2/-0.55}	64000	157000	6550	16000	2900	4400	0.150
90	K 90x98x30	98	30 ^{-0.2/-0.55}	72500	184000	7400	18800	2900	4400	0.172
95	K 95x102x21	102	21 ^{-0.2/-0.55}	48000	122000	4900	12400	2800	4200	0.115
95	K 95x102x31	102	31 ^{-0.2/-0.55}	70500	199000	7200	20300	2800	4200	0.172
95	K 95x103x27	103	27 ^{-0.2/-0.55}	65500	165000	6700	16800	2800	4200	0.159

Remark: If you have more inquiry of technical, please inquire
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Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Cage and roller type needle roller bearings series K

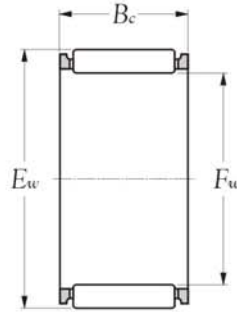


Inner bore F_w mm	Bearing number	Principal dimensions		Basic load ratings				Max runout speed		Mass kg (approx.)
		E_w mm	B_c mm	dynamic C N	static C_o kgf	dynamic C kgf	static C_o kgf	grease r/min	oil r/min	
95	K 95x103x30	103	30 ^{-0.2/-0.55}	74000	193000	7550	19600	2800	4200	0.165
100	K 100x107x21	107	21 ^{-0.3/-0.65}	49000	127000	5000	12900	2700	4000	0.120
100	K 100x107x31	107	31 ^{-0.3/-0.65}	71500	207000	7300	21100	2700	4000	0.173
100	K 100x108x27	108	27 ^{-0.3/-0.65}	61000	153000	6250	15600	2700	4000	0.176
100	K 100x108x30	108	30 ^{-0.3/-0.65}	76000	201000	7700	20500	2700	4000	0.190
105	K 105x112x21	112	21 ^{-0.3/-0.65}	48500	127000	4950	12900	2500	3800	0.130
105	K 105x112x31	112	31 ^{-0.3/-0.65}	71000	207000	7250	21100	2500	3800	0.176
105	K 105x113x30	113	30 ^{-0.3/-0.65}	77500	210000	7900	21400	2500	3800	0.198
110	K 110x117x24	117	24 ^{-0.3/-0.65}	54500	149000	5550	15200	2400	3600	0.145
110	K 110x117x34	117	34 ^{-0.3/-0.65}	77500	235000	7900	24000	2400	3600	0.205
110	K 110x118x30	118	30 ^{-0.3/-0.65}	79000	219000	8050	22300	2400	3600	0.217
115	K 115x123x27	123	27 ^{-0.3/-0.65}	64000	170000	6550	17300	2300	3500	0.200
115	K 115x125x34	125	34 ^{-0.3/-0.65}	95000	241000	9700	24600	2300	3500	0.330
120	K 120x127x24	127	24 ^{-0.3/-0.65}	57500	165000	5850	16800	2200	3300	0.160
120	K 120x127x34	127	34 ^{-0.3/-0.65}	82000	260000	8350	26600	2200	3300	0.235
125	K 125x133x35	133	35 ^{-0.3/-0.65}	87000	260000	8900	26500	2100	3200	0.275
125	K 125x135x34	135	34 ^{-0.3/-0.65}	100000	265000	10200	27000	2100	3200	0.350
130	K 130x137x24	137	24 ^{-0.3/-0.65}	59000	175000	6000	17900	2100	3100	0.170
130	K 130x137x34	137	34 ^{-0.3/-0.65}	84500	277000	8600	28300	2100	3100	0.240
135	K 135x143x35	143	35 ^{-0.3/-0.65}	92500	288000	9450	29400	2000	3000	0.300
135	K 135x150x38	150	38 ^{-0.3/-0.65}	145000	325000	14800	33500	2000	3000	0.590
145	K 145x153x26	153	26 ^{-0.3/-0.65}	72000	214000	7350	21800	1900	2800	0.250
145	K 145x153x28	153	28 ^{-0.3/-0.65}	80500	247000	8200	25200	1900	2800	0.252
145	K 145x153x36	153	36 ^{-0.3/-0.65}	100000	325000	10200	33000	1900	2800	0.335
150	K 150x160x46	160	46 ^{-0.3/-0.65}	149000	470000	15200	48000	1800	2700	0.550
155	K 155x163x26	163	26 ^{-0.3/-0.65}	73500	224000	7500	22800	1700	2600	0.270

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
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Cage and roller type needle roller bearings series K



Inner bore F_w mm	Bearing number	Principal dimensions		Basic load ratings				Max runout speed		Mass kg(s) (approx.)
		E_w mm	B_c mm	dynamic C N	static C_o	dynamic C kgf	static C_o	grease r/min	oil r/min	
155	K 155x163x36	163	36 ^{-0.3} _{-0.65}	102000	340000	10400	34500	1700	2600	0.355
160	K 160x170x46	170	46 ^{-0.3} _{-0.65}	155000	505000	15800	51500	1700	2500	0.570
165	K 165x173x26	173	26 ^{-0.3} _{-0.65}	79000	251000	8050	25600	1600	2400	0.290
165	K 165x173x32	173	32 ^{-0.3} _{-0.65}	97000	330000	9900	33500	1600	2400	0.340
165	K 165x173x36	173	36 ^{-0.3} _{-0.65}	109000	380000	11100	39000	1600	2400	0.375
170	K 170x180x46	180	46 ^{-0.3} _{-0.65}	160000	540000	16400	55000	1600	2400	0.620
175	K 175x183x32	183	32 ^{-0.3} _{-0.65}	101000	350000	10300	35500	1500	2300	0.360
185	K 185x195x37	195	37 ^{-0.3} _{-0.65}	131000	425000	13300	43500	1500	2200	0.560
195	K 195x205x37	205	37 ^{-0.3} _{-0.65}	135000	450000	13800	46000	1400	2100	0.620
210	K 210x220x42	220	42 ^{-0.3} _{-0.65}	156000	560000	15900	57000	1300	1900	0.740
220	K 220x230x42	230	42 ^{-0.3} _{-0.65}	161000	590000	16400	60000	1200	1800	0.790
240	K 240x250x42	250	42 ^{-0.3} _{-0.65}	167000	635000	17000	64500	1100	1700	0.850
265	K 265x280x50	280	50 ^{-0.3} _{-0.65}	256000	850000	26100	87000	1000	1500	1.810
285	K 285x300x50	300	50 ^{-0.3} _{-0.65}	268000	930000	27300	94500	950	1400	1.970

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
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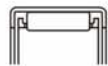


Drawn cup needle roller bearings



TECHNICAL SUPPLEMENT 138 - 139

PRODUCT INFORMATION 140 - 145



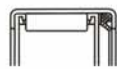
HK

140 - 143



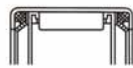
BK

140 - 143



HK..RS

144 - 145



HK..2RS

144 - 145



BK..RS

144 - 145

1. Types and designs

KSM Drawn Cup Needle Roller Bearings can be classified into open-end and closed-end types according to the form of their outer ring. The open-end design is further subcategorized into the series HK (metric standard series). The closed-end design is further classified into series BK (metric standard series). Sealed **KSM** Drawn Cup Needle Roller Bearings (suffix RS or 2RS) having a synthetic rubber seal on one or both ends are pre-filled with lithium soap grease. The allowable operating temperature range with this bearing variant is -25°C to +100°C. Its rollers are shorter than those in an open-ended type of the same dimension, so its load rating is accordingly smaller.

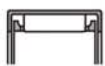


Fig. 1 Series HK

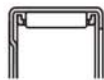


Fig. 2 Series BK

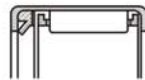


Fig. 3 Series HK..RS

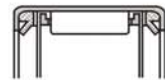


Fig. 4 Series HK..2RS

The cages used for drawn cup needle roller bearings are usually pressed-steel cages. Also, certain small drawn cup needle roller bearings use molded polyamide cages reinforced with glass fiber or carbon fiber.

2. Interpreting bearing numbers

As summarized in Fig. 5, the bearing numbers of **KSM** Drawn Cup Needle Roller Bearings comprise a series number, dimension code (inscribed enveloping circle diameter × width dimension), and suffix.



Fig. 5

3. Bearing fits

The fit of an **KSM** Drawn Cup Needle Roller Bearing to a housing is usually a tight fit where the inscribed enveloping circle diameter (Fw) of press-fit rollers satisfies ISO tolerance class F8. However, the inscribed enveloping circle diameter (Fw) of press-fit rollers varies with the material and rigidity of the housing. Therefore, actual bearing fit (interference) should be measured and determined through trials before the bearing is mounted.

If a housing has sufficient rigidity, selecting a fit to housing or shaft from Table 1 can result in an inscribed enveloping circle diameter (Fw) of press-fit rollers close to F8 and a radial clearance close to normal clearance.

Table 1 Fit to housing and shaft

Series number	Housing		Shaft	
	Steel	Light alloy	Without inner ring	With inner ring
HK, BK	N6 (N7)	R6 (R7)	h5 (h6)	K5 (j6)

4. Housing bore accuracy

Because the outer ring has a thinner wall, the performance of drawn cup needle roller bearings is significantly affected by the surface roughness and the dimensional and form accuracy of the housing bore to which a bearing is press-fit. The housing bore must satisfy the accuracy of Table 2.

5. Bearing tolerances and measuring methods

The outer ring of a drawn cup needle roller bearing is thin-walled. Therefore, some deformation of the outer ring unavoidably develops during the manufacturing process, particularly during heat treatment. However, when the outer ring is press-fit into a correctly dimensioned housing, the deformation is corrected, restoring the design functions of the outer ring. For this reason, measuring the dimensional accuracy of a drawn cup needle roller bearing before it is press-fit is meaningless. Therefore, its accuracy is evaluated by measuring its inscribed enveloping circle diameter (F_w) after it has been press-fit into a ring gauge of correct dimensions (wall thickness 20 mm or greater). The tolerances of the bore diameter of the ring gauges and the inscribed enveloping circle diameter (F_w) are given in Tables 3, which apply to the series HK and BK (standard metric series). When measuring the inscribed enveloping circle diameter (F_w) with a plug gauge, the dimension at GO side must satisfy "Low" tolerance for inscribed enveloping circle diameter, and that at NO GO side must satisfy "Height" tolerance plus $2\mu\text{m}$. These values comply with the relevant ISO standard.

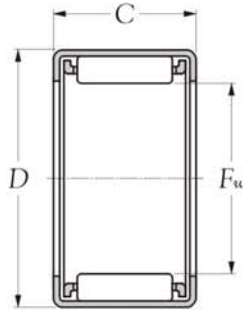
Table 2 Recommended fits

Characteristics	Tolerance
Circularity (max.)	IT4 or less
Cylindricity (max.)	IT4 or less
Surface roughness (max.)	1.6a

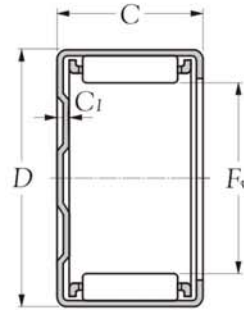
Table 3 Enveloping circle diameter tolerance (series HK and BK) (Unit: mm)

Enveloping circle dia. F_w	Outside dia. of outer ring D	Ring gauge bore dia.	Enveloping circle dia. tolerance	
			Hight	low
3	6.5	6.4840	3.016	3.006
4	8	7.9840	4.022	4.010
5	9	8.9840	5.022	5.010
6	10	9.9840	6.022	6.010
7	11	10.980	7.028	7.013
8	12	11.980	8.028	8.013
9	13	12.980	9.028	9.013
10	14	13.980	10.028	10.013
12	16	15.980	12.034	12.016
12	18	17.980	12.034	12.016
13	19	18.976	13.034	13.016
14	20	19.976	14.034	14.016
15	21	20.976	15.034	15.016
16	22	21.976	16.034	16.016
17	23	22.976	17.034	17.016
18	24	23.976	18.034	18.016
20	26	25.976	20.041	20.020
22	28	27.976	22.041	22.020
25	32	31.972	25.041	25.020
28	35	34.972	28.041	28.020
30	37	36.972	30.041	30.020
35	42	41.972	35.050	35.025
40	47	46.972	40.050	40.025
45	52	51.967	45.050	45.025
50	58	57.967	50.050	50.025
55	63	62.967	55.060	55.030
60	68	67.967	60.060	60.030

Drawn cup needle roller bearings series HK..., BK..



Type HK



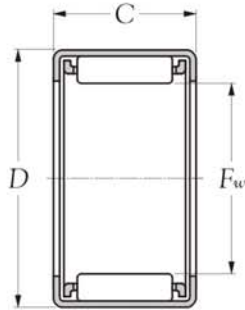
Type BK

Inner bore <i>F_w</i> mm	Bearing number		Principal dimensions			Basic load ratings				Max runout speed		Appropriate inner ring (as a reference)	Mass kg (approx.)
	Open end design	Closed end design	<i>D</i>	<i>C</i> 0-02 mm	<i>C_l</i> <i>max</i>	dynamic <i>C</i> N	static <i>C_o</i> kgf	dynamic <i>C</i> kgf	static <i>C_o</i> kgf	grease r/min	oil r/min		
3	HK 0306	-	6.5	6	-	1250	835	128	85	33000	50000	-	0.0006
3	-	BK 0306	6.5	6	0.8	1250	835	128	85	33000	50000	-	0.0007
4	HK 0408	-	8.0	8	-	1770	1270	180	129	30000	45000	-	0.0016
4	-	BK 0408	8.0	8	1.6	1770	1270	180	129	30000	45000	-	0.0018
5	HK 0509	-	9.0	9	-	2640	2190	269	224	27000	40000	-	0.0019
5	-	BK 0509	9.0	9	1.6	2640	2190	269	224	27000	40000	-	0.0021
6	HK 0609	-	10.0	9	-	2660	2280	272	233	25000	37000	-	0.0022
6	-	BK 0609	10.0	9	1.6	2660	2280	272	233	25000	37000	-	0.0024
7	HK 0709	-	11.0	9	-	3400	3250	345	330	23000	34000	-	0.0025
7	-	BK 0709	11.0	9	1.6	3400	3250	345	330	23000	34000	-	0.0027
8	HK 0810	-	12.0	10	-	3850	3950	395	400	20000	30000	IR 5x8x12	0.0032
8	-	BK 0810	12.0	10	1.6	3850	3950	395	400	20000	30000	IR 5x8x12	0.0034
9	HK 0910	-	13.0	10	-	4600	5050	465	515	18000	27000	IR 6x9x12	0.0035
9	-	BK 0910	13.0	10	1.6	4600	5050	465	515	18000	27000	IR 6x9x12	0.0039
9	HK 0912	-	13.0	12	-	5650	6650	575	680	18000	27000	IR 6x9x12	0.0042
9	-	BK 0912	13.0	12	1.6	5650	6650	575	680	18000	27000	IR 6x9x12	0.0045
10	HK 1010	-	14.0	10	-	4500	5100	460	520	16000	24000	IR 7x10x10.5	0.0038
10	-	BK 1010	14.0	10	1.6	4500	5100	460	520	16000	24000	IR 7x10x10.5	0.0042
10	HK 1012	-	14.0	12	-	5900	7250	605	735	16000	24000	IR 7x1x16	0.0045
10	-	BK 1012	14.0	12	1.6	5900	7250	605	735	16000	24000	IR 7x10x16	0.0050
10	HK 1015	-	14.0	15	-	7100	9150	725	935	16000	24000	IR 7x10x16	0.0056
10	-	BK 1015	14.0	15	1.6	7100	9150	725	935	16000	24000	IR 7x10x16	0.0062
12	HK 1210	-	16.0	10	-	5050	6250	515	635	13000	20000	IR 8x12x10.5	0.0046
12	-	BK 1210	16.0	10	1.6	5050	6250	515	635	13000	20000	IR 8x12x10.5	0.0052
12	HK 1212	-	18.0	12	-	6600	7300	675	745	13000	20000	IR 8x12x12.5	0.0091
12	-	BK 1212	18.0	12	2.7	6600	7300	675	745	13000	20000	IR 8x12x12.5	0.0100
13	HK 1312	-	19.0	12	-	7300	8450	745	865	12000	18000	IR10x13x12.5	0.0100
13	-	BK 1312	19.0	12	2.7	7300	8450	745	865	12000	18000	IR10x13x12.5	0.0110

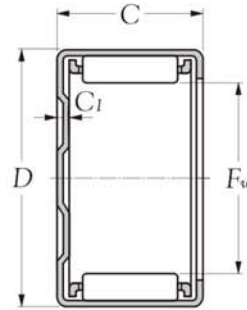
Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Drawn cup needle roller bearings series HK..., BK..



Type HK



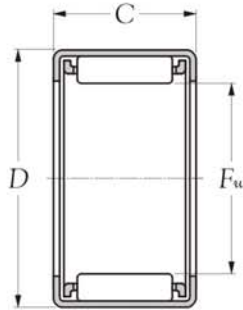
Type BK

Inner bore <i>F_w</i> mm	Bearing number		Principal dimensions			Basic load ratings				Max runout speed		Appropriate inner ring (as a reference)	Mass kg (approx.)
	Open end design	Closed end design	<i>D</i>	<i>C</i> <small>0-02</small> mm	<i>C_l</i> <small>max</small>	dynamic <i>C</i> N	static <i>C_o</i> N	dynamic <i>C</i> kgf	static <i>C_o</i> kgf	grease r/min	oil r/min		
14	HK 1412	-	20.0	12	-	7200	8500	735	865	11000	17000	IR 10x14x13	0.011
14	-	BK 1412	20.0	12	2.7	7200	8500	735	865	11000	17000	IR 10x14x13	0.012
14	HK 1416	-	20.0	16	-	10700	14000	1090	1430	11000	17000	-	0.015
14	-	BK 1416	20.0	16	2.7	10700	14000	1090	1430	11000	17000	-	0.016
15	HK 1512	-	21	12	-	7500	9100	765	930	11000	16000	IR 12x15x12.5	0.011
15	-	BK 1512	21	12	2.7	7500	9100	765	930	11000	16000	IR 12x15x12.5	0.013
15	HK 1516	-	21	16	-	10700	14400	1090	1470	11000	16000	IR 12x15x16.5	0.015
15	-	BK 1516	21	16	2.7	10700	14400	1090	1470	11000	16000	IR 12x15x16.5	0.017
16	HK 1612	-	22	12	-	7750	9700	795	990	10000	15000	IR 12x16x13	0.012
16	-	BK 1612	22	12	2.7	7750	9700	795	990	10000	15000	IR 12x16x13	0.014
16	HK 1616	-	22	16	-	11100	15300	1130	1570	10000	15000	IR 12x16x20	0.016
16	-	BK 1616	22	16	2.7	11100	15300	1130	1570	10000	15000	IR 12x16x20	0.018
17	HK 1712	-	23	12	-	8500	11100	865	1130	9500	14000	-	0.012
17	-	BK 1712	23	12	2.7	8500	11100	865	1130	9500	14000	-	0.015
18	HK 1812	-	24	12	-	8300	10900	845	1110	8500	13000	IR 15x18x12.5	0.013
18	-	BK 1812	24	12	2.7	8300	10900	845	1110	8500	13000	IR 15x18x12.5	0.015
18	HK 1816	-	24	16	-	11800	17300	1210	1760	8500	13000	IR 15x18x16.5	0.018
18	-	BK 1816	24	16	2.7	11800	17300	1210	1760	8500	13000	IR 15x18x16.5	0.020
20	HK 2012	-	26	12	-	9250	13000	945	1330	8000	12000	IR 15x20x13	0.014
20	-	BK 2012	26	12	2.7	9250	13000	945	1330	8000	12000	IR 15x20x13	0.017
20	HK 2016	-	26	16	-	13000	20100	1320	2050	8000	12000	IR 17x20x16.5	0.019
20	-	BK 2016	26	16	2.7	13000	20100	1320	2050	8000	12000	IR 17x20x16.5	0.022
20	HK 2020	-	26	20	-	16400	27100	1670	2760	8000	12000	IR 17x20x20.5	0.024
20	-	BK 2020	26	20	2.7	16400	27100	1670	2760	8000	12000	IR 17x20x20.5	0.027
22	HK 2212	-	28	12	-	9750	14300	995	1460	7500	11000	IR 17x22x13	0.013
22	-	BK 2212	28	12	2.7	9750	14300	995	1460	7500	11000	IR 17x22x13	0.015
22	HK 2216	-	28	16	-	13600	22100	1390	2250	7500	11000	IR 17x22x18	0.021
22	-	BK 2216	28	16	2.7	13600	22100	1390	2250	7500	11000	IR 17x22x18	0.024

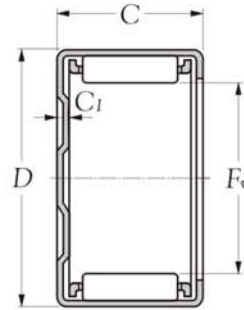
Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

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Drawn cup needle roller bearings series HK... BK..



Type HK



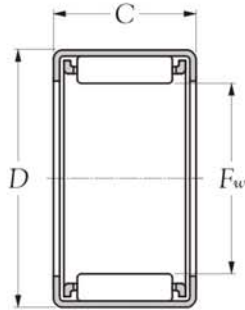
Type BK

Inner bore <i>F_w</i> mm	Bearing number		Principal dimensions			Basic load ratings				Max runout speed		Appropriate inner ring (as a reference)	Mass kg (approx.)
	Open end design	Closed end design	<i>D</i>	<i>C</i> 0-02 mm	<i>C_l</i> <i>max</i>	dynamic <i>C</i> N	static <i>C_o</i> kgf	dynamic <i>C</i> kgf	static <i>C_o</i> kgf	grease r/min	oil r/min		
22	HK 2220	-	28	20	-	17200	29800	1760	3050	7500	11000	IR 17x22x20.5	0.026
22	-	BK 2220	28	20	2.7	17200	29800	1760	3050	7500	11000	IR 17x22x20.5	0.030
25	HK 2512	-	32	12	-	11800	16300	1200	1660	6500	9500	IR 20x25x12.5	0.021
25	-	BK 2512	32	12	2.7	11800	16300	1200	1660	6500	9500	IR 20x25x12.5	0.023
25	HK 2516	-	32	16	-	15900	24000	1620	2450	6500	9500	IR 20x25x17	0.027
25	-	BK 2516	32	16	2.7	15900	24000	1620	2450	6500	9500	IR 20x25x17	0.031
25	HK 2520	-	32	20	-	20300	33000	2070	3350	6500	9500	IR 20x25x20.5	0.034
25	-	BK 2520	32	20	2.7	20300	33000	2070	3350	6500	9500	IR 20x25x20.5	0.039
25	HK 2526	-	32	26	-	26400	46000	2690	4700	6500	9500	IR 20x25x26.5	0.045
25	-	BK 2526	32	26	2.7	26400	46000	2690	4700	6500	9500	IR 20x25x26.5	0.049
28	HK 2816	-	35	16	-	17300	27600	1760	2820	5500	8500	IR 22x28x17	0.030
28	-	BK 2816	35	16	2.7	17300	27600	1760	2820	5500	8500	IR 22x28x17	0.034
28	HK 2820	-	35	20	-	21300	36000	2170	3700	5500	8500	IR 22x28x20.5	0.038
28	-	BK 2820	35	20	2.7	21300	36000	2170	3700	5500	8500	IR 22x28x20.5	0.043
30	HK 3012	-	37	12	-	13000	19500	1320	1990	5500	8000	IR 25x30x12.5	0.024
30	-	BK 3012	37	12	2.7	13000	19500	1320	1990	5500	8000	IR 25x30x12.5	0.028
30	HK 3016	-	37	16	-	18100	30000	1850	3050	5500	8000	IR 25x30x17	0.032
30	-	BK 3016	37	16	2.7	18100	30000	1850	3050	5500	8000	IR 25x30x17	0.037
30	HK 3020	-	37	20	-	22300	39500	2280	4000	5500	8000	IR 25x30x20.5	0.040
30	-	BK 3020	37	20	2.7	22300	39500	2280	4000	5500	8000	IR 25x30x20.5	0.047
30	HK 3026	-	37	26	-	29100	55000	2960	5650	5500	8000	IR 25x30x26.5	0.053
30	-	BK 3026	37	26	2.7	29100	55000	2960	5650	5500	8000	IR 25x30x26.5	0.059
35	HK 3512	-	42	12	-	14000	22800	1430	2320	4700	7000	-	0.028
35	-	BK 3512	42	12	2.7	14000	22800	1430	2320	4700	7000	-	0.033
35	HK 3516	-	42	16	-	19700	35000	2000	3600	4700	7000	-	0.037
35	-	BK 3516	42	16	2.7	19700	35000	2000	3600	4700	7000	-	0.044
35	HK 3520	-	42	20	-	24800	47500	2530	4850	4700	7000	-	0.046
35	-	BK 3520	42	20	2.7	24800	47500	2530	4850	4700	7000	-	0.055

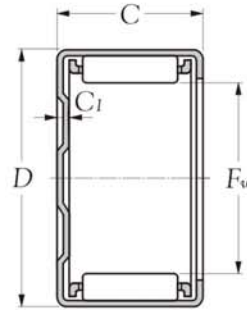
Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

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Drawn cup needle roller bearings series **HK...**, **BK...**




Type HK



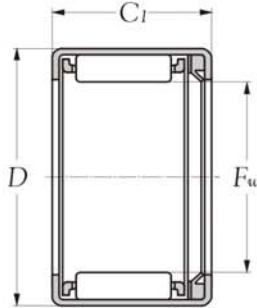
Type BK

Inner bore <i>F_w</i> mm	Bearing number		Principal dimensions			Basic load ratings				Max runout speed		Appropriate inner ring (as a reference)	Mass kg (approx.)
	Open end design	Closed end design	<i>D</i>	<i>C</i> <small>0-0.2</small> mm	<i>C_i</i> <small>max</small>	dynamic <i>C</i>	static <i>C₀</i> N	dynamic <i>C</i> kgf	static <i>C₀</i>	grease r/min	oil		
40	HK 4012	-	47	12	-	15100	26000	1540	2660	4000	6000	IR 35x40x12.5	0.031
40	-	BK 4012	47	12	2.7	15100	26000	1540	2660	4000	6000	IR 35x40x12.5	0.038
40	HK 4016	-	47	16	-	21100	40000	2150	4100	4000	6000	IR 35x40x17	0.041
40	-	BK 4016	47	16	2.7	21100	40000	2150	4100	4000	6000	IR 35x40x17	0.051
40	HK 4020	-	47	20	-	25900	52500	2650	5350	4000	6000	IR 35x40x20.5	0.052
40	-	BK 4020	47	20	2.7	25900	52500	2650	5350	4000	6000	IR 35x40x20.5	0.064
45	HK 4516	-	52	16	-	21600	43000	2210	4400	3700	5500	IR 40x45x17	0.046
45	-	BK 4516	52	16	2.7	21600	43000	2210	4400	3700	5500	IR 40x45x17	0.058
45	HK 4520	-	52	20	-	27600	59000	2810	6000	3700	5500	IR 40x45x20.5	0.058
45	-	BK 4520	52	20	2.7	27600	59000	2810	6000	3700	5500	IR 40x45x20.5	0.072
50	HK 5020	-	58	20	-	31500	63000	3200	6450	3200	4800	IR 40x50x22	0.072
50	-	BK 5020	58	20	2.7	31500	63000	3200	6450	3200	4800	IR 40x50x22	0.087
50	HK 5025	-	58	25	-	38500	82000	3900	8400	3200	4800	IR 45x50x25.5	0.090
50	-	BK 5025	58	25	2.7	38500	82000	3900	8400	3200	4800	IR 45x50x25.5	0.109

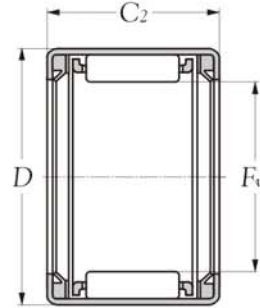
	Technical supplement		
	Cages	Precision	Grease
Steel -	<input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid -	<input checked="" type="checkbox"/>		
Brass -	<input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
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Drawn cup needle roller bearings sealed type series **HK..RS, HK..2RS, BK..RS**



Type HK..RS
(Open end, single seal)



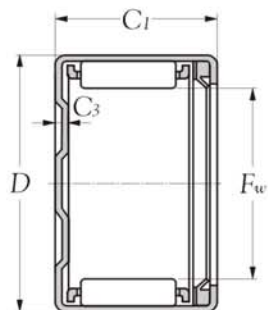
Type HK..2RS
(Open end, double seals)

Inner bore <i>F_w</i> mm	Bearing number			Principal dimensions				Basic load ratings			
	open end single seal	open end double seals	closed end single seal	<i>D</i>	<i>C</i> ₁ ₀ ^{-0.02} mm	<i>C</i> ₂ ₀ ^{-0.02} mm	<i>C</i> ₃ <i>max</i>	dynamic <i>C</i> N	static <i>C</i> ₀ N	dynamic <i>C</i> Kgf	static <i>C</i> ₀ Kgf
12	HK 1214 RS	HK 1216 2RS	BK 1214 RS	18	14	16	2.7	6600	7300	675	745
14	HK 1414 RS	HK 1416 2RS	BK 1414 RS	20	14	16	2.7	7200	8500	735	865
15	HK 1514 RS	HK 1516 2RS	BK 1514 RS	21	14	16	2.7	7500	9100	765	930
16	HK 1614 RS	HK 1616 2RS	BK 1614 RS	22	14	16	2.7	7750	9700	795	990
18	HK 1814 RS	HK 1816 2RS	BK 1814 RS	24	14	16	2.7	8300	10900	845	1110
20	-	HK 2016 2RS	-	26	-	16	-	9250	13000	945	1330
20	HK 2018 RS	HK 2020 2RS	BK 2018 RS	26	18	20	2.7	13000	20100	1320	2050
22	-	HK 2216 2RS	-	28	-	16	-	9750	14300	995	1460
22	HK 2218 RS	HK 2220 2RS	BK 2218 RS	28	18	20	2.7	13600	22100	1390	2250
25	-	HK 2516 2RS	-	32	-	16	-	11800	16300	1200	1660
25	HK 2518 RS	HK 2520 2RS	BK 2518 RS	32	18	20	2.7	15900	24000	1620	2450
28	-	HK 2820 2RS	-	35	-	20	-	17300	27600	1760	2820
30	-	HK 3016 2RS	BK 3018 RS	37	-	16	-	13000	19500	1320	1990
30	HK 3018 RS	HK 3020 2RS	-	37	18	20	2.7	18100	30000	1850	3050
35	-	HK 3516 2RS	-	42	-	16	-	14000	22800	1430	2320
35	HK 3518 RS	HK 3520 2RS	BK 3518 RS	42	18	20	2.7	19700	35000	2000	3600
40	-	HK 4016 2RS	-	47	-	16	-	15100	26000	1540	2660
40	HK 4018 RS	HK 4020 2RS	BK 4018 RS	47	18	20	2.7	21100	40000	2150	4100
45	HK 4518 RS	HK 4520 2RS	BK 4518 RS	52	18	20	2.7	21600	43000	2210	4400
50	HK 5022 RS	HK 5024 2RS	BK 5022 RS	58	22	24	2.7	31500	63000	3200	6450

Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Drawn cup needle roller bearings sealed type series **HK..RS, HK..2RS, BK..RS**



Type **BK..RS**
(Closed end, single seal)

Max runout speed grease r/min	Appropriate inner ring (as a reference)		Mass (approx.) kg		
	single seal	double seals	open end single seal	open end double seals	closed end single seal
10000	IR 9×12×16	-	0.011	0.012	0.012
10000	IR 10×14×16	IR 10×14×20	0.012	0.014	0.014
10000	IR 12×15×16.5	IR 12×15×16.5	0.013	0.014	0.014
10000	IR 12×16×16	IR 12×16×20	0.013	0.015	0.015
9000	IR 15×18×16	IR 15×18×17.5	0.015	0.017	0.017
8000	-	IR 15×20×18	-	0.019	-
8000	IR 17×20×20	IR 17×20×20.5	0.021	0.024	0.024
7500	-	IR 17×22×18	-	0.020	-
7500	IR 17×22×20.5	IR 17×22×23	0.024	0.026	0.027
6500	-	IR 20×25×18D	-	0.027	-
6500	IR 20×25×20	IR 20×25×23	0.031	0.033	0.035
5500	-	IR 22×28×23	-	0.037	-
5500	-	IR 25×30×18D	-	0.027	-
5500	IR 25×30×20	IR 25×30×23	0.037	0.039	0.045
4600	-	-	-	0.036	-
4600	-	-	0.037	0.040	0.047
4000	-	IR 35×40×17	-	0.041	-
4000	IR 35×40×20	-	0.047	0.050	0.062
3600	IR 40×45×20	-	0.054	0.057	0.072
3200	IR 45×50×25	IR 45×50×25.5	0.086	0.089	0.104



One-way clutches



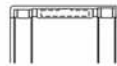
TECHNICAL SUPPLEMENT 148

PRODUCT INFORMATION 149 - 150



HF

149



HFL

150

1. Bearing materials

KSM Series HF one-way clutches have an outer ring formed by precision drawing of thin steel plate, and are capable of a clutching function only. In order to carry a radial load and rotate smoothly, a one-way clutch must have bearings on both sides.

KSM Engineering.

All of **KSM**'s series HF one-way clutches use a polyamide resin cage that supports a leaf spring. The leaf spring in turn forces the needle rollers to the wedge section formed between the outer ring cam way and the shaft.

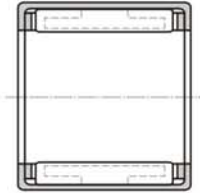


Fig. 1 Series HF

2. Interpreting clutch numbers

Clutch numbers of **KSM** one-way clutches comprise a series number and dimension code.

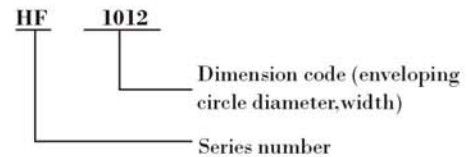


Fig. 2

3. Lubrication

Oil is the best lubrication for **KSM** one-way clutches. However, they are supplied prefilled with adequate grease, as they are often grease-lubricated. Under normal operating conditions, this grease does not need replenishment. Note, however, that excessive grease can inhibit reliable clutch operation.

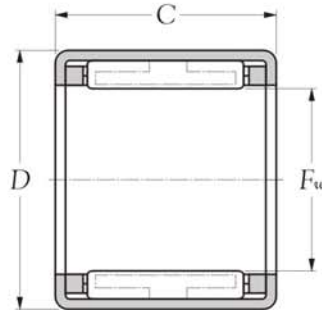
4. Mounting practices

Using a press-fit mandrel is convenient when assembling one-way clutch as illustrated in Fig.7. With series HF be sure to press-fit the clutch with its inscription side placed onto the shoulder on the mandrel. With series HFL, it is important to press-fit the clutch by using a special tool that presses the outer ring without pressing the oil retaining bearing. When assembling, be sure not to pry the outer ring or directly hit the outer ring with a hammer. Be sure place the appropriate tool on the face of the outer ring when press-fitting the clutch. When mass-producing clutches with a press, using a mandrel equipped with an O-ring facilitates insertion of the one-way clutch by keeping it from falling out. Turning the shaft in the direction in which the clutch slips facilitates the assembly. If this can't be done, providing a tapered guide (chamfered) on the shaft end will also facilitate assembly.


Transmission direction (direction of engagement)

The clutch is engaged when the outer ring (housing) is turned relative to the shaft in the direction indicated by the arrow mark. With the series HF clutch, the mark is on the rib of the outer ring.

One-way clutch miniature type series HF

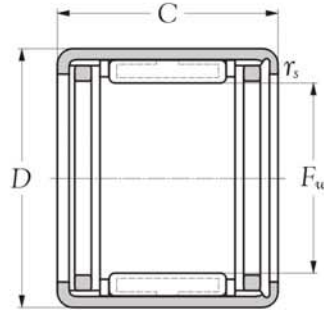


Inner bore F_w mm	Bearing number	Principal dimensions		Torque capacity		Part number by radial load		Mass kg (approx.)
		D mm	C mm	$N \cdot m$ Md	$kgf \cdot m$	needle roller bearing	oil retaining bearing	
6	HF 0612	10	12	1.76	0.18	HK 0609 T2	B-S 6-22	0.0030
8	HF 0812	12	12	3.15	0.32	HK 0810	B-S 8-25	0.0035
10	HF 1012	14	12	5.30	0.54	HK 1010	B-S 10-21	0.0040
12	HF 1216	18	16	12.20	1.24	HK 1212	B-S 12-32	0.0116
14	HF 1416	20	16	17.30	1.76	HK 1412	B-S 14-13	0.0130
16	HF 1616	22	16	20.50	2.09	HK 1612	B-S 16-13	0.0140
18	HF 1816	24	16	24.10	2.46	HK 1812	B-S 18-8	0.0155
20	HF 2016	26	16	28.50	2.91	HK 2012	B-S 20-19	0.0170
25	HF 2520	32	20	66.00	6.73	HK 2512	B-S 25-11	0.0309
30	HF 3020	37	20	90.00	9.18	HK 3012	B-S 30-19	0.0360
35	HF 3520	42	20	121.00	12.30	HK 3512	B-S 35-7	0.0400

	Technical supplement		
	Cages	Precision	Grease
Steel -	X	Class 0 (JIS)	Nil
Polymid -	TV		
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Drawn cup needle clutch series HFL



Inner bore F_w mm	Bearing number	Principal dimensions		Basic load ratings		Limiting speed		Rotation torque Nm
		D mm	C mm	dynamic C N	static C_0	n rpm	n_l^{**}	
4	HFL 0408	8	8	1270	1740	34000	14000	0.34
6	HFL 0615	10	15	1650	2030	23000	13000	1.76
8	HFL 0822	12	22	4050	4150	17000	12000	3.15
10	HFL 1022	14	22	4300	4650	14000	11000	5.30
12	HFL 1226	18	26	6300	6500	11000	8000	12.20
14	HFL 1426	20	26	6300	6500	9500	8000	17.30
16	HFL 1626	22	26	7300	8400	8500	7500	20.50
18	HFL 1826	24	26	8200	10300	7500	7500	24.10
20	HFL 2026	26	26	8300	10400	7000	6500	28.50
25	HFL 2530	32	30	10900	14100	5500	5500	66.00
30	HFL 3030	37	30	12600	17600	4500	4500	90.00
35	HFL 3530	42	30	13000	19300	3900	3900	121.00

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)



Machined-ring needle roller bearings



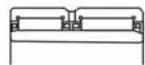
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PRODUCT INFORMATION 154 - 182



NA 48, NA 49, NA 59

154 - 163



NA 69 ZW

154 - 163



NA 49..RSR, RNA 49..RSR

164 - 165



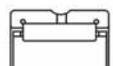
NA 49..2RSR, RNA 49..2RSR

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RNA 48, RNA 49, RNA 59, NK
RNA 69 ZW

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NK

176 - 179



NKI

180 - 182

I. Bearing materials

The available **KSM** Machined Ring Needle Roller Bearings, without an inner ring, include the series NK and RNA (metric series). The dimension series of the series RNA includes the RNA 49, RNA 59, and RNA 69. The bearing series with an inner ring include NKI and NA (metric series). The dimension series of series NA include NA 48, NA 49, NA 59, and NA 69. The boundary dimensions (bore diameter, outside diameter, width, and chamfer dimension) for these dimension series are specified in ISO 15. The third and fourth significant numerals in their bearing numbers represent width number and diameter number, respectively. Particular bearings, whose inscribed enveloping circle diameter is 40 mm or greater, among the RNA 69 (NA 69) bearings have double-row needle rollers, while bearings of other models and dimension series have single-row needle rollers. With bearings whose inscribed enveloping circle diameter (F_w) does not exceed 12 mm, the needle rollers and cage are retained in the outer ring by the side plate; in the case of the inscribed enveloping circle diameter (F_w) exceeding 12 mm, the needle rollers and cage are retained in the outer ring by the rib. The outer rings (other than those of series NK bearings whose inscribed enveloping circle diameter does not exceed 12 mm) have a lubrication hole and oil groove to simplify relubrication of the bearing. The cage used on **KSM** Machined Ring Needle Roller Bearings is usually a machined or pressed-steel type. However, cages of molded polyamide reinforced with glass fiber or carbon fiber (suffix TV) may be used. The T2 cage features a maximum allowable operating temperature of 120°C and maximum allowable continuous operating temperature of 100°C. Series RNA 49 (NA 49) bearings include a sealed type whose outer ring has a synthetic rubber seal on one or both ends (suffix RSR, 2RSR). This variant is pre-filled with lithium soap grease and can operate within a temperature range of -25°C to 100°C.

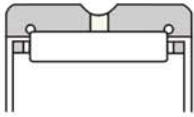


Fig. 1 Series RNA (NK)

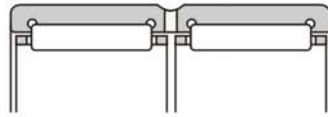


Fig. 2 Series RNA (double row)

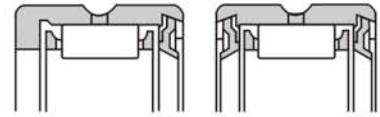


Fig. 3 Series RNA 49..RSR(2RSR)

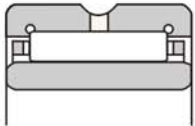


Fig. 4 Series NA

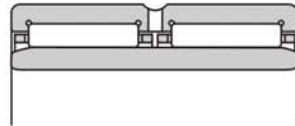


Fig. 5 Series NA (double row)

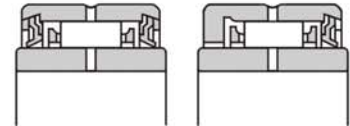


Fig. 6 Series NA 49..RSR (2RSR)

2. Interpreting bearing numbers

The bearing numbers of **KSM** Machined Ring Needle Roller Bearings, series RNA and NA, comprise a series number, dimension series code, bore diameter number, and suffix. Bearing numbers of series NK bearings comprise a series number, dimension code (inscribed enveloping circle diameter/width dimension)

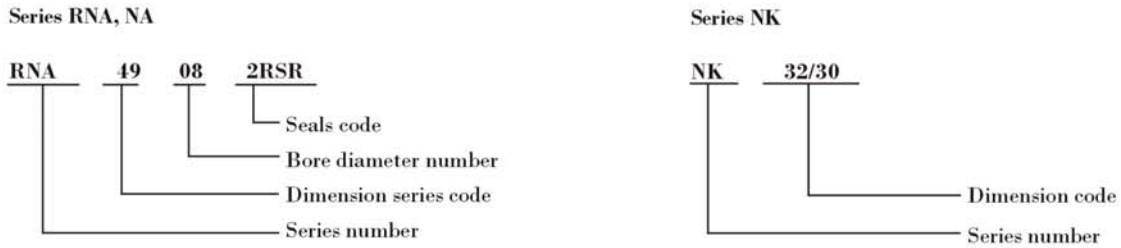


Fig. 7

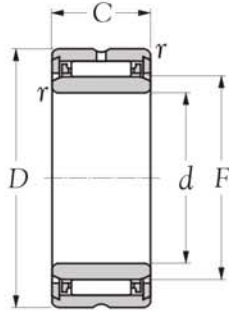
3. Interpreting clearance and bearing fits

The radial clearances of **KSM** Machined Ring Roller Bearings with an Inner ring are given in "Bearing Internal Clearance". Because the range of non-interchangeable clearance is limited, a bearing delivered adjusted to a non-interchangeable clearance must be mounted as is. The dimensional tolerances (fits) with the shaft and housing bore when installing a bearing with an inner ring vary with the type and magnitude of load, shaft diameter, and housing bore size, and must satisfy the requirements in "Recommended fits". The required form accuracy and surface roughness are specified in "Shaft and housing accuracy". The bearing without an inner ring uses a shaft as a raceway surface. The required tolerances of the shaft diameter (raceway diameter) corresponding with the running clearance are given in Table 1 below. The dimensional tolerance of the housing bore is K7, which is commonly used. For the form accuracy, roughness, and hardness of the shaft as a raceway surface, refer to Table 1 "Accuracy of Raceway surface".

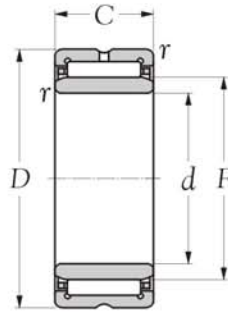
Table 1 Dimensional tolerances of shaft (raceway diameter)

Enveloping circle dia.		Tolerance class of shaft		
F_w		smaller than normal clearance	normal clearance	greater than normal clearance
over	incl.			
-	80	k5	h5	f6
80	160	k5	g5	f6
160	180	k5	g5	e6
180	200	j5	g5	e6
200	250	j5	f6	e6
250	315	h5	f6	e6
315	400	g5	f6	d6

Machined-ring needle roller bearings with inner ring series NA 49-59-69



Type NA 49 ($d \leq 9$ mm)



Type NA 49 ($d \geq 10$ mm)

Type NA 59

Type NA 69 ($d \leq 30$ mm)



Inner bore d mm	Bearing number	Principal dimensions					Basic load ratings			
		D	C	r_3 mm ¹⁾ mm	F	s ²⁾	dynamic C N	static C_0	dynamic C kgf	static C_0
5	NA 495	13	10	0.15	7	-	2670	2350	272	239
6	NA 496	15	10	0.15	8	-	3150	3000	320	305
7	NA 497	17	10	0.15	9	-	3600	3650	365	375
8	NA 498	19	11	0.15	10	-	4300	3950	435	405
9	NA 499	20	11	0.30	12	-	4850	4900	495	500
10	NA 4900	22	13	0.30	14	0.5	8600	9200	875	935
12	NA 4901	24	13	0.30	16	0.5	9550	10900	975	1110
12	NA 6901	24	22	0.30	16	1.0	15400	20000	1570	2040
15	NA 4902	28	13	0.30	20	0.5	10300	12800	1050	1310
15	NA 5902	28	18	0.30	20	0.5	14100	19100	1440	1950
15	NA 6902	28	23	0.30	20	1.0	17600	25300	1790	2580
17	NA 4903	30	13	0.30	22	0.5	11200	14600	1140	1490
17	NA 5903	30	18	0.30	22	0.5	15200	21700	1550	2210
17	NA 6903	30	23	0.30	22	1.0	18200	27200	1850	2770
20	NA 4904	37	17	0.30	25	0.8	21300	25500	2170	2600
20	NA 5904	37	23	0.30	25	0.8	28400	37000	2900	3750
20	NA 6904	37	30	0.30	25	1.0	36500	50500	3700	5150
22	NA 49/22	39	17	0.30	28	0.8	23200	29300	2360	2990
22	NA 59/22	39	23	0.30	28	0.8	26400	37500	2690	3850
22	NA 69/22	39	30	0.30	28	0.5	40000	58500	4050	6000
25	NA 4905	42	17	0.30	30	0.8	24000	31500	2450	3200
25	NA 5905	42	23	0.30	30	0.8	30500	43000	3150	4350
25	NA 6905	42	30	0.30	30	1.0	41500	63000	4200	6400
28	NA 49/28	45	17	0.30	32	0.8	24800	33500	2530	3400
28	NA 59/28	45	23	0.30	32	0.8	32000	45500	3250	4650
28	NA 69/28	45	30	0.30	32	1.0	43000	67000	4350	6850

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

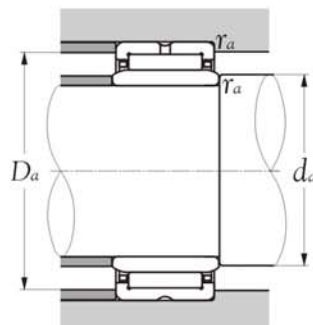
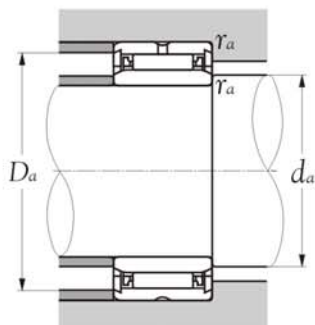
2) These values are the possible axial displacement of the inner ring against outer ring

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire

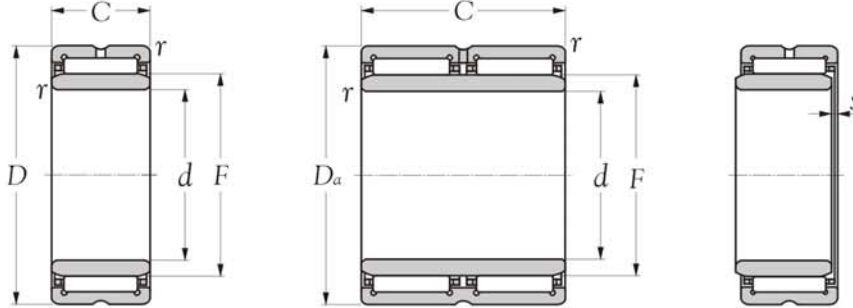
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Machined-ring needle roller bearings with inner ring series NA 49-59-69



Max runout speed		Abutment dimensions			Mass kg (approx.)
grease	oil	d_a mm	D_a max	r_a max	
r/min					
23000	34000	6.2	8.5	0.15	0.007
21000	32000	8.0	9.5	0.15	0.009
20000	30000	9.0	10.5	0.15	0.010
19000	28000	10.0	12.0	0.15	0.016
17000	26000	11.0	14.0	0.30	0.017
16000	24000	12.0	20.0	0.30	0.024
15000	23000	14.0	22.0	0.30	0.026
15000	23000	14.0	22.0	0.30	0.046
13000	20000	17.0	26.0	0.30	0.036
13000	20000	17.0	26.0	0.30	0.052
13000	20000	17.0	26.0	0.30	0.064
12000	18000	19.0	28.0	0.30	0.056
12000	18000	19.0	28.0	0.30	0.037
12000	18000	19.0	28.0	0.30	0.069
11000	16000	22.0	35.0	0.30	0.074
11000	16000	22.0	35.0	0.30	0.115
11000	16000	22.0	35.0	0.30	0.141
9500	14000	24.0	37.0	0.30	0.080
9500	14000	24.0	37.0	0.30	0.134
9500	14000	24.0	37.0	0.30	0.154
8500	13000	27.0	40.0	0.30	0.088
8500	13000	27.0	40.0	0.30	0.139
8500	13000	27.0	40.0	0.30	0.162
8500	13000	30.0	43.0	0.30	0.098
8500	13000	30.0	43.0	0.30	0.142
8500	13000	30.0	43.0	0.30	0.179

Machined-ring needle roller bearings with inner ring series NA 49-59-69



Type NA 49 ($d \geq 10$ mm)
Type NA 59

Type NA 69 ZW ($d \geq 32$ mm)

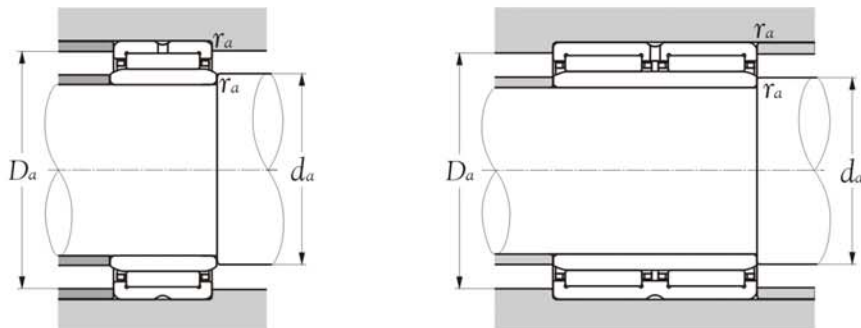
Inner bore d mm	Bearing number	Principal dimensions					Basic load ratings			
		D	C	r_s mm ¹⁾ mm	F	s ²⁾	dynamic C N	static C_o	dynamic C kgf	static C_o
30	NA 4906	47	17	0.30	35	0.8	25500	35500	2600	3600
30	NA 5906	47	23	0.30	35	0.8	32500	48500	3350	4950
30	NA 6906	47	30	0.30	35	1.0	42500	67500	4300	6900
32	NA 49/32	52	20	0.60	40	0.8	31500	47500	3200	4850
32	NA 59/32	52	27	0.60	40	0.8	38000	61000	3850	6250
32	NA 69/32 ZW	52	36	0.6	40	0.5	47500	82000	4850	4350
35	NA 4907	55	20	0.6	42	0.8	32000	50000	3300	5100
35	NA 5907	55	27	0.6	42	0.8	39000	64500	3950	6550
35	NA 6907 ZW	55	36	0.6	42	0.5	49000	86500	5000	8800
40	NA 4908	62	22	0.6	48	1.0	43500	66500	4450	6800
40	NA 5908	62	30	0.6	48	1.0	53000	92500	5450	9450
40	NA 6908 ZW	62	40	0.6	48	0.5	67000	116000	6850	11800
45	NA 4909	68	22	0.6	52	1.0	46000	73000	4700	7450
45	NA 5909	68	30	0.6	52	1.0	56000	101000	5700	10300
45	NA 6909 ZW	68	40	0.6	52	0.5	70500	127000	7200	13000
50	NA 4910	72	22	0.6	58	1.0	48000	80000	4900	8150
50	NA 5910	72	30	0.6	58	1.0	58000	110000	5950	11200
50	NA 6910 ZW	72	40	0.6	58	0.5	74000	139000	7500	14200
55	NA 4911	80	25	1.0	63	1.5	58500	99500	6000	10100
55	NA 5911	80	34	1.0	63	1.5	76500	140000	7800	14300
55	NA 6911 ZW	80	45	1.0	63	1.5	94000	183000	9600	18600
60	NA 4912	85	25	1.0	68	1.5	61500	108000	6250	11000
60	NA 5912	85	34	1.0	68	1.5	80500	153000	8200	15600
60	NA 6912 ZW	85	45	1.0	68	1.5	95500	191000	9750	19400
65	NA 4913	90	25	1.0	72	1.5	62500	112000	6350	11400
65	NA 5913	90	34	1.0	72	1.5	84000	165000	8600	16800

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r
2) These values are the possible axial displacement of the inner ring against outer ring

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

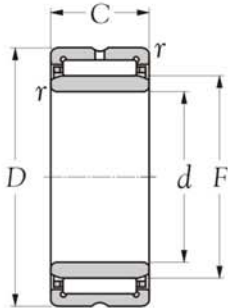
Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Machined-ring needle roller bearings with inner ring series NA 49-59-69

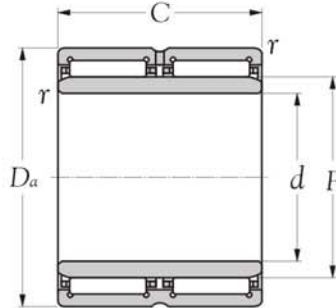


Max runout speed		Abutment dimensions			Mass kg (approx.)
grease	oil	d_a mm	D_a max	r_a max	
7500	11000	32.0	45.0	0.30	0.101
7500	11000	32.0	45.0	0.30	0.152
7500	11000	32.0	45.0	0.30	0.185
6500	10000	36.0	48.0	0.60	0.157
6500	10000	36.0	48.0	0.60	0.241
6500	10000	36	48	0.6	0.286
6500	9500	39	51	0.6	0.171
6500	9500	39	51	0.6	0.256
6500	9500	39	51	0.6	0.310
5500	8500	44	58	0.6	0.232
5500	8500	44	58	0.6	0.348
5500	8500	44	58	0.6	0.426
5000	7500	49	64	0.6	0.270
5000	7500	49	64	0.6	0.396
5000	7500	49	64	0.6	0.437
4700	7000	54	68	0.6	0.276
4700	7000	54	68	0.6	0.498
4700	7000	54	68	0.6	0.529
4300	6500	60	75	1.0	0.396
4300	6500	60	75	1.0	0.559
4300	6500	60	75	1.0	0.726
4000	6000	65	80	1.0	0.427
4000	6000	65	80	1.0	0.614
4000	6000	65	80	1.0	0.758
3700	5500	70	85	1.0	0.454
3700	5500	70	85	1.0	0.655

Machined-ring needle roller bearings with inner ring series NA 48-49-59-69



Type NA 48
Type NA 49 ($d \geq 10$ mm)



Type NA 69 ZW ($d \geq 32$ mm)



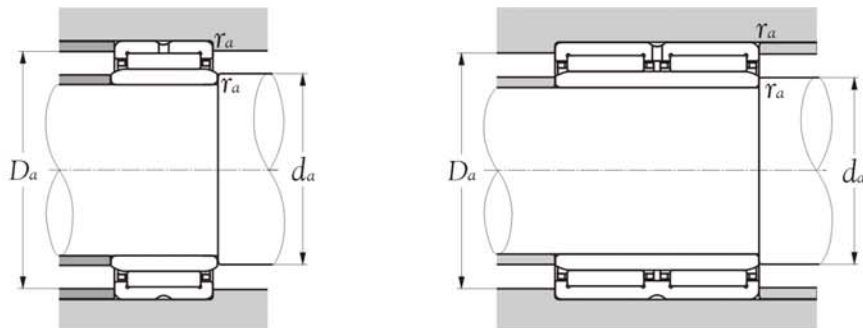
Inner bore d mm	Type NA 59 Bearing number	Principal dimensions					Basic load ratings			
		D	C	r_s mm ¹⁾ mm	F	s ²⁾	dynamic C N	static C_o	dynamic C kgf	static C_o
65	NA 6913 ZW	90	45	1.0	72	1.5	97000	198000	9900	20200
70	NA 4914	100	30	1.0	80	1.5	85500	156000	8750	15900
70	NA 5914	100	40	1.0	80	1.5	103000	187000	10500	19100
70	NA 6914 ZW	100	54	1.0	80	1.0	130000	267000	13300	27200
75	NA 4915	105	30	1.0	85	1.5	87000	162000	8900	16500
75	NA 5915	105	40	1.0	85	1.5	109000	205000	11100	20900
75	NA 6915 ZW	105	54	1.0	85	1.0	132000	277000	13500	28300
80	NA 4916	110	30	1.0	90	1.5	90500	174000	9250	17700
80	NA 5916	110	40	1.0	90	1.5	115000	223000	11700	22700
80	NA 6916 ZW	110	54	1.0	90	1.5	137000	298000	14000	30500
85	NA 4917	120	35	1.1	100	1.0	112000	237000	11500	24200
85	NA 5917	120	46	1.1	100	1.5	137000	290000	14000	29600
85	NA 6917 ZW	120	63	1.1	100	1.0	169000	400000	17300	41000
90	NA 4918	125	35	1.1	105	1.0	116000	252000	11900	25700
90	NA 5918	125	46	1.1	105	1.0	143000	310000	14600	32000
90	NA 6918 ZW	125	63	1.1	105	1.0	175000	425000	17900	43500
95	NA 4919	130	35	1.1	110	1.0	118000	260000	12000	26500
95	NA 5919	130	46	1.1	110	1.0	149000	335000	15200	34000
95	NA 6919 ZW	130	63	1.1	110	1.0	177000	440000	18100	45000
100	NA 4920	140	40	1.1	115	2.0	127000	260000	12900	26500
100	NA 5920	140	54	1.1	115	2.0	182000	395000	18600	40500
110	NA 4822	140	30	1.0	120	0.8	93500	210000	9550	21400
110	NA 4922	150	40	1.1	125	2.0	131000	279000	13300	28400
110	NA 5922	150	54	1.1	125	2.0	193000	440000	19700	45000
120	NA 4824	150	30	1.0	130	0.8	99500	233000	10100	23800
120	NA 4924	165	45	1.1	135	2.0	180000	380000	18300	38500

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r
2) These values are the possible axial displacement of the inner ring against outer ring

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Machined-ring needle roller bearings with inner ring series NA 48-49-59-69



Max runout speed		Abutment dimensions			Mass kg(s) (approx.)
grease	oil	d_a mm	D_a max	r_a max	
r/min					
3700	5500	70.0	85.0	1.0	0.779
3300	5000	75.0	95.0	1.0	0.727
3300	5000	75.0	95.0	1.0	1.060
3300	5000	75.0	95.0	1.0	1.340
3100	4700	80.0	100.0	1.0	0.776
3100	4700	80.0	100.0	1.0	1.130
3100	4700	80.0	100.0	1.0	1.450
2900	4400	85.0	105.0	1.0	0.820
2900	4400	85.0	105.0	1.0	1.150
2900	4400	85.0	105.0	1.0	1.530
2700	4000	91.5	113.5	1.0	1.240
2700	4000	91.5	113.5	1.0	1.760
2700	4000	91.5	113.5	1.0	2.250
2500	3800	96.5	118.5	1.0	1.310
2500	3800	96.5	118.5	1.0	1.840
2500	3800	96.5	118.5	1.0	2.440
2400	3600	101.5	123.5	1.0	1.360
2400	3600	101.5	123.5	1.0	1.980
2400	3600	101.5	123.5	1.0	2.630
2300	3500	106.5	133.5	1.0	1.930
2300	3500	106.5	133.5	1.0	2.850
2200	3300	115.0	135.0	1.0	1.110
2100	3200	116.5	143.5	1.0	2.080
2100	3200	116.5	143.5	1.0	2.980
2100	3100	125.0	145.0	1.0	1.170
2000	3000	126.5	158.5	1.0	2.840

Machined-ring needle roller bearings with inner ring series NA 48-49



Type NA 48

Type NA 49 (d ≥ 10 mm)

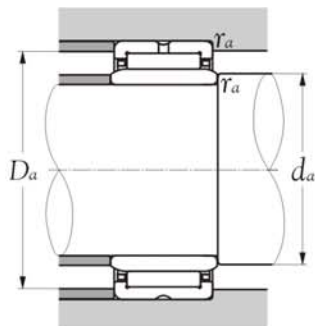
Inner bore d mm	Bearing number	Principal dimensions					Basic load ratings			
		D	C	r _s mm ¹⁾ mm	F	s ²⁾	dynamic C N	static C ₀	dynamic C kgf	static C ₀
120	NA 5924	165	60	1.1	135	2.0	245000	525000	25000	53500
130	NA 4826	165	35	1.1	145	1.0	118000	305000	12100	31000
130	NA 4926	180	50	1.5	150	1.5	202000	455000	20600	46500
130	NA 5926	180	67	1.5	150	1.5	294000	685000	30000	70000
140	NA 4828	175	35	1.1	155	1.0	121000	315000	12300	32500
140	NA 4928	190	50	1.5	160	1.5	209000	485000	21300	49500
140	NA 5928	190	67	1.5	160	1.5	310000	755000	31500	77000
150	NA 4830	190	40	1.1	165	1.5	152000	390000	15500	40000
150	NA 4930	210	60	2.0	170	1.5	261000	610000	26600	62500
160	NA 4832	200	40	1.1	175	1.5	160000	425000	16300	43500
160	NA 4932	220	60	2.0	180	1.5	270000	650000	27600	66500
170	NA 4834	215	45	1.1	185	1.5	185000	495000	18800	50500
170	NA 4934	230	60	2.0	190	1.5	279000	690000	28500	70500
180	NA 4836	225	45	1.1	195	1.5	195000	540000	19800	55000
180	NA 4936	250	69	2.0	205	1.5	375000	890000	38500	90500
190	NA 4838	240	50	1.5	210	1.5	227000	680000	23200	69000
190	NA 4938	260	69	2.0	215	1.5	390000	945000	40000	96500
200	NA 4840	250	50	1.5	220	1.5	231000	705000	23600	71500
200	NA 4940	280	80	2.1	225	1.5	505000	1180000	51500	120000
220	NA 4844	270	50	1.5	240	1.5	244000	780000	24900	79500
220	NA 4944	300	80	2.1	245	1.5	525000	1270000	53500	129000
240	NA 4848	300	60	2.0	265	2.0	360000	1080000	37000	110000
240	NA 4948	320	80	2.1	265	2.0	540000	1350000	55000	138000
260	NA 4852	320	60	2.0	285	2.0	375000	1160000	38000	119000
260	NA 4952	360	100	2.1	290	2.0	805000	1900000	82000	193000
280	NA 4856	350	69	2.0	305	2.5	455000	1300000	46500	133000

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r
 2) These values are the possible axial displacement of the inner ring against outer ring

Remark: If you have more inquiry of technical, please inquire
 KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Machined-ring needle roller bearings with inner ring series NA 48-49-59-69



Max runout speed		Abutment dimensions			Mass kgs (approx.)
grease	oil	d_a mm	D_a max	r_a max	
r/min					
2000	3000	126.5	158.5	1.0	3.92
1900	2800	136.5	158.5	1.0	1.60
1800	2700	138.0	172.0	1.5	3.90
1800	2700	138.0	172.0	1.5	5.60
1700	2600	146.5	168.5	1.0	1.82
1700	2500	148.0	182.0	1.5	4.05
1700	2500	148.0	182.0	1.5	6.18
1600	2400	156.5	183.5	1.0	2.72
1600	2400	159.0	201.0	2.0	5.33
1500	2300	166.5	193.5	1.0	2.90
1500	2200	169.0	211.0	2.0	5.60
1500	2200	176.5	208.5	1.0	3.99
1400	2100	179.0	221.0	2.0	5.87
1400	2100	186.5	218.5	1.0	4.19
1300	2000	189.0	241.0	2.0	8.58
1300	1900	198	232	1.5	5.62
1300	1900	199	251	2.0	8.68
1200	1800	208	242	1.5	5.84
1200	1800	211	269	2.0	12.20
1100	1700	228	262	1.5	6.37
1100	1600	231	289	2.0	13.50
1000	1500	249	291	2.0	10.00
1000	1500	251	309	2.0	14.70
950	1400	269	311	2.0	10.80
950	1400	271	349	2.0	25.90
850	1300	289	341	2.0	15.50

Machined-ring needle roller bearings with inner ring series NA 48-49



Type NA 48

Type NA 49 (d ≥ 10 mm)

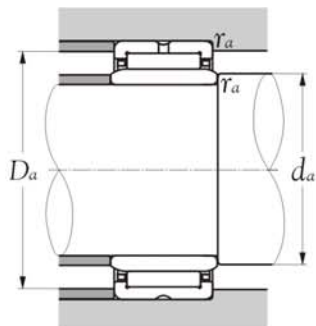
Inner bore d mm	Bearing number	Principal dimensions					Basic load ratings			
		D	C	r _s min ¹⁾ mm	F	s ²⁾	dynamic C N	static C ₀	dynamic C kgf	static C ₀
280	NA 4956	380	100	2.1	310	2.5	835000	2030000	85000	207000
300	NA 4860	380	80	2.1	330	2.0	625000	1770000	64000	180000
300	NA 4960	420	118	3.0	340	2.0	1080000	2640000	110000	269000
320	NA 4864	400	80	2.1	350	2.0	640000	1850000	65500	189000
320	NA 4964	440	118	3.0	360	2.0	1120000	2820000	114000	288000
340	NA 4868	420	80	2.1	370	2.0	655000	1940000	66500	197000
340	NA 4968	460	118	3.0	380	2.0	1160000	3000000	118000	305000
360	NA 4872	440	80	2.1	390	2.0	665000	2020000	68000	206000
360	NA 4972	480	118	3.0	400	2.0	1200000	3200000	122000	325000
380	NA 4876	480	100	2.1	415	2.0	1000000	2840000	102000	289000
380	NA 4976	520	140	4.0	430	2.0	1400000	3750000	143000	385000
400	NA 4980	540	140	4.0	450	2.5	1450000	4000000	148000	410000
420	NA 4984	560	140	4.0	470	2.5	1500000	4250000	153000	430000
440	NA 4988	600	160	4.0	490	2.5	1750000	4600000	179000	470000

Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r
 2) These values are the possible axial displacement of the inner ring against outer ring

Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

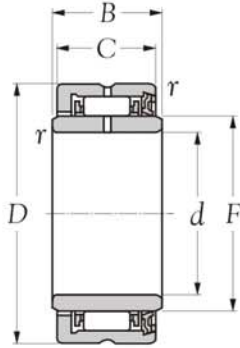
Remark: If you have more inquiry of technical, please inquire
 KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Machined-ring needle roller bearings with inner ring series NA 48-49-59-69

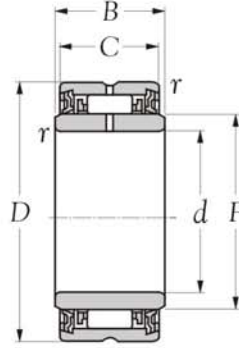


Max runout speed		Abutment dimensions			Mass
grease	oil	d_a mm	D_a max	r_a max	kgs
r/min					(approx.)
850	1300	291	369	2.0	27.50
800	1200	311	369	2.0	22.00
800	1200	313	407	2.5	42.50
750	1100	331	389	2.0	23.20
750	1100	333	427	2.5	45.20
750	1100	351	409	2.0	24.10
750	1100	353	447	2.5	47.30
650	1000	371	429	2.0	25.70
650	1000	373	467	2.5	49.00
650	950	391	469	2.0	44.50
650	950	396	504	3.0	73.60
600	900	416	524	3.0	76.60
550	850	436	544	3.0	89.80
550	800	456	584	3.0	123.00

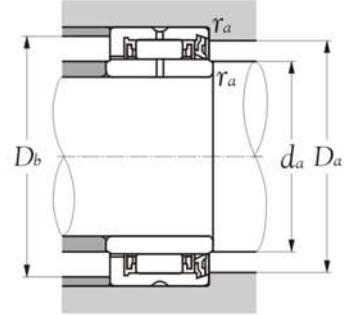
Machined-ring needle roller bearings with inner ring sealed type series NA 49..RSR, 2RSR



Type NA 49..RSR
(With single seal)



Type NA 49..2RSR
(With double seals)



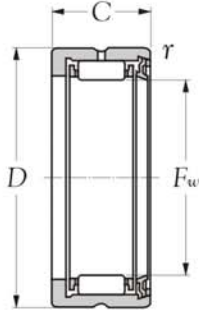
Inner bore <i>d</i> mm	Bearing number		Principal dimensions					Basic load ratings				Limiting speeds rpm	Abutment dimensions				Mass kg (approx.)
			<i>D</i>	<i>B</i>	<i>C</i>	<i>F</i>	<i>r</i> mm ¹⁾	<i>C</i>	<i>C</i> ₀	<i>C</i>	<i>C</i> ₀		<i>d</i> _{a max}	<i>D</i> _{a max}	<i>D</i> _{b max}	<i>r</i> _{a max}	
10	NA 4900 RSR	NA 4900 2RSR	22	14	13	14	0.3	7200	8500	735	865	10000	12	16	20	0.3	0.025
12	NA 4901 RSR	NA 4901 2RSR	24	14	13	16	0.3	7750	9700	795	990	10000	14	18	22	0.3	0.028
15	NA 4902 RSR	NA 4902 2RSR	28	14	13	20	0.3	8300	11200	845	1150	10000	17	22	26	0.3	0.036
17	NA 4903 RSR	NA 4903 2RSR	30	14	13	22	0.3	8500	11900	865	1220	9000	19	24	28	0.3	0.039
20	NA 4904 RSR	NA 4904 2RSR	37	18	17	25	0.3	15200	19900	1550	2030	8000	22	28	35	0.3	0.080
25	NA 4905 RSR	NA 4905 2RSR	42	18	17	30	0.3	16000	22600	1640	2300	6500	27	33	40	0.3	0.093
30	NA 4906 RSR	NA 4906 2RSR	47	18	17	35	0.3	18000	27400	1830	2800	5500	32	38	45	0.3	0.107
35	NA 4907 RSR	NA 4907 2RSR	55	21	20	42	0.6	22700	39500	2320	4000	4800	39	45	51	0.6	0.175
40	NA 4908 RSR	NA 4908 2RSR	62	23	22	48	0.6	27800	53500	2830	5450	4200	44	51	58	0.6	0.252
45	NA 4909 RSR	NA 4909 2RSR	68	23	22	52	0.6	28600	57000	2920	5800	3800	49	55	64	0.6	0.290
50	NA 4910 RSR	NA 4910 2RSR	72	23	22	58	0.6	30500	64000	3100	6500	3400	54	61	68	0.6	0.295

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

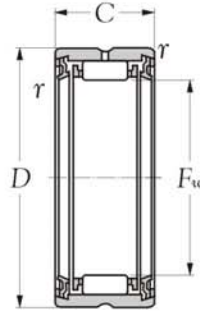
Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

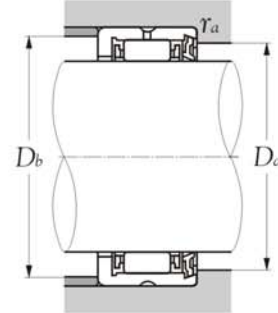
Machined-ring needle roller bearings without inner ring sealed type series RNA 49..RSR, 2RSR



Type RNA 49..RSR
(With single seal)



Type RNA 49..2RSR
(With double seals)



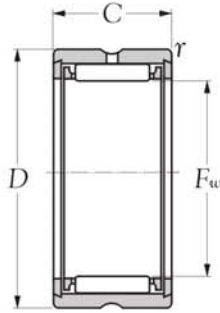
Inner bore F_w mm	Bearing number		Principal dimensions			Basic load ratings				Limiting speeds rpm	Abutment dimensions			Mass kg (approx.)
			D	C	$r_s \text{ min}^{\circ}$	dynamic	static	dynamic	static		D_a max	D_b max	r_{ax} max	
			mm	mm		C	C_o N	C	C_o kgf					
14 ^{+0.027} / _{-0.016}	RNA 4900 RSR	RNA 4900 2RSR	22	13	0.3	7200	8500	735	865	10000	16	20	0.3	0.016
16 ^{+0.027} / _{-0.016}	RNA 4901 RSR	RNA 4901 2RSR	24	13	0.3	7750	9700	795	990	10000	18	22	0.3	0.018
20 ^{+0.033} / _{+0.020}	RNA 4902 RSR	RNA 4902 2RSR	28	13	0.3	8300	11200	845	1150	10000	22	26	0.3	0.022
22 ^{+0.033} / _{+0.020}	RNA 4903 RSR	RNA 4903 2RSR	30	13	0.3	8500	11900	865	1220	9000	24	28	0.3	0.022
25 ^{+0.033} / _{+0.020}	RNA 4904 RSR	RNA 4904 2RSR	37	17	0.3	15200	19900	1550	2030	8000	28	35	0.3	0.055
30 ^{+0.033} / _{+0.020}	RNA 4905 RSR	RNA 4905 2RSR	42	17	0.3	16000	22600	1640	2300	6500	33	40	0.3	0.063
35 ^{+0.041} / _{+0.025}	RNA 4906 RSR	RNA 4906 2RSR	47	17	0.3	18000	27400	1830	2800	5500	38	45	0.3	0.072
42 ^{+0.041} / _{+0.025}	RNA 4907 RSR	RNA 4907 2RSR	55	20	0.6	22700	39500	2320	4000	4800	45	51	0.6	0.113
48 ^{+0.041} / _{+0.025}	RNA 4908 RSR	RNA 4908 2RSR	62	22	0.6	27800	53500	2830	5450	4200	51	58	0.6	0.154
52 ^{+0.049} / _{+0.030}	RNA 4909 RSR	RNA 4909 2RSR	68	22	0.6	28600	57000	2920	5800	3800	55	64	0.6	0.157
58 ^{+0.049} / _{+0.030}	RNA 4910 RSR	RNA 4910 2RSR	72	22	0.6	30500	64000	3100	6500	3400	61	68	0.6	0.160

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

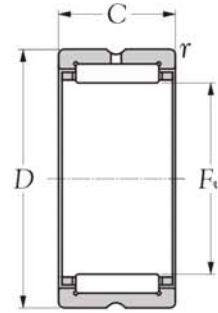
Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Machined-ring needle roller bearings without inner ring series RNA 49-59-69



Type RNA 49 ($F_w \leq 12 \text{ mm}$)



Type RNA 49 ($F_w \geq 14 \text{ mm}$)
 Type RNA 59
 Type RNA 69 ($F_w \leq 35 \text{ mm}$)

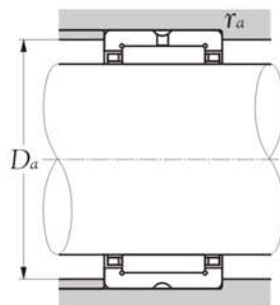
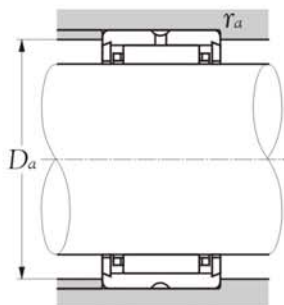
Inner bore F_w mm	Bearing number	Principal dimensions			Basic load ratings			
		D	C mm	$r_s \text{ mm}^D$	dynamic C N	static C_o	dynamic C kgf	static C_o
7 ^{+0.022} / _{+0.013}	RNA 495	13	10	0.15	2670	2350	272	239
8 ^{+0.022} / _{+0.013}	RNA 496	15	10	0.15	3150	3000	320	305
9 ^{+0.022} / _{+0.013}	RNA 497	17	10	0.15	3600	3650	365	375
10 ^{+0.022} / _{+0.013}	RNA 498	19	11	0.15	4300	3950	435	405
12 ^{+0.027} / _{+0.016}	RNA 499	20	11	0.30	4850	4900	495	500
14 ^{+0.027} / _{+0.016}	RNA 4900	22	13	0.30	8600	9200	875	935
16 ^{+0.027} / _{+0.016}	RNA 4901	24	13	0.30	9550	10900	975	1110
16 ^{+0.027} / _{+0.016}	RNA 6901	24	22	0.30	15400	20000	1570	2040
20 ^{+0.033} / _{+0.020}	RNA 4902	28	13	0.30	10300	12800	1050	1310
20 ^{+0.033} / _{+0.020}	RNA 5902	28	18	0.30	14100	19100	1440	1950
20 ^{+0.033} / _{+0.020}	RNA 6902	28	23	0.30	17600	25300	1790	2580
22 ^{+0.033} / _{+0.020}	RNA 4903	30	13	0.30	11200	14600	1140	1490
22 ^{+0.033} / _{+0.020}	RNA 5903	30	18	0.30	15200	21700	1550	2210
22 ^{+0.033} / _{+0.020}	RNA 6903	30	23	0.30	18200	27200	1850	2770
25 ^{+0.033} / _{+0.020}	RNA 4904	37	17	0.30	21300	25500	2170	2600
25 ^{+0.033} / _{+0.020}	RNA 5904	37	23	0.30	28400	37000	2900	3750
25 ^{+0.033} / _{+0.020}	RNA 6904	37	30	0.30	36500	50500	3700	5150
28 ^{+0.033} / _{+0.020}	RNA 49/22	39	17	0.30	23200	29300	2360	2990
28 ^{+0.033} / _{+0.020}	RNA 59/22	39	23	0.30	26400	37500	2690	3850
28 ^{+0.033} / _{+0.020}	RNA 69/22	39	30	0.30	40000	58500	4050	6000
30 ^{+0.033} / _{+0.020}	RNA 4905	42	17	0.30	24000	31500	2450	3200
30 ^{+0.033} / _{+0.020}	RNA 5905	42	23	0.30	30500	43000	3150	4350
30 ^{+0.033} / _{+0.020}	RNA 6905	42	30	0.30	41500	63000	4200	6400
32 ^{+0.041} / _{+0.025}	RNA 49/28	45	17	0.30	24800	33500	2530	3400
32 ^{+0.041} / _{+0.025}	RNA 59/28	45	23	0.30	32000	45500	3250	4650
32 ^{+0.041} / _{+0.025}	RNA 69/28	45	30	0.30	43000	67000	4350	6850

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

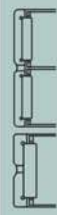
Remark: If you have more inquiry of technical, please inquire
 KSM web-site: <http://www.minamiguchi-bearings.com>

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

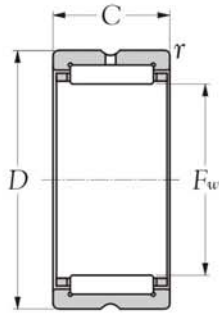
Machined-ring needle roller bearings without inner ring series RNA 49-59-69



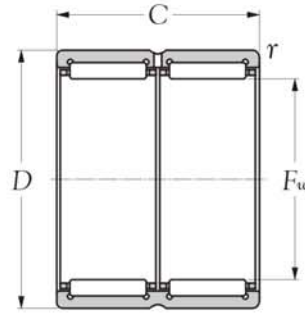
Max runout speed		Abutment dimensions		Mass kg (approx.)
grease	oil	D_a <i>max</i>	r_{as} <i>max</i>	
r/min				
23000	34000	8.5	0.15	0.0055
21000	32000	9.5	0.15	0.0073
20000	30000	10.5	0.15	0.0095
19000	28000	12.0	0.15	0.0130
17000	26000	14.0	0.30	0.0130
16000	24000	20.0	0.30	0.0170
15000	23000	22.0	0.30	0.0170
15000	23000	22.0	0.30	0.0310
13000	20000	26.0	0.30	0.0220
13000	20000	26.0	0.30	0.0330
13000	20000	26.0	0.30	0.0400
12000	18000	28.0	0.30	0.0220
12000	18000	28.0	0.30	0.0350
12000	18000	28.0	0.30	0.0420
11000	16000	35.0	0.30	0.0520
11000	16000	35.0	0.30	0.0840
11000	16000	35.0	0.30	0.1000
9500	14000	37.0	0.30	0.0500
9500	14000	37.0	0.30	0.0920
9500	14000	37.0	0.30	0.1000
8500	13000	40.0	0.30	0.0610
8500	13000	40.0	0.30	0.1010
8500	13000	40.0	0.30	0.1120
8500	13000	43.0	0.30	0.0730
8500	13000	43.0	0.30	0.1080
8500	13000	43.0	0.30	0.1350



Machined-ring needle roller bearings without inner ring series RNA 49-59-69



Type RNA 49 ($F_w \geq 14$ mm)
Type RNA 59



Type RNA 69 ZW ($F_w \geq 40$ mm)

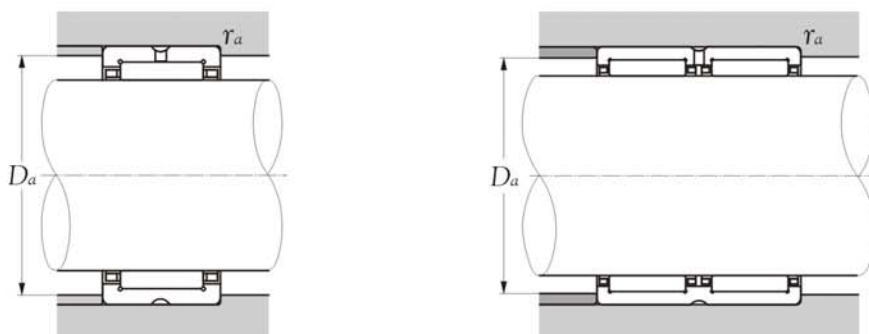
Inner bore F_w mm	Bearing number	Principal dimensions			Basic load ratings			
		D	C mm	r_s mm ^d	dynamic C N	static C_o	dynamic C kgf	static C_o
35 ^{+0.041} / _{+0.025}	RNA 4906	47	17	0.3	25500	35500	2600	3600
35 ^{+0.041} / _{+0.025}	RNA 5906	47	23	0.3	32500	48500	3350	4950
35 ^{+0.041} / _{+0.025}	RNA 6906	47	30	0.3	42500	67500	4300	6900
40 ^{+0.041} / _{+0.025}	RNA 49/32	52	20	0.6	31500	47500	3200	4850
40 ^{+0.041} / _{+0.025}	RNA 59/32	52	27	0.6	38000	61000	3850	6250
40 ^{+0.041} / _{+0.025}	RNA 69/32 ZW	52	36	0.6	47500	82000	4850	8350
42 ^{+0.041} / _{+0.025}	RNA 4907	55	20	0.6	32000	50000	3300	5100
42 ^{+0.041} / _{+0.025}	RNA 5907	55	27	0.6	39000	64500	3950	6550
42 ^{+0.041} / _{+0.025}	RNA 6907 ZW	55	36	0.6	49000	86500	5000	8800
48 ^{+0.041} / _{+0.025}	RNA 4908	62	22	0.6	43500	66500	4450	6800
48 ^{+0.041} / _{+0.025}	RNA 5908	62	30	0.6	53000	92500	5450	9450
48 ^{+0.041} / _{+0.025}	RNA 6908 ZW	62	40	0.6	67000	116000	6850	11800
52 ^{+0.049} / _{+0.030}	RNA 4909	68	22	0.6	46000	73000	4700	7450
52 ^{+0.049} / _{+0.030}	RNA 5909	68	30	0.6	56000	101000	5700	10300
52 ^{+0.049} / _{+0.030}	RNA 6909	68	40	0.6	70500	127000	7200	13000
58 ^{+0.049} / _{+0.030}	RNA 4910	72	22	0.6	48000	80000	4900	8150
58 ^{+0.049} / _{+0.030}	RNA 5910	72	30	0.6	58000	110000	5950	11200
58 ^{+0.049} / _{+0.030}	RNA 6910 ZW	72	40	0.6	74000	139000	7500	14200
63 ^{+0.049} / _{+0.030}	RNA 4911	80	25	1.0	58500	99500	6000	10100
63 ^{+0.049} / _{+0.030}	RNA 5911	80	34	1.0	76500	140000	7800	14300
63 ^{+0.049} / _{+0.030}	RNA 6911 ZW	80	45	1.0	94000	183000	9600	18600
68 ^{+0.049} / _{+0.030}	RNA 4912	85	25	1.0	61500	108000	6250	11000
68 ^{+0.049} / _{+0.030}	RNA 5912	85	34	1.0	80500	153000	8200	15600
68 ^{+0.049} / _{+0.030}	RNA 6912 ZW	85	45	1.0	95500	191000	9750	19400
72 ^{+0.049} / _{+0.030}	RNA 4913	90	25	1.0	62500	112000	6350	11400
72 ^{+0.049} / _{+0.030}	RNA 5913	90	34	1.0	84000	165000	8600	16800

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

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

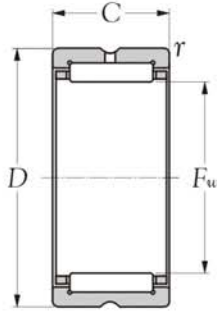
Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Machined-ring needle roller bearings without inner ring series RNA 49-59-69

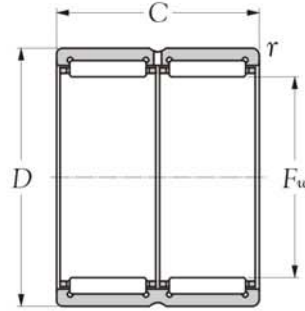


Max runout speed		Abutment dimensions		Mass kg (approx.)
grease r/min	oil r/min	D_a max	r_{as} max	
7500	11000	45	0.3	0.069
7500	11000	45	0.3	0.108
7500	11000	45	0.3	0.126
6500	10000	48	0.6	0.089
6500	10000	48	0.6	0.149
6500	10000	48	0.6	0.162
6500	9500	51	0.6	0.107
6500	9500	51	0.6	0.176
6500	9500	51	0.6	0.193
5500	8500	58	0.6	0.140
5500	8500	58	0.6	0.225
5500	8500	58	0.6	0.256
5000	7500	64	0.6	0.182
5000	7500	64	0.6	0.232
5000	7500	64	0.6	0.273
4700	7000	68	0.6	0.163
4700	7000	68	0.6	0.289
4700	7000	68	0.6	0.320
4300	6500	75	1.0	0.255
4300	6500	75	1.0	0.367
4300	6500	75	1.0	0.470
4000	6000	80	1.0	0.275
4000	6000	80	1.0	0.408
4000	6000	80	1.0	0.488
3700	5500	85	1.0	0.312
3700	5500	85	1.0	0.462

Machined-ring needle roller bearings without inner ring series RNA 48-49-59-69



Type RNA 48
Type RNA 49 ($F_w \geq 14$ mm)
Type RNA 59



Type RNA 69 ZW ($F_w \geq 40$ mm)

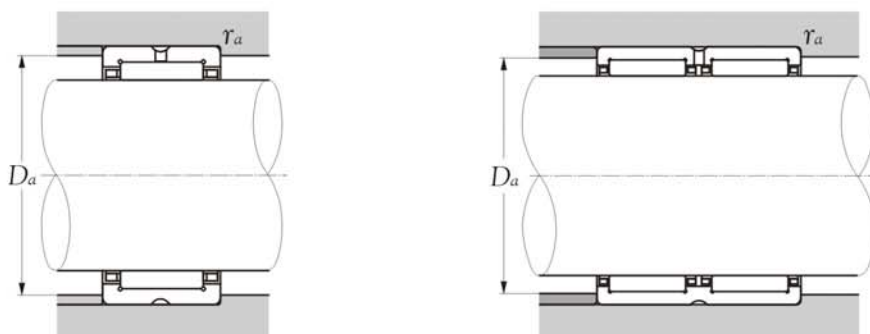
Inner bore F_w	Bearing number	Principal dimensions			Basic load ratings			
		D	C	r_s mm ^D	dynamic C	static C_o	dynamic C	static C_o
		mm			N			
72 ^{+0.049} / _{+0.030}	RNA 6913 ZW	90	45	1.0	97000	198000	9900	20200
80 ^{+0.049} / _{+0.030}	RNA 4914	100	30	1.0	85500	156000	8750	15900
80 ^{+0.049} / _{+0.030}	RNA 5914	100	40	1.0	103000	187000	10500	19100
80 ^{+0.049} / _{+0.030}	RNA 6914 ZW	100	54	1.0	130000	267000	13300	27200
85 ^{+0.058} / _{+0.036}	RNA 4915	105	30	1.0	87000	162000	8900	16500
85 ^{+0.058} / _{+0.036}	RNA 5915	105	40	1.0	109000	205000	11100	20900
85 ^{+0.058} / _{+0.036}	RNA 6915 ZW	105	54	1.0	132000	277000	13500	28300
90 ^{+0.058} / _{+0.036}	RNA 4916	110	30	1.0	90500	174000	9250	17700
90 ^{+0.058} / _{+0.036}	RNA 5916	110	40	1.0	115000	223000	11700	22700
90 ^{+0.058} / _{+0.036}	RNA 6916 ZW	110	54	1.0	137000	298000	14000	30500
100 ^{+0.058} / _{+0.036}	RNA 4917	120	35	1.1	112000	237000	11500	24200
100 ^{+0.058} / _{+0.036}	RNA 5917	120	46	1.1	137000	290000	14000	29600
100 ^{+0.058} / _{+0.036}	RNA 6917 ZW	120	63	1.1	169000	400000	17300	41000
105 ^{+0.058} / _{+0.036}	RNA 4918	125	35	1.1	116000	252000	11900	25700
105 ^{+0.058} / _{+0.036}	RNA 5918	125	46	1.1	143000	310000	14600	32000
105 ^{+0.058} / _{+0.036}	RNA 6918 ZW	125	63	1.1	175000	425000	17900	43500
110 ^{+0.058} / _{+0.036}	RNA 4919	130	35	1.1	118000	260000	12000	26500
110 ^{+0.058} / _{+0.036}	RNA 5919	130	46	1.1	149000	335000	15200	34000
110 ^{+0.058} / _{+0.036}	RNA 6919 ZW	130	63	1.1	177000	440000	18100	45000
115 ^{+0.058} / _{+0.036}	RNA 4920	140	40	1.1	127000	260000	12900	26500
115 ^{+0.058} / _{+0.036}	RNA 5920	140	54	1.1	182000	395000	18600	40500
120 ^{+0.058} / _{+0.036}	RNA 4822	140	30	1.0	93500	210000	9550	21400
125 ^{+0.068} / _{+0.043}	RNA 4922	150	40	1.1	131000	279000	13300	28400
125 ^{+0.068} / _{+0.043}	RNA 5922	150	54	1.1	193000	440000	19700	45000
130 ^{+0.068} / _{+0.043}	RNA 4824	150	30	1.0	99500	233000	10100	23800
135 ^{+0.068} / _{+0.043}	RNA 4924	165	45	1.1	180000	380000	18300	38500

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

Remark: If you have more inquiry of technical, please inquire
KSM web-site: <http://www.minamiguchi-bearings.com>

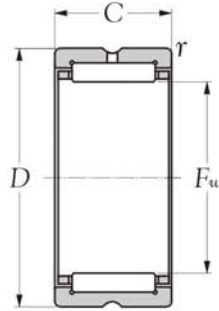
Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

Machined-ring needle roller bearings without inner ring series RNA 49-59-69



Max runout speed		Abutment dimensions		Mass kg(s) (approx.)
grease	oil	D_a <i>max</i>	r_{as} <i>max</i>	
r/min				
3700	5500	85.0	1	0.520
3300	5000	95.0	1	0.460
3300	5000	95.0	1	0.706
3300	5000	95.0	1	0.857
3100	4700	100.0	1	0.489
3100	4700	100.0	1	0.745
3100	4700	100.0	1	0.935
2900	4400	105.0	1	0.516
2900	4400	105.0	1	0.787
2900	4400	105.0	1	0.987
2700	4000	113.5	1	0.657
2700	4000	113.5	1	1.000
2700	4000	113.5	1	1.200
2500	3800	118.5	1	0.697
2500	3800	118.5	1	1.040
2500	3800	118.5	1	1.330
2400	3600	123.5	1	0.719
2400	3600	123.5	1	1.130
2400	3600	123.5	1	1.460
2300	3500	133.5	1	1.150
2300	3500	133.5	1	1.760
2200	3300	135.0	1	0.670
2100	3200	143.5	1	1.240
2100	3200	143.5	1	1.890
2100	3100	145.0	1	0.730
2000	3000	158.5	1	1.860

Machined-ring needle roller bearings without inner ring series RNA 48-49-59



Type RNA 48
Type RNA 49 ($F_w \geq 14$ mm)
Type RNA 59

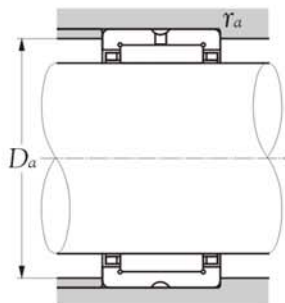
Inner bore F_w	Bearing number	Principal dimensions			Basic load ratings			
		D	C	$r_s \text{ mm}^D$	dynamic C N	static C_o	dynamic C kgf	static C_o
135 ^{+0.068} / _{+0.043}	RNA 5924	165	60	1.1	245000	525000	25000	53500
145 ^{+0.068} / _{+0.043}	RNA 4826	165	35	1.1	118000	305000	12100	31000
150 ^{+0.068} / _{+0.043}	RNA 4926	180	50	1.5	202000	455000	20600	46500
150 ^{+0.068} / _{+0.043}	RNA 5926	180	67	1.5	294000	685000	30000	70000
155 ^{+0.068} / _{+0.043}	RNA 4828	175	35	1.1	121000	315000	12300	32500
160 ^{+0.068} / _{+0.043}	RNA 4928	190	50	1.5	209000	485000	21300	49500
160 ^{+0.068} / _{+0.043}	RNA 5928	190	67	1.5	310000	755000	31500	77000
165 ^{+0.068} / _{+0.043}	RNA 4830	190	40	1.1	152000	390000	15500	40000
170 ^{+0.068} / _{+0.043}	RNA 4930	210	60	2.0	261000	610000	26600	62500
175 ^{+0.068} / _{+0.043}	RNA 4832	200	40	1.1	160000	425000	16300	43500
180 ^{+0.068} / _{+0.043}	RNA 4932	220	60	2.0	270000	650000	27600	66500
185 ^{+0.079} / _{+0.050}	RNA 4834	215	45	1.1	185000	495000	18800	50500
190 ^{+0.079} / _{+0.050}	RNA 4934	230	60	2.0	279000	690000	28500	70500
195 ^{+0.079} / _{+0.050}	RNA 4836	225	45	1.1	195000	540000	19800	55000
205 ^{+0.079} / _{+0.050}	RNA 4936	250	69	2.0	375000	890000	38500	90500
210 ^{+0.079} / _{+0.050}	RNA 4838	240	50	1.5	227000	680000	23200	69000
215 ^{+0.079} / _{+0.050}	RNA 4938	260	69	2.0	390000	945000	40000	96500
220 ^{+0.079} / _{+0.050}	RNA 4840	250	50	1.5	231000	705000	23600	71500
225 ^{+0.079} / _{+0.050}	RNA 4940	280	80	2.1	505000	1180000	51500	120000
240 ^{+0.079} / _{+0.050}	RNA 4844	270	50	1.5	242000	770000	24700	78500
245 ^{+0.079} / _{+0.050}	RNA 4944	300	80	2.1	525000	1270000	53500	129000
265 ^{+0.088} / _{+0.056}	RNA 4848	300	60	2.0	360000	1080000	37000	110000
265 ^{+0.088} / _{+0.056}	RNA 4948	320	80	2.1	540000	1350000	55000	138000
285 ^{+0.088} / _{+0.056}	RNA 4852	320	60	2.0	375000	1160000	38000	119000
290 ^{+0.088} / _{+0.056}	RNA 4952	360	100	2.1	805000	1900000	82000	193000
305 ^{+0.088} / _{+0.056}	RNA 4856	350	69	2.0	455000	1300000	46500	133000

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

Remark: If you have more inquiry of technical, please inquire
KSM web-site: <http://www.minamiguchi-bearings.com>

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

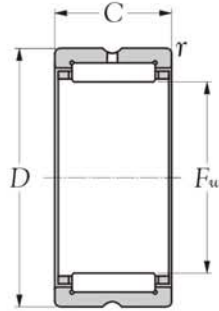
Machined-ring needle roller bearings without inner ring series **RNA 48-49-59**



Max runout speed		Abutment dimensions		Mass kg(s) (approx.)
grease	oil	D_a <i>max</i>	r_{as} <i>max</i>	
r/min				
2000	3000	158.5	1.0	2.67
1900	2800	158.5	1.0	0.95
1800	2700	172.0	1.5	2.21
1800	2700	172.0	1.5	3.21
1700	2600	168.5	1.0	1.02
1700	2500	182.0	1.5	2.35
1700	2500	182.0	1.5	3.48
1600	2400	183.5	1.0	1.60
1600	2400	201.0	2.0	2.98
1500	2300	193.5	1.0	1.70
1500	2200	211.0	2.0	3.10
1500	2200	208.5	1.0	2.54
1400	2100	221.0	2.0	3.22
1400	2100	218.5	1.0	2.68
1300	2000	241.0	2.0	4.48
1300	1900	232.0	1.5	3.21
1300	1900	251.0	2.0	4.53
1200	1800	242.0	1.5	3.35
1200	1800	269.0	2.0	7.20
1100	1700	262.0	1.5	3.62
1100	1600	289.0	2.0	7.81
1000	1500	291.0	2.0	5.40
1000	1500	309.0	2.0	8.40
950	1400	311.0	2.0	5.80
950	1400	349.0	2.0	15.90
850	1300	341.0	2.0	9.30



Machined-ring needle roller bearings without inner ring series RNA 48-49



Type RNA 48
Type RNA 49 ($F_w \geq 14$ mm)
Type RNA 59

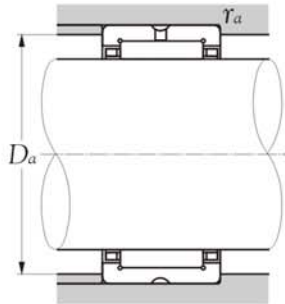
Inner bore F_w	Bearing number	Principal dimensions			Basic load ratings			
		D	C	$r_s \text{ min}^D$	dynamic C	static C_o	dynamic C	static C_o
		mm			N		kgf	
310 ^{+0.088} / _{+0.056}	RNA 4956	380	100	2.1	835000	2030000	85000	207000
330 ^{+0.098} / _{+0.062}	RNA 4860	380	80	2.1	625000	1770000	64000	180000
340 ^{+0.098} / _{+0.062}	RNA 4960	420	118	3.0	1080000	2640000	110000	269000
350 ^{+0.098} / _{+0.062}	RNA 4864	400	80	2.1	640000	1850000	655000	189000
360 ^{+0.098} / _{+0.062}	RNA 4964	440	118	3.0	1120000	2820000	114000	288000
370 ^{+0.098} / _{+0.062}	RNA 4868	420	80	2.1	665000	1940000	66500	197000
380 ^{+0.098} / _{+0.062}	RNA 4968	460	118	3.0	1160000	3000000	118000	305000
390 ^{+0.098} / _{+0.062}	RNA 4872	440	80	2.1	665000	2020000	68000	206000
400 ^{+0.108} / _{+0.068}	RNA 4972	480	118	3.0	1200000	3200000	122000	325000
415 ^{+0.108} / _{+0.068}	RNA 4876	480	100	2.1	1000000	2840000	102000	289000
430 ^{+0.108} / _{+0.068}	RNA 4976	520	140	4.0	1400000	3750000	143000	385000
450 ^{+0.108} / _{+0.068}	RNA 4980	540	140	4.0	1450000	4000000	148000	410000
470 ^{+0.108} / _{+0.068}	RNA 4984	560	140	4.0	1500000	4250000	153000	430000
490 ^{+0.108} / _{+0.068}	RNA 4988	600	160	4.0	1750000	4600000	179000	470000

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

Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

Remark: If you have more inquiry of technical, please inquire
KSM web-site: <http://www.minamiguchi-bearings.com>

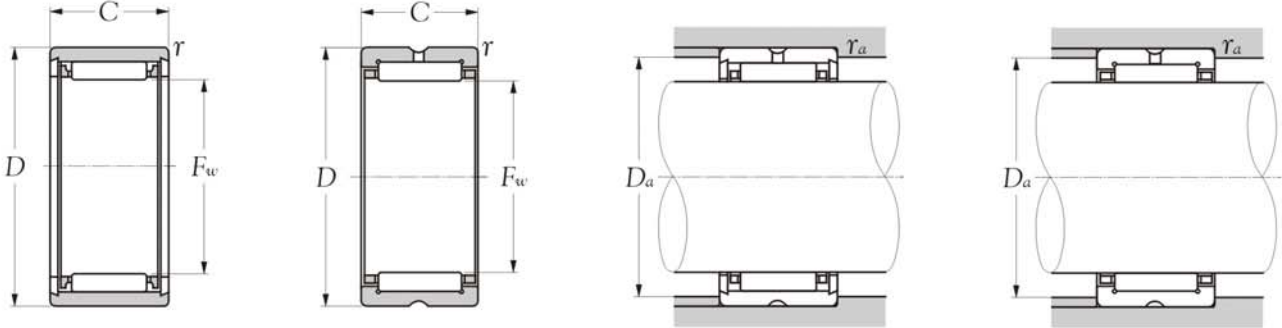
Machined-ring needle roller bearings without inner ring series RNA 48-49



Max runout speed		Abutment dimensions		Mass kg(s) (approx.)
grease	oil	D_a <i>max</i>	r_a <i>max</i>	
r/min				
850	1300	369	2.0	16.70
800	1200	369	2.0	12.70
800	1200	407	2.5	24.00
750	1100	389	2.0	13.40
750	1100	427	2.5	25.20
750	1100	409	2.0	14.00
750	1100	447	2.5	26.50
650	1000	429	2.0	14.80
650	1000	467	2.5	28.20
650	950	469	3.0	26.00
650	950	504	3.0	38.60
600	900	524	3.0	40.10
550	850	544	3.0	51.60
550	800	584	3.0	66.90



Machined-ring needle roller bearings without inner ring series NK



Type NK ($F_w \leq 12 \text{ mm}$)

Type NK ($F_w \geq 14 \text{ mm}$)

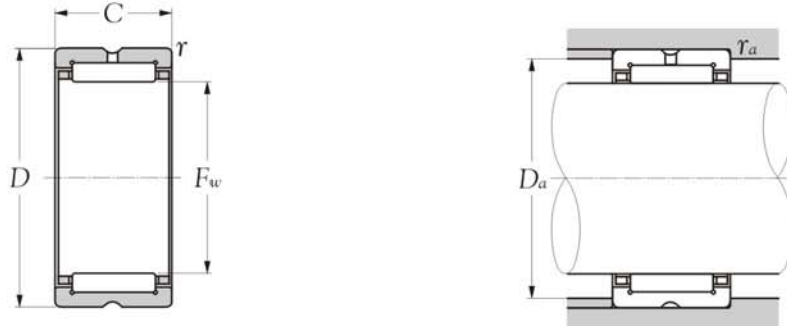
Inner bore F_w mm	Bearing number	Principal dimensions			Basic load ratings				Max runout speed		Abutment dimensions		Mass kg (approx.)
		D	C mm	$r_s \text{ min}^1)$	dynamic C	static C_o N	dynamic C	static C_o kgf	grease r/min	oil r/min	$D_{a \text{ max}}$	$D_{b \text{ max}}$	
5 ^{+0.018} / _{+0.010}	NK 5/10	10	10	0.15	2640	2190	269	224	27000	40000	6.5	0.15	0.0031
5 ^{+0.018} / _{+0.010}	NK 5/12	10	12	0.15	2720	2250	277	230	27000	40000	6.5	0.15	0.0037
6 ^{+0.018} / _{+0.010}	NK 6/10	12	10	0.15	2660	2280	272	233	25000	37000	7.5	0.15	0.0047
6 ^{+0.018} / _{+0.010}	NK 6/12	12	12	0.15	3400	3150	345	320	25000	37000	7.5	0.15	0.0057
7 ^{+0.022} / _{+0.013}	NK 7/10	14	10	0.30	2670	2350	272	239	23000	34000	8.5	0.30	0.0069
7 ^{+0.022} / _{+0.013}	NK 7/12	14	12	0.30	3400	3200	345	330	23000	34000	8.5	0.30	0.0082
8 ^{+0.022} / _{+0.013}	NK 8/12	15	12	0.30	4000	4100	410	420	21000	32000	9.5	0.30	0.0087
8 ^{+0.022} / _{+0.013}	NK 8/16	15	16	0.30	4850	5200	495	535	21000	32000	9.5	0.30	0.0120
9 ^{+0.022} / _{+0.013}	NK 9/12	16	12	0.30	4550	5000	465	510	20000	30000	10.5	0.30	0.0100
9 ^{+0.022} / _{+0.013}	NK 9/16	16	16	0.30	5500	6400	560	650	20000	30000	10.5	0.30	0.0130
10 ^{+0.022} / _{+0.013}	NK 10/12	17	12	0.30	4550	5100	460	520	19000	28000	11.5	0.30	0.0100
10 ^{+0.022} / _{+0.013}	NK 10/16	17	16	0.30	5450	6450	555	660	19000	28000	11.5	0.30	0.0130
12 ^{+0.027} / _{+0.016}	NK 12/12	19	12	0.30	5000	6100	510	620	17000	26000	13.5	0.30	0.0130
12 ^{+0.027} / _{+0.016}	NK 12/16	19	16	0.30	6000	7700	615	785	17000	26000	13.5	0.30	0.0160
14 ^{+0.027} / _{+0.016}	NK 14/16	22	16	0.30	10300	11500	1050	1170	16000	24000	20.0	0.30	0.0210
14 ^{+0.027} / _{+0.016}	NK 14/20	22	20	0.30	13000	15600	1330	1590	16000	24000	20.0	0.30	0.0260
15 ^{+0.027} / _{+0.016}	NK 15/16	23	16	0.30	10900	12700	1110	1290	15000	23000	21.0	0.30	0.0220
15 ^{+0.027} / _{+0.016}	NK 15/20	23	20	0.30	13800	17200	1410	1750	15000	23000	21.0	0.30	0.0270
16 ^{+0.027} / _{+0.016}	NK 16/16	24	16	0.30	12200	14900	1240	1520	15000	23000	22.0	0.30	0.0220
16 ^{+0.027} / _{+0.016}	NK 16/20	24	20	0.30	14600	18800	1490	1920	15000	23000	22.0	0.30	0.0280
17 ^{+0.027} / _{+0.016}	NK 17/16	25	16	0.30	12100	15000	1240	1530	15000	22000	23.0	0.30	0.0240
17 ^{+0.027} / _{+0.016}	NK 17/20	25	20	0.30	15400	20400	1570	2080	15000	22000	23.0	0.30	0.0300
18 ^{+0.027} / _{+0.016}	NK 18/16	26	16	0.30	12700	16200	1300	1650	14000	21000	24.0	0.30	0.0250
18 ^{+0.027} / _{+0.016}	NK 18/20	26	20	0.30	16100	22000	1640	2250	14000	21000	24.0	0.30	0.0310
19 ^{+0.033} / _{+0.020}	NK 19/16	27	16	0.30	13300	17400	1350	1780	14000	21000	25.0	0.30	0.0260
19 ^{+0.033} / _{+0.020}	NK 19/20	27	20	0.30	16000	22200	1630	2260	14000	21000	25.0	0.30	0.0320

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

Remark: If you have more inquiry of technical, please inquire
KSM web-site: <http://www.minamiguchi-bearings.com>

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Machined-ring needle roller bearings without inner ring series NK



Type NK ($F_w \geq 14$ mm)

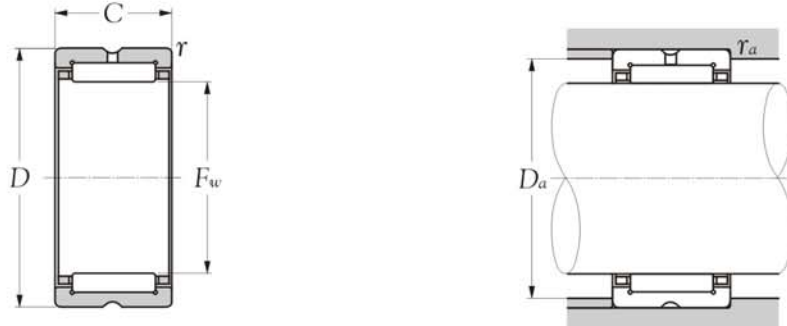
Inner bore F_w mm	Bearing number	Principal dimensions			Basic load ratings				Max runout speed		Abutment dimensions		Mass kg (approx.)
		D	C mm	r_s mm ¹⁾	dynamic C	static Co N	dynamic C	static Co kgf	grease r/min	oil r/min	$D_{a_{max}}$	$D_{b_{max}}$	
20 ^{+0.033} / _{+0.020}	NK 20/16	28	16	0.30	13200	17500	1340	1790	13000	20000	26.0	0.30	0.0270
20 ^{+0.033} / _{+0.020}	NK 20/20	28	20	0.30	16700	23800	1700	2420	13000	20000	26.0	0.30	0.0340
21 ^{+0.033} / _{+0.020}	NK 21/16	29	16	0.30	13700	18700	1400	1910	13000	19000	27.0	0.30	0.0280
21 ^{+0.033} / _{+0.020}	NK 21/20	29	20	0.30	18300	27100	1860	2760	13000	19000	27.0	0.30	0.0350
22 ^{+0.033} / _{+0.020}	NK 22/16	30	16	0.30	14200	19900	1450	2030	12000	18000	28.0	0.30	0.0340
22 ^{+0.033} / _{+0.020}	NK 22/20	30	20	0.3	18000	27000	1840	2760	12000	18000	28	0.3	0.037
24 ^{+0.033} / _{+0.020}	NK 24/16	32	16	0.3	15200	22300	1550	2280	11000	17000	30	0.3	0.032
24 ^{+0.033} / _{+0.020}	NK 24/20	32	20	0.3	18600	28800	1890	2930	11000	17000	30	0.3	0.040
25 ^{+0.033} / _{+0.020}	NK 25/16	33	16	0.3	15100	22400	1540	2280	11000	16000	31	0.3	0.033
25 ^{+0.033} / _{+0.020}	NK 25/20	33	20	0.3	19200	30500	1960	3100	11000	16000	31	0.3	0.042
26 ^{+0.033} / _{+0.020}	NK 26/16	34	16	0.3	15600	23600	1590	2410	10000	15000	32	0.3	0.034
26 ^{+0.033} / _{+0.020}	NK 26/20	34	20	0.3	19100	30500	1940	3100	10000	15000	32	0.3	0.042
28 ^{+0.033} / _{+0.020}	NK 28/20	37	20	0.3	22300	34000	2280	3450	9500	14000	35	0.3	0.052
28 ^{+0.033} / _{+0.020}	NK 28/30	37	30	0.3	26700	48000	2720	4900	9500	14000	35	0.3	0.082
29 ^{+0.033} / _{+0.020}	NK 29/20	38	20	0.3	22200	34000	2270	3450	9500	14000	36	0.3	0.054
29 ^{+0.033} / _{+0.020}	NK 29/30	38	30	0.3	27500	50500	2810	5150	9500	14000	36	0.3	0.084
30 ^{+0.033} / _{+0.020}	NK 30/20	40	20	0.3	22100	34000	2260	3500	8500	13000	38	0.3	0.065
30 ^{+0.033} / _{+0.020}	NK 30/30	40	30	0.3	33000	57000	3350	5800	8500	13000	38	0.3	0.098
32 ^{+0.041} / _{+0.025}	NK 32/20	42	20	0.3	23500	37500	2400	3850	8500	13000	40	0.3	0.068
32 ^{+0.041} / _{+0.025}	NK 32/30	42	30	0.3	34000	60500	3450	6150	8500	13000	40	0.3	0.102
35 ^{+0.041} / _{+0.025}	NK 35/20	45	20	0.3	24800	41500	2520	4250	7500	11000	43	0.3	0.074
35 ^{+0.041} / _{+0.025}	NK 35/30	45	30	0.3	36000	66500	3650	6800	7500	11000	43	0.3	0.112
37 ^{+0.041} / _{+0.025}	NK 37/20	47	20	0.3	25300	43500	2580	4400	7500	11000	45	0.3	0.077
37 ^{+0.041} / _{+0.025}	NK 37/30	47	30	0.3	36500	69500	3750	7100	7500	11000	45	0.3	0.107
38 ^{+0.041} / _{+0.025}	NK 38/20	48	20	0.3	25900	45000	2640	4600	7500	11000	46	0.3	0.079
38 ^{+0.041} / _{+0.025}	NK 38/30	48	30	0.3	37500	73000	3850	7400	7500	11000	46	0.3	0.107

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

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: <http://www.minamiguchi-bearings.com>

Machined-ring needle roller bearings without inner ring series NK



Type NK (Fw ≥ 14 mm)

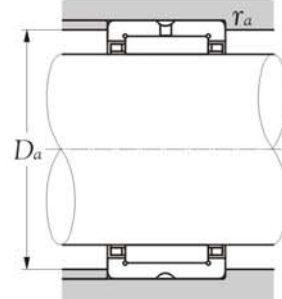
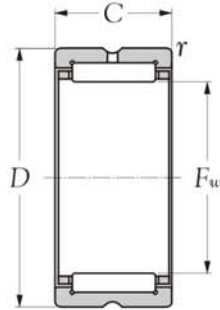
Inner bore Fw mm	Bearing number	Principal dimensions			Basic load ratings				Max runout speed		Abutment dimensions		Mass kg (approx.)
		D	C mm	rs min ¹⁾	dynamic C	static Co N	dynamic C	static Co kgf	grease oil	r/min	Da max	Db max	
40 ^{+0.041} / _{+0.025}	NK 40/20	50	20	0.3	26400	47000	2700	4800	6500	10000	48	0.3	0.083
40 ^{+0.041} / _{+0.025}	NK 40/30	50	30	0.3	38500	76000	3900	7750	6500	10000	48	0.3	0.125
42 ^{+0.041} / _{+0.025}	NK 42/20	52	20	0.3	26900	49000	2750	5000	6500	9500	50	0.3	0.086
42 ^{+0.041} / _{+0.025}	NK 42/30	52	30	0.3	39000	79000	4000	8050	6500	9500	50	0.3	0.130
43 ^{+0.041} / _{+0.025}	NK 43/20	53	20	0.3	27500	51000	2810	5200	6500	9500	51	0.3	0.086
43 ^{+0.041} / _{+0.025}	NK 43/30	53	30	0.3	40000	82000	4100	8400	6500	9500	51	0.3	0.133
45 ^{+0.041} / _{+0.025}	NK 45/20	55	20	0.3	28000	52500	2860	5400	6000	9000	53	0.3	0.092
45 ^{+0.041} / _{+0.025}	NK 45/30	55	30	0.3	41000	85500	4150	8700	6000	9000	53	0.3	0.139
47 ^{+0.041} / _{+0.025}	NK 47/20	57	20	0.3	28800	55500	2940	5650	5500	8500	55	0.3	0.095
47 ^{+0.041} / _{+0.025}	NK 47/30	57	30	0.3	42500	91500	4350	9350	5500	8500	55	0.3	0.142
50 ^{+0.041} / _{+0.025}	NK 50/25	62	25	0.6	38500	74500	3950	7550	5500	8000	58.0	0.6	0.158
50 ^{+0.041} / _{+0.025}	NK 50/35	62	35	0.6	51000	106000	5200	10800	5500	8000	58.0	0.6	0.221
55 ^{+0.049} / _{+0.030}	NK 55/25	68	25	0.6	41000	82000	4150	8400	5000	7500	64.0	0.6	0.193
55 ^{+0.049} / _{+0.030}	NK 55/35	68	35	0.6	54000	118000	5500	12000	5000	7500	64.0	0.6	0.267
60 ^{+0.049} / _{+0.030}	NK 60/25	72	25	0.6	41000	85000	4200	8700	4300	6500	68.0	0.6	0.185
60 ^{+0.049} / _{+0.030}	NK 60/35	72	35	0.6	57000	130000	5800	13200	4300	6500	68.0	0.6	0.258
65 ^{+0.049} / _{+0.030}	NK 65/25	78	25	0.6	45000	98000	4550	10000	4000	6000	74.0	0.6	0.221
65 ^{+0.049} / _{+0.030}	NK 65/35	78	35	0.6	60000	142000	6100	14400	4000	6000	74.0	0.6	0.310
68 ^{+0.049} / _{+0.030}	NK 68/25	82	25	1.0	44500	89000	4500	9050	4000	6000	77.0	0.6	0.241
68 ^{+0.049} / _{+0.030}	NK 68/35	82	35	0.6	63000	139000	6400	14200	4000	6000	78.0	0.6	0.338
70 ^{+0.049} / _{+0.030}	NK 70/25	85	25	0.6	45000	91500	4600	9350	3700	5500	81.0	0.6	0.275
70 ^{+0.049} / _{+0.030}	NK 70/35	85	35	0.6	64000	144000	6550	14700	3700	5500	81.0	0.6	0.386
73 ^{+0.049} / _{+0.030}	NK 73/25	90	25	0.6	54000	100000	5500	10200	3700	5500	86.0	0.6	0.302
73 ^{+0.049} / _{+0.030}	NK 73/35	90	35	0.6	76500	156000	7800	16000	3700	5500	86.0	0.6	0.428
75 ^{+0.049} / _{+0.030}	NK 75/25	92	25	0.6	55000	104000	5600	10600	3700	5500	88.0	0.6	0.315
75 ^{+0.049} / _{+0.030}	NK 75/35	92	35	0.6	78000	162000	7950	16500	3700	5500	88.0	0.6	0.492

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

Remark: If you have more inquiry of technical, please inquire
KSM web-site: <http://www.minamiguchi-bearings.com>

Technical supplement		
Cages	Pre2ecision	Grease
Steel - <input checked="" type="checkbox"/>		
Polymid - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Brass - <input checked="" type="checkbox"/>		

Machined-ring needle roller bearings without inner ring series NK



Type NK ($F_w \geq 14$ mm)

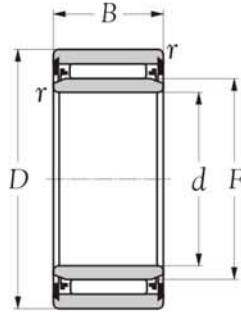
Inner bore F_w mm	Bearing number	Principal dimensions			Basic load ratings				Max runout speed		Abutment dimensions		Mass kg(s) (approx.)
		D	C	r_s mm ¹⁾	dynamic C	static Co	dynamic C	static Co	grease r/min	oil r/min	D_a max	D_b max	
80 ^{+0.049} _{+0.030}	NK 80/25	95	25	1.0	57000	119000	5800	12200	3300	5000	90.0	1.0	0.301
80 ^{+0.049} _{+0.030}	NK 80/35	95	35	1.0	79500	184000	8150	18700	3300	5000	90.0	1.0	0.425
85 ^{+0.058} _{+0.036}	NK 85/25	105	25	1.0	70500	123000	7200	12600	3100	4700	100.0	1.0	0.404
85 ^{+0.058} _{+0.036}	NK 85/35	105	35	1.0	100000	193000	10200	19700	3100	4700	100.0	1.0	0.517
90 ^{+0.058} _{+0.036}	NK 90/25	110	25	1.0	71500	128000	7300	13100	2900	4400	105.0	1.0	0.426
90 ^{+0.058} _{+0.036}	NK 90/35	110	35	1.0	104000	208000	10600	21200	2900	4400	105.0	1.0	0.604
95 ^{+0.058} _{+0.036}	NK 95/26	115	26	1.0	74500	137000	7600	14000	2800	4200	110.0	1.0	0.364
95 ^{+0.058} _{+0.036}	NK 95/36	115	36	1.0	108000	223000	11100	22700	2800	4200	110.0	1.0	0.652
100 ^{+0.058} _{+0.036}	NK 100/26	120	26	1.0	73500	137000	7500	14000	2700	4000	115.0	1.0	0.487
100 ^{+0.058} _{+0.036}	NK 100/36	120	36	1.0	107000	223000	11000	22800	2700	4000	115.0	1.0	0.679
105 ^{+0.058} _{+0.036}	NK 105/26	125	26	1.0	76500	147000	7800	14900	2500	3800	120.0	1.0	0.506
105 ^{+0.058} _{+0.036}	NK 105/36	125	36	1.0	111000	238000	11400	24300	2500	3800	120.0	1.0	0.713
110 ^{+0.058} _{+0.036}	NK 110/30	130	30	1.1	97500	204000	9950	20800	2400	3600	123.5	1.0	0.612
110 ^{+0.058} _{+0.036}	NK 110/40	130	40	1.1	129000	292000	13100	29700	2400	3600	123.5	1.0	0.830
120 ^{+0.058} _{+0.043}	NK 120/40	140	40	1.1	113000	268000	11500	27300	2200	3300	133.5	1.0	0.910
130 ^{+0.068} _{+0.043}	NK 130/40	150	40	1.1	116000	283000	11800	28800	2100	3100	143.5	1.0	0.980
145 ^{+0.068} _{+0.043}	NK 145/32	170	32	1.5	111000	238000	11300	24300	1900	2800	162.5	1.5	1.120
145 ^{+0.068} _{+0.043}	NK 145/42	170	42	1.5	153000	360000	15600	36500	1900	2800	162.5	1.5	1.490
155 ^{+0.068} _{+0.043}	NK 155/32	180	32	1.5	114000	252000	11600	25700	1700	2600	172.0	1.5	1.200
155 ^{+0.068} _{+0.043}	NK 155/42	180	42	1.5	156000	380000	16000	38500	1700	2600	172.0	1.5	1.590
165 ^{+0.068} _{+0.043}	NK 165/32	190	32	1.5	117000	265000	11900	27000	1600	2400	182.0	1.5	1.420
165 ^{+0.068} _{+0.043}	NK 165/42	190	42	1.5	160000	400000	16300	40500	1600	2400	182.0	1.5	1.660

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

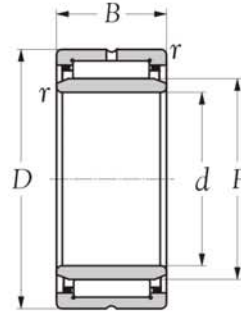
Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: <http://www.minamiguchi-bearings.com>

Machined-ring needle roller bearings with inner ring series NKI



Type NKI ($d \leq 9 \text{ mm}$)



Type NKI ($d \geq 10 \text{ mm}$)

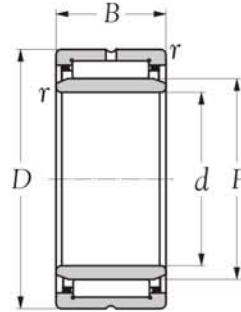
Inner bore d mm	Bearing number	Principal dimensions				Basic load ratings		Limiting speed oil r/min	Mass kg (approx.)
		F	D	B	$r_s \text{ min}^1$	dynamic C	static C_0		
5	NKI 5/12	8	15	12	0.3	3950	4100	32000	0.012
5	NKI 5/16	8	15	16	0.3	5100	5800	32000	0.015
6	NKI 6/12	9	16	12	0.3	4500	5000	31000	0.014
6	NKI 6/16	9	16	16	0.3	5900	7100	31000	0.018
7	NKI 7/12	10	17	12	0.3	4750	5500	29000	0.014
7	NKI 7/16	10	17	16	0.3	6200	7800	29000	0.018
9	NKI 9/12	12	19	12	0.3	6400	7100	27000	0.017
9	NKI 9/16	12	19	16	0.3	9000	11000	27000	0.022
10	NKI 10/16	14	22	16	0.3	10100	11500	25000	0.029
10	NKI 10/20	14	22	20	0.3	12800	15600	25000	0.037
12	NKI 12/16	16	24	16	0.3	11300	13900	23000	0.033
12	NKI 12/20	16	24	20	0.3	14400	18800	23000	0.042
15	NKI 15/16	19	27	16	0.3	13000	17400	22000	0.039
15	NKI 15/20	19	27	20	0.3	16500	23600	22000	0.049
17	NKI 17/16	21	29	16	0.3	13500	18700	21000	0.043
17	NKI 17/20	21	29	20	0.3	17100	25500	21000	0.054
20	NKI 20/16	24	32	16	0.3	15000	22300	18000	0.049
20	NKI 20/20	24	32	20	0.3	19000	30500	18000	0.061
22	NKI 22/16	26	34	16	0.3	15300	23600	17000	0.052
22	NKI 22/20	26	34	20	0.3	19400	32000	17000	0.065
25	NKI 25/20	29	38	20	0.3	21900	34000	15000	0.080
25	NKI 25/30	29	38	30	0.3	32500	57000	15000	0.120
28	NKI 28/20	32	42	20	0.3	23100	37500	14000	0.097
28	NKI 28/30	32	42	30	0.3	34500	63000	14000	0.150
30	NKI 30/20	35	45	20	0.3	24300	41500	13000	0.110
30	NKI 30/30	35	45	30	0.3	36500	69000	13000	0.170

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

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Machined-ring needle roller bearings with inner ring series NKI



Type NKI ($d \geq 10$ mm)

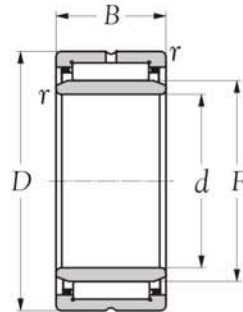
Inner bore d mm	Bearing number	Principal dimensions				Basic load ratings		Limiting speed oil r/min	Mass kg (approx.)
		F	D	B	$r_s \text{ min}^1$	dynamic C	static C_0		
32	NKI 32/20	37	47	20	0.3	24900	43500	12000	0.120
32	NKI 32/30	37	47	30	0.3	37000	73000	12000	0.180
35	NKI 35/20	40	50	20	0.3	26000	47000	11000	0.130
35	NKI 35/30	40	50	30	0.3	39000	79000	11000	0.190
38	NKI 38/20	43	53	20	0.3	27000	51000	11000	0.140
38	NKI 38/30	43	53	30	0.3	40500	85000	11000	0.210
40	NKI 40/20	45	55	20	0.3	27500	53000	10000	0.140
40	NKI 40/30	45	55	30	0.3	41000	88000	10000	0.220
42	NKI 42/20	47	57	20	0.3	28500	56000	10000	0.150
42	NKI 42/30	47	57	30	0.3	43000	94000	10000	0.220
45	NKI 45/25	50	62	25	0.6	38000	74000	9000	0.230
45	NKI 45/35	50	62	35	0.6	50000	106000	9000	0.320
50	NKI 50/25	55	68	25	0.6	40000	82000	8500	0.270
50	NKI 50/35	55	68	35	0.6	53000	118000	8500	0.380
55	NKI 55/25	60	72	25	0.6	42000	90000	7500	0.270
55	NKI 55/35	60	72	35	0.6	56000	130000	7500	0.380
60	NKI 60/25	68	82	25	0.6	43500	89000	7000	0.400
60	NKI 60/35	68	82	35	0.6	62000	139000	7000	0.550
65	NKI 65/25	73	90	25	1.0	53000	100000	6500	0.470
65	NKI 65/35	73	90	35	1.0	75000	156000	6500	0.660
70	NKI 70/25	80	95	25	1.0	56000	119000	6000	0.520
70	NKI 70/35	80	95	35	1.0	78000	184000	6000	0.740
75	NKI 75/25	85	105	25	1.0	69000	123000	5500	0.640
75	NKI 75/35	85	105	35	1.0	98000	193000	5500	0.910
80	NKI 80/25	90	110	25	1.0	72000	132000	5000	0.680
80	NKI 80/35	90	110	35	1.0	103000	208000	5000	0.960

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

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)


Machined-ring needle roller bearings with inner ring series NKI



Type NKI ($d \geq 10$ mm)

Inner bore d mm	Bearing number	Principal dimensions				Basic load ratings		Limiting speed oil r/min	Mass kg(s) (approx.)
		F	D	B	$r_s \text{ min}^D$	dynamic C	static C_0		
85	NKI 85/26	95	115	26	1.0	73000	137000	4800	0.750
85	NKI 85/36	95	115	36	1.0	107000	223000	4800	1.050
90	NKI 90/26	100	120	26	1.0	76000	146000	4600	0.780
90	NKI 90/36	100	120	36	1.0	111000	237000	4600	1.100
95	NKI 95/26	105	125	26	1.0	78000	155000	4400	0.820
95	NKI 95/36	105	125	36	1.0	114000	250000	4400	1.150
100	NKI 100/30	110	130	30	1.1	98000	210000	4200	1.000
100	NKI 100/40	110	130	40	1.1	127000	290000	4200	1.350

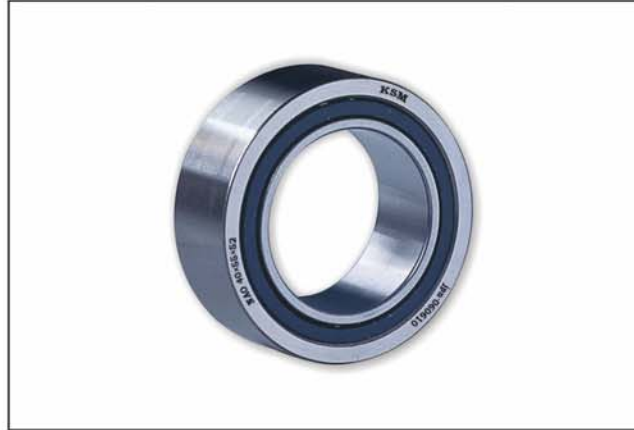
Note: 1) These values are the allowable minimum dimensions of the chamfer dimension r

	Technical supplement		
	Cages	Precision	Grease
Steel -	<input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid -	<input checked="" type="checkbox"/>		
Brass -	<input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
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Machined-ring needle roller bearings, Separable



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RNAO

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NAO

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1. Bearing materials

The available **KSM** Machined Ring Needle Roller Bearings, Separable, include the series RNAO (without inner ring) and series NAO (with inner ring). The cage used for **KSM** Machined Ring Needle Roller Bearings, Separable, is usually a machined ring type. However, cages of molded polyamide reinforced with glass fiber or carbon fiber (suffix TV) may be used. The TV cage features a maximum allowable operating temperature of 120°C and maximum allowable continuous operating temperature of 100°C.

2. Interpreting bearing numbers

The bearing numbers of **KSM** Machined Ring Needle Roller Bearings, Separable, comprise a series number (RNAO, NAO), dimension code (inscribed enveloping circle diameter or bore diameter X outside diameter X width), and suffix (Fig. 1-3).

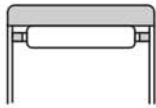


Fig. 1 Series RNAO

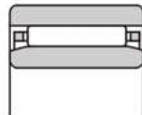


Fig. 2 Series NAO

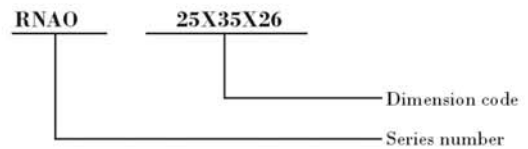
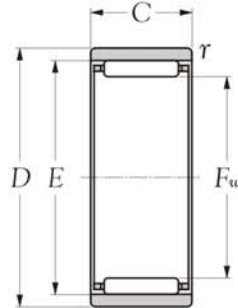


Fig. 3

Machined-ring needle roller bearings, separable series RNAO



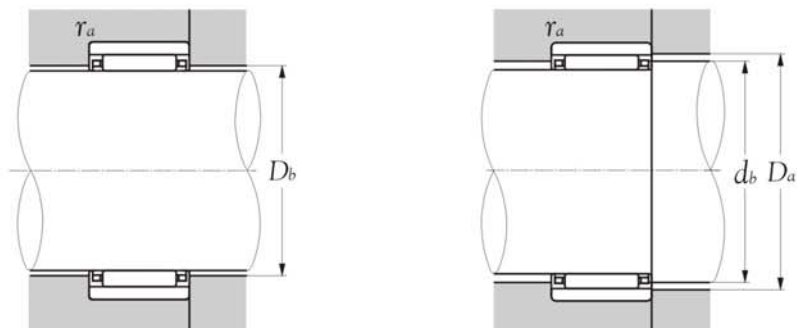
Inner bore F_w mm	Bearing number	Boundary dimensions				Basic load ratings (Radial)			
		D	C	$r_s \text{ min.}^D$ mm	E	dynamic C N	static C_o	dynamic C kgf	static C_o
5 ^{+0.018} / _{+0.010}	RNAO 5x10x8	10	8.0	0.15	8	2640	2190	269	224
6 ^{+0.018} / _{+0.010}	RNAO 6x13x8	13	8.0	0.30	9	2660	2280	272	233
7 ^{+0.022} / _{+0.013}	RNAO 7x14x8	14	8.0	0.30	10	2670	2350	272	239
8 ^{+0.022} / _{+0.013}	RNAO 8x15x10	15	10.0	0.30	11	4000	4100	410	420
10 ^{+0.022} / _{+0.013}	RNAO 10x17x10	17	10.0	0.30	13	4550	5100	460	520
10 ^{+0.022} / _{+0.013}	RNAO 10x20x12	20	12.0	0.30	16	7100	5950	720	610
12 ^{+0.027} / _{+0.016}	RNAO 12x19x13.5	19	13.5	0.30	15	6000	7700	615	785
12 ^{+0.027} / _{+0.016}	RNAO 12x22x12	22	12.0	0.30	18	8650	8000	880	815
14 ^{+0.027} / _{+0.016}	RNAO 14x22x13	22	13.0	0.30	18	8300	10100	845	1030
14 ^{+0.027} / _{+0.016}	RNAO 14x26x12	26	12.0	0.30	20	9350	9150	955	930
15 ^{+0.027} / _{+0.016}	RNAO 15x23x13	23	13.0	0.30	19	8250	10200	840	1040
16 ^{+0.027} / _{+0.016}	RNAO 16x24x13	24	13.0	0.30	20	9050	11800	925	1200
16 ^{+0.027} / _{+0.016}	RNAO 16x28x12	28	12.0	0.30	22	11700	12500	1190	1280
17 ^{+0.027} / _{+0.016}	RNAO 17x25x13	25	13.0	0.30	21	9400	12600	960	1280
18 ^{+0.027} / _{+0.016}	RNAO 18x26x13	26	13.0	0.30	22	8900	11900	910	1210
18 ^{+0.027} / _{+0.016}	RNAO 18x30x12	30	12.0	0.30	24	12300	13800	1250	1410
20 ^{+0.033} / _{+0.020}	RNAO 20x28x13	28	13.0	0.30	24	10000	14300	1020	1460
20 ^{+0.033} / _{+0.020}	RNAO 20x32x12	32	12.0	0.30	26	12900	15100	1320	1540
22 ^{+0.033} / _{+0.020}	RNAO 22x30x13	30	13.0	0.30	26	10200	15200	1040	1550
22 ^{+0.033} / _{+0.020}	RNAO 22x35x16	35	16.0	0.30	29	18700	22700	1910	2310
25 ^{+0.033} / _{+0.020}	RNAO 25x35x17	35	17.0	0.30	29	14200	24000	1450	2450
25 ^{+0.033} / _{+0.020}	RNAO 25x37x16	37	16.0	0.30	32	19500	24700	1990	2520
26 ^{+0.033} / _{+0.020}	RNAO 26x39x13	39	13.0	0.30	30	11800	19200	1200	1960
28 ^{+0.033} / _{+0.020}	RNAO 28x40x16	40	16.0	0.30	35	21200	28400	2160	2900
30 ^{+0.033} / _{+0.020}	RNAO 30x40x17	40	17.0	0.30	35	19400	32500	1970	3350
30 ^{+0.033} / _{+0.020}	RNAO 30x42x16	42	16.0	0.30	37	21900	30500	2230	3100
32 ^{+0.041} / _{+0.025}	RNAO 32x42x13	42	13.0	0.30	37	14500	23000	1480	2350

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

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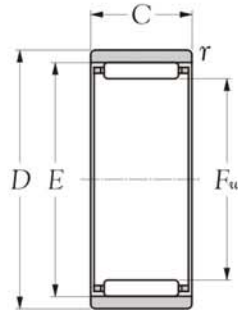
Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Machined-ring needle roller bearings, separable series RNAO



Max runout speed		Abutment dimensions				Mass
grease	oil	D_b mm	D_a max	d_b mm	r_a max	kg
r/min						(approx.)
27000	40000	7.7	8.8	5.3	0.15	0.003
25000	37000	8.7	11.0	6.3	0.30	0.006
23000	34000	9.7	12.0	7.3	0.30	0.006
21000	32000	10.7	13.0	8.3	0.30	0.008
19000	28000	12.7	15.0	10.3	0.30	0.010
19000	28000	15.7	18.0	10.3	0.30	0.018
17000	26000	14.7	17.0	12.3	0.30	0.015
17000	26000	17.6	20.0	12.3	0.30	0.019
16000	24000	17.6	20.0	14.4	0.30	0.018
16000	24000	19.6	24.0	14.4	0.30	0.029
15000	23000	18.6	21.0	15.4	0.30	0.020
15000	23000	19.6	22.0	16.4	0.30	0.021
15000	23000	21.6	26.0	16.4	0.30	0.032
15000	22000	20.6	23.0	17.4	0.30	0.022
14000	21000	21.6	24.0	18.4	0.30	0.022
14000	21000	23.6	28.0	18.4	0.30	0.035
13000	20000	23.6	26.0	20.4	0.30	0.025
13000	20000	25.6	30.0	20.4	0.30	0.038
12000	18000	25.6	28.0	22.4	0.30	0.027
12000	18000	28.4	33.0	22.4	0.30	0.059
11000	16000	28.4	33.0	25.6	0.30	0.053
11000	16000	31.4	35.0	25.6	0.30	0.060
10000	15000	29.4	37.0	26.6	0.30	0.060
9500	14000	34.4	38.0	28.6	0.30	0.061
9000	13000	34.4	38.0	30.6	0.30	0.060
9000	13000	36.4	40.0	30.6	0.30	0.069
8500	13000	36.4	40.0	32.6	0.30	0.049

Machined-ring needle roller bearings, separable series RNAO



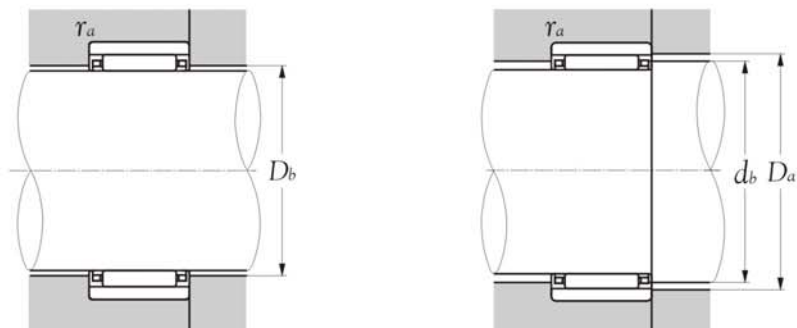
Inner bore F_w mm	Bearing number	Boundary dimensions				Basic load ratings (Radial)			
		D	C	$r_s \text{ min.}^D$	E	dynamic C N	static C_o	dynamic C kgf	static C_o
35 ^{+0.041} / _{+0.025}	RNAO 35x45x13	45	13	0.3	40	15200	25100	1550	2560
35 ^{+0.041} / _{+0.025}	RNAO 35x45x17	45	17	0.3	40	20000	36000	2040	3650
35 ^{+0.041} / _{+0.025}	RNAO 35x47x16	47	16	0.3	42	24100	36000	2450	3650
35 ^{+0.041} / _{+0.025}	RNAO 35x47x18	47	18	0.3	42	24700	37000	2510	3750
37 ^{+0.041} / _{+0.025}	RNAO 37x47x13	47	13	0.3	42	15900	27100	1620	2770
37 ^{+0.041} / _{+0.025}	RNAO 37x52x18	52	18	0.3	44	26300	41000	2680	4150
40 ^{+0.041} / _{+0.025}	RNAO 40x50x17	50	17	0.3	45	21800	41500	2220	4250
40 ^{+0.041} / _{+0.025}	RNAO 40x55x20	55	20	0.3	47	31000	51500	3150	5250
45 ^{+0.041} / _{+0.025}	RNAO 45x55x17	55	17	0.3	50	22300	44500	2280	4550
45 ^{+0.041} / _{+0.025}	RNAO 45x62x20	62	20	0.3	53	36000	59000	3650	6000
50 ^{+0.041} / _{+0.025}	RNAO 50x62x20	62	20	0.3	55	27900	62000	2850	6300
50 ^{+0.041} / _{+0.025}	RNAO 50x65x20	65	20	0.3	58	38500	67500	3950	6850
55 ^{+0.049} / _{+0.060}	RNAO 55x68x20	68	20	0.6	60	28800	66500	2940	6750
55 ^{+0.049} / _{+0.030}	RNAO 55x68x25	68	25	0.6	63	50500	97500	5150	9950
55 ^{+0.049} / _{+0.030}	RNAO 55x72x20	72	20	0.6	63	39000	70000	3950	7100
60 ^{+0.049} / _{+0.030}	RNAO 60x78x20	78	20	1.0	68	40000	75000	4100	7650
65 ^{+0.049} / _{+0.030}	RNAO 65x85x30	85	30	1.0	73	61000	132000	6200	13400
70 ^{+0.049} / _{+0.030}	RNAO 70x90x30	90	30	1.0	78	65500	149000	6700	15200
75 ^{+0.049} / _{+0.030}	RNAO 75x95x30	95	30	1.0	83	67500	157000	6850	16100
80 ^{+0.049} / _{+0.030}	RNAO 80x95x30	95	30	1.0	86	57000	159000	5800	16200
80 ^{+0.049} / _{+0.030}	RNAO 80x100x30	100	30	1.0	88	69000	166000	7050	17000
85 ^{+0.058} / _{+0.036}	RNAO 85x105x25	105	25	1.0	93	61500	146000	6250	14900
85 ^{+0.058} / _{+0.036}	RNAO 85x105x30	105	30	1.0	93	71000	175000	7200	17900
90 ^{+0.058} / _{+0.036}	RNAO 90x105x26	105	26	1.0	98	64000	157000	6550	16000
90 ^{+0.058} / _{+0.036}	RNAO 90x110x30	110	30	1.0	98	72500	184000	7400	18800
95 ^{+0.058} / _{+0.036}	RNAO 95x115x30	115	30	1.0	103	74000	193000	7550	19600
100 ^{+0.058} / _{+0.035}	RNAO 100x120x30	120	30	1.0	108	76000	201000	7700	20500

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

Remark: If you have more inquiry of technical, please inquire
KSM web-site: <http://www.minamiguchi-bearings.com>

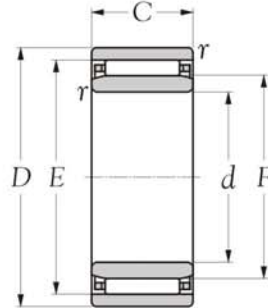
Technical supplement		
Cages	Pre2ccision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Machined-ring needle roller bearings, separable series RNAO



Max runout speed grease oil		Abutment dimensions				Mass
r/min		D_b mm	D_a max	d_b mm	r_a max	kg (approx.)
7500	11000	39.4	43	35.6	0.3	0.053
7500	11000	39.4	43	35.6	0.3	0.069
7500	11000	41.4	45	35.6	0.3	0.078
7500	11000	41.4	45	35.6	0.3	0.089
7000	11000	41.4	45	37.6	0.3	0.056
7000	11000	43.4	50	37.6	0.3	0.125
6500	10000	44.4	48	40.6	0.3	0.074
6500	10000	46.2	53	40.6	0.3	0.145
6000	9000	49.2	53	45.6	0.3	0.083
6000	9000	52.2	60	45.6	0.3	0.175
5500	8000	54.2	60	50.6	0.3	0.140
5500	8000	57.2	63	50.6	0.3	0.168
4800	7500	59.4	64	55.8	0.6	0.166
4800	7500	62.4	64	55.8	0.6	0.200
4800	7500	62.4	68	55.8	0.6	0.216
4400	6500	67.2	73	60.8	1.0	0.255
4100	6000	72.2	80	66.0	1.0	0.464
3800	5500	77.2	85	71.0	1.0	0.199
3600	5500	82.2	90	76.0	1.0	0.520
3300	5000	85.2	90	81.0	1.0	0.405
3300	5000	87.2	95	81.0	1.0	0.580
3100	4700	92.2	100	86.0	1.0	0.459
3100	4700	92.2	100	86.0	1.0	0.585
3000	4400	97.2	100	91.0	1.0	0.373
3000	4400	97.2	105	91.0	1.0	0.610
2800	4200	102.2	110	96.0	1.0	0.640
2700	4000	107.2	115	101.0	1.0	0.694

Machined-ring needle roller bearings, separable series NAO



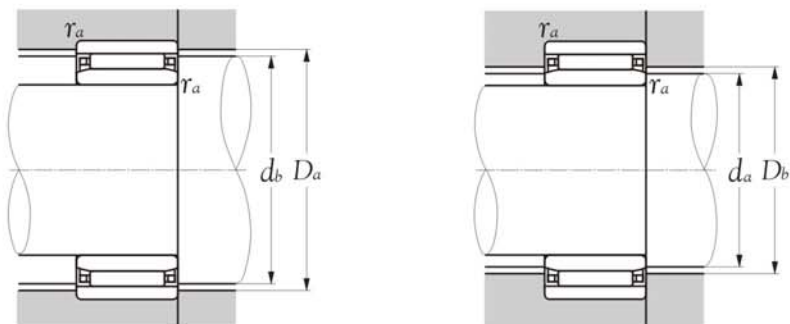
Inner bore <i>d</i> mm	Bearing number	Boundary dimensions					Basic load ratings (Radial)			
		<i>D</i>	<i>C</i>	$r_s \text{ min}^n$ mm	<i>F</i>	<i>E</i>	dynamic <i>C</i> N	static <i>C₀</i>	dynamic <i>C</i> kgf	static <i>C₀</i>
6	NAO 6x17x10	17	10	0.3	10	13	4550	5100	460	520
7	NAO 7x20x12	20	12	0.3	10	16	7100	5950	720	610
9	NAO 9x22x12	22	12	0.3	12	18	8650	8000	880	815
10	NAO 10x22x13	22	13	0.3	14	18	8300	10100	845	1030
10	NAO 10x26x12	26	12	0.3	14	20	9350	9150	955	930
12	NAO 12x24x13	24	13	0.3	16	20	9050	11800	925	1200
12	NAO 12x28x12	28	12	0.3	16	22	11700	12500	1190	1280
15	NAO 15x28x13	28	13	0.3	20	24	10000	14300	1020	1460
15	NAO 15x32x12	32	12	0.3	20	26	12900	15100	1320	1540
17	NAO 17x30x13	30	13	0.3	22	26	10200	15200	1040	1550
17	NAO 17x35x16	35	16	0.3	22	29	18700	22700	1910	2310
20	NAO 20x35x17	35	17	0.3	25	29	14200	24000	1450	2450
20	NAO 20x37x16	37	16	0.3	25	32	19500	24700	1990	2520
25	NAO 25x40x17	40	17	0.3	30	35	19400	32500	1970	3350
25	NAO 25x42x16	42	16	0.3	30	37	21900	30500	2230	3100
29	NAO 29x42x13	42	13	0.3	32	37	14500	23000	1480	2350
30	NAO 30x45x13	45	13	0.3	35	40	15200	25100	1550	2560
30	NAO 30x45x17	45	17	0.3	35	40	20000	36000	2040	3650
30	NAO 30x47x16	47	16	0.3	35	42	24100	36000	2450	3650
30	NAO 30x47x18	47	18	0.3	35	42	24700	37000	2510	3750
30	NAO 30x52x18	52	18	0.3	37	44	26300	41000	2680	4150
33	NAO 33x47x13	47	13	0.3	37	42	15900	27100	1620	2770
35	NAO 35x50x17	50	17	0.3	40	45	21800	41500	2220	4250
35	NAO 35x55x20	55	20	0.3	40	47	31000	51500	3150	5250
40	NAO 40x55x17	55	17	0.3	45	50	22300	44500	2280	4550
40	NAO 40x62x20	62	20	0.3	45	53	36000	59000	3650	6000
40	NAO 40x65x20	65	20	0.3	50	58	38500	67500	3950	6850

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

Remark: If you have more inquiry of technical, please inquire
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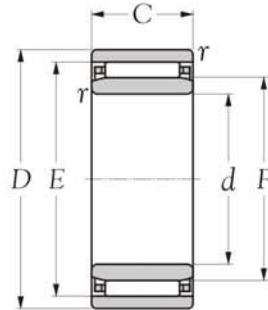
Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Machined-ring needle roller bearings, separable series NAO



Max runout speed grease oil		Abutment dimensions					Mass
r/min		$d_{a\ min}$	d_b	$D_{a\ max}$	D_b	$r_{a\ max}$	kg (approx.)
19000	28000	8	12.7	15	10.3	0.3	0.014
19000	28000	9	15.7	18	10.3	0.3	0.022
17000	26000	11	17.6	20	12.3	0.3	0.024
16000	24000	12	17.6	20	14.4	0.3	0.026
16000	24000	12	19.6	24	14.4	0.3	0.036
15000	23000	14	19.6	22	16.4	0.3	0.030
15000	23000	14	21.6	26	16.4	0.3	0.040
13000	20000	17	23.6	26	20.4	0.3	0.029
13000	20000	17	25.6	30	20.4	0.3	0.050
12000	18000	19	25.6	28	22.4	0.3	0.042
12000	18000	19	28.4	33	22.4	0.3	0.078
11000	16000	22	28.4	33	25.6	0.3	0.076
11000	16000	22	31.4	35	25.6	0.3	0.082
9000	13000	27	34.4	38	30.6	0.3	0.088
9000	13000	27	36.4	40	30.6	0.3	0.086
8500	13000	31	36.4	40	32.6	0.3	0.062
7500	11000	32	39.4	43	35.6	0.3	0.077
7500	11000	32	39.4	43	35.6	0.3	0.102
7500	11000	32	41.4	45	35.6	0.3	0.109
7500	11000	32	41.4	45	35.6	0.3	0.119
7000	11000	32	43.4	50	37.6	0.3	0.177
7000	11000	35	41.4	45	37.6	0.3	0.085
6500	10000	37	44.4	48	40.6	0.3	0.113
6500	10000	37	46.2	53	40.6	0.3	0.190
6000	9000	42	49.2	53	45.6	0.3	0.127
6000	9000	42	52.2	60	45.6	0.3	0.230
5500	9000	42	57.2	63	50.6	0.3	0.279

Machined-ring needle roller bearings, separable series NAO



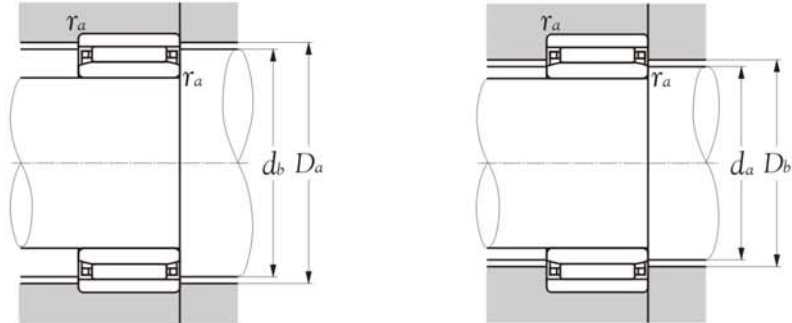
Inner bore <i>d</i> mm	Bearing number	Boundary dimensions					Basic load ratings (Radial)			
		<i>D</i>	<i>C</i>	$r_s \min^{1)}$ mm	<i>F</i>	<i>E</i>	dynamic <i>C</i> N	static <i>C₀</i>	dynamic <i>C</i> kgf	static <i>C₀</i>
45	NAO 45x62x20	62	20	0.3	50	55	27900	62000	2850	6300
45	NAO 45x72x20	72	20	0.6	55	63	39000	70000	3950	7100
50	NAO 50x68x20	68	20	0.6	55	60	28800	66500	2940	6750
50	NAO 50x78x20	78	20	1.0	60	68	40000	75000	4100	7650
55	NAO 55x85x30	85	30	1.0	65	73	61000	132000	6200	13400
60	NAO 60x90x30	90	30	1.0	70	78	65500	149000	6700	15200
65	NAO 65x95x30	95	30	1.0	75	83	67500	157000	6850	16100
70	NAO 70x95x30	95	30	1.0	80	86	57000	159000	5800	16200
70	NAO 70x100x30	100	30	1.0	80	88	69000	166000	7050	17000
75	NAO 75x105x25	105	25	1.0	85	93	61500	146000	6250	14900
75	NAO 75x105x30	105	30	1.0	85	93	71000	175000	7200	17900
80	NAO 80x110x30	110	30	1.0	90	98	72500	184000	7400	18800
85	NAO 85x115x30	115	30	1.0	95	103	74000	193000	7550	19600
90	NAO 90x120x30	120	30	1.0	100	108	76000	201000	7700	20500

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

Remark: If you have more inquiry of technical, please inquire
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Technical supplement			
Cages	Pre2ecision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

Machined-ring needle roller bearings, separable series NAO

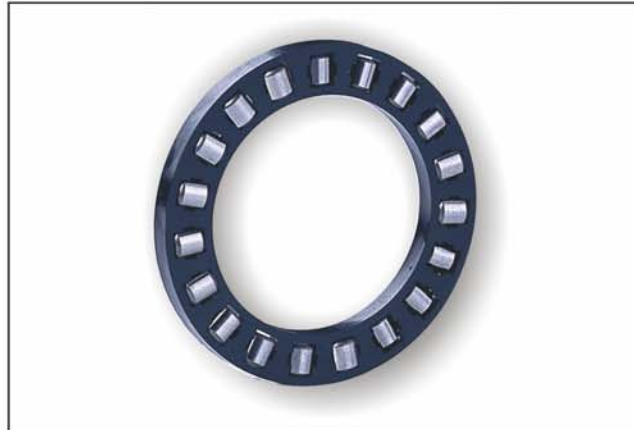








Max runout speed grease	oil	Abutment dimensions					Mass kg(s) (approx.)
		d_a <small>min</small>	d_b	D_a <small>max</small>	D_b	r_a <small>max</small>	
r/min							
5500	8000	47	54.2	60	50.6	0.3	0.192
4800	7500	49	62.4	68	55.8	0.6	0.335
4800	7500	54	59.4	64	55.8	0.6	0.230
4400	6500	55	67.2	73	60.8	1.0	0.410
4100	6000	60	72.2	80	66.0	1.0	0.680
3800	5500	65	77.2	85	71.0	1.0	0.720
3600	5500	70	82.2	90	76.0	1.0	0.770
3300	5000	75	85.2	90	81.0	1.0	0.675
3300	5000	75	87.2	95	81.0	1.0	0.850
3100	4700	80	92.2	100	86.0	1.0	0.700
3100	4700	80	92.2	100	86.0	1.0	0.880
3000	4400	85	97.2	105	91.0	1.0	0.920
2800	4200	90	102.2	110	96.0	1.0	0.960
2700	4000	95	107.2	115	101.0	1.0	1.040





Thrust roller bearings



TECHNICAL SUPPLEMENT	196 - 197
PRODUCT INFORMATION	198 - 202
 ANK 11	198 - 199
 AS	198 - 199
 WS	198 - 199
 GS	198 - 199
 LS	200
 K 811, K 812	201 - 202

1. Types and designs

KSM Roller and Cage Thrust Assemblies are available in the series AXK, which has needle rollers; and in series K 811, K 812, each of which incorporates cylindrical rollers. Each pocket of the series K 811 and K 812 has a single row of cylindrical rollers. Series AXK bearings, which have needle rollers, use a pressed-steel cage. Series K 811, and K 812 they can optionally employ a pressed-steel cage or a cage of molded polyamide reinforced with glass fiber or carbon fiber (suffix TV). The TV cage features a maximum allowable operating temperature of 120°C and maximum allowable continuous operating temperature of 100°C. The bearing washers for **KSM** Thrust Roller Bearings are available in an AS model made of surface-hardened 1 mm-thick steel plate, and in WS and GS models, which are machined types. The AS model can be used on either the shaft or housing side. This bearing washer, however, requires that the adjacent mechanical components have sufficient rigidity and good form accuracy. Before being mounted, the bearing washer may remain somewhat warped. This phenomenon should not be regarded as a problem because the warpage will be eliminated once a predetermined level of thrust load is exerted on the washer. The bore of the WS model is fitted to a shaft, and the outside surface of the GS model is fitted to a housing. Both models therefore provide the bearings with greater rigidity and higher running accuracy. Bearing models 811, 812 are formed by respectively combining the roller and cage thrust assemblies of models K 811 and K 812 with the associated model WS or GS bearing washer. They are standard series bearings whose dimension series, specified in ISO 104 (Boundary dimensions for rolling bearings), are 11, 12, and 93, respectively.



Fig. 1 Series AXK



Fig. 2 Series K 811, K 812



Fig. 3 Series AS



Fig. 4 Series WS

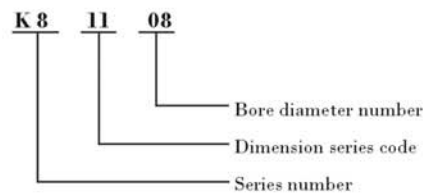
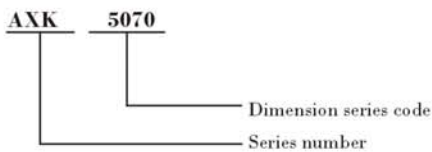


Fig. 5 Series GS

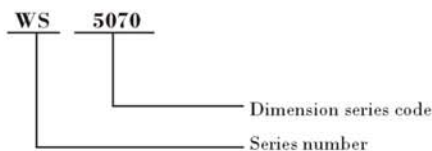
2. Interpreting bearing numbers

The bearing numbers of **KSM** Roller and Cage Thrust Assemblies, Bearing Rings, and Thrust Roller Bearings comprise a series number, dimension series code, bore diameter number, and suffix.

Roller and cage thrust assembly



Bearing washer



3. Bearing tolerance

The dimensional accuracy, form accuracy, and running accuracy of series 811, 812 thrust cylindrical roller bearings are given in "Bearing Tolerances". The bore (De) of roller and cage thrust assemblies (series AXK, K 811, K 812) is machined to a tolerance of E11 (or E12 for bearings having a suffix T2). The outside surface (Dc) of the series AXK is machined to a tolerance of c12, while those of the series K 811, K 812 are machined to a tolerance of a13.

4. Raceway surface requirements

When the shaft and housing are used as a raceway for a roller and cage thrust assembly, the raceway should satisfy the requirements in Table 1.

Table 1 Raceway requirements

Characteristics	Requirement
Squareness (max.)	IT6 (IT4)
Surface roughness	0.4a
Surface hardness	HRC58~64

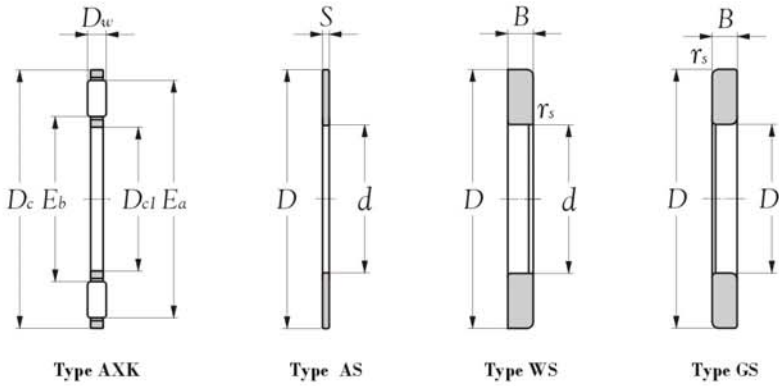
5. Bearing washer fits

The fits of the shafts and housing that mount the thrust bearing washers (AS, WS, and GS models) are given in Table 2 below.

Table 2 Raceway requirements

Bearing washer	Shaft	Housing
Series AS	H10	H11
Series WS	h6	—
Series GS	—	H7

Thrust needle roller bearings series AXK, AS, WS, GS



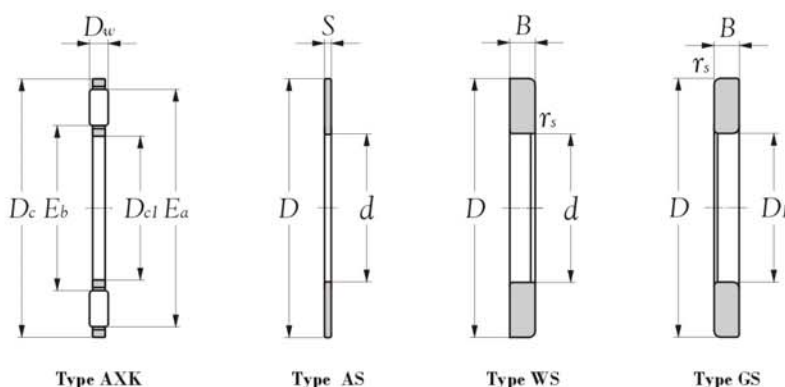
Inner bore D_{c1} E11 mm	Bearing number				Boundary dimensions (mm)										
	thrust needle roller and cage assembly (consistent with cylindrical)	Washer	Inner ring	Outer ring	D_c C12	D_w 0 -0.01	D_p e13	D_{p1} E12	$S^{(2)}$ ± 0.05	d	d_1 -0.2 -0.5	D	D_1 +0.5 +0.2	B	r_s min ¹⁾
10	AXK 1024	AS 1024	WS 1024	GS 1024	24	2	24	10	1	10	24	24	10	2.75 ⁰ _{-0.060}	0.3
12	AXK 1226	AS 1226	WS 1226	GS 1226	26	2	26	12	1	12	26	26	12	2.75 ⁰ _{-0.060}	0.3
15	AXK 1528	AS 1528	WS 1528	GS 1528	28	2	28	15	1	15	28	28	16	2.75 ⁰ _{-0.060}	0.3
17	AXK 1730	AS 1730	WS 1730	GS 1730	30	2	30	17	1	17	30	30	18	2.75 ⁰ _{-0.060}	0.3
20	AXK 2035	AS 2035	WS 2035	GS 2035	35	2	35	20	1	20	35	35	21	2.75 ⁰ _{-0.060}	0.3
25	AXK 2542	AS 2542	WS 2542	GS 2542	42	2	42	25	1	25	42	42	26	3.00 ⁰ _{-0.060}	0.6
30	AXK 3047	AS 3047	WS 3047	GS 3047	47	2	47	30	1	30	47	47	32	3.00 ⁰ _{-0.060}	0.6
35	AXK 3552	AS 3552	WS 3552	GS 3552	52	2	52	35	1	35	52	52	37	3.50 ⁰ _{-0.075}	0.6
40	AXK 4060	AS 4060	WS 4060	GS 4060	60	3	60	40	1	40	60	60	42	3.50 ⁰ _{-0.075}	0.6
45	AXK 4565	AS 4565	WS 4565	GS 4565	65	3	65	45	1	45	65	65	47	4.00 ⁰ _{-0.075}	0.6
50	AXK 5070	AS 5070	WS 5070	GS 5070	70	3	70	50	1	50	70	70	52	4.00 ⁰ _{-0.075}	0.6
55	AXK 5578	AS 5578	WS 5578	GS 5578	78	3	78	55	1	55	78	78	57	5.00 ⁰ _{-0.075}	0.6
60	AXK 6085	AS 6085	WS 6085	GS 6085	85	3	85	60	1	60	85	85	62	4.75 ⁰ _{-0.075}	1.0
65	AXK 6590	AS 6590	WS 6590	GS 6590	90	3	90	65	1	65	90	90	67	5.25 ⁰ _{-0.075}	1.0
70	AXK 7095	AS 7095	WS 7095	GS 7095	95	4	95	70	1	70	95	95	72	5.25 ⁰ _{-0.075}	1.0
75	AXK 75100	AS 75100	WS 75100	GS 75100	100	4	100	75	1	75	100	100	77	5.75 ⁰ _{-0.075}	1.0
80	AXK 80105	AS 80105	WS 80105	GS 80105	105	4	105	80	1	80	105	105	82	5.75 ⁰ _{-0.075}	1.0
85	AXK 85110	AS 85110	WS 85110	GS 85110	110	4	110	85	1	85	110	110	87	5.75 ⁰ _{-0.075}	1.0
90	AXK 90120	AS 90120	WS 90120	GS 90120	120	4	120	90	1	90	120	120	92	6.50 ⁰ _{-0.090}	1.0
100	AXK 100135	AS 100135	WS 100135	GS 100135	135	4	135	100	1	100	135	135	102	7.00 ⁰ _{-0.090}	1.0
110	AXK 110145	AS 110145	WS 110145	GS 110145	145	4	145	110	1	110	145	145	112	7.00 ⁰ _{-0.090}	1.0
120	AXK 120155	AS 120155	WS 120155	GS 120155	155	4	155	120	1	120	155	155	122	7.00 ⁰ _{-0.090}	1.0
130	AXK 130170	AS 130170	WS 130170	GS 130170	170	5	170	130	1	130	170	170	132	9.00 ⁰ _{-0.090}	1.0
140	AXK 140180	AS 140180	WS 140180	GS 140180	180	5	180	140	1	140	178	180	142	9.50 ⁰ _{-0.090}	1.0
150	AXK 150190	AS 150190	WS 150190	GS 150190	190	5	190	150	1	150	188	190	152	9.50 ⁰ _{-0.090}	1.0
160	AXK 160200	AS 160200	WS 160200	GS 160200	200	5	200	160	1	160	198	200	162	9.50 ⁰ _{-0.090}	1.0

Notes: 1) These values are the allowable minimum dimensions of the chamfer dimension r .
2) Measured axial load is more than 20kgf.

Remark: If you have more inquiry of technical, please inquire
KSM web-site: <http://www.minamiguchi-bearings.com>

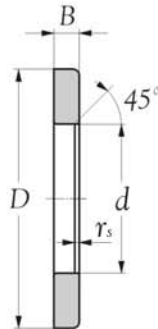
Technical supplement		
Cages	Pr2ecision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Thrust needle roller bearings series AXK, AS, WS, GS



dynamic C	Basic load ratings			Max runout speed		Reference dimensions		Mass (approx.)		
	N	static Co	dynamic C kgf	static Co	grease r/min	oil	Eb	Ea	AXK..	AS.. kg
9150	25300	935	2580	3500	14000	11	21	0.0028	0.0030	0.008
9850	28900	1010	2940	3300	13000	13	23	0.0030	0.0033	0.009
11300	36000	1150	3700	2800	11000	17	27	0.0035	0.0035	0.010
11900	39500	1220	4050	2500	10000	19	29	0.0040	0.0038	0.011
13200	46500	1340	4750	2100	8500	22	34	0.0050	0.0051	0.014
14600	58000	1490	5900	1800	7000	29	41	0.0070	0.0070	0.021
16300	69500	1660	7100	1500	6000	35	46	0.0080	0.0080	0.025
17800	81500	1820	8300	1400	5500	40	51	0.0100	0.0091	0.033
27400	110000	2790	11300	1200	4700	45	58	0.0185	0.0123	0.044
29800	128000	3050	13100	1100	4300	50	63	0.0205	0.0136	0.055
31500	143000	3250	14500	1000	3900	55	68	0.0235	0.0148	0.060
38000	186000	3850	19000	900	3500	60	76	0.0308	0.0189	0.095
44500	234000	4550	23900	800	3200	65	83	0.0390	0.0223	0.101
46500	254000	4750	25900	750	3000	70	88	0.0400	0.0239	0.125
53500	253000	5500	25800	750	2900	74	93	0.0600	0.0254	0.134
55000	266000	5650	27100	700	2700	79	98	0.0610	0.0270	0.155
56500	279000	5750	28400	650	2600	84	103	0.0630	0.0284	0.163
57500	291000	5900	29700	600	2400	89	108	0.0668	0.0301	0.175
71000	390000	7250	39500	600	2300	94	118	0.0860	0.0388	0.250
90500	550000	9200	56500	500	2000	105	133	0.1120	0.0505	0.350
93500	590000	9550	60500	480	1900	115	143	0.1220	0.0549	0.385
99000	650000	10100	66500	430	1700	125	153	0.1310	0.0592	0.415
140000	900000	14300	92000	400	1600	136	167	0.2050	0.0740	0.663
145000	960000	14800	97500	380	1500	146	177	0.2190	0.0790	0.749
149000	1020000	15200	104000	350	1400	156	187	0.2320	0.0840	0.796
154000	1070000	15700	110000	330	1300	166	197	0.2460	0.0890	0.842

Thrust needle roller bearings series LS

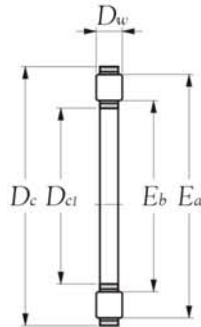


Inner bore <i>d</i> mm	Bearing number	Boundary dimensions			Basic load ratings		Limiting speed $n_{grease} \approx$ min^{-1}	Roll path size	
		<i>D</i>	<i>B</i> mm	r_s mm	dynamic <i>C</i>	static <i>C</i> ₀ N		<i>E</i> _b	<i>E</i> _a
6	LS 0619	19	2.75	0.3	6800	15500	16000	7	18
8	LS 0821	21	2.75	0.3	7800	19400	15000	9	20
10	LS 1024	24	2.75	0.3	9200	25500	14000	12	23
12	LS 1226	26	2.75	0.3	9900	29000	13000	14	25
15	LS 1528	28	2.75	0.3	11300	36000	11000	17	27
17	LS 1730	30	2.75	0.3	11900	39500	10000	19	29
20	LS 2035	35	2.75	0.3	13100	46500	8500	22	34
25	LS 2542	42	3.00	0.6	14700	58000	7000	29	41
30	LS 3047	47	3.00	0.6	16300	70000	6000	34	46
35	LS 3552	52	3.50	0.6	17800	81000	5500	39	51
40	LS 4060	60	3.50	0.6	28000	114000	4700	45	58
45	LS 4565	65	4.00	0.6	30000	128000	4300	50	63
50	LS 5070	70	4.00	0.6	32000	143000	3900	55	68
55	LS 5578	78	5.00	0.6	38000	186000	3500	60	76
60	LS 6085	85	4.75	1.0	44500	234000	3200	65	83
65	LS 6590	90	5.25	1.0	46500	255000	3000	70	88
70	LS 7095	95	5.25	1.0	54000	255000	2900	74	93
75	LS 75100	100	5.75	1.0	55000	265000	2700	79	98
80	LS 80105	105	5.75	1.0	56000	280000	2600	84	103
85	LS 85110	110	5.75	1.0	58000	290000	2400	89	108
90	LS 90120	120	6.50	1.0	73000	405000	2300	94	118
100	LS 100135	135	7.00	1.0	91000	560000	2000	105	133
110	LS 110145	145	7.00	1.0	97000	620000	1900	115	143

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Technical supplement			
	Cages	Precision	Grease
	Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
	Polymid - <input checked="" type="checkbox"/>		
	Brass - <input checked="" type="checkbox"/>		

Thrust needle roller bearings series K 811



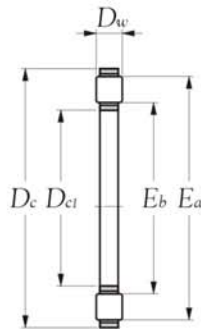
Inner bore D_{cl} E11	Bearing number thrust needle roller and cage assembly	Boundary dimensions		Basic load ratings				Max runout speed		Reference dimensions		Mass kg (approx.)
		D_c C12 mm	D_w 0 -0.01	C N	C_o	C kgf	C_o	grease oil	r/min	E_b	E_a	
10	K 81100	24	3.5	10800	21500	1110	2190	3400	13000	12	23	0.0035
12	K 81101	26	3.5	11500	23900	1170	2430	3000	12000	14	25	0.0040
15	K 81102	28	3.5	12900	28600	1310	2920	2800	11000	16	27	0.0060
17	K 81103	30	3.5	13400	31000	1370	3150	2500	10000	18	29	0.0080
20	K 81104	35	4.5	20200	46500	2060	4700	2100	8500	21	34	0.0120
25	K 81105	42	5.0	27300	68000	2780	6900	1800	7000	27	40	0.0180
30	K 81106	47	5.0	27800	72500	2840	7400	1500	6000	32	45	0.0200
35	K 81107	52	5.0	31000	87000	3150	8900	1400	5500	37	50	0.0240
40	K 81108	60	6.0	43000	121000	4350	12400	1200	4800	42	58	0.0350
45	K 81109	65	6.0	45500	135000	4650	13800	1100	4400	47	63	0.0400
50	K 81110	70	6.0	48000	150000	4900	15300	1000	4000	52	68	0.0450
55	K 81111	78	6.0	62500	215000	6350	21900	900	3600	57	76	0.0600
60	K 81112	85	7.5	69000	215000	7000	21900	830	3300	63	82	0.0830
65	K 81113	90	7.5	73000	236000	7400	24100	780	3100	68	87	0.0900
70	K 81114	95	7.5	76500	257000	7800	26200	730	2900	73	92	0.0970
75	K 81115	100	7.5	78000	268000	7950	27300	680	2700	78	97	0.1150
80	K 81116	105	7.5	79500	279000	8100	28400	650	2600	83	102	0.1190
85	K 81117	110	7.5	83000	300000	8450	30500	630	2500	88	107	0.1250
90	K 81118	120	9.0	112000	395000	11400	40500	580	2300	93	117	0.1700

Notes: 1) The dimensional tolerance for a bearing with a T2 suffix is E12.

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)


Thrust needle roller bearings series K 812



Inner bore D_{ci} E11 mm	Bearing number thrust needle roller and cage assembly	Boundary dimensions (mm)		Basic load ratings				Max runout speed		Reference dimensions		Mass kg (approx.)
		D_c C12	D_{cw} 0 0.01	C N	C_o	C kgf	C_o	grease oil	r/min	E_b	E_a	
30	K 81206	52	7.5	53500	129000	5450	13100	1500	6000	32	50	0.050
35	K 81207	62	7.5	54500	139000	5550	14200	1200	4900	37	60	0.065
40	K 81208	68	9.0	74500	190000	7600	19400	1100	4400	43	66	0.085
45	K 81209	73	9.0	82000	222000	8350	22600	1000	4100	48	71	0.100
50	K 81210	78	9.0	85000	238000	8650	24200	950	3800	53	76	0.105
55	K 81211	90	11.0	121000	340000	12300	34500	830	3300	58	87	0.190
60	K 81212	95	11.0	125000	365000	12800	37000	780	3100	64	92	0.200
65	K 81213	100	11.0	130000	385000	13200	39500	730	2900	69	97	0.215
70	K 81214	105	11.0	134000	410000	13700	42000	680	2700	74	102	0.225
75	K 81215	110	11.0	138000	435000	14100	44500	650	2600	79	107	0.240
80	K 81216	115	11.0	142000	460000	14500	47000	630	2500	84	112	0.250

Notes: 1) The dimensional tolerance for a bearing with a T2 suffix is E12.

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

	Technical supplement		
	Cages	Precision	Grease
Steel -	✓	Class 0 (JIS)	Nil
Polymid -	X		
Brass -	X		

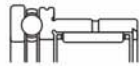


Complex bearings



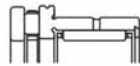
TECHNICAL SUPPLEMENT 204 - 205

PRODUCT INFORMATION 206 - 213



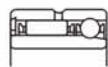
NKX, NKX..Z

206 - 207



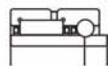
NKXR, NKXR..Z

208 - 209



NKIA 59

210 - 211



NKIB 59

212 - 213

I. Bearing materials

Depending on the thrust bearing type that is combined with a radial needle roller bearing, **KSM** Complex Bearings can be categorized as thrust ball bearings (series NKX), thrust cylindrical roller bearings (series NKXR). The series NKX and NKXR complex bearings can carry a relatively large axial load in one direction and can be axially located.

When used in opposing pairs, they can bear an axial load in both directions and can be axially located. However, because they cannot accommodate a greater axial expansion, they should be mounted on a shorter shaft whose axial expansion is small. The variant with a dust-proofing cover on its thrust bearing (suffix Z) is easily handled because the thrust bearing is a non-separable type. This arrangement can also prevent splashing of the grease within the thrust bearing.

Generally, radial needle roller bearings in these complex bearings use a shaft as a raceway surface, without using an inner ring. However, they can incorporate an inner ring when a shaft is inappropriate as a raceway surface.

The tolerance class of the inscribed enveloping circle diameter (F_w) with needle roller bearings is class F6, the same as with machined ring needle roller bearings.

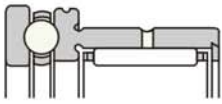


Fig. 1 Series NKX

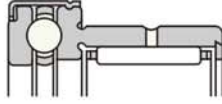


Fig. 2 Series NKX..Z

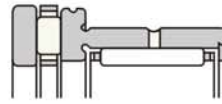


Fig. 3 Series NKXR

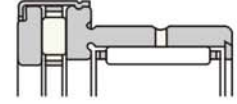


Fig. 4 Series NKXR..Z

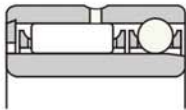


Fig. 5 Series NKIA

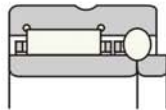
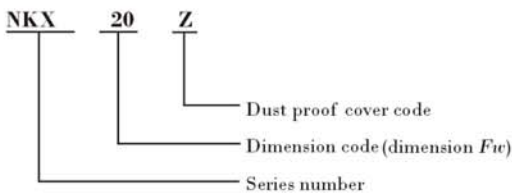


Fig. 6 Series NKIB

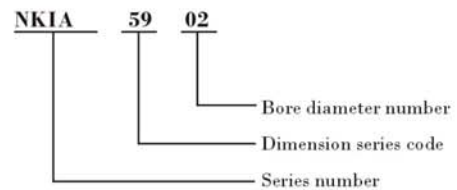
2. Interpreting bearing numbers

The bearing numbers of **KSM** Complex Bearings comprise a series number, dimension series code, Dimension code, and suffix.

Series NKX, NKXR



Series NKIA, NKIB



3. Bearing fits

Table 1 summarizes the fits of radial needle roller bearings to a shaft and housing. The thrust bearing washers of series NKX and NKXR bearings are installed in a housing whose bore diameter is at least 0.5 mm larger than the outside diameter D_1 or D_2 of the bearing washer.

Table 1 Fit to shaft and housing

Bearing number	Shaft	Housing
Series NKX, NKXR	k5	K6(M6)
Series NKIA, NKIB	k5	M6

Remarks: Fits appearing in parentheses are for applications requiring greater rigidity.

4. Rating life calculation

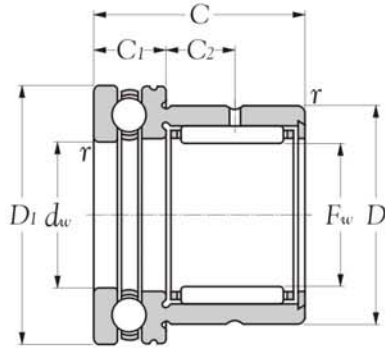
The rating life (L) of a complex bearings can be determined by inputting the results of the following calculations into the formula below:

Calculate the rating life (L_r) of the radial needle roller bearing according to the working radial load.

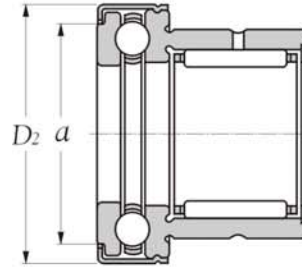
Calculate the rating life (L_a) of the thrust bearing according to the working axial load.

$$L = \frac{1}{\left(\frac{1}{L_r^{1.1}} + \frac{1}{L_a^{1.1}} \right)^{0.91}} \dots\dots\dots(1)$$

Needle roller bearings with thrust ball bearings series NKX, NKX..Z



Type NKX
(Open type)



Type NKX..Z
(With cover)

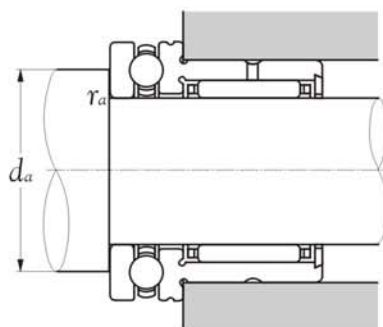
Inner bore F_w mm	Bearing number		Boundary dimensions (mm)										Basic load ratings (Radial)			
			d_w	D	D_1	D_2	C _{-0.25} ⁰	C_1 _{-0.20} ⁰	C_2	a	r_5 mm ⁽¹⁾	dynamic C	static C_o	dynamic C	static C_o	
													N		kgf	
10 ^{+0.022} _{+0.013}	NKX 10	NKX 10 Z	10 ^{+0.040} _{+0.025}	19	24	25.0	23	9	6.5	19.7	0.3	5450	6450	555	660	
12 ^{+0.027} _{+0.016}	NKX 12	NKX 12 Z	12 ^{+0.050} _{+0.032}	21	26	27.0	23	9	6.5	21.7	0.3	6000	7700	615	785	
15 ^{+0.027} _{+0.016}	NKX 15	NKX 15 Z	15 ^{+0.050} _{+0.032}	24	28	29.0	23	9	6.5	23.7	0.3	8250	10200	840	1040	
17 ^{+0.027} _{+0.016}	NKX 17	NKX 17 Z	17 ^{+0.050} _{+0.032}	26	30	31.0	25	9	8.0	25.7	0.3	10400	14400	1060	1460	
20 ^{+0.033} _{+0.020}	NKX 20	NKX 20 Z	20 ^{+0.061} _{+0.040}	30	35	36.0	30	10	10.5	30.7	0.3	16400	27100	1670	2760	
25 ^{+0.033} _{+0.020}	NKX 25	NKX 25 Z	25 ^{+0.061} _{+0.040}	37	42	43.0	30	11	9.5	37.7	0.6	14200	24000	1450	2450	
30 ^{+0.033} _{+0.020}	NKX 30	NKX 30 Z	30 ^{+0.061} _{+0.040}	42	47	48.0	30	11	9.5	42.7	0.6	22300	39500	2280	4000	
35 ^{+0.041} _{+0.025}	NKX 35	NKX 35 Z	35 ^{+0.075} _{+0.050}	47	52	53.0	30	12	9.0	47.7	0.6	20000	36000	2040	3650	
40 ^{+0.041} _{+0.025}	NKX 40	NKX 40 Z	40 ^{+0.075} _{+0.050}	52	60	61.0	32	13	10.0	55.7	0.6	25900	52500	2650	5350	
45 ^{+0.041} _{+0.025}	NKX 45	NKX 45 Z	45 ^{+0.075} _{+0.050}	58	65	66.5	32	14	9.0	60.5	0.6	27600	59000	2810	6000	
50 ^{+0.041} _{+0.025}	NKX 50	NKX 50 Z	50 ^{+0.075} _{+0.050}	62	70	71.5	35	14	10.0	65.5	0.6	27900	62000	2850	6300	
60 ^{+0.049} _{+0.030}	NKX 60	NKX 60 Z	60 ^{+0.090} _{+0.060}	72	85	86.5	40	17	12.0	80.5	1.0	29800	71500	3050	7300	
70 ^{+0.049} _{+0.030}	NKX 70	NKX 70 Z	70 ^{+0.090} _{+0.060}	85	95	96.5	40	18	11.0	90.5	1.0	36500	86000	3700	8750	

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

Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: <http://www.minamiguchi-bearings.com>

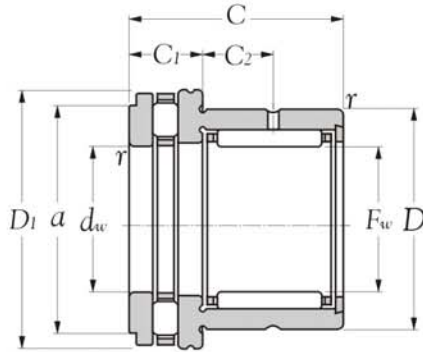
Needle roller bearings with thrust ball bearings series NKX, NKX..Z



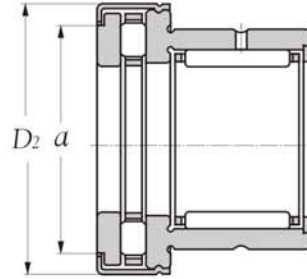
dynamic C	Basic load ratings (Axial)		dynamic C	static C ₀	Max runout speed		Abutment dimensions		Mass (approx.)	
	static C ₀	kgf			grease	oil	d _a mm	r _{as} max	Type NKX	Type NKX..Z
N					r/min				kg	
10000	14000	1020	1420	6700	9500	18	0.3	0.037	0.039	
10300	15400	1050	1570	6400	9200	20	0.3	0.042	0.044	
10500	16800	1070	1710	6200	8800	23	0.3	0.044	0.048	
10800	18200	1100	1850	6000	8500	25	0.3	0.051	0.056	
14200	24700	1450	2520	5200	7500	29	0.3	0.085	0.090	
19600	37000	1990	3800	4600	6500	35	0.6	0.125	0.132	
20400	42000	2080	4300	4300	6200	40	0.6	0.140	0.148	
20400	44500	2080	4550	3900	5600	45	0.6	0.167	0.175	
26900	63000	2740	6400	3500	5000	52	0.6	0.216	0.225	
27900	69000	2840	7050	3200	4600	57	0.6	0.252	0.265	
28800	75500	2930	7700	3100	4500	62	0.6	0.302	0.318	
41500	113000	4200	11500	2600	3700	75	1.0	0.465	0.484	
43000	127000	4400	12900	2400	3400	85	1.0	0.612	0.635	



Needle roller bearings with thrust cylindrical roller bearings series NKXR, NKXR..Z



Type NKXR
(Open type)



Type NKXR..Z
(With cover)

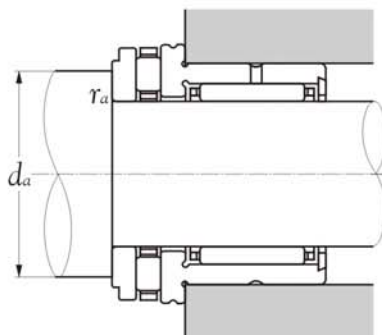
Inner bore F_w mm	Bearing number		Boundary dimensions (mm)									Basic load ratings (Radial)			
			d_w	D	D_1	D_2	C 0 -0.25	C_1 0 -0.20	C_2	a	$r_5 \text{ min}^{(1)}$	dynamic C	static C_o N	dynamic C	static C_o kgf
15 ^{+0.027} +0.016	NKXR 15	NKXR 15 Z	15 ^{+0.050} +0.032	24	28	29.0	23	9	6.5	23.7	0.3	8250	10200	840	1040
17 ^{+0.027} +0.016	NKXR 17	NKXR 17 Z	17 ^{+0.050} +0.032	26	30	31.0	25	9	8.0	25.7	0.3	10400	14400	1060	1460
20 ^{+0.033} +0.020	NKXR 20	NKXR 20 Z	20 ^{+0.061} +0.040	30	35	36.0	30	10	10.5	30.7	0.3	16400	27100	1670	2760
25 ^{+0.033} +0.020	NKXR 25	NKXR 25 Z	25 ^{+0.061} +0.040	37	42	43.0	30	11	9.5	37.7	0.6	14200	24000	1450	2450
30 ^{+0.033} +0.020	NKXR 30	NKXR 30 Z	30 ^{+0.061} +0.040	42	47	48.0	30	11	9.5	42.7	0.6	22300	39500	2280	4000
35 ^{+0.041} +0.025	NKXR 35	NKXR 35 Z	35 ^{+0.075} +0.050	47	52	53.0	30	12	9.0	47.7	0.6	20000	36000	2040	3650
40 ^{+0.041} +0.025	NKXR 40	NKXR 40 Z	40 ^{+0.075} +0.050	52	60	61.0	32	13	10.0	55.7	0.6	25900	52500	2650	5350
45 ^{+0.041} +0.025	NKXR 45	NKXR 45 Z	45 ^{+0.075} +0.050	58	65	66.5	32	14	9.0	60.5	0.6	27600	59000	2810	6000
50 ^{+0.041} +0.025	NKXR 50	NKXR 50 Z	50 ^{+0.075} +0.050	62	70	71.5	35	14	10.0	65.5	0.6	27900	62000	2850	6300

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

Technical supplement			
	Cages	Pre2ecision	Grease
	Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
	Polymid - <input checked="" type="checkbox"/>		
	Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
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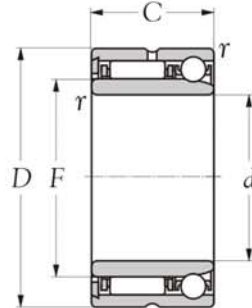
Needle roller bearings with thrust cylindrical roller bearings series **NKXR, NKXR..Z**



dynamic C	Basic load ratings (Axial)		dynamic C	static Co	Max runout speed		Abutment dimensions		Mass (approx.)	
	static Co	dynamic C			grease	oil	da mm	ras max	Type NKXR	Type NKXR..Z
N		kgf			r/min				kg	
12900	28600	1310	2920	2800	11000	25	0.3	0.048	0.052	
13400	31000	1370	3150	2500	10000	27	0.3	0.050	0.053	
20200	46500	2060	4700	2100	8500	32	0.3	0.090	0.095	
27300	68000	2780	6900	1800	7000	39	0.6	0.128	0.135	
27800	72500	2840	7400	1500	6000	44	0.6	0.162	0.169	
31000	87000	3150	8900	1400	5500	49	0.6	0.184	0.195	
43000	121000	4350	12400	1200	4800	56	0.6	0.226	0.237	
45500	135000	4650	13800	1100	4400	61	0.6	0.267	0.286	
48000	150000	4900	15300	1000	4000	66	0.6	0.309	0.329	




Needle roller bearings with angular contact ball bearings series NKIA 59



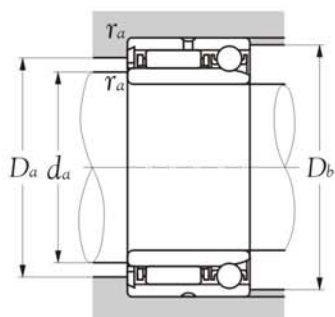
Inner bore <i>d</i> mm	Bearing number	Boundary dimensions				Basic load ratings (Radial)			
		<i>D</i>	<i>C</i>	<i>F</i>	<i>r</i> mm ¹⁾	dynamic <i>C</i> N	static <i>C</i> ₀	dynamic <i>C</i> kgf	static <i>C</i> ₀
15	NKIA 5902	28	18	20	0.3	9500	13400	970	1370
17	NKIA 5903	30	18	22	0.3	10100	14900	1030	1520
20	NKIA 5904	37	23	25	0.3	16500	22100	1680	2250
22	NKIA 59/22	39	23	28	0.3	17500	24800	1790	2530
25	NKIA 5905	42	23	30	0.3	17400	25000	1770	2550
30	NKIA 5906	47	23	35	0.3	19400	30500	1980	3100
35	NKIA 5907	55	27	42	0.6	25700	46000	2630	4700
40	NKIA 5908	62	30	48	0.6	31000	61000	3150	6250
45	NKIA 5909	68	30	55	0.6	33000	69500	3350	7100
50	NKIA 5910	72	30	60	0.6	33500	73500	3450	7500
55	NKIA 5911	80	34	63	1.0	44500	95500	4500	9700
60	NKIA 5912	85	34	68	1.0	45500	101000	4600	10300
65	NKIA 5913	90	34	75	1.0	46000	106000	4700	10800
70	NKIA 5914	100	40	80	1.0	62500	146000	6350	14900

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

Technical supplement			
	Cages	Precision	Grease
	Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
	Polymid - <input checked="" type="checkbox"/>		
	Brass - <input checked="" type="checkbox"/>		

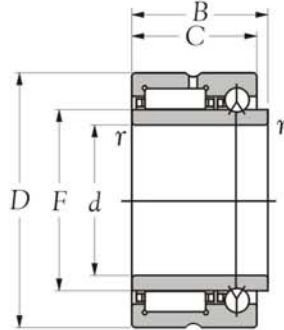
Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Needle roller bearings with angular contact ball bearings series NKIA 59




Basic load ratings (Axial)				Max runout speed		Abutment dimensions				Mass kg(s) (approx.)
dynamic C	static Co	dynamic C	static Co	grease	oil	da mm	Da max	Db max	ra max	
N		kgf		r/min						
2340	3050	239	310	13000	20000	17.5	22.0	25.5	0.3	0.050
2530	3550	258	360	12000	18000	19.5	24.0	27.5	0.3	0.056
4700	6150	480	625	11000	16000	22.5	28.0	34.5	0.3	0.111
4900	6750	500	690	9500	14000	24.5	31.0	36.5	0.3	0.120
5100	7350	520	750	8500	13000	27.5	33.0	39.5	0.3	0.130
5400	8550	550	870	7500	11000	32.5	38.0	44.5	0.3	0.147
7400	12300	755	1260	6500	9500	40.0	45.0	50.0	0.6	0.243
7750	14000	790	1430	5500	8500	45.0	51.0	57.0	0.6	0.347
8500	17100	870	1740	5000	7500	50.0	58.0	63.0	0.6	0.401
8800	18700	900	1910	4300	6500	55.0	63.0	67.0	0.6	0.410
14300	33000	1460	3350	4300	6500	61.0	66.5	74.0	1.0	0.590
14800	36000	1510	3650	4000	6000	66.0	71.5	79.0	1.0	0.632
15200	39000	1550	4000	3700	5500	71.0	78.5	84.0	1.0	0.708
18600	47500	1890	4850	3300	5000	76.0	84.0	94.0	1.0	1.050

Needle roller bearings with three-point contact ball bearings series NKIB 59



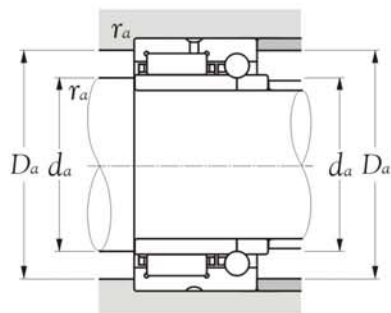
Inner bore <i>d</i> mm	Bearing number	Boundary dimensions					Basic load ratings (Radial)			
		<i>D</i>	<i>B</i>	<i>C</i>	<i>F</i>	<i>r</i> mm ¹⁾	dynamic <i>C</i>	static <i>C₀</i>	dynamic <i>C</i>	static <i>C₀</i>
		mm					N	kgf		
15	NKIB 5902	28	20	18	20	0.3	10800	13600	1100	1390
17	NKIB 5903	30	20	18	22	0.3	11200	14600	1140	1490
20	NKIB 5904	37	25	23	25	0.3	21300	25500	2170	2600
22	NKIB 59/22	39	25	23	28	0.3	23200	29300	2360	2990
25	NKIB 5905	42	25	23	30	0.3	24000	31500	2450	3200
30	NKIB 5906	47	25	23	35	0.3	25500	35500	2600	3600
35	NKIB 5907	55	30	42	42	0.6	32000	50000	3300	5100
40	NKIB 5908	62	34	48	28	0.6	43500	66500	4450	6800
45	NKIB 5909	68	34	52	52	0.6	46000	73000	4700	7450
50	NKIB 5910	72	34	58	58	0.6	48000	80000	4900	8150
55	NKIB 5911	80	38	63	63	1.0	58500	99500	6000	10100
60	NKIB 5912	85	38	68	68	1.0	61500	108000	6250	11000
65	NKIB 5913	90	38	72	72	1.0	62500	112000	6350	11400
70	NKIB 5914	100	45	80	80	1.0	85500	156000	8750	15900

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

Technical supplement			
	Cages	Precision	Grease
	Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
	Polymid - <input checked="" type="checkbox"/>		
	Brass - <input checked="" type="checkbox"/>		

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Needle roller bearings with three-point contact ball bearings series NKIB 59



dynamic C	Basic load ratings (Axial)		dynamic C	static C ₀	Max runout speed		Abutment dimensions			Mass kg (approx.)
	static C ₀	dynamic C			grease	oil	d _a mm	D _a max	r _{as} max	
N		kgf			r/min					
2750	4200	280	430	13000	20000	17.5	25.5	0.3	0.052	
2960	4900	300	495	12000	18000	19.5	27.5	0.3	0.058	
4650	7400	475	755	11000	16000	22.5	34.5	0.3	0.107	
5000	8650	510	880	9500	14000	24.5	36.5	0.3	0.122	
5150	9250	525	945	8500	13000	27.5	39.5	0.3	0.134	
5600	11200	570	1140	7500	11000	32.5	44.5	0.3	0.151	
7050	14900	720	1520	6500	9500	40.0	50.0	0.6	0.247	
8700	19400	890	1980	5500	8500	45.0	57.0	0.6	0.320	
9100	21400	925	2180	5000	7500	50.0	63.0	0.6	0.380	
9600	24300	980	2480	4300	6500	55.0	67.0	0.6	0.385	
11400	29400	1170	3000	4300	6500	61.0	74.0	1.0	0.555	
11800	32000	1200	3250	4000	6000	66.0	79.0	1.0	0.595	
12100	34000	1240	3500	3700	5500	71.0	84.0	1.0	0.640	
15900	44500	1620	4550	3300	5000	76.0	94.0	1.0	0.985	



Roller followers



TECHNICAL SUPPLEMENT	216 - 218
PRODUCT INFORMATION	220 - 229



NATR

220 - 221



NATR..PP

220 - 221



NATV

222 - 223



NATV..PP

222 - 223



NUTR

224 - 225



NA 22..2RSR

226 - 227



RNA 22..2RSR

226 - 227



PWTR..2RSR

228 - 229

I. Bearing materials

KSM Yoke-type Track Rollers include the series RNA 22 (without inner ring) and series NA 22 (with inner ring), whose outer ring is not guided in the axial direction; and the NATR, NATV and series NUTR whose outer ring is guided in the axial direction. With the series RNA 22 and NA 22, a needle roller and cage assembly and steel plate reinforced synthetic rubber seal are built into the outer ring, and these components are inseparable from each other. Since the bearing can be shifted in the axial direction, the shaft must have a thrust washer or flange to guide the outer ring.

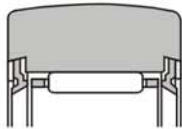


Fig. 1 Series RNA 22..2RSR

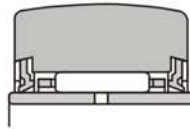


Fig. 2 Series NA 22..2RSR

With the series NATR, NATV, the outer ring is guided in the axial direction by two side plates that are press-fit into the inner ring. The series NATR bearing has an integral cage and needle roller assembly. The series NATV full-complement type can carry a larger load compared with the series NATR bearing, although its limiting speed is low.

On **KSM** Yoke-type Track Rollers, a labyrinth occurs between the outer ring and inner ring to provide sealing. For enhanced sealing, one type of bearing (suffix PP) incorporates a synthetic rubber seal between the outer ring and inner ring.

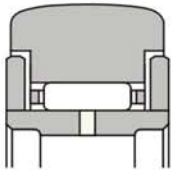


Fig. 3 Series NATR

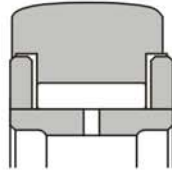


Fig. 4 Series NATV

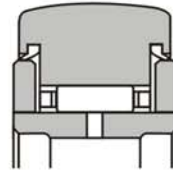


Fig. 5 Series NATR..PP

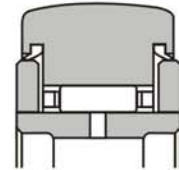


Fig. 6 Series NATV..PP

The rollers of the series NUTR are full-complement type rollers whose rolling elements are double-row cylindrical rollers. Compared with full-complement needle roller bearings, they feature greater load carrying capacity and thus are suitable for heavy load applications. Their outer ring incorporates a press-fit steel plate to form a labyrinth between the side plates on both sides of the inner ring to ensure reliable sealing and maintain the position of the side plates. The outer ring is guided in the axial direction by the outer ring rib and end faces of the cylindrical rollers, and can carry some axial load. The inner ring and side plates are tightened in the axial direction to eliminate clearance.

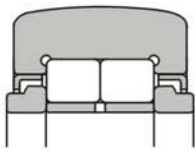
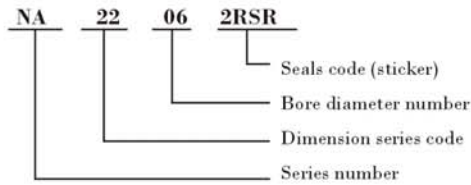


Fig. 7 Series NUTR

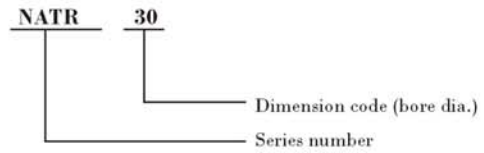
2. Interpreting bearing numbers

The bearing numbers of **KSM** Yoke-type Track Rollers comprise a series number, dimension series code, dimension code, and suffix.

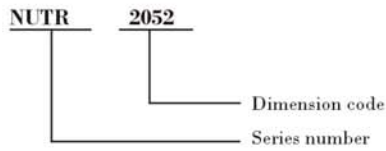
Series RNA, NA



Series NATR, NATV



Series NUTR



3. Bearing fits and radial clearance

The tolerance class of the shaft in relation to a bearing with an inner ring is g6 (h6). If a shaft is used directly as a raceway surface (series RNA 22), the tolerance class of the shaft must be k5 (k6). Usually, the outer ring of an **KSM** Yoke-type Track Roller is not built into a housing.

Table 1 Radial clearance

(Unit: μm)

Enveloping circle diameter F_w (mm)		Clearance							
		C2		Normal		C3		C4	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
3	6	0	10	3	17	15	30	20	40
6	10	0	12	5	20	15	30	25	45
10	18	0	15	5	25	15	35	30	55
18	30	0	20	10	30	20	40	40	65
30	50	0	25	10	40	25	55	50	80
50	80	0	30	15	50	30	65	60	100
80	100	0	35	20	55	35	75	70	115

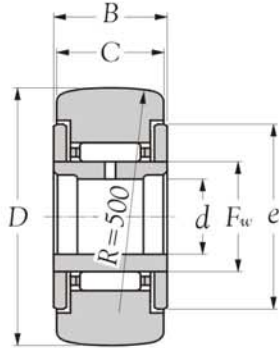
4. Mounting dimensions

If a bearing lacks a function for axially guiding the outer ring, as in the case of the series RNA 22 series or NA 22 bearings, the shaft must be provided with a flange or thrust washer to guide the outer ring. The guide surface should preferably be hardened, and the guide width should be at least half the outer ring width. At minimum, the guide surface must be finished by a turning process, and must be smooth and free from burrs. The mounting surface for series NATR, NATV and NUTR rollers must at least adopt dimensions e specified in the associated bearing tables so that their side plates can make full contact.

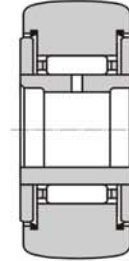
5. Lubrication

Rollers having a synthetic rubber seal (suffix PP) and those of the full-complement type are pre-filled with lithium soap grease and can operate at a temperature range of 25 °C to 100 °C. The internal bearing grease can be replenished through a lubrication hole on the inner ring. The rollers must be installed so that the lubrication hole is located in a non-load zone. The series NATV and NUTR being full-complement types, must be lubricated more frequently than the caged types.

Roller followers yoke type truck rollers series NATR



Type NATR
(With cage)



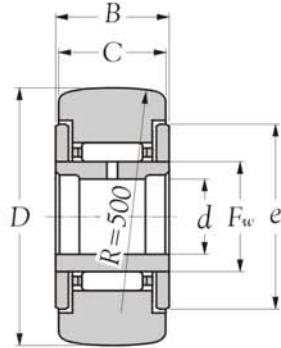
Type NATR..PP
(Double seals with cage)

Inner bore D 0 ^{-0.05} mm	Bearing number		Boundary dimensions					Basic load ratings			
			B	C	d	e	F _w	dynamic C	static C ₀	dynamic C	static C ₀
			mm					N			
16	NATR 5	NATR 5 PP	12 ⁰ _{-0.180}	11	5	12	8.0	3850	3950	395	400
19	NATR 6	NATR 6 PP	12 ⁰ _{-0.180}	11	6	14	10.0	4500	5100	460	520
24	NATR 8	NATR 8 PP	15 ⁰ _{-0.180}	14	8	19	12.0	6600	7300	675	745
30	NATR 10	NATR 10 PP	15 ⁰ _{-0.180}	14	10	23	15.0	7500	9100	765	930
32	NATR 12	NATR 12 PP	15 ⁰ _{-0.180}	14	12	25	17.0	8500	11100	865	1130
35	NATR 15	NATR 15 PP	19 ⁰ _{-0.210}	18	15	27	20.0	13000	20100	1320	2050
40	NATR 17	NATR 17 PP	21 ⁰ _{-0.210}	20	17	32	22.0	13600	22100	1390	2250
47	NATR 20	NATR 20 PP	25 ⁰ _{-0.210}	24	20	37	25.0	20300	33000	2070	3350
52	NATR 25	NATR 25 PP	25 ⁰ _{-0.210}	24	25	42	30.0	22300	39500	2280	4000
62	NATR 30	NATR 30 PP	29 ⁰ _{-0.210}	28	30	51	38.0	35000	64000	3600	6550
72	NATR 35	NATR 35 PP	29 ⁰ _{-0.210}	28	35	58	44.5	38000	74500	3850	7600
80	NATR 40	NATR 40 PP	32 ⁰ _{-0.250}	30	40	66	50.0	48500	90000	4950	9150
85	NATR 45	NATR 45 PP	32 ⁰ _{-0.250}	30	45	71	55.0	50500	97500	5150	9950
90	NATR 50	NATR 50 PP	32 ⁰ _{-0.250}	30	50	76	60.0	52000	105000	5300	10700

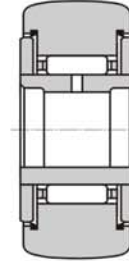
Technical supplement		
Cages	Pre2ccision	Grease
Steel - <input checked="" type="checkbox"/>		
Polymid - <input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
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Roller followers yoke type truck rollers series NATR



Type NATR
(With cage)



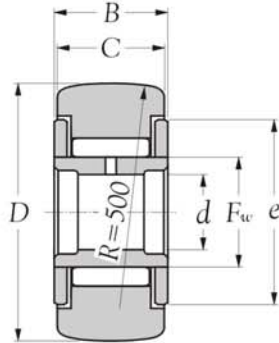
Type NATR..PP
(Double seals with cage)

Spherical outer ring N	Load ratings of truck			Max runout speed		Mass kg (approx.)
	Cylindrical outer ring	Cylindrical outer ring	Cylindrical outer ring kgf	grease r/min	oil r/min	
1080	3400	110	350	※19000	※25000	0.018
1380	4050	141	415	※15000	※20000	0.025
1900	6650	193	680	※12000	※16000	0.042
2620	7700	267	785	10000	※13000	0.061
2860	8200	291	835	9000	※12000	0.069
3200	11900	325	1220	7500	10000	0.098
3850	14500	390	1480	7000	9000	0.140
4700	21000	480	2150	6000	8000	0.246
5500	23300	565	2370	5000	6500	0.275
6950	33000	710	3350	4000	5500	0.470
8050	37000	820	3750	3300	4500	0.635
9800	44500	1000	4500	3000	4000	0.875
10400	47000	1060	4800	2700	3600	0.910
11400	50000	1160	5100	2500	3300	0.960

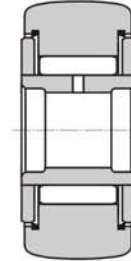
Notes: Limiting speed of sealed type bearings marked with ※ is approximately 10 000 r/min.



Roller followers yoke type truck rollers series NATV



Type NATV
(Full complement type)



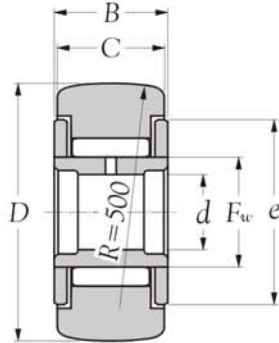
Type NATV..PP
(Full complement type with seals)

Inner bore D 0-0.05 mm	Bearing number		Boundary dimensions					Basic load ratings			
			B	C	d	e	F_w	dynamic C	static C_o	dynamic C	static C_o
			mm					N			
16	NATV 5	NATV 5 PP	12 ⁰ _{-0.180}	11	5	12	8.0	6250	8900	640	910
19	NATV 6	NATV 6 PP	12 ⁰ _{-0.180}	11	6	14	10.0	7200	11200	735	1140
24	NATV 8	NATV 8 PP	15 ⁰ _{-0.180}	14	8	19	12.0	10300	15500	1050	1580
30	NATV 10	NATV 10 PP	15 ⁰ _{-0.180}	14	10	23	15.0	11700	19500	1190	1980
32	NATV 12	NATV 12 PP	15 ⁰ _{-0.180}	14	12	25	17.0	12600	22100	1280	2250
35	NATV 15	NATV 15 PP	19 ⁰ _{-0.210}	18	15	27	20.0	18000	37000	1830	3750
40	NATV 17	NATV 17 PP	21 ⁰ _{-0.210}	20	17	32	22.0	18900	40500	1930	4150
47	NATV 20	NATV 20 PP	25 ⁰ _{-0.210}	24	20	37	25.0	28400	60000	2900	6100
52	NATV 25	NATV 25 PP	25 ⁰ _{-0.210}	24	25	42	30.0	31000	72000	3150	7350
62	NATV 30	NATV 30 PP	29 ⁰ _{-0.210}	28	30	51	38.0	46500	112000	4750	11400
72	NATV 35	NATV 35 PP	29 ⁰ _{-0.210}	28	35	58	44.5	51000	130000	5200	13300
80	NATV 40	NATV 40 PP	32 ⁰ _{-0.250}	30	40	66	50.0	67500	167000	6850	17100
90	NATV 50	NATV 50 PP	32 ⁰ _{-0.250}	30	50	76	60.0	74500	200000	7600	20400

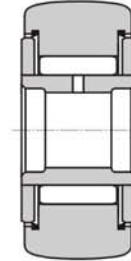
	Technical supplement		
	Cages	Pre2ccision	Grease
Steel -	<input checked="" type="checkbox"/>		
Polymid -	<input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2
Brass -	<input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Roller followers yoke type truck rollers series NATV



Type NATV
(Full complement type)



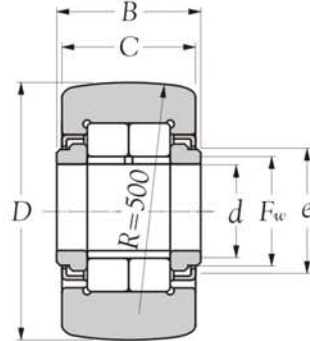
Type NATV..PP
(Full complement type with seals)

Spherical outer ring	Load ratings of truck			Max runout speed		Mass kg (approx.)
	Cylindrical outer ring N	Cylindrical outer ring	Cylindrical outer ring kgf	grease r/min	oil r/min	
1080	3400	110	350	※13000	※16000	0.020
1380	4050	141	415	10000	※13000	0.027
1900	6650	193	680	8500	※11000	0.044
2620	7700	267	785	6500	8500	0.065
2860	8200	291	835	6000	7500	0.074
3200	11900	325	1220	5000	6500	0.102
3850	14500	390	1480	4500	6000	0.145
4700	21000	480	2150	4000	5000	0.254
5500	23300	565	2370	3300	4500	0.285
6950	33000	710	3350	2600	3500	0.481
8050	37000	820	3750	2200	2900	0.647
9800	44500	1000	4500	2000	2600	0.890
11400	50000	1160	5100	1600	2100	0.990

Notes: Limiting speed of sealed type bearings marked with ※ is approximately 10 000 r/min.



Roller followers yoke type truck rollers series NUTR



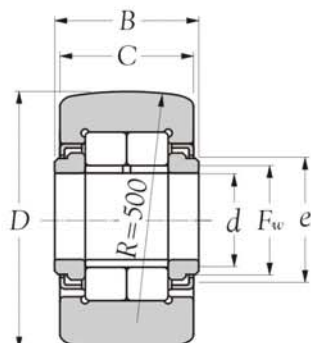
Inner bore D 0-0.05 mm	Bearing number	Boundary dimensions						Basic load ratings			
		B	C	d	e	F_w	$r_s \text{ min}^0$	dynamic C	static C_0	dynamic C	static C_0
		mm						N			
35	NUTR 15	$19_{-0.210}^0$	18	15	20	19.0	0.3	22300	25700	2280	2620
40	NUTR 17	$21_{-0.210}^0$	20	17	22	21.5	0.3	24100	29100	2450	2970
42	NUTR 1542	$19_{-0.210}^0$	18	15	20	19.0	0.3	22300	25700	2280	2620
47	NUTR 1747	$21_{-0.210}^0$	20	17	22	21.5	0.3	24100	29100	2450	2970
47	NUTR 20	$25_{-0.210}^0$	24	20	27	25.5	0.3	38500	48000	3950	4900
52	NUTR 2052	$25_{-0.210}^0$	24	20	27	25.5	0.3	38500	48000	3950	4900
52	NUTR 25	$25_{-0.210}^0$	24	25	31	30.0	0.3	42500	57500	4350	5850
62	NUTR 2562	$25_{-0.210}^0$	24	25	31	30.0	0.3	42500	57500	4350	5850
62	NUTR 30	$29_{-0.210}^0$	28	30	38	35.0	0.3	56500	72500	5750	7400
72	NUTR 3072	$29_{-0.210}^0$	28	30	38	35.0	0.3	56500	72500	5750	7400
72	NUTR 35	$29_{-0.210}^0$	28	35	44	41.5	0.6	62000	85500	6350	8700
80	NUTR 3580	$29_{-0.210}^0$	28	35	44	41.5	0.6	62000	85500	6350	8700
80	NUTR 40	$32_{-0.250}^0$	30	40	51	47.5	0.6	87000	125000	8850	12700
85	NUTR 45	$32_{-0.250}^0$	30	45	55	52.5	0.6	92000	137000	9350	14000
90	NUTR 4090	$32_{-0.250}^0$	30	40	51	47.5	0.6	87000	125000	8850	12700
90	NUTR 50	$32_{-0.250}^0$	30	50	60	57.0	0.6	96500	150000	9800	15300
100	NUTR 45100	$32_{-0.250}^0$	30	45	55	52.5	0.6	92000	137000	9350	14000
110	NUTR 50110	$32_{-0.250}^0$	30	50	60	57.0	0.6	96500	150000	9800	15300

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

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

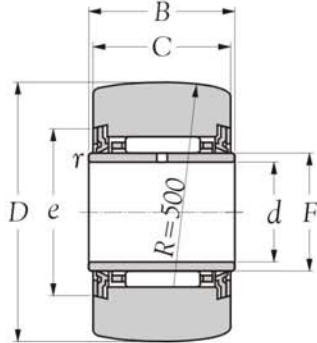
Technical supplement			
Cages	Pr2ecision	Grease	
Steel - <input checked="" type="checkbox"/>			
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			
	Class 0 (JIS)	Shell Alvania S2	

Roller followers yoke type truck rollers series NUTR

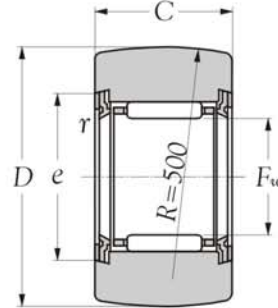


Spherical outer ring	Load ratings of truck			Max runout speed grease r/min	Mass kg(s) (approx.)
	Cylindrical outer ring N	Cylindrical outer ring kgf	Cylindrical outer ring		
3200	11900	325	1220	5500	0.100
3850	14500	390	1480	4700	0.147
4100	14300	415	1460	5500	0.160
4700	17000	480	1740	4700	0.222
4700	21000	480	2150	4000	0.245
5550	23300	565	2370	4000	0.321
5550	23300	565	2370	3300	0.281
6950	27800	710	2830	3300	0.450
6950	33000	710	3350	2900	0.466
8050	38500	820	3900	2900	0.697
8050	37000	820	3750	2400	0.630
9800	41000	1000	4150	2400	0.840
9800	44500	1000	4500	2100	0.817
10400	47000	1060	4800	1900	0.883
11400	50000	1160	5100	2100	1.130
11400	50000	1160	5100	1800	0.950
13000	55500	1330	5650	1900	1.400
14700	61000	1500	6200	1800	1.690

Roller followers yoke type truck rollers sealed type series NA 22..2RSR, RNA 22..2RSR




Type NA 22..2RSR
(With inner ring and double seals)



Type RNA 22..2RSR
(Without inner ring and double seals)

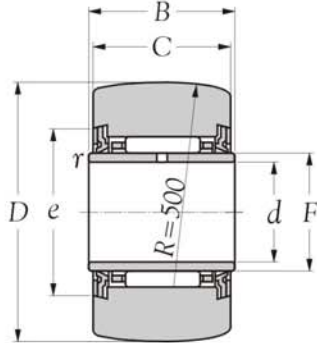
Inner bore <i>D</i> 0-0.05 mm	Bearing number		Boundary dimensions							Basic load ratings			
			<i>B</i>	<i>C</i>	<i>d</i>	<i>F_w</i>	<i>e</i>	<i>F</i>	<i>r</i> 3 mm ¹⁾	dynamic <i>C</i>	static <i>C₀</i>	dynamic <i>C</i>	static <i>C₀</i>
			mm							kgf			
19	NA 22/6 2RSR	RNA 22/6 2RSR	12	11.8	6	10 ^{+0.022} _{+0.013}	16	10	0.3	4300	3950	435	405
24	NA 22/8 2RSR	RNA 22/8 2RSR	12	11.8	8	12 ^{+0.027} _{+0.016}	18	12	0.3	4850	4900	495	500
30	NA 2200 2RSR	RNA 2200 2RSR	14	13.8	10	14 ^{+0.027} _{+0.016}	20	14	0.3	7200	8500	735	865
32	NA 2201 2RSR	RNA 2201 2RSR	14	13.8	12	16 ^{+0.027} _{+0.016}	22	16	0.3	7750	9700	795	990
35	NA 2202 2RSR	RNA 2202 2RSR	14	13.8	15	20 ^{+0.033} _{+0.020}	26	20	0.3	9500	13400	970	1370
40	NA 2203 2RSR	RNA 2203 2RSR	16	15.8	17	22 ^{+0.033} _{+0.020}	28	22	0.3	10100	14900	1030	1520
47	NA 2204 2RSR	RNA 2204 2RSR	18	17.8	20	25 ^{+0.033} _{+0.020}	33	25	0.3	16500	22100	1680	2250
52	NA 2205 2RSR	RNA 2205 2RSR	18	17.8	25	30 ^{+0.033} _{+0.020}	38	30	0.3	17400	25000	1770	2550
62	NA 2206 2RSR	RNA 2206 2RSR	20	19.8	30	35 ^{+0.041} _{+0.025}	43	35	0.3	20900	33500	2130	3400
72	NA 2207 2RSR	RNA 2207 2RSR	23	22.7	35	42 ^{+0.041} _{+0.025}	50	42	0.6	25700	46000	2630	4700
80	NA 2208 2RSR	RNA 2208 2RSR	23	22.7	40	48 ^{+0.041} _{+0.025}	57	48	0.6	27800	53500	2830	5450
85	NA 2209 2RSR	RNA 2209 2RSR	23	22.7	45	52 ^{+0.049} _{+0.030}	62	52	0.6	28600	57000	2920	5800
90	NA 2210 2RSR	RNA 2210 2RSR	23	22.7	50	58 ^{+0.049} _{+0.030}	68	58	0.6	30500	64000	3100	6500

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

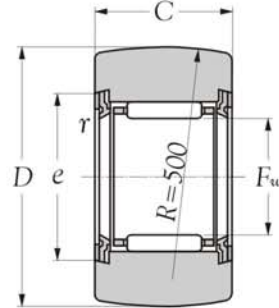
Technical supplement			
	Cages	Precision	Grease
	Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2
	Polymid - <input checked="" type="checkbox"/>		
	Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Roller followers yoke type truck rollers sealed type series NA 22..2RSR, RNA 22..2RSR



Type NA 22..2RSR
(With inner ring and double seals)

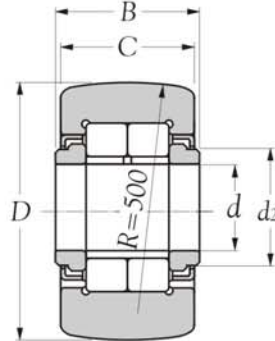


Type RNA 22..2RSR
(Without inner ring and double seals)

Spherical outer ring	Load ratings of truck			Max runout speed grease r/min	Mass (approx.)	
	Cylindrical outer ring N	Cylindrical outer ring kgf	Cylindrical outer ring kgf		Typt NA 22..2RSR	Typt RNA 22..2RSR
1380	4400	141	445	10000	0.023	0.018
1900	5500	193	565	10000	0.035	0.027
2620	7550	267	770	10000	0.060	0.052
2860	8050	291	820	9500	0.067	0.057
3200	8800	325	900	7500	0.075	0.060
3850	10900	390	1110	7000	0.113	0.094
4700	14800	480	1510	6000	0.176	0.152
5550	16400	565	1670	5000	0.209	0.179
6950	22200	710	2260	4300	0.322	0.284
8050	28700	820	2930	3600	0.506	0.432
9800	32000	1000	3250	3100	0.623	0.530
10400	34000	1060	3450	2900	0.638	0.545
11400	36000	1160	3650	2600	0.682	0.563



Needle roller bearings with thrust cylindrical roller bearings series PWTR .. 2RS



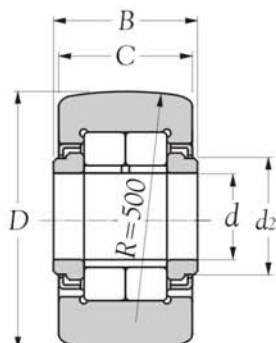
Inner bore D 0/-0.05 mm	Bearing number	Boundary dimensions						Basic load ratings			
		d	B	C	d_2	r	r_1	dynamic C	static C_0	dynamic C	static C_0
		mm						N		N	
35	PWTR 15 2RS	15	19	18	20.0	0.6	0.3	12600	14600	10700	14600
40	PWTR 17 2RS	17	21	20	22.0	1.0	0.5	14300	17900	16500	17900
42	PWTR 1542 2RS	15	19	18	20.0	0.6	0.3	14700	16200	16200	16200
47	PWTR 1747 2RS	17	21	20	22.0	1.0	0.5	15900	18400	18400	18400
47	PWTR 20 2RS	20	25	24	27.0	1.0	0.5	24500	30500	20700	30500
52	PWTR 2052 2RS	20	25	24	27.0	1.0	0.5	27000	35000	31000	35000
52	PWTR 25 2RS	25	25	24	31.0	1.0	0.5	25000	33000	21800	33000
62	PWTR 2562 2RS	25	25	24	31.0	1.0	0.5	30000	42500	42500	42500
62	PWTR 30 2RS	30	29	28	38.0	1.0	0.5	35000	45500	29000	45500
72	PWTR 3072 2RS	30	29	28	38.0	1.0	0.5	41000	56000	54000	56000
72	PWTR 35 2RS	35	29	28	44.0	1.1	0.6	38500	54000	39000	54000
80	PWTR 3580 2RS	35	29	28	44.0	1.1	0.6	43500	63000	59000	63000
80	PWTR 40 2RS	40	32	30	50.5	1.1	0.6	45000	61000	39500	61000
85	PWTR 45 2RS	45	32	30	55.2	1.1	0.6	45500	63000	41000	63000
90	PWTR 4090 2RS	40	32	30	50.5	1.1	0.6	52000	75000	67000	75000
90	PWTR 50 2RS	50	32	30	59.8	1.1	0.6	46000	66000	42000	66000
100	PWTR 45100 2RS	45	32	30	55.2	1.1	0.6	56000	85000	85000	85000
110	PWTR 50110 2RS	50	32	30	59.8	1.1	0.6	59000	94000	94000	94000

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

Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

Remark: If you have more inquiry of technical, please inquire
KSM web-site: <http://www.minamiguchi-bearings.com>

Needle roller bearings with thrust cylindrical roller bearings series PWTR .. 2RS



Fatigue limit load N	Max runout speed grease r/min	Mass kg(s) (approx.)
1760	6000	0.099
2160	5000	0.147
2140	6000	0.158
2440	5000	0.220
3750	3800	0.245
4250	3800	0.321
4100	3800	0.281
5200	3800	0.450
5800	2200	0.465
7200	2200	0.697
6900	1800	0.630
8100	1800	0.836
7900	1500	0.816
8200	1300	0.883
9600	1500	1.129
8500	1100	0.950
10900	1300	1.396
12100	1100	1.690




Cam followers



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PRODUCT INFORMATION 234 - 245

 KR 234 - 235

 KRV 236 - 237

 NUKR 238 - 239

 NUKRE 240-241

 PWKR..2RS 242-243

 PWKRE..2RS 244-245

I. Bearing materials

KSM Stud-type Track Rollers are available in three basic series: the series KR, whose rolling elements are needle rollers retained and guided by a cage; the full-complement series KRV lacking a cage, whose rolling elements are needle rollers; and the series NUKR, a full-complement type whose rolling elements are double-row cylindrical rollers. The cage of the stud-type track rollers is pressed steel. However, cages of molded polyamide reinforced with glass fiber or carbon fibre may be used. The carbon fibre cage features a maximum allowable operating temperature of 120° C and maximum allowable continuous operating temperature of 100° C. The series KR is suitable for high-speed applications because the cage guides the needle rollers. Compared with a full-complement configuration, this bearing's larger internal volume holds a larger amount of grease, which contributes to relatively extended relubrication intervals. Also available is a variant (suffix PP) with synthetic rubber seal located between the outer ring, flange, and side plate.

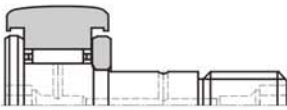


Fig. 1 Series KR

Compared with the series KR, the track roller series KRV has more needle rollers and therefore is suitable for heavy load applications, but it has a lower limiting speed. A variant (suffix PP) with seals is also available. Because this bearing holds less grease, the relubrication intervals for this type are shorter.

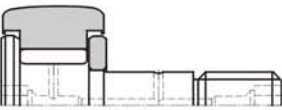


Fig. 2 Series KRV

Compared with full-complement needle roller bearings. The series NUKR track rollers can carry a greater load and are therefore suitable for applications involving heavy load and impact load, as they are full-complement types using double-row cylindrical rollers as rolling elements. They are guided in the axial direction by the outer ring rib and end faces of cylindrical rollers, and can carry some axial load. Although they are a full-complement configuration, their limiting speed is greater than that of series KRV rollers. Their outer ring incorporates a press-fit steel plate to form a labyrinth between the flange and the outer surface of the side plate. Because there is limited space available for adding grease to the bearing, the bearing must be relubricated more frequently.



Fig. 3 Series NUKR

2. Interpreting bearing numbers

The bearing numbers of **KSM** Stud-type Track Rollers comprise a series number, dimension code (outside diameter), and suffix.

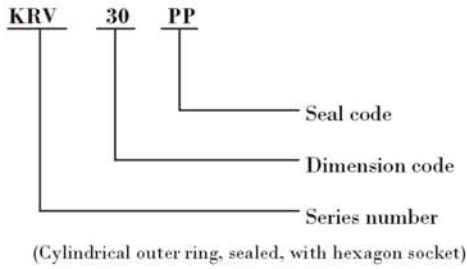
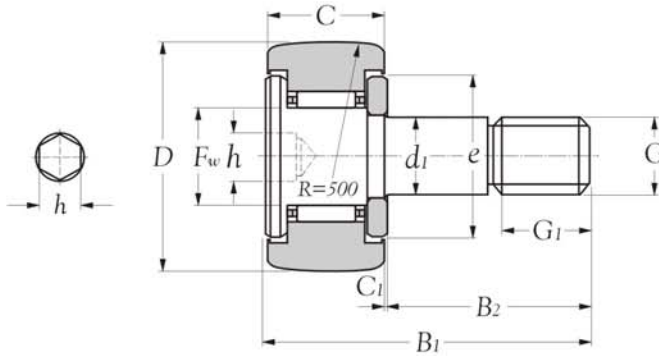


Fig. 4

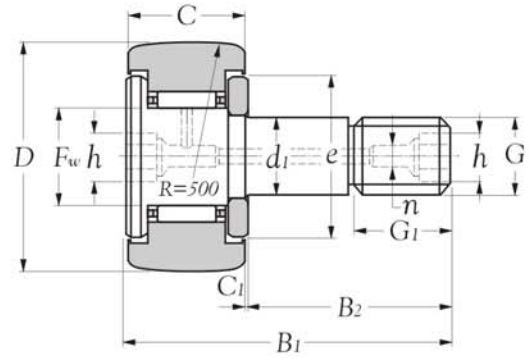
3. Lubrication

The rollers having synthetic rubber seals (suffix **PP**) as well as the full-complement type are pre-filled with lithium soap grease and can operate at a temperature range of -25°C to 100°C . The inside of the bearing can be refilled through a grease nipple installed on the bearing-side end face (flange end face) or threaded end face of the stud. Any lubrication holes not used for relubrication must be plugged. The necessary grease nipple and plug are included in the package and must be installed on the roller before the cam follower is mounted.

Cam followers stud type truck rollers series KR




Type KR (10~19 mm)



Type KR (22~26 mm)

Inner bore D 0 ^{+0.05} mm	Bearing number		Boundary dimensions												
			C	d ₁	F _w	B ₁	B ₂	G	G ₁	C ₁	n	B ₃	a	e	h
10	KR 10	KR 10 PP	7	3 ⁰ _{-0.010}	4.00	17	9.0	M 3 X 0.5	5.0	0.5	-	-	-	7.0	-
12	KR 12	KR 12 PP	8	4 ⁰ _{-0.012}	4.80	20	11.0	M 4 X 0.7	6.0	0.5	-	-	-	8.5	-
13	KR 13	KR 13 PP	9	5 ⁰ _{-0.012}	5.75	23	13.0	M 5 X 0.8	7.5	0.5	-	-	-	9.5	-
16	KR 16	KR 16 PP	11	6 ⁰ _{-0.012}	8.00	28	16.0	M 6 X 1.0	8.0	0.6	42)	-	-	12.0	4
19	KR 19	KR 19 PP	11	8 ⁰ _{-0.015}	10.00	32	20.0	M 8 X 1.25	10.0	0.6	42)	-	-	14.0	4
22	KR 22	KR 22 PP	12	10 ⁰ _{-0.015}	12.00	36	23.0	M 10 X 1.0	12.0	0.6	4	-	-	17.0	5
26	KR 26	KR 26 PP	12	10 ⁰ _{-0.015}	12.00	36	23.0	M 10 X 1.0	12.0	0.6	4	-	-	17.0	5
30	KR 30	KR 30 PP	14	12 ⁰ _{-0.018}	15.00	40	25.0	M 12 X 1.5	13.0	0.6	6	6	3	23.0	6
32	KR 32	KR 32 PP	14	12 ⁰ _{-0.018}	15.00	40	25.0	M 12 X 1.5	13.0	0.6	6	6	3	23.0	6
35	KR 35	KR 35 PP	18	16 ⁰ _{-0.018}	18.00	52	32.5	M 16 X 1.5	17.0	0.8	6	8	3	27.0	8
40	KR 40	KR 40 PP	20	18 ⁰ _{-0.018}	22.00	58	36.5	M 18 X 1.5	19.0	0.8	6	8	3	32.0	8
47	KR 47	KR 47 PP	24	20 ⁰ _{-0.021}	25.00	66	40.5	M 20 X 1.5	21.0	0.8	8	9	4	37.0	10
52	KR 52	KR 52 PP	24	20 ⁰ _{-0.021}	25.00	66	40.5	M 20 X 1.5	21.0	0.8	8	9	4	37.0	10
62	KR 62	KR 62 PP	29	24 ⁰ _{-0.021}	30.00	80	49.5	M 24 X 1.5	25.0	0.8	8	11	4	44.0	14
72	KR 72	KR 72 PP	29	24 ⁰ _{-0.021}	30.00	80	49.5	M 24 X 1.5	25.0	0.8	8	11	4	44.0	14
80	KR 80	KR 80 PP	35	30 ⁰ _{-0.021}	38.00	100	63.0	M 30 X 1.5	32.0	1.0	8	15	4	53.0	14
85	KR 85	KR 85 PP	35	30 ⁰ _{-0.021}	38.00	100	63.0	M 30 X 1.5	32.0	1.0	8	15	4	53.0	-
90	KR 90	KR 90 PP	35	30 ⁰ _{-0.021}	38.00	100	63.0	M 30 X 1.5	32.0	1.0	8	15	4	53.0	14

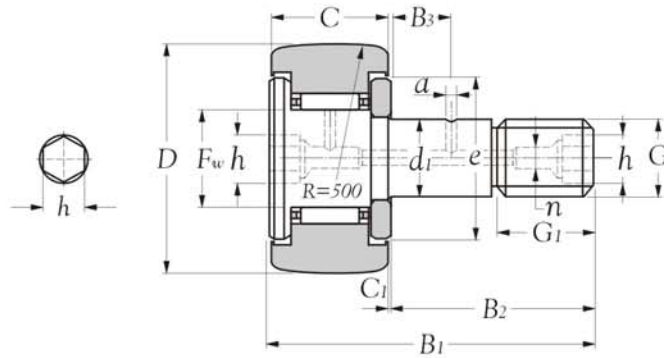


Technical supplement

Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>		
Polymid - <input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Cam followers stud type truck rollers series KR

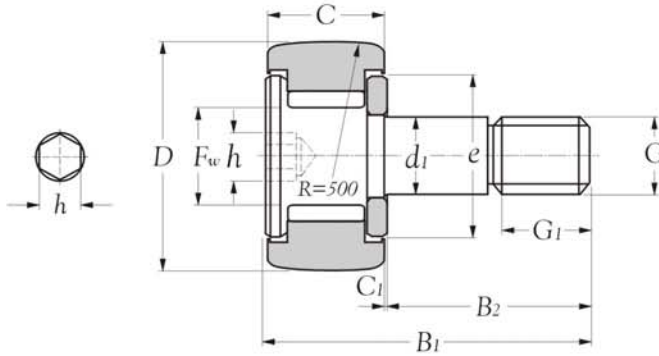


Type KR (30~90 mm)

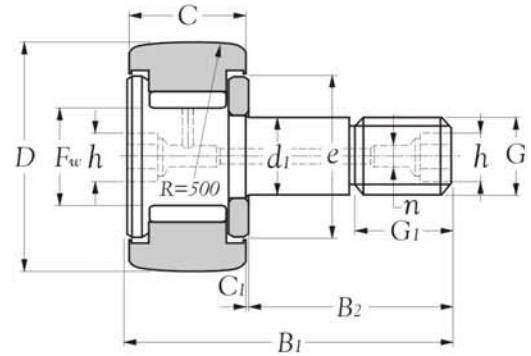
Basic load ratings				Load ratings of truck				Max runout speed		Maximum tightening torque		Stud diameter	Mass
dynamic	static	dynamic	static	Spherical	Cylindrical	Spherical	Cylindrical	grease	oil	N.m	Kgf.m	mm	kg(s)
C	Co	C	Co	outer ring	outer ring	outer ring	outer ring	r/min					
N		kgf		N		kgf							(approx.)
1510	1140	154	116	560	1360	57	139	※27000	※40000	0.5	0.05	3	0.005
2030	1550	207	159	725	1790	74	183	※25000	※36000	1.0	0.10	4	0.008
2480	2070	253	211	805	2220	82	226	※23000	※33000	2.0	0.20	5	0.010
3850	3950	395	400	1080	3400	110	350	※19000	※25000	3.0	0.30	6	0.019
4500	5100	460	520	1380	4050	141	415	※15000	※20000	8.0	0.80	8	0.031
5050	6250	515	635	1690	5150	172	525	※12000	※16000	15.0	1.50	10	0.046
5050	6250	515	635	2120	6100	216	620	※12000	※16000	15.0	1.50	10	0.059
7500	9100	765	930	2620	7700	267	785	10000	※13000	22.0	2.20	12	0.087
7500	9100	765	930	2860	8200	291	835	10000	※13000	22.0	2.20	12	0.097
11800	17300	1210	1760	3200	11900	325	1220	8000	※11000	58.0	5.80	16	0.169
13600	22100	1390	2250	3850	14500	390	1480	7000	9000	87.0	8.70	18	0.248
20300	33000	2070	3350	4700	21000	480	2150	6000	8000	120.0	12.00	20	0.386
20300	33000	2070	3350	5550	23300	565	2370	6000	8000	120.0	12.00	20	0.461
29100	55000	2960	5650	6950	34500	710	3500	5000	6500	220.0	22.00	24	0.790
29100	55000	2960	5650	8050	38500	820	3900	5000	6500	220.0	22.00	24	1.040
44000	86500	4500	8800	9800	53000	1000	5400	4000	5500	450.0	45.00	30	1.550
44000	86500	4500	8800	10400	56000	1060	5750	4000	5500	450.0	45.00	30	1.740
44000	86500	4500	8800	11400	59000	1160	6100	4000	5500	450.0	45.00	30	1.950

Notes: Limiting speed of sealed type bearings marked with ※ is approximately 10 000 r/min.

Cam followers stud type truck rollers series KRV



Type KRV (10~19 mm)



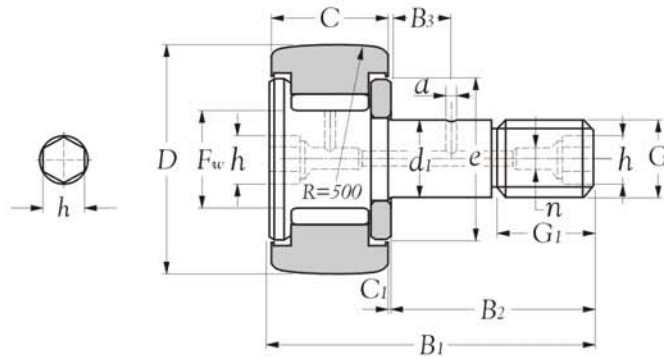
Type KRV (22~26 mm)

Inner bore D 0-0.05 mm	Bearing number		Boundary dimensions												
			C	d ₁	F _w	B ₁	B ₂	G	G ₁	C ₁	n	B ₃	a	e	h
10	KRV 10	KRV 10 PP	7	3 ⁰ _{-0.010}	4.00	17	9.0	M 3 X 0.5	5.0	0.5	-	-	-	7.0	-
12	KRV 12	KRV 12 PP	8	4 ⁰ _{-0.012}	4.80	20	11.0	M 4 X 0.7	6.0	0.5	-	-	-	8.5	-
13	KRV 13	KRV 13 PP	9	5 ⁰ _{-0.012}	5.75	23	13.0	M 5 X 0.8	7.5	0.5	-	-	-	9.5	-
16	KRV 16	KRV 16 PP	11	6 ⁰ _{-0.012}	8.00	28	16.0	M 6 X 1.0	8.0	0.6	42)	-	-	12.0	-
19	KRV 19	KRV 19 PP	11	8 ⁰ _{-0.015}	10.00	32	20.0	M 8 X 1.25	10.0	0.6	42)	-	-	14.0	-
22	KRV 22	KRV 22 PP	12	10 ⁰ _{-0.015}	12.00	36	23.0	M 10 X 1.0	12.0	0.6	4	-	-	17.0	5
26	KRV 26	KRV 26 PP	12	10 ⁰ _{-0.015}	12.00	36	23.0	M 10 X 1.0	12.0	0.6	4	-	-	17.0	5
30	KRV 30	KRV 30 PP	14	12 ⁰ _{-0.018}	15.00	40	25.0	M 12 X 1.5	13.0	0.6	6	6	3	23.0	6
32	KRV 32	KRV 32 PP	14	12 ⁰ _{-0.018}	15.00	40	25.0	M 12 X 1.5	13.0	0.6	6	6	3	23.0	6
35	KRV 35	KRV 35 PP	18	16 ⁰ _{-0.018}	18.00	52	32.5	M 16 X 1.5	17.0	0.8	6	8	3	27.0	8
40	KRV 40	KRV 40 PP	20	18 ⁰ _{-0.018}	22.00	58	36.5	M 18 X 1.5	19.0	0.8	6	8	3	32.0	8
47	KRV 47	KRV 47 PP	24	20 ⁰ _{-0.021}	25.00	66	40.5	M 20 X 1.5	21.0	0.8	8	9	4	37.0	10
52	KRV 52	KRV 52 PP	24	20 ⁰ _{-0.021}	25.00	66	40.5	M 20 X 1.5	21.0	0.8	8	9	4	37.0	10
62	KRV 62	KRV 62 PP	29	24 ⁰ _{-0.021}	30.00	80	49.5	M 24 X 1.5	25.0	0.8	8	11	4	44.0	14
72	KRV 72	KRV 72 PP	29	24 ⁰ _{-0.021}	30.00	80	49.5	M 24 X 1.5	25.0	0.8	8	11	4	44.0	14
80	KRV 80	KRV 80 PP	35	30 ⁰ _{-0.021}	38.00	100	63.0	M 30 X 1.5	32.0	1.0	8	15	4	53.0	14
90	KRV 90	KRV 90 PP	35	30 ⁰ _{-0.021}	38.00	100	63.0	M 30 X 1.5	32.0	1.0	8	15	4	53.0	14

Technical supplement		
Cages	Pre2ecision	Grease
Steel - <input checked="" type="checkbox"/>		
Polymid - <input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2
Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Cam followers stud type truck rollers series **KRV**

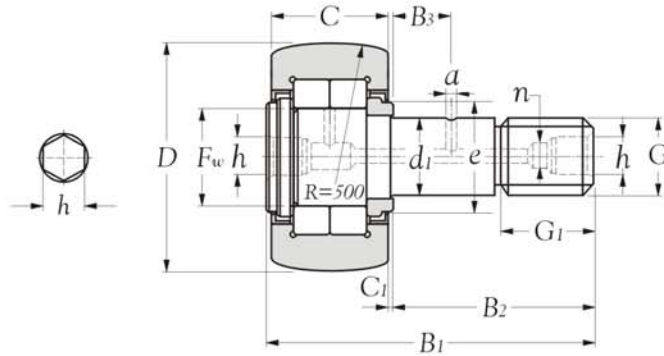


Type KRV (30~90 mm)

Basic load ratings				Load ratings of truck				Max runout speed		Maximum tightening torque		Stud diameter	Mass
dynamic	static	dynamic	static	Spherical	Cylindrical	Spherical	Cylindrical	grease	oil	N.m	Kgf.m	mm	kg(s)
C	Co	C	Co	outer ring	outer ring	outer ring	outer ring	r/min					
N		kgf		N	kgf	N	kgf						(approx.)
2330	2400	238	244	560	1360	57	139	※25000	※32000	0.5	0.05	3	0.005
3350	3550	340	360	725	1790	74	183	※20000	※27000	1.0	0.10	4	0.008
4300	5050	435	510	805	2220	82	226	※17000	※22000	2.0	0.20	5	0.011
6250	8900	640	910	1080	3400	110	350	※13000	※16000	3.0	0.30	6	0.020
7200	11200	735	1140	1380	4050	141	415	10000	※13000	8.0	0.80	8	0.032
7900	13300	810	1360	1690	5150	172	525	8500	※11000	15.0	1.50	10	0.047
7900	13300	810	1360	2120	6100	216	620	8500	※11000	15.0	1.50	10	0.061
11700	19500	1190	1980	2620	7700	267	785	6500	8500	22.0	2.20	12	0.089
11700	19500	1190	1980	2860	8200	291	835	6500	8500	22.0	2.20	12	0.100
17200	33000	1750	3400	3200	11900	325	1220	5500	7000	58.0	5.80	16	0.172
18900	40500	1930	4150	3850	14500	390	1480	4500	6000	87.0	8.70	18	0.252
28300	60000	2890	6100	4700	21000	480	2150	4000	5000	120.0	12.00	20	0.390
28300	60000	2890	6100	5550	23300	565	2370	4000	5000	120.0	12.00	20	0.465
39000	96500	3950	9850	6950	34500	710	3500	3300	4500	220.0	22.00	24	0.800
39000	96500	3950	9850	8050	38500	820	3900	3300	4500	220.0	22.00	24	1.050
57000	144000	5800	14700	9800	53000	1000	5400	2600	3500	450.0	45.00	30	1.560
57000	144000	5800	14700	11400	59000	1160	6100	2600	3500	450.0	45.00	30	1.970


Notes: Limiting speed of sealed type bearings marked with ※ is approximately 10 000 r/min.

Cam followers stud type truck rollers (multi-row cylindrical roller bearings) series NUKR



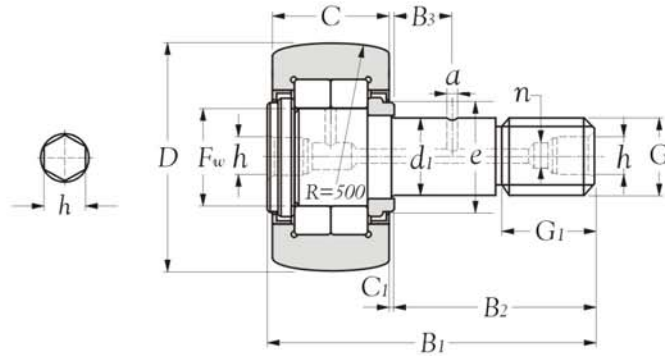
Type NUKR (D<100 mm) (Double row type full complement with seals)

Inner bore D 0-0.05 mm	Bearing number	Boundary dimensions												
		C	d ₁	F _w	B ₁	B ₂	G	G ₁	C ₁	n	B ₃	a	e	h
35	NUKR 35	18	16 ⁰ _{-0.018}	19.0	52	32.5	M 16 X 1.5	17	0.8	6	8	3	21	8
40	NUKR 40	20	18 ⁰ _{-0.018}	21.5	58	36.5	M 18 X 1.5	19	0.8	6	8	3	23	8
47	NUKR 47	24	20 ⁰ _{-0.021}	25.5	66	40.5	M 20 X 1.5	21	0.8	8	9	4	27	10
52	NUKR 52	24	20 ⁰ _{-0.021}	30.0	66	40.5	M 20 X 1.5	21	0.8	8	9	4	31	10
62	NUKR 62	29	24 ⁰ _{-0.021}	35.0	80	49.5	M 24 X 1.5	25	0.8	8	11	4	38	14
72	NUKR 72	29	24 ⁰ _{-0.021}	41.5	80	49.5	M 24 X 1.5	25	0.8	8	11	4	44	14
80	NUKR 80	35	30 ⁰ _{-0.021}	47.5	100	63.0	M 30 X 1.5	32	1.0	8	15	4	51	14
90	NUKR 90	35	30 ⁰ _{-0.021}	47.5	100	63.0	M 30 X 1.5	32	1.0	8	15	4	51	14

Technical supplement			
	Cages	Pre2ecision	Grease
	Steel - <input checked="" type="checkbox"/>		
	Polymid - <input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2
	Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

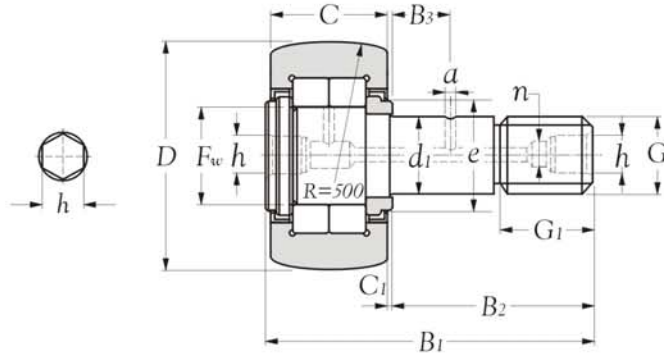
Cam followers stud type truck rollers (multi-row cylindrical roller bearings) series NUKR



Type NUKR (D<100 mm) (Double row type full complement with seals)


Basic load ratings				Load ratings of truck				Max runout speed grease r/min	Maximum tightening torque		Stud diameter mm	Mass kg(s) (approx.)
dynamic C	static Co	dynamic C	static Co	Spherical outer ring	Cylindrical outer ring	Spherical outer ring	Cylindrical outer ring		N.m	Kgf.m		
N		kgf		N		kgf						
22300	25700	2280	2620	3200	11900	325	1220	5500	58	5.8	16	0.165
24100	29100	2450	2970	3850	14500	390	1480	4700	87	8.7	18	0.242
38500	48000	3950	4900	4700	21000	480	2150	4000	120	12.0	20	0.380
42500	57500	4350	5850	5550	23300	565	2370	3300	120	12.0	20	0.450
56500	72500	5750	7400	6950	34500	710	3500	2900	220	22.0	24	0.795
62000	85500	6350	8700	8050	38500	820	3900	2400	220	22.0	24	1.010
101000	151000	10300	15400	9800	53000	1000	5400	2100	450	45.0	30	1.540
101000	151000	10300	15400	11400	59000	1160	6100	2100	450	45.0	30	1.960

Cam followers stud type truck rollers (multi-row cylindrical roller bearings) series NUKRE



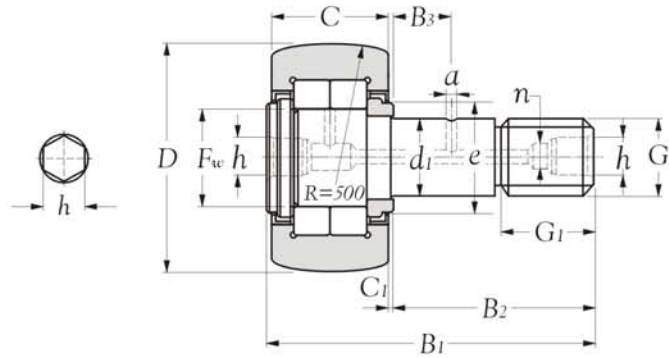
Inner bore D 0-0.05 mm	Bearing number	Boundary dimensions						Basic load ratings			
		d	B	C	d_2	r	r_1	dynamic C N	static C_0	dynamic C N	static C_0
35	NUKRE 35	16	52	18	27.6	3.8	0.6	15300	18700	8500	16800
40	NUKRE 40	18	58	20	30.0	3.8	1.0	18700	24900	13000	24900
47	NUKRE 47	20	66	24	27.0	0.8	1.0	28500	37500	16200	32500
52	NUKRE 52	20	66	24	31.0	0.8	1.0	29000	40500	17100	34000
62	NUKRE 62	24	80	28	38.0	1.3	1.0	40000	55000	23400	46000
72	NUKRE 72	24	80	28	44.0	1.3	1.1	45000	65000	31500	63000
80	NUKRE 80	30	100	35	47.0	1.0	1.1	69000	104000	47500	95000
90	NUKRE 90	30	100	35	47.0	1.0	1.1	78000	123000	76000	123000

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

Technical supplement			
	Cages	Pr2ecision	Grease
	Steel - <input checked="" type="checkbox"/>		
	Polymid - <input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2
	Brass - <input checked="" type="checkbox"/>		

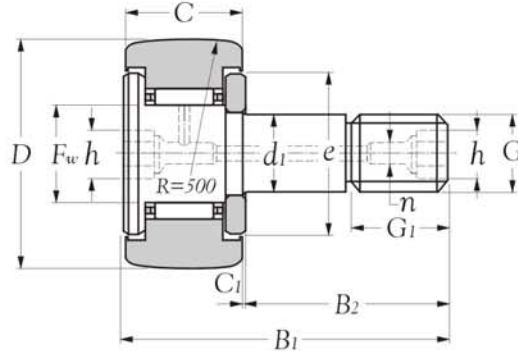
Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

**Cam followers stud type truck rollers (multi-row cylindrical roller bearings)
series NUKRE**




Fatigue limit load N	Max runout speed grease r/min	Mass kg(s) (approx.)
2430	6500	0.177
3150	5500	0.258
4850	4200	0.400
5300	4200	0.470
7300	2600	0.824
8700	2600	1.050
14100	1800	1.670
16700	1800	2.020

Cam followers stud type truck rollers series PWKR .. 2RS



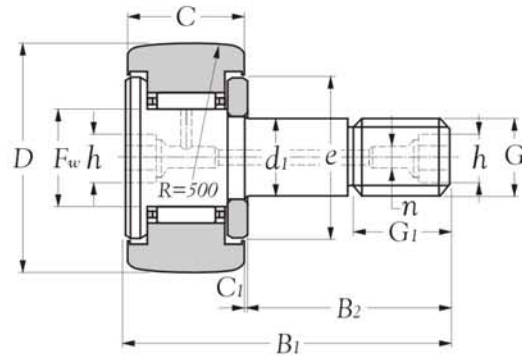
Inner bore D 0-0.05 mm	Bearing number	Boundary dimensions						Basic load ratings			
		d	B	C	d_1	r	r_1	dynamic C	static C_0	dynamic C	static C_0
35	PWKR 35 2RS	16	52	18	20	0.8	0.6	12600	14600	10700	14600
40	PWKR 40 2RS	18	58	20	22	0.8	1.0	14300	17900	16500	17900
47	PWKR 47 2RS	20	66	24	27	0.8	1.0	24500	30500	20700	30500
52	PWKR 52 2RS	20	66	24	31	0.8	1.0	25000	33000	21800	33000
62	PWKR 62 2RS	24	80	28	38	1.3	1.0	35000	45500	29000	45500
72	PWKR 72 2RS	24	80	28	44	1.3	1.1	38500	54000	39000	54000
80	PWKR 80 2RS	30	100	35	47	1.0	1.1	56000	79000	60000	79000
90	PWKR 90 2RS	30	100	35	47	1.0	1.1	62000	92000	92000	92000

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

Technical supplement			
	Cages	Precision	Grease
	Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2
	Polymid - <input type="checkbox"/>		
	Brass - <input type="checkbox"/>		

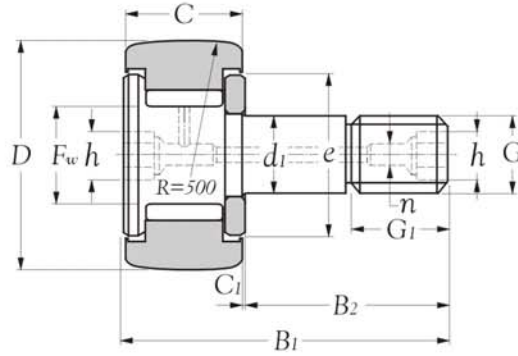
Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Cam followers stud type truck rollers series PWKR .. 2RS




Fatigue limit load N	Max runout speed grease r/min	Mass kg(s) (approx.)
1760	6000	-
2160	5000	-
3750	3800	0.400
4100	3800	0.470
5800	2200	0.824
6900	2200	1.050
10600	1800	1.670
12200	1800	2.020

Cam followers stud type truck rollers series PWKRE .. 2RS



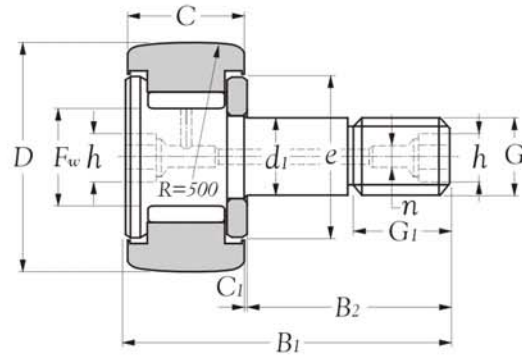
Inner bore D 0-0.05 mm	Bearing number	Boundary dimensions						Basic load ratings			
		d	B	C	d_1	r	r_1	dynamic C	static C_0	dynamic C	static C_0
		mm									
35	PWKRE 35 2RS	16	52	18	27.6	3.8	0.6	12600	14600	10700	14600
40	PWKRE 40 2RS	18	58	20	30.0	3.8	1.0	14300	17900	16500	17900
47	PWKRE 47 2RS	20	66	24	27.0	0.8	1.0	24500	30500	20700	30500
52	PWKRE 52 2RS	20	66	24	31.0	0.8	1.0	25000	33000	21800	33000
62	PWKRE 62 2RS	24	80	28	38.0	1.3	1.0	35000	45500	29000	45500
72	PWKRE 72 2RS	24	80	28	44.0	1.3	1.1	38500	54000	39000	54000
80	PWKRE 80 2RS	30	100	35	47.0	1.0	1.1	56000	79000	60000	79000
90	PWKRE 90 2RS	30	100	35	47.0	1.0	1.1	62000	92000	92000	92000

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

Technical supplement			
	Cages	Precision	Grease
	Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Shell Alvania S2
	Polymid - <input checked="" type="checkbox"/>		
	Brass - <input checked="" type="checkbox"/>		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: <http://www.minamiguchi-bearings.com>

Cam followers stud type truck rollers series **PWKRE .. 2RS**



Fatigue limit load N	Max runout speed grease r/min	Mass kg(s) (approx.)
1760	6000	-
2160	5000	-
3750	3800	0.400
4100	3800	0.470
5800	2200	0.824
6900	2200	1.050
10600	1800	1.670
12200	1800	2.020



Components



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1. Bearing materials

KSM Inner Rings are available in the series IR, whose boundary dimensions are in metric measurements. Both ends of the inner ring are lead-chamfered for easier assembly. Inner rings marked with an asterisk have a slight chamfer in order to provide greater axial displacement. **KSM** Also offers inner rings having a lubrication hole at their midpoint (suffix D). For much greater running accuracy, the raceway of the inner ring can be finish-ground after the inner ring has been mounted to a shaft. To accommodate this need, **KSM** can supply an inner ring whose raceway surface allows for grinding. For details, contact **KSM** Engineering.

2. Interpreting inner ring numbers

The inner ring numbers of **KSM** Inner Rings comprise of a series number (IR), dimension code inside dia. (D) \times raceway dia. (F) \times width (B), and a suffix.

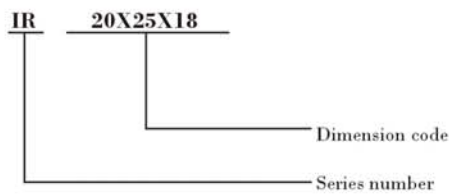
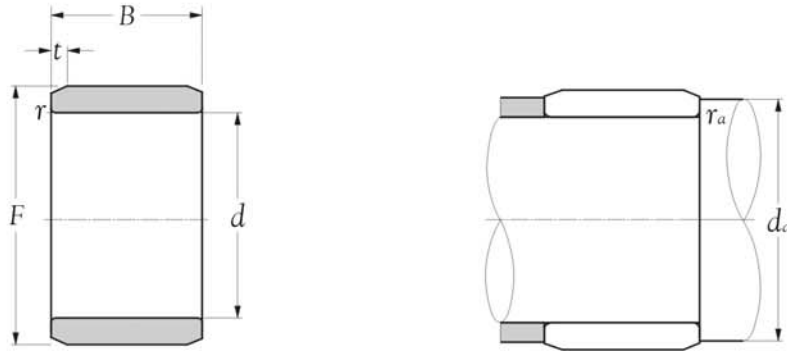


Fig. 1

Inner rings series IR



Inner bore <i>d</i> mm	Bearing number	Principal dimensions				Abutment dimensions			Mass kg (approx.)
		<i>F</i> ¹⁾	<i>B</i> mm	<i>r</i> mm ²⁾	<i>t</i>	<i>d</i> _a mm	mm	<i>r</i> _{as} max	
5	IR 5x7x10	7 ⁰ _{-0.006}	10.0	0.15	1	6.2		0.15	0.0014
5	IR 5x8x12	8 ⁰ _{-0.006}	12.0	0.30	1	7.0		0.30	0.0028
5	IR 5x8x16	8 ⁰ _{-0.006}	16.0	0.30	-	7.0		0.30	0.0038
6	IR 6x8x10	8 ⁰ _{-0.006}	10.0	0.15	1	7.2		0.15	0.0017
6	IR 6x9x12	9 ⁰ _{-0.006}	12.0	0.30	1	8.0		0.30	0.0032
6	IR 6x9x16	9 ⁰ _{-0.006}	16.0	0.30	1	8.0		0.30	0.0043
6	IR 6x10x10	10 ⁰ _{-0.006}	10.0	0.30	1	8.0		0.30	0.0037
6	IR 6x10x12	10 ⁰ _{-0.006}	12.0	0.30	-	8.0		0.30	0.0046
6	IR 6x10x13	10 ⁰ _{-0.006}	13.0	0.30	1	8.0		0.30	0.0050
7	IR 7x9x10	9 ⁰ _{-0.006}	10.0	0.15	1	8.2		0.15	0.0019
7	IR 7x10x10.5	10 ⁰ _{-0.006}	10.5	0.30	1	9.0		0.30	0.0031
7	IR 7x10x12	10 ⁰ _{-0.006}	12.0	0.30	1	9.0		0.30	0.0036
7	IR 7x10x16	10 ⁰ _{-0.006}	16.0	0.30	1	9.0		0.30	0.0049
7	IR 7x12x16	12 ⁰ _{-0.008}	16.0	0.30	1	9.0		0.30	0.0093
8	IR 8x10x11	10 ⁰ _{-0.006}	11.0	0.15	1	9.2		0.15	0.0024
8	IR 8x12x10	12 ⁰ _{-0.008}	10.0	0.30	1	10.0		0.30	0.0048
8	IR 8x12x10.5	12 ⁰ _{-0.008}	10.5	0.30	1	10.0		0.30	0.0050
8	IR 8x12x12	12 ⁰ _{-0.008}	12.0	0.30	-	10.0		0.30	0.0057
8	IR 8x12x12.5	12 ⁰ _{-0.008}	12.5	0.30	1	10.0		0.30	0.0059
8	IR 8x14x16	14 ⁰ _{-0.008}	16.0	0.30	1	10.0		0.30	0.0130
9	IR 9x12x11	12 ⁰ _{-0.008}	11.0	0.30	1	11.0		0.30	0.0041
9	IR 9x12x12	12 ⁰ _{-0.008}	12.0	0.30	1	11.0		0.30	0.0045
9	IR 9x12x16	12 ⁰ _{-0.008}	16.0	0.30	1	11.0		0.30	0.0061
9	IR 9x15x16	15 ⁰ _{-0.008}	16.0	0.30	1	11.0		0.30	0.0140
10	IR 10x13x12.5	13 ⁰ _{-0.008}	12.5	0.30	1	12.0		0.30	0.0052
10	IR 10x14x12	14 ⁰ _{-0.008}	12.0	0.30	1	12.0		0.30	0.0073

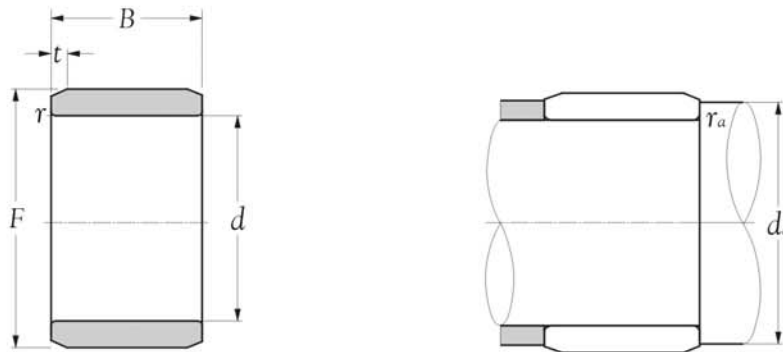
Notes: 1) The tolerance for this dimension provides regular clearance when an inner ring is combined with a needle roller bearing that lacks an inner ring.

2) These values are the allowable minimum dimensions of the chamfer dimension *r*.

Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)


Inner rings series IR



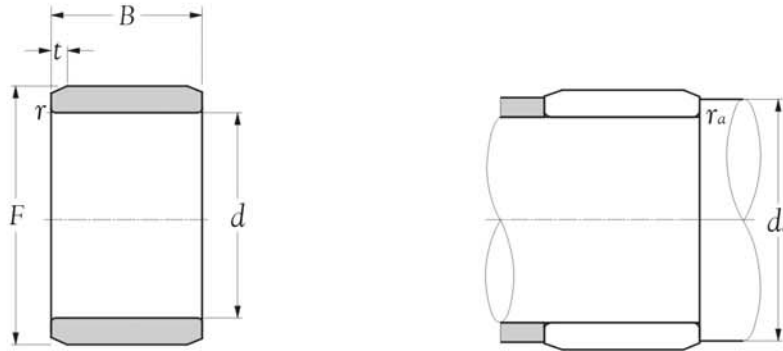
Inner bore <i>d</i> mm	Bearing number	Principal dimensions				Abutment dimensions			Mass kg (approx.)
		<i>F</i> ¹⁾	<i>B</i>	<i>r</i> mm ²⁾	<i>t</i>	<i>d</i> _a mm	<i>r</i> _a mm	<i>r</i> _{as} max	
10	IR 10x14x13	14 ⁰ _{-0.008}	13.0	0.3	1.0	12.0	0.30	0.0074	
10	IR 10x14x14	14 ⁰ _{-0.008}	14.0	0.3	-	12.0	0.30	0.0080	
10	IR 10x14x16	14 ⁰ _{-0.008}	16.0	0.3	-	12.0	0.30	0.0092	
10	IR 10x14x20	14 ⁰ _{-0.008}	20.0	0.3	1.0	12.0	0.30	0.0120	
10	IR 10x15x15.5	15 ⁰ _{-0.008}	15.5	0.3	1.0	12.0	0.30	0.0120	
10	IR 10x15x20.5	15 ⁰ _{-0.008}	20.5	0.3	1.0	12	0.3	0.0150	
10	IR 10x16x16	16 ⁰ _{-0.008}	16.0	0.3	1.0	12	0.3	0.0150	
12	IR 12x15x12	15 ⁰ _{-0.008}	12.0	0.3	1.0	14	0.3	0.0058	
12	IR 12x15x12.5	15 ⁰ _{-0.008}	12.5	0.3	1.0	14	0.3	0.0061	
12	IR 12x15x16	15 ⁰ _{-0.008}	16.0	0.3	1.0	14	0.3	0.0078	
12	IR 12x15x16.5	15 ⁰ _{-0.008}	16.5	0.3	-	14	0.3	0.0080	
12	IR 12x15x22.5	15 ⁰ _{-0.008}	22.5	0.3	-	14	0.3	0.0110	
12	IR 12x16x12	16 ⁰ _{-0.008}	12.0	0.3	1.5	14	0.3	0.0079	
12	IR 12x16x13	16 ⁰ _{-0.008}	13.0	0.3	1.5	14	0.3	0.0087	
12	IR 12x16x14	16 ⁰ _{-0.008}	14.0	0.3	-	14	0.3	0.0095	
12	IR 12x16x16	16 ⁰ _{-0.008}	16.0	0.3	1.5	14	0.3	0.0110	
12	IR 12x16x20	16 ⁰ _{-0.008}	20.0	0.3	1.5	14	0.3	0.0140	
12	IR 12x16x22	16 ⁰ _{-0.008}	22.0	0.3	1.5	14	0.3	0.0150	
12	IR 12x17x20.5	17 ⁰ _{-0.008}	20.5	0.3	1.5	14	0.3	0.0190	
12	IR 12x17x25.5	17 ⁰ _{-0.008}	25.5	0.3	1.5	14	0.3	0.0240	
12	IR 12x18x16	18 ⁰ _{-0.008}	16.0	0.3	1.5	14	0.3	0.0180	
14	IR 14x17x17	17 ⁰ _{-0.008}	17.0	0.3	1.5	16	0.3	0.0095	
15	IR 15x18x12.5	18 ⁰ _{-0.008}	12.5	0.3	1.5	17	0.3	0.0072	
15	IR 15x18x16	18 ⁰ _{-0.008}	16.0	0.3	1.5	17	0.3	0.0093	
15	IR 15x18x16.5	18 ⁰ _{-0.008}	16.5	0.3	1.5	17	0.3	0.0096	
15	IR 15x18x17.5	18 ⁰ _{-0.008}	17.5	0.3	1.5	17	0.3	0.0100	

Notes: 1) The tolerance for this dimension provides regular clearance when an inner ring is combined with a needle roller bearing that lacks an inner ring.
2) These values are the allowable minimum dimensions of the chamfer dimension *r*.

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	Technical supplement		
	Cages	Pre2ecision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	<input type="checkbox"/>	Nil
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

Inner rings series IR



Inner bore <i>d</i> mm	Bearing number	Principal dimensions				Abutment dimensions			Mass kg (approx.)
		<i>F</i> ¹⁾	<i>B</i> mm	<i>r</i> mm ²⁾	<i>t</i>	<i>d</i> _a mm	mm	<i>r</i> _{as} max	
15	IR 15x18x20.5	18 ⁰ _{-0.008}	20.5	0.3	1.5	17		0.3	0.012
15	IR 15x18x25.5	18 ⁰ _{-0.008}	25.5	0.3	1.5	17		0.3	0.015
15	IR 15x19x16	19 ⁰ _{-0.009}	16.0	0.3	1.5	17		0.3	0.013
15	IR 15x19x20	19 ⁰ _{-0.009}	20.0	0.3	1.5	17		0.3	0.016
15	IR 15x20x12	20 ⁰ _{-0.009}	12.0	0.3	1.5	17		0.3	0.012
15	IR 15x20x13	20 ⁰ _{-0.009}	13.0	0.3	1.5	17		0.3	0.014
15	IR 15x20x14	20 ⁰ _{-0.009}	14.0	0.3	-	17		0.3	0.015
15	IR 15x20x18	20 ⁰ _{-0.009}	18.0	0.3	1.5	17		0.3	0.019
15	IR 15x20x20.5	20 ⁰ _{-0.009}	20.5	0.3	1.5	17		0.3	0.021
15	IR 15x20x23	20 ⁰ _{-0.009}	23.0	0.3	-	17		0.3	0.024
15	IR 15x20x26	20 ⁰ _{-0.009}	26.0	0.3	1.5	17		0.3	0.027
15	IR 15x20x30.5	20 ⁰ _{-0.009}	30.5	0.3	1.5	17		0.3	0.032
15	IR 15x22x20	22 ⁰ _{-0.009}	20.0	0.6	1.5	19		0.6	0.032
17	IR 17x20x16	20 ⁰ _{-0.009}	16.0	0.3	1.5	19		0.3	0.011
17	IR 17x20x16.5	20 ⁰ _{-0.009}	16.5	0.3	1.5	19		0.3	0.011
17	IR 17x20x20	20 ⁰ _{-0.009}	20.0	0.3	1.5	19		0.3	0.014
17	IR 17x20x20.5	20 ⁰ _{-0.009}	20.5	0.3	-	19		0.3	0.014
17	IR 17x20x30.5	20 ⁰ _{-0.009}	30.5	0.3	-	19		0.3	0.021
17	IR 17x21x16	21 ⁰ _{-0.009}	16.0	0.3	1.5	19		0.3	0.014
17	IR 17x21x20	21 ⁰ _{-0.009}	20.0	0.3	-	19		0.3	0.018
17	IR 17x22x13	22 ⁰ _{-0.009}	13.0	0.3	1.5	19		0.3	0.015
17	IR 17x22x14	22 ⁰ _{-0.009}	14.0	0.3	-	19		0.3	0.016
17	IR 17x22x16	22 ⁰ _{-0.009}	16.0	0.3	-	19		0.3	0.019
17	IR 17x22x18	22 ⁰ _{-0.009}	18.0	0.3	1.5	19		0.3	0.021
17	IR 17x22x20.5	22 ⁰ _{-0.009}	20.5	0.3	1.5	19		0.3	0.024
17	IR 17x22x23	22 ⁰ _{-0.009}	23.0	0.3	-	19		0.3	0.027

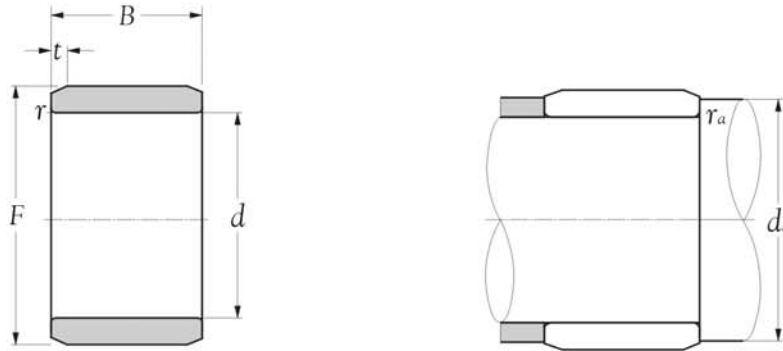
Notes: 1) The tolerance for this dimension provides regular clearance when an inner ring is combined with a needle roller bearing that lacks an inner ring.

2) These values are the allowable minimum dimensions of the chamfer dimension *r*.

Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

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Inner rings series IR



Inner bore <i>d</i> mm	Bearing number	Principal dimensions				Abutment dimensions		Mass kg (approx.)
		<i>F</i> ¹⁾	<i>B</i> mm	<i>r</i> mm ²⁾	<i>t</i>	<i>d</i> _a mm	<i>r</i> _{as} max	
17	IR 17x22x26	22 ⁰ _{-0.009}	26.0	0.3	1.5	19	0.3	0.030
17	IR 17x22x32	22 ⁰ _{-0.009}	32.0	0.3	1.5	19	0.3	0.036
17	IR 17x24x20	24 ⁰ _{-0.009}	20.0	0.6	1.5	21	0.6	0.034
20	IR 20x24x16	24 ⁰ _{-0.009}	16.0	0.3	1.8	22	0.3	0.017
20	IR 20x24x20	24 ⁰ _{-0.009}	20.0	0.3	-	22	0.3	0.021
20	IR 20x24x28.5	24 ⁰ _{-0.009}	28.5	0.3	-	22	0.3	0.030
20	IR 20x25x12.5	25 ⁰ _{-0.009}	12.5	0.3	1.8	22	0.3	0.016
20	IR 20x25x16	25 ⁰ _{-0.009}	16.0	0.3	-	22	0.3	0.021
20	IR 20x25x16.5	25 ⁰ _{-0.009}	16.5	0.3	1.8	22	0.3	0.022
20	IR 20x25x17	25 ⁰ _{-0.009}	17.0	0.3	1.8	22	0.3	0.022
20	IR 20x25x18	25 ⁰ _{-0.009}	18.0	0.3	-	22	0.3	0.024
20	IR 20x25x20	25 ⁰ _{-0.009}	20.0	0.3	-	22	0.3	0.027
20	IR 20x25x20.5	25 ⁰ _{-0.009}	20.5	0.3	1.8	22	0.3	0.028
20	IR 20x25x23	25 ⁰ _{-0.009}	23.0	0.3	1.8	22	0.3	0.031
20	IR 20x25x26	25 ⁰ _{-0.009}	26.0	0.3	1.8	22	0.3	0.034
20	IR 20x25x26.5	25 ⁰ _{-0.009}	26.5	0.3	-	22	0.3	0.036
20	IR 20x25x30	25 ⁰ _{-0.009}	30.0	0.3	1.8	22	0.3	0.041
20	IR 20x25x32	25 ⁰ _{-0.009}	32.0	0.3	1.8	22	0.3	0.041
20	IR 20x25x38.5	25 ⁰ _{-0.009}	38.5	0.3	-	22	0.3	0.053
20	IR 20x28x20	28 ⁰ _{-0.009}	20.0	0.6	1.8	24	0.6	0.045
22	IR 22x26x16	26 ⁰ _{-0.009}	16.0	0.3	1.8	24	0.3	0.017
22	IR 22x26x20	26 ⁰ _{-0.009}	20.0	0.3	-	24	0.3	0.022
22	IR 22x28x17	28 ⁰ _{-0.009}	17.0	0.3	1.8	24	0.3	0.030
22	IR 22x28x20	28 ⁰ _{-0.009}	20.0	0.3	1.8	24	0.3	0.035
22	IR 22x28x20.5	28 ⁰ _{-0.009}	20.5	0.3	1.8	24	0.3	0.036
22	IR 22x28x23	28 ⁰ _{-0.009}	23.0	0.3	1.8	24	0.3	0.042

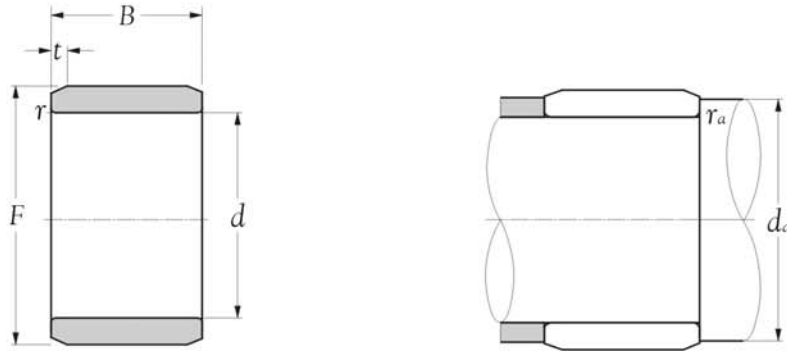
Notes: 1) The tolerance for this dimension provides regular clearance when an inner ring is combined with a needle roller bearing that lacks an inner ring.

2) These values are the allowable minimum dimensions of the chamfer dimension *r*.

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Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Inner rings series IR



Inner bore <i>d</i> mm	Bearing number	Principal dimensions				Abutment dimensions		Mass kg (approx.)
		<i>F</i> ¹⁾	<i>B</i> mm	<i>r</i> mm ²⁾	<i>t</i>	<i>d</i> _a mm	<i>r</i> _{as} max	
22	IR 22x28x30	28 ⁰ _{-0.009}	30.0	0.3	-	24	0.3	0.054
25	IR 25x29x20	29 ⁰ _{-0.009}	20.0	0.3	-	27	0.3	0.026
25	IR 25x29x30	29 ⁰ _{-0.009}	30.0	0.3	1.8	27	0.3	0.039
25	IR 25x30x12.5	30 ⁰ _{-0.009}	12.5	0.3	1.8	27	0.3	0.020
25	IR 25x30x16	30 ⁰ _{-0.009}	16.0	0.3	1.0	27	0.3	0.024
25	IR 25x30x16.5	30 ⁰ _{-0.009}	16.5	0.3	1.8	27	0.3	0.026
25	IR 25x30x17	30 ⁰ _{-0.009}	17.0	0.3	1.8	27	0.3	0.027
25	IR 25x30x18	30 ⁰ _{-0.009}	18.0	0.3	-	27	0.3	0.030
25	IR 25x30x20	30 ⁰ _{-0.009}	20.0	0.3	1.8	27	0.3	0.033
25	IR 25x30x20.5	30 ⁰ _{-0.009}	20.5	0.3	1.8	27	0.3	0.034
25	IR 25x30x23	30 ⁰ _{-0.009}	23.0	0.3	1.8	27	0.3	0.038
25	IR 25x30x26	30 ⁰ _{-0.009}	26.0	0.3	1.8	27	0.3	0.041
25	IR 25x30x26.5	30 ⁰ _{-0.009}	26.5	0.3	-	27	0.3	0.043
25	IR 25x30x30	30 ⁰ _{-0.009}	30.0	0.3	1.8	27	0.3	0.050
25	IR 25x30x32	30 ⁰ _{-0.009}	32.0	0.3	1.0	27	0.3	0.054
25	IR 25x30x38.5	30 ⁰ _{-0.009}	38.5	0.3	-	27	0.3	0.064
25	IR 25x32x22	32 ^{+0.008} _{-0.002}	22.0	0.6	1.8	29	0.6	0.052
25	IR 25x32x30.5	32 ^{+0.008} _{-0.002}	30.5	0.6	1.8	29	0.6	0.072
28	IR 28x32x17	32 ^{+0.008} _{-0.002}	17.0	0.3	1.8	30	0.3	0.025
28	IR 28x32x20	32 ^{+0.008} _{-0.002}	20.0	0.3	1.8	30	0.3	0.028
28	IR 28x32x23	32 ^{+0.008} _{-0.002}	23.0	0.3	1.8	30	0.3	0.034
28	IR 28x32x30	32 ^{+0.008} _{-0.002}	30.0	0.3	-	30	0.3	0.044
29	IR 29x32x13	32 ^{+0.008} _{-0.002}	13.0	0.3	1.8	31	0.3	0.015
30	IR 30x35x12.5	35 ^{+0.008} _{-0.002}	12.5	0.3	1.8	32	0.3	0.024
30	IR 30x35x13	35 ^{+0.008} _{-0.002}	13.0	0.3	1.3	32	0.3	0.025
30	IR 30x35x16	35 ^{+0.008} _{-0.002}	16.0	0.3	-	32	0.3	0.031

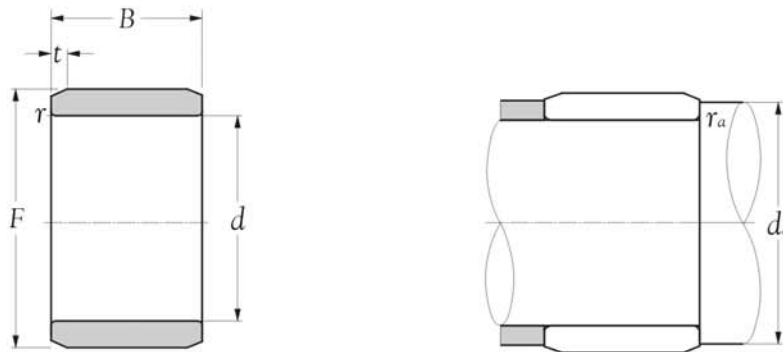
Notes: 1) The tolerance for this dimension provides regular clearance when an inner ring is combined with a needle roller bearing that lacks an inner ring.

2) These values are the allowable minimum dimensions of the chamfer dimension *r*.

Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

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Inner rings series IR



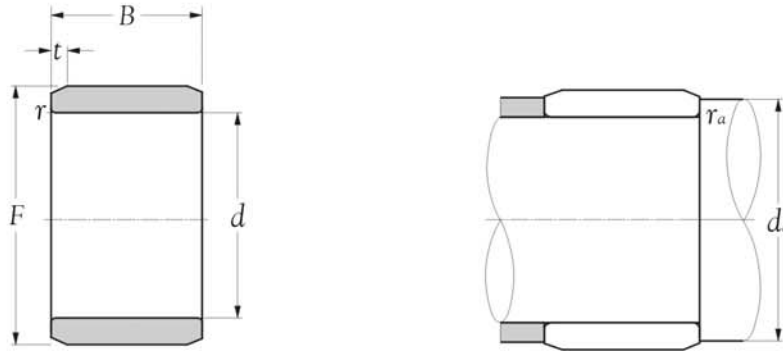
Inner bore <i>d</i> mm	Bearing number	Principal dimensions				Abutment dimensions		Mass kg (approx.)
		<i>F</i> ¹⁾	<i>B</i> mm	<i>r</i> mm ²⁾	<i>t</i>	<i>d</i> _a mm	<i>r</i> _{as} mm	
30	IR 30x35x16.5	35 ^{+0.008} _{-0.002}	16.5	0.3	1.8	32	0.3	0.032
30	IR 30x35x17	35 ^{+0.008} _{-0.002}	17.0	0.3	1.8	32	0.3	0.032
30	IR 30x35x18	35 ^{+0.008} _{-0.002}	18.0	0.3	-	32	0.3	0.035
30	IR 30x35x20	35 ^{+0.008} _{-0.002}	20.0	0.3	-	32	0.3	0.038
30	IR 30x35x20.5	35 ^{+0.008} _{-0.002}	20.5	0.3	1.8	32	0.3	0.039
30	IR 30x35x23	35 ^{+0.008} _{-0.002}	23.0	0.3	1.8	32	0.3	0.044
30	IR 30x35x26	35 ^{+0.008} _{-0.002}	26.0	0.3	1.8	32	0.3	0.050
30	IR 30x35x30	35 ^{+0.008} _{-0.002}	30.0	0.3	-	32	0.3	0.059
30	IR 30x35x32	35 ^{+0.008} _{-0.002}	32.0	0.3	1.8	32	0.3	0.063
30	IR 30x37x18	37 ^{+0.008} _{-0.002}	18.0	0.3	1.8	32	0.3	0.050
30	IR 30x37x22	37 ^{+0.008} _{-0.002}	22.0	0.6	1.8	34	0.6	0.061
30	IR 30x38x20	38 ^{+0.008} _{-0.002}	20.0	0.6	-	34	0.6	0.065
32	IR 32x37x20	37 ⁰ _{-0.011}	20.0	0.3	2.0	34	0.3	0.040
32	IR 32x37x30	37 ⁰ _{-0.011}	30.0	0.3	-	34	0.3	0.063
32	IR 32x38x32	38 ⁰ _{-0.011}	32.0	0.3	2.0	34	0.3	0.082
32	IR 32x40x20	40 ⁰ _{-0.011}	20.0	0.6	2.0	36	0.6	0.068
32	IR 32x40x27	40 ⁰ _{-0.011}	27.0	0.6	2.0	36	0.6	0.092
32	IR 32x40x36	40 ⁰ _{-0.011}	36.0	0.6	2.0	36	0.6	0.124
33	IR 33x37x13	37 ⁰ _{-0.011}	13.0	0.3	2.0	35	0.3	0.022
35	IR 35x40x12.5	40 ⁰ _{-0.011}	12.5	0.3	2.0	37	0.3	0.027
35	IR 35x40x16.5	40 ⁰ _{-0.011}	16.5	0.3	2.0	37	0.3	0.037
35	IR 35x40x17	40 ⁰ _{-0.011}	17.0	0.3	2.0	37	0.3	0.038
35	IR 35x40x20	40 ⁰ _{-0.011}	20.0	0.3	2.0	37	0.3	0.044
35	IR 35x40x20.5	40 ⁰ _{-0.011}	20.5	0.3	2.0	37	0.3	0.046
35	IR 35x40x30	40 ⁰ _{-0.011}	30.0	0.3	-	37	0.3	0.068
35	IR 35x40x34	40 ⁰ _{-0.011}	34.0	0.3	1.8	37	0.3	0.079

Notes: 1) The tolerance for this dimension provides regular clearance when an inner ring is combined with a needle roller bearing that lacks an inner ring.
2) These values are the allowable minimum dimensions of the chamfer dimension *r*.

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Technical supplement		
Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid - <input checked="" type="checkbox"/>		
Brass - <input checked="" type="checkbox"/>		

Inner rings series IR



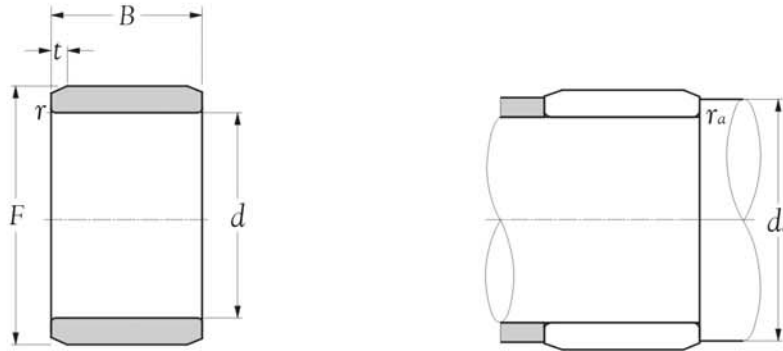
Inner bore <i>d</i> mm	Bearing number	Principal dimensions				Abutment dimensions		Mass kg (approx.)
		<i>F</i> ¹⁾	<i>B</i> mm	<i>r</i> mm ²⁾	<i>t</i>	<i>d_a</i> mm	<i>r_{as max}</i> mm	
35	IR 35x40x40	40 ⁰ _{-0.011}	40.0	0.3	2.0	37	0.3	0.091
35	IR 35x42x20	42 ⁰ _{-0.011}	20.0	0.6	1.8	39	0.3	0.064
35	IR 35x42x21	42 ⁰ _{-0.011}	21.0	0.6	-	39	0.6	0.068
35	IR 35x42x23	42 ⁰ _{-0.011}	23.0	0.6	-	39	0.6	0.074
35	IR 35x42x27	42 ⁰ _{-0.011}	27.0	0.6	2.0	39	0.6	0.080
35	IR 35x42x36	42 ⁰ _{-0.011}	36.0	0.6	2.0	39	0.6	0.117
35	IR 35x43x22	43 ⁰ _{-0.011}	22.0	0.6	2.0	39	0.6	0.081
38	IR 38x43x20	43 ⁰ _{-0.011}	20.0	0.3	1.8	40	0.6	0.048
38	IR 38x43x30	43 ⁰ _{-0.011}	30.0	0.3	-	40	0.3	0.074
40	IR 40x45x16.5	45 ⁰ _{-0.011}	16.5	0.3	2.0	42	0.3	0.042
40	IR 40x45x17	45 ⁰ _{-0.011}	17.0	0.3	2.0	42	0.3	0.043
40	IR 40x45x20	45 ⁰ _{-0.011}	20.0	0.3	2.0	42	0.3	0.051
40	IR 40x45x20.5	45 ⁰ _{-0.011}	20.5	0.3	2.0	42	0.3	0.053
40	IR 40x45x26.5	45 ⁰ _{-0.011}	26.5	0.3	-	42	0.3	0.068
40	IR 40x45x30	45 ⁰ _{-0.011}	30.0	0.3	2.0	42	0.3	0.077
40	IR 40x45x34	45 ⁰ _{-0.011}	34.0	0.3	2.0	42	0.3	0.088
40	IR 40x45x40	45 ⁰ _{-0.011}	40.0	0.3	2.0	42	0.3	0.106
40	IR 40x48x22	48 ⁰ _{-0.011}	22.0	0.6	2.0	44	0.3	0.092
40	IR 40x48x23	48 ⁰ _{-0.011}	23.0	0.6	-	44	0.6	0.097
40	IR 40x48x30	48 ⁰ _{-0.011}	30.0	0.6	2.0	44	0.6	0.123
40	IR 40x48x40	48 ⁰ _{-0.011}	40.0	0.6	2.0	44	0.6	0.170
40	IR 40x50x20	50 ⁰ _{-0.011}	20.0	0.3	0.8	44	0.6	0.106
40	IR 40x50x22	50 ⁰ _{-0.011}	22.0	1.0	2.0	45	0.3	0.118
42	IR 42x47x20	47 ⁰ _{-0.011}	20.0	0.3	2.0	44	1.0	0.053
42	IR 42x47x30	47 ⁰ _{-0.011}	30.0	0.3	2.0	44	0.3	0.080
45	IR 45x50x20	50 ⁰ _{-0.011}	20.0	0.3	2.0	47	0.3	0.057

Notes: 1) The tolerance for this dimension provides regular clearance when an inner ring is combined with a needle roller bearing that lacks an inner ring.
2) These values are the allowable minimum dimensions of the chamfer dimension *r*.

	Technical supplement		
	Cages	Precision	Grease
Steel -	<input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
Polymid -	<input checked="" type="checkbox"/>		
Brass -	<input checked="" type="checkbox"/>		

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Inner rings series IR



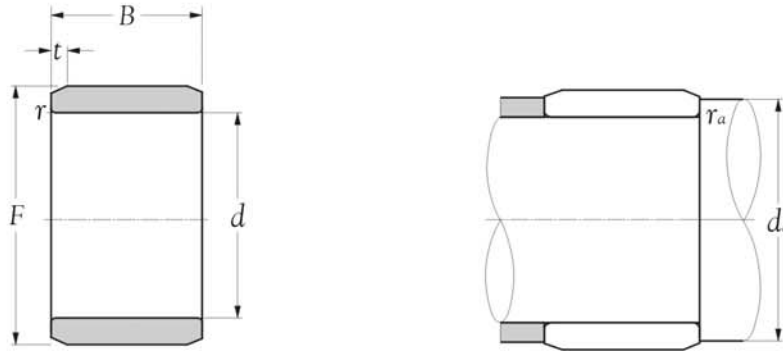
Inner bore <i>d</i> mm	Bearing number	Principal dimensions				Abutment dimensions			Mass kg (approx.)
		<i>F</i> ¹⁾	<i>B</i> mm	<i>r</i> mm ²⁾	<i>t</i>	<i>d_a</i> mm	<i>r_{as}</i> mm	<i>r_{as}</i> max	
45	IR 45x50x25	50 ⁰ _{-0.011}	25.0	0.6	2.0	49.0	0.3		0.071
45	IR 45x50x25.5	50 ⁰ _{-0.011}	25.5	0.3	-	47.0	0.6		0.074
45	IR 45x50x32	50 ⁰ _{-0.011}	32.0	0.6	-	49.0	0.3		0.092
45	IR 45x50x35	50 ⁰ _{-0.011}	35.0	0.6	2.0	49.0	0.6		0.101
45	IR 45x50x40	50 ⁰ _{-0.011}	40.0	0.3	1.5	47.0	0.8		0.115
45	IR 45x52x22	52 ^{+0.008} _{-0.004}	22.0	0.6	2.0	49.0	0.6		0.088
45	IR 45x52x23	52 ^{+0.008} _{-0.004}	23.0	0.6	-	49.0	0.6		0.093
45	IR 45x52x30	52 ^{+0.008} _{-0.004}	30.0	0.6	2.0	49.0	0.6		0.123
45	IR 45x52x40	52 ^{+0.008} _{-0.004}	40.0	0.6	2.0	49.0	0.6		0.164
45	IR 45x55x20	55 ^{+0.008} _{-0.004}	20.0	0.6	2.0	49.0	0.6		0.116
45	IR 45x55x22	55 ^{+0.008} _{-0.004}	22.0	1.0	2.0	50.0	1.0		0.130
45	IR 45x55x40	55 ^{+0.008} _{-0.004}	40.0	0.6	2.0	49.0	0.6		0.173
50	IR 50x55x20	55 ^{+0.008} _{-0.004}	20.0	0.6	2.0	54.0	0.6		0.063
50	IR 50x55x25	55 ^{+0.008} _{-0.004}	25.0	0.6	2.0	54.0	0.6		0.780
50	IR 50x55x35	55 ^{+0.008} _{-0.004}	35.0	0.6	2.0	54.0	0.6		0.112
50	IR 50x55x40	55 ^{+0.008} _{-0.004}	40.0	0.6	2.0	54.0	0.6		0.128
50	IR 50x58x22	58 ^{+0.008} _{-0.004}	22.0	0.6	2.0	54.0	0.6		0.113
50	IR 50x58x23	58 ^{+0.008} _{-0.004}	23.0	0.6	-	54.0	0.6		0.119
50	IR 50x58x30	58 ^{+0.008} _{-0.004}	30.0	0.6	2.0	54.0	0.6		0.159
50	IR 50x58x40	58 ^{+0.008} _{-0.004}	40.0	0.6	2.0	54.0	0.6		0.209
50	IR 50x60x20	60 ^{+0.008} _{-0.004}	20.0	1.0	2.0	55.0	1.0		0.129
50	IR 50x60x25	60 ^{+0.008} _{-0.004}	25.0	1.0	2.0	55.0	1.0		0.163
50	IR 50x60x28	60 ^{+0.008} _{-0.004}	28.0	1.1	2.0	56.5	1.0		0.183
50	IR 50x60x40	60 ^{+0.008} _{-0.004}	40.0	1.0	2.0	55.0	1.0		0.262
55	IR 55x60x25	60 ⁰ _{-0.013}	25.0	0.6	2.2	59.0	0.6		0.086
55	IR 55x60x35	60 ⁰ _{-0.013}	35.0	0.6	2.0	59.0	0.6		0.121

Notes: 1) The tolerance for this dimension provides regular clearance when an inner ring is combined with a needle roller bearing that lacks an inner ring.
2) These values are the allowable minimum dimensions of the chamfer dimension *r*.

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Technical supplement			
Cages	Pre2cision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

Inner rings series IR



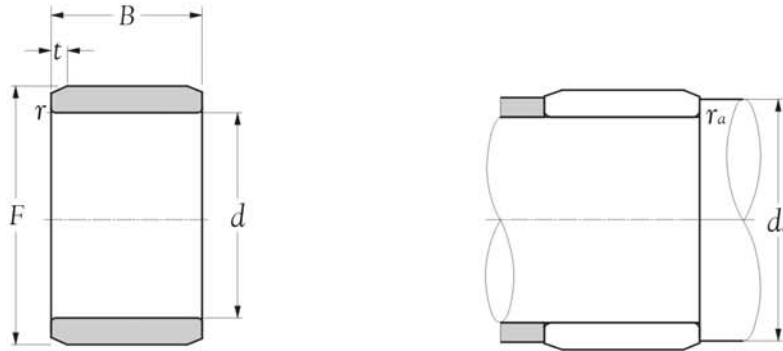
Inner bore <i>d</i> mm	Bearing number	Principal dimensions				Abutment dimensions			Mass kg (approx.)
		<i>F</i> ¹⁾	<i>B</i> mm	<i>r</i> mm ²⁾	<i>t</i>	<i>d</i> _a mm	mm	<i>r</i> _{as} max	
55	IR 55x63x25	63 ⁰ _{-0.013}	25	1.0	2.0	60.0		1.0	0.141
55	IR 55x63x34	63 ⁰ _{-0.013}	34	1.0	2.2	60.0		1.0	0.192
55	IR 55x63x45	63 ⁰ _{-0.013}	45	1.0	2.2	60.0		1.0	0.256
55	IR 55x65x28	65 ⁰ _{-0.013}	28	1.1	2.2	61.5		1.0	0.206
55	IR 55x65x30	65 ⁰ _{-0.013}	30	1.0	2.2	60.0		1.0	0.220
55	IR 55x65x60	65 ⁰ _{-0.013}	60	1.0	1.5	60.0		1.0	0.440
60	IR 60x68x25	68 ⁰ _{-0.013}	25	1.0	2.2	65.0		1.0	0.152
60	IR 60x68x34	68 ⁰ _{-0.013}	34	1.0	2.2	65.0		1.0	0.206
60	IR 60x68x35	68 ⁰ _{-0.013}	35	0.6	2.2	64.0		0.6	0.213
60	IR 60x68x45	68 ⁰ _{-0.013}	45	1.0	2.2	65.0		1.0	0.270
60	IR 60x70x25	70 ⁰ _{-0.013}	25	1.0	2.2	65.0		1.0	0.195
60	IR 60x70x28	70 ⁰ _{-0.013}	28	1.1	2.2	66.5		1.0	0.216
60	IR 60x70x30	70 ⁰ _{-0.013}	30	1.0	2.2	65.0		1.0	0.232
60	IR 60x70x60	70 ⁰ _{-0.013}	60	1.0	2.2	65.0		1.0	0.463
65	IR 65x72x25	72 ⁰ _{-0.013}	25	1.0	2.2	70.0		1.0	0.142
65	IR 65x72x34	72 ⁰ _{-0.013}	34	1.0	2.2	70.0		1.0	0.193
65	IR 65x72x45	72 ⁰ _{-0.013}	45	1.0	2.2	70.0		1.0	0.259
65	IR 65x73x25	73 ⁰ _{-0.013}	25	0.6	2.2	69.0		0.6	0.164
65	IR 65x73x35	73 ⁰ _{-0.013}	35	0.6	2.2	69.0		0.6	0.232
65	IR 65x75x28	75 ⁰ _{-0.013}	28	1.1	2.2	71.5		1.0	0.240
65	IR 65x75x30	75 ⁰ _{-0.013}	30	1.0	2.2	70.0		1.0	0.256
65	IR 65x75x60	75 ⁰ _{-0.013}	60	1.0	2.2	70.0		1.0	0.513
70	IR 70x80x25	80 ⁰ _{-0.013}	25	1.0	2.2	75.0		1.0	0.224
70	IR 70x80x28	80 ⁰ _{-0.013}	28	1.1	2.2	76.5		1.0	0.250
70	IR 70x80x30	80 ⁰ _{-0.013}	30	1.0	2.2	75.0		1.0	0.267
70	IR 70x80x35	80 ⁰ _{-0.013}	35	1.0	2.2	75.0		1.0	0.313

Notes: 1) The tolerance for this dimension provides regular clearance when an inner ring is combined with a needle roller bearing that lacks an inner ring.
2) These values are the allowable minimum dimensions of the chamfer dimension *r*.

	Technical supplement		
	Cages	Precision	Grease
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

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Inner rings series IR



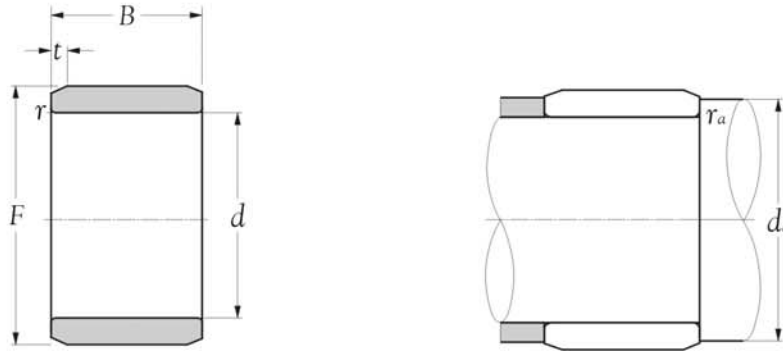
Inner bore <i>d</i> mm	Bearing number	Principal dimensions				Abutment dimensions			Mass kg (approx.)
		<i>F</i> ¹⁾	<i>B</i>	<i>r</i> mm ²⁾	<i>t</i>	<i>d</i> _a mm	<i>r</i> _a mm	<i>r</i> _a max	
70	IR 70x80x40	80 ⁰ _{-0.013}	40	1.0	2.2	75.0	1		0.358
70	IR 70x80x54	80 ⁰ _{-0.013}	54	1.0	2.2	75.0	1		0.483
70	IR 70x80x56	80 ⁰ _{-0.013}	56	1.0	2.2	75.0	1		0.502
70	IR 70x80x60	80 ⁰ _{-0.013}	60	1.0	2.2	75.0	1		0.540
75	IR 75x85x25	85 ⁰ _{-0.015}	25	1.0	2.2	80.0	1		0.238
75	IR 75x85x30	85 ⁰ _{-0.015}	30	1.0	2.2	80.0	1		0.287
75	IR 75x85x35	85 ⁰ _{-0.015}	35	1.0	2.2	80.0	1		0.336
75	IR 75x85x40	85 ⁰ _{-0.015}	40	1.0	2.2	80.0	1		0.385
75	IR 75x85x54	85 ⁰ _{-0.015}	54	1.0	2.2	80.0	1		0.515
75	IR 75x90x32	90 ⁰ _{-0.015}	32	1.1	2.2	81.5	1		0.480
80	IR 80x90x25	90 ⁰ _{-0.015}	25	1.0	2.2	85.0	1		0.254
80	IR 80x90x30	90 ⁰ _{-0.015}	30	1.0	2.2	85.0	1		0.304
80	IR 80x90x35	90 ⁰ _{-0.015}	35	1.0	2.2	85.0	1		0.355
80	IR 80x90x40	90 ⁰ _{-0.015}	40	1.0	2.2	85.0	1		0.408
80	IR 80x90x54	90 ⁰ _{-0.015}	54	1.0	2.2	85.0	1		0.543
80	IR 80x95x32	95 ⁰ _{-0.015}	32	1.1	2.2	86.5	1		0.510
85	IR 85x95x26	95 ⁰ _{-0.015}	26	1.0	2.5	90.0	1		0.280
85	IR 85x95x30	95 ⁰ _{-0.015}	30	1.0	2.5	90.0	1		0.323
85	IR 85x95x36	95 ⁰ _{-0.015}	36	1.0	2.5	90.0	1		0.398
85	IR 85x100x32	100 ⁰ _{-0.015}	32	1.1	2.5	91.5	1		0.530
85	IR 85x100x35	100 ⁰ _{-0.015}	35	1.1	2.5	91.5	1		0.580
85	IR 85x100x46	100 ⁰ _{-0.015}	46	1.1	2.5	91.5	1		0.760
85	IR 85x100x63	100 ⁰ _{-0.015}	63	1.1	2.5	91.5	1		1.050
90	IR 90x100x26	100 ⁰ _{-0.015}	26	1.0	2.5	95.0	1		0.294
90	IR 90x100x30	100 ⁰ _{-0.015}	30	1.0	2.5	95.0	1		0.340
90	IR 90x100x36	100 ⁰ _{-0.015}	36	1.0	2.5	95.0	1		0.406

Notes: 1) The tolerance for this dimension provides regular clearance when an inner ring is combined with a needle roller bearing that lacks an inner ring.
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Technical supplement			
Cages	Pre2ecision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

Inner rings series IR

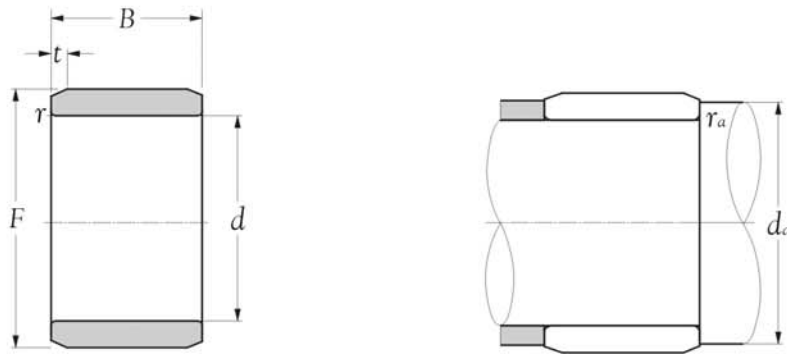


Inner bore <i>d</i> mm	Bearing number	Principal dimensions				Abutment dimensions		Mass kg(s) (approx.)
		$F^{1)}$	<i>B</i> mm	r_s mm ²⁾	<i>t</i>	d_a mm	r_{as} mm	
90	IR 90x105x32	105 ⁰ _{-0.015}	32	1.1	2.5	96.5	1	0.560
90	IR 90x105x35	105 ⁰ _{-0.015}	35	1.1	2.5	96.5	1	0.610
90	IR 90x105x46	105 ⁰ _{-0.015}	46	1.1	2.5	96.5	1	0.800
90	IR 90x105x63	105 ⁰ _{-0.015}	63	1.1	2.5	96.5	1	1.110
95	IR 95x105x26	105 ⁰ _{-0.015}	26	1.0	2.5	100.0	1	0.313
95	IR 95x105x36	105 ⁰ _{-0.015}	36	1.0	2.5	100.0	1	0.430
95	IR 95x110x32	110 ⁰ _{-0.015}	32	1.1	2.5	101.5	1	0.590
95	IR 95x110x35	110 ⁰ _{-0.015}	35	1.1	2.5	101.5	1	0.640
95	IR 95x110x46	110 ⁰ _{-0.015}	46	1.1	2.5	101.5	1	0.850
95	IR 95x110x63	110 ⁰ _{-0.015}	63	1.1	2.5	101.5	1	1.170
100	IR 100x110x30	110 ⁰ _{-0.015}	30	1.1	2.5	106.5	1	0.375
100	IR 100x110x40	110 ⁰ _{-0.015}	40	1.1	2.5	106.5	1	0.505
100	IR 100x115x32	115 ⁰ _{-0.015}	32	1.1	2.5	106.5	1	0.620
100	IR 100x115x40	115 ⁰ _{-0.015}	40	1.1	2.5	106.5	1	0.775
100	IR 100x115x54	115 ⁰ _{-0.015}	54	1.1	2.5	106.5	1	1.090
110	IR 110x120x30	120 ⁰ _{-0.015}	30	1.0	2.5	115.0	1	0.440
110	IR 110x120x40	120 ⁰ _{-0.015}	40	1.1	2.5	116.5	1	0.580
110	IR 110x125x40	125 ⁰ _{-0.018}	40	1.1	2.5	116.5	1	0.840
110	IR 110x125x54	125 ⁰ _{-0.018}	54	1.1	2.5	116.5	1	1.160
120	IR 120x130x30	130 ⁰ _{-0.018}	30	1.0	2.2	125.0	1.0	0.440
120	IR 120x130x40	130 ⁰ _{-0.018}	40	1.1	2.5	126.5	1.0	0.590
120	IR 120x135x40	135 ⁰ _{-0.018}	40	2.0	2.5	129.0	2.0	0.870
120	IR 120x135x45	135 ⁰ _{-0.018}	45	1.1	2.5	126.5	1.0	0.980
120	IR 120x135x60	135 ⁰ _{-0.018}	60	1.1	2.5	126.5	1.0	1.250
130	IR 130x145x32	145 ⁰ _{-0.018}	32	1.5	3.0	138.0	1.5	0.780
130	IR 130x145x35	145 ⁰ _{-0.018}	35	1.1	3.0	136.5	1.0	0.855

Notes: 1) The tolerance for this dimension provides regular clearance when an inner ring is combined with a needle roller bearing that lacks an inner ring.
2) These values are the allowable minimum dimensions of the chamfer dimension *r*.

Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

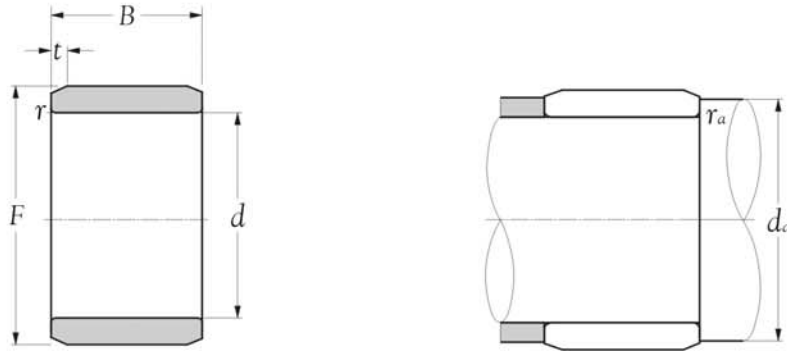


Inner bore <i>d</i> mm	Bearing number	Principal dimensions				Abutment dimensions			Mass kg(s) (approx.)
		<i>F</i> ¹⁾	<i>B</i> mm	<i>r</i> mm ²⁾	<i>t</i>	<i>d</i> _a mm	<i>r</i> _a mm	<i>r</i> _a max	
130	IR 130x145x42	145 ⁰ _{-0.018}	42	1.5	3.0	138.0	1.5		1.050
130	IR 130x150x50	150 ⁰ _{-0.018}	50	1.5	3.0	138.0	1.5		1.690
130	IR 130x150x52	150 ⁰ _{-0.018}	52	2.0	3.0	139.0	2.0		1.750
130	IR 130x150x67	150 ⁰ _{-0.018}	67	1.5	3.0	138.0	1.5		2.250
140	IR 140x155x32	155 ⁰ _{-0.018}	32	1.5	3.0	148.0	1.5		0.840
140	IR 140x155x35	155 ⁰ _{-0.018}	35	1.1	3.0	146.5	1.0		0.917
140	IR 140x155x42	155 ⁰ _{-0.018}	42	1.5	3.0	148.0	1.5		1.100
140	IR 140x160x50	160 ⁰ _{-0.018}	50	1.5	3.0	148.0	1.5		1.700
140	IR 140x160x52	160 ⁰ _{-0.018}	52	2.0	3.0	149.0	2.0		1.780
140	IR 140x160x67	160 ⁰ _{-0.018}	67	1.5	3.0	148.0	1.5		2.300
150	IR 150x165x32	165 ^{-0.017} _{-0.035}	32	1.5	3.0	158.0	1.5		0.900
150	IR 150x165x40	165 ^{-0.017} _{-0.035}	40	1.1	3.0	156.5	1.0		1.120
150	IR 150x165x42	165 ^{-0.017} _{-0.035}	42	1.5	3.0	158.0	1.5		1.180
150	IR 150x170x52	170 ^{-0.017} _{-0.035}	52	2.0	3.0	159.0	2.0		2.000
150	IR 150x170x60	170 ^{-0.017} _{-0.035}	60	2.0	3.0	159.0	2.0		2.350
160	IR 160x175x40	175 ^{-0.017} _{-0.035}	40	1.1	3.0	166.5	1.0		1.200
160	IR 160x180x60	180 ^{-0.017} _{-0.035}	60	2.0	3.0	169.0	2.0		2.500
170	IR 170x185x45	185 ^{-0.013} _{-0.043}	45	1.1	3.0	176.5	1.0		1.450
170	IR 170x190x60	190 ^{-0.013} _{-0.043}	60	2.0	3.0	179.0	2.0		2.650
180	IR 180x195x45	195 ^{-0.013} _{-0.043}	45	1.1	3.0	186.5	1.0		1.510
180	IR 180x205x69	205 ^{-0.013} _{-0.043}	69	2.0	3.0	189.0	2.0		4.100
190	IR 190x210x50	210 ^{-0.020} _{-0.050}	50	1.5	3.5	198.0	1.5		2.410
190	IR 190x215x69	215 ^{-0.020} _{-0.050}	69	2.0	3.5	199.0	2.0		4.100
200	IR 200x220x50	220 ^{-0.020} _{-0.050}	50	1.5	3.5	208.0	1.5		2.490
200	IR 200x225x80	225 ^{-0.020} _{-0.050}	80	2.1	3.5	211.0	2.0		5.100
220	IR 220x240x50	240 ^{-0.033} _{-0.063}	50	1.5	3.5	228.0	1.5		2.750

Notes: 1) The tolerance for this dimension provides regular clearance when an inner ring is combined with a needle roller bearing that lacks an inner ring.
 2) These values are the allowable minimum dimensions of the chamfer dimension *r*.

Remark: If you have more inquiry of technical, please inquire
 KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)


Technical supplement			
Cages	Pre2cision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			



Inner bore <i>d</i> mm	Bearing number	Principal dimensions				Abutment dimensions		Mass kgs (approx.)
		<i>F</i> ¹⁾	<i>B</i> mm	<i>r</i> mm ²⁾	<i>t</i>	<i>d</i> _a mm	<i>r</i> _{as} max mm	
220	IR 220x245x80	245 ^{-0.033} _{-0.063}	80	2.1	3.5	231	2.0	5.70
240	IR 240x265x60	265 ^{-0.037} _{-0.069}	60	2.0	3.5	249	2.0	4.60
240	IR 240x265x80	265 ^{-0.037} _{-0.069}	80	2.1	3.5	251	2.0	6.30
260	IR 260x285x60	285 ^{-0.064} _{-0.092}	60	2.0	4.0	269	2.0	4.98
260	IR 260x290x100	290 ^{-0.064} _{-0.092}	100	2.1	4.0	271	2.0	10.00
280	IR 280x305x69	305 ^{-0.064} _{-0.092}	69	2.0	4.0	289	2.0	6.20
280	IR 280x310x100	310 ^{-0.064} _{-0.092}	100	2.1	4.0	291	2.0	10.80
300	IR 300x330x80	330 ^{-0.062} _{-0.098}	80	2.1	4.0	311	2.0	9.30
300	IR 300x340x118	340 ^{-0.062} _{-0.098}	118	3.0	4.0	313	2.5	18.50
320	IR 320x350x80	350 ^{-0.062} _{-0.098}	80	2.1	5.0	331	2.0	9.80
320	IR 320x360x118	360 ^{-0.062} _{-0.098}	118	3.0	5.0	333	2.5	20.00
340	IR 340x370x80	370 ^{-0.062} _{-0.098}	80	2.1	5.0	351	2.0	10.10
340	IR 340x380x118	380 ^{-0.062} _{-0.098}	118	3.0	5.0	353	2.5	22.00
360	IR 360x390x80	390 ^{-0.090} _{-0.126}	80	2.1	5.0	371	2.0	10.90
360	IR 360x400x118	400 ^{-0.090} _{-0.126}	118	3.0	5.0	373	2.5	22.00
380	IR 380x415x100	415 ^{-0.080} _{-0.120}	100	2.1	5.0	391	2.0	18.50
380	IR 380x430x140	430 ^{-0.080} _{-0.120}	140	4.0	5.0	396	3.0	35.00
400	IR 400x450x140	450 ^{-0.080} _{-0.120}	140	4.0	5.0	416	3.0	36.50
420	IR 420x470x140	470 ^{-0.105} _{-0.145}	140	4.0	5.0	436	3.0	38.20
440	IR 440x490x160	490 ^{-0.105} _{-0.145}	160	4.0	5.0	456	3.0	46.50

Notes: 1) The tolerance for this dimension provides regular clearance when an inner ring is combined with a needle roller bearing that lacks an inner ring.

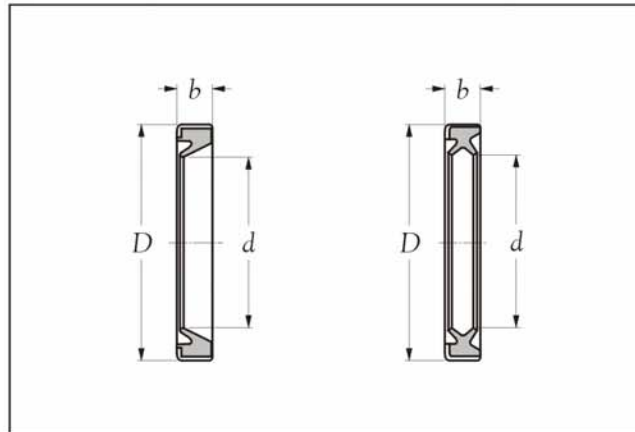
2) These values are the allowable minimum dimensions of the chamfer dimension *r*.

	Technical supplement		
	Cages	Precision	Grease
Steel -	X	Class 0 (JIS)	Nil
Polymid -	X		
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)



Seals



TECHNICAL SUPPLEMENT 264 - 265

PRODUCT INFORMATION 266 - 268



G

266 - 268



SD

266 - 268

1. Seals

Seals for needle roller bearings are special seals having a low cross-sectional height to accommodate needle roller bearings. These steel plate-reinforced synthetic rubber contact seals should be used within a standard operating temperature range of -25 to 120 °C; the seals should not be used in excess of 100 °C or continuous operation. Consult **KSM** Engineering if you are considering an application involving special operating conditions including operating temperature of 120 °C or higher.

2. Seal types

Seals for needle roller bearings are available in the series G, which has a single lip, and the series SD, which has a double lip. For special operating conditions, such as an operating temperature exceeding 120 °C, consult **KSM** Engineering. Where good seal seating and lubricating conditions are present, the maximum allowable peripheral velocity is 10m/s for the single-lip series G, and 6 m/s for the double lip series SD.

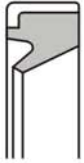


Fig. 1 Series G



Fig. 2 Series SD

3. Interpreting seal numbers

Seal numbers comprise a series number (G or SD) and a dimension code (inside diameter X outside diameter X width.)

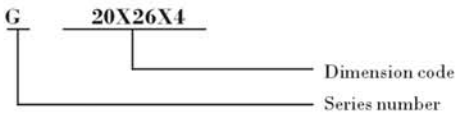


Fig. 3

4. Mounting practices

To achieve a reliable seal, the seal seating must be hardened and finish-ground. If the raceway surface of an inner ring is used as the seal seat, an extended inner ring should be used. To prevent the seal lip and outside surface of the seal from being damaged during mounting, the shaft end or housing end should be tapered (Fig.4). If the shaft end lacks a taper or rounding, use of the mounting jig as shown in Fig.5 is recommended. Sufficient interference between the seal and housing will be obtained from an ordinary housing tolerance of S7 to R7.

To lubricate the lip, apply lubricant to the lip before mounting the seal.

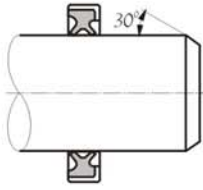


Fig. 4

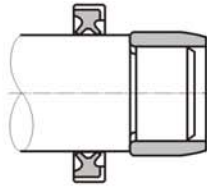


Fig. 5

5. Typical seal applications

Fig. 6 to 8 illustrate typical designs of seals for needle roller bearings.

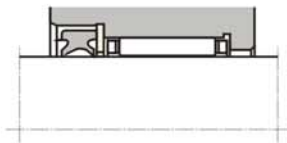


Fig. 6

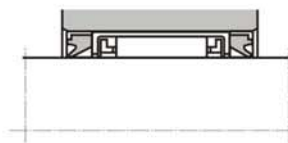


Fig. 7

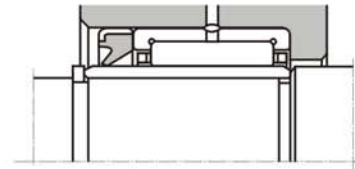
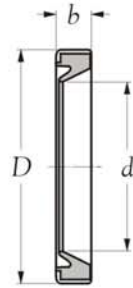
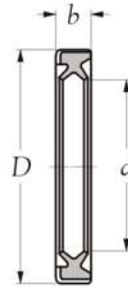


Fig. 8



Type G




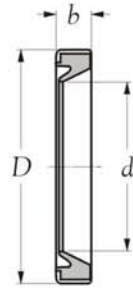
Type SD

Inner bore <i>d</i> mm	Bearing number	Boundary dimensions		Mass (approx.)	
		<i>D</i> ¹⁾ mm	<i>b</i> _{-0.02} ⁰	G kg(s)	SD
4	G 4x8x2	8 ^{+0.081} _{+0.023}	2	0.18	-
5	G 5x9x3	9 ^{+0.081} _{+0.023}	2	0.19	-
5	G 5x10x2	10 ^{+0.081} _{+0.023}	2	0.22	-
6	G 6x10x2	10 ^{+0.081} _{+0.023}	2	0.21	-
6	G 6x12x2	12 ^{+0.098} _{+0.028}	2	0.38	-
7	G 7x11x2	11 ^{+0.098} _{+0.028}	2	0.25	-
7	G 7x14x2	14 ^{+0.098} _{+0.028}	2	0.52	-
8	G 8x12x3	12 ^{+0.098} _{+0.028}	3	0.41	-
8	G 8x15x3	15 ^{+0.098} _{+0.028}	3	0.74	-
9	G 9x13x3	13 ^{+0.098} _{+0.028}	3	0.44	-
9	G 9x16x3	16 ^{+0.098} _{+0.028}	3	0.69	-
10	G 10x14x3	14 ^{+0.098} _{+0.028}	3	0.50	-
10	G 10x17x3	17 ^{+0.098} _{+0.028}	3	0.87	-
12	G 12x16x3	16 ^{+0.098} _{+0.028}	3	0.56	-
12	G 12x18x3	18 ^{+0.098} _{+0.028}	3	0.86	-
12	G 12x19x3	19 ^{+0.119} _{+0.035}	3	0.94	-
13	G 13x19x3	19 ^{+0.119} _{+0.035}	3	0.87	-
14	G 14x20x3	20 ^{+0.119} _{+0.035}	3	0.96	0.99
14	G 14x21x3	21 ^{+0.119} _{+0.035}	3	1.10	1.10
14	G 14x22x3	22 ^{+0.119} _{+0.035}	3	1.30	1.30
15	G 15x21x3	21 ^{+0.119} _{+0.035}	3	1.00	1.00
15	G 15x23x3	23 ^{+0.119} _{+0.035}	3	1.30	1.30
16	G 16x22x3	22 ^{+0.119} _{+0.035}	3	1.30	1.10
16	G 16x24x3	24 ^{+0.119} _{+0.035}	3	1.30	1.30
16	G 16x25x3	25 ^{+0.119} _{+0.035}	3	1.60	1.60
17	G 17x23x3	23 ^{+0.119} _{+0.035}	3	1.30	1.10
17	G 17x25x3	25 ^{+0.119} _{+0.035}	3	1.50	1.40

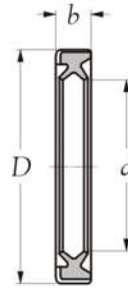
Notes: 1) The tolerance of the outside diameter is an average of two measurements taken at equally spaced points on the outside surface.

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Technical supplement			
	Cages	Precision	Grease
	Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil
	Polymid - <input checked="" type="checkbox"/>		
	Brass - <input checked="" type="checkbox"/>		



Type G



Type SD

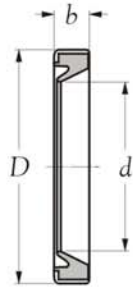
Inner bore <i>d</i>	Bearing number		Boundary dimensions		Mass (approx.)	
			<i>D</i> ¹⁾	<i>b</i> _{-0.02} ⁰	G	SD
18	G 18x24x3	SD 18x24x3	24 ^{+0.119} _{+0.035}	3	1.2	1.2
18	G 18x26x4	SD 18x26x4	26 ^{+0.119} _{+0.035}	4	1.8	1.8
19	G 19x27x4	SD 19x27x4	27 ^{+0.119} _{+0.035}	4	2.0	1.9
20	G 20x26x4	SD 20x26x4	26 ^{+0.119} _{+0.035}	4	1.8	1.8
20	G 20x28x4	SD 20x28x4	28 ^{+0.119} _{+0.035}	4	2.1	2.1
21	G 21x29x4	SD 21x29x4	29 ^{+0.119} _{+0.035}	4	2.2	2.1
22	G 22x28x4	SD 22x28x4	28 ^{+0.119} _{+0.035}	4	1.8	1.9
22	G 22x30x4	SD 22x30x4	30 ^{+0.119} _{+0.035}	4	2.2	2.3
24	G 24x32x4	SD 24x32x4	32 ^{+0.143} _{+0.043}	4	2.5	2.4
25	G 25x32x4	SD 25x32x4	32 ^{+0.143} _{+0.043}	4	2.3	2.2
25	G 25x33x4	SD 25x33x4	33 ^{+0.143} _{+0.043}	4	2.5	2.5
25	G 25x35x4	SD 25x35x4	35 ^{+0.143} _{+0.043}	4	2.6	2.6
26	G 26x34x4	SD 26x34x4	34 ^{+0.143} _{+0.043}	4	2.6	2.6
28	G 28x35x4	SD 28x35x4	35 ^{+0.143} _{+0.043}	4	2.4	2.5
28	G 28x37x4	SD 28x37x4	37 ^{+0.143} _{+0.043}	4	3.1	2.8
29	G 29x37x4	SD 29x37x4	37 ^{+0.143} _{+0.043}	4	2.7	2.7
29	G 29x38x4	SD 29x38x4	38 ^{+0.143} _{+0.043}	4	3.2	2.9
30	G 30x37x4	SD 30x37x4	37 ^{+0.143} _{+0.043}	4	2.7	2.6
30	G 30x40x4	SD 30x40x4	40 ^{+0.143} _{+0.043}	4	3.6	3.3
32	G 32x42x4	SD 32x42x4	42 ^{+0.143} _{+0.043}	4	3.7	3.9
32	G 32x45x4	SD 32x45x4	45 ^{+0.143} _{+0.043}	4	5.1	5.2
35	G 35x42x4	SD 35x42x4	42 ^{+0.143} _{+0.043}	4	3.0	2.9
35	G 35x45x4	SD 35x45x4	45 ^{+0.143} _{+0.043}	4	4.1	3.6
37	G 37x47x4	SD 37x47x4	47 ^{+0.143} _{+0.043}	4	4.0	3.8
38	G 38x48x4	SD 38x48x4	48 ^{+0.143} _{+0.043}	4	4.4	4.0
40	G 40x47x4	SD 40x47x4	47 ^{+0.143} _{+0.043}	4	3.3	3.5
40	G 40x50x4	SD 40x50x4	50 ^{+0.143} _{+0.043}	4	4.6	4.0

Notes: 1) The tolerance of the outside diameter is an average of two measurements taken at equally spaced points on the outside surface.

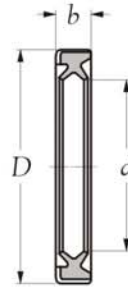
Technical supplement			
Cages	Precision	Grease	
Steel - <input checked="" type="checkbox"/>	Class 0 (JIS)	Nil	
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			

Remark: If you have more inquiry of technical, please inquire
KSM web-site: <http://www.minamiguchi-bearings.com>






Type G



Type SD

Inner bore <i>d</i>	Bearing number		Boundary dimensions		Mass (approx.)	
			<i>D</i> ¹⁾	<i>b</i> _{-0.02 0}	G	SD
40	G 40x52x4	SD 40x52x4	52 ^{+0.173 +0.053}	4	4.8	4.7
42	G 42x52x4	SD 42x52x4	52 ^{+0.173 +0.053}	4	4.7	4.2
43	G 43x53x4	SD 43x53x4	53 ^{+0.173 +0.053}	4	4.8	4.3
45	G 45x52x4	SD 45x52x4	52 ^{+0.173 +0.053}	4	3.8	3.8
45	G 45x55x4	SD 45x55x4	55 ^{+0.173 +0.053}	4	5.2	5.5
50	G 50x58x4	SD 50x58x4	58 ^{+0.173 +0.053}	4	4.5	5.2
50	G 50x62x4	SD 50x62x4	62 ^{+0.173 +0.053}	4	10.4	10.0

Notes: 1) The tolerance of the outside diameter is an average of two measurements taken at equally spaced points on the outside surface.

	Technical supplement		
	Cages	Precision	Grease
Steel -	X	Class 0 (JIS)	Nil
Polymid -	X		
Brass -	X		

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)



KSM[®]



MOUNTED UNITS (SUPER)



Technical Information		Pages for refer
		272 ~ 300
1	Characteristics	272
2	Design features	272 ~ 274
3	Tolerance	274 ~ 278
4	Basic load rating and life	278 ~ 283
5	Loads	283 ~ 287
6	Bearing internal clearance	287 ~ 289
7	Lubrication	290 ~ 292
8	Shaft designs	292 ~ 294
9	Handling of the bearings unit	295 ~300

1. Characteristics

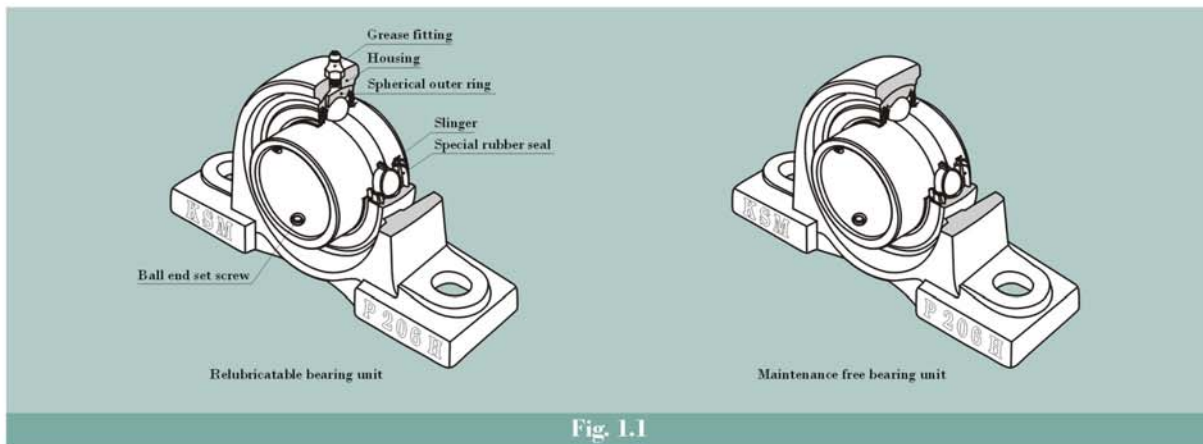
The **KSM** bearing unit is a combination of a radial ball bearing, seal, and a housing of high-grade cast iron or pressed steel, which comes in various shapes.

The outer surface of the bearing and the internal surface of the housing are spherical, so that the unit is self-aligning.

The inside construction of the ball bearing for the unit is such that steel balls and retainers of the same type as in series 62 and 63 of the **KSM** deep groove ball bearing are used. A duplex seal consisting of a combination of an oil-proof synthetic rubber seal and a slinger, unique to **KSM**, is provided on both sides.

Depending on the type, the following methods of fitting to the shaft are employed:

- (1) The inner ring is fastened onto the shaft in two places by set screws.
- (2) The inner ring has a tapered bore and is fitted to the shaft by means of an adapter.
- (3) In the eccentric locking collar system the inner ring is fastened to the shaft by means of eccentric grooves provided at the side of the inner ring and on the collar.



2. Design features

2.1 Maintenance free type

The **KSM** Maintenance free bearing unit contains a high-grade lithium-based grease, good for use over a long period, which is ideally suited to sealed-type bearings. Also provided is an excellent sealing device, unique to **KSM**, which prevents any leakage of grease or penetration of dust and water from outside.

It is designed so that the rotation of the shaft causes the sealed-in grease to circulate through the inside space, effectively providing maximum lubrication. The lubrication effect is maintained over a long period with no need for replenishment of grease.

To summarize the advantages of the **KSM** maintenance free bearing unit:

- (1) As an adequate amount of good quality grease is sealed in at the time of manufacture, there is no need for replenishment. This means savings in terms of time and maintenance costs.
- (2) Since there is no need for any regreasing facilities, such as piping, a more compact design is possible.
- (3) The sealed-in design eliminates the possibility of grease leakage, which could lead to stained products.

2.2 Relubricatable type

The **KSM** relubricatable type bearing unit has an advantage over other similar units bearing so designed as to permit regreasing even in the case of misalignment of 2° to the right or left. The hole through which the grease fitting is mounted usually causes structural weakening of the housing.

However, as a result of extensive testing, in the **KSM** bearing unit the hole is positioned so as to minimize this adverse effect. In addition, the regreasing groove has been designed to minimize weakening of the housing.

While the **KSM** maintenance free type bearing unit is satisfactory for use under normal operating conditions in-doors, in the following circumstances it is necessary to use the relubricatable type bearing unit:

- (1) Cases where the temperature of the bearing rises above 100° C, 212° F:
 - * -Normal temperature of up to 200° C, 392° F heat-resistant bearing units.
- (2) Cases where there is excessive dust, but space does not permit using a bearing unit with a cover.
- (3) Cases where the bearing unit is constantly exposed to splashes of water or any other liquid, but space does not permit using a bearing unit with a cover.
- (4) Cases in which the humidity is very high, and the machine in which the bearing unit is used to run only intermittently.
- (5) Cases involving a heavy load of which the Cr/Pr value is about 10 or below, and the speed is 10 rpm or below, or the movement is oscillatory.
- (6) Cases where the number of revolutions is relatively high and the noise problem has to be considered; for example, when the bearing is used with the fan of an air conditioner.

2.3 Special sealing feature

2.3.1 Standard bearing units

The sealing device of the ball bearing for the **KSM** Bearing unit is a Combination of a heat-resistant and oil-proof synthetic rubber seal and a slinger of an exclusive **KSM** design.

The seal, which is fixed in the outer ring, is steel-reinforced, and its lip, in contact with the inner ring, is designed to minimize frictional torque.

The slinger is fixed to the inner ring of the bearing with which it rotates. There is a small clearance between its periphery and the outer ring.

There are triangular protrusions on the outside face of the slinger and, as the bearing rotates, these protrusions on the slinger create a flow of air outward from the bearing. In this way, the slinger acts as a fan which keeps dust and water away from the bearing.

These two types of seals on both sides of the bearing prevent grease leakage, and foreign matter is prevented from entering the bearing from outside.

2.3.2 Bearing units with covers

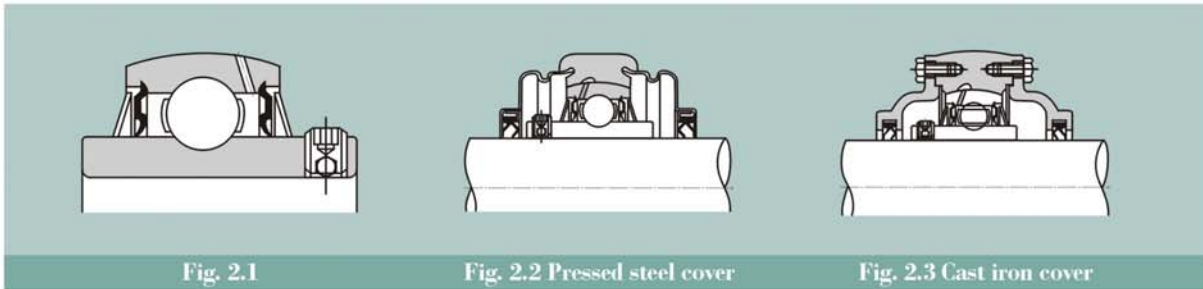
The **KSM** bearing unit with a cover consists of a standard bearing unit and an outside cover for extra protection against dust. Special consideration has been given to its design with respect to dust-proofing.

Sealing devices are provided in both the bearing and the housing, so that units of this type operate satisfactorily even in such adverse environments as flour mills, steel mills, foundries, galvanizing plants and chemical plants, where excessive dust is produced and/or liquids are used. They are also eminently suitable for outdoor environments where dust and rain are inevitable, and in heavy industrial machinery such as construction and transportation equipment.

The rubber seal of the cover contacts with the shaft by its two lips, as shown in Fig.2.2 and 2.3. By filling the groove between the two lips with grease, an excellent sealing effect is obtained and, at the same time, the contacting portions of the lips are lubricated. Furthermore, the groove is so designed that when the shaft is inclined the rubber seal can move in the radial direction.

When bearing units are exposed to splashes of water rather than to dust, a drain hole (5 to 8 mm, 0.2 to 0.3 inches in diameter) is provided at the bottom of the cover, and grease should be applied to the side of the bearing itself instead of into the cover.





2.4 Secure fitting

Fastening the bearing to the shaft is effected by tightening the ball-end set screw, situated on the inner ring. This is a unique **KSM** feature which prevents loosening, even if the bearing is subjected to intense vibrations and shocks.

2.5 Self-aligning

With the **KSM** bearing unit, the outer surface of the ball bearing and the inner surface of the housing are spherical, thus alignment of the assembly is automatic. Any misalignment of axis that may arise from poor workmanship on the shaft or errors in fitting will be automatically adjusted.

2.6 Higher rated load capacity

The bearing used in the unit is of the same internal construction as those in **KSM** bearing series 62 and 63, and is capable of accommodating axial load as well as radial load, or composite load. The rated load capacity of this bearing is considerably higher than that of the corresponding self-aligning ball bearings used for standard plummer blocks.

2.7 Light weight yet strong housing

Housings for **KSM** bearing units come in various shapes. They consist of either high-grade cast iron, one-piece Casting, or of precision finished pressed steel, the latter being lighter in weight. In either case, they are practically designed to combine lightness with maximum strength.

2.8 Easy mounting

The **KSM** bearing unit is an integrated unit consisting of a bearing and a housing.

As the bearing is prelubricated at manufacture with the correct amount of high-grade lithium base, it can be mounted on the shaft just as it is. It is sufficient to carry out a short test run after mounting.

2.9 Accurate fitting of the housing

In order to simplify the fitting of the pillow block and flange type bearing units, the housings are provided with a seat for a dowel pin, which may be utilized as needed.

2.10 Bearing replaceability

The bearing used in the **KSM** bearing unit is replaceable. In the event of bearing failure, a new bearing can be fitted to the existing housing.

3. Tolerance

The tolerances of the **KSM** bearing units are in accordance with the following JIS specifications:

3.1 Tolerances of ball bearings for the unit

Tolerances of ball bearings used in the unit are shown in the following tables 3.1 to 3.3.

Table 3.1 Cylindrical bore (UC, AS, AEL)

(Unit : μm)

Nominal bore diameter d mm		Cylindrical bore				width $\Delta B_s, \Delta C_s$ Deviations (reference)		Radial runout K_{ia} (reference)
over	incl.	Bore diameter Δd_{mp} Deviations		Bore diameter variation V_{dp} Variations	high	low	max.	
		high	low	max.				
10.00	18.00	+15	0	10	0	-120	15	
18.00	31.75	+18	0	12	0	-120	18	
31.75	50.80	+21	0	14	0	-120	20	
50.80	80.00	+24	0	16	0	-150	25	
80.00	120.00	+28	0	19	0	-200	30	

Note: Symbols Δd_{mp} : Mean bore diameter deviation

V_{dp} : Bore diameter variation

ΔB_s : Inner ring width deviation

ΔC_s : Outer ring width deviation

Table 3.2 Outer ring

(Unit : μm)

Nominal outside diameter D mm		Mean outside diameter deviation ΔD_m		Radial runout K_{ea} (reference)
over	incl.	high	low	max.
18	30	0	-9	15
30	50	0	-11	20
50	80	0	-13	25
80	120	0	-15	35
120	150	0	-18	40
150	180	0	-25	45

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

Table 3.3 Eccentric locking collar

(Unit : μm)

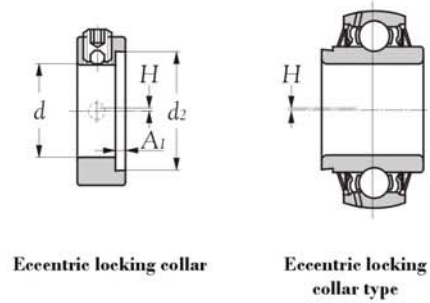
Nominal bore diameter d mm		Bore diameter Δd_s		Small bore diameter of eccentric surface deviation Δd_{2s}		Eccentricity deviation ΔH_s		Collar width deviation ΔB_{2s}			
over	incl.	High	low	High	low	High	low	High	low	High	low
10.000	36.512	0.25	+0.025	+0.3	0	+0.1	-0.1	+0.27	-0.27	0	-0.18
36.512	55.562	0.30	+0.025	+0.4	0	+0.1	-0.1	+0.33	-0.33	0	-0.18



3.4 Tolerances of housings

(Unit : μm)

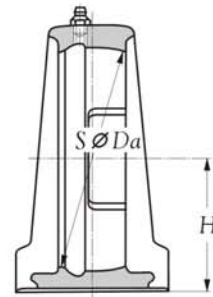
Nominal spherical bore diameter D_a mm		D_a Deviations ΔD_a	
		Tolerance class H7	
over	incl.	High	low
30	50	+25	0
50	80	+30	0
80	120	+35	0
120	180	+40	0



Note: 1) Symbols ΔD_{am} : Mean spherical bore diameter deviation.
 2) Dimensional tolerances for spherical bore diameter of housing are classified as H7 for clearance fit, and J7 for intermediate fit.

Table 3.5 Pillow block housings (P, UP) (Unit : μm)

Housing numbers	H Deviations ΔH_s
P 203	-
P 204	UP 204
P 205	UP 205
P 206	UP 206
P 207	UP 207
P 208	UP 208
P 209	UP 209
P 210	UP 210
P 211	-
P 212	-
P 213	-
P 214	-
P 215	-
P 216	-
P 217	-
P 218	-



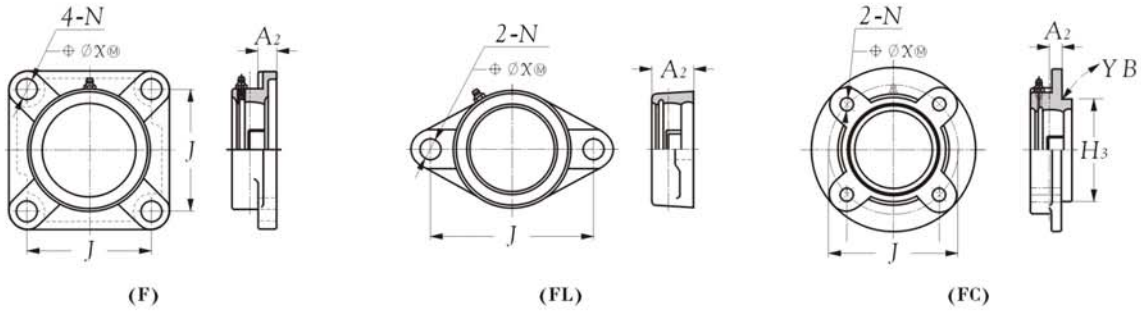


Table 3.6 (1) Flange unit housings (F, FC, FL)

(Unit : mm)

Housing numbers			Location tolerance of bolt hole	A2 Deviations $\Delta A2s$	H3 Deviations FC 2		Radial runout of spigot joint Y			
					high	low				
F 204	FL 204	FC 204	0.7	± 0.5	0	-0.0460	0.2			
F 205	FL 205	FC 205								
F 206	FL 206	FC 206								
F 207	FL 207	FC 207								
F 208	FL 208	FC 208								
F 209	FL 209	FC 209								
F 210	FL 210	FC 210								
F 211	FL 211	FC 211			1.0	± 0.8		0	-0.0630	0.3
F 212	FL 212	FC 212								
F 213	FL 213	FC 213								
F 214	FL 214	FC 214								
F 215	FL 215	FC 215								
F 216	FL 216	FC 216								
F 217	FL 217	FC 217								
F 218	FL 218	FC 218	0	-0.0720						

Note: 1) J is the bolt hole's center line dimension, and P, C, D, A2 is distance between the center line of spherical bore diameter of the housing and mounting surfaces, and H3 is outside diameter of the spigot joint.

2) Radial runout of spigot joint is applied for flange units with spigot joints.

Table 3.6(2) Flange unit housings (diameter of bolt hole)

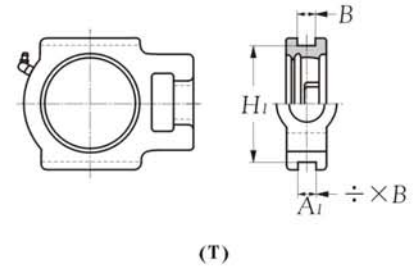
(Unit : mm)

Housing type	Nominal bore diameter N		N Deviators ΔNs
	mm		
	over	incl.	mm
E, FL, FC	-	30	± 0.2
	30	40	± 0.3



Table 3.7 Take-up unit housings (T) (Unit : mm)

Housing type	AI Deviators ΔAIs	HI Deviators ΔHIs		Parallelism of guide
		high	Low	
T 204	± 0.2	0	-0.5	0.5
T 205				
T 206				
T 207				
T 208				
T 209				
T 210				
T 211	± 0.3	0	-0.8	0.6
T 212				
T 213				
T 214				
T 215				
T 216				
T 217				



- Note: 1) AI is the width of guide rail grooves.
 2) HI is the maximum span of guide rail grooves.
 3) This table can be applied for bearing units with dust covers.

4. Basic Load Rating and Life

4.1 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 cause 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 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.

4.2 Basic rated 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 rated life is defined as follows.

The basic rated 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 rated 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 catalog are for bearings constructed of **KSM** standard bearing materials, using standard manufacturing techniques. Please consult **KSM** for basic load ratings of bearings constructed of special materials or using special manufacturing techniques.

The relationship between the basic rated life, the basic dynamic load rating and the bearing load is given in formula (4.1).

$$L_{10} = \left(\frac{C_r}{P_r} \right)^3 \dots\dots\dots(4.1)$$

where,

- L_{10} : Basic rated life 10^6 revolutions
- C_r : Basic dynamic rated load, N, lbf
- P_r : Equivalent dynamic load, N, lbf

The basic rated life can also be expressed in terms of hours of operation (revolution), and is calculated as shown in formula (4.2).

$$L_{10h} = 500f_h^3 \dots\dots\dots(4.2)$$

$$f_h = f_n \frac{C_r}{P_r} \dots\dots\dots(4.3)$$

$$f_n = \left(\frac{33.3}{n} \right)^{1/3} \dots\dots\dots(4.4)$$

Where,

- L_{10h} : Basic rated life, h
- f_h : Life factor
- f_n : Speed factor
- n : Rotational speed, r/min

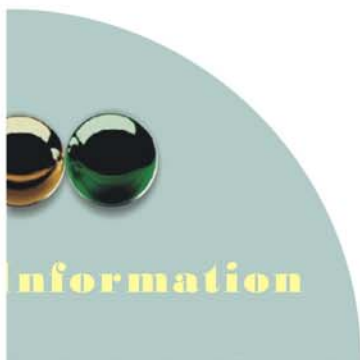
Formula (4.2) can also be expressed as shown in formula (4.5).

$$L_{10h} = \frac{10^6}{60n} \left(\frac{C_r}{P_r} \right)^3 \dots\dots\dots(4.5)$$

The relation between rotational speed n and speed factor f_n as well as the relation between the basic rated life L_{10h} and the life factor f_h is shown in Fig. 4.1.

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 4.6). 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.

$$L = \frac{1}{\left(\frac{1}{L_1^{1.1}} + \frac{1}{L_2^{1.1}} + \dots\dots + \frac{1}{L_n^{1.1}} \right)^{1.1}} \dots\dots\dots(4.6)$$



where,

L : Total life of the whole bearing assembly
h

L_1, L_2, \dots, L_n : Rated life of bearings 1, 2, ..., n, h

In the case where load and the number of revolutions change at regulated intervals, after finding the rated life L_1, L_2, \dots, L_n under conditions of $n_1, P_1; n_2, P_2; \dots; n_n, P_n$; the built-life L_m can be given by the formula (4.7).

$$L_1 = \frac{10^6}{60n_1} \left(\frac{C_r}{P_1} \right)^3$$

$$L_2 = \frac{10^6}{60n_2} \left(\frac{C_r}{P_2} \right)^3$$

$$\vdots$$

$$L_n = \frac{10^6}{60n_n} \left(\frac{C_r}{P_n} \right)^3$$

$$L_m = \left(\frac{\phi_1}{L_1} + \frac{\phi_2}{L_2} + \dots + \frac{\phi_n}{L_n} \right)^{-1} \dots \dots \dots (4.7)$$

where,

- L_1, L_2, \dots, L_n : Rated life under condition 1, 2, ..., n, h
- n_1, n_2, \dots, n_n : Number of revolutions under condition 1, 2, ..., n, r/min
- P_1, P_2, \dots, P_n : Equivalent load under condition 1, 2, ..., n, N, lbf
- $\phi_1, \phi_2, \dots, \phi_n$: Ratio of condition 1, 2, ..., n accounting for the total operating time
- L_m : Built-in life, h

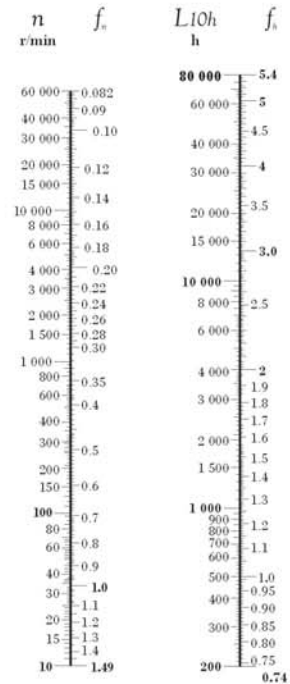


Fig. 4.1 Bearing life rating scale

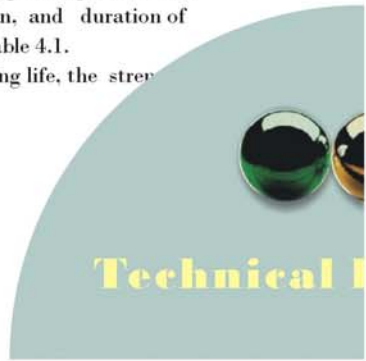
Table 4.1 Rating life for applications

Service classification	Machine application	Life time L_n
Machines used occasionally	Door mechanisms, Garage shutter	500
Equipment for short period or intermittent service-interruption permissible	Household appliances, Electric hand tools, Agricultural machines, Lifting tackles in shops	4000~8000
Intermittent service machines-high reliability	Power-Station auxiliary equipment, Elevators, Conveyors, Deck cranes	8000~14000
Machines used for 8 hours a day, but not always in full operation	Ore wagon axles, Important gear units	14000~20000
Machines fully used for 8 hours	Dblowers, General machinery in shops, Continuous operation cranes	20000~30000
Machines continuously used for 24 hours a day	Compressors, Pumps	50000~60000
Machines continuously used for 24 hours a day with maximum reliability	Power-station equipment, Water-supply equipment for urban areas, Mine ventilators	100000~200000

4.3 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 the bearing is to be used in, and duration of service and operational reliability requirements. A general guide to these requisite life criteria is shown in Table 4.1.

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.



4.4 Adjusted life rating factor

The basic bearing life rating (90% reliability factor) can be calculated through the formulas mentioned earlier in Section 4.2. 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, and using the life adjustment factor as prescribed in ISO 281, the adjusted bearing life can be arrived at.

$$L_{na} = a_1 a_2 a_3 \left(\frac{C}{P} \right)^3 \dots\dots\dots(4.8)$$

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

4.4.1 Life adjustment factor for reliability a_1

The values for the reliability adjustment factor a_1 (for a reliability factor higher than 90%) can be found in table 4.2.

Table 4.2 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

4.4.2 Life adjustment factor for material a_2

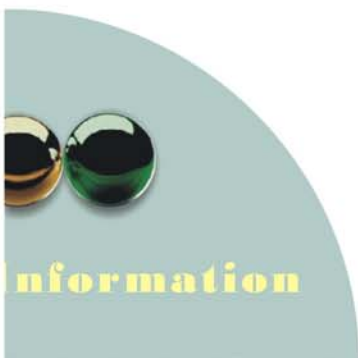
The life of a bearing is affected by the material type and quality as well as the manufacturing process. In this regard, the life is adjusted by the use of an a_2 factor.

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 a_2 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 micro-structure change. This special heat treatment might cause the reduction of bearing life because of a hardness change.

4.4.3 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, a_3 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 $13\text{mm}^2/\text{s}$ for ball bearings); or by exceptionally low rotational speed ($n \text{ r/min} \times d_p \text{ mm}$ less than 10 000). For bearings used under special operating conditions, please consult **KSM**.

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. 4.2.

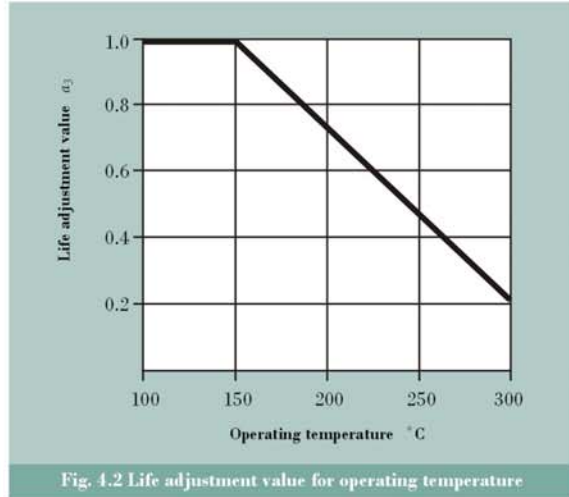


Fig. 4.2 Life adjustment value for operating temperature

4.5 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 bearing 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 rated 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. The maximum applied load values for contact stress occurring at the rolling element and raceway contact points are given below.

For ball bearings (for bearing unit) : 4200 MPa

4.6 Allowable static equivalent load

Generally the static equivalent load which can be permitted (see section 5.3) is limited by the basic static rated load as stated in Section 4.5. However, depending on requirements regarding friction and smooth operation, these limits may be greater or lesser than the basic static rated load.

In the following formula (4.9) and Table 4.3 the safety factor S_o can be determined considering the maximum static equivalent load.

$$S_o = \frac{C_o}{P_{o\max}} \dots\dots\dots(4.9)$$



Where,

S_o : Safety factor

C_o : Basic static rated load, N, lbf

$P_o \text{ max}$: Maximum static equivalent load, N, lbf

Table 4.3 Minimum safety factor values S_o

Operating conditions	Ball bearings
High rotational accuracy demand	2.0
Normal rotating accuracy demand (Universal application)	1.0
Slight rotational accuracy deterioration permitted (Low speed, heavy loading, etc.)	0.5

Note : 1) When vibration and/or shock loads are present, a load factor based on the shock load needs to be included in the $P_o \text{ max}$ value.

5. Loads

5.1 Load acting on the bearing

It is very rare that the load on a bearing can be obtained by a simple calculation. Loads applied to the bearing generally include the weight of the rotating element itself, the load produced by the working of the machine, and the load resulting from transmission of power by the belt and gearwheel. Such loads include the radial load, which works on the bearing at right angles to its axis, and the thrust load, which works on the bearing parallel to its axis. These can work either singly or in combination. In addition, the operation of a machine inevitably produces a varying degree of vibrations and shocks. To take this into account, the theoretical value of a load is multiplied by a safety factor that has been derived from past experience. This is known as the "load factor".

$$\text{Load acting on the bearing} = \text{Load factor } f_w \times \text{Calculated Load}$$

Table 5.1 below shows the generally accepted load factors f_w which correspond to the degree of shock to which the machine is subjected.

Table 5.1 Load factors f_w

Load conditions	f_w	Examples
Little or on shock	1 to 1.2	Machines tools, electric machines, etc
Some degree of shock; machines with reciprocating parts	1.2 to 1.5	Vehicles, driving mechanism, metal-working machinery, steel-making machines, paper-making machinery, rubber mixing machines, hydraulic equipment, hoists, transportation machinery, power-transmission equipment, woodworking machines, printing machines, etc
violent shocks	1.5 to 3	Agricultural machines, vibrator screens, ball and tube mills, etc.

In the case of power transmission by belts, gear wheels, etc, load factors adopted are somewhat different from the above. Factors used for power transmission by belts, gearwheels and chains, respectively, are given in the following sections.



5.1.1 Load applied to the bearing by power transmission

The force working on the shaft when power is transmitted by belts, chains or gearwheels is obtained, in general, by the following formula:

$$T = 9550 \frac{H}{n}, 84500 \frac{H}{n} \dots\dots\dots(5.1)$$

$$K_t = \frac{T}{r} \dots\dots\dots(5.2)$$

where,

T : Torque, N · m, lbf · inch

H : Transmission power, kW

n : Number of revolutions, r/min

K_t : Transmission force (effective transmission force of belt or chain; tangential force of gearwheel), N, lbf

r : effective radius of belt pulley, sprocket wheel or gearwheel, m, inch

Accordingly, the load actually applied to the shaft by the transmission force can be obtained by the following formula:

$$\text{Actual load} = \text{Factor} \times K_t \dots\dots\dots(5.3)$$

Different factors are adopted according to the transmission system in use. These will be dealt with in the following paragraphs.

Belt transmission

When power is transmitted by belt, the effective transmission force working on the belt pulley is calculated by formula (5.2). The term "effective transmission force of the belt" refers to the difference in tension between the tensioned side and the loose side of the belt. Therefore, to obtain the load actually acting on the shaft through the medium of the belt pulley, it is necessary to multiply the effective transmission force by a factor which takes into account the type of belt and the initial tension. This is known as the "belt factor".

Table 5.2 Belt factor *f_b*

Belt type	<i>f_b</i>
V-belt	1.5 to 2.0
Timing belt	1.1 to 1.3
Flat belt(with tension pulley)	2.5 to 3.0
Flat belt(with tension pulley)	3.0 to 4.0

Note: In cases where the distance between shafts is short the revolution speed is low, or where operating conditions severe, the higher *f_b* values should be adopted.

Gear transmission

In the case of gear transmissions, the theoretical gear load can be calculated from the transmissions force and the type of gear. With spur gears, only a radial load is involved; whereas, with helical gears and bevel gears, an additional axial load is present.

The simplest case is that of spur gears. In this instance, the tangential force *K_t* is obtained from the formula (5.2) and the radial force *K_s* can be obtained from the following formula:

$$K_s = K_t \cdot \tan \alpha \dots\dots\dots(5.4)$$



where,

α is the pressure angle of the gear.

Accordingly, the theoretical composite force, K_r , working on the gear is obtained from the following formula:

$$K_r = \sqrt{K_t^2 \cdot K_s^2} = K_t \cdot \sec \alpha \dots\dots\dots(5.5)$$

Therefore, to obtain the radial load actually working on the shaft, the theoretical composite force, as above, multiplied by a factor in which the accuracy and the degree of precision of the gear is taken into account. This is called the "gear factor" and is represented by the symbol f_z . In Table 5.3 is below, f_z values for spur wheels are given.

The gear factor is essentially almost the same as the previously described load factor, f_w . In some cases, however, vibrations and shocks are produced also by the machine of which the gear is a part. here it is necessary to calculate the actual load working on the gear by further multiplying the gear load, as obtained above, by the load factor shown in Table 5.1, according to the degree of shock.

Table 5.3 Gear factors f_z

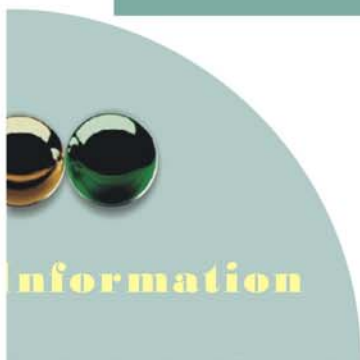
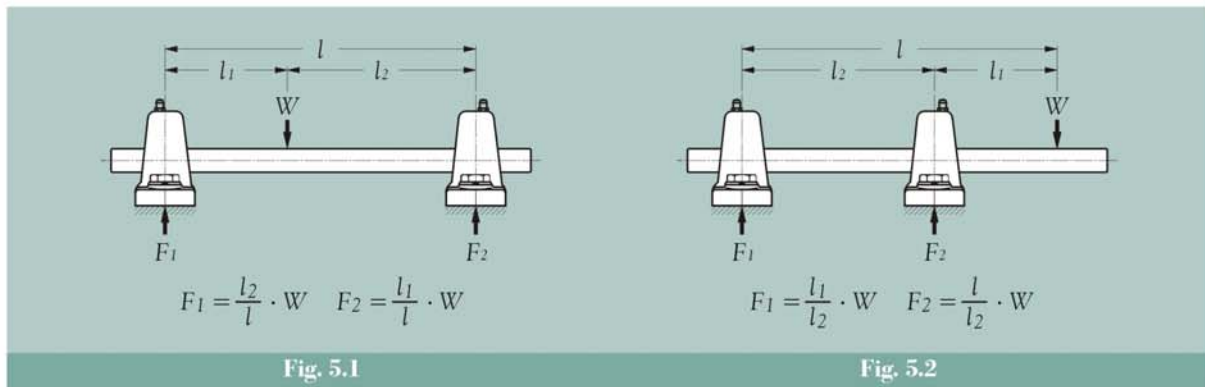
Gear	f_z
Precision gears (tolerance 0.02mm max., For both pitch and shape)	1.05 to 1.1
Gears finished by ordinary machining work (tolerance 0.02 to 0.1mm, for both pitch and shape)	1.10 to 1.3

Chain transmission

When power is transmitted by chain, the effective transmission force working on the sprocket wheel is calculated by formula (5.2). To obtain the load actually working, the effective transmission force must be multiplied by the "chain factor", 1.2 to 1.5.

5.1.2 Distribution of the radial load

The load acting on the shaft is distributed to the bearings which support the shaft. In Fig. 5.1, the load is applied to the shaft between two bearings; In Fig. 5.2 the load is applied to the shaft outside the two bearings. In practice, however, most cases are combinations of Fig.5.1 and 5.2, and the load is usually a composite load, that is to say, a combination of radial and axial loads. Therefore they are calculated by the methods described in the following sections.



5.2 Equivalent dynamic radial load

For ball bearings used in the **KSM** unit, the basic rated dynamic loads C_r mentioned in the table of dimensions are applicable only when the load is purely radial. In practice, however, bearings are usually subjected to a composite load. As the table of dimensions is not directly applicable here, it is necessary to convert the values of the radial and axial loads into a single radial load value that would have an effect on the life of bearing equivalent to that of the actual load applied. This is known as the "equivalent dynamic radial load", and from this the life of the ball bearings for the unit is calculated. The equivalent dynamic radial load is calculated by the following formula:

$$P_r = X \cdot F_r + Y \cdot F_a \dots \dots \dots (5.6)$$

where,

- P_r : equivalent dynamic radial load N, lbf
- F_r : radial load N, lbf
- F_a : axial load N, lbf
- X : radial factor
- Y : axial factor

Values of X and Y are shown in Table 5.4 below.

With ball bearings for the unit, when only radial load is involved, or when $F_a/F_r \leq e$ (e is value which is determined, by the size of an individual bearing and the load acting thereon), the values of X and Y will be 1 and 0 respectively, resulting in the following equation:

$$P_r = F_r \dots \dots \dots (5.7)$$

Table 5.4 Values of X and Y applying when $\frac{F_a}{F_r} > e$

$\frac{F_a}{C_{or}}$	e	$\frac{F_a}{F_r} > e$	
		X	Y
0.01	0.18	0.56	2.46
0.02	0.20		2.14
0.04	0.24		1.83
0.07	0.27		1.61
0.10	0.29		1.48
0.15	0.32		1.35
0.20	0.35		1.25
0.30	0.38		1.13
0.40	0.41		1.05
0.50	0.44		1.00

Note : C_{or} is the basic rated static load. (See the table of dimensions.) When the value of $\frac{F_a}{C_{or}}$ or $\frac{F_a}{F_r}$ is not in conformity with those given in Table 5.4 above, find the value by interpolation.

5.3 Equivalent static radial load

In the case of a bearing which is stationary, rotates at a low speed of about 10rpm, or makes slight oscillating movements, it is necessary to take into account the equivalent static radial load, which is the counterpart of the equivalent dynamic radial load of a rotating bearing. In this case, the following formula is used.

$$P_{or} = X_o \cdot F_r + Y_o \cdot F_a \dots \dots \dots (5.8)$$



where,

- P_{or} : equivalent static radial load N, lbf
- F_r : radial load N, lbf
- F_a : axial load N, lbf
- X_o : static radial factor
- Y_o : static axial factor

With the ball bearings for the **KSM** unit, the values of X_o and Y_o are $X_o = 0.6$; $Y_o = 0.5$.
 However when only radial load is involved, or when $F_a / F_r \leq e$, the following values in used:

$$X_o = 1 \quad Y_o = 0$$

Accordingly, the following equation holds.

$$P_{or} = F_r \dots\dots\dots(5.9)$$

6. Bearing Internal Clearance

6.1 Bearing internal clearance

Bearing internal clearance (initial clearance) is the amount of internal clearance a bearing has before being installed on a shaft or in a housing.

As shown in Fig.6.1, when either the inner ring or the outer ring is fixed and the other ring is free to move, displacement can take place in either an axial or radial direction. This amount of displacement (radially or axially) is termed the internal clearance and, depending on the direction, is called the radial internal clearance or the axial internal clearance.

When the internal clearance of a bearing is measured, a slight measurement load is applied to the raceway so the internal clearance may be measured accurately. However, at this time, a slight amount of elastic deformation of the bearing occurs under the measurement load, and the clearance measurement value (measured clearance) is slightly larger than the true clearance. This discrepancy between the true bearing clearance and the increased amount due to the elastic deformation must be compensated for. These compensation values are given in Table 6.1.

The internal clearance values for each bearing class are shown in Tables 6.3.

Table 6.1 Adjustment of radial internal clearance based on measured load (Unit: μm)

Nominal bore diameter d (mm)		Measuring Load (N)	Radial Clearance Increase				
over	incl.		C2	CN	C3	C4	C5
10	18	24.5	3~4	4	4	4	4
18	50	49.0	4~5	5	6	6	6
50	200	147.0	6~8	8	9	9	9

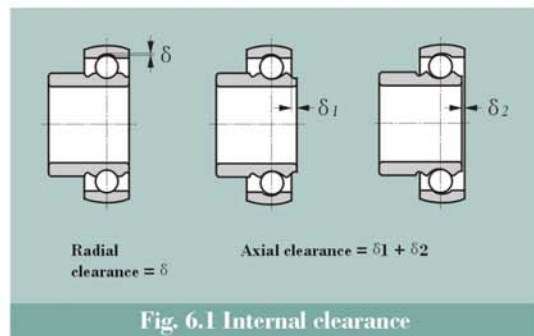
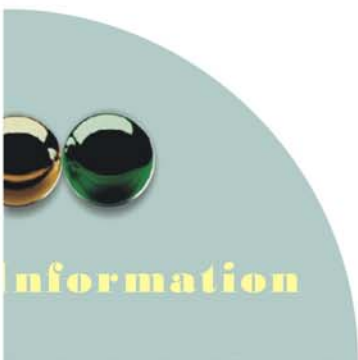


Fig. 6.1 Internal clearance



6.2 Internal clearance selection

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

Effective internal clearance:

The internal clearance differential between the initial clearance and the operating (effective) clearance (the amount of clearance reduction caused by interference fits, or clearance variation due to the temperature difference between the inner and outer rings) can be calculated by the following formula:

$$\delta_{eff} = \delta_o - (\delta_f + \delta_t) \dots\dots\dots(6.1)$$

where,

- δ_{eff} : Effective internal clearance, mm
- δ_o : Bearing internal clearance, mm
- δ_f : Reduced amount of clearance due to interference, mm
- δ_t : Reduced amount of clearance due to temperature differential of inner and outer rings, mm

Reduced clearance due to interference:

When bearings are installed with interference fits on shafts and in housings, the inner ring will expand and the outer ring will contract; thus reducing the bearing's internal clearance. The amount of expansion or contraction varies depending on the shape of the bearing, the shape of the shaft or housing, dimensions of the respective parts, and the type of materials used. The differential can range from approximately 70% to 90% of the effective interference.

$$\delta_f = (0.70 \sim 0.90) \cdot \Delta d_{eff} \dots\dots\dots(6.2)$$

where,

- δ_f : Reduced amount of clearance due to interference, mm
- Δd_{eff} : Effective interference, mm

Reduced internal clearance due to inner/outer ring temperature difference:

During operation, normally the outer ring will be from 5° to 10° C cooler than the inner ring or rotating parts. However, if the cooling effect of the housing is large, the shaft is connected to a heat source, or a heated substance is conducted through the hollow shaft; the temperature difference between the two rings can be even greater. The amount of internal clearance is thus further reduced by the differential expansion of the two rings.

$$\delta_l = \alpha \cdot \Delta T \cdot D_o \dots\dots\dots(6.3)$$

where,

- δ_l : Amount of reduced clearance due to heat differential, mm
- α : Bearing steel linear expansion coefficient $12.5 \times 10^{-6} / ^\circ\text{C}$
- ΔT : Inner / outer ring temperature differential, °C
- D_o : Outer ring raceway diameter, mm



Outer ring raceway diameter, D_o , values can be approximated by using formula 6.4. For ball bearings,

$$D_o = 0.20 (d + 4.0 D) \dots\dots\dots(6.4)$$

where,

d : Bearing bore diameter, mm

D : Bearing outside diameter, mm

6.3 Bearing internal clearance selection standards

Theoretically, in regard to bearing life, the optimum operating internal clearance for any bearing would be a slight negative clearance after the bearing had reached normal operating temperature.

Unfortunately, under actual operating conditions, maintaining such optimum tolerances is often difficult at best. Due to various fluctuating operating conditions this slight minus clearance can quickly become a large minus, greatly lowering the life of the bearing and causing excessive heat to be generated. Therefore, an initial internal clearance which will result in a slightly greater than negative internal operating clearance should be selected.

Under normal operating conditions (e.g. normal load, fit, speed, temperature, etc.), a standard internal clearance will give a very satisfactory operating clearance.

Table 6.2 lists non-standard clearance recommendations for various applications and operating conditions.

Table 6.2 Examples of applications where bearing clearances other than normal clearance are used

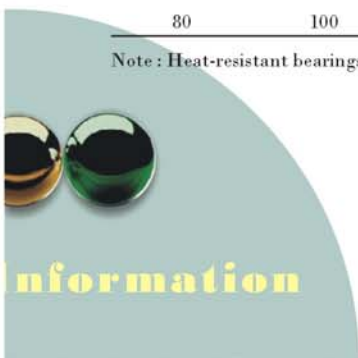
Operating conditions	Applications	Selected clearance
Shaft is heated and housing is cooled.	Conveyor of casting machine	C5
Shaft or inner ring is heated.	Annealing pit, Drying pit, Curing pit	C4
Allows for shaft deflection and fitting errors.	Disc harrows	C4
	Combines	C3
Tight-fitted for both inner and outer rings.	Large blowers	C3
To reduce noise and vibration when rotating	Multi-wing fan of air conditioners	C2

Table 6.3 Cylindrical bore bearings

(Unit : μm)

Nominal bore diameter		Radial internal clearance							
d (mm)		C2		CN		C3		C4	
over	incl.	min.	max.	min.	max.	min.	max.	min.	max.
10	18	0	9	3	18	11	25	18	33
18	24	0	10	5	20	13	28	20	36
24	30	1	11	5	20	13	28	23	41
30	40	1	11	6	20	15	33	28	46
40	50	1	11	6	23	18	36	30	51
50	65	1	15	8	28	23	43	38	61
65	80	1	15	10	30	25	51	46	71
80	100	1	18	12	36	30	58	53	84

Note : Heat-resistant bearings with suffix HT2 have C4 clearances.



7. Lubrication

As bearings in **KSM** bearing units have sufficient high-grade grease sealed in at the time of manufacture, there is no need for replenishment while in use. The amount of grease necessary for lubrication is, in general, very small. With the **KSM** Bearing units, the amount of grease occupies about a half to a third of the space inside the bearing.

7.1 Maximum permissible speed of rotation

The maximum speed possible while ensuring the safety and long life of ball bearings used in the unit is limited by their size, the circumferential speed at the point where the seal comes into contact, and the load acting on them.

To indicate the maximum speed permissible, it is customary to use the value of dn or dmn (d is the bore of the bearing; dm is the diameter of the pitch circle = $(I.d.+O.D.)/2$; n is the number of revolutions).

Problems connected with the lubrication of bearings are the generation of heat and seizures occurring at the sliding parts inside the bearing, in particular at the points where the ball is in contact with the retainer, inner and outer rings. The contact pressure at the points where friction occurs on the retainer is only slightly affected by the load acting on the bearing; the amount of heat generated there is approximately in proportion to the sliding velocity. Therefore, this sliding velocity serves as a yardstick to measure the limit of the rotating speed of the another large factor that has to be taken into account — the circumferential speed at the part where the seal is in contact.

The graph in Fig.7.1 indicates the maximum speed of rotation permissible, taking into account the aforementioned factors.

There are two common methods of locking the bearing unit onto the shaft — the set screw system and the eccentric collar system. However, in both of these systems high-speed operation will cause deformation of the inner ring, which may result in vibration of the bearing. For high-speed operation, therefore, it is recommended that an interference fit or a clearance fit with a near-zero clearance be used, with a shaft of the larger size as shown later in this manual in Fig. 3.1, Fig.3.6.

For standard bearing units with the contact type seal, the maximum speed permissible is $120000/d$. Where a higher speed is required, bearing units with the non-contact type seal, are advised. Please contact **KSM** regarding the use of the latter type. Additionally, it is necessary that the surface on which the housing is mounted be finished to as a high a degree of accuracy as possible. A regularity of within $\pm 0.05\text{mm}$, ± 0.002 inch is required.

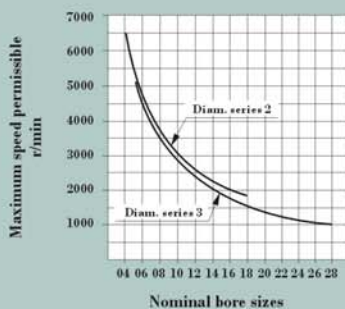


Fig. 7.1

7.2 Replenishment of grease

7.2.1 Sealed-in grease

with **KSM** bearing units, no relubrication is the general rule. The standard self-lubricating type of bearing units contain high-grade lithium-based grease which, being suitable for long-term use, is ideal for sealed-type bearings. They also feature **KSM's** unique sealing device. Relubrication, therefore, is unnecessary under most operating conditions.

At high temperatures, or where there is exposure to water or excessive dust, the highest quality grease is essential. Therefore, **KSM** uses its own specially selected brands which are shown in Table 7.1. It is necessary to use the same brand when replenishing grease.

Table 7.1 Brands of grease used in **KSM** bearing units

Bearing units	Grease			Symbols	Operating temperature range
	Name of grease	Thickening agent	Base oil		
Standard	Alvania grease 3	Li soap	Mineral oil	D1	-15° to +100° C, (+5° to +212° F)
Heat-resistant	SH44M	Li soap	Silicone oil	HT2D1	Normal temp. To +200° C (392° F)
Cold-resistant	SH33L	Li soap	Silicone oil	CT1D1	-60° C, (-76° F) to normal temp.

7.2.2 Mixing of different kinds of grease

Whether or not different kinds of grease may be mixed usually depends on their thickeners. The commonly used criteria are shown in Table 7.2. Properties which are most susceptible to influences from mixing are viscosity, dropping point and penetration. Water and heat resisting properties as well as mechanical stability are also lowered. Therefore, when mixing in a grease which is different to that which is already in use, it is essential that the thickener (soap base) and the base oil be of the same group.

When relubricating **KSM** bearing units, it is advisable to use the brands of grease shown in Table 7.1.

Table 7.2 Mixing properties of grease

Soap base	Ca	Na	Al	Ba	Li
Ca	○	△	△	X	△
Na	△	○	△	X	X
Al	△	△	○	X	X
Ba	X	X	X	○	X
Li	△	X	X	X	○

○ Mixing will not produce any appreciable change of properties.

△ Mixing may produce considerable variations of properties.

X Mixing will cause a drastic change of properties.

7.2.3 Relubrication frequency

Relubrication frequency varies with the kind and quality of grease used as well as the operating conditions. Therefore, it is difficult to establish a general rule, but under ordinary operating conditions, it is desirable that grease be replenished before one third (1/3) of its calculated life elapses. It is necessary, however, to take into consideration such factors as hardening of grease in the oil hole, making replenishment impossible; deterioration of grease while operation of the machine is suspended, and so forth.

In Table 7.3 below are shown standard relubrication frequencies. Irrespective of the calculated life of the grease, this list takes into consideration such factors as the rotational speed of the bearings, operating temperatures and environmental conditions, with a view to safety.



7.2.4 Re-greasing

The performance of a bearing is greatly influenced by the quantity of grease. In order to avoid over-filling, it is advisable to replenish the grease while the machine is in operation.

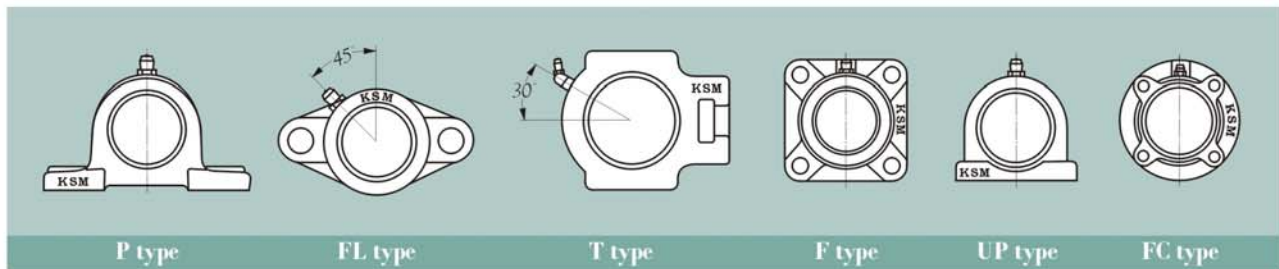
Continue to insert grease until a little oozes out from between the outer ring raceway and the periphery of the slinger, for optimum performance.

Table 7.3 Standard relubrication frequencies

Type of unit	Symbol	d_n Value	Environmental conditions	Operating temp °C, °F	Relubrication frequency	
					Hours	Period
Standard	D1	40 000 and below	Ordinary	-15 to +80, +5 to +176	1550 to 3000	6 to 12 mo.
Standard	D1	70 000 and below	Ordinary	-15 to +80, +5 to +176	1000 to 2000	3 to 6 mo.
Standard	D1	70 000 and below	Ordinary	+80 to +100, +176 to +212	500 to 700	1 mo.
Heat-resistant	HT2D1	70 000 and below	Ordinary	+140 to +170, +284 to +338	300 to 700	1 mo.
Heat-resistant	HT2D1	70 000 and below	Ordinary	+170 to +200, +338 to +392	100	1 wk.
Cold-resistant	CT2D1	70 000 and below	Ordinary	-60 to +80, -76 to +176	1000 to 2000	3 to 6 mo.
Standard	D1	70 000 and below	Very dusty	-15 to +100, +5 to +212	100 to 500	1 wk. To 1 mo.
Standard	D1	70 000 and below	Exposed to water splashes	-15 to +100, +5 to +212	30 to 100	1 day To 1 week.

7.4 Standard location of the grease fitting

Standard location of grease fitting on the housing for the relubricatable bearing units of each type is illustrated below.



8. Shaft Designs

Although the shafts used for **KSM** bearing units require no particularly high standards of accuracy, it is desirable that, as far as possible, they are free from bends and flaws.

8.1 Set screw system bearing units

with set screw system bearing units, under normal operating conditions the inner ring is usually fitted onto the shaft by means of a clearance fit to ensure convenience of assembly. In this case the values shown in Fig. 8.1 are appropriate dimensional tolerances for the shaft.

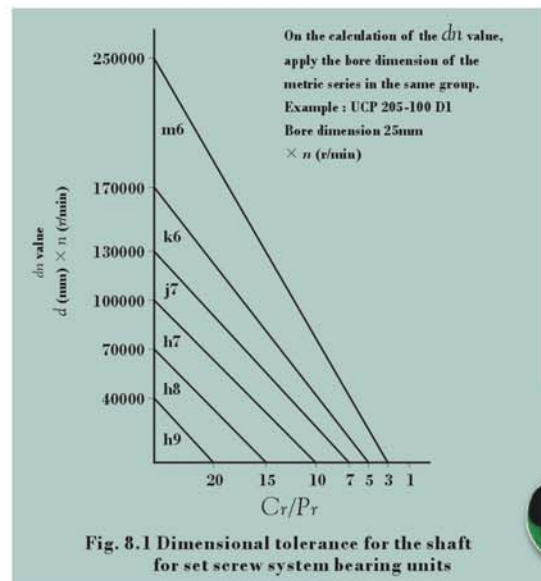


Fig. 8.1 Dimensional tolerance for the shaft for set screw system bearing units

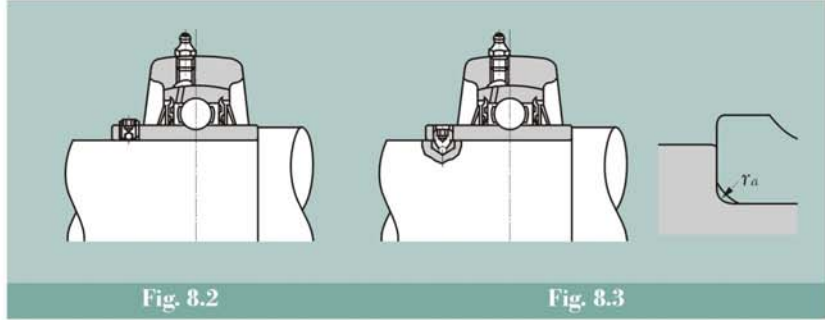
Step shafts

Wherever there is a noticeably large axial load, a step shaft, as shown in Fig. 8.2, should, if practical, be used.

As an expedient, there may be provided a bored hole on the shaft as illustrated in Fig. 8.3. In this case it is necessary to ensure the accuracy of the relationship between the positions of the housing of the bearing and of the bored hole on the shaft.

Table 8.2 Radial of the round corners of step shafts

Designation of bearings	ras max. mm
UC 201 to UC 203	0.6
UC 204 to UC 206	1.0
UC 207 to UC 210	1.5
UC 211 to UC 215	2.0
UC 216 to UC 218	2.5



Relief in the axial direction

Where several bearing units are fitted on the shaft, or where there is a great distance between two bearing units, one of the bearings is secured to the shaft as the "fixed-side bearing" and is subjected to both the axial and radial loads. The other is mounted on the shaft as the "free-side bearing" and is subjected only to radial load, compensating for expansion of the shaft due to a rise in temperature or for any errors in the distance between bearings that may have occurred during assembly.

If there is no free-side bearing, the bearings will be subjected to an abnormal axial load, which could cause premature breakdown.

Although it is desirable to use a cartridge-type bearing unit for the above purpose (Fig. 8.4), the following method is often employed. As illustrated in Fig. 8.5 (a) and (b), a key way is cut in the shaft, to accommodate a special set screw.

When relief is provided in the axial direction by the use of screwed bolts as above, the dimensional relationships applicable are as shown in Table 8.3(a) and 8.3 (b) on the following pages.

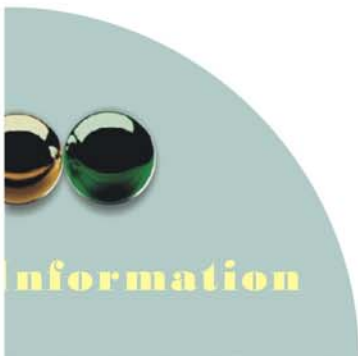
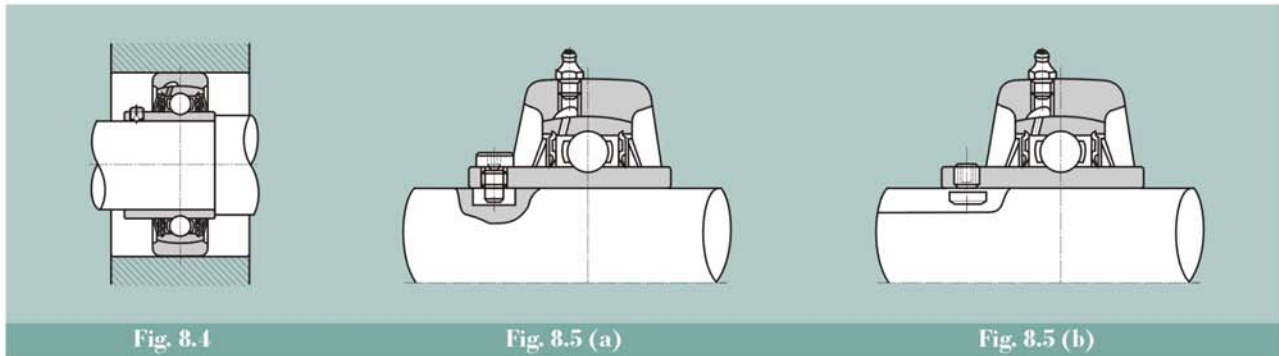




Table 8.3 Screwed bolt system (Metric series, applied to metric bore size.)

(Unit : mm)

Designation of bearings	Key way		Designation and size of bolts	d_1	l	l_1	D	H
	Width b	Depth h						
UC 201 D1 W5	3.5	3.0	S5W 5 x 0.80 x 11.0	3.5	11.0	5.0	6	3
UC 202 D1 W5	3.5	4.5	S5W 5 x 0.80 x 11.0	3.5	11.0	5.0	6	3
UC 203 D1 W5	3.5	5.5	S5W 5 x 0.80 x 11.0	3.5	11.0	5.0	6	3
UC 204 D1 W5	3.5	4.5	S5W 5 x 0.80 x 8.5	3.5	8.5	5.0	6	3
UC 205 D1 W5	3.5	5.0	S5W 5 x 0.80 x 8.5	3.5	8.5	5.0	6	3
UC 206 D1 W5	4.0	5.5	S5W 6 x 0.75 x 10.0	4.0	10.0	5.9	8	3
UC 207 D1 W5	4.0	5.0	S5W 6 x 0.75 x 10.0	4.0	10.0	5.9	8	3
UC 208 D1 W5	6.0	5.5	S5W 8 x 1.00 x 11.5	6.0	11.5	5.5	10	3
UC 209 D1 W5	6.0	6.0	S5W 8 x 1.00 x 11.5	6.0	11.5	5.5	10	3
UC 210 D1 W5	6.0	6.0	S5W 8 x 1.00 x 11.5	6.0	11.5	5.5	10	3
UC 211 D1 W5	6.0	5.5	S5W 8 x 1.00 x 11.5	6.0	11.5	5.5	10	3
UC 212 D1 W5	7.0	5.5	S5W10 x 1.25 x 13.5	7.0	13.5	6.5	12	3
UC 213 D1 W5	7.0	5.5	S5W10 x 1.25 x 13.5	7.0	13.5	6.5	12	3
UC 214 D1 W5	7.0	5.5	S5W10 x 1.25 x 13.5	7.0	13.5	6.5	12	3
UC 215 D1 W5	7.0	5.0	S5W10 x 1.25 x 13.5	7.0	13.5	6.5	12	3
UC 216 D1 W5	7.0	6.5	S5W10 x 1.25 x 15.0	7.0	15.0	7.0	12	3
UC 217 D1 W5	9.0	6.5	S5W12 x 1.50 x 16.5	9.0	16.5	7.0	14	4
UC 218 D1 W5	9.0	6.5	S5W12 x 1.50 x 16.5	9.0	16.5	7.0	14	4

Note : The tolerance for the width (b) of the key way should preferably be set at the range of 0 to +0.2 mm.

8.2 Eccentric collar system

As in the case of the set screw system, it is usual under normal operating conditions to fit the inner ring onto the shaft by means of a clearance fit, for ease of assembly. Fig. 8.6 shows the appropriate values of dimensional tolerances for the shaft.

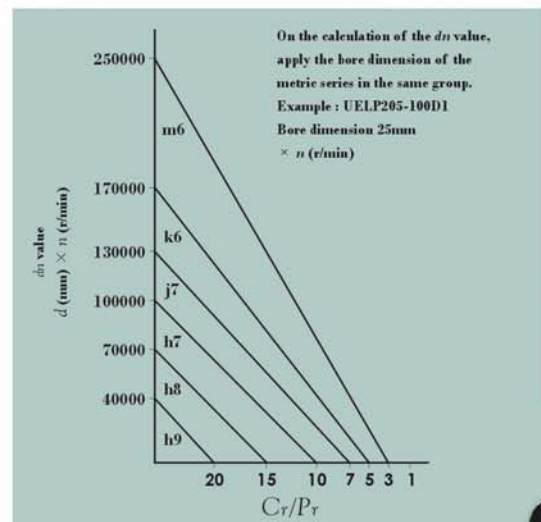


Fig. 8.6 Dimensional tolerances for the shaft eccentric collar system bearing units

9. Handling of the Bearing Unit

9.1 Mounting of the housing

9.1.1 Pillow block type and flange type

Although an advantage of the **KSM** bearing unit is that it can be fitted easily and will function efficiently on any part of a machine, attention must be paid to the following points in order to ensure its normal service life.

- (1) The surface on which the housing is mounted must be sufficiently rigid.
- (2) The surface on which the housing is mounted should be as flat as possible (The housing should set firmly in its position).
Deformation of the housing caused by incorrect mounting will in turn cause deformation of the bearing, leading to its premature breakdown.
- (3) It is desirable that the angle between the surface on which the housing is mounted and the shaft be maintained to a tolerance of 2° .
- (4) The pillow block type and flange type housings are provided with a seat for a dowel for accurate location. For the use of dowel pins, refer to Table 9.1.

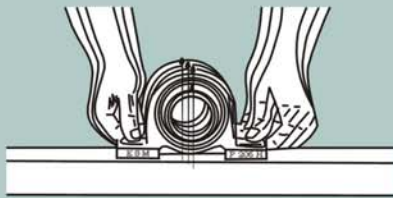


Fig. 9.1

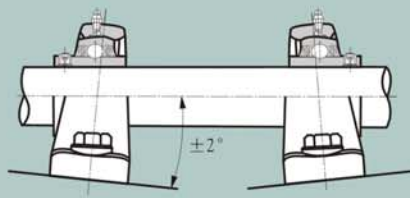


Fig. 9.2

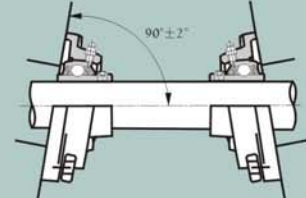
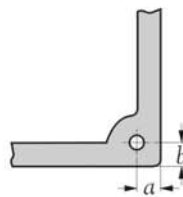
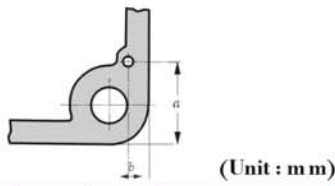


Fig. 9.3

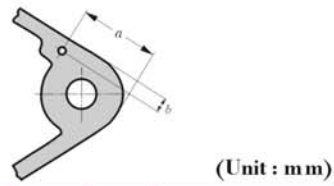
Table 9.1 Recommended dimensions of dowel pins
(Unit : mm)

Designation of the housings	a	b	Recommended pin diameter
P 203	5.5	5.5	3
P 204	5.5	5.5	3
P 205	5.5	5.5	3
P 206	5.5	5.5	3
P 207	5.5	5.5	3
P 208	7.0	7.0	5
P 209	7.0	7.0	5
P 210	7.5	7.5	5
P 211	7.5	7.5	5
P 212	9.0	9.0	7
P 213	9.0	9.0	7
P 214	9.0	9.0	7
P 215	9.0	9.0	7
P 216	10.0	10.0	7
P 217	12.0	12.0	10
P 218	12.0	12.0	10





Designation of the housings	a	b	Recommended pin diameter
F 204	33	6	4
F 205	35	6	4
F 206	35	6	4
F 207	38	7	5
F 208	40	8	5
F 209	43	8	5
F 210	49	8	5
F 211	49	8	5
F 212	49	8	5
F 213	52	9	6
F 214	52	9	6
F 215	52	9	6
F 216	55	12	6
F 217	55	12	6
F 218	61	14	6



Designation of the housings	a	b	Recommended pin diameter
FL 204	22	10	4
FL 205	28	10	4
FL 206	33	12	4
FL 207	30	14	5
FL 208	33	15	5
FL 209	38	15	5
FL 210	39	16	5
FL 211	44	18	5
FL 212	54	19	5
FL 213	53	18	6
FL 214	53	18	6
FL 215	55	21	6
FL 216	55	21	6
FL 217	55	21	6
FL 218	55	22	6

9.1.2 Cartridge type

The inside diameter of the housing into which a cartridge type unit is inserted should be H7 under general operating conditions. It should be so furnished as to permit the bearing unit to move freely in the axial direction.

9.2 Mounting the bearing unit on the shaft

9.2.1 Mounting of the set screw system unit

To mount the set screw system bearing unit on the shaft, it is sufficient to tighten the two set screws uniformly. The construction of the **KSM** "Ball-End Set Screw" is illustrated in Fig. 9.4 with the pin design that prevents it from becoming loose even when it is subjected to vibrations or impact loads.

If the fit clearance between the inner ring and the shaft is very small, it is advisable, prior to fastening on the screw, to file off that part of the shaft at which the end of the set screw (ball) strikes, by approximately 0.2 to 0.5mm 0.01 to 0.02 inches, to flatten it, as illustrated in Fig 9.5.

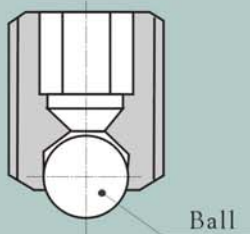


Fig. 9.4

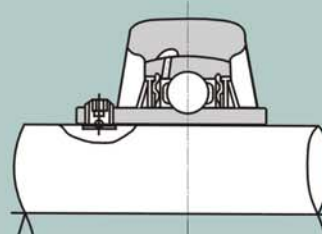


Fig. 9.5

This will facilitate dismounting of the bearing from the shaft to become necessary.

The method of mounting the unit on the shaft is as follows:

- 1) Make certain that the end of the set screw is not protruding into the bore of the bearing.
- 2) Holding the unit at right angles to the shaft, insert the shaft into the bore of the bearing without twisting the bearing. Take care not to strike the slinger nor to subject the unit to any shock (Fig. 9.6).
- 3) Insert a hexagonal bar wrench securely into the hexagonal hole of the set screw, and tighten the two screws uniformly. Use the tightening torque shown in Table 9.2.
- 4) Mount the housing securely in position on the machine. Sometimes the order of steps 3) and 4) is reversed.

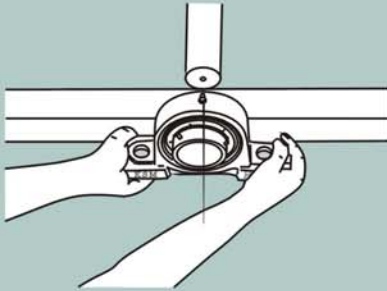


Fig. 9.6

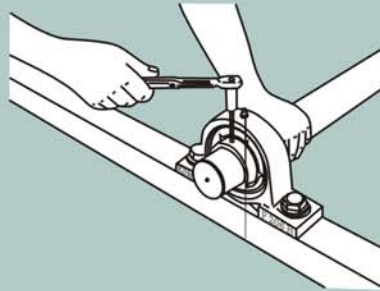


Fig. 9.7

Table 9.2 Recommended torques for tightening set screws
(Metric series, applied to metric bore size.)

Designation of the bearings of applicable units	Designation of set screws	Tightening torques N.m (max.)
UC 201 to UC 205	M 5 x 0.8 x 7	3.9
UC 206	M 6 x 0.75 x 8	4.9
UC 207	M 6 x 0.75 x 8	5.8
UC 208 to UC 210	M 8 x 1 x 10	7.8
UC 211	M 8 x 1 x 10	9.8
UC 212	M10 x 1.25 x 12	16.6
UC 213 to UC 215	M10 x 1.25 x 12	19.6
UC 216	M10 x 1.25 x 12	22.5
UC 217 to UC 218	M12 x 1.5 x 13	29.4

Designation of the bearings of applicable units	Designation of set screws	Tightening torques N.m (max.)
AS 201 to 205	M5 x 0.8 x 7	3.4
AS 206	M6 x 0.75 x 8	4.4
AS 207	M6 x 0.75 x 8	4.9
AS 208	M8 x 1 x 10	6.8

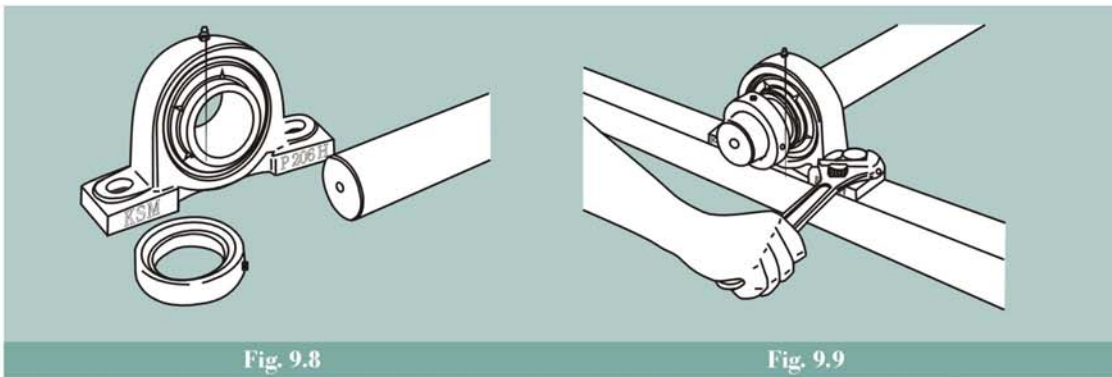


9.2.2 Mounting the eccentric locking collar system unit

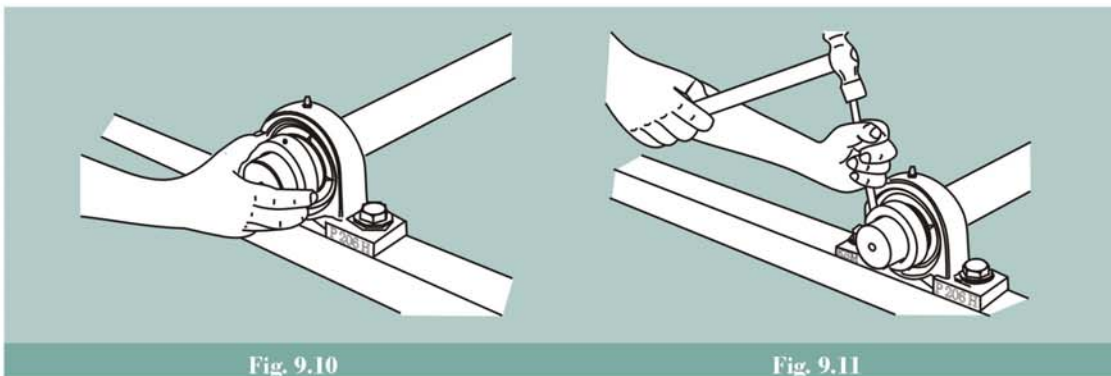
In this system, unlike the screw system, the shaft and inner ring are fastened together by fastening the eccentric collar in the direction of the rotation of the shaft. They are fastened together securely, and deformation of the inner ring seldom occurs. This system, however, is not recommended for applications where the direction of rotation is sometimes reversed.

Directions for mounting the unit are as follows:

- 1) Make certain that the frame in which the housing is to be mounted is suitable to the operating conditions with regard to rigidity, flatness, etc.
- 2) Make sure that the end of the shaft is not burred and that the end of the set screw in the eccentric collar is not protruding from the interior surface of the collar (Fig. 9.8).
- 3) Mount the housing of the unit securely onto the frame.
- 4) Determine the relative position of the unit and the shaft accurately so that the unit will not be subjected to any thrust, and then insert the eccentric collar (Fig. 9.9).



- 5) Fit the eccentric circular ridge provided on the inner ring into the eccentric circular groove of the eccentric collar, and then provisionally tighten by turning the collar by hand in the direction of the shaft (Fig. 9.10).
- 6) Insert a bar into the hole provided on the periphery of the eccentric collar and tap the bar so that the collar turns in the direction of rotation of the shaft (see Fig. 9.11).
- 7) Fasten the set screw of the eccentric collar onto the shaft. Recommended tightening torques are given in Table 9.3.

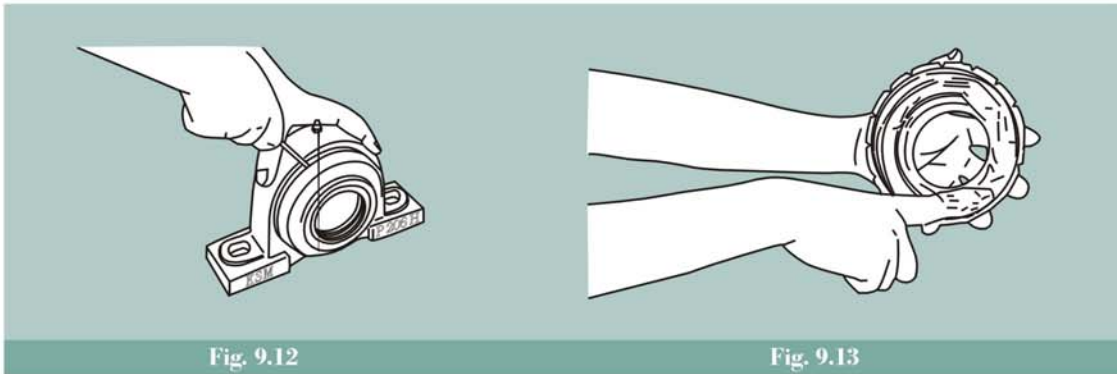


9.2.3 Mounting covered bearing units

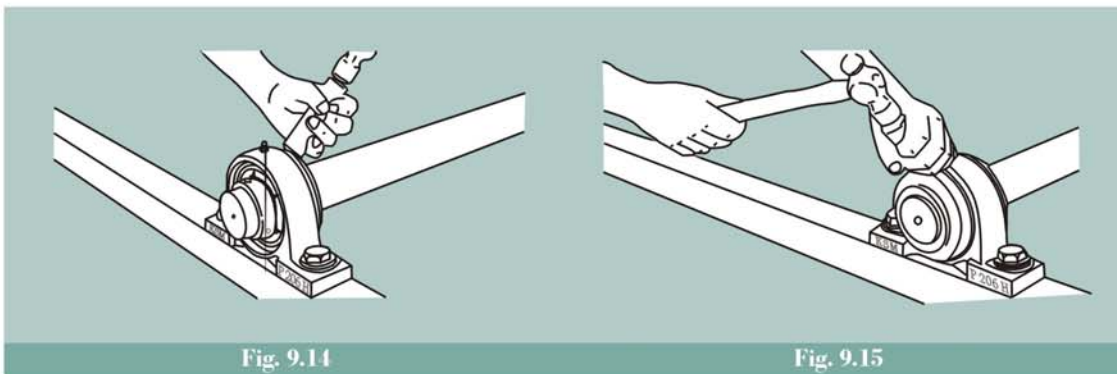
For selection of the shaft, mounting the bearing onto the shaft and fitting the housing follow the same procedure as for standard bearing units. Furthermore, fitting the cover presents no special difficulty, with no need for special tools or jigs.

The procedure for mounting covered bearing units is as follows:

- 1) Remove the cover from the bearing unit. The steel cover can usually be removed easily by hand, but should there be any difficulty due to an over-tight fit, insert a screwdriver or similar tool in a twisting motion, as shown in Fig. 9.12.
- 2) In order to augment the dust and waterproofing effects, completely fill the space between the two lips of the rubber seal incorporated in the cover with grease, and apply grease to the inside of the cover, filling about two-thirds of the space. Cup grease is commonly used for this purpose (Fig. 9.13).



- 3) First, pass one of the two grease-packed covers along the shaft, and then slide the bearing unit onto the shaft and fix the inner ring fast on the shaft before tightening the bolts holding the housing. Sometimes these steps are reversed for convenience of assembly. It is recommended that the end of the shaft be chamfered beforehand to avoid damaging the lips of the rubber seal.
- 4) Next take the cover which has been passed along the shaft and press it into the housing as follows: Be Careful not to strike the surface of the steel cover directly with a steel hammer but use a synthetic resin or wood block in between. Do not strike only in one place but tap the cover all the way round until it is firmly seated in the housing. (Fig. 9.14).
- 5) Pack the second cover with grease as in step 2 and pass it along the shaft. In the case of a blind cover, the recess of the housing should be filled with grease (Fig. 9.13).
- 6) Fit the cover into the recess of the housing using the same procedure as detailed in Step 4) (Fig. 9.15).



9.3 Running tests

After mounting the bearing unit, check that it has been done correctly.

First, turn the shaft or the rotor by hand to make certain that it rotates smoothly. If there is no irregularity, start up the machine. Run the machine at low speed under no load and gradually bring it up to full operating speed while checking that there are no abnormalities.

Some indications of abnormality of faulty assembly are as follows:

When the shaft is turned by hand a resistance or drag is felt, or the shaft appears to become heavy or light in turn. Or, if the machine is running under power, any abnormal noise, vibration or overheating is evident.

9.4 Inspection during operation

Although the **KSM** lubrication-free bearing unit does not require refilling with grease while in use, periodic inspections are necessary to ensure safe operation of the unit's most important parts. While the interval between inspections varies from case to case, according to the degree of importance and the rate of operation, it is usually some time between two weeks and a month. Since the inside of the bearing can be examined only by removing the slinger, seal etc., The condition of the bearing should be judged by checking for the presence of vibration, noise, overheating of the housing, etc., while the machine is running.

9.5 Dismounting the bearing unit

If some abnormality makes it necessary to dismount the bearing unit from the shaft in order to replace it, the procedure used to mount the bearing is followed in reverse order. In this case, special care should be given to the following points:

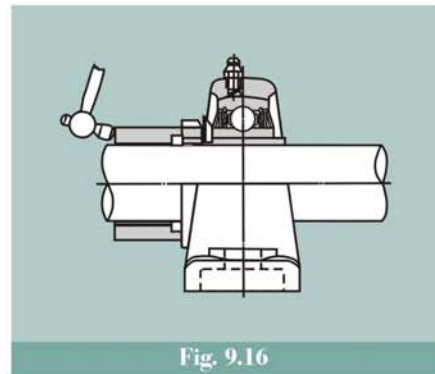
1) Set screw system units:

If the set screw is protruding into the bore of the bearing when the unit is withdrawn from the shaft, it will damage the shaft. Therefore the screw should be turned back fully.

2) Adapter system units:

To remove an adapter system bearing unit from the shaft, raise the tab of the washer, turn the nut two or three turns back, and apply a metal block to the nut and tap it with a hammer. Do this all round the nut, until the sleeve can be moved (Fig. 9.16).

If the nut is turned back too far and the screws are only slightly engaged, tapping to remove it will eventually ruin the screws.



9.6 Replacement of the bearing

If the bearing in the **KSM** bearing unit needs to be replaced, this can be carried out simply with a plummer block. There is no need to replace the housing, as it is reusable.

The bearing is changed using the following procedure: First, the set screw should be tightened as much as possible. Otherwise, there is a danger that it may catch in the housing when the bearing is tilted.

Next, insert the handle of a hammer or similar tool into the bore of the bearing and twist. Tilt the bearing through a full 90°, and pull it in the direction of the notch on the housing to remove it. To install a new bearing in the housing, follow the same procedure in reverse.



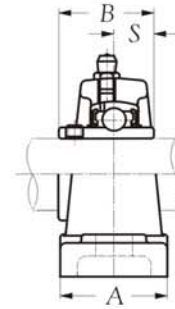
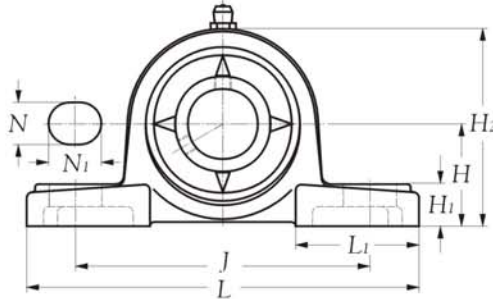
KSM[®]



MOUNTED UNITS (SUPER)

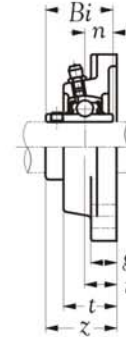
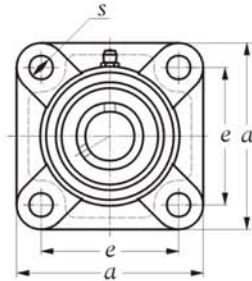


Standard Duty Pillow Blocks Cast Housing Set Screws Type series UCP 200



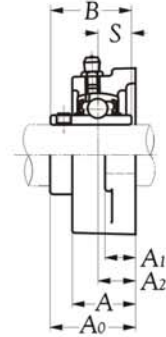
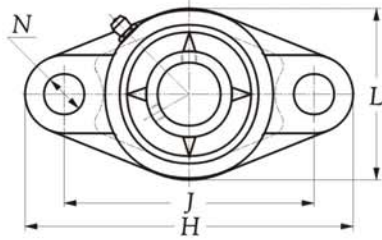
Shaft dia. mm	Unit number	Nominal dimensions											Bolt size mm	Bearing number	Housing number	Mass kg(s) (approx.)
		H	L	J	A	N	mm		H1	H2	L1	B				
12	UCP 201 (H)	30.2	127	95	38	13	16	14	62	42	31.0	12.7	M10	UC 201	P 203	0.7
15	UCP 202 (H)	30.2	127	95	38	13	16	14	62	42	31.0	12.7	M10	UC 202	P 203	0.7
17	UCP 203 (H)	30.2	127	95	38	13	16	14	62	42	31.0	12.7	M10	UC 203	P 203	0.7
20	UCP 204 (H)	33.3	127	95	38	13	16	14	65	42	31.0	12.7	M10	UC 204	P 204	0.7
25	UCP 205 (H)	36.5	140	105	38	13	16	15	71	42	34.1	14.3	M10	UC 205	P 205	0.8
30	UCP 206 (H)	42.9	165	121	48	17	20	17	83	54	38.1	15.9	M14	UC 206	P 206	1.3
35	UCP 207 (H)	47.6	167	127	48	17	20	18	93	54	42.9	17.5	M14	UC 207	P 207	1.6
40	UCP 208 (H)	49.2	184	137	54	17	20	18	98	52	49.2	19.0	M14	UC 208	P 208	1.9
45	UCP 209 (H)	54.0	190	146	54	17	20	20	106	60	49.2	19.0	M14	UC 209	P 209	2.2
50	UCP 210 (H)	57.2	206	159	60	20	23	21	114	65	51.6	19.0	M16	UC 210	P 210	2.6
55	UCP 211 (H)	63.5	219	171	60	20	23	23	126	65	55.6	22.2	M16	UC 211	P 211	3.3
60	UCP 212 (H)	69.8	241	184	70	20	23	25	138	70	65.1	25.4	M16	UC 212	P 212	4.6
65	UCP 213 (H)	76.2	265	203	70	25	28	27	151	77	65.1	25.4	M20	UC 213	P 213	5.9
70	UCP 214 (H)	79.4	266	210	72	25	28	27	157	77	74.6	30.2	M20	UC 214	P 214	6.6
75	UCP 215 (H)	82.6	275	217	74	25	28	28	163	80	77.8	33.3	M20	UC 215	P 215	7.4
80	UCP 216 (H)	88.9	292	232	78	25	28	30	175	85	82.6	33.3	M20	UC 216	P 216	9.0
85	UCP 217 (H)	95.2	310	247	83	25	28	32	187	85	85.7	34.1	M20	UC 217	P 217	11.0
90	UCP 218 (H)	101.6	327	262	88	27	30	33	200	90	96.0	39.7	M22	UC 218	P 218	13.0

Standard Duty Flanged Units Cast Housing Set Screws Type series UCF 200



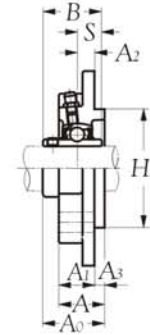
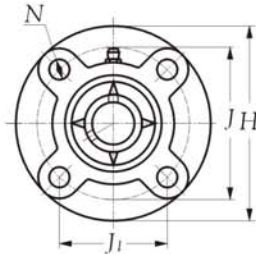
Shaft dia. mm	Unit number	Nominal dimensions									Bolt size mm	Bearing number	Housing number	Mass kg(s) (approx.)
		L	J	A ₂	A ₁	mm		N	A ₀	B				
12	UCF 201 (H)	86	64	15	11	25.5	12	33.3	31.0	12.7	M10	UC 201	F 204	0.7
15	UCF 202 (H)	86	64	15	11	25.5	12	33.3	31.0	12.7	M10	UC 202	F 204	0.7
17	UCF 203 (H)	86	64	15	11	25.5	12	33.3	31.0	12.7	M10	UC 203	F 204	0.6
20	UCF 204 (H)	86	64	15	11	25.5	12	33.3	31.0	12.7	M10	UC 204	F 204	0.6
25	UCF 205 (H)	95	70	16	13	27.0	12	35.8	34.1	14.3	M10	UC 205	F 205	0.8
30	UCF 206 (H)	108	83	18	13	31.0	12	40.2	38.1	15.9	M10	UC 206	F 206	1.0
35	UCF 207 (H)	117	92	19	15	34.0	14	44.4	42.9	17.5	M12	UC 207	F 207	1.4
40	UCF 208 (H)	130	102	21	15	36.0	16	51.2	49.2	19.0	M14	UC 208	F 208	1.8
45	UCF 209 (H)	137	105	22	16	38.0	16	52.2	49.2	19.0	M14	UC 209	F 209	2.2
50	UCF 210 (H)	143	111	22	16	40.0	16	54.6	51.6	19.0	M14	UC 210	F 210	2.4
55	UCF 211 (H)	162	130	25	18	43.0	19	58.4	55.6	22.2	M16	UC 211	F 211	3.6
60	UCF 212 (H)	175	143	29	18	48.0	19	68.7	65.1	25.4	M16	UC 212	F 212	4.4
65	UCF 213 (H)	187	149	30	22	50.0	19	69.7	65.1	25.4	M16	UC 213	F 213	5.5
70	UCF 214 (H)	193	152	31	22	54.0	19	75.4	74.6	30.2	M16	UC 214	F 214	6.1
75	UCF 215 (H)	200	159	34	22	56.0	19	78.5	77.8	33.3	M16	UC 215	F 215	6.9
80	UCF 216 (H)	208	165	34	22	58.0	23	83.3	82.6	33.3	M20	UC 216	F 216	8.1
85	UCF 217 (H)	220	175	36	24	63.0	23	87.6	85.7	34.1	M20	UC 217	F 217	9.3
90	UCF 218 (H)	235	187	40	24	68.0	23	96.3	96.0	39.7	M20	UC 218	F 218	11.0

Standard Duty Two Bolts Flanged Units Cast Housing Set Screws Type series UCFL 200



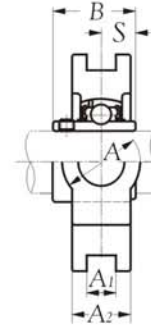
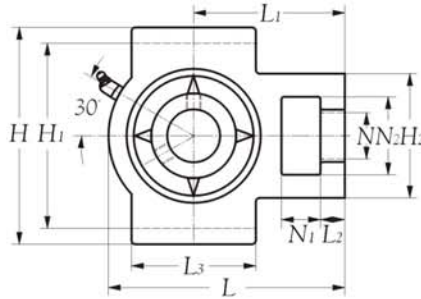
Shaft dia. mm	Unit number	Nominal dimensions										Bolt size mm	Bearing number	Housing number	Mass kg(s) (approx.)
		H	J	A ₂	A ₁	mm			A ₀	B	S				
12	UCFL 201 (H)	113	90	15	11	25.5	12	60	33.3	31.0	12.7	M10	UC 201	FL 204	0.6
15	UCFL 202 (H)	113	90	15	11	25.5	12	60	33.3	31.0	12.7	M10	UC 202	FL 204	0.6
17	UCFL 203 (H)	113	90	15	11	25.5	12	60	33.3	31.0	12.7	M10	UC 203	FL 204	0.5
20	UCFL 204 (H)	113	90	15	11	25.5	12	60	33.3	31.0	12.7	M10	UC 204	FL 204	0.5
25	UCFL 205 (H)	130	99	16	13	27.0	16	68	35.8	34.1	14.3	M14	UC 205	FL 205	0.6
30	UCFL 206 (H)	148	117	18	13	31.0	16	80	40.2	38.1	15.9	M14	UC 206	FL 206	0.9
35	UCFL 207 (H)	161	130	19	15	34.0	16	90	44.4	42.9	17.5	M14	UC 207	FL 207	1.2
40	UCFL 208 (H)	175	144	21	15	36.0	16	100	51.2	49.2	19.0	M14	UC 208	FL 208	1.6
45	UCFL 209 (H)	188	148	22	16	38.0	19	108	52.2	49.2	19.0	M16	UC 209	FL 209	1.9
50	UCFL 210 (H)	197	157	22	16	40.0	19	115	54.6	51.6	19.0	M16	UC 210	FL 210	2.2
55	UCFL 211 (H)	224	184	25	18	43.0	19	130	58.4	55.6	22.2	M16	UC 211	FL 211	3.1
60	UCFL 212 (H)	250	202	29	18	48.0	23	140	68.7	65.1	25.4	M20	UC 212	FL 212	4.0
65	UCFL 213 (H)	258	210	30	22	50.0	23	155	69.7	65.1	25.4	M20	UC 213	FL 213	5.0
70	UCFL 214 (H)	265	216	31	22	54.0	23	160	75.4	74.6	30.2	M20	UC 214	FL 214	5.6
75	UCFL 215 (H)	275	225	34	22	56.0	23	165	78.5	77.8	33.3	M20	UC 215	FL 215	6.2
80	UCFL 216 (H)	290	233	34	22	58.0	25	180	83.3	82.6	33.3	M22	UC 216	FL 216	8.2
85	UCFL 217 (H)	305	248	36	24	63.0	25	190	87.6	85.7	34.1	M22	UC 217	FL 217	9.3
90	UCFL 218 (H)	320	265	40	24	68.0	25	205	96.3	96.0	39.7	M22	UC 218	FL 218	11.0

Standard Duty Flanged Cartridge Units Cast Housing Set Screws Type series UCFC 200



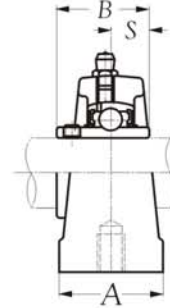
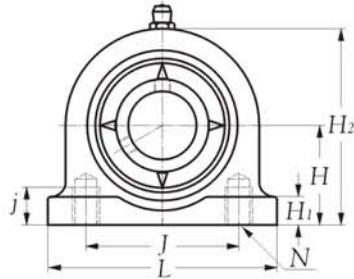
Shaft dia. mm	Unit number	Nominal dimensions												Bolt size mm	Bearing number	Housing number	Mass kg(s) (approx.)
		H	J	J1	A2	N	mm			A3	A1	A	H3				
12	UCFC 201 (H)	100	78	55.1	10	12	5	20.5	25.5	62	33.3	31.0	12.7	M10	UC 201	FC 204	0.8
15	UCFC 202 (H)	100	78	55.1	10	12	5	20.5	25.5	62	33.3	31.0	12.7	M10	UC 202	FC 204	0.8
17	UCFC 203 (H)	100	78	55.1	10	12	5	20.5	25.5	62	33.3	31.0	12.7	M10	UC 203	FC 204	0.7
20	UCFC 204 (H)	100	78	55.1	10	12	5	20.5	25.5	62	33.3	31.0	12.7	M10	UC 204	FC 204	0.7
25	UCFC 205 (H)	115	90	63.6	10	12	6	21.0	27.0	70	35.8	34.1	14.3	M10	UC 205	FC 205	1.0
30	UCFC 206 (H)	125	100	70.7	10	12	8	23.0	31.0	80	40.2	38.1	15.9	M10	UC 206	FC 206	1.3
35	UCFC 207 (H)	135	110	77.8	11	14	8	26.0	34.0	90	44.4	42.9	17.5	M12	UC 207	FC 207	1.6
40	UCFC 208 (H)	145	120	84.8	11	14	10	26.0	36.0	100	51.2	49.2	19.0	M12	UC 208	FC 208	2.1
45	UCFC 209 (H)	160	132	93.3	10	16	12	26.0	38.0	105	52.2	49.2	19.0	M14	UC 209	FC 209	2.7
50	UCFC 210 (H)	165	138	97.6	10	16	12	28.0	40.0	110	54.6	51.6	19.0	M14	UC 210	FC 210	3.1
55	UCFC 211 (H)	185	150	106.1	13	19	12	31.0	43.0	125	58.4	55.6	22.2	M16	UC 211	FC 211	4.2
60	UCFC 212 (H)	195	160	113.1	17	19	12	36.0	48.0	135	68.7	65.1	25.4	M16	UC 212	FC 212	5.3
65	UCFC 213 (H)	205	170	120.2	16	19	14	36.0	50.0	145	69.7	65.1	25.4	M16	UC 213	FC 213	6.0
70	UCFC 214 (H)	215	177	125.1	17	19	14	40.0	44.0	150	75.4	74.6	30.2	M16	UC 214	FC 214	7.0
75	UCFC 215 (H)	220	184	130.1	18	19	16	40.0	56.0	160	78.5	77.8	33.3	M16	UC 215	FC 215	7.8
80	UCFC 216 (H)	240	200	141.4	18	23	16	42.0	58.0	170	83.3	82.6	33.3	M20	UC 216	FC 216	9.3
85	UCFC 217 (H)	250	208	147.1	18	23	18	45.0	63.0	180	87.6	85.7	34.1	M20	UC 217	FC 217	11.0
90	UCFC 218 (H)	265	220	155.5	22	23	18	50.0	68.0	190	96.3	96.0	39.7	M20	UC 218	FC 218	13.0

Standard Duty Take-up Units Cast Housing Set Screws Type series UCT 200



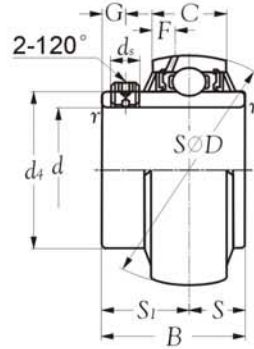
Shaft dia. mm	Unit number	Nominal dimensions															Bearing number	Housing number	Mass kg(s) (approx.)	
		mm																		
		N1	L2	H2	N2	N	L3	A1	H1	H	L	A2	A	r	L1	B	S			
12	UCT 201 (H)	16	12	51	32	19	51	12	76	89	94	21	32	33	61	31.0	12.7	UC 201	T 204	0.8
15	UCT 202 (H)	16	12	51	32	19	51	12	76	89	94	21	32	33	61	31.0	12.7	UC 202	T 204	0.8
17	UCT 203 (H)	16	12	51	32	19	51	12	76	89	94	21	32	33	61	31.0	12.7	UC 203	T 204	0.8
20	UCT 204 (H)	16	12	51	32	19	51	12	76	89	94	21	32	33	61	31.0	12.7	UC 204	T 204	0.8
25	UCT 205 (H)	16	12	51	32	19	51	12	76	89	97	24	32	35	62	34.1	14.3	UC 205	T 205	0.9
30	UCT 206 (H)	16	12	56	37	22	57	12	89	102	113	28	37	43	70	38.1	15.9	UC 206	T 206	1.3
35	UCT 207 (H)	16	15	64	37	22	64	12	89	102	129	30	37	51	78	42.9	17.5	UC 207	T 207	1.7
40	UCT 208 (H)	19	18	83	49	29	83	16	102	114	144	33	49	56	88	49.2	19.0	UC 208	T 208	2.3
45	UCT 209 (H)	19	18	83	49	29	83	16	102	117	145	35	49	57	88	49.2	19.0	UC 209	T 209	2.4
50	UCT 210 (H)	19	18	83	49	29	86	16	102	117	151	37	49	59	92	51.6	19.0	UC 210	T 210	2.5
55	UCT 211 (H)	25	21	102	64	35	95	22	130	146	171	38	64	65	106	55.6	22.2	UC 211	T 211	3.8
60	UCT 212 (H)	32	21	102	64	35	102	22	130	146	194	42	64	75	119	65.1	25.4	UC 212	T 212	4.7
65	UCT 213 (H)	32	23	111	70	41	121	26	151	167	224	44	70	87	137	65.1	25.4	UC 213	T 213	7.0
70	UCT 214 (H)	32	23	111	70	41	121	26	151	167	224	46	70	87	137	74.6	30.2	UC 214	T 214	7.3
75	UCT 215 (H)	32	23	111	70	41	121	26	151	167	232	48	70	92	140	77.8	33.3	UC 215	T 215	7.7
80	UCT 216 (H)	32	23	111	70	41	121	26	165	184	235	51	70	95	140	82.6	33.3	UC 216	T 216	8.4
85	UCT 217 (H)	38	31	124	73	48	157	30	173	198	260	54	73	98	162	85.7	34.1	UC 217	T 217	11.0

Standard Duty Pillow Blocks Cast Housing Set Screws Type series UCUP 200



Shaft dia. mm	Unit number	Nominal dimensions										Bearing number	Housing number	Mass kg(s) (approx.)	
		H	L	J	A	mm j		H1	H2	B	S				N
12	UCUP 201 (H)	30.2	76	52	38	13		11	62	31.0	12.7	M10x1.5	UC 201	UP 204	0.6
15	UCUP 202 (H)	30.2	76	52	38	13		11	62	31.0	12.7	M10x1.5	UC 202	UP 204	0.6
17	UCUP 203 (H)	30.2	76	52	38	13		11	62	31.0	12.7	M10x1.5	UC 203	UP 204	0.6
20	UCUP 204 (H)	30.2	76	52	38	13		11	62	31.0	12.7	M10x1.5	UC 204	UP 204	0.6
25	UCUP 205 (H)	36.5	84	56	38	15		12	72	34.1	14.3	M10x1.5	UC 205	UP 205	0.8
30	UCUP 206 (H)	42.9	94	66	48	18		12	84	38.1	15.9	M14x2	UC 206	UP 206	1.2
35	UCUP 207 (H)	47.6	110	80	48	20		13	95	42.9	17.5	M14x2	UC 207	UP 207	1.7
40	UCUP 208 (H)	49.2	116	84	54	20		13	100	49.2	19.0	M14x2	UC 208	UP 208	2.0
45	UCUP 209 (H)	54.2	120	90	54	25		13	108	49.2	19.0	M14x2	UC 209	UP 209	2.2
50	UCUP 210 (H)	57.2	130	94	60	25		14	116	51.6	19.0	M16x2	UC 210	UP 210	2.9

Standard Duty Spherical Outside Surface Ball Bearings Set Screws Type series UC 200




Shaft dia. mm	Unit number	Nominal dimensions											Basic load ratings		Mass kg(s) (approx.)
		<i>d</i>	<i>D</i>	<i>B</i>	<i>C</i>	<i>r_s</i>	<i>S</i>	<i>S_l</i>	<i>G</i>	<i>d_s</i>	<i>d₄</i>	<i>F</i>	N dynamic <i>C_r</i>	N static <i>C_{or}</i>	
12	UC 201 D1	12	47	31.0	16	0.6	12.7	18.3	5.0	M5x0.8	29.6	3.5	12800	6650	0.21
15	UC 202 D1	15	47	31.0	16	0.6	12.7	18.3	5.0	M5x0.8	29.6	3.5	12800	6650	0.20
17	UC 203 D1	17	47	31.0	16	0.6	12.7	18.3	5.0	M5x0.8	29.6	3.5	12800	6650	0.18
20	UC 204 D1	20	47	31.0	16	1.0	12.7	18.3	5.0	M6x1	29.6	3.8	12800	6650	0.17
25	UC 205 D1	25	52	34.1	17	1.0	14.3	19.8	5.0	M6x1	33.9	4.3	14000	7850	0.20
30	UC 206 D1	30	62	38.1	19	1.0	15.9	22.2	5.0	M6x1	40.8	4.3	19500	11300	0.33
35	UC 207 D1	35	72	42.9	20	1.5	17.5	25.4	7.0	M6x1	46.8	4.3	25700	15300	0.49
40	UC 208 D1	40	80	49.2	21	1.5	19.0	30.2	8.0	M8x1	53.0	4.3	29100	17800	0.65
45	UC 209 D1	45	85	49.2	22	1.5	19.0	30.2	8.0	M8x1	57.5	4.7	32500	20400	0.70
50	UC 210 D1	50	90	51.6	24	1.5	19.0	32.6	10.0	M10x1.25	62.4	5.2	35000	23200	0.80
55	UC 211 D1	55	100	55.6	25	2.0	22.2	33.4	10.0	M10x1.25	69.0	5.2	43500	29200	1.08
60	UC 212 D1	60	110	65.1	27	2.0	25.4	39.7	10.0	M10x1.25	77.0	5.5	52500	36000	1.53
65	UC 213 D1	65	120	65.1	29	2.0	25.4	39.7	10.0	M10x1.25	82.5	5.5	57500	40000	1.85
70	UC 214 D1	70	125	74.6	30	2.0	30.2	44.4	12.0	M12x1.5	87.0	5.9	62000	44000	2.10
75	UC 215 D1	75	130	77.8	32	2.0	33.3	44.5	12.0	M12x1.5	93.0	6.6	66000	49500	2.35
80	UC 216 D1	80	140	82.6	33	2.5	33.3	49.3	12.0	M12x1.5	98.1	6.7	72500	53000	2.80
85	UC 217 D1	85	150	85.7	35	2.5	34.1	51.6	12.0	M12x1.5	106.4	6.9	83500	64000	3.37
90	UC 218 D1	90	160	96.0	37	2.5	39.7	56.3	12.0	M12x1.5	111.6	7.0	96000	71500	4.36

Note: 1) UC 201 ~ UC 213 same with NTN technical datasheet.

2) It's applied to assemble with KSM housings P, F, FL, FC, T and UP.

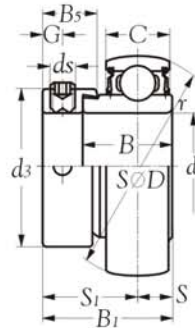
Remark: If you have more inquiry of technical, please inquire KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)




Technical supplement

Cage	Slings	Precision	Grease
Steel	Steel	Class 0 (JIS)	Shell Alvania S2

Standard Duty Spherical Outside Surface Ball Bearings Set Screw Type series AEL 200



Shaft dia. mm	Unit number	Nominal dimensions												Basic load ratings		Mass kg (approx.)
		mm												dynamic Cr	static Cor	
		d	D	B1	B	C	rs	S	S1	G	ds	d3	B5			
12	AEL 201	12	40	28.5	19.0	12	0.6	6.0	22.5	4.8	M6x1	29.0	13.6	9600	4600	0.12
15	AEL 202	15	40	28.5	19.0	12	0.6	6.0	22.5	4.8	M6x1	29.0	13.6	9600	4600	0.11
17	AEL 203	17	40	28.5	19.0	12	0.6	6.0	22.5	4.8	M6x1	29.0	13.6	9600	4600	0.10
20	AEL 204	20	47	30.9	21.5	14	1.0	7.0	23.9	4.8	M6x1	33.0	13.5	12800	6650	0.17
25	AEL 205	25	52	30.9	21.5	15	1.0	7.5	23.4	4.8	M6x1	38.0	13.5	14000	7850	0.20
30	AEL 206	30	62	35.7	23.8	16	1.0	8.0	27.7	6.0	M6x1	44.5	15.9	19500	11300	0.31
35	AEL 207	35	72	38.9	25.4	17	1.5	8.5	30.4	6.8	M8x1	55.5	17.5	25700	15300	0.49
40	AEL 208	40	80	43.6	30.2	18	1.5	9.0	34.6	6.8	M8x1	60.0	18.3	29100	17800	0.66

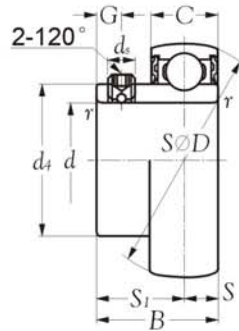


Technical supplement


Cage	Slings	Precision	Grease
Steel	Steel	Class 0 (JIS)	Shell Alvania S2

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Standard Duty Spherical Outside Surface Ball Bearings Set Screws Type series AS 200

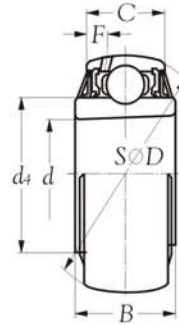
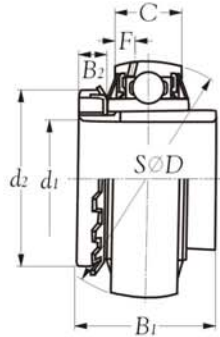


Shaft dia. mm	Unit number	Nominal dimensions										Basic load ratings		Mass kg (approx.)
		d	D	B	C	r_s	S	S_1	G	d_s	d_4	dynamic Cr	static Cor	
12	AS 201	12	40	22.0	12	0.6	6.0	16.0	4.0	M5x0.8	24.3	9600	4600	0.10
15	AS 202	15	40	22.0	12	0.6	6.0	16.0	4.0	M5x0.8	24.3	9600	4600	0.09
17	AS 203	17	40	22.0	12	0.6	6.0	16.0	4.0	M5x0.8	24.3	9600	4600	0.08
20	AS 204	20	47	24.8	14	1.0	7.0	17.8	5.0	M6x1	29.6	12800	6650	0.13
25	AS 205	25	52	27.0	15	1.0	7.5	19.5	5.5	M6x1	33.9	14000	7850	0.16
30	AS 206	30	62	30.0	16	1.0	8.0	22.0	6.0	M6x1	40.8	19500	11300	0.25
35	AS 207	35	72	32.0	17	1.5	8.5	23.5	6.5	M8x1	46.8	25700	15300	0.37
40	AS 208	40	80	34.0	18	1.5	9.0	25.0	7.0	M8x1	53.0	29100	17800	0.50

	Technical supplement			
	Cage	Slings	Precision	Grease
	Steel	Steel	Class 0 (JIS)	Shell Alvania S2


Remark: If you have more inquiry of technical, please inquire KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Standard Duty Spherical Outside Surface Ball Bearings Adapter Type series UK 200



Taper 1:12

Shaft dia. mm	Unit number	Nominal dimensions										Basic load ratings		Mass kg(s) (approx.)
		mm										N		
		d	D	B	C	d4	d1	B1	B2	d2	F	dynamic Cr	static Cor	
20	UK 205 D1	25	52	23	17	33.9	20	35	8	38	4.2	14000	7850	0.25
25	UK 206 D1	30	62	26	19	40.8	25	38	8	45	4.2	19500	11300	0.36
30	UK 207 D1	35	72	27	20	46.8	30	43	9	52	4.2	25700	15300	0.57
35	UK 208 D1	40	80	29	21	53.0	35	46	10	58	4.2	29100	17800	0.74
40	UK 209 D1	45	85	31	22	57.5	40	50	11	65	4.2	32500	20400	0.83
45	UK 210 D1	50	90	31	24	62.4	45	55	12	70	5.0	35000	23200	0.97
50	UK 211 D1	55	100	33	25	69.0	50	59	12	75	6.3	43500	29200	1.26
55	UK 212 D1	60	110	36	27	77.0	55	62	13	80	5.3	52500	36000	1.59
60	UK 213 D1	65	120	36	29	82.5	60	65	14	85	6.0	57500	40000	2.00
65	UK 215 D1	75	130	44	34	93.0	65	73	15	98	9.0	66000	49500	2.56
70	UK 216 D1	80	140	45	35	98.1	70	78	17	105	9.5	72500	53000	3.23

	Technical supplement			
	Cage	Slings	Precision	Grease
	Steel	Steel	Class 0 (JIS)	Shell Alvania S2

Remark: If you have more inquiry of technical, please inquire KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)



KSM[®]



MOUNTED UNITS (NORMAL)



Technical Information		Pages for refer
		310 ~ 325
1	Feature	310
2	Lubrication	310 ~ 311
3	Tolerances for Mounted Units	311 ~ 316
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5	Selection of Bearing Size	318 ~ 322
6	Selection of Shafts	322 ~ 323
7	Mounting of Mounted Units on Shafts	323 ~ 324
8	Standard of Set-screws	324
9	Material for Cast Iron Housing	325

1. Feature

The Insert Ball Bearings of **KSM** are deep groove ball bearing with wide and narrow inner rings, consisting of insert bearings (SB200, UC200, UK200, SA200, CSA200, CSB200, SER200) and various housings. The types of mounted units are defined according to the different mounting methods of the bearings to shafts: the set-screws type, the adapter type.

The **KSM** housings are mainly casting housings. There are pressed steel plate housings as well align with ease during operation and can be conveniently mounted or dismounted.

The mounted units can operate satisfactorily under working conditions, especially for machines operating in dusty or muddy surroundings. Thus, they are widely used in agricultural, construction and transmission machineries, etc.

There are various types of sealing devices for our products, such as synthetic rubber seals, slinger with synthetic rubber seals and triple lip seals etc.

Sufficient lubricating grease has been put into the bearings during manufacturing, which can act as lubricating as well as rust proof. No more grease is needed to put in during the lubricating period when the bearings operate under normal conditions. Lubricating grease can be added from the fittings when the relubricate bearings operate under hard conditions.

The outer ring of the bearing has spherical outside surface which can be fitted to the concave spherical surface of the housing, and the fit between them can be clearance fit or interference fit according to different conditions. This combination provides self-alignment between the self-contained bearing and the housing, and compensates for a certain alignment errors or flexing of the shaft when the bearing is in operation. This definitely increases the bearing service life.

2. Lubrication

The Insert Ball Bearings of **KSM** generally use CG-2 rust proof lithium based lubricating grease, with physical chemical properties shown in the following Table 2.1. Grease is filled in the Insert Ball Bearings during manufacturing.

Table 2.1 Physical chemical properties of lubricating grease

Density (1/mm)	Without operation	268
	Operated 60 times	260
Dropping point (°C)		128
Mechanical impurities (pc / gram)	10-25 μm	within 1000
	25-75 μm	within 500
	above 75 μm	0
Base oil kinematical Viscosity 40 °C. cst		80.3

The bearings usually operate below the temperature of 120° C (the measuring temperature of the outer rings is 100° C). Grease life reduction has to be taken into account when the bearing continues to operate at a temperature above 70°C. The lowest operating temperature should not be lower than - 30 °C.

The permissible speed of rotation is connected with the fit between shaft and bearing. It is recommended that, under normal operating conditions, the fit between the bearing and the shaft is h7. Looser fit allowing lower speed is recommended when heavier load is applied.

3. Tolerances for Mounted Units

Table 3.1.1 Tolerances on inner rings of bearing with cylindrical bore

Unit: 0.001 mm

Nominal bore diameter d		Cylindrical bore				Width B_i Deviations		Radial run-out (Max.)
		Bore diameter d_m Deviations		d Deviations				
Over (mm)	Incl. (mm)	High	Low	High	Low	High	Low	
10	18	+18	0	+22	-4	0	-120	12
18	30	+21	0	+25	-4	0	-120	15
30	50	+25	0	+30	-5	0	-120	18
50	80	+30	0	+36	-6	0	-150	22
80	120	+35	0	+42	-7	0	-200	28
120	150	+40	0	+48	-8	0	-250	35

Note: d_m is defined as the arithmetical mean of the largest and the smallest diameter obtained by two-point measurements.

Table 3.1.2 Tolerances on inner rings of bearings with tapered bore

Unit: 0.001 mm

Nominal bore diameter d		Δd Deviations		$\Delta d_1 - \Delta d$	
Over (mm)	Incl. (mm)	High	Low	Max.	Min.
18	30	+33	0	+21	0
30	50	+39	0	+25	0
50	80	+46	0	+30	0
80	120	+54	0	+35	0
120	150	+63	0	+40	0

Note (1) The deviations from nominal taper are defined by the limits of $(\Delta d_1 - \Delta d)$, where $(\Delta d_1$ is actual deviation of d_1 from nominal diameter at the largest end of bore and Δd is actual deviation of d from bearing bore nominal diameter.

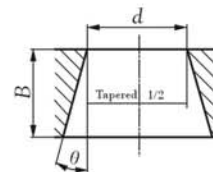
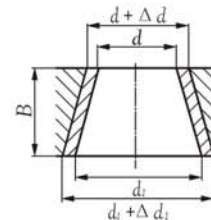
(2) d_1 is obtained by the following formula:

$$d_1 = d + 0.083333 B$$

Where B is width of the bearing inner ring.

(3) The nominal taper angle = 2° 23'9.4"

(4) Please refer to the Figs. 3.1.2



Figs. 3.1.2



Table 3.1.3 Tolerances on outer ring

Unit: 0.001 mm

Nominal bore diameter <i>D</i>		<i>D_m</i> Deviations		Radial run-out (Max.)
Over (mm)	Incl. (mm)	High	Low	
40	50	0	-11	20
50	80	0	-13	25
80	120	0	-15	35
120	180	0	-18	40
180	250	0	-20	45

Note: (1) *D_m* is defined as the arithmetical means of the largest and the smallest diameter obtained by two-point measurement.
 (2) The low deviation of outside diameter *D_m* does not apply within the distance of 1/4 the width of outer ring from the sides.

Table 3.1.4 Tolerance for distance "n" between the radial plane passing through center of outer ring and aside of inner ring

Unit: 0.001 mm

Nominal bore diameter <i>d</i>		<i>n</i> Deviations
Over (mm)	Incl. (mm)	
40	50	±200
50	80	±250
80	120	±300
120	160	±350

Please refer to Fig. 3.1.4

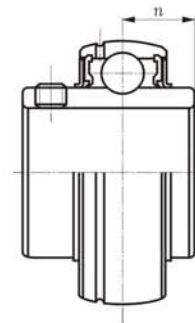


Fig. 3.1.4

Table 3.1.5 Chamfer dimensions

Nominal dimensions <i>r</i> (mm)	<i>r</i>	
	Max. (mm)	Min. (mm)
1.0	1.5	0.6
1.5	2.0	1.0
2.0	2.5	1.5
2.5	3.0	2.0
3.0	3.5	2.5
3.5	4.0	3.0
4.0	4.5	3.5
5.0	6.0	4.0

Please refer to Fig. 3.1.5

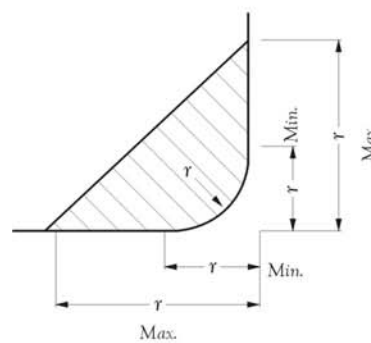


Fig. 3.1.5

3.2.1 Center height tolerances for pillow block type housings

Please refer to below Figs. 3.2.1 and Table 3.2.1

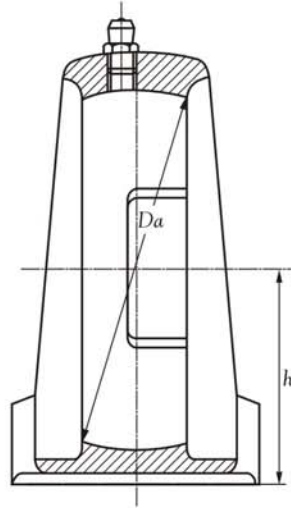


Fig. 3.2.1

Table 3.2.1 Center height tolerances for pillow block type housings

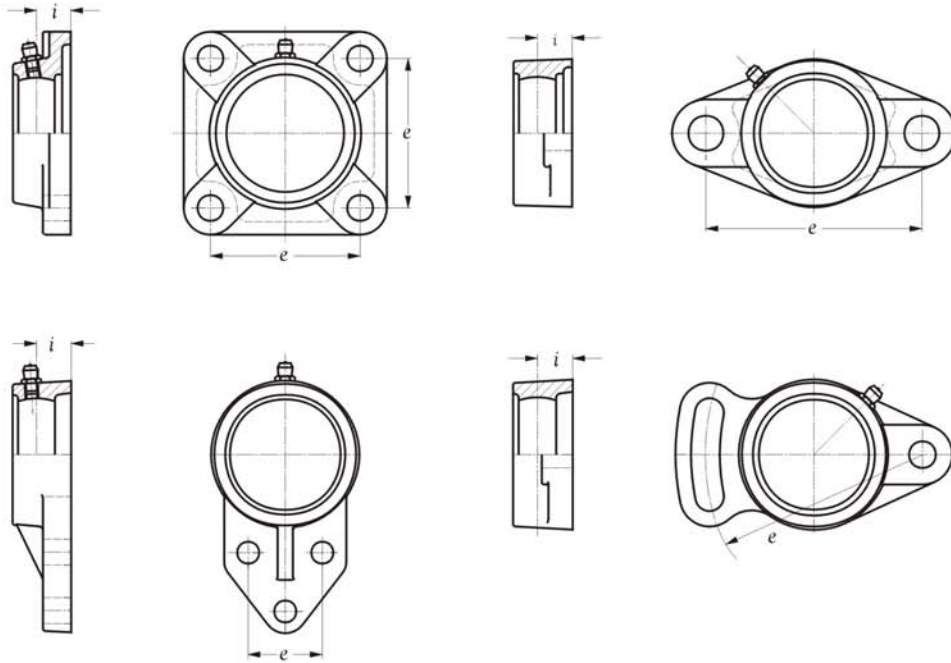
Unit: 0.001 mm

Housing No.				h Deviations	
P 201		PA 201	PH 201	± 150	
P 202	AK 204	PA 202	PH 202		
P 203	AK 205	PA 203	PH 203		
P 204	AK 206	PA 204	PH 204		
P 205	AK 207	PA 205	PH 205		
P 206	AK 208	PA 206	PH 206		
P 207	AK 209	PA 207	PH 207		
P 208	AK 210	PA 208	PH 208		
P 209	AK 211	PA 209	PH 209		
P 210	AK 212	PA 210	PH 210		
P 211	AK 213	PA 211	PH 211		± 200
P 212	AK 214	PA 212	PH 212		
P 213	AK 215	PA 213	PH 213		
P 214					
P 215					
P 216					
P 217					
P 218					



3.2.2 Tolerances for flanged type housings (F, FL, FA, FB, FC)

Please refer to below Figs. 3.2.2 (a), 3.2.2 (b) and Table 3.2.2 (a), 3.2.2 (b).



Figs. 3.2.2 (a)

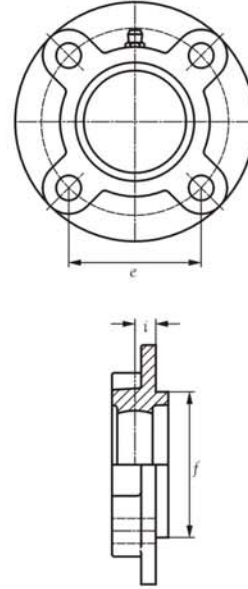
Table 3.2.2 (a) Tolerances for flanged type housings (F, FL, FA, FB)

Unit: 0.001 mm

Housing No.				<i>e</i> Deviations	<i>i</i> Deviations
F 201	FL 201	FA 201	FB 201	± 700	± 500
F 202	FL 202	FA 202	FB 202		
F 203	FL 203	FA 203	FB 203		
F 204	FL 204	FA 204	FB 204		
F 205	FL 205	FA 205	FB 205		
F 206	FL 206	FA 206	FB 206		
F 207	FL 207	FA 207	FB 207		
F 208	FL 208	FA 208	FB 208		
F 209	FL 209	FA 209	FB 209		
F 210	FL 210	FA 210	FB 210		
F 211	FL 211	FA 211	FB 211	± 1000	± 800
F 212	FL 212	FA 212	FB 212		
F 213	FL 213	FA 213	FB 213		
F 214	FL 214				
F 215	FL 215				
F 216	FL 216				
F 217	FL 217				
F 218	FL 218				

Table 3.2.2 (b) Tolerance for flanged type housing (FC) Unit: 0.001 mm

Housing No.	<i>f</i> Deviations		<i>e</i> Deviations	<i>i</i> Deviations	Radial run-out of machined pilot Max.
	High	Low			
FC 201	0	-46	±700	±700	200
FC 202					
FC 203					
FC 204					
FC 205					
FC 206	0	-54	±1000	±800	300
FC 207					
FC 208					
FC 209					
FC 210	0	-63	±1000	±800	300
FC 211					
FC 212					
FC 213					
FC 214					
FC 215					
FC 216					
FC 217					
FC 218	0	-72			



Figs. 3.2.2 (b)

3.2.3 Tolerance for take-up type housing (T)

Please refer to below Fig. 3.2.3 and Table 3.2.3 .

Table 3.2.3 Tolerance for take-up type housing (T) Unit: 0.001 mm

Housing No.	<i>k</i> Deviations		<i>e</i> Deviations	Parallelism of guide Max.
	High	Low		
T 201 ~ T 210	+200	0	0, -500	500
T 211 ~ T 217	+300	0	0, -800	600

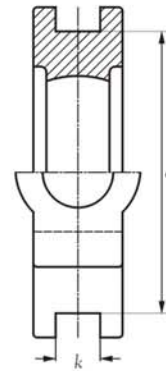


Fig 3.2.3



Table 3.2.4 Tolerance on spherical inside diameter

Unit: 0.001 mm

Nominal spherical inside diameter <i>Da</i>		Symbol J7				Symbol H7			
Over (mm)	Incl. (mm)	<i>D_{am}</i> Deviations		<i>Da</i> Deviations		<i>D_{am}</i> Deviations		<i>Da</i> Deviations	
		High	Low	High	Low	High	Low	High	Low
30	50	+14	-11	+19	-16	+25	0	+30	-5
50	80	+18	-12	+24	-18	+30	0	+36	-6
80	120	+22	-13	+29	-20	+35	0	+42	-7
120	180	+26	-14	+34	-22	+40	0	+48	-8
180	250	+30	-16	+39	-25	+46	0	+55	-9

Note: (1) $D_{am} = (D_{a \max} + D_{a \min})/2$

D_{a max} - maximum measured value of *Da*

D_{a min} - minimum measured value of *Da*

(2) Dimensional tolerances for spherical inside diameter of housing are classified as H7 for clearance fit and J7 for interference fit.

(3) As the self-contained for bearings are equipped with locking-pin, clearance fit H7 is normally applied.

Table 3.2.5 Machining tolerances

Nominal dimension		Dimensional Tolerance (mm)
Over (mm)	Incl. (mm)	
4	16	±0.2
16	63	±0.3
63	250	±0.5

Table 3.2.6 Casting tolerances on length

Nominal dimension		Dimensional Tolerance (mm)
Over (mm)	Incl. (mm)	
Up	100	±1.5
100	200	±2.0
200	400	±3.0
400	800	±4.0

Table 3.2.7 Casting tolerances on thickness

Nominal dimension		Dimensional Tolerance (mm)
Over (mm)	Incl. (mm)	
Up	5	±1.0
5	10	±1.5
10	20	±2.0
20	30	±3.0
30	50	±3.5

Table 3.2.8 One side machining tolerances

Nominal dimension		Dimensional Tolerance (mm)
Over (mm)	Incl. (mm)	
Up	~ 5	±1.0
5	~ 100	±1.5
100	~ 200	±2.0
200	~ 400	±3.0

Note: (1) Dimensional tolerances and deviations are for ordinary grade.

(2) Dimensional tolerances on length and thickness may be added with deviations on draft taper.



4. Radial Internal Clearance of Bearings

The internal radial clearance for the Insert Ball Bearing is usually greater than that for the same size of Deep Groove Ball Bearing. The clearance for the cylindrical bore bearing is shown in Table 4.1 while the clearance for the tapered bore bearing is shown in Table 4.2 .

**Table 4.1 Radial internal clearance of cylindrical bore bearings
(with set-screws and eccentric locking collar)**

Unit: 0.001mm

Nominal bore diameter <i>d</i>		Clearance symbol					
Over (mm)	Incl. (mm)	C 2		Normal		C 3	
		Min.	Max.	Min.	Max.	Min.	Max.
10	18	0	9	3	18	11	25
18	24	0	10	5	20	13	28
24	30	1	11	5	20	13	28
30	40	1	11	6	20	15	33
40	50	1	11	6	23	18	36
50	65	1	15	8	28	23	43
65	80	1	15	10	30	25	51
80	100	1	18	12	36	30	58
100	120	2	20	15	41	36	66
120	140	2	23	18	48	41	81

Table 4.2 Radial internal clearance of tapered bore bearings (with adapter sleeve)

Unit: 0.001mm

Nominal bore diameter <i>d</i>		Clearance symbol					
Over (mm)	Incl. (mm)	C 2		Normal		C 3	
		Min.	Max.	Min.	Max.	Min.	Max.
24	30	5	20	13	28	23	41
30	40	6	20	15	33	28	46
40	50	6	23	18	36	30	51
50	65	8	28	23	43	38	61
65	80	10	30	25	51	46	71
80	100	12	36	30	58	53	84
100	120	15	41	36	66	61	97
120	140	18	48	41	81	71	114



5. Selection of Bearing Size

5.1 The bearing size is usually selected according to the required life and reliability under a specific type of load charged on the Insert Ball Bearing

The load applied to the bearing operating under static or slow oscillating and rotating ($n < 10 \tau / \text{min}$) condition is defined as static load, while the load applied to the bearing operating under a speedy rotating ($n > 10 \tau / \text{min}$) condition is defined as dynamic load.

The load capacity of the bearing is expressed by the basic dynamic load rating which is shown in the Insert Ball Bearing's table.

Under normal mounting, lubricating and maintaining conditions, the operating bearing will have fatigue flaking due to the repeating action of variable load charged on the contact area between the rings and rolling elements. Generally, the fatigue flaking is the cause of normal damage of rolling bearings. Therefore, the usual bearing life refers to the bearing fatigue life. The life of group of apparently identical bearings operating under a considerable dispersion. For this reason, the bearing life is closely connected with the damaging probability or the reliability requirement.

The radial rating load of ball bearing with 90% reliability and 500 hours minimum life is shown in Fig. 5.1 (Refer to page 18).

Life: The life of a rolling bearing is defined as the total number of revolution which the bearing is capable of enduring before the first evidence of fatigue flaking develops on any one rings or rolling elements.

Reliability: The reliability is the percentage of the bearings of a group of apparently identical bearings operating under identical conditions which can expect to attain or exceed a certain defined life. The reliability of individual bearing is the probability of the bearing to attain or exceed a defined life.

Basic rating life: For a group of apparently identical rolling bearings operating under identical conditions, the basic rating life is defined as the total number of revolution that 90% of the bearings can be expected to complete or exceed.

Basic Rating life

The fatigue rating life of Insert Ball Bearing is calculated by the following formula:

$$L_{10} = \left(\frac{C}{P}\right)^3 \text{ or } \frac{C}{P} = L_{10}^{1/3}$$

Where L_{10} = basic rating life ($10^6 \tau$)

P = basic dynamic load rating (N)

N = equivalent dynamic bearing load (N)

The basic dynamic load rating C is a hypothetical constant load with a fixed direction under which the bearing can attain a basic life of one million revolutions theoretically. For radial bearings, the load refers to the radial load.

The equivalent dynamic bearing load P is a constant load with a fixed direction under which the bearing life is identical to that of the bearing operating under actual load.



For a bearing operating with a constant rotation speed, the basic rating life can be expressed in terms of operating hours:

$$L_{10h} = \frac{10^6}{60n} \left(\frac{C}{P} \right)^3 \text{ or } L_{10h} = \frac{10^6}{60n} L_{10h} = \frac{16666}{n} \left(\frac{C}{P} \right)^3$$

Where L_{10h} = basic rating life (h)
 n = bearing operating speed of rotation (τ /min)

For easier calculation, 500 hours as base of rating life is taken, and the speed factor f_n and the life factor f_h is introduced.

$$f_n = \left(\frac{331/3}{n} \right)^{1/3} \qquad f_h = \left(\frac{L_{10h}}{500} \right)^{1/3}$$

In this way, the formula is simplified to: $C = \frac{f_h}{f_n} P$

The values of f_h and f_n can be found in Fig. 5.1 by referring to the operation speed n and the anticipated bearing service life L_{10h} . Then, with the radial load (or the equivalent dynamic bearing load), the basic dynamic load rating can be determined. By this way, the bearing size can be determined according to the basic dynamic load rating value in the Insert Ball Bearing's table. If the bearing operate under indeterminate loads and rotation speed, the following formula should be applied when calculating the bearing life:

$$P_m = \sqrt[3]{\frac{1}{N} \int_0^N P^3 dN}$$

Where P_m = mean equivalent dynamic bearing load (N)
 P = equivalent dynamic bearing load (N)
 N = total revolution numbers within one load changing cycle (τ)

5.2 Anticipated bearing service life

When selecting a bearing, one should usually predetermine an appropriate service life according to the relevant machine type, operating condition and reliability requirement. Generally the anticipated bearing service life can be determined by referring to the maintenance period of a machine.

Calculating method of equivalent dynamic bearing load P

The basic equivalent dynamic bearing load is determined under a hypothetical condition. When calculating the bearing life, the actual load has to be converted to dynamic bearing load which is in conformity with the load condition determining the dynamic load rating. General equation for calculating the equivalent dynamic bearing load:

$$P = XFr + Yfa$$

Where: P --- equivalent dynamic bearing load (N)
 Fr --- actual radial load (N)
 Fa --- actual axial load (N)
 X --- radial factor
 Y --- thrust factor

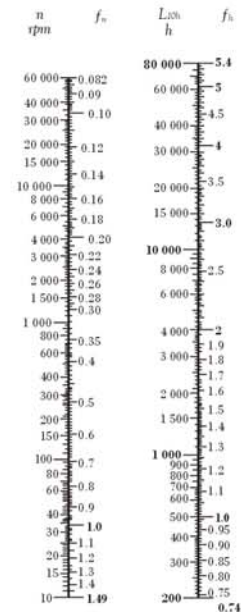
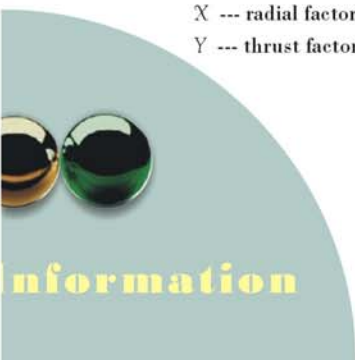


Fig. 5.1



The values of X and Y are determined by the ratio between the applied axial load F_a and the basic static load rating C_0 . The axial load which the Insert Ball Bearing can carry is determined by the mounting method of the bearing on the shaft.

For bearings of set-screw Locking type or eccentric Locking collar type, if flexible shafts are applied and the set-screws are tightened enough, the axial load F_a which the bearings can carry not surpass 20% of the radial load F_r .

For bearing of adapter sleeve Locking type, if the nut is properly tightened, the axial load F_a can be maximally 15% to 20% of the radial load.

The value of radial and thrust factors X and Y for Insert Ball Bearings can be obtained from the following Table 5.3.1.

When twist load is applied to the bearing, the equivalent dynamic bearing load is calculated by the following equation:

Where: $P_m = f_m \cdot P$

P_m --- equivalent dynamic bearing load when considering twist load

f_m --- twist load factor, which is defined as follows:

when the twist load is small : $f_m = 1.5$

when the twist load is big : $f_m = 2$

5.3 Example of bearing size selection

When shocking load is applied to the bearing, the equivalent dynamic bearing load can be calculated by the following equation:

$$P_d = f_d \cdot P$$

Where: P_d --- equivalent dynamic bearing load when considering shocking load

f_d --- shocking load factor, which is defined as follows:

when no shocking load or mirror shocking load is applied: $f_d = 1 - 1.2$

when adequate shocking load is applied: $f_d = 1.2 - 1.8$

Table 5.3.1 Radial and thrust factors X and Y for Insert Ball Bearings

$\frac{F_a}{C_a}$	Clearance for normal				e	Clearance for C3				e
	$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$			$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$		
	X	Y	X	Y		X	Y	X	Y	
0.025	1	0	0.56	2.0	0.22	1	0	0.46	1.74	0.3
0.04	1	0	0.56	1.8	0.24	1	0	0.46	1.61	0.33
0.07	1	0	0.56	1.6	0.27	1	0	0.46	1.46	0.36
0.13	1	0	0.56	1.4	0.31	1	0	0.46	1.30	0.41
0.25	1	0	0.56	1.2	0.37	1	0	0.46	1.14	0.47
0.5	1	0	0.56	1.0	0.44	1	0	0.46	1.00	0.54

How to select the size of bearing

One Insert Ball Bearings is to operate at a rotation speed of 1000 r/min under only a radial load of $F_r = 3000\text{ N}$, with a basic rating life of at least 20,000 hours. Select the bearing size.

From the required rotation speed it can be found that:

$$f_n = 0.322 \text{ (Fig. 5.1 shows about 0.32)}$$

From the required basic rating life (anticipated service life), it can be found that:

$$f_h = 3.42 \text{ (Fig. 5.1 shows about 3.4)}$$

Under only radial load, i.e.

$$P = F_r = 3000\text{ N}$$

Therefore,

$$C = \frac{F_h}{f_n} P = \frac{3.42}{0.322} \times 3000 = 31,863\text{ (N)}$$

A simplified way to calculate the bearing life can be applied by using Fig. 5.3: By connecting n and the required basic rating life L_{10h} with a straight line, it can be found that C/P value is 10.6. As is known, $P = F_r = 3000\text{ N}$, thus the required basic dynamic load rating is:

$$C = 3000 \times 10.6 = 31,800\text{ (N)}$$

In this way, we can select the Insert Ball Bearings inside this catalogue.

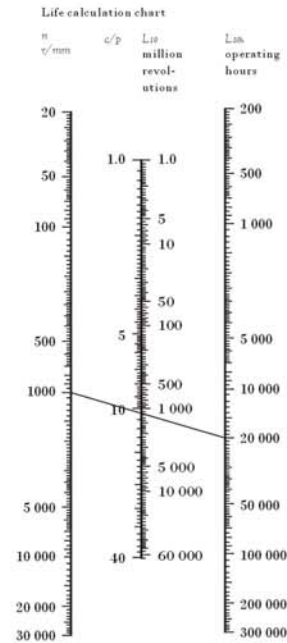


Fig. 5.3

5.4 Adjusted rating life equation

The basic rating life L_{10} calculated with the bearing life calculation formula can be applied to calculate the rating life of bearing made of ordinary bearing steel (i.e. bearing life with reliability of 90%).

Due to more and more of machinery products demanding higher reliability and better quality steel (ISO 281/1-1977), an adjusted rating life calculation equation is suggested, i. e.

$$L_n = a_1 \cdot a_2 \cdot a_3 \cdot L_{10}$$

For Spherical Outside Surface Ball Bearing:

$$L_n = a_1 \cdot a_2 \cdot a_3 \cdot (C/P)^3$$

Where L_n --- under specified material and lubricating conditions, bearing life with (100-n)% no breaking probability (i. e. reliability).

a_1 --- life adjustment factor for reliability (Table 4.4.1)

a_2 --- life adjustment factor materials (Table 4.4.2)

a_3 --- life adjustment factor for operating conditions (Table 4.4.3)

Table 5.4.1 Life adjustment factor for reliability a_1

Reliability%	90	95	96	97	98	99
L_n	L_{10}	L_5	L_4	L_3	L_2	L_1
a_1	1	0.62	0.53	0.44	0.33	0.21



Table 5.4.2 Life adjustment factor for materials a_2

Normal chromium bearing steel		$a_2 = 1$
Special smelted bearing steel	--- Vacuum degassed bearing steel	$a_2 = 3$
	--- Vacuum resmelted bearing steel	$a_2 = 5$
When material hardness lowered by high frequency tempering		$a_2 < 1$

Table 5.4.3 Life adjustment factor for operating conditions a_3

When under normal operating conditions:		
(1) Properly mounted,		
(2) Sufficiently lubricated,		$a_3 = 1$
(3) Without outside matters intrusion.		
When under operating temperature, the Insert Ball Bearings lubricating grease viscosity lower than 13 mm ² /s		$a_3 < 1$

6. Selection of Shafts

The shaft on which bearing units are mounted shall be free from bend and flexure.

For the units with cylindrical bore (with set-screws or eccentric locking collar) clearance fit is usually adopted for mounting the units on the shaft, and shaft tolerances in Table 6.1 are recommended for such loose fit, but for high speed or highly accurate operation or such application which is accompanied by heavy shock loads, interference fit is to be adopted. Table 6.2 shows recommended shaft tolerances for interference fit, when mounted units with eccentric locking collar are mounted on the shaft with interference fit, the eccentric locking collar may be omitted.

Tapered bore bearings permit wider tolerances of the shaft since they are locked to the shaft by means of adapted sleeves.

Recommended shaft tolerances for tapered bore bearings listed in Table 6.3.

Table 6.1 Shaft tolerances for clearance fit for bearing with cylindrical bore

Shaft diameter		Deviation of tolerances in shaft							
		For lower speed h9		For medium speed h8		For rather high speed h7		For high speed j6	
Over mm	Incl. mm	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
10	18	0	-43	0	-27	0	-18	+8	-3
18	30	0	-52	0	-33	0	-21	+9	-4
30	50	0	-62	0	-39	0	-25	+11	-5
50	80	0	-74	0	-46	0	-30	+12	-7
80	120	0	-87	0	-54	0	-35	+13	-9
120	180	0	-100	0	-63	0	-40	+14	-11

Table 6.2 Shaft tolerance for interference fit for bearing with cylindrical bore

Shaft diameter		Deviation of tolerances in shaft							
		Higher speed		Rather heavy load		Highest load		Heavy load	
		Over mm	Incl. mm	m6		m7		m6	
Over mm	Incl. mm	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
10	18	+18	+7	+25	+7	+23	+12	+30	+12
18	30	+21	+8	+29	+8	+28	+15	+36	+15
30	50	+25	+9	+34	+9	+33	+17	+42	+17
50	80	+30	+11	+41	+11	+39	+20	+50	+20
80	120	+35	+13	+48	+13	+45	+23	+58	+23
120	180	+40	+15	+55	+15	+52	+27	+67	+27

Table 6.3 Shaft tolerances for bearing with tapered bore

Shaft diameter		Deviation of tolerances in shaft			
		For shot shaft		For shot shaft	
		Over mm	Incl. mm	h9	
Over mm	Incl. mm	Max.	Min.	Max.	Min.
10	18	0	-43	0	-70
18	30	0	-52	0	-84
30	50	0	-62	0	-100
50	80	0	-74	0	-120
80	120	0	-87	0	-140
120	180	0	-100	0	-160

7. Mounting of Mounted Units on Shafts

The mounted units can be easily installed in principle at any place. However, in order to have a long service life, it is desirable that the mounting base is flat and rigid.

In case of either the vibration is caused to the bearing, the alternating movement takes place, the load applied to the bearing is large, or the shaft rotation speed is rapid, it is desired to provide with the filed seat or concave section at the part where the set-screws contact with the shaft. If large thrust load is charged, it is recommended that joggling tightened with nuts be used to install the bearing most effectively to the shaft: As shown in Fig 7.1.

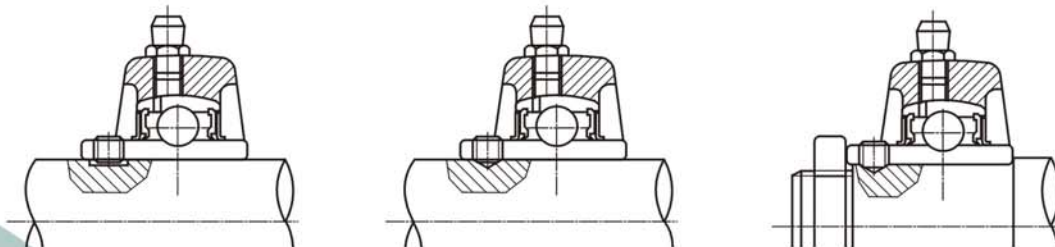


Fig 7.1



7.1 Mounted units with adapter sleeve

Mounted unit with adapter sleeve permits wider shaft tolerance and can be used in applications where vibrations and shocks are heavy.

Mounting processes of these units are as follows:

First, the sleeve is installed to an arbitrary position. After the shark proof washer is inserted, the nut is tightened. The proper nut tightening condition can be obtained if it is tightened enough by hand and then rotated by 2/5 to 3/5 revolution with a spanner.

After tightening the nut, bend the shark proof washer within the slot. Otherwise, the nut may be loosened and creep may be caused between the shaft and sleeve. It is necessary the nut can not be tightened too much.

7.2 Mounted units with eccentric locking collar

The eccentric part of the collar mates with the inner ring of the bearing which is made eccentric with the collar. When locked to the shaft by hand in direction of the shaft rotation, the eccentric locking collar tightens automatically to the shaft by force of working radial load. Then, lock the set-screws provided on the collar to fix the eccentric collar to the shaft. At the shaft rotation force or load is not charged on the set-screws directly, it will not loosen during operation.

8. Standard of Set-screws

There are two set-screws located at two places on one side of the wide inner ring 120 apart with which the bearing units can be mounted to the shaft. When mounting the bearing to the shaft, the torque shown in the following Table 8.1 is recommended to tighten the set-screws to shaft.

Table 8.1 Proper tightening torque of set-screws

Set-screws tap (mm) (inch)		Model Nos. of insert ball bearings	Tightening torque (N.m) (lbf.in)	
M5 x 0.8	10#-32 UNF	UC 201~UC 203, SB 201~SB 203, CSB 201~CSB 203	3.0~3.5	28
		CSB 201-8~CSB 203-11		
M6 x 0.75		UC 204~UC 206, SB 204~SB 206	3.0~3.5	28
M6 x 1	1/4-28 UNF	SA 201~SA 206, CSA 201~CSA 206, CSB 204~CSB 207	3.5~4.0	30~35.4
		SER 201~SER 206 CSB 204-12~CSB 207-22, SER 201-10~SER 206-20		
M8 x 1	5/16-24 UNF	UC 207~UC 209, SA 207~SA 210, SB 207~SB 208	8.0~8.5	69~73.5
		CSA 207~CSA 210, CSB 208, SER 207~SER 209 CSB 208-24, SER 207-22~SER 209-28		
M10 x 1.25	3/8-24 UNF	UC 210~UC 213, SA 211, CSA 211~CSA 212, SER 210~SER 212	16.5~17.5	144~152
M12 x 1.25	7/16-20 UNF	SER 214~SER 215	26.5~27.5	235~243
		SER 214-40~SER 215-47		
M12 x 1.5		UC 214~UC 218	33.5~34.5	296~304

9. Material for Cast Iron Housing

The material of cast iron housing under ISO / DIS GG20, the mechanical properties please refer to Tabel 9.1.

Table 9.1 The mechanical properties of cast iron housing

Number	Major wall thickness of casting piece (mm)	Strain stress σ_b (N/mm ²)	Hardness
			HB
JIS FC20	2.5 - 10	220	170 - 220
	>10 - 20	195	
	>20 - 30	170	
	>30 - 50	160	





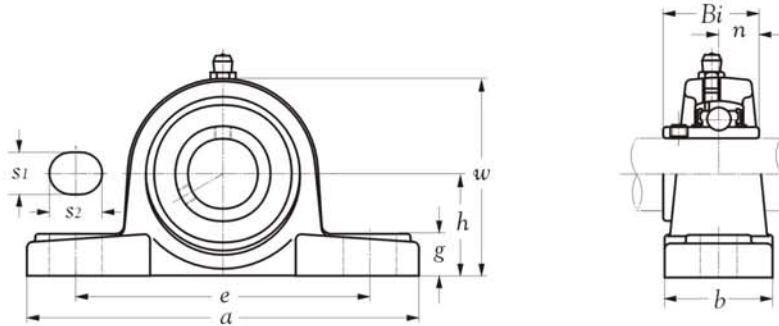
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MOUNTED UNITS (NORMAL)

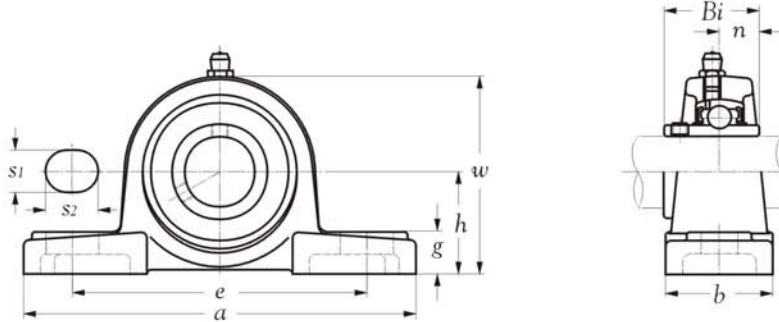


Standard Duty Pillow Blocks Cast Housing Set Screws Type series UCAK 200



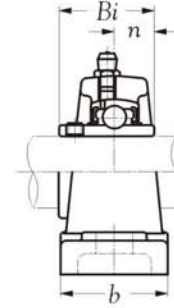
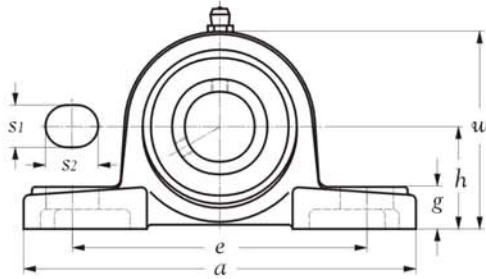
Shaft dia. mm inch	Unit number	Nominal dimensions										Bolt size mm inch	Bearing number	Housing number	Mass of unit kg
		h	a	e	b	s ₁	s ₂	g	w	Bi	n				
20	UCAK 204	31.8	128	98	38	11.0	14	14	63.0	31.0	12.7	M 10	UC 204	AK 204	0.74
3/4	UCAK 204-12	1-1/4	5-1/16	3-55/64	1-1/2	7/16	35/64	35/64	2-31/64	1.2205	0.5000	3/8	UC 204-12	AK 204	0.75
25	UCAK 205	33.3	140	105	40	11.0	14	15	66.5	34.0	14.3	M 10	UC 205	AK 205	0.85
1	UCAK 205-16	1-5/16	5-3/64	4-9/64	1-37/64	7/16	35/64	19/32	2-5/8	1.3386	0.5630	3/8	UC 205-16	AK 205	0.84
30	UCAK 206	39.7	160	121	44	14.0	19	17	79.0	38.1	15.9	M 12	UC 206		1.24
1-1/8	UCAK 206-18	1-9/16	6-19/64	4-49/64	1-47/64	35/64	3/4	43/64	3-7/64	1.5000	0.6260	7/16	UC 206-18	AK 206	1.26
1-1/4	UCAK 206-20	1-9/16	6-19/64	4-49/64	1-47/64	35/64	3/4	43/64	3-7/64	1.5000	0.6260	7/16	UC 206-20	AK 206	1.22
35	UCAK 207	46.0	167	127	48	14.0	19	18	91.0	42.9	17.5	M 12	UC 207		1.70
1-1/4	UCAK 207-20	1-13/16	6-37/64	5	1-57/64	35/64	3/4	45/64	3-37/64	1.6890	0.6890	7/16	UC 207-20	AK 207	1.76
1-3/8	UCAK 207-22	1-13/16	6-37/64	5	1-57/64	35/64	3/4	45/64	3-37/64	1.6890	0.6890	7/16	UC 207-22	AK 207	1.71
40	UCAK 208	49.2	181	140	52	14.0	19	19	98.0	49.2	19.0	M 12	UC 208	AK 208	2.13
1-1/2	UCAK 208-24	1-15/16	7-1/8	5-3/64	2-1/16	35/64	3/4	3/4	3-55/64	1.9370	0.7480	7/16	UC 208-24	AK 208	2.17
45	UCAK 209	52.4	189	146	54	14.0	19	20	105.0	49.2	19.0	M 12	UC 209	AK 209	2.39
1-5/8	UCAK 209-26	2-1/16	7-7/16	5-3/4	2-1/8	35/64	3/4	25/32	4-9/64	1.9370	0.7480	7/16	UC 209-26	AK 209	2.49
50	UCAK 210	55.6	203	159	57	17.5	21	21	111.5	51.6	19.0	M 16	UC 210	AK 210	2.83
1-7/8	UCAK 210-30	2-3/16	7-63/64	6-17/64	2-1/4	11/16	53/64	53/64	4-25/64	2.0315	0.7480	5/8	UC 210-30	AK 210	2.90
55	UCAK 211	61.9	232	181	60	18.0	24	23	123.0	55.6	22.2	M 16	UC 211	AK 211	3.85
2	UCAK 211-32	2-7/16	9-9/64	7-1/8	2-23/64	45/64	15/16	29/32	4-27/32	2.1890	0.8740	5/8	UC 211-32	AK 211	4.00
60	UCAK 212	68.3	241	191	64	18.0	24	25	136.0	65.1	25.4	M 16	UC 212	AK 212	4.92
2-1/4	UCAK 212-36	2-11/16	9-31/64	7-3/64	2-3/64	45/64	15/16	63/64	5-23/64	2.5630	1.0000	5/8	UC 212-36	AK 212	5.06
65	UCAK 213	74.6	262	203	70	21.0	28	27	147.5	65.1	25.4	M 20	UC 213	AK 213	6.13
2-1/2	UCAK 213-40	2-15/16	10-5/16	7-63/64	2-3/4	53/64	1-7/64	1-1/16	5-13/16	2.5630	1.0000	3/4	UC 213-40	AK 213	6.21
70	UCAK 214	77.8	266	210	74	21.0	28	28	153.5	74.6	30.2	M 20	UC 214	AK 214	6.90
2-3/4	UCAK 214-44	3-1/16	10-15/32	8-17/64	2-29/32	53/64	1-7/64	1-7/64	6-1/16	2.9370	1.1890	3/4	UC 214-44	AK 214	6.91
75	UCAK 215	82.6	304	241	78	22.0	32	30	162.0	77.8	33.3	M 20	UC 215	AK 215	8.56
3	UCAK 215-48	3-1/4	11-31/32	9-31/64	3-5/64	55/64	1-17/64	1-3/16	6-3/8	3.0630	1.3110	3/4	UC 215-48	AK 215	8.48

Standard Duty Pillow Blocks Cast Housing Set Screws Type series UCP 200



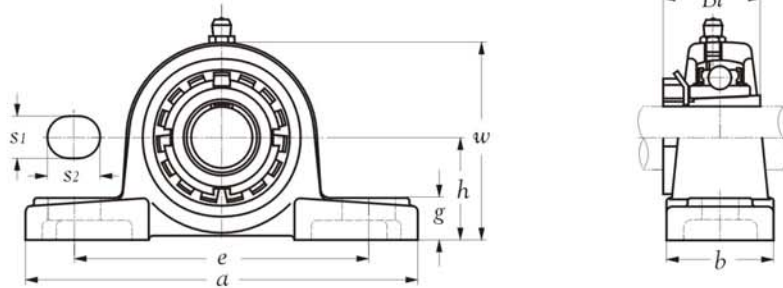
Shaft dia. mm inch	Unit number	Nominal dimensions										Bolt size mm inch	Bearing number	Housing number	Mass of unit kg
		h	a	e	b	s ₁	s ₂	g	w	Bi	n				
12 1/2	UCP 201	30.2	127	96	38	13	16	11	60.7	31.0	12.7	M 10	UC 201	P 203	0.68
	UCP 201-8	1-3/16	5	3-25/32	1-1/2	3/64	5/8	7/16	2-25/64	1.2205	0.5000	3/8	UC 201-8		0.68
15 5/8	UCP 202	30.2	127	96	38	13	16	11	60.7	31.0	12.7	M 10	UC 202	P 203	0.67
	UCP 202-10	1-3/16	5	3-25/32	1-1/2	3/64	5/8	7/16	2-25/64	1.2205	0.5000	3/8	UC 202-10		0.67
17 11/16	UCP 203	30.2	127	96	38	13	16	11	60.7	31.0	12.7	M 10	UC 203	P 203	0.66
	UCP 203-11	1-3/16	5	3-25/32	1-1/2	3/64	5/8	7/16	2-25/64	1.2205	0.5000	3/8	UC 203-11		0.66
20 3/4	UCP 204	33.3	127	96	35	13	19	14	65.0	31.0	12.7	M 10	UC 204	P 204	0.66
	UCP 204-12	1-5/16	5	3-25/32	1-3/8	3/64	3/4	35/64	2-9/16	1.2205	0.5000	3/8	UC 204-12		0.67
25 1	UCP 205	36.5	140	105	36	13	19	15	71.0	34.0	14.3	M 10	UC 205	P 205	0.77
	UCP 205-16	1-7/16	5-3/64	4-9/64	1-27/64	3/64	3/4	19/32	2-51/64	1.3386	0.5630	3/8	UC 205-16		0.76
30 1-1/8 1-1/4	UCP 206	42.9	160	121	42	17	22	16	84.0	38.1	15.9	M 14	UC 206	P 206	1.22
	UCP 206-18	1-11/16	6-19/64	4-49/64	1-21/32	43/64	55/64	5/8	3-5/16	1.5000	0.6260	1/2	UC 206-18		1.24
	UCP 206-20												UC 206-20		1.20
35 1-1/4 1-3/8	UCP 207	47.6	167	127	45	17	22	17	94.0	42.9	17.5	M 14	UC 207	P 207	1.55
	UCP 207-20	1-7/8	6-37/64	5	1-49/64	43/64	55/64	43/64	3-45/64	1.6890	0.6890	1/2	UC 207-20		1.61
	UCP 207-22												UC 207-22		1.56
40 1-1/2	UCP 208	49.2	180	137	49	17	22	18	100.0	49.2	19.0	M 14	UC 208	P 208	1.88
	UCP 208-24	1-15/16	7-3/32	5-25/64	1-59/64	43/64	55/64	45/64	3-15/16	1.9370	0.7480	1/2	UC 208-24		1.92
45 1-5/8	UCP 209	54	189	146	50	17	22	20	107.5	49.2	19.0	M 14	UC 209	P 209	2.19
	UCP 209-26	2-1/8	7-7/16	5-3/4	1-31/32	43/64	55/64	25/32	4-15/64	1.9370	0.7480	1/2	UC 209-26		2.29
50 1-7/8	UCP 210	57.2	204	159	56	20	25	21	114.0	51.6	19.0	M 16	UC 210	P 210	2.73
	UCP 210-30	2-1/4	8-1/64	6-17/64	2-13/64	25/32	63/64	53/64	4-31/64	2.0315	0.7480	5/8	UC 210-30		2.80
55 2	UCP 211	63.5	217	172	58	20	25	22	126	55.6	22.2	M 16	UC 211	P 211	3.38
	UCP 211-32	2-1/2	8-35/64	6-49/64	2-9/32	25/32	63/64	55/64	4-61/64	2.1890	0.8740	5/8	UC 211-32		3.53
60 2-1/4	UCP 212	69.9	238	186	64	20	25	24	139	65.1	25.4	M 16	UC 212	P 212	4.75
	UCP 212-36	2-3/4	9-3/8	7-21/64	2-3/64	25/32	63/64	15/16	5-15/32	2.5630	1.0000	5/8	UC 212-36		4.89
65 2-1/2	UCP 213	76.2	262	203	70	25	30	26	149	65.1	25.4	M 20	UC 213	P 213	5.81
	UCP 213-40	3	10-5/16	7-63/64	2-3/4	63/64	1-3/16	1-1/64	5-55/64	2.5630	1.0000	3/4	UC 213-40		5.89
70 2-3/4	UCP 214	79.4	266	210	72	25	30	27	155	74.6	30.2	M 20	UC 214	P 214	6.50
	UCP 214-44	3-1/8	10-15/32	8-17/64	2-53/64	63/64	1-3/16	1-1/16	6-7/64	2.9370	1.1890	3/4	UC 214-44		6.51
75 3	UCP 215	82.6	274	217	74	25	30	28	161.6	77.8	33.3	M 20	UC 215	P 215	7.11
	UCP 215-48	3-1/4	10-25/32	8-35/64	2-29/32	63/64	1-3/16	1-7/64	6-23/64	3.0630	1.3110	3/4	UC 215-48		7.03

Standard Duty Pillow Blocks Cast Housing Set Screws Type series UCP 200



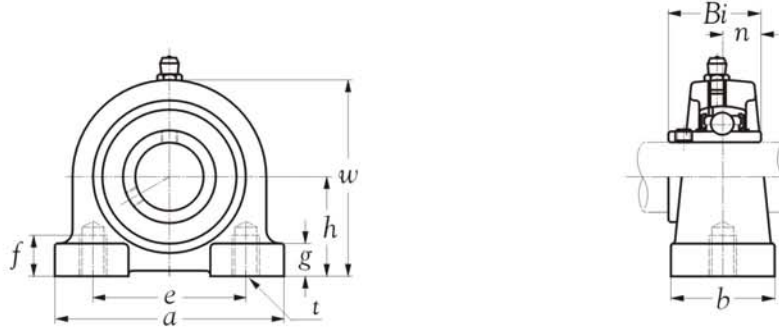
Shaft dia. mm inch	Unit number	Nominal dimensions										Bolt size mm inch	Bearing number	Housing number	Mass of unit kg	
		h	a	e	b	mm		inch		w	B_i					n
						s_1	s_2	g								
80 3-1/8	UCP 216	88.9	292	232	78	25	30	30	174	82.6	33.3	M 20	UC 216	P 216	8.69	
	UCP 216-50	3-1/2	11-1/2	9-9/64	3-5/64	63/64	1-3/16	1-3/16	6-27/32	3.2520	1.3110	3/4	UC 216-50		8.74	
85 3-1/4	UCP 217	95.2	310	247	83	25	30	32	186	85.7	34.1	M 20	UC 217	P 217	10.63	
	UCP 217-52	3-3/4	12-13/64	9-23/32	3-17/64	63/64	1-3/16	1-17/64	7-21/64	3.3740	1.3425	3/4	UC 217-52		10.85	
90 3-1/2	UCP 218	101.6	326	262	88	27	30	33	198	96.0	39.7	M 22	UC 218	P 218	12.95	
	UCP 218-56	4	12-53/64	10-5/16	3-15/32	1-1/16	1-3/16	1-19/64	7-51/64	3.7800	1.5630	7/8	UC 218-56		13.06	

Standard Duty Pillow Blocks Cast Housing Adapter Type series UKP 200



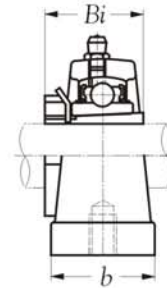
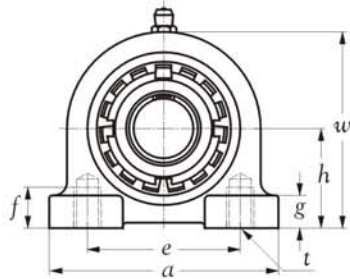
Shaft dia. mm	Unit number	Nominal dimensions									Bolt size mm	Bearing number	Housing number	Mass of unit kg
		<i>h</i>	<i>a</i>	<i>e</i>	<i>b</i>	mm		<i>g</i>	<i>w</i>	<i>Bi</i>				
20	UKP 205	36.5	140	105	36	13	19	15	71.0	35	M 10	UK 205	P 205	0.71
25	UKP 206	42.9	160	121	42	17	22	16	84.0	38	M 12	UK 206	P 206	1.15
30	UKP 207	47.6	167	127	45	17	22	17	94.0	43	M 12	UK 207	P 207	1.45
35	UKP 208	49.2	180	137	49	17	22	18	100.0	46	M 12	UK 208	P 208	1.72
40	UKP 209	54.0	189	146	50	17	22	20	107.5	50	M 12	UK 209	P 209	2.04
45	UKP 210	57.2	204	159	56	20	25	21	114.0	55	M 16	UK 210	P 210	2.52
50	UKP 211	63.5	217	172	58	20	25	22	126.0	59	M 16	UK 211	P 211	3.03
55	UKP 212	69.9	238	186	64	20	25	24	139.0	62	M 16	UK 212	P 212	4.25
60	UKP 213	76.2	262	203	70	25	30	26	149.0	65	M 20	UK 213	P 213	5.31

Standard Duty Pillow Blocks Cast Housing Set Screws Type series UCPA 200



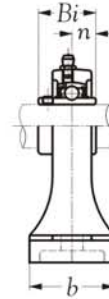
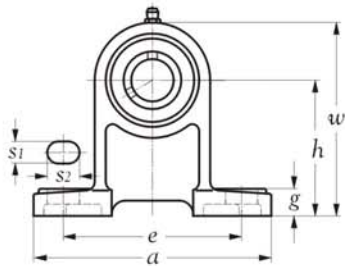
Shaft dia. mm inch	Unit number	Nominal dimensions										Bolt size mm inch	Bearing number	Housing number	Mass of unit kg
		h	a	e	b	g	w	f	t	Bi	n				
12	UCPA 201	30.2	76	52	40	11	62	13	M 10	31.0	12.7	M 10	UC 201	PA 204	0.57
1/2	UCPA 201-8	1-3/16	2-63/64	2-1/16	1-37/64	7/16	2-7/16	3/64	3/8	1.2205	0.5000	3/8	UC 201-8		0.57
15	UCPA 202	30.2	76	52	40	11	62	13	M 10	31.0	12.7	M 10	UC 202	PA 204	0.56
5/8	UCPA 202-10	1-3/16	2-63/64	2-1/16	1-37/64	7/16	2-7/16	3/64	3/8	1.2205	0.5000	3/8	UC 202-10		0.56
17	UCPA 203	30.2	76	52	40	11	62	13	M 10	31.0	12.7	M 10	UC 203	PA 204	0.55
11/16	UCPA 203-11	1-3/16	2-63/64	2-1/16	1-37/64	7/16	2-7/16	3/64	3/8	1.2205	0.5000	3/8	UC 203-11		0.55
20	UCPA 204	30.2	76	52	40	11	62	13	M 10	31.0	12.7	M 10	UC 204	PA 204	0.53
3/4	UCPA 204-12	1-3/16	2-63/64	2-1/16	1-37/64	7/16	2-7/16	3/64	3/8	1.2205	0.5000	3/8	UC 204-12		0.54
25	UCPA 205	36.5	84	56	38	12	72	15	M 10	34.0	14.3	M 10	UC 205	PA 205	0.71
1	UCPA 205-16	1-7/16	3-5/16	2-13/64	1-1/2	15/32	2-53/64	19/32	3/8	1.3386	0.5630	3/8	UC 205-16		0.70
30	UCPA 206	42.9	94	66	48	13	84	18	M 14	38.1	15.9	M 14	UC 206	PA 206	1.07
1-1/8	UCPA 206-18	1-11/16	3-45/64	2-19/32	1-57/64	3/64	3-5/16	45/64	1/2	1.5000	0.6260	1/2	UC 206-18		1.09
1-1/4	UCPA 206-20	1-11/16	3-45/64	2-19/32	1-57/64	3/64	3-5/16	45/64	1/2	1.5000	0.6260	1/2	UC 206-20		1.05
35	UCPA 207	47.6	110	80	48	13	95	20	M 14	42.9	17.5	M 14	UC 207	PA 207	1.49
1-1/4	UCPA 207-20	1-7/8	4-21/64	3-5/32	1-57/64	3/64	3-47/64	25/32	1/2	1.6890	0.6890	1/2	UC 207-20		1.55
1-3/8	UCPA 207-22	1-7/8	4-21/64	3-5/32	1-57/64	3/64	3-47/64	25/32	1/2	1.6890	0.6890	1/2	UC 207-22		1.50
40	UCPA 208	49.2	116	84	54	13	100	20	M 14	49.2	19.0	M 14	UC 208	PA 208	1.75
1-1/2	UCPA 208-24	1-15/16	4-9/16	3-5/16	2-1/8	3/64	3-15/16	25/32	1/2	1.9370	0.7480	1/2	UC 208-24		1.79
45	UCPA 209	54.2	120	90	60	13	108	25	M 14	49.2	19.0	M 14	UC 209	PA 209	2.17
1-5/8	UCPA 209-26	2-9/64	4-23/32	3-35/64	2-23/64	3/64	4-1/4	63/64	1/2	1.9370	0.7480	1/2	UC 209-26		2.27
50	UCPA 210	57.2	130	94	60	14	116	25	M 16	51.6	19.0	M 16	UC 210	PA 210	2.53
1-7/8	UCPA 210-30	2-1/4	5-1/8	3-45/64	2-23/64	35/64	4-9/16	63/64	5/8	2.0315	0.7480	5/8	UC 210-30		2.60
55	UCPA 211	63.5	140	104	66	14	125	25	M 16	55.6	22.2	M 16	UC 211	PA 211	3.17
2	UCPA 211-32	2-1/2	5-3/64	4-3/32	2-19/32	35/64	4-59/64	63/64	5/8	2.1890	0.8740	5/8	UC 211-32		3.32
60	UCPA 212	69.9	150	114	68	15	138	25	M 16	65.1	25.4	M 16	UC 212	PA 212	4.17
2-1/4	UCPA 212-36	2-3/4	5-29/32	4-31/64	2-43/64	19/32	5-7/16	63/64	5/8	2.5630	1.0000	5/8	UC 212-36		4.31
65	UCPA 213	76.2	160	124	70	15	150	25	M 16	65.1	25.4	M 16	UC 213	PA 213	4.96
2-1/2	UCPA 213-40	3	6-19/64	4-7/8	2-3/4	19/32	5-29/32	63/64	5/8	2.5630	1.0000	5/8	UC 213-40		5.04

Standard Duty Pillow Blocks Cast Housing Adapter Type series UKPA 200



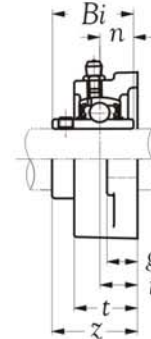
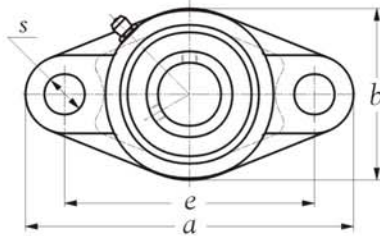
Shaft dia. mm	Unit number	Nominal dimensions									Bolt size mm	Bearing number	Housing number	Mass of unit kg
		<i>h</i>	<i>a</i>	<i>e</i>	<i>b</i>	mm		<i>f</i>	<i>t</i>	<i>Bi</i>				
20	UKPA 205	36.5	84	56	38	12	72	15	M 10	35	M 10	UK 205	PA 205	0.65
25	UKPA 206	42.9	94	66	48	13	84	18	M 14	38	M 14	UK 206	PA 206	1.00
30	UKPA 207	47.6	110	80	48	13	95	20	M 14	43	M 14	UK 207	PA 207	1.39
35	UKPA 208	49.2	116	84	54	13	100	20	M 14	46	M 14	UK 208	PA 208	1.59
40	UKPA 209	54.2	120	90	60	13	108	25	M 14	50	M 14	UK 209	PA 209	2.02
45	UKPA 210	57.2	130	94	60	14	116	25	M 16	55	M 16	UK 210	PA 210	2.32
50	UKPA 211	63.5	140	104	66	14	125	25	M 16	59	M 16	UK 211	PA 211	2.82
55	UKPA 212	69.9	150	114	68	15	138	25	M 16	62	M 16	UK 212	PA 212	3.67
60	UKPA 213	76.2	160	124	70	15	150	25	M 16	65	M 16	UK 213	PA 213	4.46

Standard Duty Pillow Blocks Cast Housing Set Screws Type series UCPH 200



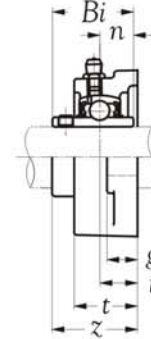
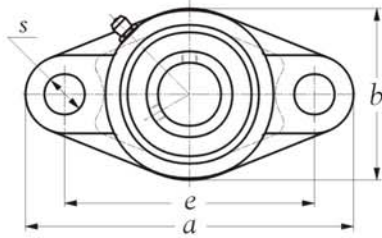
Shaft dia. mm inch	Unit number	Nominal dimensions										Bolt size mm inch	Bearing number	Housing number	Mass of unit kg
		h	a	e	b	s_1	s_2	g	w	B_i	n				
12	UCPH 201	70	127	95	40	12	16	13	101	31.0	12.7	M 10	UC 201	PH 204	0.81
1/2	UCPH 201-8	2-3/4	5	3-47/64	1-37/64	15/32	5/8	3/64	3-31/32	1.2205	0.5000	3/8	UC 201-8	PH 204	0.81
15	UCPH 202	70	127	95	40	12	16	13	101	31.0	12.7	M 10	UC 202	PH 204	0.80
5/8	UCPH 202-10	2-3/4	5	3-47/64	1-37/64	15/32	5/8	3/64	3-31/32	1.2205	0.5000	3/8	UC 202-10	PH 204	0.80
17	UCPH 203	70	127	95	40	12	16	13	101	31.0	12.7	M 10	UC 203	PH 204	0.79
11/16	UCPH 203-11	2-3/4	5	3-47/64	1-37/64	15/32	5/8	3/64	3-31/32	1.2205	0.5000	3/8	UC 203-11	PH 204	0.79
20	UCPH 204	70	127	95	40	12	16	13	101	31.0	12.7	M 10	UC 204	PH 204	0.77
3/4	UCPH 204-12	2-3/4	5	3-47/64	1-37/64	15/32	5/8	3/64	3-31/32	1.2205	0.5000	3/8	UC 204-12	PH 204	0.78
25	UCPH 205	80	140	105	50	13	19	16	114	34.0	14.3	M 10	UC 205	PH 205	1.01
1	UCPH 205-16	3-5/32	5-3/64	4-9/64	1-31/32	3/64	3/4	5/8	4-31/64	1.3386	0.5630	3/8	UC 205-16	PH 205	1.00
30	UCPH 206	90	165	121	50	17	21	18	130	38.1	15.9	M 14	UC 206		1.56
1-1/8	UCPH 206-18	3-35/64	6-1/2	4-49/64	1-31/32	43/64	53/64	45/64	5-1/8	1.5000	0.6260	1/2	UC 206-18	PH 206	1.58
1-1/4	UCPH 206-20	3-35/64	6-1/2	4-49/64	1-31/32	43/64	53/64	45/64	5-1/8	1.5000	0.6260	1/2	UC 206-20		1.54
35	UCPH 207	95	167	127	60	17	21	19	140	42.9	17.5	M 14	UC 207		1.88
1-1/4	UCPH 207-20	3-47/64	6-37/64	5	2-23/64	43/64	53/64	3/4	5-3/64	1.6890	0.6890	1/2	UC 207-20	PH 207	1.94
1-3/8	UCPH 207-22	3-47/64	6-37/64	5	2-23/64	43/64	53/64	3/4	5-3/64	1.6890	0.6890	1/2	UC 207-22		1.89
40	UCPH 208	100	184	137	66	17	21	20	150	49.2	19.0	M 14	UC 208	PH 208	2.44
1-1/2	UCPH 208-24	3-15/16	7-1/4	5-25/64	2-19/32	43/64	53/64	25/32	5-29/32	1.9370	0.7480	1/2	UC 208-24	PH 208	2.48
45	UCPH 209	105	190	146	70	17	21	20	158	49.2	19.0	M 14	UC 209	PH 209	2.72
1-5/8	UCPH 209-26	4-9/64	7-31/64	5-3/4	2-3/4	43/64	53/64	25/32	6-7/32	1.9370	0.7480	1/2	UC 209-26	PH 209	2.82
50	UCPH 210	110	204	159	70	19	22	22	165	51.6	19.0	M 16	UC 210	PH 210	3.08
1-7/8	UCPH 210-30	4-21/64	8-1/64	6-17/64	2-3/4	3/4	55/64	55/64	6-1/2	2.0315	0.7480	5/8	UC 210-30	PH 210	3.15
55	UCPH 211	120	217	171	75	19	22	23	181	55.6	22.2	M 16	UC 211	PH 211	4.05
2	UCPH 211-32	4-23/32	8-35/64	6-47/64	2-61/64	3/4	55/64	29/32	7-1/8	2.1890	0.8740	5/8	UC 211-32	PH 211	4.20
60	UCPH 212	130	236	186	80	19	22	24	197	65.1	25.4	M 16	UC 212	PH 212	4.78
2-1/4	UCPH 212-36	5-1/8	9-19/64	7-21/64	3-5/32	3/4	55/64	15/16	7-3/4	2.5630	1.0000	5/8	UC 212-36	PH 212	4.92
65	UCPH 213	140	258	203	85	23	28	26	213	65.1	25.4	M 20	UC 213	PH 213	5.93
2-1/2	UCPH 213-40	5-3/64	10-5/32	7-63/64	3-11/32	29/32	1-7/64	1-1/64	8-25/64	2.563	1.0000	3/4	UC 213-40	PH 213	6.01

Standard Duty Two Bolts Flanged Units Cast Housing Set Screws Type series UCFL 200



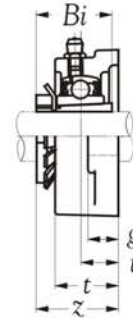
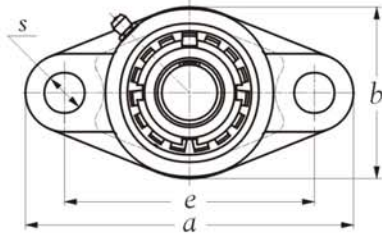
Shaft dia. mm inch	Unit number	Nominal dimensions										Bolt size mm inch	Bearing number	Housing number	Mass of unit kg
		a	e	i	g	t	s	b	z	Bi	n				
12	UCFL 201	113	90	15	11	25.5	12	60	33.3	31.0	12.7	M 10	UC 201	FL 204	0.47
1/2	UCFL 201-8	4-29/64	3-35/64	19/32	7/16	1	15/32	2-23/64	1-5/16	1.2205	0.5000	3/8	UC 201-8	FL 204	0.47
15	UCFL 202	113	90	15	11	25.5	12	60	33.3	31.0	12.7	M 10	UC 202	FL 204	0.46
5/8	UCFL 202-10	4-29/64	3-35/64	19/32	7/16	1	15/32	2-23/64	1-5/16	1.2205	0.5000	3/8	UC 202-10	FL 204	0.46
17	UCFL 203	113	90	15	11	25.5	12	60	33.3	31.0	12.7	M 10	UC 203	FL 204	0.45
11/16	UCFL 203-11	4-29/64	3-35/64	19/32	7/16	1	15/32	2-23/64	1-5/16	1.2205	0.5000	3/8	UC 203-11	FL 204	0.45
20	UCFL 204	113	90	15	11	25.5	12	60	33.3	31.0	12.7	M 10	UC 204	FL 204	0.43
3/4	UCFL 204-12	4-29/64	3-35/64	19/32	7/16	1	15/32	2-23/64	1-5/16	1.2205	0.5000	3/8	UC 204-12	FL 204	0.44
25	UCFL 205	130	99	16	13	27.0	16	68	35.7	34.0	14.3	M 14	UC 205	FL 205	0.60
1	UCFL 205-16	5-1/8	3-57/64	5/8	3/64	1-1/16	5/8	2-43/64	1-13/32	1.3386	0.5630	1/2	UC 205-16	FL 205	0.59
30	UCFL 206	148	117	18	13	31.0	16	80	40.2	38.1	15.9	M 14	UC 206	FL 206	0.91
1-1/8	UCFL 206-18	5-53/64	4-39/64	45/64	3/64	1-7/32	5/8	3-5/32	1-37/64	1.5000	0.6260	1/2	UC 206-18	FL 206	0.93
1-1/4	UCFL 206-20	5-53/64	4-39/64	45/64	3/64	1-7/32	5/8	3-5/32	1-37/64	1.5000	0.6260	1/2	UC 206-20	FL 206	0.89
35	UCFL 207	161	130	19	14	34.0	16	90	44.4	42.9	17.5	M 14	UC 207	FL 207	1.14
1-1/4	UCFL 207-20	6-11/32	5-1/8	3/4	35/64	1-11/32	5/8	3-35/64	1-3/4	1.6890	0.6890	1/2	UC 207-20	FL 207	1.20
1-3/8	UCFL 207-22	6-11/32	5-1/8	3/4	35/64	1-11/32	5/8	3-35/64	1-3/4	1.6890	0.6890	1/2	UC 207-22	FL 207	1.15
40	UCFL 208	175	144	21	14	36.0	16	100	51.2	49.2	19.0	M 14	UC 208	FL 208	1.43
1-1/2	UCFL 208-24	6-57/64	5-43/64	53/64	35/64	1-27/64	5/8	3-15/16	2-1/64	1.9370	0.7480	1/2	UC 208-24	FL 208	1.47
45	UCFL 209	188	148	22	16	38.0	19	108	52.2	49.2	19.0	M 16	UC 209	FL 209	1.80
1-5/8	UCFL 209-26	7-13/32	5-53/64	55/64	5/8	1-1/2	3/4	4-1/4	2-1/16	1.9370	0.7480	5/8	UC 209-26	FL 209	1.90
50	UCFL 210	197	157	22	16	40.0	19	115	54.6	51.6	19.0	M 16	UC 210	FL 210	2.13
1-7/8	UCFL 210-30	7-3/4	6-3/16	55/64	5/8	1-37/64	3/4	4-17/32	2-5/32	2.0315	0.7480	5/8	UC 210-30	FL 210	2.20
55	UCFL 211	224	184	25	18	43.0	19	130	58.4	55.6	22.2	M 16	UC 211	FL 211	2.86
2	UCFL 211-32	8-13/16	7-1/4	63/64	45/64	1-11/16	3/4	5-1/8	2-19/64	2.1890	0.8740	5/8	UC 211-32	FL 211	3.01
60	UCFL 212	250	202	29	18	48.0	23	140	68.7	65.1	25.4	M 20	UC 212	FL 212	3.76
2-1/4	UCFL 212-36	9-27/32	7-61/64	1-9/64	45/64	1-57/64	29/32	5-3/64	2-45/64	2.5630	1.0000	3/4	UC 212-36	FL 212	3.90
65	UCFL 213	258	210	30	20	50.0	23	155	69.7	65.1	25.4	M 20	UC 213	FL 213	4.63
2-1/2	UCFL 213-40	10-5/32	8-17/64	1-3/16	25/32	1-31/32	29/32	6-7/64	2-3/4	2.5630	1.0000	3/4	UC 213-40	FL 213	4.71
70	UCFL 214	265	216	31	20	54.0	23	160	75.4	74.6	30.2	M 20	UC 214	FL 214	5.22
2-3/4	UCFL 214-44	10-7/16	8-1/2	1-7/32	25/32	2-1/8	29/32	6-19/64	2-31/32	2.9370	1.1890	3/4	UC 214-44	FL 214	5.23
75	UCFL 215	275	225	34	22	55.0	23	164	78.5	77.8	33.3	M 20	UC 215	FL 215	5.36
3	UCFL 215-48	10-53/64	8-55/64	1-11/32	25/32	2-13/64	29/32	6-1/2	3-3/32	3.0630	1.3110	3/4	UC 215-48	FL 215	5.28

Standard Duty Two Bolts Flanged Units Cast Housing Set Screws Type series UCFL 200



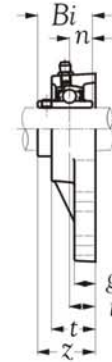
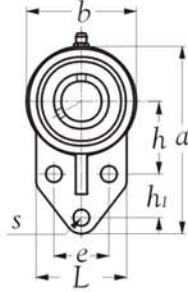
Shaft dia. mm inch	Unit number	Nominal dimensions										Bolt size mm inch	Bearing number	Housing number	Mass of unit kg
		mm inch													
		a	e	i	g	t	s	b	z	Bi	n				
80 3-1/8	UCFL 216	290	233	34	22	58.0	25	180	83.3	82.6	33.3	M 22	UC 216	FL 216	6.99
	UCFL 216-50	11-27/64	9-11/64	1-11/32	55/64	2-9/32	63/64	7-3/32	3-9/32	3.2520	1.3110	7/8	UC 216-50	FL 216	7.04
85 3-1/4	UCFL 217	305	248	36	22	63.0	25	190	87.6	85.7	34.1	M 22	UC 217	FL 217	8.28
	UCFL 217-52	12-1/64	9-49/64	1-27/64	55/64	2-31/64	63/64	7-31/64	3-29/64	3.3740	1.3425	7/8	UC 217-52	FL 217	8.50
90 3-1/2	UCFL 218	320	265	40	23	68.0	25	205	96.3	96.0	39.7	M 22	UC 218	FL 218	10.70
	UCFL 218-56	12-19/32	10-7/16	1-37/64	29/32	2-43/64	63/64	8-5/64	3-51/64	3.7800	1.5630	7/8	UC 218-56	FL 218	10.81

Standard Duty Two Bolts Flanged Units Cast Housing Adapter Type series UKFL 200



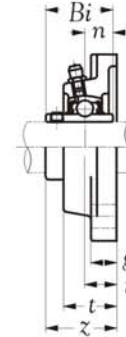
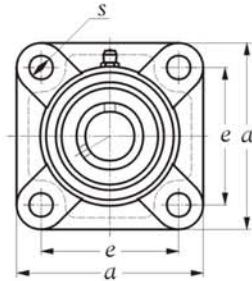
Shaft dia. mm	Unit number	Nominal dimensions									Bolt size mm	Bearing number	Housing number	Mass of unit kg
		<i>a</i>	<i>e</i>	<i>i</i>	<i>g</i>	<i>t</i>	<i>b</i>	<i>s</i>	<i>z</i>	<i>Bi</i>				
20	UKFL 205	130	99	16	13	27	68	16	35.5	35	M 14	UK 205	FL 205	0.54
25	UKFL 206	148	117	18	13	31	80	16	39.0	38	M 14	UK 206	FL 206	0.84
30	UKFL 207	161	130	19	14	34	90	16	42.5	43	M 14	UK 207	FL 207	1.04
35	UKFL 208	175	144	21	14	36	100	16	46.5	46	M 14	UK 208	FL 208	1.27
40	UKFL 209	188	148	22	16	38	108	19	48.5	50	M 16	UK 209	FL 209	1.65
45	UKFL 210	197	157	22	16	40	115	19	50.0	55	M 16	UK 210	FL 210	1.92
50	UKFL 211	224	184	25	18	43	130	19	54.5	59	M 16	UK 211	FL 211	2.51
55	UKFL 212	250	202	29	18	48	140	23	61.0	62	M 20	UK 212	FL 212	3.26
60	UKFL 213	258	210	30	20	50	155	23	64.0	65	M 20	UK 213	FL 213	4.13

Standard Duty Flanged Units Cast Housing Special Type Set Screws Type series UCFB 200



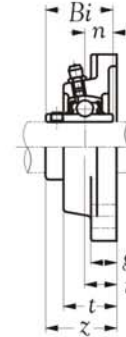
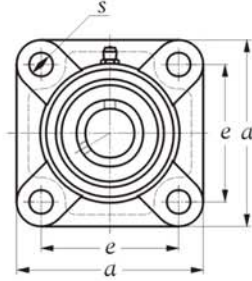
Shaft dia. mm inch	Unit number	Nominal dimensions														Bolt size mm inch	Bearing number	Housing number	Mass of unit kg
		mm inch																	
		a	e	i	g	t	s	h	h ₁	L	b	z	Bi	n					
12	UCFB 201	109	32	15	11	25.5	10	42	27	52	60	33.3	31.0	12.7	M 8	UC 201	FB 204	0.53	
1/2	UCFB 201-8	4-19/64	1-17/64	19/32	7/16	1	25/64	1-21/32	1-1/16	2-1/16	2-23/64	1-5/16	1.2205	0.5000	5/16	UC 201-8	FB 204	0.53	
15	UCFB 202	109	32	15	11	25.5	10	42	27	52	60	33.3	31.0	12.7	M 8	UC 202	FB 204	0.52	
5/8	UCFB 202-10	4-19/64	1-17/64	19/32	7/16	1	25/64	1-21/32	1-1/16	2-1/16	2-43/64	1-5/16	1.2205	0.5000	5/16	UC 202-10	FB 204	0.52	
17	UCFB 203	109	32	15	11	25.5	10	42	27	52	60	33.3	31.0	12.7	M 8	UC 203	FB 204	0.51	
11/16	UCFB 203-11	4-19/64	1-17/64	19/32	7/16	1	25/64	1-21/32	1-1/16	2-1/16	2-43/64	1-5/16	1.2205	0.5000	5/16	UC 203-11	FB 204	0.51	
20	UCFB 204	109	32	15	11	25.5	10	42	27	52	60	33.3	31.0	12.7	M 8	UC 204	FB 204	0.49	
3/4	UCFB 204-12	4-19/64	1-17/64	19/32	7/16	1	25/64	1-21/32	1-1/16	2-1/16	2-43/64	1-5/16	1.2205	0.5000	5/16	UC 204-12	FB 204	0.50	
25	UCFB 205	116	34	16	13	27.0	10	45	27	56	68	35.7	34.0	14.3	M 8	UC 205	FB 205	0.66	
1	UCFB 205-16	4-9/16	1-11/32	5/8	3/64	1-1/16	25/64	1-49/64	1-1/16	2-13/64	2-43/64	1-13/32	1.3386	0.5630	5/16	UC 205-16	FB 205	0.65	
30	UCFB 206	132	40	18	13	31.0	10	50	29	65	80	40.2	38.1	15.9	M 8	UC 206	FB 206	0.99	
1-1/8	UCFB 206-18	5-13/64	1-37/64	45/64	3/64	1-7/32	25/64	1-31/32	1-9/64	2-9/16	3-5/32	1-37/64	1.5000	0.6260	5/16	UC 206-18	FB 206	1.01	
1-1/4	UCFB 206-20	5-13/64	1-37/64	45/64	3/64	1-7/32	25/64	1-31/32	1-9/64	2-9/16	3-5/32	1-37/64	1.5000	0.6260	5/16	UC 206-20	FB 206	0.97	
35	UCFB 207	144	46	19	14	33.0	10	55	32	70	90	44.4	42.9	17.5	M 8	UC 207	FB 207	1.21	
1-1/4	UCFB 207-20	5-43/64	1-13/16	3/4	35/64	1-19/64	25/64	2-11/64	1-17/64	2-3/4	3-35/64	1-3/4	1.6890	0.6890	5/16	UC 207-20	FB 207	1.27	
1-3/8	UCFB 207-22	5-43/64	1-13/16	3/4	35/64	1-19/64	25/64	2-11/64	1-17/64	2-3/4	3-35/64	1-3/4	1.6890	0.6890	5/16	UC 207-22	FB 207	1.22	
40	UCFB 208	164	50	21	16	35.0	12	60	41	78	100	51.2	49.2	19.0	M 10	UC 208	FB 208	1.72	
1-1/2	UCFB 208-24	6-29/64	1-31/32	53/64	5/8	1-3/8	15/32	2-23/64	1-39/64	3-5/64	3-15/16	2-1/64	1.9370	0.7480	3/8	UC 208-24	FB 208	1.76	
45	UCFB 209	175	54	22	16	38.0	12	65	43	80	108	52.2	49.2	19.0	M 10	UC 209	FB 209	1.86	
1-5/8	UCFB 209-26	6-57/64	2-1/8	55/64	5/8	1-1/2	15/32	2-9/16	1-11/16	3-5/32	4-1/4	2-1/16	1.9370	0.7480	3/8	UC 209-26	FB 209	1.96	
50	UCFB 210	184	58	22	16	39.0	12	68	46	86	114	54.6	51.6	19.0	M 10	UC 210	FB 210	2.36	
1-7/8	UCFB 210-30	7-1/4	2-9/32	55/64	5/8	1-17/32	15/32	2-43/64	1-13/16	3-25/64	4-31/64	2-5/32	2.0315	0.7480	3/8	UC 210-30	FB 210	2.43	
55	UCFB 211	207	62	25	18	42.5	14	78	50	90	128	58.4	55.6	22.2	M 12	UC 211	FB 211	3.11	
2	UCFB 211-32	8-5/32	2-7/16	63/64	45/64	1-43/64	35/64	3-5/64	1-31/32	3-35/64	5-1/16	2-19/64	2.1890	0.8740	7/16	UC 211-32	FB 211	3.26	
60	UCFB 212	224	66	29	19	47.5	14	84	55	94	140	68.7	65.1	25.4	M 12	UC 212	FB 212	4.07	
2-1/4	UCFB 212-36	8-13/16	2-19/32	1-9/64	3/4	1-7/8	35/64	3-5/16	2-11/64	3-45/64	5-3/64	2-45/64	2.5630	1.0000	7/16	UC 212-36	FB 212	4.21	
65	UCFB 213	244	70	30	20	49.0	14	92	60	102	152	69.7	65.1	25.4	M 12	UC 213	FB 213	4.86	
2-1/2	UCFB 213-40	9-39/64	2-3/4	1-3/16	25/32	1-59/64	35/64	3-5/8	2-23/64	4-1/64	5-63/64	2-3/4	2.5630	1.0000	7/16	UC 213-40	FB 213	4.94	

Standard Duty Flanged Units Cast Housing Set Screws Type series UCF 200



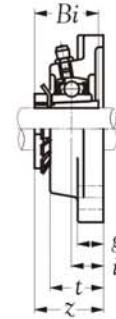
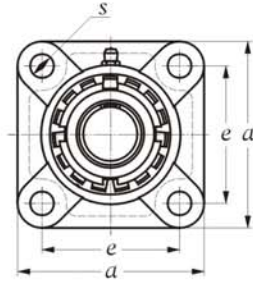
Shaft dia. mm inch	Unit number	Nominal dimensions									Bolt size mm inch	Bearing number	Housing number	Mass of unit kg
		mm inch												
		a	e	i	g	t	s	z	Bi	n				
12	UCF 201	86	64	15	12	25.5	12	33.3	31.0	12.7	M 10	UC 201	F 204	0.57
1/2	UCF 201-8	3-25/64	2-3/64	19/32	15/32	1	15/32	1-5/16	1.2205	0.5000	3/8	UC 201-8	F 204	0.57
15	UCF 202	86	64	15	12	25.5	12	33.3	31.0	12.7	M 10	UC 202	F 204	0.56
5/8	UCF 202-10	3-25/64	2-3/64	19/32	15/32	1	15/32	1-5/16	1.2205	0.5000	3/8	UC 202-10	F 204	0.56
17	UCF 203	86	64	15	12	25.5	12	33.3	31.0	12.7	M 10	UC 203	F 204	0.55
11/16	UCF 203-11	3-25/64	2-3/64	19/32	15/32	1	15/32	1-5/16	1.2205	0.5000	3/8	UC 203-11	F 204	0.55
20	UCF 204	86	64	15	12	25.5	12	33.3	31.0	12.7	M 10	UC 204	F 204	0.53
3/4	UCF 204-12	3-25/64	2-3/64	19/32	15/32	1	15/32	1-5/16	1.2205	0.5000	3/8	UC 204-12	F 204	0.54
25	UCF 205	95	70	16	13	27.0	12	35.7	34.0	14.3	M 10	UC 205	F 205	0.74
1	UCF 205-16	3-47/64	2-3/4	5/8	3/64	1-1/16	15/32	1-13/32	1.3386	0.5630	3/8	UC 205-16	F 205	0.73
30	UCF 206	108	83	18	13	31.0	12	40.2	38.1	15.9	M 10	UC 206	F 206	1.05
1-1/8	UCF 206-18	4-1/4	3-17/64	45/64	3/64	1-7/32	15/32	1-37/64	1.5000	0.6260	3/8	UC 206-18	F 206	1.07
1-1/4	UCF 206-20	4-1/4	3-17/64	45/64	3/64	1-7/32	15/32	1-37/64	1.5000	0.6260	3/8	UC 206-20	F 206	1.03
35	UCF 207	117	92	19	15	34.0	14	44.4	42.9	17.5	M 12	UC 207	F 207	1.34
1-1/4	UCF 207-20	4-39/64	3-5/8	3/4	19/32	1-11/32	35/64	1-3/4	1.6890	0.6890	7/16	UC 207-20	F 207	1.40
1-3/8	UCF 207-22	4-39/64	3-5/8	3/4	19/32	1-11/32	35/64	1-3/4	1.6890	0.6890	7/16	UC 207-22	F 207	1.35
40	UCF 208	130	102	21	15	36.0	16	51.2	49.2	19.0	M 14	UC 208	F 208	1.77
1-1/2	UCF 208-24	5-1/8	4-1/64	53/64	19/32	1-27/64	5/8	2-1/64	1.9370	0.7480	1/2	UC 208-24	F 208	1.81
45	UCF 209	137	105	22	16	38.0	16	52.2	49.2	19.0	M 14	UC 209	F 209	2.05
1-5/8	UCF 209-26	5-25/64	4-9/64	55/64	5/8	1-1/2	5/8	2-1/16	1.9370	0.7480	1/2	UC 209-26	F 209	2.15
50	UCF 210	143	111	22	16	40.0	16	54.6	51.6	19.0	M 14	UC 210	F 210	2.35
1-7/8	UCF 210-30	5-5/8	4-3/8	55/64	5/8	1-37/64	5/8	2-5/32	2.0315	0.7480	1/2	UC 210-30	F 210	2.42
55	UCF 211	162	130	25	18	43.0	19	58.4	55.6	22.2	M 16	UC 211	F 211	3.00
2	UCF 211-32	6-3/8	5-1/8	63/64	45/64	1-11/16	3/4	2-19/64	2.1890	0.8740	5/8	UC 211-32	F 211	3.15
60	UCF 212	175	143	29	18	48.0	19	68.7	65.1	25.4	M 16	UC 212	F 212	3.57
2-1/4	UCF 212-36	6-57/64	5-5/8	1-9/64	45/64	1-57/64	3/4	2-45/64	2.5630	1.0000	5/8	UC 212-36	F 212	3.71
65	UCF 213	187	149	30	22	50.0	19	69.7	65.1	25.4	M 16	UC 213	F 213	4.92
2-1/2	UCF 213-40	7-23/64	5-55/64	1-3/16	55/64	1-31/32	3/4	2-3/4	2.5630	1.0000	5/8	UC 213-40	F 213	5.00
70	UCF 214	193	152	31	22	54.0	19	75.4	74.6	30.2	M 16	UC 214	F 214	5.62
2-3/4	UCF 214-44	7-19/32	5-63/64	1-7/32	55/64	2-1/8	3/4	2-31/32	2.9370	1.1890	5/8	UC 214-44	F 214	5.63
75	UCF 215	200	159	34	22	56.0	19	78.5	77.8	33.3	M 16	UC 215	F 215	5.55
3	UCF 215-48	7-7/8	6-17/64	1-11/32	55/64	2-13/64	3/4	3-3/32	3.0630	1.3110	5/8	UC 215-48	F 215	5.47

Standard Duty Flanged Units Cast Housing Set Screws Type series UCF 200



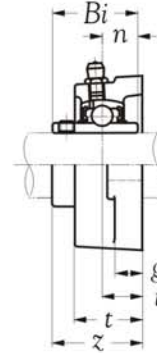
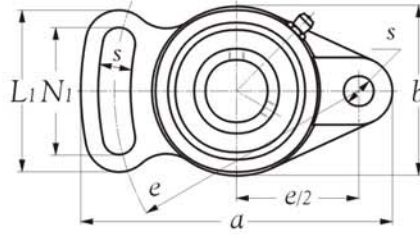
Shaft dia. mm inch	Unit number	Nominal dimensions									Bolt size mm inch	Bearing number	Housing number	Mass of unit kg
		mm inch												
		a	e	i	g	t	s	z	Bi	n				
80 3-1/8	UCF 216	208	165	34	24	58.0	23	83.3	82.6	33.3	M 20	UC 216	F 216	6.99
	UCF 216-50	8-3/16	6-1/2	1-11/32	15/16	2-9/32	29/32	3-9/32	3.2520	1.3110	3/4	UC 216-50	F 216	7.04
85 3-1/4	UCF 217	220	175	36	26	63.0	23	87.6	85.7	34.1	M 20	UC 217	F 217	8.58
	UCF 217-52	8-21/32	6-57/64	1-27/64	1-1/64	2-31/64	29/32	3-29/64	3.3740	1.3425	3/4	UC 217-52	F 217	8.80
90 3-1/2	UCF 218	235	187	40	26	68.0	23	96.3	96.0	39.7	M 20	UC 218	F 218	11.20
	UCF 218-56	9-1/4	7-23/64	1-37/64	1-1/64	2-43/64	29/32	3-51/64	3.7800	1.5630	3/4	UC 218-56	F 218	11.31

Standard Duty Flanged Units Cast Housing Adapter Type series UKF 200



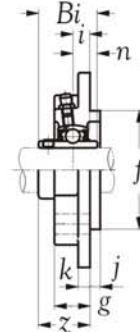
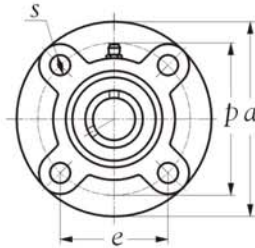
Shaft dia. mm	Unit number	Nominal dimensions								Bolt size mm	Bearing number	Housing number	Mass of unit kg
		inch											
		<i>a</i>	<i>e</i>	<i>i</i>	<i>g</i>	<i>t</i>	<i>s</i>	<i>z</i>	<i>Bi</i>				
20	UKF 205	95	70	16	13	27	12	35.5	35	M 10	UK 205	F 205	0.68
25	UKF 206	108	83	18	13	31	12	39.0	38	M 10	UK 206	F 206	0.98
30	UKF 207	117	92	19	15	34	14	42.5	43	M 12	UK 207	F 207	1.24
35	UKF 208	130	102	21	15	36	16	46.5	46	M 14	UK 208	F 208	1.61
40	UKF 209	137	105	22	16	38	16	48.5	50	M 14	UK 209	F 209	1.90
45	UKF 210	143	111	22	16	40	16	50.0	55	M 14	UK 210	F 210	2.14
50	UKF 211	162	130	25	18	43	19	54.5	59	M 16	UK 211	F 211	2.65
55	UKF 212	175	143	29	18	48	19	61.0	62	M 16	UK 212	F 212	3.07
60	UKF 213	187	149	30	22	50	19	64.0	65	M 16	UK 213	F 213	4.42

Standard Duty Flanged Units Cast Housing Special Type Set Screws Type series UCFA 200



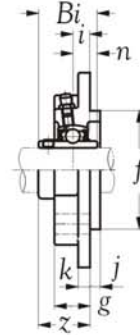
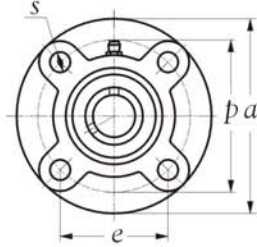
Shaft dia. mm inch	Unit number	Nominal dimensions													Bolt size mm inch	Bearing number	Housing number	Mass of unit kg
		mm inch																
		a	e	i	g	t	s	N ₁	b	L ₁	z	Bi	n					
12	UCFA 201	102	78	15	12	25.5	10	40	60	54	33.3	31.0	12.7	M 8	UC 201	FA 204	0.49	
1/2	UCFA 201-8	4-1/64	3-5/64	19/32	15/32	1	25/64	1-37/64	2-23/64	2-1/8	1-5/16	1.2205	0.5000	5/16	UC 201-8		0.49	
15	UCFA 202	102	78	15	12	25.5	10	40	60	54	33.3	31.0	12.7	M 8	UC 202	FA 204	0.48	
5/8	UCFA 202-10	4-1/64	3-5/64	19/32	15/32	1	25/64	1-37/64	2-23/64	2-1/8	1-5/16	1.2205	0.5000	5/16	UC 202-10		0.48	
17	UCFA 203	102	78	15	12	25.5	10	40	60	54	33.3	31.0	12.7	M 8	UC 203	FA 204	0.47	
11/16	UCFA 203-11	4-1/64	3-5/64	19/32	15/32	1	25/64	1-37/64	2-23/64	2-1/8	1-5/16	1.2205	0.5000	5/16	UC 203-11		0.47	
20	UCFA 204	102	78	15	12	25.5	10	40	60	54	33.3	31.0	12.7	M 8	UC 204	FA 204	0.45	
3/4	UCFA 204-12	4-1/64	3-5/64	19/32	15/32	1	25/64	1-37/64	2-23/64	2-1/8	1-5/16	1.2205	0.5000	5/16	UC 204-12		0.46	
25	UCFA 205	125	98	16	14	27.0	12	51	68	65	34.7	34.0	14.3	M 10	UC 205	FA 205	0.64	
1	UCFA 205-16	4-9/64	3-55/64	5/8	35/64	1-1/16	15/32	2-1/64	2-43/64	2-9/16	1-23/64	1.3386	0.5630	3/8	UC 205-16		0.63	
30	UCFA 206	144	117	18	14	31.0	12	58	80	72	40.2	38.1	15.9	M 10	UC 206		0.92	
1-1/8	UCFA 206-18	5-43/64	4-39/64	45/64	35/64	1-7/32	15/32	2-9/32	3-5/32	2-53/64	1-37/64	1.5000	0.6260	3/8	UC 206-18	FA 206	0.94	
1-1/4	UCFA 206-20														UC 206-20		0.90	
35	UCFA 207	161	130	19	16	34.0	14	66	90	82	45.4	42.9	17.5	M 12	UC 207		1.27	
1-1/4	UCFA 207-20	6-11/32	5-1/8	3/4	5/8	1-11/32	35/64	2-19/32	3-35/64	3-15/64	1-25/32	1.6890	0.6890	7/16	UC 207-20	FA 207	1.33	
1-3/8	UCFA 207-22														UC 207-22		1.28	
40	UCFA 208	175	144	21	16	36.0	14	71	100	87	52.2	49.2	19.0	M 12	UC 208	FA 208	1.62	
1-1/2	UCFA 208-24	6-57/64	5-43/64	53/64	5/8	1-27/64	35/64	2-51/64	3-15/16	3-27/64	2-1/16	1.9370	0.7480	7/16	UC 208-24		1.66	
45	UCFA 209	178	146	22	16	38.0	16	72	108	88	52.2	49.2	19.0	M 14	UC 209	FA 209	1.84	
1-5/8	UCFA 209-26	7-1/64	5-3/4	55/64	5/8	1-1/2	5/8	2-53/64	4-1/4	3-15/32	2-1/16	1.9370	0.7480	1/2	UC 209-26		1.94	
50	UCFA 210	188	155	22	16	39.0	16	75	114	92	54.6	51.6	19.0	M 14	UC 210	FA 210	2.10	
1-7/8	UCFA 210-30	7-13/32	6-7/64	55/64	5/8	1-17/32	5/8	2-61/64	4-31/64	3-5/8	2-5/32	2.0315	0.7480	1/2	UC 210-30		2.17	
55	UCFA 211	216	182	25	18	42.5	16	84	128	102	58.4	55.6	22.2	M 14	UC 211	FA 211	2.16	
2	UCFA 211-32	8-1/2	7-11/64	63/64	45/64	1-43/64	5/8	3-5/16	5-1/16	4-1/64	2-19/64	2.1890	0.8740	1/2	UC 211-32		2.31	
60	UCFA 212	238	202	29	19	47.5	18	104	140	122	68.7	65.1	25.4	M 16	UC 212	FA 212	2.92	
2-1/4	UCFA 212-36	9-3/8	7-61/64	1-9/64	3/4	1-7/8	45/64	4-3/32	5-3/64	4-51/64	2-45/64	2.5630	1.0000	5/8	UC 212-36		3.06	
65	UCFA 213	248	210	30	20	49.0	18	106	152	126	69.7	65.1	25.4	M 16	UC 213	FA 213	3.61	
2-1/2	UCFA 213-40	9-49/64	8-17/64	1-3/16	25/32	1-59/64	45/64	4-11/64	5-63/64	4-61/64	2-3/4	2.5630	1.0000	5/8	UC 213-40		3.69	

Standard Duty Flanged Cartridge Units Cast Housing Set Screws Type series UCFC 200



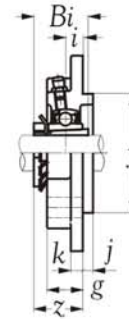
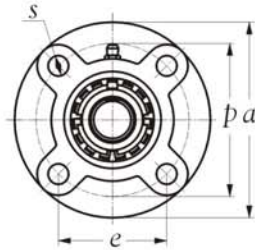
Shaft dia. mm inch	Unit number	Nominal dimensions											Bolt size mm inch	Bearing number	Housing number	Mass of unit kg	
		mm inch															
		a	p	e	i	s	j	k	g	f	z	Bi					n
12	UCFC 201	100	78	55.1	10	12	5	6	20.5	62	28.3	31.0	12.7	M 10	UC 201	FC 204	0.73
1/2	UCFC 201-8	3-15/16	3-5/16	2-11/64	25/64	15/32	13/64	15/64	13/16	2-7/16	1-7/64	1.2205	0.5000	3/8	UC 201-8	FC 204	0.73
15	UCFC 202	100	78	55.1	10	12	5	6	20.5	62	28.3	31.0	12.7	M 10	UC 202	FC 204	0.72
5/8	UCFC 202-10	3-15/16	3-5/16	2-11/64	25/64	15/32	13/64	15/64	13/16	2-7/16	1-7/64	1.2205	0.5000	3/8	UC 202-10	FC 204	0.72
17	UCFC 203	100	78	55.1	10	12	5	6	20.5	62	28.3	31.0	12.7	M 10	UC 203	FC 204	0.71
11/16	UCFC 203-11	3-15/16	3-5/16	2-11/64	25/64	15/32	13/64	15/64	13/16	2-7/16	1-7/64	1.2205	0.5000	3/8	UC 203-11	FC 204	0.71
20	UCFC 204	100	78	55.1	10	12	5	6	20.5	62	28.3	31.0	12.7	M 10	UC 204	FC 204	0.69
3/4	UCFC 204-12	3-15/16	3-5/16	2-11/64	25/64	15/32	13/64	15/64	13/16	2-7/16	1-7/64	1.2205	0.5000	3/8	UC 204-12	FC 204	0.70
25	UCFC 205	115	90	63.6	10	12	6	7	21.0	70	29.7	34.0	14.3	M 10	UC 205	FC 205	0.99
1	UCFC 205-16	4-17/32	3-35/64	2-1/2	25/64	15/32	15/64	9/32	53/64	2-3/4	1-11/64	1.3386	0.5630	3/8	UC 205-16	FC 205	0.98
30	UCFC 206	125	100	70.7	10	12	8	8	23.0	80	32.2	38.1	15.9	M 10	UC 206		1.25
1-1/8	UCFC 206-18	4-59/64	3-15/16	2-25/32	25/64	15/32	5/16	5/16	29/32	3-5/32	1-17/64	1.5000	0.6260	3/8	UC 206-18	FC 206	1.27
1-1/4	UCFC 206-20	4-59/64	3-15/16	2-25/32	25/64	15/32	5/16	5/16	29/32	3-5/32	1-17/64	1.5000	0.6260	3/8	UC 206-20	FC 206	1.23
35	UCFC 207	135	110	77.8	11	14	8	9	26.0	90	36.4	42.9	17.5	M 12	UC 207		1.64
1-1/4	UCFC 207-20	5-5/16	4-21/64	3-1/16	7/16	35/64	5/16	23/64	1-1/64	3-35/64	1-7/16	1.6890	0.6890	7/16	UC 207-20	FC 207	1.70
1-3/8	UCFC 207-22	5-5/16	4-21/64	3-1/16	7/16	35/64	5/16	23/64	1-1/64	3-35/64	1-7/16	1.6890	0.6890	7/16	UC 207-22	FC 207	1.65
40	UCFC 208	145	120	84.8	11	14	10	9	26.0	100	41.2	49.2	19.0	M 12	UC 208	FC 208	2.01
1-1/2	UCFC 208-24	5-45/64	4-23/32	3-11/32	7/16	35/64	25/64	23/64	1-1/64	3-15/16	1-5/8	1.9370	0.7480	7/16	UC 208-24	FC 208	2.05
45	UCFC 209	160	132	93.3	10	16	12	10	26.0	105	40.2	49.2	19.0	M 14	UC 209	FC 209	2.57
1-5/8	UCFC 209-26	6-19/64	5-13/64	3-43/64	25/64	5/8	15/32	25/64	1-1/64	4-9/64	1-37/64	1.9370	0.7480	1/2	UC 209-26	FC 209	2.67
6	UCFC 210	165	138	97.6	10	16	12	14	28.0	110	42.6	51.6	19.0	M 14	UC 210	FC 210	2.85
1-7/8	UCFC 210-30	6-1/2	5-7/16	3-27/32	25/64	5/8	15/32	35/64	1-7/64	4-21/64	1-43/64	2.0315	0.7480	1/2	UC 210-30	FC 210	2.92
55	UCFC 211	185	150	106.1	13	19	12	13	30.0	125	46.4	55.6	22.2	M 16	UC 211	FC 211	3.92
2	UCFC 211-32	7-9/32	5-29/32	4-11/64	3/64	3/4	15/32	3/64	1-3/16	4-59/64	1-53/64	2.1890	0.8740	5/8	UC 211-32	FC 211	4.07
60	UCFC 212	195	160	113.1	17	19	12	15	36.0	135	56.7	65.1	25.4	M 16	UC 212	FC 212	5.03
2-1/4	UCFC 212-36	7-43/64	6-19/64	4-29/64	43/64	3/4	15/32	19/32	1-27/64	5-5/16	2-15/64	2.5630	1.0000	5/8	UC 212-36	FC 212	5.17
65	UCFC 213	205	170	120.2	16	19	14	15	35.0	145	55.7	65.1	25.4	M 16	UC 213	FC 213	5.52
2-1/2	UCFC 213-40	8-5/64	6-11/16	4-47/64	5/8	3/4	35/64	19/32	1-3/8	5-45/64	2-3/16	2.5630	1.0000	5/8	UC 213-40	FC 213	5.60
70	UCFC 214	215	177	125.1	17	19	14	16	38.0	150	61.4	74.6	30.2	M 16	UC 214	FC 214	6.55
2-3/4	UCFC 214-44	8-15/32	6-31/32	4-59/64	43/64	3/4	35/64	5/8	1-1/2	5-29/32	2-27/64	2.9370	1.1890	5/8	UC 214-44	FC 214	6.56
75	UCFC 215	220	184	130.1	18	19	16	17	39.0	160	62.5	77.8	33.3	M 16	UC 215	FC 215	7.01
3	UCFC 215-48	8-21/32	7-1/4	5-1/8	45/64	3/4	5/8	43/64	1-17/32	6-19/64	2-29/64	3.0630	1.3110	5/8	UC 215-48	FC 215	6.93

Standard Duty Flanged Cartridge Units Cast Housing Set Screws Type series UCFC 200



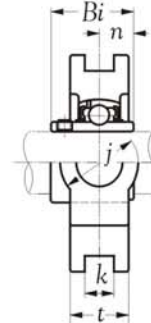
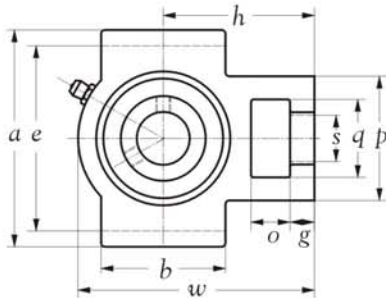
Shaft dia. mm inch	Unit number	Nominal dimensions												Bolt size mm inch	Bearing number	Housing number	Mass of unit kg
		mm inch															
		a	p	e	i	s	j	k	g	f	z	Bi	n				
80 3-1/8	UCFC 216	240	200	141.4	18	23	16	18	42.0	170	67.3	82.6	33.3	M 20	UC 216	FC 216	8.94
	UCFC 216-50	9-29/64	7-7/8	5-9/16	45/64	29/32	5/8	45/64	1-21/32	6-11/16	2-21/32	3.2520	1.3110	3/4	UC 216-50		8.99
85 3-1/4	UCFC 217	250	208	147.1	18	23	18	20	45.0	180	69.6	85.7	34.1	M 20	UC 217	FC 217	10.68
	UCFC 217-52	9-27/32	8-3/16	5-51/64	45/64	29/32	45/64	25/32	1-49/64	7-3/32	2-47/64	3.3740	1.3425	3/4	UC 217-52		10.90
90 3-1/2	UCFC 218	265	220	155.5	22	23	18	20	50.0	190	78.3	96.0	39.7	M 20	UC 218	FC 218	12.95
	UCFC 218-56	10-7/16	8-21/32	6-1/8	55/64	29/32	45/64	25/32	1-31/32	7-31/64	3-5/64	3.7800	1.5630	3/4	UC 218-56		13.06

Standard Duty Flanged Cartridge Units Housing Adapter Type series UKFC 200



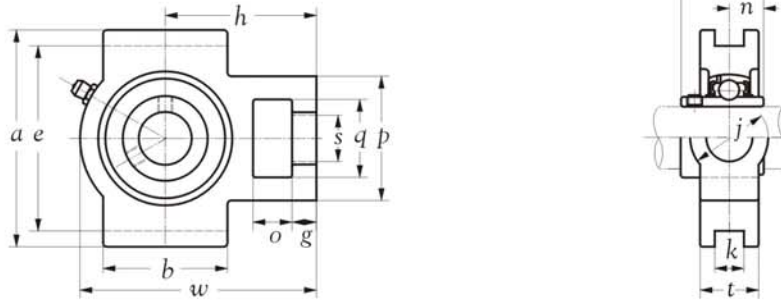
Shaft dia. mm	Unit number	Nominal dimensions											Bolt size mm	Bearing number	Housing number	Mass of unit kg
		<i>a</i>	<i>p</i>	<i>e</i>	<i>i</i>	<i>s</i>	mm		<i>j</i>	<i>k</i>	<i>g</i>	<i>f</i>				
20	UKFC 205	115	90	63.6	10	12	6	7	21	70	29.5	35	M 10	UK 205	FC 205	0.93
25	UKFC 206	125	100	70.7	10	12	8	8	23	80	31.0	38	M 10	UK 206	FC 206	1.18
30	UKFC 207	135	110	77.8	11	14	8	9	26	90	34.5	43	M 12	UK 207	FC 207	1.54
35	UKFC 208	145	120	84.8	11	14	10	9	26	100	36.5	46	M 12	UK 208	FC 208	1.85
40	UKFC 209	160	132	93.3	10	16	12	10	26	105	36.5	50	M 14	UK 209	FC 209	2.42
45	UKFC 210	165	138	97.6	10	16	12	14	28	110	38.0	55	M 14	UK 210	FC 210	2.64
50	UKFC 211	185	150	106.1	13	19	12	13	30	125	42.5	59	M 16	UK 211	FC 211	3.57
55	UKFC 212	195	160	113.1	17	19	12	15	36	135	49.0	62	M 16	UK 212	FC 212	4.53
60	UKFC 213	205	170	120.2	16	19	14	15	35	145	50.0	65	M 16	UK 213	FC 213	5.02

Standard Duty Take-up Units Cast Housing Set Screws Type series UCT 200



Shaft dia. mm inch	Unit number	Nominal dimensions														Bearing number	Housing number	Mass of unit kg	
		mm inch																	
		o	g	p	q	s	b	k	e	a	w	j	t	h	Bi				n
12	UCT 201	16	10	51	32	19	51	12	76	89	94	32	21	61	31.0	12.7	UC 201	T 204	0.77
1/2	UCT 201-8	5/8	25/64	2-1/64	1-17/64	3/4	2-1/64	15/32	2-63/64	3-1/2	3-45/64	1-17/64	53/64	2-13/32	1.2205	0.5000	UC 201-8	T 204	0.77
15	UCT 202	16	10	51	32	19	51	12	76	89	94	32	21	61	31.0	12.7	UC 202	T 204	0.76
5/8	UCT 202-10	5/8	25/64	2-1/64	1-17/64	3/4	2-1/64	15/32	2-63/64	3-1/2	3-45/64	1-17/64	53/64	2-13/32	1.2205	0.5000	UC 202-10	T 204	0.76
17	UCT 203	16	10	51	32	19	51	12	76	89	94	32	21	61	31.0	12.7	UC 203	T 204	0.75
11/16	UCT 203-11	5/8	25/64	2-1/64	1-17/64	3/4	2-1/64	15/32	2-63/64	3-1/2	3-45/64	1-17/64	53/64	2-13/32	1.2205	0.5000	UC 203-11	T 204	0.75
20	UCT 204	16	10	51	32	19	51	12	76	89	94	32	21	61	31.0	12.7	UC 204	T 204	0.73
3/4	UCT 204-12	5/8	25/64	2-1/64	1-17/64	3/4	2-1/64	15/32	2-63/64	3-1/2	3-45/64	1-17/64	53/64	2-13/32	1.2205	0.5000	UC 204-12	T 204	0.74
25	UCT 205	16	10	51	32	19	51	12	76	89	97	32	24	62	34.0	14.3	UC 205	T 205	0.83
1	UCT 205-16	5/8	25/64	2-1/64	1-17/64	3/4	2-1/64	15/32	2-63/64	3-1/2	3-13/16	1-17/64	15/16	2-7/16	1.3385	0.5630	UC 205-16	T 205	0.82
30	UCT 206	16	10	56	37	22	57	12	89	102	113	37	28	70	38.1	15.9	UC 206	T 206	1.26
1-1/8	UCT 206-18	5/8	25/64	2-13/64	1-29/64	55/64	2-1/4	15/32	3-1/2	4-1/4	4-29/64	1-29/64	1-7/64	2-3/4	1.5000	0.6260	UC 206-18	T 206	1.28
1-1/4	UCT 206-20	5/8	25/64	2-13/64	1-29/64	55/64	2-1/4	15/32	3-1/2	4-1/4	4-29/64	1-29/64	1-7/64	2-3/4	1.5000	0.6260	UC 206-20	T 206	1.24
35	UCT 207	16	13	64	37	22	64	12	89	102	129	37	30	78	42.9	17.5	UC 207	T 207	1.58
1-1/4	UCT 207-20	5/8	3/64	2-3/64	1-29/64	55/64	2-3/64	15/32	3-1/2	4-1/4	5-5/64	1-29/64	1-3/16	3-5/64	1.6890	0.6890	UC 207-20	T 207	1.64
1-3/8	UCT 207-22	5/8	3/64	2-3/64	1-29/64	55/64	2-3/64	15/32	3-1/2	4-1/4	5-5/64	1-29/64	1-3/16	3-5/64	1.6890	0.6890	UC 207-22	T 207	1.59
40	UCT 208	19	16	83	49	29	83	16	102	114	144	49	33	88	49.2	19.0	UC 208	T 208	2.31
1-1/2	UCT 208-24	3/4	5/8	3-17/64	1-59/64	1-9/64	3-17/64	5/8	4-1/64	4-31/64	5-43/64	1-59/64	1-19/64	3-15/32	1.9370	0.7480	UC 208-24	T 208	2.35
45	UCT 209	19	16	83	49	29	83	16	102	117	144	49	35	87	49.2	19.0	UC 209	T 209	2.28
1-5/8	UCT 209-26	3/4	5/8	3-17/64	1-59/64	1-9/64	3-17/64	5/8	4-1/64	4-39/64	5-43/64	1-59/64	1-3/8	3-27/64	1.9370	0.7480	UC 209-26	T 209	2.38
50	UCT 210	19	16	83	49	29	86	16	102	117	149	49	37	90	51.6	19.0	UC 210	T 210	2.50
1-7/8	UCT 210-30	3/4	5/8	3-17/64	1-59/64	1-9/64	3-25/64	5/8	4-1/64	4-39/64	5-55/64	1-59/64	1-29/64	3-35/64	2.0315	0.7480	UC 210-30	T 210	2.57
55	UCT 211	25	19	102	64	35	95	22	130	146	171	64	38	106	55.6	22.2	UC 211	T 211	3.79
2	UCT 211-32	63/64	3/4	4-1/64	2-3/64	1-3/8	3-47/64	55/64	5-1/8	5-3/4	6-47/64	2-3/64	1-1/2	4-11/64	2.1890	0.8740	UC 211-32	T 211	3.94
60	UCT 212	32	19	102	64	35	102	22	130	146	194	64	42	119	65.1	25.4	UC 212	T 212	4.79
2-1/4	UCT 212-36	1-17/64	3/4	4-1/64	2-3/64	1-3/8	4-1/64	55/64	5-1/8	5-3/4	7-41/64	2-3/64	1-21/32	4-11/16	2.5630	1.0000	UC 212-36	T 212	4.93
65	UCT 213	32	21	111	70	41	121	26	151	167	224	70	44	137	65.1	25.4	UC 213	T 213	6.66
2-1/2	UCT 213-40	1-17/64	53/64	4-3/8	2-3/4	1-39/64	4-49/64	1-1/64	5-15/16	6-37/64	8-13/16	2-3/4	1-47/64	5-25/64	2.5630	1.0000	UC 213-40	T 213	6.74
70	UCT 214	32	21	111	70	41	121	26	151	167	224	70	46	137	74.6	30.2	UC 214	T 214	6.75
2-3/4	UCT 214-44	1-17/64	53/64	4-3/8	2-3/4	1-39/64	4-49/64	1-1/64	5-15/16	6-37/64	8-13/16	2-3/4	1-13/16	5-25/64	2.9370	1.1890	UC 214-44	T 214	6.76
75	UCT 215	32	21	111	70	41	121	26	151	167	232	70	48	140	77.8	33.3	UC 215	T 215	7.11
3	UCT 215-48	1-17/64	53/64	4-3/8	2-3/4	1-39/64	4-49/64	1-1/64	5-15/16	6-37/64	9-9/64	2-3/4	1-57/64	5-3/64	3.0630	1.3110	UC 215-48	T 215	7.03

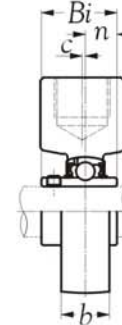
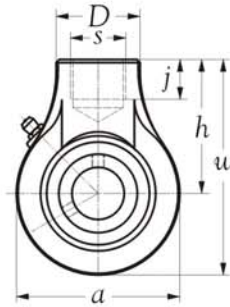
Standard Duty Take-up Units Cast Housing Set Screws Type series UCT 200



Shaft dia. mm inch	Unit number	Nominal dimensions														Bearing number	Housing number	Mass of unit kg	
		mm inch																	
		o	g	p	q	s	b	k	e	a	w	j	t	h	Bi				n
80 3-1/8	UCT 216	32	21	111	70	41	121	26	165	184	235	70	51	140	82.6	33.3	UC 216	T 216	8.19
	UCT 216-50	1-17/64	53/64	4-3/8	2-3/4	1-39/64	4-49/64	1-1/64	6-1/2	7-1/4	9-1/4	2-3/4	2-1/64	5-3/64	3.2520	1.3110	UC 216-50		8.24
85 3-1/4	UCT 217	38	29	124	73	48	157	30	173	198	260	73	54	162	85.7	34.1	UC 217	T 217	10.58
	UCT 217-52	1-1/2	1-9/64	4-7/8	2-7/8	1-57/64	6-3/16	1-3/16	6-13/16	7-51/64	10-15/64	2-7/8	2-1/8	6-3/8	3.3740	1.3425	UC 217-52		10.80

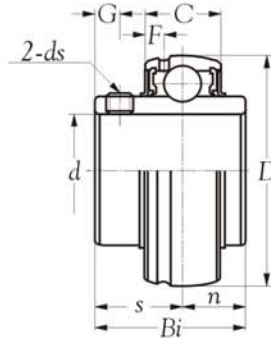


Standard Duty Hanger Units Set Screws Type series UCHA 200



Shaft dia. mm inch	Unit number	Nominal dimensions										Bearing number	Housing number	Mass of unit kg
		mm inch												
		a	w	c	b	h	s	D	j	Bi	n			
12	UCHA 201	64	96.0	0	22	64	RP 3/4	40	19	31.0	12.7	UC 201	HA 204	0.66
1/2	UCHA 201-8	2-3/64	3-25/32	0	55/64	2-3/64	RP 3/4	1-37/64	3/4	1.2205	0.5000	UC 201-8		0.66
15	UCHA 202	64	96.0	0	22	64	RP 3/4	40	19	31.0	12.7	UC 202	HA 204	0.65
5/8	UCHA 202-10	2-3/64	3-25/32	0	55/64	2-3/64	RP 3/4	1-37/64	3/4	1.2205	0.5000	UC 202-10		0.65
17	UCHA 203	64	96.0	0	22	64	RP 3/4	40	19	31.0	12.7	UC 203	HA 204	0.64
11/16	UCHA 203-11	2-3/64	3-25/32	0	55/64	2-3/64	RP 3/4	1-37/64	3/4	1.2205	0.5000	UC 203-11		0.64
20	UCHA 204	64	96.0	0	22	64	RP 3/4	40	19	31.0	12.7	UC 204	HA 204	0.62
3/4	UCHA 204-12	2-3/64	3-25/32	0	55/64	2-3/64	RP 3/4	1-37/64	3/4	1.2205	0.5000	UC 204-12		0.63
25	UCHA 205	78	103.0	0	23	64	RP 3/4	40	19	34.0	14.3	UC 205	HA 205	0.83
1	UCHA 205-16	3-5/64	4-1/16	0	29/32	2-3/64	RP 3/4	1-37/64	3/4	1.3386	0.5630	UC 205-16		0.82
30	UCHA 206	78	103.0	0	25	64	RP 3/4	40	19	38.1	15.9	UC 206	HA 206	0.78
1-1/8	UCHA 206-18	3-5/64	4-1/16	0	63/64	2-3/64	RP 3/4	1-37/64	3/4	1.5000	0.6260	UC 206-18		0.80
1-1/4	UCHA 206-20	3-5/64	4-1/16	0	63/64	2-3/64	RP 3/4	1-37/64	3/4	1.5000	0.6260	UC 206-20		0.76
35	UCHA 207	92	116.0	0	26	70	RP 3/4	40	19	42.9	17.5	UC 207	HA 207	1.11
1-1/4	UCHA 207-20	3-5/8	4-9/16	0	1-1/64	2-3/4	RP 3/4	1-37/64	3/4	1.6890	0.6890	UC 207-20		1.17
1-3/8	UCHA 207-22	3-5/8	4-9/16	0	1-1/64	2-3/4	RP 3/4	1-37/64	3/4	1.6890	0.6890	UC 207-22		1.12
40	UCHA 208	96	121.0	2.0	30	73	RP 3/4	40	19	49.2	19.0	UC 208	HA 208	1.25
1-1/2	UCHA 208-24	3-25/32	4-49/64	5/64	1-3/16	2-7/8	RP 3/4	1-37/64	3/4	1.9370	0.7480	UC 208-24		1.29
45	UCHA 209	108	136.0	5.0	30	82	RP 1	48	21	49.2	19.0	UC 209	HA 209	1.65
1-5/8	UCHA 209-26	4-1/4	5-23/64	13/64	1-3/16	3-15/64	RP 1	1-57/64	53/64	1.9370	0.7480	UC 209-26		1.75
50	UCHA 210	115	140.5	5.0	32	83	RP 1	48	21	51.6	19.0	UC 210	HA 210	1.95
1-7/8	UCHA 210-30	4-17/32	5-17/32	13/64	1-17/64	3-17/64	RP 1	1-57/64	53/64	2.0315	0.7480	UC 210-30		2.02
55	UCHA 211	126	150.0	7.0	33	87	RP 1-1/4	60	24	55.6	22.2	UC 211	HA 211	2.48
2	UCHA 211-32	4-61/64	5-29/32	9/32	1-19/64	3-27/64	RP 1-1/4	2-23/64	15/16	2.1890	0.874	UC 211-32		2.63
60	UCHA 212	142	173.0	9.0	36	102	RP 1-1/4	60	28	65.1	25.4	UC 212	HA 212	3.59
2-1/4	UCHA 212-36	5-19/32	6-13/16	23/64	1-27/64	4-1/64	RP 1-1/4	2-23/64	1-7/64	2.5630	1.0000	UC 212-36		3.73
65	UCHA 213	166	200.0	9.5	38	117	RP 1-1/2	70	32	65.1	25.4	UC 213	HA 213	5.37
2-1/2	UCHA 213-40	6-17/32	7-7/8	3/8	1-1/2	4-39/64	RP 1-1/2	2-3/4	1-17/64	2.5630	1.0000	UC 213-40		5.45

Standard Duty Spherical Outside Surface Ball Bearings Set Screws Type series UC 200

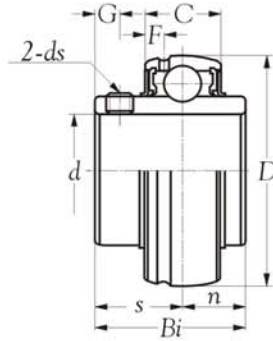


Shaft dia. mm inch	Bearing number	Nominal dimensions									Basic load ratings N		Mass kg
		d	D	Bi	C	mm inch		G	F	ds	dynamic Cr	static Cor	
						n	s						
12	UC 201	12	47	31.0	16	12.7	18.3	5.0	3.5	M 5 x 0.8	12800	6650	0.21
1/2	UC 201-8	0.5000	1.8504	1.2205	0.6299	0.5000	0.7205	0.1969	0.1378	1/4-28	12800	6650	0.21
15	UC 202	15	47	31.0	16	12.7	18.3	5.0	3.5	M 5 x 0.8	12800	6650	0.20
5/8	UC 202-10	0.6250	1.8504	1.2205	0.6299	0.5000	0.7205	0.1969	0.1378	1/4-28	12800	6650	0.20
17	UC 203	17	47	31.0	16	12.7	18.3	5.0	3.5	M 5 x 0.8	12800	6650	0.19
11/16	UC 203-11	0.6875	1.8504	1.2205	0.6299	0.5000	0.7205	0.1969	0.1378	1/4-28	12800	6650	0.19
20	UC 204	20	47	31.0	16	12.7	18.3	5.0	3.80	M 6 x 1.0	12800	6650	0.17
3/4	UC 204-12	0.7500	1.8504	1.2205	0.6299	0.5000	0.7205	0.1969	0.1496	1/4-28	12800	6650	0.18
25	UC 205	25	52	34.1	17	14.3	19.8	5.0	4.30	M 6 x 1.0	14000	7850	0.21
1	UC 205-16	1.0000	2.0472	1.3425	0.6693	0.5630	0.7795	0.1969	0.1693	1/4-28	14000	7850	0.20
30	UC 206	30	62	38.1	19	15.9	22.2	5.0	4.30	M 6 x 1.0	19500	11300	0.32
1-1/8	UC 206-18	1.1250	2.4409	1.5000	0.7480	0.6260	0.8740	0.1969	0.1693	1/4-28	19500	11300	0.34
1-1/4	UC 206-20	1.2500	2.4409	1.5000	0.7480	0.6260	0.8740	0.1969	0.1693	1/4-28	19500	11300	0.30
35	UC 207	35	72	42.9	20	17.5	25.4	7.0	4.3	M 8 x 1.0	25700	15300	0.47
1-1/4	UC 207-20	1.2500	2.8346	1.6890	0.7874	0.6890	1.0000	0.2756	0.1693	5/16-24	25700	15300	0.53
1-3/8	UC 207-22	1.3750	2.8346	1.6890	0.7874	0.6890	1.0000	0.2756	0.1693	5/16-24	25700	15300	0.48
40	UC 208	40	80	49.2	21	19.0	30.2	8.0	4.30	M 8 x 1.0	29100	17800	0.64
1-1/2	UC 208-24	1.5000	3.1496	1.9370	0.8268	0.7480	1.1890	0.3150	0.1693	5/16-24	29100	17800	0.68
45	UC 209	45	85	49.2	22	19.0	30.2	8.0	4.70	M 8 x 1.0	32500	20400	0.68
1-5/8	UC 209-26	1.6250	3.3465	1.9370	0.8661	0.7480	1.1890	0.3150	0.1850	5/16-24	32500	20400	0.78
50	UC 210	50	90	51.6	24	19.0	32.6	10	5.20	M 10 x 1.25	35000	23200	0.80
1-7/8	UC 210-30	1.8750	3.5433	2.0315	0.9449	0.7480	1.2835	0.3937	0.2047	3/8-24	35000	23200	0.87
55	UC 211	55	100	55.6	25	22.2	33.4	10	5.20	M 10 x 1.25	43500	29200	1.12
2	UC 211-32	2.0000	3.9370	2.1890	0.9843	0.8740	1.3150	0.3937	0.2047	3/8-24	43500	29200	1.27
60	UC 212	60	110	65.1	27	25.4	39.7	10	5.50	M 10 x 1.25	52500	36000	1.53
2-1/4	UC 212-36	2.2500	4.3307	2.5630	1.0630	1.0000	1.5630	0.3937	0.2165	3/8-24	52500	36000	1.67

Technical supplement			
Cages	Precision	Precision	Grease
Steel - <input checked="" type="checkbox"/>			
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			
	Steel	Class 0 (JIS)	Shell Alvania S2

Remark: If you have more inquiry of technical, please inquire KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Standard Duty Spherical Outside Surface Ball Bearings Set Screws Type series UC 200

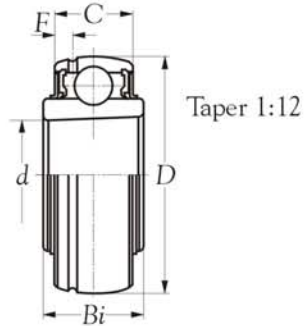


Shaft dia. mm inch	Bearing number	Nominal dimensions									Basic load ratings N		Mass kg
		d	D	Bi	C	mm inch		G	F	ds	dynamic Cr	static Cor	
65	UC 213	65	120	65.1	29	25.4	39.7	10	5.50	M10 x 1.25	57500	40000	1.86
2-1/2	UC 213-40	2.5000	4.7244	2.5630	1.1417	1.0000	1.5630	0.3937	0.2165	3/8-24	57500	40000	1.94
70	UC 214	70	125	74.6	30	30.2	44.4	12.0	5.90	M12 x 1.5	62000	44000	2.05
2-3/4	UC 214-44	2.7500	4.9213	2.9370	1.1811	1.1890	1.7480	0.4724	0.2323	7/16-20	62000	44000	2.06
75	UC 215	75	130	77.8	32	33.3	44.5	12.0	6.6	M12 x 1.5	66000	49500	2.21
3	UC 215-48	3.0000	5.1181	3.0630	1.2598	1.3110	1.7520	0.4724	0.2598	7/16-20	66000	49500	2.13
80	UC 216	80	140	82.6	33	33.3	49.3	12.0	6.7	M12 x 1.5	72500	53000	2.79
3-1/8	UC 216-50	3.1250	5.5118	3.2520	1.2992	1.3110	1.9409	0.4724	0.2638	7/16-20	72500	53000	2.84
85	UC 217	85	150	85.7	35	34.1	51.6	12.0	6.9	M12 x 1.5	83500	64000	3.38
3-1/4	UC 217-52	3.2500	5.9055	3.3740	1.3780	1.3425	2.0315	0.4724	0.2717	7/16-20	83500	64000	3.60
90	UC 218	90	160	96.0	37	39.7	56.3	12.0	7.0	M12 x 1.5	96000	71500	4.45
3-1/2	UC 218-56	3.5000	6.2992	3.7795	1.4567	1.5630	2.2165	0.4724	0.2756	1/2-20	96000	71500	4.56

Technical supplement			
Cages	Precision	Precision	Grease
Steel - <input checked="" type="checkbox"/>			
Polymid - <input checked="" type="checkbox"/>	Steel	Class 0 (JIS)	Shell Alvania S2
Brass - <input checked="" type="checkbox"/>			

Remark: If you have more inquiry of technical, please inquire KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Standard Duty Spherical Outside Surface Ball Bearings Adapter Type series UK 200

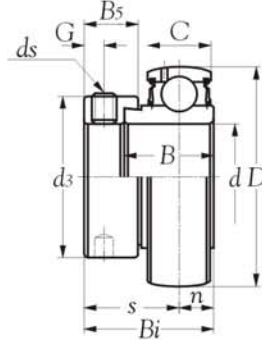


Shaft dia. mm	Bearing number	Nominal dimensions					Basic load ratings		Mass kg
		<i>d</i>	<i>D</i>	<i>Bi</i>	<i>C</i>	<i>F</i>	N dynamic Cr	N static Cor	
20	UK 205	25	52	23	17	4.2	14000	7850	0.15
25	UK 206	30	62	26	19	4.5	19500	11300	0.25
30	UK 207	35	72	27	20	4.2	25700	15300	0.37
35	UK 208	40	80	29	21	4.2	29100	17800	0.48
40	UK 209	45	85	31	22	4.2	32500	20400	0.53
45	UK 210	50	90	31	24	5.0	35000	23200	0.59
50	UK 211	55	100	33	25	6.3	43500	29200	0.77
55	UK 212	60	110	36	27	5.3	52500	36000	1.03
60	UK 213	65	120	36	29	6.0	57500	40000	1.36

Technical supplement			
Cages	Precision	Precision	Grease
Steel - <input checked="" type="checkbox"/>			
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>	Steel	Class 0 (JIS)	Shell Alvania S2

Remark: If you have more inquiry of technical, please inquire KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Standard Duty Spherical Outside Surface Ball Bearings Eccentric Locking Collar Type series SA 200

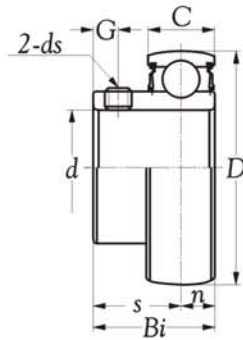


Shaft dia. mm inch	Bearing number	Nominal dimensions											Basic load ratings N		Mass kg
		d	D	Bi	B	C	mm inch		G	ds	d3	B5	dynamic Cr	static Cor	
12	SA 201	12	40	28.5	19.0	12	6.0	22.5	4.8	M 6 x 1	28.6	13.5	9600	4600	0.14
1/2	SA 201-8	0.5000	1.5748	1.1220	0.7480	0.4724	0.2362	0.8858	0.1890	1/4-28	1.1260	0.5315			
15	SA 202	15	40	28.5	19.0	12	6.0	22.5	4.8	M 6 x 1	28.6	13.5	9600	4600	0.13
5/8	SA 202-10	0.6250	1.5748	1.1220	0.7480	0.4724	0.2362	0.8858	0.1890	1/4-28	1.1260	0.5315			
17	SA 203	17	40	28.5	19.0	12	6.0	22.5	4.8	M 6 x 1	28.6	13.5	9600	4600	0.12
11/16	SA 203-11	0.6875	1.5748	1.1220	0.7480	0.4724	0.2362	0.8858	0.1890	1/4-28	1.1260	0.5315			
20	SA 204	20	47	30.9	20.0	14	7.0	23.9	4.8	M 6 x 1	33.3	13.5	12800	6650	0.18
3/4	SA 204-12	0.7500	1.8504	1.2165	0.7874	0.5512	0.2756	0.8858	0.1890	1/4-28	1.3110	0.5315			
25	SA 205	25	52	30.9	21.0	15	7.5	23.4	4.8	M 6 x 1	38.1	13.5	14000	7850	0.20
1	SA 205-16	1.0000	2.0472	1.2165	0.8268	0.5906	0.2953	0.9055	0.1890	1/4-28	1.5000	0.5315			
30	SA 206	30	62	35.7	22.0	16	8.0	27.7	6.0	M 6 x 1	44.5	15.9	19500	11300	0.33
1-1/8	SA 206-18	1.1250	2.4409	1.4055	0.8661	0.6299	0.3150	1.0197	0.2362	1/4-28	1.7520	0.6260			
1-1/4	SA 206-20	1.2500													
35	SA 207	35	72	38.9	24.0	17	8.5	30.4	6.8	M 8 x 1	55.6	17.5	25700	15300	0.50
1-1/4	SA 207-20	1.2500	2.8346	1.5315	0.9449	0.6693	0.3346	1.1417	0.2677	5/16-24	2.1890	0.6890			
1-3/8	SA 207-22	1.3750													
40	SA 208	40	80	43.6	27.0	18	9	34.6	6.8	M 8 x 1	60.3	18.3	29100	17800	0.65
1-1/2	SA 208-24	1.5000	3.1496	1.7165	1.0630	0.7087	0.3740	1.2205	0.2677	5/16-24	2.3740	0.7205			
45	SA 209	45	85	43.6	28.7	19	9.5	34.1	6.8	M 8 x 1	63.5	18.3	32500	20400	0.69
1-5/8	SA 209-26	1.6250	3.3465	1.7165	1.1299	0.7480	0.3937	1.2677	0.2677	5/16-24	2.5000	0.7205			
50	SA 210	50	90	43.6	30.2	20	10	33.6	6.8	M 8 x 1	69.9	18.3	35000	23200	0.80
1-7/8	SA 210-30	1.8750	3.5433	1.7165	1.1890	0.7874	0.4134	1.3071	0.2677	3/8-24	2.7520	0.7205			
55	SA 211	55	100	48.4	32.4	21	11.5	36.9	8.0	M 10 x 1.25	76.2	18.3	43500	29200	0.87
2	SA 211-32	2.0000	3.9370	1.9055	1.2756	0.8268	0.4528	1.4528	0.3150	3/8-24	3.0000	0.7205			

Technical supplement			
Cages	Precision	Precision	Grease
Steel - <input checked="" type="checkbox"/>			
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			
	Steel	Class 0 (JIS)	Shell Alvania S2

Remark: If you have more inquiry of technical, please inquire KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Standard Duty Spherical Outside Surface Ball Bearings Set Screws Type series SB 200

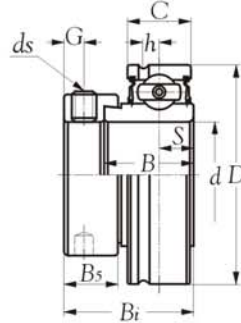


Shaft dia. mm inch	Bearing number	Nominal dimensions								Basic load ratings N		Mass kg
		d	D	Bi	C	mm n	inch s	G	ds	dynamic Cr	static Cor	
12	SB 201	12	40	22	12	6.0	16.0	4.0	M 5 x 0.8	9600	4600	0.10
1/2	SB 201-8	0.5000	1.5748	0.8661	0.4724	0.2362	0.6299	0.1575	1/4-28			0.10
15	SB 202	15	40	22	12	6.0	16.0	4.0	M 5 x 0.8	9600	4600	0.09
5/8	SB 202-10	0.6250	1.5748	0.8661	0.4724	0.2362	0.6299	0.1575	1/4-28			0.09
17	SB 203	17	40	22	12	6.0	16.0	4.0	M 5 x 0.8	9600	4600	0.08
11/16	SB 203-11	0.6875	1.5748	0.8661	0.4724	0.2362	0.6299	0.1575	1/4-28			0.08
20	SB 204	20	47	24.8	14	7.0	17.8	5.0	M 6 x 1	12800	6650	0.13
3/4	SB 204-12	0.7500	1.8504	0.9920	0.5512	0.2756	0.7087	0.1969	1/4-28			0.15
25	SB 205	25	52	27	15	7.5	19.5	5.5	M 6 x 1	14000	7850	0.17
1	SB 205-16	1.0000	2.0472	1.0800	0.5906	0.2953	0.7677	0.2165	1/4-28			0.16
30	SB 206	30	62	30	16	8.0	22.0	6.0	M 6 x 1	19500	11300	0.26
1-1/8	SB 206-18	1.1250	2.4409	1.2000	0.6299	0.3150	0.8268	0.2362	1/4-28			0.27
1-1/4	SB 206-20	1.2500										0.24
35	SB 207	35	72	32	17	8.5	23.5	6.5	M 8 x 1	25700	15300	0.38
1-1/4	SB 207-20	1.2500	2.8346	1.2800	0.6693	0.3346	0.9252	0.2559	5/16-24			0.43
1-3/8	SB 207-22	1.3750										0.41
40	SB 208	40	80	34	18	9	25	7.0	M 8 x 1	29100	17800	0.50
1-1/2	SB 208-24	1.5000	3.1496	1.3600	0.7087	0.3543	0.9646	0.2756	5/16-24			0.54

	Technical supplement			
	Cages	Precision	Precision	Grease
	Steel - <input checked="" type="checkbox"/>			
	Polymid - <input checked="" type="checkbox"/>	Steel	Class 0 (JIS)	Shell Alvania S2
Brass - <input checked="" type="checkbox"/>				

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Standard Duty Cylindrical Surface Ball Bearings Eccentric Locking Collar Type series CSA 200

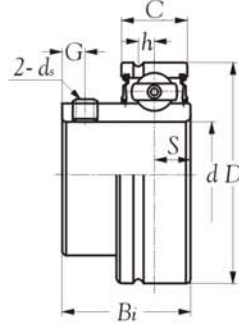


Shaft dia. mm inch	Bearing number	Nominal dimensions										Basic load ratings N		Mass kg
		d	D	C	B	mm		h	Bs	G	ds	dynamic Cr	static Cor	
						inch	inch							
12 1/2	CSA 201	12	40	13	19.1	28.6	6.5	3.6	13.5	4.8	M 6X1	9550	4780	0.14
	CSA 201-8	0.5000	1.5748	0.5118	0.7520	1.1260	0.2559	0.1417	0.5315	0.1890				0.14
15 5/8	CSA 202	15	40	13	19.1	28.6	6.5	3.6	13.5	4.8	M 6X1	9550	4780	0.13
	CSA 202-10	0.6250	1.5748	0.5118	0.7520	1.1260	0.2559	0.1417	0.5315	0.1890				0.13
17 11/16	CSA 203	17	40	13	19.1	28.6	6.5	3.6	13.5	4.8	M 6X1	9550	4780	0.13
	CSA 203-11	0.6875	1.5748	0.5118	0.7520	1.1260	0.2559	0.1417	0.5315	0.1890				0.13
20 3/4	CSA 204	20	47	14	21.4	30.9	7.5	4	13.5	4.8	M 6X1	12800	6650	0.15
	CSA 204-12	0.7500	1.8504	0.5512	0.8425	1.2165	0.2953	0.1575	0.5315	0.1890				0.18
25 1	CSA 205	25	52	15	21.4	30.9	7.5	4.3	13.5	4.8	M 6X1	14000	7880	0.19
	CSA 205-16	1.0000	2.0472	0.5906	0.8425	1.2165	0.2953	0.1693	0.5315	0.1890				0.18
30 1-1/8 1-1/4	CSA 206	30	62	16	23.8	35.7	9	5	15.9	6.0	M 6X1	19500	11200	0.33
	CSA 206-18	1.1250	2.4409	0.6299	0.9370	1.4055	0.3543	0.1969	0.6260	0.2362				0.35
	CSA 206-20	1.2500												0.29
35 1-1/4 1-3/8	CSA 207	35	72	17	25.4	38.9	9.5	5.7	17.5	6.8	M 8X1	25700	15200	0.50
	CSA 207-20	1.2500	2.8346	0.6693	1.0000	1.5315	0.3740	0.2244	0.6890	0.2677				0.52
	CSA 207-22	1.3750												0.51
40 1-1/2	CSA 208	40	80	18	30.2	43.6	11	6.2	18.3	6.8	M 8X1	29600	18200	0.65
	CSA 208-24	1.5000	3.1496	0.7087	1.1890	1.7165	0.4331	0.2441	0.7205	0.2677				0.68
45 1-3/4	CSA 209	45	85	19	30.2	43.7	11	6.5	18.3	6.8	M 8X1	31850	20800	0.69
	CSA 209-28	1.7500	3.3465	0.7480	1.1890	1.7205	0.4331	0.2677	0.7205	0.2677				0.69
50 1-7/8	CSA 210	50	90	20	30.2	43.6	11	6.5	18.3	6.8	M 8X1	35100	23200	0.79
	CSA 210-30	1.8750	3.5433	0.7874	1.1890	1.7165	0.4331	0.2559	0.7205	0.2677				0.83
55 2	CSA 211	55	100	24	32.4	48.4	12	7.2	20.7	8.0	M 10X1.25	43550	29200	0.84
	CSA 211-32	2.0000	3.9370	0.9449	1.2756	1.9055	0.4724	0.2835	0.8150	0.3150				0.96
60 2-1/4	CSA 212	60	110	24	33.4	49.3	12	8	22.3	8.4	M 10X1.25	47800	32800	1.20
	CSA 212-36	2.2500	4.3307	0.9449	1.3150	1.9409	0.4724	0.3150	0.8780	0.3307				1.30

Technical supplement			
Cages	Precision	Precision	Grease
Steel - <input checked="" type="checkbox"/>			
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			
	Steel	Class 0 (JIS)	Shell Alvania S2

Remark: If you have more inquiry of technical, please inquire KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Standard Duty Cylindrical Surface Ball Bearings Eccentric Locking Collar Type series CSB 200

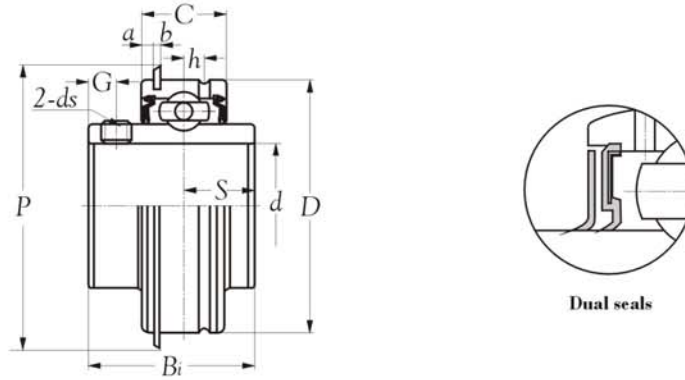


Shaft dia. mm inch	Bearing number	Nominal dimensions								Basic load ratings N		Mass kg
		d	D	C	mm inch		S	G	ds	dynamic Cr	static Cor	
					h	Bi						
12 1/2	CSB 201	12	40	12	3.6	22	6	4	M5x0.8	9550	4780	0.90
	CSB 201-8	0.5000	1.5748	0.4724	0.1417	0.8661	0.2362	0.1575	10#-32UNF			0.90
15 5/8	CSB 202	15	40	12	3.6	22	6	4	M5x0.8	9550	4780	0.80
	CSB 202-10	0.6250	1.5748	0.4724	0.1417	0.8661	0.2362	0.1575	10#-32UNF			0.80
17 11/16	CSB 203	17	40	12	3.6	22	6	4	M5x0.8	9550	4780	0.10
	CSB 203-11	0.6875	1.5748	0.4724	0.1417	0.8661	0.2362	0.1575	10#-32UNF			0.10
20 3/4	CSB 204	20	47	14	4	25	7	5	M6x1	12800	6650	0.13
	CSB 204-12	0.7500	1.8504	0.5512	0.1575	0.9843	0.2756	0.1969	1/4-28UNF			0.15
25 1	CSB 205	25	52	15	4.3	27	7.5	5.5	M6x1	14000	7880	0.17
	CSB 205-16	1.0000	2.0472	0.5906	0.1693	1.0630	0.2953	0.2165	1/4-28UNF			0.16
30 1-1/8 1-1/4	CSB 206	30	62	16	5	29	8	6	M6x1	19500	11200	0.27
	CSB 206-18	1.1250	2.4409	0.6299	0.1969	1.1417	0.3150	0.2362	1/4-28UNF			0.28
	CSB 206-20	1.2500										0.24
35 1-1/4 1-3/8	CSB 207	35	72	18	5.7	32	9	6	M6x1	25700	15200	0.38
	CSB 207-20	1.2500	2.8346	0.7087	0.2244	1.2598	0.3543	0.2362	1/4-28UNF			0.42
	CSB 207-22	1.3750										0.41
40 1-1/2	CSB 208	40	80	19	6.2	34	9.5	7	M8x1	29600	18200	0.50
	CSB 208-24	1.5000	3.1496	0.7480	0.2441	1.3386	0.3740	0.2756	5/16-24UNF			0.60

	Technical supplement			
	Cages	Precision	Precision	Grease
	Steel - <input checked="" type="checkbox"/>			
	Polymid - <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Brass - <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Remark: If you have more inquiry of technical, please inquire
KSM web-site: [Http://www.minamiguchi-bearings.com](http://www.minamiguchi-bearings.com)

Standard Duty Cylindrical Surface Ball Bearings Eccentric Locking Collar Type series SER 200



Shaft dia. mm inch	Bearing number	Nominal dimensions											Basic load ratings		Mass kg
		mm inch											N dynamic Cr	static Cor	
		d	D	Bi	C	S	a	b	p	G	h	d _s			
15 5/8	SER 202 SER 202-10	15 0.6250	47 1.8504	31 1.2205	15.9 0.6260	12.7 0.5000	2.38 0.0937	1.07 0.0421	52.7 2.0748	4.7 0.1850	4.4 0.1732	M6x1 1/4-28UNF	12800	6650	0.17
17 11/16	SER 203 SER 203-11	17 0.6875	47 1.8504	31 1.2205	15.9 0.6260	12.7 0.5000	2.38 0.0937	1.07 0.0421	52.7 2.0748	4.7 0.1850	4.4 0.1732	M6x1 1/4-28UNF	12800	6650	0.17
20 3/4	SER 204 SER 204-12	20 0.7500	47 1.8504	31 1.2205	15.9 0.626	12.7 0.5	2.38 0.0937	1.07 0.0421	52.7 2.0748	4.7 0.1850	4.4 0.1732	M6x1 1/4-28UNF	12800	6650	0.24
25 15/16	SER 205 SER 205-16	25 1.0000	52 2.0472	34 1.3386	19 0.7480	14.3 0.5630	2.38 0.0937	1.07 0.0421	57.9 2.2795	5.5 0.2165	4.5 0.1772	M6x1 1/4-28UNF	14000	7880	0.27
30 1-1/8 1-1/4	SER 206 SER 206-18 SER 206-20	30 1.1250 1.2500	62 2.4409	38.1 1.5000	22.2 0.8740	15.9 0.6260	3.18 0.1252	1.65 0.0650	67.7 2.6654	5.5 0.2165	5.3 0.2087	M6x1 1/4-28UNF	19500	11200	0.39
35 1-1/4 1-3/8	SER 207 SER 207-20 SER 207-22	35 1.2500 1.3750	72 2.8346	42.9 1.6890	23.8 0.9370	17.5 0.6890	3.18 0.1252	1.65 0.0650	78.6 3.0945	6.5 0.2559	5.8 0.2283	M8x1 5/16-24UNF	25700	15200	0.61
40 1-9/16	SER 208 SER 208-26	40 1.5625	80 3.1496	49.2 1.9370	27.8 1.0945	19 0.7480	3.18 0.1252	1.65 0.0650	86.6 3.4094	8 0.3150	6.3 0.2480	M8x1 5/16-24UNF	29600	18200	0.81
45 1-3/4	SER 209 SER 209-28	45 1.7500	85 3.3465	49.2 1.9370	27.8 1.0945	19 0.7480	3.18 0.1252	1.65 0.0650	91.6 3.6063	8 0.3150	7.5 0.2953	M8x1 5/16-24UNF	31850	20800	0.90
50 1-7/8	SER 210 SER 210-30	50 1.8750	90 3.5433	51.6 2.0315	28.6 1.1260	19 0.7480	3.18 0.1252	2.41 0.0949	96.5 3.7992	9 0.3543	6.8 0.2677	M10x1.25 3/8-24UNF	35100	23200	0.96
55 2	SER 211 SER 211-32	55 2.0000	100 3.9370	55.6 2.1890	30.2 1.1890	22.2 0.8740	3.18 0.1252	2.41 0.0949	106.5 4.1929	9 0.3543	7.6 0.2992	M10x1.25 3/8-24UNF	43550	29200	1.41
60 2-1/4	SER 212 SER 212-36	60 2.2500	110 4.3307	65.1 2.5630	31.8 1.2520	25.4 1.0000	3.18 0.1252	2.41 0.0949	116.6 4.5906	10.5 0.4134	8.4 0.3307	M10x1.25 3/8-24UNF	47800	32800	1.95

Technical supplement			
Cages	Precision	Precision	Grease
Steel - <input checked="" type="checkbox"/>			
Polymid - <input checked="" type="checkbox"/>			
Brass - <input checked="" type="checkbox"/>			
	Steel	Class 0 (JIS)	Shell Alvania S2

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