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SYI
NEEDLE ROLLER BEARINGS CATALOGUE

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NEEDLE ROLLER BEARINGS



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NEEDLE ROLLER BEARINGS

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Catalogue  2005

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TECHNICAL INFORMATION



1. Bearing materials

1.1 Raceway and rolling element materials

1.1.1 High/mid carbon alloy steel

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

1.1.2 Mid-carbon chromium steel

Mid-carbon chromium steel incorporating 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 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 2.1 Bearings types and applicable tolerance

Bearing type		Applicable standard	Applicable tolerance class				Applicable table
			class change	class 6	class 5	class 4	
Needle roller bearing		JIS B 1514 ISO 492 (SYI [®] standard)	class 0	class 6	class 5	class 4	Table 3.2
Complex bearing	Radial bearing		class 0	class 6	class 5	—	Table 3.2
	Thrust bearing		SYI [®] class 0	SYI [®] class 6	SYI [®] class 5	SYI [®] 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		—	—	SYI [®] class 5	SYI [®] class 4	Table 3.3
Thrust roller bearings		SYI [®] class 0	SYI [®] class 6	SYI [®] class 5	SYI [®] class 4	Table 3.3	
Roller follower/cam follower		class 0	—	—	—	Table 3.2	

Note: JIS B 1514 and ISO 492 have the same specification level.

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_s 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		class 0	class 6	class 5	class 4
		max.			max.			high	low	high	low	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_{id} ^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	Identical to ΔB_s of inner ring of same bearing		5 2.5		
18	30	8	4	8	5			Identical to ΔB_s and V_{bs} of inner ring of same bearing		
30	50	8	4	8	5			5 2.5		
50	80	8	4	10	5			6 3.0		
80	120	9	5	11	6			8 4.0		
120	150	10	5	13	7			8 5.0		
150	180	10	5	14	8			8 5.0		
180	250	11	7	15	10			10 7.0		
250	315	13	8	18	10			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, respectively.

Table 2.3 Tolerance of thrust roller bearings

Table 2.3.1 Inner rings

 (Unit: μm)

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

Table 2.3.2 Outer rings

 (Unit: μm)

Nominal outside diameter		Single plane mean outside diameter deviation				Single radial plane outside diameter variation		Thrust bearing housing washer raceway thickness variation			
D		ΔD_{mp}				V_{Dp}		S_e			
mm		class 0,6,5		class 4		class 0,6,5	class 4	class 0	class 6	class 5	class 4
over	incl.	high	low	high	low	max.			max.		
10	18	0	-11	0	-7	8	5	According to the tolerance of S_i against " d " or " d_2 " of the same bearings			
18	30	0	-13	0	-8	10	6				
30	50	0	-16	0	-9	12	7				
50	80	0	-19	0	-11	14	8				
80	120	0	-22	0	-13	17	10				
120	180	0	-25	0	-15	19	11				
180	250	0	-30	0	-20	23	15				
250	315	0	-35	0	-25	26	19				
315	400	0	-40	0	-28	30	21				
400	500	0	-45	0	-33	34	25				
500	630	0	-50	0	-38	38	29				
630	800	0	-75	0	-45	55	34				

 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 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.)


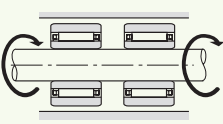

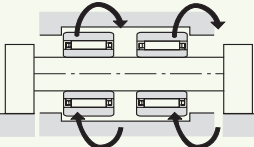
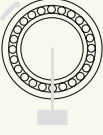
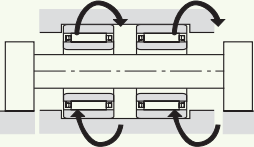

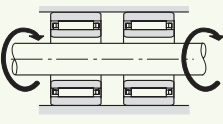
3.3.1 "Tight fit," "transition fit," or "loose fit"

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 and bearing

Illustration	Bearing rotation	Ring load	Fit
Static load 	 Inner ring: Rotating Outer ring: Stationary	Rotating inner ring load	Inner ring: Tight fit
Imbalanced 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
Imbalanced load 	 Inner ring: Rotating Outer ring: Stationary	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 1:1,000 of the shaft or outside diameter.

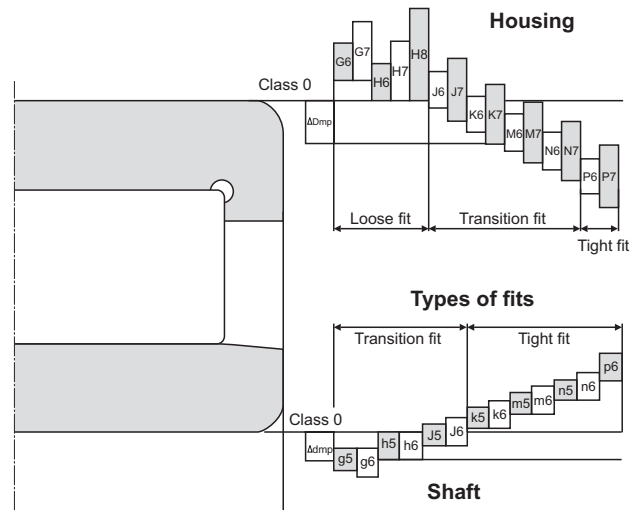


Fig. 4.1

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 mm incl	Tolerance class	Remarks
Indeterminate direction load Rotating inner ring load	Tight fit/ Transition fit	Light load ^①	~ 50 50 ~ 100 100 ~ 200	js6 k6 m6	When greater accuracy is required m5 may be substituted for m6.
		Normal load ^①	~ 50 50 ~ 100 100 ~ 150 150 ~ 200 200 ~	k5 m5 m6 n6 p6	
		Heavy load ^① or shock load	~ 150 150 ~	n6 p6 r6	When greater accuracy is required m5 may be substituted for m6.
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.

^① Standards for light loads, normal loads, and heavy loads

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

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

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

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	—
	Direction indeterminate load	Solid housing	Transition or loose fit	High rotation accuracy required with light to normal loads	K6	Displacement not possible(in principle)
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	Solid housing	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	Solid housing	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 $\leq 0.06 Cr$

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

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

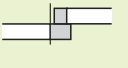
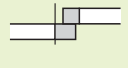
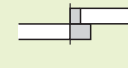
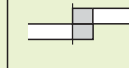
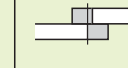
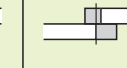
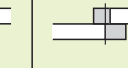
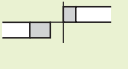
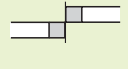
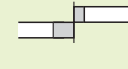
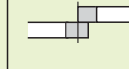
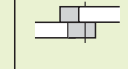
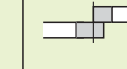
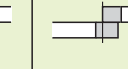



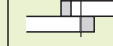

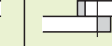


Nominal bore diameter of bearing d mm	Single plane mean bore diameter deviation Δd_{mp}		g5		g6		h5		h6		j5		js5		j6				
			bearing shaft		bearing shaft		bearing shaft		bearing shaft		bearing shaft		bearing shaft		bearing shaft				
			high	low															
over	incl.																		
3	6	0	-8	4T ~ 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		1ST ~ 5L		17.5T ~ 5.5L		23T ~ 5L			
50	80	0	-15	5T ~ 23L		5T ~ 29L		15T ~ 13L		15T ~ 19L		21T ~ 7L		21.5T ~ 6.5L		27T ~ 7L			
80	120	0	-20	8T ~ 27L		8T ~ 34L		20T ~ 15L		20T ~ 22L		26T ~ 9L		27.5T ~ 7.5L		33T ~ 9L			
120	140	0	-25	11T ~ 32L		11 ~ T39L		25T ~ 18L		25T ~ 25L		32T ~ 11L		34T ~ 9L		39T ~ 11L			
140	160																		
160	180																		
180	200	0	-30	15T ~ 35L		15T ~ 44L		30T ~ 20L		30T ~ 29L		37T ~ 13L		40T ~ 10L		46T ~ 13L			
200	225																		
225	250																		
250	280	0	-35	18T ~ 40L		18T ~ 49L		35T ~ 23L		35T ~ 32L		42T ~ 16L		46.5T ~ 11.5L		51T ~ 16L			
280	315																		
315	355	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

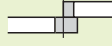
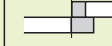
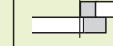
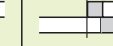
Nominal outside diameter of bearing d mm	Single plane mean outside diameter deviation ΔD_{mp}		G7		H6		H7		J6		J7		Js7		K6		
			housing bearing		housing bearing		housing bearing		housing bearing		housing bearing		housing bearing		housing bearing		
			high	low													
over	incl.																
6	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	k5	k6	m5	m6	n6	p6	r6	Nominal bore diameter of bearing	
bearing shaft	bearing shaft	bearing shaft	bearing shaft	bearing shaft	bearing shaft	bearing shaft	bearing shaft	<i>d</i>	
								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
37.5T ~ 12.5L	46T ~ 3T	53T ~ 3T	58T ~ 15T	65T ~ 15T	77T ~ 27T	93T ~ 43T	113T ~ 63T	120	140
							115T ~ 65T	140	160
							118T ~ 68T	160	180
44.5T ~ 14.5L	54T ~ 4T	63T ~ 4T	67T ~ 17T	76T ~ 17T	90T ~ 31T	109T ~ 50T	136T ~ 77T	180	200
							139T ~ 80T	200	225
							143T ~ 84T	225	250
51T ~ 16L	62T ~ 4T	71T ~ 4T	78T ~ 20T	87T ~ 20T	101T ~ 34T	123T ~ 56T	161T ~ 94T	250	280
							165T ~ 98T	280	315
58T ~ 18L	69T ~ 4T	80T ~ 4T	86T ~ 21T	97T ~ 21T	113T ~ 37T	138T ~ 62T	184T ~ 108T	315	355
							190T ~ 114T	355	400
65T ~ 20L	77T ~ 5T	90T ~ 4T	95T ~ 23T	108T ~ 23T	125T ~ 40T	153T ~ 68T	211T ~ 126T	400	450
							217T ~ 132T	450	500

 (Unit: μm)

K7	M7	N7	P7	Nominal outside diameter of bearing	
housing bearing	housing bearing	housing bearing	housing bearing	<i>d</i>	
				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	88 ~ 1L	250	315
40T ~ 57L	57T ~ 40L	73T ~ 24L	98 ~ 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		CN		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 seating 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

5.2 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.

5.2.1 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 the 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 ~ 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.	Excellent low temperature and wear characteristics.	Suitable for high and low temperatures.	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 ~ 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.	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.

5.2.2 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)

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

where,

V : Quantity of bearing space open type (approx.) cm^3

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 rating -s given in the bearing tables of this catalog are for bearings constructed of SYI® standard bearing materials, using standard manufacturing techniques. Please consult SYI® 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

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

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).

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

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

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

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_n 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.

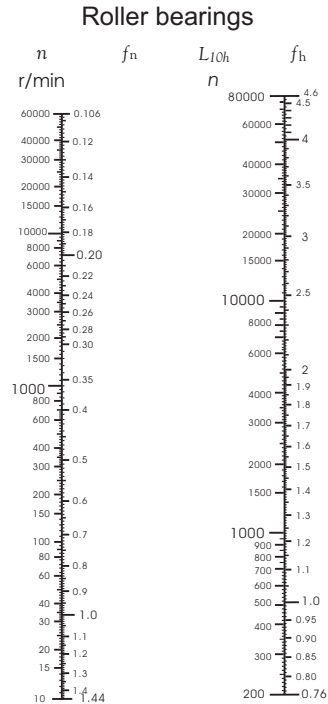


Fig. 7.1 Bearing life rating scale

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 SYI'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.

SYI 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 SYI 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).

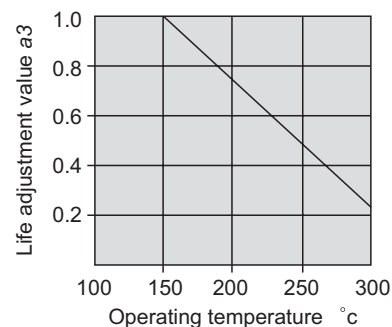


Fig. 6.2 Life adjustment value for operating temperature

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 SYI® 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 6.3 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]

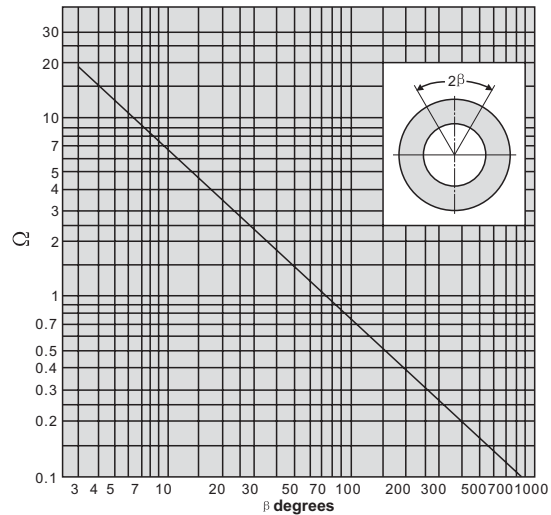


Fig. 6.3 Relationship between half angle β and factor Ω

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

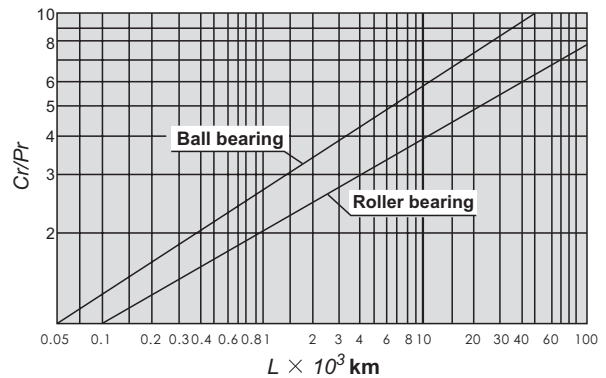


Fig. 6.4 Life of bearing with axial motion

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) .

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

Where,

L_h : 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_o can be determined considering the maximum static equivalent load.

$$S_o = C_o / P_o \dots\dots \text{Formula (6.11)}$$

where,

S_o : Safety factor

C_o : Basic static rated load, N

(radial bearings: C_{or} , thrust bearings: C_{oa})

$P_o \text{ max}$: Maximum static equivalent load, N

(radial: $P_{or \text{ max}}$, thrust: $C_{oa \text{ max}}$)

Table 6.4 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

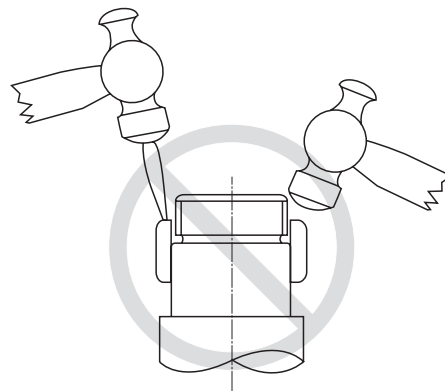
Most rolling bearings are coated with a rust preventative before being packed and shipped, and they should be stored at room temperature with a relative humidity of less than 60%.

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. 8.1, 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. 8.1

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 the 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.

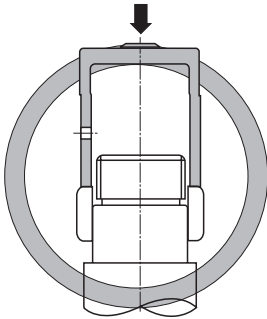


Fig. 7.2 Fitting sleeve pressure against inner ring

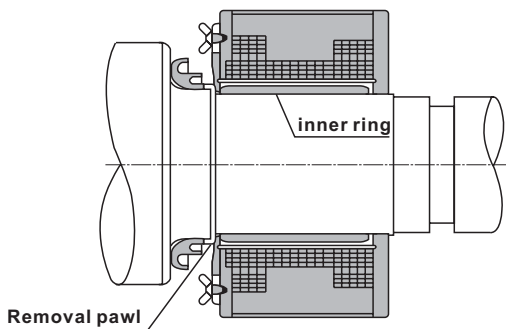


Fig. 7.4 Removal of inner ring using an induction heater

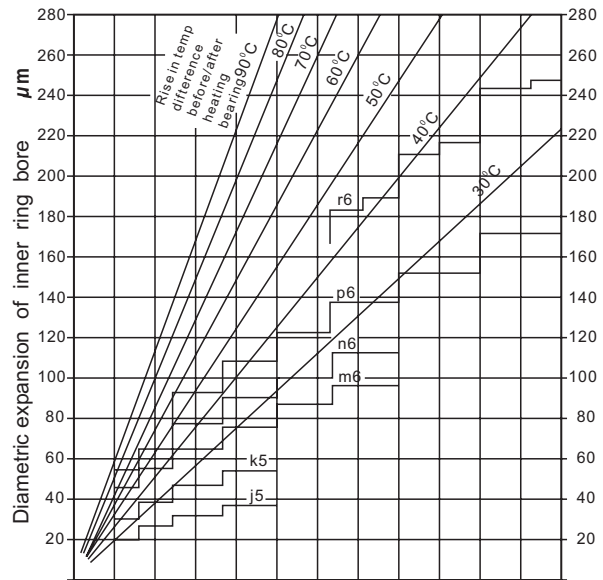


Fig. 7.3 Temperature differential required for shrinkage fit of inner ring

The most commonly used method of heating bearings is to immerse them in hot oil. However, this method should not be used for prelubricated 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 I 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.

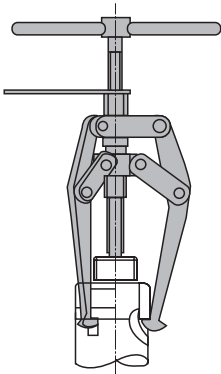


Fig. 7.5 Puller disassembly

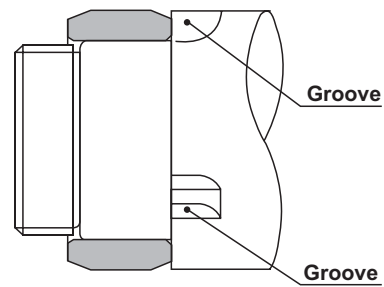


Fig. 7.7 Extracting grooves

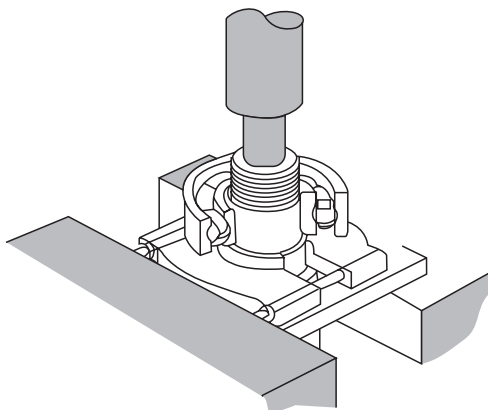


Fig. 7.6 press disassembly

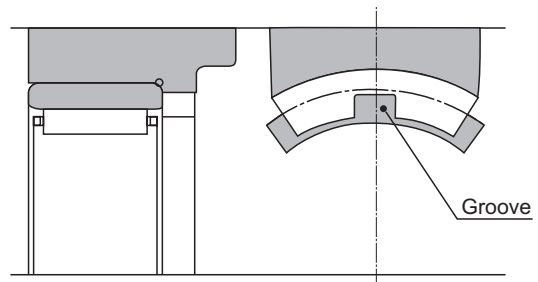


Fig. 7.8 Extraction groove for outer ring disassembly

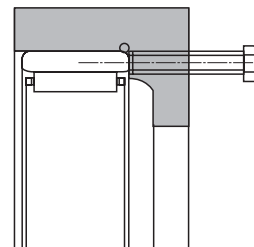
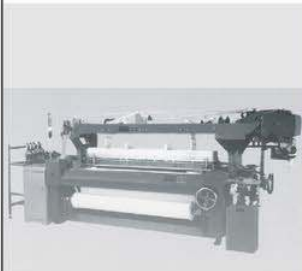


Fig. 7.9 Outer ring disassembly bolt



NEEDLE ROLLER BEARINGS

Using applications

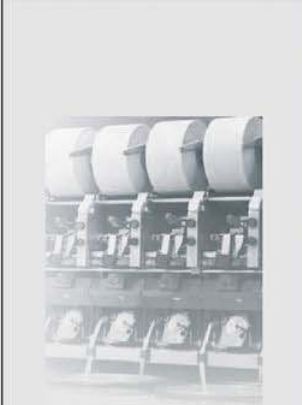


Expand all sectors

Power transmission and electrical engineering

Construction, building materials and mining machinery, offshore engineering, civil engineering

Precision engineering and medical equipment



Conveying trucks, conveying and warehousing equipment

Rubber and plastics processing machinery, machinery for the chemical industry

Hydraulic and pneumatic engineering

Agricultural machinery

Assembly, handling and industrial robots

Passenger and estate cars, automotive supplier industry

Power tools

Rail vehicles

Toys, pedal cycles and sports equipment



Iron and steel industry

Internal combustion engines for gardening and forestry equipment, outboard motors

Machine tools and production systems

Electrical household appliances





	Technical Information		Product Information
	34	K Series	35-43



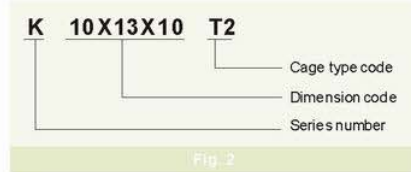
1. Types and designs

SYI 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-T2). The T2 cage features a maximum allowable operating temperature of 120°C and maximum allowable continuous operating temperature of 100°C.



2. Bearing numbers

As summarized in Fig. 2, the bearing numbers of SYI 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.



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

Radial clearance	Shaft dia. mm	~80	80~140	140~
	Smaller than normal clearance		j5/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

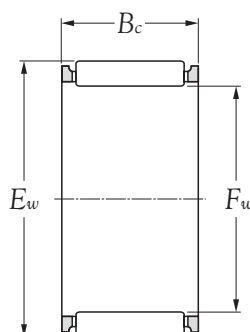
Characteristics	Shaft	Housing
Circularity (max.)	IT3	IT4
Cylindricity (max.)	IT3	IT4
Surface roughness (max.)	0.4 a	0.4 a
Surface roughness (max.)	HRC58-64	

5. Mounting dimensions for bearings

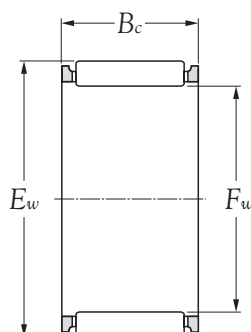
Table 3 gives the recommended tolerance for the cage guide width b dimension relative to the nominal dimension "Bc".

Table 3 Tolerance for guide width

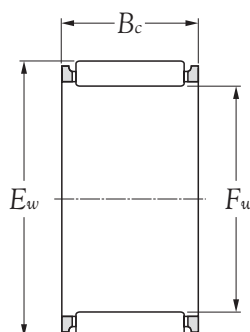
Series classification	Tolerance for b
Metric	Bc ^{+0.2} ₀

Cage and roller type needle roller bearings series K


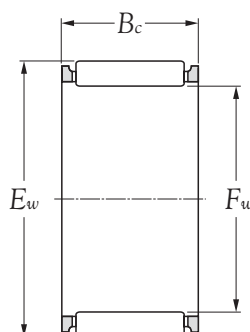
Boundary dimensions			Basic load ratings				Limiting speeds		Bearing numbers	Mass kg (approx.)
mm			dynamic N	static	dynamic kgf	static	rpm			
<i>F_w</i>	<i>E_w</i>	<i>B_c</i>	<i>C_r</i>	<i>C_{or}</i>	<i>C_r</i>	<i>C_{or}</i>	grease	oil		
3	6	7 ^{-0.2/-0.55}	1.460	970	149	99	33.000	50.000	K3X6X7	0,0004
4	7	7 ^{-0.2/-0.55}	1.770	1.270	180	129	30.000	45.000	K4X7X7	0,0005
5	8	8 ^{-0.2/-0.55}	2.640	2.190	269	224	27.000	40.000	K5X8X8	0,0007
5	8	10 ^{-0.2/-0.55}	2.720	2.250	277	230	27.000	40.000	K5X8X10	0,0009
6	9	8 ^{-0.2/-0.55}	2.660	2.280	272	233	25.000	37.000	K6X9X8	0,0009
6	9	10 ^{-0.2/-0.55}	3.400	3.150	345	320	25.000	37.000	K6X9X10	0,0011
6	10	13 ^{-0.2/-0.55}	4.400	3.700	450	380	25.000	37.000	K6X10X13	0,0019
7	10	8 ^{-0.2/-0.55}	2.670	2.350	272	239	23.000	34.000	K7X10X8	0,0009
7	10	10 ^{-0.2/-0.55}	3.400	3.200	345	330	23.000	34.000	K7X10X10	0,0011
8	11	8 ^{-0.2/-0.55}	3.150	3.000	320	305	21.000	32.000	K8X11X8	0,0011
8	11	10 ^{-0.2/-0.55}	4.000	4.100	410	420	21.000	32.000	K8X11X10	0,0013
8	11	13 ^{-0.2/-0.55}	4.850	5.200	495	535	21.000	32.000	K8X11X13	0,0026
8	12	10 ^{-0.2/-0.55}	4.650	4.150	475	425	21.000	32.000	K8X12X10	0,0020
8	12	12 ^{-0.2/-0.55}	5.600	5.300	570	540	21.000	32.000	K8X12X12	0,0034
8	12	13 ^{-0.2/-0.55}	5.600	5.300	570	540	21.000	32.000	K8X12X13	0,0036
9	12	10 ^{-0.2/-0.55}	4.550	5.000	465	510	20.000	30.000	K9X12X10	0,0015
9	12	13 ^{-0.2/-0.55}	5.500	6.400	560	650	20.000	30.000	K9X12X13	0,0021
10	13	10 ^{-0.2/-0.55}	4.550	5.100	460	520	19.000	28.000	K10X13X10	0,0016
10	13	13 ^{-0.2/-0.55}	5.450	6.450	555	660	19.000	28.000	K10X13X13	0,0031
10	14	8 ^{-0.2/-0.55}	4.300	3.950	435	405	19.000	28.000	K10X14X8	0,0027
10	14	10 ^{-0.2/-0.55}	5.500	5.450	560	555	19.000	28.000	K10X14X10	0,0034
10	14	13 ^{-0.2/-0.55}	6.600	6.900	675	705	19.000	28.000	K10X14X13	0,0044
10	16	12 ^{-0.2/-0.55}	7.100	5.950	720	610	19.000	28.000	K10X16X12	0,0066
11	14	10 ^{-0.2/-0.55}	5.050	6.000	515	615	18.000	27.000	K11X14X10	0,0028
12	15	9 ^{-0.2/-0.55}	4.450	5.250	455	535	17.000	26.000	K12X15X9	0,0027
12	15	13 ^{-0.2/-0.55}	6.000	7.700	615	785	17.000	26.000	K12X15X13	0,0038
12	16	8 ^{-0.2/-0.55}	4.850	4.900	495	500	17.000	26.000	K12X16X8	0,0034
12	16	13 ^{-0.2/-0.55}	7.500	8.500	765	870	17.000	26.000	K12X16X13	0,0055

Cage and roller type needle roller bearings series K


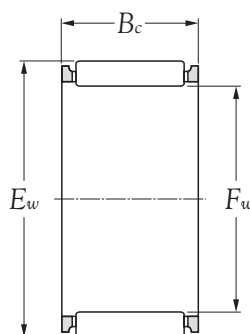
Boundary dimensions			Basic load ratings				Limiting speeds		Bearing numbers	Mass kg (approx.)
mm			dynamic N	static	dynamic kgf	static	rpm			
<i>F_w</i>	<i>E_w</i>	<i>B_c</i>	<i>C_r</i>	<i>C_{or}</i>	<i>C_r</i>	<i>C_{or}</i>	grease	oil		
12	17	13 ^{-0.2/-0.55}	9.000	9.400	920	960	17.000	26.000	K12X17X13	0,0075
12	18	12 ^{-0.2/-0.55}	8.650	8.000	880	815	17.000	26.000	K12X18X12	0,0084
14	17	10 ^{-0.2/-0.55}	5.400	7.050	550	720	16.000	24.000	K14X17X10	0,0033
14	18	10 ^{-0.2/-0.55}	6.900	8.000	705	815	16.000	24.000	K14X18X10	0,0046
14	18	11 ^{-0.2/-0.55}	7.600	9.050	775	925	16.000	24.000	K14X18X11	0,0053
14	18	13 ^{-0.2/-0.55}	8.300	10.100	845	1.030	16.000	24.000	K14X18X13	0,0063
14	18	17 ^{-0.2/-0.55}	10.900	14.400	1.120	1.470	16.000	24.000	K14X18X17	0,0081
14	19	13 ^{-0.2/-0.55}	8.950	9.650	915	985	16.000	24.000	K14X19X13	0,0080
14	20	12 ^{-0.2/-0.55}	9.350	9.150	955	930	16.000	24.000	K14X20X12	0,0095
14	20	17 ^{-0.2/-0.55}	13.500	14.600	1.370	1.490	16.000	24.000	K14X20X17	0,0140
15	18	14 ^{-0.2/-0.55}	7.850	11.600	800	1.190	15.000	23.000	K15X18X14	0,0060
15	19	17 ^{-0.2/-0.55}	10.900	14.600	1.110	1.490	15.000	23.000	K15X19X17	0,0090
15	20	13 ^{-0.2/-0.55}	10.100	11.500	1.030	1.170	15.000	23.000	K15X20X13	0,0088
15	21	15 ^{-0.2/-0.55}	11.900	12.500	1.210	1.280	15.000	23.000	K15X21X15	0,0130
15	21	21 ^{-0.2/-0.55}	16.500	19.100	1.680	1.950	15.000	23.000	K15X21X21	0,0170
16	20	10 ^{-0.2/-0.55}	7.500	9.250	765	945	15.000	23.000	K16X20X10	0,0057
16	20	11 ^{-0.2/-0.55}	8.300	10.500	845	1.070	15.000	23.000	K16X20X11	0,0061
16	20	13 ^{-0.2/-0.55}	9.050	11.800	925	1.200	15.000	23.000	K16X20X13	0,0071
16	22	12 ^{-0.2/-0.55}	11.700	12.500	1.190	1.280	15.000	23.000	K16X22X12	0,0100
16	22	17 ^{-0.2/-0.55}	14.400	16.400	1.470	1.670	15.000	23.000	K16X22X17	0,0150
16	22	20 ^{-0.2/-0.55}	16.000	18.800	1.640	1.920	15.000	23.000	K16X22X20	0,0170
17	21	15 ^{-0.2/-0.55}	10.400	14.400	1.060	1.460	15.000	22.000	K17X21X15	0,0089
17	21	17 ^{-0.2/-0.55}	11.800	16.900	1.210	1.720	15.000	22.000	K17X21X17	0,0095
17	22	20 ^{-0.2/-0.55}	14.700	19.200	1.500	1.960	15.000	22.000	K17X22X20	0,0150
17	23	17 ^{-0.2/-0.55}	14.400	16.500	1.460	1.690	15.000	22.000	K17X23X17	0,0160
18	22	10 ^{-0.2/-0.55}	7.400	9.400	755	955	14.000	21.000	K18X22X10	0,0061
18	22	13 ^{-0.2/-0.55}	8.900	11.900	910	1.210	14.000	21.000	K18X22X13	0,0077
18	22	17 ^{-0.2/-0.55}	11.700	17.000	1.200	1.730	14.000	21.000	K18X22X17	0,0110

**Cage and roller type needle roller bearings
series K**


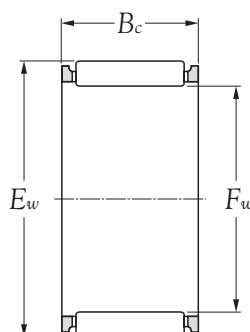
Boundary dimensions			Basic load ratings				Limiting speeds		Bearing numbers	Mass kg (approx.)
mm			dynamic N	static	dynamic kgf	static	rpm			
<i>F_w</i>	<i>E_w</i>	<i>B_c</i>	<i>C_r</i>	<i>C_{or}</i>	<i>C_r</i>	<i>C_{or}</i>	grease	oil		
18	24	12 ^{-0.2/-0.55}	12.300	13.800	1.250	1.410	14.000	21.000	K18X24X12	0,0120
18	24	13 ^{-0.2/-0.55}	11.600	12.800	1.180	1.300	14.000	21.000	K18X24X13	0,0130
18	24	20 ^{-0.2/-0.55}	17.000	20.900	1.730	2.130	14.000	21.000	K18X24X20	0,0190
18	25	17 ^{-0.2/-0.55}	18.000	20.400	1.830	2.080	14.000	21.000	K18X25X17	0,0190
18	25	22 ^{-0.2/-0.55}	22.100	26.600	2.250	2.710	14.000	21.000	K18X25X22	0,0240
19	23	13 ^{-0.2/-0.55}	9.650	13.500	985	1.370	14.000	21.000	K19X23X13	0,0082
19	23	17 ^{-0.2/-0.55}	12.700	19.200	1.300	1.960	14.000	21.000	K19X23X17	0,0110
20	24	11 ^{-0.2/-0.55}	9.500	13.400	970	1.370	13.000	20.000	K20X24X11	0,0072
20	26	12 ^{-0.2/-0.55}	12.900	15.100	1.320	1.540	13.000	20.000	K20X26X12	0,0130
20	28	25 ^{-0.2/-0.55}	27.100	32.500	2.760	3.300	13.000	20.000	K20X28X25	0,0370
21	25	13 ^{-0.2/-0.55}	10.300	15.100	1.050	1.540	13.000	19.000	K21X25X13	0,0090
21	25	17 ^{-0.2/-0.55}	13.600	21.500	1.380	2.200	13.000	19.000	K21X25X17	0,0120
22	26	13 ^{-0.2/-0.55}	10.200	15.200	1.040	1.550	12.000	18.000	K22X26X13	0,0094
22	27	20 ^{-0.2/-0.55}	17.500	25.900	1.780	2.640	12.000	18.000	K22X27X20	0,0200
22	28	17 ^{-0.2/-0.55}	17.700	23.300	1.810	2.380	12.000	18.000	K22X28X17	0,0200
22	30	15 ^{-0.2/-0.55}	19.300	21.700	1.970	2.210	12.000	18.000	K22X30X15	0,0220
23	28	24 ^{-0.2/-0.55}	19.800	31.000	2.020	3.150	11.000	17.000	K23X28X24	0,0230
24	28	13 ^{-0.2/-0.55}	10.800	16.800	1.100	1.710	11.000	17.000	K24X28X13	0,0100
24	28	17 ^{-0.2/-0.55}	14.300	23.900	1.460	2.440	11.000	17.000	K24X28X17	0,0130
24	29	13 ^{-0.2/-0.55}	12.300	16.900	1.250	1.720	11.000	17.000	K24X29X13	0,0120
24	30	17 ^{-0.2/-0.55}	18.400	25.200	1.880	2.570	11.000	17.000	K24X30X17	0,0220
25	29	10 ^{-0.2/-0.55}	8.950	13.300	910	1.350	11.000	16.000	K25X29X10	0,0083
25	29	13 ^{-0.2/-0.55}	10.800	16.900	1.100	1.720	11.000	16.000	K25X29X13	0,0100
25	30	13 ^{-0.2/-0.55}	13.200	18.800	1.350	1.920	11.000	16.000	K25X30X13	0,0130
25	31	13 ^{-0.2/-0.55}	15.200	19.900	1.550	2.030	11.000	16.000	K25X31X13	0,0160
25	31	14 ^{-0.2/-0.55}	16.500	22.100	1.680	2.250	11.000	16.000	K25X31X14	0,0180
25	31	17 ^{-0.2/-0.55}	18.300	25.300	1.870	2.580	11.000	16.000	K25X31X17	0,0220
25	31	21 ^{-0.2/-0.55}	22.500	33.000	2.290	3.350	11.000	16.000	K25X31X21	0,0260

Cage and roller type needle roller bearings series K


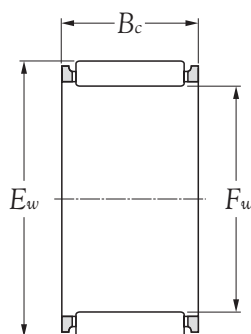
Boundary dimensions			Basic load ratings				Limiting speeds		Bearing numbers	Mass kg (approx.)
<i>F_w</i>	<i>E_w</i>	<i>B_c</i>	dynamic N	static	dynamic kgf	static	rpm			
			<i>C_r</i>	<i>C_{or}</i>	<i>C_r</i>	<i>C_{or}</i>	grease	oil		
26	30	13 ^{-0.2/-0.55}	11.800	19.200	1.200	1.960	10.000	15.000	K26X30X13	0,011
26	30	17 ^{-0.2/-0.55}	15.500	27.400	1.580	2.790	10.000	15.000	K26X30X17	0,015
26	34	22 ^{-0.2/-0.55}	24.200	30.000	2.470	3.050	10.000	15.000	K26X34X22	0,041
28	32	17 ^{-0.2/-0.55}	15.300	27.500	1.560	2.810	9.500	14.000	K28X32X17	0,017
28	32	21 ^{-0.2/-0.55}	18.700	35.500	1.910	3.650	9.500	14.000	K28X32X21	0,020
28	33	13 ^{-0.2/-0.55}	13.900	20.900	1.420	2.130	9.500	14.000	K28X33X13	0,015
28	33	27 ^{-0.2/-0.55}	28.300	52.000	2.890	5.300	9.500	14.000	K28X33X27	0,032
28	34	14 ^{-0.2/-0.55}	17.500	24.800	1.790	2.530	9.500	14.000	K28X34X14	0,020
28	34	17 ^{-0.2/-0.55}	18.100	25.800	1.850	2.630	9.500	14.000	K28X34X17	0,024
28	35	16 ^{-0.2/-0.55}	21.200	28.400	2.160	2.900	9.500	14.000	K28X35X16	0,029
28	35	18 ^{-0.2/-0.55}	21.500	28.900	2.190	2.950	9.500	14.000	K28X35X18	0,031
29	34	27 ^{-0.2/-0.55}	28.100	52.000	2.870	5.300	9.500	14.000	K29X34X27	0,033
30	37	16 ^{-0.2/-0.55}	21.900	30.500	2.230	3.100	8.500	13.000	K30X37X16	0,029
30	37	18 ^{-0.2/-0.55}	23.300	33.000	2.370	3.350	8.500	13.000	K30X37X18	0,034
30	38	18 ^{-0.2/-0.55}	25.000	33.000	2.550	3.350	8.500	13.000	K30X38X18	0,036
32	37	13 ^{-0.2/-0.55}	14.500	23.000	1.480	2.350	8.500	13.000	K32X37X13	0,018
32	38	26 ^{-0.2/-0.55}	31.500	54.000	3.200	5.550	8.500	13.000	K32X38X26	0,041
32	39	16 ^{-0.2/-0.55}	22.600	32.000	2.310	3.300	8.500	13.000	K32X39X16	0,034
32	39	18 ^{-0.2/-0.55}	24.000	35.000	2.450	3.550	8.500	13.000	K32X39X18	0,037
35	40	13 ^{-0.2/-0.55}	15.200	25.100	1.550	2.560	7.500	11.000	K35X40X13	0,019
35	40	17 ^{-0.2/-0.55}	20.000	36.000	2.040	3.650	7.500	11.000	K35X40X17	0,025
35	41	14 ^{-0.2/-0.55}	19.400	30.500	1.980	3.100	7.500	11.000	K35X41X14	0,026
35	41	15 ^{-0.2/-0.55}	20.900	33.500	2.130	3.400	7.500	11.000	K35X41X15	0,027
35	42	16 ^{-0.2/-0.55}	24.100	36.000	2.450	3.650	7.500	11.000	K35X42X16	0,035
35	42	18 ^{-0.2/-0.55}	24.700	37.000	2.510	3.750	7.500	11.000	K35X42X18	0,039
35	42	20 ^{-0.2/-0.55}	28.500	44.500	2.910	4.550	7.500	11.000	K35X42X20	0,041
35	42	30 ^{-0.2/-0.55}	39.500	68.000	4.050	6.950	7.500	11.000	K35X42X30	0,062
37	42	13 ^{-0.2/-0.55}	15.900	27.100	1.620	2.770	7.500	11.000	K37X42X13	0,021

**Cage and roller type needle roller bearings
series K**


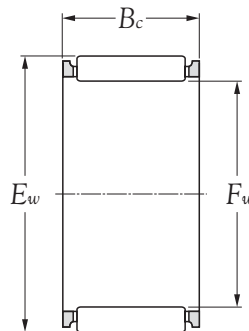
Boundary dimensions			Basic load ratings				Limiting speeds		Bearing numbers	Mass kg (approx.)
<i>F_w</i>	<i>E_w</i>	<i>B_c</i>	dynamic N	static	dynamic kgf	static	rpm			
			<i>C_r</i>	<i>C_{or}</i>	<i>C_r</i>	<i>C_{or}</i>	grease	oil		
37	44	18 ^{-0.2/-0.55}	26.300	41.000	2.680	4.150	7.500	11.000	K37X44X18	0,042
38	43	17 ^{-0.2/-0.55}	20.900	38.500	2.130	39.500	7.500	11.000	K38X43X17	0,026
38	43	27 ^{-0.2/-0.55}	32.000	67.500	3.300	6.900	7.500	11.000	K38X43X27	0,043
38	46	32 ^{-0.2/-0.55}	54.000	95.500	5.500	9.700	7.500	11.000	K38X46X32	0,073
40	45	13 ^{-0.2/-0.55}	16.500	29.200	1.680	2.980	6.500	10.000	K40X45X13	0,022
40	45	17 ^{-0.2/-0.55}	21.800	41.500	2.220	4.250	6.500	10.000	K40X45X17	0,027
40	45	21 ^{-0.2/-0.55}	26.700	54.000	2.720	5.500	6.500	10.000	K40X45X21	0,037
40	45	27 ^{-0.2/-0.55}	33.500	72.500	3.400	7.400	6.500	10.000	K40X45X27	0,044
40	46	17 ^{-0.2/-0.55}	24.600	43.000	2.500	4.350	6.500	10.000	K40X46X17	0,030
40	47	18 ^{-0.2/-0.55}	27.700	45.000	2.820	4.550	6.500	10.000	K40X47X18	0,045
40	47	20 ^{-0.2/-0.55}	31.000	51.500	3.150	5.250	6.500	10.000	K40X47X20	0,048
40	48	20 ^{-0.2/-0.55}	33.000	51.000	3.350	5.200	6.500	10.000	K40X48X20	0,052
40	48	25 ^{-0.2/-0.55}	42.500	71.000	4.350	7.250	6.500	10.000	K40X48X25	0,065
42	47	17 ^{-0.2/-0.55}	22.100	43.000	2.250	4.400	6.500	9.500	K42X47X17	0,028
42	47	27 ^{-0.2/-0.55}	34.000	75.500	3.450	7.700	6.500	9.500	K42X47X27	0,047
42	48	17 ^{-0.2/-0.55}	25.700	46.000	2.630	4.700	6.500	9.500	K42X48X17	0,036
42	50	20 ^{-0.2/-0.55}	34.000	53.500	3.450	5.500	6.500	9.500	K42X50X20	0,054
43	48	17 ^{-0.2/-0.55}	22.000	43.000	2.240	4.400	6.500	9.500	K43X48X17	0,029
43	48	27 ^{-0.2/-0.55}	34.000	75.500	3.450	7.700	6.500	9.500	K43X48X27	0,046
43	50	18 ^{-0.2/-0.55}	29.100	49.000	2.960	5.000	6.500	9.500	K43X50X18	0,049
45	49	19 ^{-0.2/-0.55}	22.100	52.000	2.260	5.300	6.000	9.000	K45X49X19	0,027
45	50	27 ^{-0.2/-0.55}	34.500	78.000	3.500	7.950	6.000	9.000	K45X50X27	0,050
45	52	18 ^{-0.2/-0.55}	29.700	51.000	3.000	5.200	6.000	9.000	K45X52X18	0,051
45	52	21 ^{-0.2/-0.55}	32.000	56.500	3.300	5.750	6.000	9.000	K45X52X21	0,061
45	53	20 ^{-0.2/-0.55}	36.000	59.000	3.650	6.000	6.000	9.000	K45X53X20	0,062
45	53	25 ^{-0.2/-0.55}	46.500	82.000	4.700	8.400	6.000	9.000	K45X53X25	0,077
47	52	17 ^{-0.2/-0.55}	23.200	47.500	2.360	4.850	5.500	8.500	K47X52X17	0,033
47	52	27 ^{-0.2/-0.55}	35.500	83.000	3.650	8.450	5.500	8.500	K47X52X27	0,051

Cage and roller type needle roller bearings series K


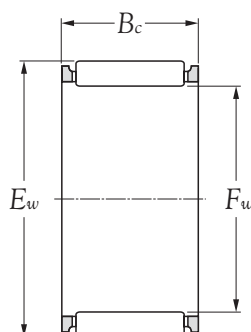
Boundary dimensions			Basic load ratings				Limiting speeds		Bearing numbers	Mass kg (approx.)
mm			dynamic N	static	dynamic kgf	static	rpm			
<i>F_w</i>	<i>E_w</i>	<i>B_c</i>	<i>C_r</i>	<i>C_{or}</i>	<i>C_r</i>	<i>C_{or}</i>	grease	oil		
48	54	19.0 ^{-0.2/-0.55}	31.000	61.000	3.150	6.250	5.500	8.500	K48X54X19	0,044
50	55	13.5 ^{-0.2/-0.55}	18.100	35.500	1.850	3.600	5.500	8.000	K50X55X13.5	0,023
50	55	20.0 ^{-0.2/-0.55}	27.900	62.000	2.850	6.300	5.500	8.000	K50X55X20	0,042
50	55	27.0 ^{-0.2/-0.55}	37.000	88.500	3.750	9.000	5.500	8.000	K50X55X27	0,053
50	55	30.0 ^{-0.2/-0.55}	39.500	97.000	4.050	9.900	5.500	8.000	K50X55X30	0,059
50	57	18.0 ^{-0.2/-0.55}	31.500	57.000	3.200	5.800	5.500	8.000	K50X57X18	0,053
50	58	20.0 ^{-0.2/-0.55}	38.500	67.500	3.950	6.850	5.500	8.000	K50X58X20	0,065
50	58	25.0 ^{-0.2/-0.55}	48.500	90.000	4.950	9.150	5.500	8.000	K50X58X25	0,081
52	58	19.0 ^{-0.2/-0.55}	32.000	65.500	3.250	6.650	5.000	7.500	K52X58X19	0,048
55	60	17.0 ^{-0.2/-0.55}	25.800	58.000	2630	5.900	5.000	7.500	K55X60X17	0,043
55	60	20.0 ^{-0.2/-0.55}	28.800	66.500	2.940	6.750	5.000	7.500	K55X60X20	0,045
55	60	30.0 ^{-0.2/-0.55}	42.000	108.000	4.300	11.000	5.000	7.500	K55X60X30	0,069
55	61	19.0 ^{-0.2/-0.55}	33.000	69500	3.350	7.100	5.000	7.500	K55X61X19	0,051
55	61	20.0 ^{-0.2/-0.55}	33.000	69.500	3.350	7.100	5.000	7.500	K55X61X20	0,054
55	61	30.0 ^{-0.2/-0.55}	48.000	113.000	4.900	11.500	5.000	7.500	K55X61X30	0,081
55	62	18.0 ^{-0.2/-0.55}	33.500	63.000	3.400	6.450	5.000	7.500	K55X62X18	0,054
55	63	20.0 ^{-0.2/-0.55}	39.000	70.000	3.950	7.100	5.000	7.500	K55X63X20	0,073
55	63	25.0 ^{-0.2/-0.55}	50.500	97.500	5.150	9.950	5.000	7.500	K55X63X25	0,088
55	63	32.0 ^{-0.2/-0.55}	61.000	125.000	6.200	12.700	5.000	7.500	K55X63X32	0,117
58	64	19.0 ^{-0.2/-0.55}	34.000	73.500	3.450	7.500	4.700	7.000	K58X64X19	0,052
60	65	20.0 ^{-0.2/-0.55}	29.800	71.500	3.050	7.300	4.300	6.500	K60X65X20	0,051
60	65	30.0 ^{-0.2/-0.55}	43.500	116.000	4.450	11.800	4.300	6.500	K60X65X30	0,071
60	66	19.0 ^{-0.2/-0.55}	33.500	73.500	3.450	7.500	4.300	6.500	K60X66X19	0,053
60	66	20.0 ^{-0.2/-0.55}	33.500	73.500	3.450	7.500	4.300	6.500	K60X66X20	0,056
60	66	30.0 ^{-0.2/-0.55}	49.000	119.000	5.000	12.200	4.300	6.500	K60X66X30	0,084
60	68	15.0 ^{-0.2/-0.55}	27.200	45.500	2.780	4.650	4.300	6.500	K60X68X15	0,058
60	68	20.0 ^{-0.2/-0.55}	40.000	75.000	4.100	7.650	4.300	6.500	K60X68X20	0,077
60	68	23.0 ^{-0.2/-0.55}	44.500	85.000	4.500	8.700	4.300	6.500	K60X68X23	0,092

Cage and roller type needle roller bearings series K


Boundary dimensions			Basic load ratings				Limiting speeds		Bearing numbers	Mass kg (approx.)
<i>F_w</i>	<i>E_w</i>	<i>B_c</i>	dynamic N	static	dynamic kgf	static	rpm			
mm	mm	mm	<i>C_r</i>	<i>C_{or}</i>	<i>C_r</i>	<i>C_{or}</i>	grease	oil		
60	68	25 ^{-0.2/-0.55}	52.000	105.000	5.300	10.700	4.300	6.500	K60X68X25	0,097
60	68	27 ^{-0.2/-0.55}	52.000	105.000	5.300	10.700	4.300	6.500	K60X68X27	0,098
61	66	20 ^{-0.2/-0.55}	29.700	71.500	3.050	7.300	4.300	6.500	K61X66X20	0,054
61	66	30 ^{-0.2/-0.55}	43.500	116.000	4.400	11.900	4.300	6.500	K61X66X30	0,073
63	70	21 ^{-0.2/-0.55}	44.500	95.500	4.500	9.700	4.300	6.500	K63X70X21	0,075
64	70	16 ^{-0.2/-0.55}	28.400	60.500	2.900	6.150	4.300	6.500	K64X70X16	0,053
65	70	20 ^{-0.2/-0.55}	30.500	75.000	3.100	7.650	4.000	6.000	K65X70X20	0,055
65	70	30 ^{-0.2/-0.55}	45.000	124.000	4.600	12.700	4.000	6.000	K65X70X30	0,083
65	73	23 ^{-0.2/-0.55}	47.000	94.000	4.800	9.600	4.000	6.000	K65X73X23	0,100
65	73	30 ^{-0.2/-0.55}	61.000	132.000	6.200	13.400	4.000	6.000	K65X73X30	0,126
68	74	20 ^{-0.2/-0.55}	36.000	83.500	3.700	8.550	4.000	6.000	K68X74X20	0,065
68	74	30 ^{-0.2/-0.55}	51.500	133.000	5.250	13.500	4.000	6.000	K68X74X30	0,097
68	75	21 ^{-0.2/-0.55}	45.500	101.000	4.600	10.300	4.000	6.000	K68X75X21	0,077
70	76	20 ^{-0.2/-0.55}	36.500	86.000	3.700	8.750	3.700	5.500	K70X76X20	0,070
70	76	30 ^{-0.2/-0.55}	53.000	139.000	5.400	14.200	3.700	5.500	K70X76X30	0,100
70	77	21 ^{-0.2/-0.55}	45.000	101.000	4.600	10.300	3.700	5.500	K70X77X21	0,080
70	78	23 ^{-0.2/-0.55}	49.500	103.000	5.050	10.500	3.700	5.500	K70X78X23	0,107
70	78	30 ^{-0.2/-0.55}	65.500	149.000	6.700	15.200	3.700	5.500	K70X78X30	0,136
72	79	21 ^{-0.2/-0.55}	46.500	106.000	4.750	10.800	3.700	5.500	K72X79X21	0,085
73	79	30 ^{-0.2/-0.55}	54.500	146.000	5.550	14.900	3.700	5.500	K73X79X30	0,106
75	81	30 ^{-0.2/-0.55}	56.000	152.000	5.700	15.500	3.700	5.500	K75X81X30	0,108
75	82	21 ^{-0.2/-0.55}	46.000	106.000	4.700	10.800	3.700	5.500	K75X82X21	0,088
75	83	23 ^{-0.2/-0.55}	50.500	109.000	5.150	11.100	3.700	5.500	K75X83X23	0,113
75	83	30 ^{-0.2/-0.55}	67.500	157.000	6.850	16.100	3.700	5.500	K75X83X30	0,147
80	86	20 ^{-0.2/-0.55}	39.000	98.000	4.000	10.000	3.300	5.000	K80X86X20	0,077
80	86	30 ^{-0.2/-0.55}	57.000	159.000	5.800	16.200	3.300	5.000	K80X86X30	0,110
80	88	23 ^{-0.2/-0.55}	53.000	118.000	5.400	12.100	3.300	5.000	K80X88X23	0,125
80	88	26 ^{-0.2/-0.55}	61.000	142.000	6.250	14.500	3.300	5.000	K80X88X26	0,131

**Cage and roller type needle roller bearings
series K**


Boundary dimensions			Basic load ratings				Limiting speeds		Bearing numbers	Mass kg (approx.)
mm			dynamic N	static	dynamic kgf	static	rpm			
<i>F_w</i>	<i>E_w</i>	<i>B_c</i>	<i>C_r</i>	<i>C_{or}</i>	<i>C_r</i>	<i>C_{or}</i>	grease	oil		
80	88	30 ^{-0.2/-0.55}	69.000	166.000	7.050	17.000	3.300	5.000	K80X88X30	0,157
85	92	30 ^{-0.2/-0.55}	66.000	176.000	6.750	18.000	3.100	4.700	K85X92X30	0,142
85	93	27 ^{-0.2/-0.55}	64.000	153.000	6.500	15.600	3.100	4.700	K85X93X27	0,145
85	93	30 ^{-0.2/-0.55}	71.000	175.000	7.200	17.900	3.100	4.700	K85X93X30	0,160
90	97	20 ^{-0.2/-0.55}	46.000	113.000	4.700	11.500	2.900	4.400	K90X97X20	0,103
90	97	30 ^{-0.2/-0.55}	67.500	184.000	6.850	18.700	2.900	4.400	K90X97X30	0,151
90	98	26 ^{-0.2/-0.55}	64.000	157.000	6.550	16.000	2.900	4.400	K90X98X26	0,148
90	98	27 ^{-0.2/-0.55}	64.000	157.000	6.550	16.000	2.900	4.400	K90X98X27	0,150
90	98	30 ^{-0.2/-0.55}	72.500	184.000	7.400	18.800	2.900	4.400	K90X98X30	0,172
95	102	21 ^{-0.2/-0.55}	48.000	122.000	4.900	12.400	2.800	4.200	K95X102X21	0,115
95	102	31 ^{-0.2/-0.55}	70.500	199.000	7.200	20.300	2.800	4.200	K95X102X31	0,172
95	103	27 ^{-0.2/-0.55}	65.500	165.000	6.700	16.800	2.800	4.200	K95X103X27	0,159
95	103	30 ^{-0.2/-0.55}	74.000	193.000	7.550	19.600	2.800	4.200	K95X103X30	0,165
100	107	21 ^{-0.3/-0.65}	49.000	127.000	5.000	12.900	2.700	4.000	K100X107X21	0,120
100	107	31 ^{-0.3/-0.65}	71.500	207.000	7.300	21.100	2.700	4.000	K100X107X31	0,173
100	108	27 ^{-0.3/-0.65}	61.000	153.000	6.250	15.600	2.700	4.000	K100X108X27	0,176
100	108	30 ^{-0.3/-0.65}	76.000	201.000	7.700	20.500	2.700	4.000	K100X108X30	0,190
105	112	21 ^{-0.3/-0.65}	48.500	127.000	4.950	12.900	2.500	3.800	K105X112X21	0,130
105	112	31 ^{-0.3/-0.65}	71.000	207.000	7.250	21.100	2.500	3.800	K105X112X31	0,176
105	113	30 ^{-0.3/-0.65}	77.500	210.000	7.900	21.400	2.500	3.800	K105X113X30	0,198
110	117	24 ^{-0.3/-0.65}	54.500	149.000	5.550	15.200	2.400	3.600	K110X117X24	0,145
110	117	34 ^{-0.3/-0.65}	77.500	235.000	7.900	24.000	2.400	3.600	K110X117X34	0,205
110	118	30 ^{-0.3/-0.65}	79.000	219.000	8.050	22.300	2.400	3.600	K110X118X30	0,217
115	123	27 ^{-0.3/-0.65}	64.000	170.000	6.550	17.300	2.300	3.500	K115X123X27	0,200
115	125	34 ^{-0.3/-0.65}	95.000	241.000	9.700	24.600	2.300	3.500	K115X125X34	0,330
120	127	24 ^{-0.3/-0.65}	57.500	165.000	5.850	16.800	2.200	3.300	K120X127X24	0,160
120	127	34 ^{-0.3/-0.65}	82.000	260.000	8.350	26.600	2.200	3.300	K120X127X34	0,235
125	133	35 ^{-0.3/-0.65}	87.000	260.000	8.900	26.500	2.100	3.200	K125X133X35	0,275

Cage and roller type needle roller bearings series K


Boundary dimensions			Basic load ratings				Limiting speeds		Bearing numbers	Mass kg (approx.)
mm			dynamic N	static	dynamic kgf	static	rpm			
<i>F_w</i>	<i>E_w</i>	<i>B_c</i>	<i>C_r</i>	<i>C_{or}</i>	<i>C_r</i>	<i>C_{or}</i>	grease	oil		
125	135	34 ^{-0.3 -0.65}	100.000	265.000	10.200	27.000	2.100	3.200	K125X135X34	0,350
130	137	24 ^{-0.3 -0.65}	59.000	175.000	6.000	17.900	2.100	3.100	K130X137X24	0,170
130	137	34 ^{-0.3 -0.65}	84.500	277.000	8.600	28.300	2.100	3.100	K130X137X34	0,240
135	143	35 ^{-0.3 -0.65}	92.500	288.000	9.450	29.400	2.000	3.000	K135X143X35	0,300
135	150	38 ^{-0.3 -0.65}	145.000	325.000	14.800	33.500	2.000	3.000	K135X150X38	0,590
145	153	26 ^{-0.3 -0.65}	72.000	214.000	7.350	21.800	1.900	2.800	K145X153X26	0,250
145	153	28 ^{-0.3 -0.65}	80.500	247.000	8.200	25.200	1.900	2.800	K145X153X28	0,252
145	153	36 ^{-0.3 -0.65}	100.000	325.000	10.200	33.000	1.900	2.800	K145X153X36	0,335
150	160	46 ^{-0.3 -0.65}	149.000	470.000	15.200	48.000	1.800	2.700	K150X160X46	0,550
155	163	26 ^{-0.3 -0.65}	73.500	224.000	7.500	22.800	1.700	2.600	K155X163X26	0,270
155	163	36 ^{-0.3 -0.65}	102.000	340.000	10.400	34.500	1.700	2.600	K155X163X36	0,355
160	170	46 ^{-0.3 -0.65}	155.000	505.000	15.800	51.500	1.700	2.500	K160X170X46	0,570
165	173	26 ^{-0.3 -0.65}	79.000	251.000	8.050	25.600	1.600	2.400	K165X173X26	0,290
165	173	32 ^{-0.3 -0.65}	97.000	330.000	9.900	33.500	1.600	2.400	K165X173X32	0,340
165	173	36 ^{-0.3 -0.65}	109.000	380.000	11.100	39.000	1.600	2.400	K165X173X36	0,375
170	180	46 ^{-0.3 -0.65}	160.000	540.000	16.400	55.000	1.600	2.400	K170X180X46	0,620
175	183	32 ^{-0.3 -0.65}	101.000	350.000	10.300	35.500	1.500	2.300	K175X183X32	0,360
185	195	37 ^{-0.3 -0.65}	131.000	425.000	13.300	43.500	1.500	2.200	K185X195X37	0,560
195	205	37 ^{-0.3 -0.65}	135.000	450.000	13.800	46.000	1.400	2.100	K195X205X37	0,620
210	220	42 ^{-0.3 -0.65}	156.000	560.000	15.900	57.000	1.300	1.900	K210X220X42	0,740
220	230	42 ^{-0.3 -0.65}	161.000	590.000	16.400	60.000	1.200	1.800	K220X230X42	0,790
240	250	42 ^{-0.3 -0.65}	167.000	635.000	17.000	64.500	1.100	1.700	K240X250X42	0,850
265	280	50 ^{-0.3 -0.65}	256.000	850.000	26.100	87.000	1.000	1.500	K265X280X50	1,810
285	300	50 ^{-0.3 -0.65}	268.000	930.000	27.300	94.500	950	1.400	K285X300X50	1,970



NEEDLE ROLLER BEARINGS

Using applications

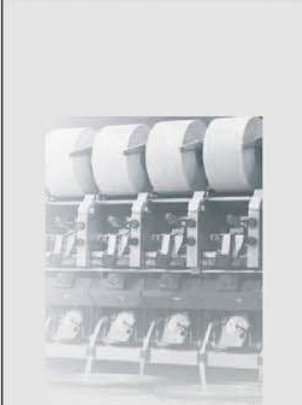


Expand all sectors

Power transmission and electrical engineering

Construction, building materials and mining machinery, offshore engineering, civil engineering

Precision engineering and medical equipment



Conveying trucks, conveying and warehousing equipment

Rubber and plastics processing machinery, machinery for the chemical industry

Hydraulic and pneumatic engineering

Agricultural machinery

Assembly, handling and industrial robots

Passenger and estate cars, automotive supplier industry

Power tools

Rail vehicles

Toys, pedal cycles and sports equipment



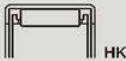
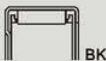
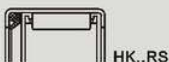

Iron and steel industry

Internal combustion engines for gardening and forestry equipment, outboard motors

Machine tools and production systems

Electrical household appliances



	Technical Information		Product Information
 HK	46~47	HK Series	48~51
 BK	46~47	BK Series	48~51
 HK..RS	46~47	HK..RS Series	52~53
 HK..2RS	46~47	HK..2RS Series	52~53



1. Types and designs

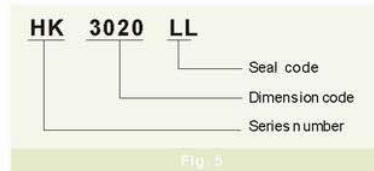
SYI Drawn Cup Needle Roller Bearings can be classified into open-end and closed-end types according to the form of their outer ring. The open-end design is further subcategorized into the series HK (metric standard series). The closed-end design is further classified into series BK (metric standard series). Sealed **SYI** Drawn Cup Needle Roller Bearings (suffix L or LL) 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 $+100^{\circ}\text{C}$. Its rollers are shorter than those in an open-ended type of the same dimension, so its load rating is accordingly smaller.



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 (suffix T2). The T2 cage features a maximum allowable operating temperature of 120°C and a maximum allowable continuous operating temperature of 100°C .

2. Interpreting bearing numbers

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



3. Bearing fits

The fit of an **SYI** Drawn Cup Needle Roller Bearing to a housing is usually a tight fit where the inscribed enveloping circle diameter (F_w) of press-fit rollers satisfies ISO tolerance class F8. However, the inscribed enveloping circle diameter (F_w) 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 (F_w) 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. For the accuracy of a shaft that is used directly as a raceway surface or that uses an inner ring, refer to [Sec.14.3](#) "Shaft and housing accuracy".

Table 2 Recommended fits

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

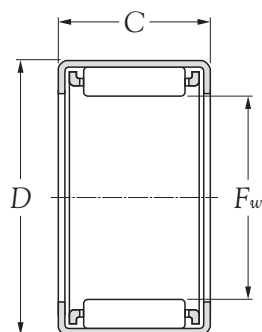
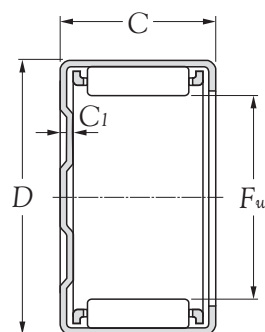
5. Bearing tolerances and measuring methods

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).

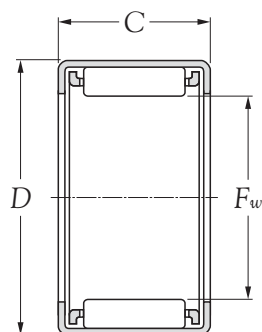
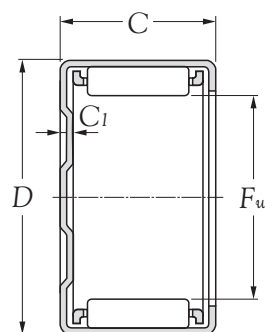
The tolerances of the bore diameter of the ring gauges and the inscribed enveloping circle diameter (F_w) are given in Tables 3, which apply to the series HK and BK (standard metric series). When measuring the inscribed enveloping circle diameter (F_w) with a plug gauge, the dimension at GO side must satisfy "Low" tolerance for inscribed enveloping circle diameter, and that at NO GO side must satisfy "Height" tolerance plus 2 μ m. These values comply with the relevant ISO standard.

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

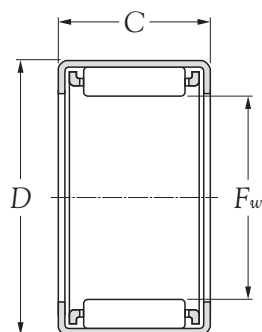
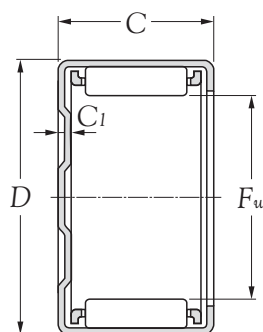
Enveloping circle dia. F_w	Outside dia. of outer ring D	Ring gauge bore dia.	Enveloping circle dia. tolerance	
			high	low
3	6.5	6.4840	3.016	3.006
4	8	7.9840	4.022	4.010
5	9	8.9840	5.022	5.010
6	10	9.9840	6.022	6.010
7	11	10.980	7.028	7.013
8	12	11.980	8.028	8.013
9	13	12.980	9.028	9.013
10	14	13.980	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

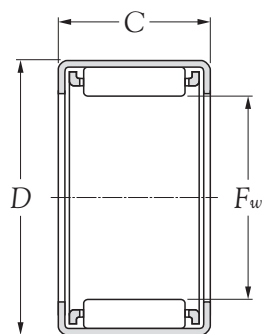
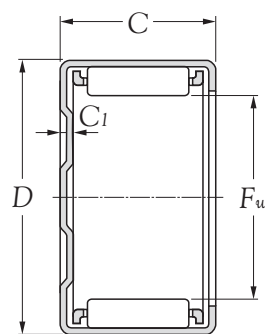
Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers		Mass	Appropriate inner ring
F_w	mm			dynamic	static	dynamic	static	rpm		Open end design	Closed end design	kg (approx.)	(as a reference)
	D	C _{0,2}	C_1 max	C_r	C_{or}	C_r	C_{or}	grease	oil				
3	6,5	6	-	1.250	835	128	85	33.000	50.000	HK0306	-	0,0006	-
3	6,5	6	0,8	1.250	835	128	85	33.000	50.000	-	BK0306	0,0007	-
4	8,0	8	-	1.770	1.270	180	129	30.000	45.000	HK0408	-	0,0016	-
4	8,0	8	1,6	1.770	1.270	180	129	30.000	45.000	-	BK0408	0,0018	-
5	9,0	9	-	2.640	2.190	269	224	27.000	40.000	HK0509	-	0,0019	-
5	9,0	9	1,6	2.640	2.190	269	224	27.000	40.000	-	BK0509	0,0021	-
6	10,0	9	-	2.660	2.280	272	233	25.000	37.000	HK0609	-	0,0022	-
6	10,0	9	1,6	2.660	2.280	272	233	25.000	37.000	-	BK0609	0,0024	-
7	11,0	9	-	3.400	3.250	345	330	23.000	34.000	HK0709	-	0,0025	-
7	11,0	9	1,6	3.400	3.250	345	330	23.000	34.000	-	BK0709	0,0027	-
8	12,0	10	-	3.850	3.950	395	400	20.000	30.000	HK0810	-	0,0032	IR 5X8X12
8	12,0	10	1,6	3.850	3.950	395	400	20.000	30.000	-	BK0810	0,0034	IR 5X8X12
9	13,0	10	-	4.600	5.050	465	515	18.000	27.000	HK0910	-	0,0035	IR 6X9X12
9	13,0	10	1,6	4.600	5.050	465	515	18.000	27.000	-	BK0910	0,0039	IR 6X9X12
9	13,0	12	-	5.650	6.650	575	680	18.000	27.000	HK0912	-	0,0042	IR 6X9X12
9	13,0	12	1,6	5.650	6.650	575	680	18.000	27.000	-	BK0912	0,0045	IR 6X9X12
10	14,0	10	-	4.500	5.100	460	520	16.000	24.000	HK1010	-	0,0038	IR 7X10X10,5
10	14,0	10	1,6	4.500	5.100	460	520	16.000	24.000	-	BK1010	0,0042	IR 7X10X10,5
10	14,0	12	-	5.900	7.250	605	735	16.000	24.000	HK1012	-	0,0045	IR 7X1X16
10	14,0	12	1,6	5.900	7.250	605	735	16.000	24.000	-	BK1012	0,0050	IR 7X10X16
10	14,0	15	-	7.100	9.150	725	935	16.000	24.000	HK1015	-	0,0056	IR 7X10X16
10	14,0	15	1,6	7.100	9.150	725	935	16.000	24.000	-	BK1015	0,0062	IR 7X10X16
12	16,0	10	-	5.050	6.250	515	635	13.000	20.000	HK1210	-	0,0046	IR 8X12X10,5
12	16,0	10	1,6	5.050	6.250	515	635	13.000	20.000	-	BK1210	0,0052	IR 8X12X10,5
12	18,0	12	-	6.600	7.300	675	745	13.000	20.000	HK1212	-	0,0091	IR 8X12X12,5
12	18,0	12	2,7	6.600	7.300	675	745	13.000	20.000	-	BK1212	0,0100	IR 8X12X12,5
13	19,0	12	-	7.300	8.450	745	865	12.000	18.000	HK1312	-	0,0100	IR10X13X12,5
13	19,0	12	2,7	7.300	8.450	745	865	12.000	18.000	-	BK1312	0,0110	IR10X13X12,5

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

Type HK

Type BK

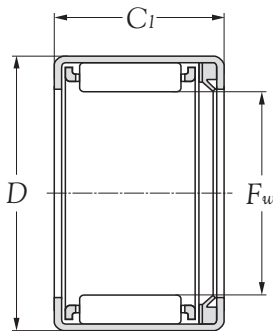
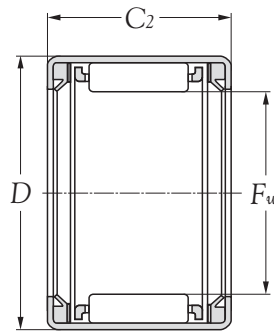
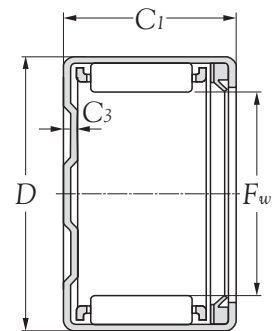
Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers		Mass	Appropriate inner ring
F_w	mm			dynamic	static	dynamic	static	rpm		Open	Closed	kg	(as a reference)
	D	C _{0,2}	C_{1max}	C_r	C_{or}	C_r	C_{or}	grease	oil	end design	end design		
14	20	12	-	7.200	8.500	735	865	11.000	17.000	HK1412	-	0,011	IR10X14X13
14	20	12	2,7	7.200	8.500	735	865	11.000	17.000	-	BK1412	0,012	IR10X14X13
14	20	16	-	10.700	14.000	1.090	1.430	11.000	17.000	HK1416	-	0,015	-
14	20	16	2,7	10.700	14.000	1.090	1.430	11.000	17.000	-	BK1416	0,016	-
15	21	12	-	7.500	9.100	765	930	11.000	16.000	HK1512	-	0,011	IR12X15X12,5
15	21	12	2,7	7.500	9.100	765	930	11.000	16.000	-	BK1512	0,013	IR12X15X12,5
15	21	16	-	10.700	14.400	1.090	1.470	11.000	16.000	HK1516	-	0,015	IR12X15X16,5
15	21	16	2,7	10.700	14.400	1.090	1.470	11.000	16.000	-	BK1516	0,017	IR12X15X16,5
16	22	12	-	7.750	9.700	795	990	10.000	15.000	HK1612	-	0,012	IR12X16X13
16	22	12	2,7	7.750	9.700	795	990	10.000	15.000	-	BK1612	0,014	IR12X16X13
16	22	16	-	11.100	15.300	1.130	1.570	10.000	15.000	HK1616	-	0,016	IR12X16X20
16	22	16	2,7	11.100	15.300	1.130	1.570	10.000	15.000	-	BK1616	0,018	IR12X16X20
17	23	12	-	8.500	11.100	865	1.130	9.500	14.000	HK1712	-	0,012	-
17	23	12	2,7	8.500	11.100	865	1.130	9.500	14.000	-	BK1712	0,015	-
18	24	12	-	8.300	10.900	845	1.110	8.500	13.000	HK1812	-	0,013	IR15X18X12,5
18	24	12	2,7	8.300	10.900	845	1.110	8.500	13.000	-	BK1812	0,015	IR15X18X12,5
18	24	16	-	11.800	17.300	1.210	1.760	8.500	13.000	HK1816	-	0,018	IR15X18X16,5
18	24	16	2,7	11.800	17.300	1.210	1.760	8.500	13.000	-	BK1816	0,020	IR15X18X16,5
20	26	12	-	9.250	13.000	945	1.330	8.000	12.000	HK2012	-	0,014	IR15X20X13
20	26	12	2,7	9.250	13.000	945	1.330	8.000	12.000	-	BK2012	0,017	IR15X20X13
20	26	16	-	13.000	20.100	1.320	2.050	8.000	12.000	HK2016	-	0,019	IR17X20X16,5
20	26	16	2,7	13.000	20.100	1.320	2.050	8.000	12.000	-	BK2016	0,022	IR17X20X16,5
20	26	20	-	16.400	27.100	1.670	2.760	8.000	12.000	HK2020	-	0,024	IR17X20X20,5
20	26	20	2,7	16.400	27.100	1.670	2.760	8.000	12.000	-	BK2020	0,027	IR17X20X20,5
22	28	12	-	9.750	14.300	995	1.460	7.500	11.000	HK2212	-	0,013	IR17X22X13
22	28	12	2,7	9.750	14.300	995	1.460	7.500	11.000	-	BK2212	0,015	IR17X22X13
22	28	16	-	13.600	22.100	1.390	2.250	7.500	11.000	HK2216	-	0,021	IR17X22X18
22	28	16	2,7	13.600	22.100	1.390	2.250	7.500	11.000	-	BK2216	0,024	IR17X22X18

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

Type HK

Type BK

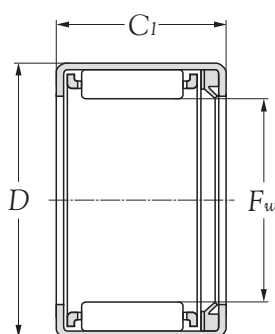
Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers		Mass	Appropriate inner ring
F _w	mm			dynamic	static	dynamic	static	rpm		Open end design	Closed end design	kg (approx.)	(as a reference)
	D	C	C _i	N	kgf	rpm	rpm	grease	oil				
		_{0,2}	max	C _r	C _{or}	C _r	C _{or}						
22	28	20	-	17.200	29.800	1.760	3.050	7.500	11.000	HK2220	-	0,026	IR17X22X20,5
22	28	20	2,7	17.200	29.800	1.760	3.050	7.500	11.000	-	BK2220	0,030	IR17X22X20,5
25	32	12	-	11.800	16.300	1.200	1.660	6.500	9.500	HK2512	-	0,021	IR20X25X12,5
25	32	12	2,7	11.800	16.300	1.200	1.660	6.500	9.500	-	BK2512	0,023	IR20X25X12,5
25	32	16	-	15.900	24.000	1.620	2.450	6.500	9.500	HK2516	-	0,027	IR20X25X17
25	32	16	2,7	15.900	24.000	1.620	2.450	6.500	9.500	-	BK2516	0,031	IR20X25X17
25	32	20	-	20.300	33.000	2.070	3.350	6.500	9.500	HK2520	-	0,034	IR20X25X20,5
25	32	20	2,7	20.300	33.000	2.070	3.350	6.500	9.500	-	BK2520	0,039	IR20X25X20,5
25	32	26	-	26.400	46.000	2.690	4.700	6.500	9.500	HK2526	-	0,045	IR20X25X26,5
25	32	26	2,7	26.400	46.000	2.690	4.700	6.500	9.500	-	BK2526	0,049	IR20X25X26,5
28	35	16	-	17.300	27.600	1.760	2.820	5.500	8.500	HK2816	-	0,030	IR22X28X17
28	35	16	2,7	17.300	27.600	1.760	2.820	5.500	8.500	-	BK2816	0,034	IR22X28X17
28	35	20	-	21.300	36.000	2.170	3.700	5.500	8.500	HK2820	-	0,038	IR22X28X20,5
28	35	20	2,7	21.300	36.000	2.170	3.700	5.500	8.500	-	BK2820	0,043	IR22X28X20,5
30	37	12	-	13.000	19.500	1.320	1.990	5.500	8.000	HK3012	-	0,024	IR25X30X12,5
30	37	12	2,7	13.000	19.500	1.320	1.990	5.500	8.000	-	BK3012	0,028	IR25X30X12,5
30	37	16	-	18.100	30.000	1.850	3.050	5.500	8.000	HK3016	-	0,032	IR25X30X17
30	37	16	2,7	18.100	30.000	1.850	3.050	5.500	8.000	-	BK3016	0,037	IR25X30X17
30	37	20	-	22.300	39.500	2.280	4.000	5.500	8.000	HK3020	-	0,040	IR25X30X20,5
30	37	20	2,7	22.300	39.500	2.280	4.000	5.500	8.000	-	BK3020	0,047	IR25X30X20,5
30	37	26	-	29.100	55.000	2.960	5.650	5.500	8.000	HK3026	-	0,053	IR25X30X26,5
30	37	26	2,7	29.100	55.000	2.960	5.650	5.500	8.000	-	BK3026	0,059	IR25X30X26,5
35	42	12	-	14.000	22.800	1.430	2.320	4.700	7.000	HK3512	-	0,028	-
35	42	12	2,7	14.000	22.800	1.430	2.320	4.700	7.000	-	BK3512	0,033	-
35	42	16	-	19.700	35.000	2.000	3.600	4.700	7.000	HK3516	-	0,037	-
35	42	16	2,7	19.700	35.000	2.000	3.600	4.700	7.000	-	BK3516	0,044	-
35	42	20	-	24.800	47.500	2.530	4.850	4.700	7.000	HK3520	-	0,046	-
35	42	20	2,7	24.800	47.500	2.530	4.850	4.700	7.000	-	BK3520	0,055	-

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

Type HK

Type BK

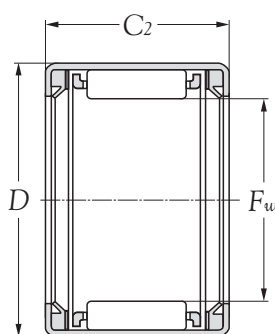
Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers		Mass	Appropriate inner ring
F_w	mm			dynamic	static	dynamic	static	rpm		Open	Closed	kg	(as a reference)
	D	C _{0,2}	C_{1max}	N	kgf	kgf	kgf	grease	oil	end design	end design		
40	47	12	-	15.100	26.000	1.540	2.660	4.000	6.000	HK4012	-	0,031	IR 35X40X12,5
40	47	12	2,7	15.100	26.000	1.540	2.660	4.000	6.000	-	BK4012	0,038	IR 35X40X12,5
40	47	16	-	21.100	40.000	2.150	4.100	4.000	6.000	HK4016	-	0,041	IR 35X40X17
40	47	16	2,7	21.100	40.000	2.150	4.100	4.000	6.000	-	BK4016	0,051	IR 35X40X17
40	47	20	-	25.900	52.500	2.650	5.350	4.000	6.000	HK4020	-	0,052	IR 35X40X20,5
40	47	20	2,7	25.900	52.500	2.650	5.350	4.000	6.000	-	BK4020	0,064	IR 35X40X20,5
45	52	16	-	21.600	43.000	2.210	4.400	3.700	5.500	HK4516	-	0,046	IR 40X45X17
45	52	16	2,7	21.600	43.000	2.210	4.400	3.700	5.500	-	BK4516	0,058	IR 40X45X17
45	52	20	-	27.600	59.000	2.810	6.000	3.700	5.500	HK4520	-	0,058	IR 40X45X20,5
45	52	20	2,7	27.600	59.000	2.810	6.000	3.700	5.500	-	BK4520	0,072	IR 40X45X20,5
50	58	20	-	31.500	63.000	3.200	6.450	3.200	4.800	HK5020	-	0,072	IR 40X50X22
50	58	20	2,7	31.500	63.000	3.200	6.450	3.200	4.800	-	BK5020	0,087	IR 40X50X22
50	58	25	-	38.500	82.000	3.900	8.400	3.200	4.800	HK5025	-	0,090	IR 45X50X25,5
50	58	25	2,7	38.500	82.000	3.900	8.400	3.200	4.800	-	BK5025	0,109	IR 45X50X25,5

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, single seal)

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

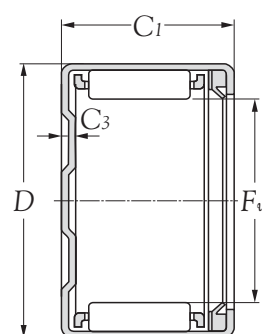
Boundary dimensions					Basic load ratings				Limiting speeds	Bearing numbers			
F_w	D	mm			dynamic	static	dynamic	static	rpm	grease	open end single seal	oen end double seal	closed end single seal
		C_1 ₀ ^{-0,02}	C_2 ₀ ^{-0,02}	C_3 max	N	kgf	kgf	kgf					
12	18	14	16	2,7	6.600	7.300	675	745	10.000	HK1214RS	HK1216 2RS	BK1214RS	
14	20	14	16	2,7	7.200	8.500	735	865	10.000	HK1414RS	HK1416 2RS	BK1414RS	
15	21	14	16	2,7	7.500	9.100	765	930	10.000	HK1514RS	HK1516 2RS	BK1514RS	
16	22	14	16	2,7	7.750	9.700	795	990	10.000	HK1614RS	HK1616 2RS	BK1614RS	
18	24	14	16	2,7	8.300	10.900	845	1.110	9.000	HK1814RS	HK1816 2RS	BK1814RS	
20	26	-	16	-	9.250	13.000	945	1.330	8.000	-	HK2016 2RS	-	
20	26	18	20	2,7	13.000	20.100	1.320	2.050	8.000	HK2018RS	HK2020 2RS	BK2018RS	
22	28	-	16	-	9.750	14.300	995	1.460	7.500	-	HK2216 2RS	-	
22	28	18	20	2,7	13.600	22.100	1.390	2.250	7.500	HK2218RS	HK2220 2RS	BK2218RS	
25	32	-	16	-	11.800	16.300	1.200	1.660	6.500	-	HK2516 2RS	-	
25	32	18	20	2,7	15.900	24.000	1.620	2.450	6.500	HK2518RS	HK2520 2RS	BK2518RS	
28	35	-	20	-	17.300	27.600	1.760	2.820	5.500	-	HK2820 2RS	-	
30	37	-	16	-	13.000	19.500	1.320	1.990	5.500	-	HK3016 2RS	-	
30	37	18	20	2,7	18.100	30.000	1.850	3.050	5.500	HK3018RS	HK3020 2RS	BK3018RS	
35	42	-	16	-	14.000	22.800	1.430	2.320	4.600	-	HK3516 2RS	-	
35	42	18	20	2,7	19.700	35.000	2.000	3.600	4.600	HK3518RS	HK3520 2RS	BK3518RS	
40	47	-	16	-	15.100	26.000	1.540	2.660	4.000	-	HK4016 2RS	-	
40	47	18	20	2,7	21.100	40.000	2.150	4.100	4.000	HK4018RS	HK4020 2RS	BK4018RS	
45	52	18	20	2,7	21.600	43.000	2.210	4.400	3.600	HK4518RS	HK4520 2RS	BK4518RS	
50	58	22	24	2,7	31.500	63.000	3.200	6.450	3.200	HK5022RS	HK5024 2RS	BK5022RS	

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


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










Type HK..LL
(Open end, double seal)



Type BK..L
(Closed end, single seal)

Appropriate inner ring (as a reference)		Bearing numbers			Mass kg (approx.)		
single seal	double seal	open end single seal	open end double seal	closed end single seal	open end single seal	open end double seal	closed end single seal
IR 9 × 12 × 16	-	HK1214RS	HK1216 2RS	BK1214RS	11	0,012	12
IR 10 × 14 × 16	IR 10 × 14 × 20	HK1414RS	HK1416 2RS	BK1414RS	12	0,014	14
IR 12 × 15 × 16,5	IR 12 × 15 × 16,5	HK1514RS	HK1516 2RS	BK1514RS	13	0,014	14
IR 12 × 16 × 16	IR 12 × 16 × 20	HK1614RS	HK1616 2RS	BK1614RS	13	0,015	15
IR 15 × 18 × 16	IR 15 × 18 × 17,5	HK1814RS	HK1816 2RS	BK1814RS	15	0,017	17
-	IR 15 × 20 × 18	-	HK2016 2RS	-	-	0,019	-
IR 17 × 20 × 20	IR 17 × 20 × 20,5	HK2018RS	HK2020 2RS	BK2018RS	21	0,024	24
-	IR 17 × 22 × 18	-	HK2216 2RS	-	-	0,020	-
IR 17 × 22 × 20,5	IR 17 × 22 × 23	HK2218RS	HK2220 2RS	BK2218RS	24	0,026	27
-	IR 20 × 25 × 18D	-	HK2516 2RS	-	-	0,027	-
IR 20 × 25 × 20	IR 20 × 25 × 23	HK2518RS	HK2520 2RS	BK2518RS	31	0,033	35
-	IR 22 × 28 × 23	-	HK2820 2RS	-	-	0,037	-
-	IR 25 × 30 × 18D	-	HK3016 2RS	-	-	0,027	-
IR 25 × 30 × 20	IR 25 × 30 × 23	HK3018RS	HK3020 2RS	BK3018RS	37	0,039	45
-	-	-	HK3516 2RS	-	-	0,036	-
-	-	HK3518RS	HK3520 2RS	BK3518RS	37	0,040	47
-	IR 35 × 40 × 17	-	HK4016 2RS	-	-	0,041	-
IR 35 × 40 × 20	-	HK4018RS	HK4020 2RS	BK4018RS	47	0,050	62
IR 40 × 45 × 20	-	HK4518RS	HK4520 2RS	BK4518RS	54	0,057	72
IR 45 × 50 × 25	IR 45 × 50 × 25,5	HK5022RS	HK5024 2RS	BK5022RS	86	0,089	104

	Technical Information		Product Information
 NA48 NA49 NA59	56~57	NA48, NA49, NA59 Series	58~67
 NA69	56~57	NA69 Series	58~67
 NA49..RS RNA49..RS	56~57	NA49..RS, RNA49..RS Series	68~69
 NA49..2RS RNA49..2RS	56~57	NA49..2RS RNA49..2RS Series	68~69
 RNA 48 RNA 49 RNA 59 NK	56~57	RNA48, RNA49, RNA 59, NK Series	70~83
 RNA69	56~57	RNA69 Series	70~79
 NKI	56~57	NKI Series	84~86



1. Types and designs

The available **SYI**[®] 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 RNA49, RNA59, and RNA69. The bearing series with an inner ring include NKI and NA (metric series). The dimension series of series NA include NA48, NA49, NA59, and NA69. The boundary dimensions (bore diameter, outside diameter, width, and chamfer dimension) for these dimension series are specified in JIS B 1512 and 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 RNA69 (NA69) 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 **SYI**[®] 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 T2) 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 RNA49 (NA49) bearings include a sealed type whose outer ring has a synthetic rubber seal on one or both ends (suffix L, LL). This variant is pre-filled with lithium soap grease and can operate within a temperate range of -25°C to 100°C.

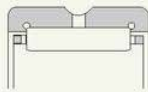


Fig. 1 Series RNA(NK)

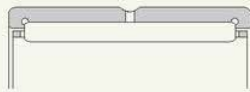


Fig. 2 Series RNA(double row)

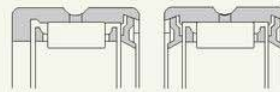


Fig. 3 Series RNA49..L(LL)

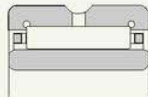


Fig. 4 Series NA

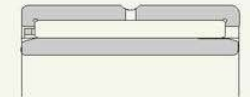


Fig. 5 Series NA(double row)

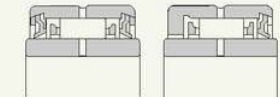
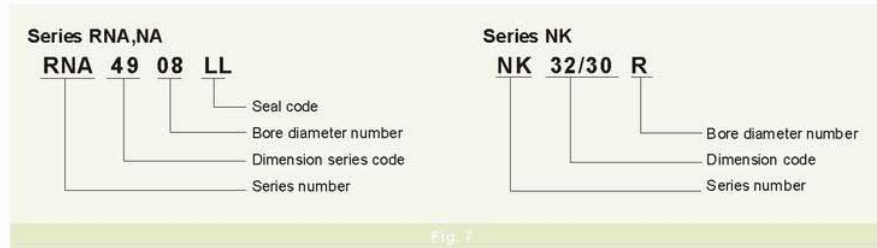


Fig. 6 Series NA49..L(LL)

2. Interpreting bearing numbers

The bearing numbers of **SYI** 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)



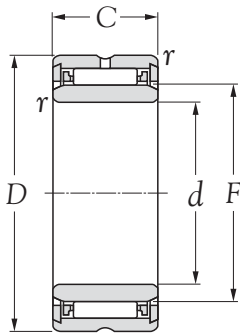
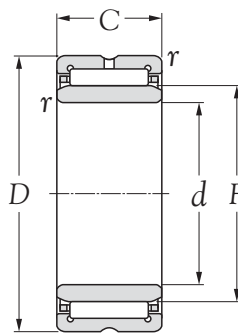
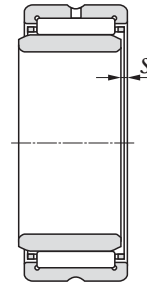
3. Interpreting clearance and bearing fits

The radial clearances of **SYI** Machined Ring Roller Bearings with an inner ring are given in **Sec. 8** "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 **Sec. 7.3.2** "Recommended fits," The required form accuracy and surface roughness are specified in **Sec. 14.3** "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 **secretary. 14.4** "Accuracy of Raceway surface".

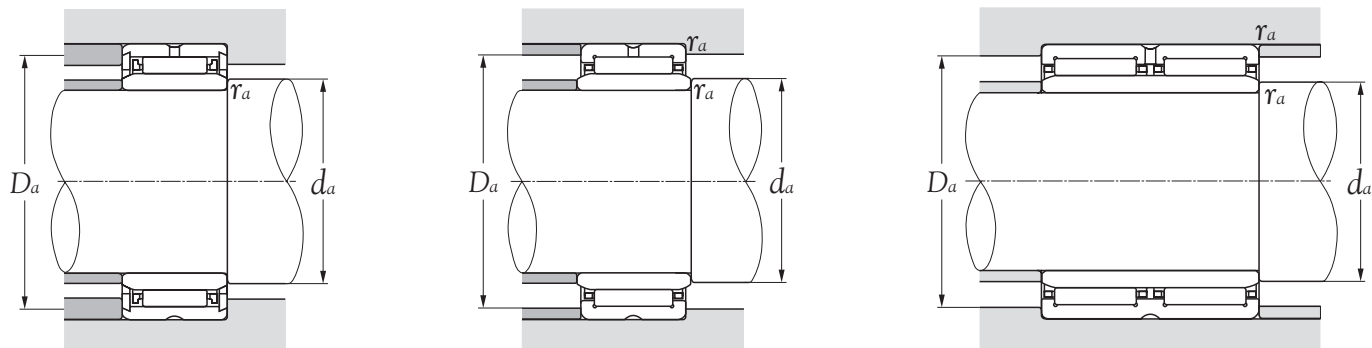
Table 1 Dimensional tolerances of shaft (raceway diameter)

Enveloping circle dia. F_w mm		Tolerance class of shaft		
		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

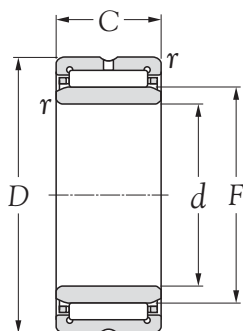
Machined-ring needle roller bearings with inner ring series NA48-49-59-69

Type 49 ($d \leq 9\text{mm}$)

**Type NA 49..R ($d \geq 10\text{mm}$)
**Type NA 59
 Type NA 69..R ($d \leq 30\text{mm}$)****

Boundary dimensions						Limiting speeds		Bearing numbers
mm						rpm		
d	D	C	$r_s \text{ min}^{1)}$	F	$s^{2)}$	grease	oil	
5	13	10	0,15	7		23.000	34.000	NA495
6	15	10	0,15	8		21.000	32.000	NA496
7	17	10	0,15	9		20.000	30.000	NA497
8	19	11	0,15	10		19.000	28.000	NA498
9	20	11	0,30	12		17.000	26.000	NA499
10	22	13	0,30	14	0,5	16.000	24.000	NA4900
12	24	13	0,30	16	0,5	15.000	23.000	NA4901
12	24	22	0,30	16	1,0	15.000	23.000	NA6901
15	28	13	0,30	20	0,5	13.000	20.000	NA4902
15	28	18	0,30	20	0,5	13.000	20.000	NA5902
15	28	23	0,30	20	1,0	13.000	20.000	NA6902
17	30	13	0,30	22	0,5	12.000	18.000	NA4903
17	30	18	0,30	22	0,5	12.000	18.000	NA5903
17	30	23	0,30	22	1,0	12.000	18.000	NA6903
20	37	17	0,30	25	0,8	11.000	16.000	NA4904
20	37	23	0,30	25	0,8	11.000	16.000	NA5904
20	37	30	0,30	25	1,0	11.000	16.000	NA6904
22	39	17	0,30	28	0,8	9.500	14.000	NA49/22
22	39	23	0,30	28	0,8	9.500	14.000	NA59/22
22	39	30	0,30	28	0,5	9.500	14.000	NA69/22
25	42	17	0,30	30	0,8	8.500	13.000	NA4905
25	42	23	0,30	30	0,8	8.500	13.000	NA5905
25	42	30	0,30	30	1,0	8.500	13.000	NA6905
28	45	17	0,30	32	0,8	8.500	13.000	NA49/28
28	45	23	0,30	32	0,8	8.500	13.000	NA59/28
28	45	30	0,30	32	1,0	8.500	13.000	NA69/28
30	47	17	0,30	35	0,8	7.500	11.000	NA4906
30	47	23	0,30	35	0,8	7.500	11.000	NA5906

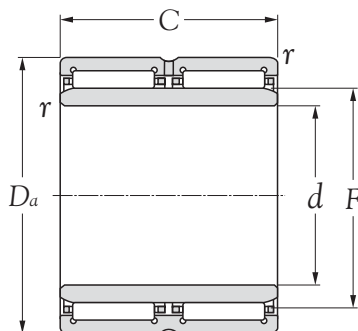
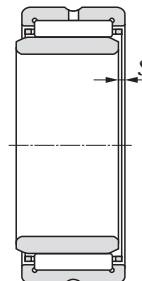
Notes: 1) These values are the allowable minimum dimensions of the chamfer dimension r.
 2) These values are the possible axial displacement of the inner ring against outer ring.

**Machined-ring needle roller bearings with inner ring
series NA48-49-59-69**


Basic load ratings				Abutment dimensions			Bearing numbers	Mass kg (approx.)
dynamic N	static	dynamic kgf	static	d_a min	D_a max	r_{as} max		
C_r	C_{or}	C_r	C_{or}					
2.670	2.350	272	239	6,2	8,5	0,15	NA495	0,007
3.150	3.000	320	305	8,0	9,5	0,15	NA496	0,009
3.600	3.650	365	375	9,0	10,5	0,15	NA497	0,010
4.300	3.950	435	405	10,0	12,0	0,15	NA498	0,016
4.850	4.900	495	500	11,0	14,0	0,30	NA499	0,017
8.600	9.200	875	935	12,0	20,0	0,30	NA4900	0,024
9.550	10.900	975	1.110	14,0	22,0	0,30	NA4901	0,026
15.400	20.000	1.570	2.040	14,0	22,0	0,30	NA6901	0,046
10.300	12.800	1.050	1.310	17,0	26,0	0,30	NA4902	0,036
14.100	19.100	1.440	1.950	17,0	26,0	0,30	NA5902	0,052
17.600	25.300	1.790	2.580	17,0	26,0	0,30	NA6902	0,064
11.200	14.600	1.140	1.490	19,0	28,0	0,30	NA4903	0,056
15.200	21.700	1.550	2.210	19,0	28,0	0,30	NA5903	0,037
18.200	27.200	1.850	2.770	19,0	28,0	0,30	NA6903	0,069
21.300	25.500	2.170	2.600	22,0	35,0	0,30	NA4904	0,074
28.400	37.000	2.900	3.750	22,0	35,0	0,30	NA5904	0,115
36.500	50.500	3.700	5.150	22,0	35,0	0,30	NA6904	0,141
23.200	29.300	2.360	2.990	24,0	37,0	0,30	NA49/22	0,080
26.400	37.500	2.690	3.850	24,0	37,0	0,30	NA59/22	0,134
40.000	58.500	4.050	6.000	24,0	37,0	0,30	NA69/22	0,154
24.000	31.500	2.450	3.200	27,0	40,0	0,30	NA4905	0,088
30.500	43.000	3.150	4.350	27,0	40,0	0,30	NA5905	0,139
41.500	63.000	4.200	6.400	27,0	40,0	0,30	NA6905	0,162
24.800	33.500	2.530	3.400	30,0	43,0	0,30	NA49/28	0,098
32.000	45.500	3.250	4.650	30,0	43,0	0,30	NA59/28	0,142
43.000	67.000	4.350	6.850	30,0	43,0	0,30	NA69/28	0,179
25.500	35.500	2.600	3.600	32,0	45,0	0,30	NA4906	0,101
32.500	48.500	3.350	4.950	32,0	45,0	0,30	NA5906	0,152

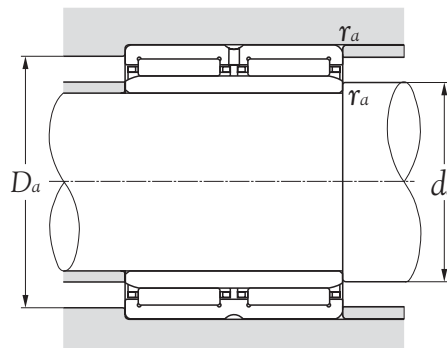
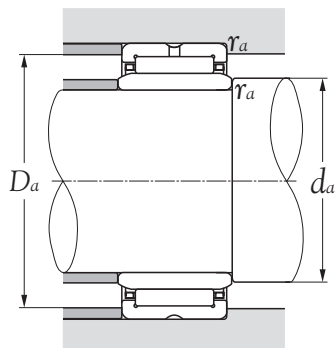
**Machined-ring needle roller bearings with inner ring
series NA48-49-59-69**

 Type NA 49..R ($d \geq 10\text{mm}$)

Type NA 59

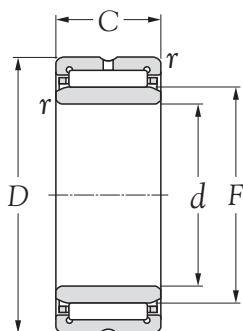
 Type NA 69..R ($d \leq 30\text{mm}$)

 Type NA 69..R ($d \geq 32\text{mm}$)


Boundary dimensions						Limiting speeds		Bearing numbers
mm						rpm		
d	D	C	$r_s \text{ min}^{1)}$	F	$s^{2)}$	grease	oil	
30	47	30	0,3	35	1,0	7.500	11.000	NA6906
32	52	20	0,6	40	0,8	6.500	10.000	NA49/32
32	52	27	0,6	40	0,8	6.500	10.000	NA59/32
32	52	36	0,6	40	0,5	6.500	10.000	NA69/32
35	55	20	0,6	42	0,8	6.500	9.500	NA4907
35	55	27	0,6	42	0,8	6.500	9.500	NA5907
35	55	36	0,6	42	0,5	6.500	9.500	NA6907
40	62	22	0,6	48	1,0	5.500	8.500	NA4908
40	62	30	0,6	48	1,0	5.500	8.500	NA5908
40	62	40	0,6	48	0,5	5.500	8.500	NA6908
45	68	22	0,6	52	1,0	5.000	7.500	NA4909
45	68	30	0,6	52	1,0	5.000	7.500	NA5909
45	68	40	0,6	52	0,5	5.000	7.500	NA6909
50	72	22	0,6	58	1,0	4.700	7.000	NA4910
50	72	30	0,6	58	1,0	4.700	7.000	NA5910
50	72	40	0,6	58	0,5	4.700	7.000	NA6910
55	80	25	1,0	63	1,5	4.300	6.500	NA4911
55	80	34	1,0	63	1,5	4.300	6.500	NA5911
55	80	45	1,0	63	1,5	4.300	6.500	NA6911
60	85	25	1,0	68	1,5	4.000	6.000	NA4912
60	85	34	1,0	68	1,5	4.000	6.000	NA5912
60	85	45	1,0	68	1,5	4.000	6.000	NA6912
65	90	25	1,0	72	1,5	3.700	5.500	NA4913
65	90	34	1,0	72	1,5	3.700	5.500	NA5913
65	90	45	1,0	72	1,5	3.700	5.500	NA6913
70	100	30	1,0	80	1,5	3.300	5.000	NA4914
70	100	40	1,0	80	1,5	3.300	5.000	NA5914
70	100	54	1,0	80	1,0	3.300	5.000	NA6914

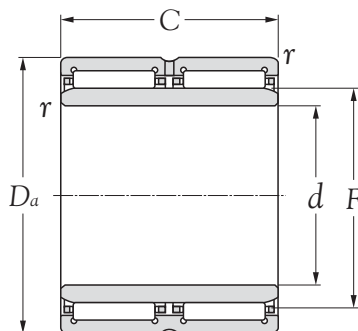
Notes: 1) These values are the allowable minimum dimensions of the chamfer dimension r .
2) These values are the possible axial displacement of the inner ring against outer ring.

Machined-ring needle roller bearings with inner ring series NA48-49-59-69


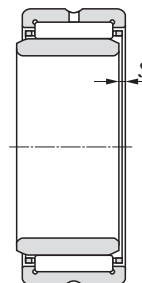
Basic load ratings				Abutment dimensions			Bearing numbers	Mass kg (approx.)
dynamic N	static	dynamic kgf	static	d_a min	D_a max	r_{as} max		
C_r	C_{or}	C_r	C_{or}					
42.500	67.500	4.300	6.900	32,0	45,0	0,3	NA6906 0,185	
31.500	47.500	3.200	4.850	36,0	48,0	0,6	NA49/32 0,157	
38.000	61.000	3.850	6.250	36,0	48,0	0,6	NA59/32 0,241	
47.500	82.000	4.850	4.350	36,0	48,0	0,6	NA69/32 0,286	
32.000	50.000	3.300	5.100	39,0	51,0	0,6	NA4907 0,171	
39.000	64.500	3.950	6.550	39,0	51,0	0,6	NA5907 0,256	
49.000	86.500	5.000	8.800	39,0	51,0	0,6	NA6907 0,310	
43.500	66.500	4.450	6.800	44,0	58,0	0,6	NA4908 0,232	
53.000	92.500	5.450	9.450	44,0	58,0	0,6	NA5908 0,348	
67.000	116.000	6.850	11.800	44,0	58,0	0,6	NA6908 0,426	
46.000	73.000	4.700	7.450	49,0	64,0	0,6	NA4909 0,270	
56.000	101.000	5.700	10.300	49,0	64,0	0,6	NA5909 0,396	
70.500	127.000	7.200	13.000	49,0	64,0	0,6	NA6909 0,437	
48.000	80.000	4.900	8.150	54,0	68,0	0,6	NA4910 0,276	
58.000	110.000	5.950	11.200	54,0	68,0	0,6	NA5910 0,498	
74.000	139.000	7.500	14.200	54,0	68,0	0,6	NA6910 0,529	
58.500	99.500	6.000	10.100	60,0	75,0	1,0	NA4911 0,396	
76.500	140.000	7.800	14.300	60,0	75,0	1,0	NA5911 0,559	
94.000	183.000	9.600	18.600	60,0	75,0	1,0	NA6911 0,726	
61.500	108.000	6.250	11.000	65,0	80,0	1,0	NA4912 0,427	
80.500	153.000	8.200	15.600	65,0	80,0	1,0	NA5912 0,614	
95.500	191.000	9.750	19.400	65,0	80,0	1,0	NA6912 0,758	
62.500	112.000	6.350	11.400	70,0	85,0	1,0	NA4913 0,454	
84.000	165.000	8.600	16.800	70,0	85,0	1,0	NA5913 0,655	
97.000	198.000	9.900	20.200	70,0	85,0	1,0	NA6913 0,779	
85.500	156.000	8.750	15.900	75,0	95,0	1,0	NA4914 0,727	
103.000	187.000	10.500	19.100	75,0	95,0	1,0	NA5914 1,060	
130.000	267.000	13.300	27.200	75,0	95,0	1,0	NA6914 1,340	

**Machined-ring needle roller bearings with inner ring
series NA48-49-59-69**


Type NA 48
Type NA 49..R ($d \geq 10\text{mm}$)
Type NA 59

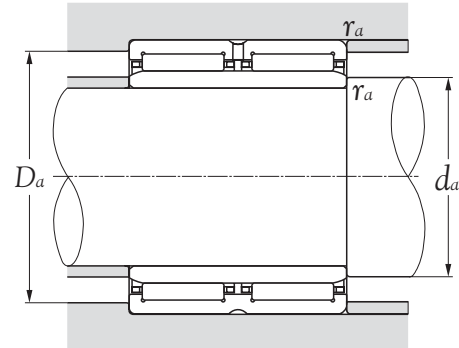
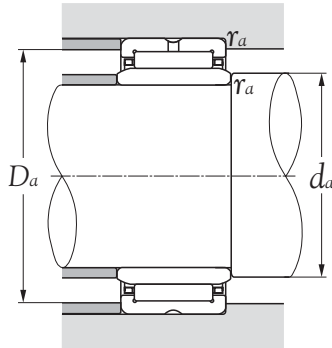


Type NA 69..R ($d \geq 32\text{mm}$)



Boundary dimensions						Limiting speeds		Bearing numbers
mm						rpm		
d	D	C	$r_s \text{ min}^{1)}$	F	$s^{2)}$	grease	oil	
75	105	30	1,0	85	1,5	3.100	4.700	NA4915
75	105	40	1,0	85	1,5	3.100	4.700	NA5915
75	105	54	1,0	85	1,0	3.100	4.700	NA6915
80	110	30	1,0	90	1,5	2.900	4.400	NA4916
80	110	40	1,0	90	1,5	2.900	4.400	NA5916
80	110	54	1,0	90	1,5	2.900	4.400	NA6916
85	120	35	1,1	100	1,0	2.700	4.000	NA4917
85	120	46	1,1	100	1,5	2.700	4.000	NA5917
85	120	63	1,1	100	1,0	2.700	4.000	NA6917
90	125	35	1,1	105	1,0	2.500	3.800	NA4918
90	125	46	1,1	105	1,0	2.500	3.800	NA5918
90	125	63	1,1	105	1,0	2.500	3.800	NA6918
95	130	35	1,1	110	1,0	2.400	3.600	NA4919
95	130	46	1,1	110	1,0	2.400	3.600	NA5919
95	130	63	1,1	110	1,0	2.400	3.600	NA6919
100	140	40	1,1	115	2,0	2.300	3.500	NA4920
100	140	54	1,1	115	2,0	2.300	3.500	NA5920
110	140	30	1,0	120	0,8	2.200	3.300	NA4822
110	150	40	1,1	125	2,0	2.100	3.200	NA4922
110	150	54	1,1	125	2,0	2.100	3.200	NA5922
120	150	30	1,0	130	0,8	2.100	3.100	NA4824
120	165	45	1,1	135	2,0	2.000	3.000	NA4924
120	165	60	1,1	135	2,0	2.000	3.000	NA5924
130	165	35	1,1	145	1,0	1.900	2.800	NA4826
130	180	50	1,5	150	1,5	1.800	2.700	NA4926
130	180	67	1,5	150	1,5	1.800	2.700	NA5926
140	175	35	1,1	155	1,0	1.700	2.600	NA4828
140	190	50	1,5	160	1,5	1.700	2.500	NA4928

Notes: 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.

Machined-ring needle roller bearings with inner ring series NA48-49-59-69


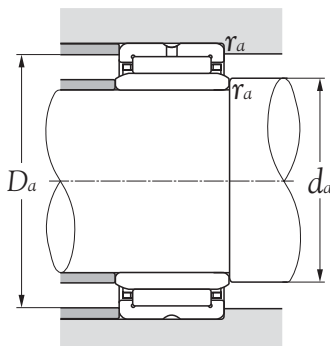
dynamic N	Basic load ratings		dynamic kgf	Abutment dimensions			Bearing numbers	Mass kg (approx.)
	static	static		d_a min	D_a max	r_{as} max		
C_r	C_{or}	C_r	C_{or}					
87.000	162.000	8.900	16.500	80,0	100,0	1,0	NA4915	0,776
109.000	205.000	11.100	20.900	80,0	100,0	1,0	NA5915	1,130
132.000	277.000	13.500	28.300	80,0	100,0	1,0	NA6915	1,450
90.500	174.000	9.250	17.700	85,0	105,0	1,0	NA4916	0,820
115.000	223.000	11.700	22.700	85,0	105,0	1,0	NA5916	1,150
137.000	298.000	14.000	30.500	85,0	105,0	1,0	NA6916	1,530
112.000	237.000	11.500	24.200	91,5	113,5	1,0	NA4917	1,240
137.000	290.000	14.000	29.600	91,5	113,5	1,0	NA5917	1,760
169.000	400.000	17.300	41.000	91,5	113,5	1,0	NA6917	2,250
116.000	252.000	11.900	25.700	96,5	118,5	1,0	NA4918	1,310
143.000	310.000	14.600	32.000	96,5	118,5	1,0	NA5918	1,840
175.000	425.000	17.900	43.500	96,5	118,5	1,0	NA6918	2,440
118.000	260.000	12.000	26.500	101,5	123,5	1,0	NA4919	1,360
149.000	335.000	15.200	34.000	101,5	123,5	1,0	NA5919	1,980
177.000	440.000	18.100	45.000	101,5	123,5	1,0	NA6919	2,630
127.000	260.000	12.900	26.500	106,5	133,5	1,0	NA4920	1,930
182.000	395.000	18.600	40.500	106,5	133,5	1,0	NA5920	2,850
93.500	210.000	9.550	21.400	115,0	135,0	1,0	NA4822	1,110
131.000	279.000	13.300	28.400	116,5	143,5	1,0	NA4922	2,080
193.000	440.000	19.700	45.000	116,5	143,5	1,0	NA5922	2,980
99.500	233.000	10.100	23.800	125,0	145,0	1,0	NA4824	1,170
180.000	380.000	18.300	38.500	126,5	158,5	1,0	NA4924	2,840
245.000	525.000	25.000	53.500	126,5	158,5	1,0	NA5924	3,920
118.000	305.000	12.100	31.000	136,5	158,5	1,0	NA4826	1,600
202.000	455.000	20.600	46.500	138,0	172,0	1,5	NA4926	3,900
294.000	685.000	30.000	70.000	138,0	172,0	1,5	NA5926	5,600
121.000	315.000	12.300	32.500	146,5	168,5	1,0	NA4828	1,820
209.000	485.000	21.300	49.500	148,0	182,0	1,5	NA4928	4,050

Machined-ring needle roller bearings with inner ring series NA48-49-59-69


Type NA 48
 Type NA 49..R ($d \geq 10\text{mm}$)
 Type NA 59

Boundary dimensions						Limiting speeds		Bearing numbers
mm						rpm		
d	D	C	$r_s \text{ min}^{1)}$	F	$s^{2)}$	grease	oil	
140	190	67	1,5	160	1,5	1.700	2.500	NA5928
150	190	40	1,1	165	1,5	1.600	2.400	NA4830
150	210	60	2,0	170	1,5	1.600	2.400	NA4930
160	200	40	1,1	175	1,5	1.500	2.300	NA4832
160	220	60	2,0	180	1,5	1.500	2.200	NA4932
170	215	45	1,1	185	1,5	1.500	2.200	NA4834
170	230	60	2,0	190	1,5	1.400	2.100	NA4934
180	225	45	1,1	195	1,5	1.400	2.100	NA4836
180	250	69	2,0	205	1,5	1.300	2.000	NA4936
190	240	50	1,5	210	1,5	1.300	1.900	NA4838
190	260	69	2,0	215	1,5	1.300	1.900	NA4938
200	250	50	1,5	220	1,5	1.200	1.800	NA4840
200	280	80	2,1	225	1,5	1.200	1.800	NA4940
220	270	50	1,5	240	1,5	1.100	1.700	NA4844
220	300	80	2,1	245	1,5	1.100	1.600	NA4944
240	300	60	2,0	265	2,0	1.000	1.500	NA4848
240	320	80	2,1	265	2,0	1.000	1.500	NA4948
260	320	60	2,0	285	2,0	950	1.400	NA4852
260	360	100	2,1	290	2,0	950	1.400	NA4952
280	350	69	2,0	305	2,5	850	1.300	NA4856
280	380	100	2,1	310	2,5	850	1.300	NA4956
300	380	80	2,1	330	2,0	800	1.200	NA4860
300	420	118	3,0	340	2,0	800	1.200	NA4960
320	400	80	2,1	350	2,0	750	1.100	NA4864
320	440	118	3,0	360	2,0	750	1.100	NA4964
340	420	80	2,1	370	2,0	750	1.100	NA4868
340	460	118	3,0	380	2,0	750	1.100	NA4968
360	440	80	2,1	390	2,0	650	1.000	NA4872

Notes: 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.

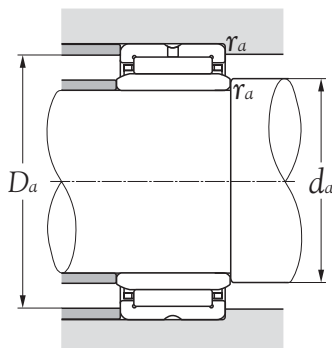
**Machined-ring needle roller bearings with inner ring
series NA48-49-59-69**


dynamic C_r N	Basic load ratings		dynamic C_r kgf	Abutment dimensions			Bearing numbers	Mass kg (approx.)
	static C_{or}	static C_{or}		d_a min	D_a max	r_{as} max		
310.000	755.000	31.500	77.000	148,0	182,0	1,5	NA5928	6,18
152.000	390.000	15.500	40.000	156,5	183,5	1,0	NA4830	2,72
261.000	610.000	26.600	62.500	159,0	201,0	2,0	NA4930	5,33
160.000	425.000	16.300	43.500	166,5	193,5	1,0	NA4832	2,90
270.000	650.000	27.600	66.500	169,0	211,0	2,0	NA4932	5,60
185.000	495.000	18.800	50.500	176,5	208,5	1,0	NA4834	3,99
279.000	690.000	28.500	70.500	179,0	221,0	2,0	NA4934	5,87
195.000	540.000	19.800	55.000	186,5	218,5	1,0	NA4836	4,19
375.000	890.000	38.500	90.500	189,0	241,0	2,0	NA4936	8,58
227.000	680.000	23.200	69.000	198,0	232,0	1,5	NA4838	5,62
390.000	945.000	40.000	96.500	199,0	251,0	2,0	NA4938	8,68
231.000	705.000	23.600	71.500	208,0	242,0	1,5	NA4840	5,84
505.000	1.180.000	51.500	120.000	211,0	269,0	2,0	NA4940	12,20
244.000	780.000	24.900	79.500	228,0	262,0	1,5	NA4844	6,37
525.000	1.270.000	53.500	129.000	231,0	289,0	2,0	NA4944	13,50
360.000	1.080.000	37.000	110.000	249,0	291,0	2,0	NA4848	10,00
540.000	1.350.000	55.000	138.000	251,0	309,0	2,0	NA4948	14,70
375.000	1.160.000	38.000	119.000	269,0	311,0	2,0	NA4852	10,80
805.000	1.900.000	82.000	193.000	271,0	349,0	2,0	NA4952	25,90
455.000	1.300.000	46.500	133.000	289,0	341,0	2,0	NA4856	15,50
835.000	2.030.000	85.000	207.000	291,0	369,0	2,0	NA4956	27,50
625.000	1.770.000	64.000	180.000	311,0	369,0	2,0	NA4860	22,00
1.080.000	2.640.000	110.000	269.000	313,0	407,0	2,5	NA4960	42,50
640.000	1.850.000	65.500	189.000	331,0	389,0	2,0	NA4864	23,20
1.120.000	2.820.000	114.000	288.000	333,0	427,0	2,5	NA4964	45,20
655.000	1.940.000	66.500	197.000	351,0	409,0	2,0	NA4868	24,10
1.160.000	3.000.000	118.000	305.000	353,0	447,0	2,5	NA4968	47,30
665.000	2.020.000	68.000	206.000	371,0	429,0	2,0	NA4872	25,70

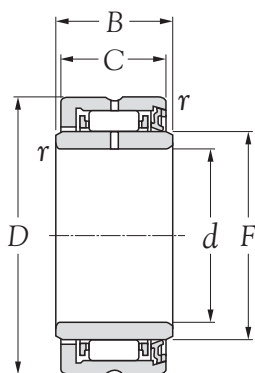
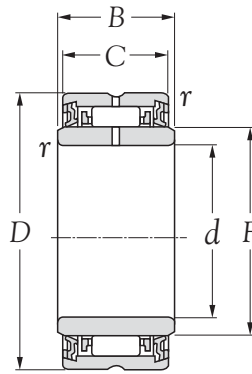
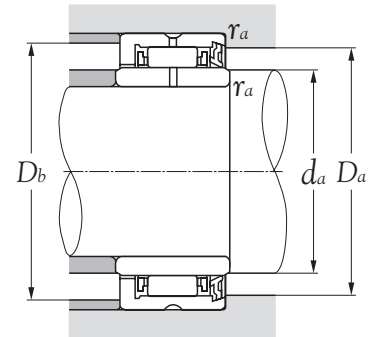
Machined-ring needle roller bearings with inner ring series NA48-49-59-69


Boundary dimensions						Limiting speeds		Bearing numbers
mm						rpm		
d	D	C	$r_s \text{ min}^{1)}$	F	$s^{2)}$	grease	oil	
360	480	118	3,0	400	2,0	650	1.000	NA4972
380	480	100	2,1	415	2,0	650	950	NA4876
380	520	140	4,0	430	2,0	650	950	NA4976
400	540	140	4,0	450	2,5	600	900	NA4980
420	560	140	4,0	470	2,5	550	850	NA4984
440	600	160	4,0	490	2,5	550	800	NA4988

Notes: 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.

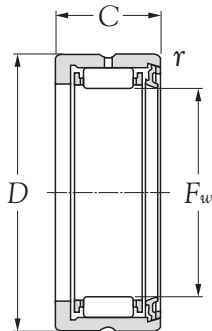
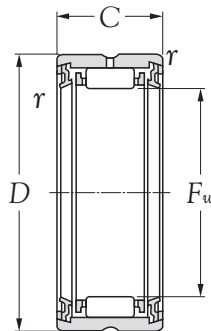
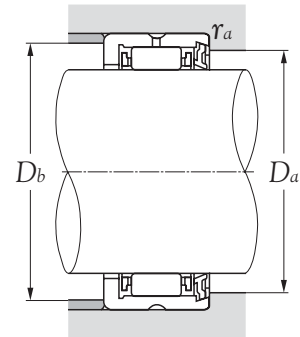
**Machined-ring needle roller bearings with inner ring
series NA48-49-59-69**


dynamic N	Basic load ratings		Abutment dimensions			Bearing numbers	Mass kg (approx.)
	static	dynamic kgf	d_a min	D_a max	r_{as} max		
C_r	C_{or}	C_r	C_{or}				
1.200.000	3.200.000	122.000	325.000	373	467	2,5	NA4972 49,0
1.000.000	2.840.000	102.000	289.000	391	469	2,0	NA4876 44,5
1.400.000	3.750.000	143.000	385.000	396	504	3,0	NA4976 73,6
1.450.000	4.000.000	148.000	410.000	416	524	3,0	NA4980 76,6
1.500.000	4.250.000	153.000	430.000	436	544	3,0	NA4984 89,8
1.750.000	4.600.000	179.000	470.000	456	584	3,0	NA4988 123,0

Machined-ring needle roller bearings with inner ring sealed type series NA49..RS, 2RS

Type NA 49..L
(With single seal)

Type NA 49..LL
(With double seal)


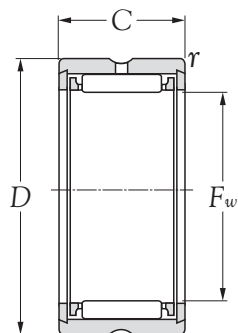
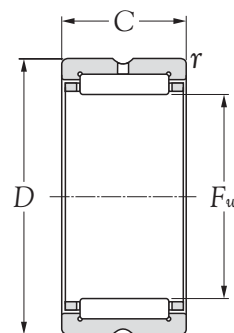
Boundary dimensions							Basic load ratings				Limiting speeds rpm	Abutment dimensions				Bearing numbers		Mass
mm							dynamic	static	dynamic	static		d_a	D_a	D_b	r_{as}			kg
d	D	B	C	F	r	$r_{s \min}^{1)}$	C_r	C_{or}	C_r	C_{or}		d_a	D_a	D_b	r_{as}			(approx.)
												max	max	max	max			
10	22	14	13	14	0,3		7.200	8.500	735	865	10.000	12	16	20	0,3	NA4900RS	NA4900 2RS	0,025
12	24	14	13	16	0,3		7.750	9.700	795	990	10.000	14	18	22	0,3	NA4901RS	NA4901 2RS	0,028
15	28	14	13	20	0,3		8.300	11.200	845	1.150	10.000	17	22	26	0,3	NA4902RS	NA4902 2RS	0,036
17	30	14	13	22	0,3		8.500	11.900	865	1.220	9.000	19	24	28	0,3	NA4903RS	NA4903 2RS	0,039
20	37	18	17	25	0,3		15.200	19.900	1.550	2.030	8.000	22	28	35	0,3	NA4904RS	NA4904 2RS	0,080
25	42	18	17	30	0,3		16.000	22.600	1.640	2.300	6.500	27	33	40	0,3	NA4905RS	NA4905 2RS	0,093
30	47	18	17	35	0,3		18.000	27.400	1.830	2.800	5.500	32	38	45	0,3	NA4906RS	NA4906 2RS	0,107
35	55	21	20	42	0,6		22.700	39.500	2.320	4.000	4.800	39	45	51	0,6	NA4907RS	NA4907 2RS	0,175
40	62	23	22	48	0,6		27.800	53.500	2.830	5.450	4.200	44	51	58	0,6	NA4908RS	NA4908 2RS	0,252
45	68	23	22	52	0,6		28.600	57.000	2.920	5.800	3.800	49	55	64	0,6	NA4909RS	NA4909 2RS	0,290
50	72	23	22	58	0,6		30.500	64.000	3.100	6.500	3.400	54	61	68	0,6	NA4910RS	NA4910 2RS	0,295

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

Machined-ring needle roller bearings without inner ring sealed type series RNA49..RS, 2RS

**Type RNA 49..L
(With single seal)**

**Type RNA 49..LL
(With double seal)**


Boundary dimensions				Basic load ratings				Limiting speeds rpm	Abutment dimensions			Bearing numbers	Mass kg (approx.)	
mm				dynamic	static	dynamic	static		Da	Db	ras			
Fw	D	C	rs min ¹⁾	Cr	Cor	Cr	Cor	max	max	max				
14	^{+0,027} / _{+0,016}	22	13	0,3	7.200	8.500	735	865	10.000	16	20	0,3	RNA4900RS RNA4900 2RS	0,016
16	^{+0,027} / _{+0,016}	24	13	0,3	7.750	9.700	795	990	10.000	18	22	0,3	RNA4901RS RNA4901 2RS	0,018
20	^{+0,033} / _{+0,020}	28	13	0,3	8.300	11.200	845	1.150	10.000	22	26	0,3	RNA4902RS RNA4902 2RS	0,022
22	^{+0,033} / _{+0,020}	30	13	0,3	8.500	11.900	865	1.220	9.000	24	28	0,3	RNA4903RS RNA4903 2RS	0,022
25	^{+0,033} / _{+0,020}	37	17	0,3	15.200	19.900	1.550	2.030	8.000	28	35	0,3	RNA4904RS RNA4904 2RS	0,055
30	^{+0,033} / _{+0,020}	42	17	0,3	16.000	22.600	1.640	2.300	6.500	33	40	0,3	RNA4905RS RNA4905 2RS	0,063
35	^{+0,041} / _{+0,025}	47	17	0,3	18.000	27.400	1.830	2.800	5.500	38	45	0,3	RNA4906RS RNA4906 2RS	0,072
42	^{+0,041} / _{+0,025}	55	20	0,6	22.700	39.500	2.320	4.000	4.800	45	51	0,6	RNA4907RS RNA4907 2RS	0,113
48	^{+0,041} / _{+0,025}	62	22	0,6	27.800	53.500	2.830	5.450	4.200	51	58	0,6	RNA4908RS RNA4908 2RS	0,154
52	^{+0,049} / _{+0,030}	68	22	0,6	28.600	57.000	2.920	5.800	3.800	55	64	0,6	RNA4909RS RNA4909 2RS	0,157
58	^{+0,049} / _{+0,030}	72	22	0,6	30.500	64.000	3.100	6.500	3.400	61	68	0,6	RNA4910RS RNA4910 2RS	0,160

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

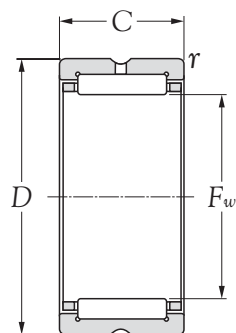
Machined-ring needle roller bearings with inner ring series RNA48-49-59-69

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

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

Boundary dimensions				Limiting speeds		Bearing numbers
mm				rpm		
F_w	D	C	$r_s \text{ min}^D$	grease	oil	
7 ^{+0,022} / _{+0,013}	13	10	0,15	23.000	34.000	RNA495
8 ^{+0,022} / _{+0,013}	15	10	0,15	21.000	32.000	RNA496
9 ^{+0,022} / _{+0,013}	17	10	0,15	20.000	30.000	RNA497
10 ^{+0,022} / _{+0,013}	19	11	0,15	19.000	28.000	RNA498
12 ^{+0,027} / _{+0,016}	20	11	0,30	17.000	26.000	RNA499
14 ^{+0,027} / _{+0,016}	22	13	0,30	16.000	24.000	RNA4900
16 ^{+0,027} / _{+0,016}	24	13	0,30	15.000	23.000	RNA4901
16 ^{+0,027} / _{+0,016}	24	22	0,30	15.000	23.000	RNA6901
20 ^{+0,033} / _{+0,020}	28	13	0,30	13.000	20.000	RNA4902
20 ^{+0,033} / _{+0,020}	28	18	0,30	13.000	20.000	RNA5902
20 ^{+0,033} / _{+0,020}	28	23	0,30	13.000	20.000	RNA6902
22 ^{+0,033} / _{+0,020}	30	13	0,30	12.000	18.000	RNA4903
22 ^{+0,033} / _{+0,020}	30	18	0,30	12.000	18.000	RNA5903
22 ^{+0,033} / _{+0,020}	30	23	0,30	12.000	18.000	RNA6903
25 ^{+0,033} / _{+0,020}	37	17	0,30	11.000	16.000	RNA4904
25 ^{+0,033} / _{+0,020}	37	23	0,30	11.000	16.000	RNA5904
25 ^{+0,033} / _{+0,020}	37	30	0,30	11.000	16.000	RNA6904
28 ^{+0,033} / _{+0,020}	39	17	0,30	9.500	14.000	RNA49/22
28 ^{+0,033} / _{+0,020}	39	23	0,30	9.500	14.000	RNA59/22
28 ^{+0,033} / _{+0,020}	39	30	0,30	9.500	14.000	RNA69/22
30 ^{+0,033} / _{+0,020}	42	17	0,30	8.500	13.000	RNA4905
30 ^{+0,033} / _{+0,020}	42	23	0,30	8.500	13.000	RNA5905
30 ^{+0,033} / _{+0,020}	42	30	0,30	8.500	13.000	RNA6905
32 ^{+0,041} / _{+0,025}	45	17	0,30	8.500	13.000	RNA49/28
32 ^{+0,041} / _{+0,025}	45	23	0,30	8.500	13.000	RNA59/28
32 ^{+0,041} / _{+0,025}	45	30	0,30	8.500	13.000	RNA69/28
35 ^{+0,041} / _{+0,025}	47	17	0,30	7.500	11.000	RNA4906
35 ^{+0,041} / _{+0,025}	47	23	0,30	7.500	11.000	RNA5906

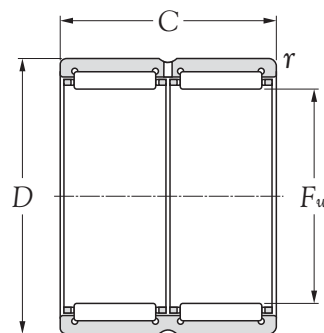
Notes: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

Machined-ring needle roller bearings with inner ring series RNA48-49-59-69


dynamic N	Basic load ratings		Abutment dimensions		Bearing numbers	Mass kg (approx.)
	static Cor	dynamic kgf Cr	static Cor	dynamic kgf Cr		
2.670	2.350	272	239	Da max 8,5	ras max 0,15	RNA495
3.150	3.000	320	305	9,5	0,15	RNA496
3.600	3.650	365	375	10,5	0,15	RNA497
4.300	3.950	435	405	12,0	0,15	RNA498
4.850	4.900	495	500	14,0	0,30	RNA499
8.600	9.200	875	935	20,0	0,30	RNA4900
9.550	10.900	975	1.110	22,0	0,30	RNA4901
15.400	20.000	1.570	2.040	22,0	0,30	RNA6901
10.300	12.800	1.050	1.310	26,0	0,30	RNA4902
14.100	19.100	1.440	1.950	26,0	0,30	RNA5902
17.600	25.300	1.790	2.580	26,0	0,30	RNA6902
11.200	14.600	1.140	1.490	28,0	0,30	RNA4903
15.200	21.700	1.550	2.210	28,0	0,30	RNA5903
18.200	27.200	1.850	2.770	28,0	0,30	RNA6903
21.300	25.500	2.170	2.600	35,0	0,30	RNA4904
28.400	37.000	2.900	3.750	35,0	0,30	RNA5904
36.500	50.500	3.700	5.150	35,0	0,30	RNA6904
23.200	29.300	2.360	2.990	37,0	0,30	RNA49/22
26.400	37.500	2.690	3.850	37,0	0,30	RNA59/22
40.000	58.500	4.050	6.000	37,0	0,30	RNA69/22
24.000	31.500	2.450	3.200	40,0	0,30	RNA4905
30.500	43.000	3.150	4.350	40,0	0,30	RNA5905
41.500	63.000	4.200	6.400	40,0	0,30	RNA6905
24.800	33.500	2.530	3.400	43,0	0,30	RNA49/28
32.000	45.500	3.250	4.650	43,0	0,30	RNA59/28
43.000	67.000	4.350	6.850	43,0	0,30	RNA69/28
25.500	35.500	2.600	3.600	45,0	0,30	RNA4906
32.500	48.500	3.350	4.950	45,0	0,30	RNA5906

Machined-ring needle roller bearings with inner ring series RNA48-49-59-69


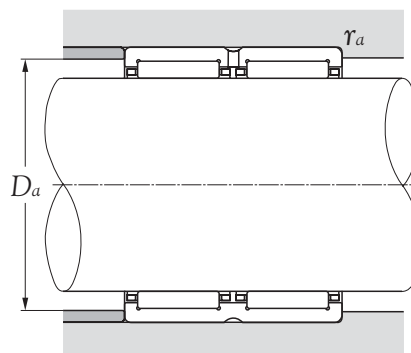
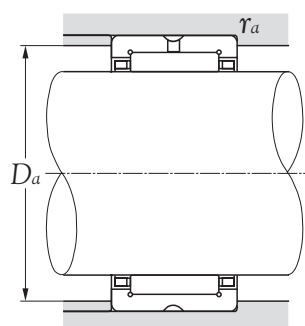
Type RNA 49..R ($F_w \geq 14\text{mm}$)
 Type RNA 59
 Type RNA 69..R ($F_w \leq 35\text{mm}$)



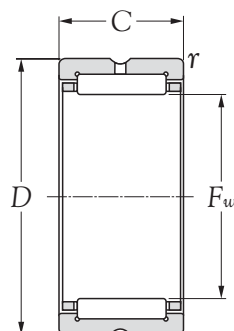
Type RNA 69..Type R ($F_w \geq 40\text{mm}$)

Boundary dimensions				Limiting speeds		Bearing numbers
mm				rpm		
F_w	D	C	$r_s \text{ min}^1)$	grease	oil	
35 ^{+0,041} / _{-0,025}	47	30	0,3	7.500	11.000	RNA6906
40 ^{+0,041} / _{-0,025}	52	20	0,6	6.500	10.000	RNA49/32
40 ^{+0,041} / _{-0,025}	52	27	0,6	6.500	10.000	RNA59/32
40 ^{+0,041} / _{-0,025}	52	36	0,6	6.500	10.000	RNA69/32
42 ^{+0,041} / _{-0,025}	55	20	0,6	6.500	9.500	RNA4907
42 ^{+0,041} / _{-0,025}	55	27	0,6	6.500	9.500	RNA5907
42 ^{+0,041} / _{-0,025}	55	36	0,6	6.500	9.500	RNA6907
48 ^{+0,041} / _{-0,025}	62	22	0,6	5.500	8.500	RNA4908
48 ^{+0,041} / _{-0,025}	62	30	0,6	5.500	8.500	RNA5908
48 ^{+0,041} / _{-0,025}	62	40	0,6	5.500	8.500	RNA6908
52 ^{+0,049} / _{-0,030}	68	22	0,6	5.000	7.500	RNA4909
52 ^{+0,049} / _{-0,030}	68	30	0,6	5.000	7.500	RNA5909
52 ^{+0,049} / _{-0,030}	68	40	0,6	5.000	7.500	RNA6909
58 ^{+0,049} / _{-0,030}	72	22	0,6	4.700	7.000	RNA4910
58 ^{+0,049} / _{-0,030}	72	30	0,6	4.700	7.000	RNA5910
58 ^{+0,049} / _{-0,030}	72	40	0,6	4.700	7.000	RNA6910
63 ^{+0,049} / _{-0,030}	80	25	1,0	4.300	6.500	RNA4911
63 ^{+0,049} / _{-0,030}	80	34	1,0	4.300	6.500	RNA5911
63 ^{+0,049} / _{-0,030}	80	45	1,0	4.300	6.500	RNA6911
68 ^{+0,049} / _{-0,030}	85	25	1,0	4.000	6.000	RNA4912
68 ^{+0,049} / _{-0,030}	85	34	1,0	4.000	6.000	RNA5912
68 ^{+0,049} / _{-0,030}	85	45	1,0	4.000	6.000	RNA6912
72 ^{+0,049} / _{-0,030}	90	25	1,0	3.700	5.500	RNA4913
72 ^{+0,049} / _{-0,030}	90	34	1,0	3.700	5.500	RNA5913
72 ^{+0,049} / _{-0,030}	90	45	1,0	3.700	5.500	RNA6913
80 ^{+0,049} / _{-0,030}	100	30	1,0	3.300	5.000	RNA4914
80 ^{+0,049} / _{-0,030}	100	40	1,0	3.300	5.000	RNA5914
80 ^{+0,049} / _{-0,030}	100	54	1,0	3.300	5.000	RNA6914

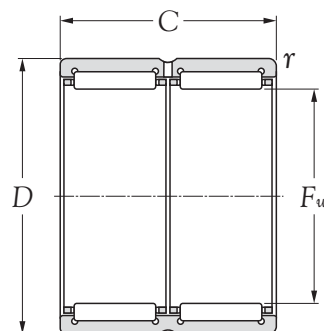
Notes: 1) These values are the allowable minimum dimensions of the chamfer dimension r.

Machined-ring needle roller bearings with inner ring series RNA48-49-59-69


dynamic N	Basic load ratings		Abutment dimensions		Bearing numbers	Mass kg (approx.)
	static	dynamic kgf	D_a max	r_{as} max		
C_r	C_{or}	C_r	C_{or}			
42.500	67.500	4.300	6.900	45	0,3	RNA6906 0,126
31.500	47.500	3.200	4.850	48	0,6	RNA49/32 0,089
38.000	61.000	3.850	6.250	48	0,6	RNA59/32 0,149
47.500	82.000	4.850	8.350	48	0,6	RNA69/32 0,162
32.000	50.000	3.300	5.100	51	0,6	RNA4907 0,107
39.000	64.500	3.950	6.550	51	0,6	RNA5907 0,176
49.000	86.500	5.000	8.800	51	0,6	RNA6907 0,193
43.500	66.500	4.450	6.800	58	0,6	RNA4908 0,140
53.000	92.500	5.450	9.450	58	0,6	RNA5908 0,225
67.000	116.000	6.850	11.800	58	0,6	RNA6908 0,256
46.000	73.000	4.700	7.450	64	0,6	RNA4909 0,182
56.000	101.000	5.700	10.300	64	0,6	RNA5909 0,232
70.500	127.000	7.200	13.000	64	0,6	RNA6909 0,273
48.000	80.000	4.900	8.150	68	0,6	RNA4910 0,163
58.000	110.000	5.950	11.200	68	0,6	RNA5910 0,289
74.000	139.000	7.500	14.200	68	0,6	RNA6910 0,320
58.500	99.500	6.000	10.100	75	1,0	RNA4911 0,255
76.500	140.000	7.800	14.300	75	1,0	RNA5911 0,367
94.000	183.000	9.600	18.600	75	1,0	RNA6911 0,470
61.500	108.000	6.250	11.000	80	1,0	RNA4912 0,275
80.500	153.000	8.200	15.600	80	1,0	RNA5912 0,408
95.500	191.000	9.750	19.400	80	1,0	RNA6912 0,488
62.500	112.000	6.350	11.400	85	1,0	RNA4913 0,312
84.000	165.000	8.600	16.800	85	1,0	RNA5913 0,462
97.000	198.000	9.900	20.200	85	1,0	RNA6913 0,520
85.500	156.000	8.750	15.900	95	1,0	RNA4914 0,460
103.000	187.000	10.500	19.100	95	1,0	RNA5914 0,706
130.000	267.000	13.300	27.200	95	1,0	RNA6914 0,857

Machined-ring needle roller bearings with inner ring series RNA48-49-59-69


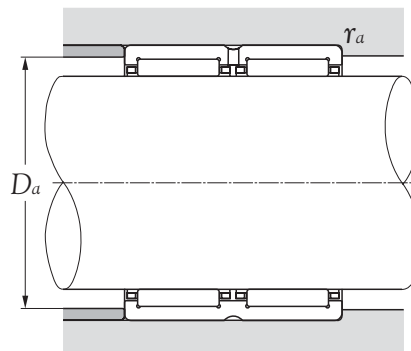
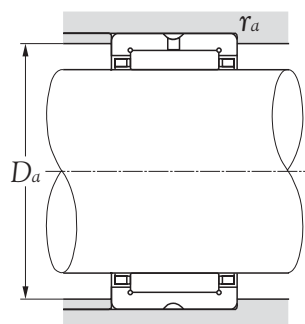
Type RNA 48
Type RNA 49..R (Fw ≥ 14mm)
Type RNA 59



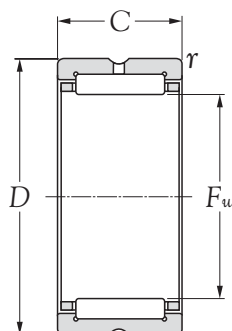
Type RNA 69..Type R (Fw ≥ 40mm)

Boundary dimensions				Limiting speeds		Bearing numbers
mm				rpm		
F _w	D	C	r _s min ¹⁾	grease	oil	
85 ^{+0,058} / _{+0,036}	105	30	1,0	3.100	4.700	RNA4915
85 ^{+0,058} / _{+0,036}	105	40	1,0	3.100	4.700	RNA5915
85 ^{+0,058} / _{+0,036}	105	54	1,0	3.100	4.700	RNA6915
90 ^{+0,058} / _{+0,036}	110	30	1,0	2.900	4.400	RNA4916
90 ^{+0,058} / _{+0,036}	110	40	1,0	2.900	4.400	RNA5916
90 ^{+0,058} / _{+0,036}	110	54	1,0	2.900	4.400	RNA6916
100 ^{+0,058} / _{+0,036}	120	35	1,1	2.700	4.000	RNA4917
100 ^{+0,058} / _{+0,036}	120	46	1,1	2.700	4.000	RNA5917
100 ^{+0,058} / _{+0,036}	120	63	1,1	2.700	4.000	RNA6917
105 ^{+0,058} / _{+0,036}	125	35	1,1	2.500	3.800	RNA4918
105 ^{+0,058} / _{+0,036}	125	46	1,1	2.500	3.800	RNA5918
105 ^{+0,058} / _{+0,036}	125	63	1,1	2.500	3.800	RNA6918
110 ^{+0,058} / _{+0,036}	130	35	1,1	2.400	3.600	RNA4919
110 ^{+0,058} / _{+0,036}	130	46	1,1	2.400	3.600	RNA5919
110 ^{+0,058} / _{+0,036}	130	63	1,1	2.400	3.600	RNA6919
115 ^{+0,058} / _{+0,036}	140	40	1,1	2.300	3.500	RNA4920
115 ^{+0,058} / _{+0,036}	140	54	1,1	2.300	3.500	RNA5920
120 ^{+0,058} / _{+0,036}	140	30	1,0	2.200	3.300	RNA4822
125 ^{+0,068} / _{+0,043}	150	40	1,1	2.100	3.200	RNA4922
125 ^{+0,068} / _{+0,043}	150	54	1,1	2.100	3.200	RNA5922
130 ^{+0,068} / _{+0,043}	150	30	1,0	2.100	3.100	RNA4824
135 ^{+0,068} / _{+0,043}	165	45	1,1	2.000	3.000	RNA4924
135 ^{+0,068} / _{+0,043}	165	60	1,1	2.000	3.000	RNA5924
145 ^{+0,068} / _{+0,043}	165	35	1,1	1.900	2.800	RNA4826
150 ^{+0,068} / _{+0,043}	180	50	1,5	1.800	2.700	RNA4926
150 ^{+0,068} / _{+0,043}	180	67	1,5	1.800	2.700	RNA5926
155 ^{+0,068} / _{+0,043}	175	35	1,1	1.700	2.600	RNA4828
160 ^{+0,068} / _{+0,043}	190	50	1,5	1.700	2.500	RNA4928

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

Machined-ring needle roller bearings with inner ring series RNA48-49-59-69


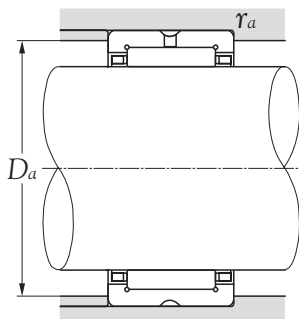
dynamic N	Basic load ratings		Abutment dimensions		Bearing numbers	Mass kg (approx.)
	static C _{or}	dynamic C _r kgf	D _a max	r _{as} max		
C _r	C _{or}	C _r	C _{or}	D _a max	r _{as} max	
87.000	162.000	8.900	16.500	100,0	1,0	RNA4915
109.000	205.000	11.100	20.900	100,0	1,0	RNA5915
132.000	277.000	13.500	28.300	100,0	1,0	RNA6915
90.500	174.000	9.250	17.700	105,0	1,0	RNA4916
115.000	223.000	11.700	22.700	105,0	1,0	RNA5916
137.000	298.000	14.000	30.500	105,0	1,0	RNA6916
112.000	237.000	11.500	24.200	113,5	1,0	RNA4917
137.000	290.000	14.000	29.600	113,5	1,0	RNA5917
169.000	400.000	17.300	41.000	113,5	1,0	RNA6917
116.000	252.000	11.900	25.700	118,5	1,0	RNA4918
143.000	310.000	14.600	32.000	118,5	1,0	RNA5918
175.000	425.000	17.900	43.500	118,5	1,0	RNA6918
118.000	260.000	12.000	26.500	123,5	1,0	RNA4919
149.000	335.000	15.200	34.000	123,5	1,0	RNA5919
177.000	440.000	18.100	45.000	123,5	1,0	RNA6919
127.000	260.000	12.900	26.500	133,5	1,0	RNA4920
182.000	395.000	18.600	40.500	133,5	1,0	RNA5920
93.500	210.000	9.550	21.400	135,0	1,0	RNA4822
131.000	279.000	13.300	28.400	143,5	1,0	RNA4922
193.000	440.000	19.700	45.000	143,5	1,0	RNA5922
99.500	233.000	10.100	23.800	145,0	1,0	RNA4824
180.000	380.000	18.300	38.500	158,5	1,0	RNA4924
245.000	525.000	25.000	53.500	158,5	1,0	RNA5924
118.000	305.000	12.100	31.000	158,5	1,0	RNA4826
202.000	455.000	20.600	46.500	172,0	1,5	RNA4926
294.000	685.000	30.000	70.000	172,0	1,5	RNA5926
121.000	315.000	12.300	32.500	168,5	1,0	RNA4828
209.000	485.000	21.300	49.500	182,0	1,5	RNA4928

Machined-ring needle roller bearings with inner ring
series RNA48-49-59-69


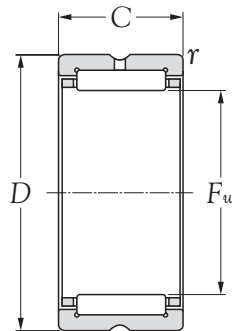
Type RNA 48
 Type RNA 49..R ($F_w \geq 14\text{mm}$)
 Type RNA 59

Boundary dimensions				Limiting speeds		Bearing numbers
mm				rpm		
F_w	D	C	$r_s \text{ min}^{1)}$	grease	oil	
160 ^{+0,068} / _{+0,043}	190	67	1,5	1.700	2.500	RNA5928
165 ^{+0,068} / _{+0,043}	190	40	1,1	1.600	2.400	RNA4830
170 ^{+0,068} / _{+0,043}	210	60	2,0	1.600	2.400	RNA4930
175 ^{+0,068} / _{+0,043}	200	40	1,1	1.500	2.300	RNA4832
180 ^{+0,068} / _{+0,043}	220	60	2,0	1.500	2.200	RNA4932
185 ^{+0,079} / _{+0,050}	215	45	1,1	1.500	2.200	RNA4834
190 ^{+0,079} / _{+0,050}	230	60	2,0	1.400	2.100	RNA4934
195 ^{+0,079} / _{+0,050}	225	45	1,1	1.400	2.100	RNA4836
205 ^{+0,079} / _{+0,050}	250	69	2,0	1.300	2.000	RNA4936
210 ^{+0,079} / _{+0,050}	240	50	1,5	1.300	1.900	RNA4838
215 ^{+0,079} / _{+0,050}	260	69	2,0	1.300	1.900	RNA4838
220 ^{+0,079} / _{+0,050}	250	50	1,5	1.200	1.800	RNA4810
225 ^{+0,079} / _{+0,050}	280	80	2,1	1.200	1.800	RNA4940
240 ^{+0,079} / _{+0,050}	270	50	1,5	1.100	1.700	RNA4844
245 ^{+0,079} / _{+0,050}	300	80	2,1	1.100	1.600	RNA4944
265 ^{+0,088} / _{+0,056}	300	60	2,0	1.000	1.500	RNA4848
265 ^{+0,088} / _{+0,056}	320	80	2,1	1.000	1.500	RNA4948
285 ^{+0,088} / _{+0,056}	320	60	2,0	950	1.400	RNA4852
290 ^{+0,088} / _{+0,056}	360	100	2,1	950	1.400	RNA4952
305 ^{+0,088} / _{+0,056}	350	69	2,0	850	1.300	RNA4856
310 ^{+0,088} / _{+0,056}	380	100	2,1	850	1.300	RNA4956
330 ^{+0,098} / _{+0,062}	380	80	2,1	800	1.200	RNA4860
340 ^{+0,098} / _{+0,062}	420	118	3,0	800	1.200	RNA4960
350 ^{+0,098} / _{+0,062}	400	80	2,1	750	1.100	RNA4864
360 ^{+0,098} / _{+0,062}	440	118	3,0	750	1.100	RNA4964
370 ^{+0,098} / _{+0,062}	420	80	2,1	750	1.100	RNA4868
380 ^{+0,098} / _{+0,062}	460	118	3,0	750	1.100	RNA4968
390 ^{+0,098} / _{+0,062}	440	80	2,1	650	1.000	RNA4872

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

**Machined-ring needle roller bearings with inner ring
series RNA48-49-59-69**


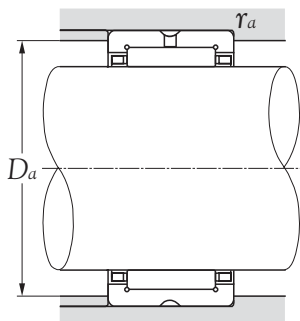
dynamic C_r N	Basic load ratings		static C_{or} kgf	Abutment dimensions		Bearing numbers	Mass kg (approx.)
	static C_{or}	dynamic C_r		D_a max	r_{as} max		
310.000	755.000	31.500	77.000	182,0	1,5	RNA5928	3,48
152.000	390.000	15.500	40.000	183,5	1,0	RNA4830	1,60
261.000	610.000	26.600	62.500	201,0	2,0	RNA4930	2,98
160.000	425.000	16.300	43.500	193,5	1,0	RNA4832	1,70
270.000	650.000	27.600	66.500	211,0	2,0	RNA4932	3,10
185.000	495.000	18.800	50.500	208,5	1,0	RNA4834	2,54
279.000	690.000	28.500	70.500	221,0	2,0	RNA4934	3,22
195.000	540.000	19.800	55.000	218,5	1,0	RNA4836	2,68
375.000	890.000	38.500	90.500	241,0	2,0	RNA4936	4,48
227.000	680.000	23.200	69.000	232,0	1,5	RNA4838	3,21
390.000	945.000	40.000	96.500	251,0	2,0	RNA4838	4,53
231.000	705.000	23.600	71.500	242,0	1,5	RNA4810	3,35
505.000	1.180.000	51.500	120.000	269,0	2,0	RNA4940	7,20
242.000	770.000	24.700	78.500	262,0	1,5	RNA4844	3,62
525.000	1.270.000	53.500	129.000	289,0	2,0	RNA4944	7,81
360.000	1.080.000	37.000	110.000	291,0	2,0	RNA4848	5,40
540.000	1.350.000	55.000	138.000	309,0	2,0	RNA4948	8,40
375.000	1.160.000	38.000	119.000	311,0	2,0	RNA4852	5,80
805.000	1.900.000	82.000	193.000	349,0	2,0	RNA4952	15,90
455.000	1.300.000	46.500	133.000	341,0	2,0	RNA4856	9,30
835.000	2.030.000	85.000	207.000	369,0	2,0	RNA4956	16,70
625.000	1.770.000	64.000	180.000	369,0	2,0	RNA4860	12,70
1.080.000	2.640.000	110.000	269.000	407,0	2,5	RNA4960	24,00
640.000	1.850.000	655.000	189.000	389,0	2,0	RNA4864	13,40
1.120.000	2.820.000	114.000	288.000	427,0	2,5	RNA4964	25,20
665.000	1.940.000	66.500	197.000	409,0	2,0	RNA4868	14,00
1.160.000	3.000.000	118.000	305.000	447,0	2,5	RNA4968	26,50
665.000	2.020.000	68.000	206.000	429,0	2,0	RNA4872	14,80

**Machined-ring needle roller bearings with inner ring
series RNA48-49-59-69**


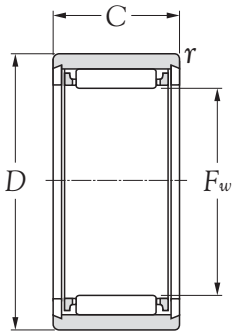
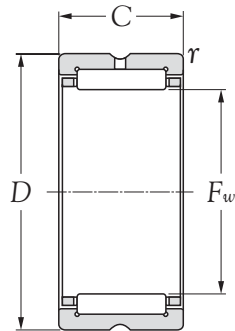
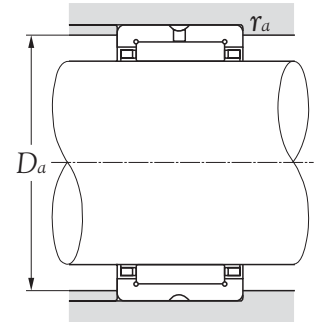
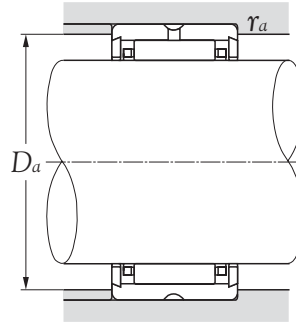
Type RNA 48
Type RNA 49..R ($F_w \geq 14\text{mm}$)

Boundary dimensions				Limiting speeds		Bearing numbers
mm				rpm		
F_w	D	C	$r_s \text{ min}^1$	grease	oil	
400 ^{+0,108} _{+0,068}	480	118	3,0	650	1.000	RNA4972
415 ^{+0,108} _{+0,068}	480	100	2,1	650	950	RNA4876
430 ^{+0,108} _{+0,068}	520	140	4,0	650	950	RNA4976
450 ^{+0,108} _{+0,068}	540	140	4,0	600	900	RNA4980
470 ^{+0,108} _{+0,068}	560	140	4,0	550	850	RNA4984
490 ^{+0,108} _{+0,068}	600	160	4,0	550	800	RNA4988

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

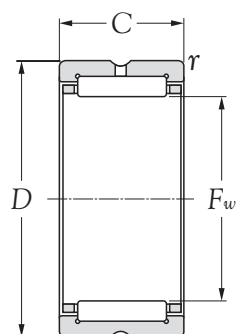
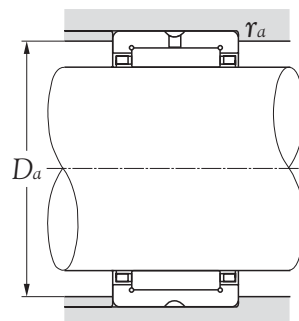
**Machined-ring needle roller bearings with inner ring
series RNA48-49-59-69**


dynamic N	Basic load ratings		Abutment dimensions		Bearing numbers	Mass kg (approx.)
	static	dynamic kgf	D_a max	r_{as} max		
C_r	C_{or}	C_r	C_{or}			
1.200.000	3.200.000	122.000	325.000	467	2,5	RNA4972 28,2
1.000.000	2.840.000	102.000	289.000	469	3,0	RNA4876 26,0
1.400.000	3.750.000	143.000	385.000	504	3,0	RNA4976 38,6
1.450.000	4.000.000	148.000	410.000	524	3,0	RNA4980 40,1
1.500.000	4.250.000	153.000	430.000	544	3,0	RNA4984 51,6
1.750.000	4.600.000	179.000	470.000	584	3,0	RNA4988 66,9

**Machined-ring needle roller bearings without inner ring
series NK**

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

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


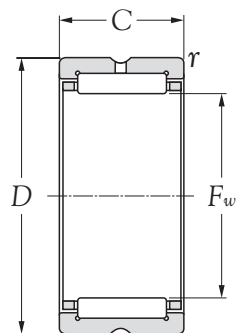
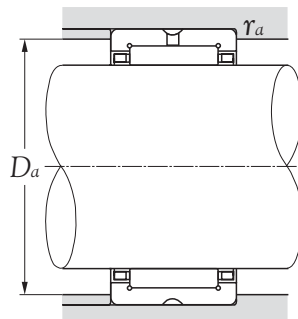
Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers	Aboutment dimensions		Mass kg (approx.)
mm				dynamic N	static	dynamic kgf	static	rpm			D_a	r_{as}	
F_w	D	C	r min ¹⁾	C_r	C_{or}	C_r	C_{or}	grease	oil		D_a max	r_{as} max	
5 ^{+0,018 -0,010}	10	10	0,15	2.640	2.190	269	224	27.000	40.000	NK5/10	6,5	0,15	0,0031
5 ^{+0,018 -0,010}	10	12	0,15	2.720	2.250	277	230	27.000	40.000	NK5/12	6,5	0,15	0,0037
6 ^{+0,018 -0,010}	12	10	0,15	2.660	2.280	272	233	25.000	37.000	NK6/10	7,5	0,15	0,0047
6 ^{+0,018 -0,010}	12	12	0,15	3.400	3.150	345	320	25.000	37.000	NK6/12	7,5	0,15	0,0057
7 ^{+0,022 -0,013}	14	10	0,30	2.670	2.350	272	239	23.000	34.000	NK7/10	8,5	0,30	0,0069
7 ^{+0,022 -0,013}	14	12	0,30	3.400	3.200	345	330	23.000	34.000	NK7/12	8,5	0,30	0,0082
8 ^{+0,022 -0,013}	15	12	0,30	4.000	4.100	410	420	21.000	32.000	NK8/12	9,5	0,30	0,0087
8 ^{+0,022 -0,013}	15	16	0,30	4.850	5.200	495	535	21.000	32.000	NK8/16	9,5	0,30	0,0120
9 ^{+0,022 -0,013}	16	12	0,30	4.550	5.000	465	510	20.000	30.000	NK9/12	10,5	0,30	0,0100
9 ^{+0,022 -0,013}	16	16	0,30	5.500	6.400	560	650	20.000	30.000	NK9/16	10,5	0,30	0,0130
10 ^{+0,022 -0,013}	17	12	0,30	4.550	5.100	460	520	19.000	28.000	NK10/12	11,5	0,30	0,0100
10 ^{+0,022 -0,013}	17	16	0,30	5.450	6.450	555	660	19.000	28.000	NK10/16	11,5	0,30	0,0130
12 ^{+0,027 -0,016}	19	12	0,30	5.000	6.100	510	620	17.000	26.000	NK12/12	13,5	0,30	0,0130
12 ^{+0,027 -0,016}	19	16	0,30	6.000	7.700	615	785	17.000	26.000	NK12/16	13,5	0,30	0,0160
14 ^{+0,027 -0,016}	22	16	0,30	10.300	11.500	1.050	1.170	16.000	24.000	NK14/16	20,0	0,30	0,0210
14 ^{+0,027 -0,016}	22	20	0,30	13.000	15.600	1.330	1.590	16.000	24.000	NK14/20	20,0	0,30	0,0260
15 ^{+0,027 -0,016}	23	16	0,30	10.900	12.700	1.110	1.290	15.000	23.000	NK15/16	21,0	0,30	0,0220
15 ^{+0,027 -0,016}	23	20	0,30	13.800	17.200	1.410	1.750	15.000	23.000	NK15/20	21,0	0,30	0,0270
16 ^{+0,027 -0,016}	24	16	0,30	12.200	14.900	1.240	1.520	15.000	23.000	NK16/16	22,0	0,30	0,0220
16 ^{+0,027 -0,016}	24	20	0,30	14.600	18.800	1.490	1.920	15.000	23.000	NK16/20	22,0	0,30	0,0280
17 ^{+0,027 -0,016}	25	16	0,30	12.100	15.000	1.240	1.530	15.000	22.000	NK17/16	23,0	0,30	0,0240
17 ^{+0,027 -0,016}	25	20	0,30	15.400	20.400	1.570	2.080	15.000	22.000	NK17/20	23,0	0,30	0,0300
18 ^{+0,027 -0,016}	26	16	0,30	12.700	16.200	1.300	1.650	14.000	21.000	NK18/16	24,0	0,30	0,0250
18 ^{+0,027 -0,016}	26	20	0,30	16.100	22.000	1.640	2.250	14.000	21.000	NK18/20	24,0	0,30	0,0310
19 ^{+0,033 -0,020}	27	16	0,30	13.300	17.400	1.350	1.780	14.000	21.000	NK19/16	25,0	0,30	0,0260
19 ^{+0,033 -0,020}	27	20	0,30	16.000	22.200	1.630	2.260	14.000	21.000	NK19/20	25,0	0,30	0,0320
20 ^{+0,033 -0,020}	28	16	0,30	13.200	17.500	1.340	1.790	13.000	20.000	NK20/16	26,0	0,30	0,0270
20 ^{+0,033 -0,020}	28	20	0,30	16.700	23.800	1.700	2.420	13.000	20.000	NK20/20	26,0	0,30	0,0340

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

**Machined-ring needle roller bearings without inner ring
series NK**

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


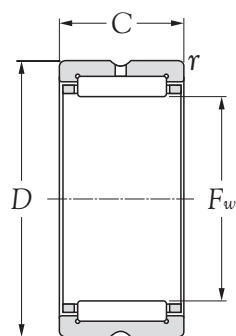
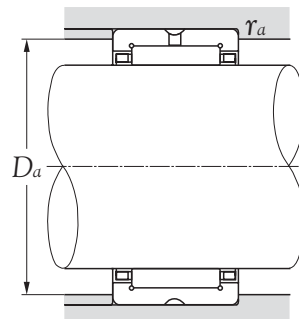
Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers	Aboutment dimensions		Mass kg (approx.)
mm				dynamic N	static	dynamic kgf	static	rpm			D_a max	r_{as} max	
F_w	D	C	$r_s \text{ min}^{1)}$	C_r	C_{or}	C_r	C_{or}	grease	oil				
21 ^{+0,033} _{-0,020}	29	16	0,3	13.700	18.700	1.400	1.910	13.000	19.000	NK21/16	27	0,3	0,028
21 ^{+0,033} _{-0,020}	29	20	0,3	18.300	27.100	1.860	2.760	13.000	19.000	NK21/20	27	0,3	0,035
22 ^{+0,033} _{-0,020}	30	16	0,3	14.200	19.900	1.450	2.030	12.000	18.000	NK22/16	28	0,3	0,034
22 ^{+0,033} _{-0,020}	30	20	0,3	18.000	27.000	1.840	2.760	12.000	18.000	NK22/20	28	0,3	0,037
24 ^{+0,033} _{-0,020}	32	16	0,3	15.200	22.300	1.550	2.280	11.000	17.000	NK24/16	30	0,3	0,032
24 ^{+0,033} _{-0,020}	32	20	0,3	18.600	28.800	1.890	2.930	11.000	17.000	NK24/20	30	0,3	0,040
25 ^{+0,033} _{-0,020}	33	16	0,3	15.100	22.400	1.540	2.280	11.000	16.000	NK25/16	31	0,3	0,033
25 ^{+0,033} _{-0,020}	33	20	0,3	19.200	30.500	1.960	3.100	11.000	16.000	NK25/20	31	0,3	0,042
26 ^{+0,033} _{-0,020}	34	16	0,3	15.600	23.600	1.590	2.410	10.000	15.000	NK26/16	32	0,3	0,034
26 ^{+0,033} _{-0,020}	34	20	0,3	19.100	30.500	1.940	3.100	10.000	15.000	NK26/20	32	0,3	0,042
28 ^{+0,033} _{-0,020}	37	20	0,3	22.300	34.000	2.280	3.450	9.500	14.000	NK28/20	35	0,3	0,052
28 ^{+0,033} _{-0,020}	37	30	0,3	26.700	48.000	2.720	4.900	9.500	14.000	NK28/30	35	0,3	0,082
29 ^{+0,033} _{-0,020}	38	20	0,3	22.200	34.000	2.270	3.450	9.500	14.000	NK29/20	36	0,3	0,054
29 ^{+0,033} _{-0,020}	38	30	0,3	27.500	50.500	2.810	5.150	9.500	14.000	NK29/30	36	0,3	0,084
30 ^{+0,033} _{-0,020}	40	20	0,3	22.100	34.000	2.260	3.500	8.500	13.000	NK30/20	38	0,3	0,065
30 ^{+0,033} _{-0,020}	40	30	0,3	33.000	57.000	3.350	5.800	8.500	13.000	NK30/30	38	0,3	0,098
32 ^{+0,041} _{-0,025}	42	20	0,3	23.500	37.500	2.400	3.850	8.500	13.000	NK32/20	40	0,3	0,068
32 ^{+0,041} _{-0,025}	42	30	0,3	34.000	60.500	3.450	6.150	8.500	13.000	NK32/30	40	0,3	0,102
35 ^{+0,041} _{-0,025}	45	20	0,3	24.800	41.500	2.520	4.250	7.500	11.000	NK35/20	43	0,3	0,074
35 ^{+0,041} _{-0,025}	45	30	0,3	36.000	66.500	3.650	6.800	7.500	11.000	NK35/30	43	0,3	0,112
37 ^{+0,041} _{-0,025}	47	20	0,3	25.300	43.500	2.580	4.400	7.500	11.000	NK37/20	45	0,3	0,077
37 ^{+0,041} _{-0,025}	47	30	0,3	36.500	69.500	3.750	7.100	7.500	11.000	NK37/30	45	0,3	0,107
38 ^{+0,041} _{-0,025}	48	20	0,3	25.900	45.000	2.640	4.600	7.500	11.000	NK38/20	46	0,3	0,079
38 ^{+0,041} _{-0,025}	48	30	0,3	37.500	73.000	3.850	7.400	7.500	11.000	NK38/30	46	0,3	0,107
40 ^{+0,041} _{-0,025}	50	20	0,3	26.400	47.000	2.700	4.800	6.500	10.000	NK40/20	48	0,3	0,083
40 ^{+0,041} _{-0,025}	50	30	0,3	38.500	76.000	3.900	7.750	6.500	10.000	NK40/30	48	0,3	0,125
42 ^{+0,041} _{-0,025}	52	20	0,3	26.900	49.000	2.750	5.000	6.500	9.500	NK42/20	50	0,3	0,086
42 ^{+0,041} _{-0,025}	52	30	0,3	39.000	79.000	4.000	8.050	6.500	9.500	NK42/30	50	0,3	0,130

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

**Machined-ring needle roller bearings without inner ring
series NK**

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


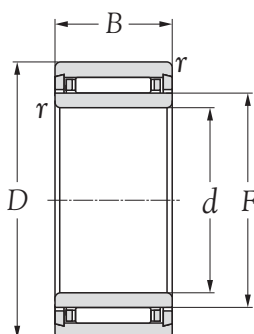
Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers	Aboutment dimensions		Mass kg (approx.)
mm				dynamic N	static	dynamic kgf	static	rpm			D_a	r_{as}	
F_w	D	C	$r_s \text{ min}^{1)}$	C_r	C_{or}	C_r	C_{or}	grease	oil		D_a max	r_{as} max	
43 ^{+0,041} _{-0,025}	53	20	0,3	27.500	51.000	2.810	5.200	6.500	9.500	NK43/20	51	0,3	0,086
43 ^{+0,041} _{-0,025}	53	30	0,3	40.000	82.000	4.100	8.400	6.500	9.500	NK43/30	51	0,3	0,133
45 ^{+0,041} _{-0,025}	55	20	0,3	28.000	52.500	2.860	5.400	6.000	9.000	NK45/20	53	0,3	0,092
45 ^{+0,041} _{-0,025}	55	30	0,3	41.000	85.500	4.150	8.700	6.000	9.000	NK45/30	53	0,3	0,139
47 ^{+0,041} _{-0,025}	57	20	0,3	28.800	55.500	2.940	5.650	5.500	8.500	NK47/20	55	0,3	0,095
47 ^{+0,041} _{-0,025}	57	30	0,3	42.500	91.500	4.350	9.350	5.500	8.500	NK47/30	55	0,3	0,142
50 ^{+0,041} _{-0,025}	62	25	0,6	38.500	74.500	3.950	7.550	5.500	8.000	NK50/25	58	0,6	0,158
50 ^{+0,041} _{-0,025}	62	35	0,6	51.000	106.000	5.200	10.800	5.500	8.000	NK50/35	58	0,6	0,221
55 ^{+0,049} _{-0,030}	68	25	0,6	41.000	82.000	4.150	8.400	5.000	7.500	NK55/25	64	0,6	0,193
55 ^{+0,049} _{-0,030}	68	35	0,6	54.000	118.000	5.500	12.000	5.000	7.500	NK55/35	64	0,6	0,267
60 ^{+0,049} _{-0,030}	72	25	0,6	41.000	85.000	4.200	8.700	4.300	6.500	NK60/25	68	0,6	0,185
60 ^{+0,049} _{-0,030}	72	35	0,6	57.000	130.000	5.800	13.200	4.300	6.500	NK60/35	68	0,6	0,258
65 ^{+0,049} _{-0,030}	78	25	0,6	45.000	98.000	4.550	10.000	4.000	6.000	NK65/25	74	0,6	0,221
65 ^{+0,049} _{-0,030}	78	35	0,6	60.000	142.000	6.100	14.400	4.000	6.000	NK65/35	74	0,6	0,310
68 ^{+0,049} _{-0,030}	82	25	1,0	44.500	89.000	4.500	9.050	4.000	6.000	NK68/25	77	0,6	0,241
68 ^{+0,049} _{-0,030}	82	35	0,6	63.000	139.000	6.400	14.200	4.000	6.000	NK68/35	78	0,6	0,338
70 ^{+0,049} _{-0,030}	85	25	0,6	45.000	91.500	4.600	9.350	3.700	5.500	NK70/25	81	0,6	0,275
70 ^{+0,049} _{-0,030}	85	35	0,6	64.000	144.000	6.550	14.700	3.700	5.500	NK70/35	81	0,6	0,386
73 ^{+0,049} _{-0,030}	90	25	0,6	54.000	100.000	5.500	10.200	3.700	5.500	NK73/25	86	0,6	0,302
73 ^{+0,049} _{-0,030}	90	35	0,6	76.500	156.000	7.800	16.000	3.700	5.500	NK73/35	86	0,6	0,428
75 ^{+0,049} _{-0,030}	92	25	0,6	55.000	104.000	5.600	10.600	3.700	5.500	NK75/25	88	0,6	0,315
75 ^{+0,049} _{-0,030}	92	35	0,6	78.000	162.000	7.950	16.500	3.700	5.500	NK75/35	88	0,6	0,492
80 ^{+0,049} _{-0,030}	95	25	1,0	57.000	119.000	5.800	12.200	3.300	5.000	NK80/25	90	1,0	0,301
80 ^{+0,049} _{-0,030}	95	35	1,0	79.500	184.000	8.150	18.700	3.300	5.000	NK80/35	90	1,0	0,425
85 ^{+0,058} _{-0,036}	105	25	1,0	70.500	123.000	7.200	12.600	3.100	4.700	NK85/25	100	1,0	0,404
85 ^{+0,058} _{-0,036}	105	35	1,0	100.000	193.000	10.200	19.700	3.100	4.700	NK85/35	100	1,0	0,517
90 ^{+0,058} _{-0,036}	110	25	1,0	71.500	128.000	7.300	13.100	2.900	4.400	NK90/25	105	1,0	0,426
90 ^{+0,058} _{-0,036}	110	35	1,0	104.000	208.000	10.600	21.200	2.900	4.400	NK90/35	105	1,0	0,604

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

**Machined-ring needle roller bearings without inner ring
series NK**

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


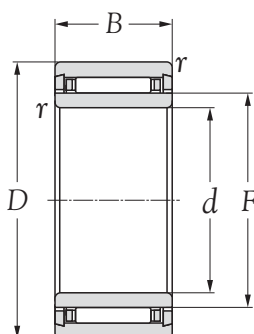
Boundary dimensions				Basic load ratings				Limiting speeds		Bearing numbers	Aboutment dimensions		Mass kg (approx.)
mm				dynamic N	static	dynamic kgf	static	rpm			D_a	r_{as}	
F_w	D	C	$r_s \text{ min}^{1)}$	C_r	C_{or}	C_r	C_{or}	grease	oil		D_a max	r_{as} max	
95 ^{+0,058} _{+0,036}	115	26	1,0	74.500	137.000	7.600	14.000	2.800	4.200	NK95/26	110,0	1,0	0,364
95 ^{+0,058} _{+0,036}	115	36	1,0	108.000	223.000	11.100	22.700	2.800	4.200	NK95/36	110,0	1,0	0,652
100 ^{+0,058} _{+0,036}	120	26	1,0	73.500	137.000	7.500	14.000	2.700	4.000	NK100/26	115,0	1,0	0,487
100 ^{+0,058} _{+0,036}	120	36	1,0	107.000	223.000	11.000	22.800	2.700	4.000	NK100/36	115,0	1,0	0,679
105 ^{+0,058} _{+0,036}	125	26	1,0	76.500	147.000	7.800	14.900	2.500	3.800	NK105/26	120,0	1,0	0,506
105 ^{+0,058} _{+0,036}	125	36	1,0	111.000	238.000	11.400	24.300	2.500	3.800	NK105/36	120,0	1,0	0,713
110 ^{+0,058} _{+0,036}	130	30	1,1	97.500	204.000	9.950	20.800	2.400	3.600	NK110/30	123,5	1,0	0,612
110 ^{+0,058} _{+0,036}	130	40	1,1	129.000	292.000	13.100	29.700	2.400	3.600	NK110/40	123,5	1,0	0,830
120 ^{+0,058} _{+0,036}	140	40	1,1	113.000	268.000	11.500	27.300	2.200	3.300	NK120/40	133,5	1,0	0,910
130 ^{+0,068} _{+0,043}	150	40	1,1	116.000	283.000	11.800	28.800	2.100	3.100	NK130/40	143,5	1,0	0,980
145 ^{+0,068} _{+0,043}	170	32	1,5	111.000	238.000	11.300	24.300	1.900	2.800	NK145/32	162,5	1,5	1,120
145 ^{+0,068} _{+0,043}	170	42	1,5	153.000	360.000	15.600	36.500	1.900	2.800	NK145/42	162,5	1,5	1,490
155 ^{+0,068} _{+0,043}	180	32	1,5	114.000	252.000	11.600	25.700	1.700	2.600	NK155/32	172,0	1,5	1,200
155 ^{+0,068} _{+0,043}	180	42	1,5	156.000	380.000	16.000	38.500	1.700	2.600	NK155/42	172,0	1,5	1,590
165 ^{+0,068} _{+0,043}	190	32	1,5	117.000	265.000	11.900	27.000	1.600	2.400	NK165/32	182,0	1,5	1,420
165 ^{+0,068} _{+0,043}	190	42	1,5	160.000	400.000	16.300	40.500	1.600	2.400	NK165/42	182,0	1,5	1,660

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

Machined-ring needle roller bearings with inner ring series NKI


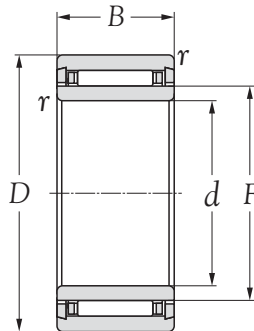
Boundary dimensions					Basic load ratings		Limiting speed	Bearing numbers	Mass
mm					dynamic	static	rpm		
<i>d</i>	<i>F</i>	<i>D</i>	<i>B</i>	<i>r</i> s min ¹⁾	<i>C_r</i>	<i>C_{or}</i>	oil		(approx.)
5	8	15	12	0,3	3.950	4.100	32.000	NKI5/12TN	0,012
5	8	15	16	0,3	5.100	5.800	32.000	NKI5/16TN	0,015
6	9	16	12	0,3	4.500	5.000	31.000	NKI6/12TN	0,014
6	9	16	16	0,3	5.900	7.100	31.000	NKI6/16TN	0,018
7	10	17	12	0,3	4.750	5.500	29.000	NKI7/12TN	0,014
7	10	17	16	0,3	6.200	7.800	29.000	NKI7/16TN	0,018
9	12	19	12	0,3	6.400	7.100	27.000	NKI9/12	0,017
9	12	19	16	0,3	9.000	11.000	27.000	NKI9/16	0,022
10	14	22	16	0,3	10.100	11.500	25.000	NKI10/16	0,029
10	14	22	20	0,3	12.800	15.600	25.000	NKI10/20	0,037
12	16	24	16	0,3	11.300	13.900	23.000	NKI12/16	0,033
12	16	24	20	0,3	14.400	18.800	23.000	NKI12/20	0,042
15	19	27	16	0,3	13.000	17.400	22.000	NKI15/16	0,039
15	19	27	20	0,3	16.500	23.600	22.000	NKI15/20	0,049
17	21	29	16	0,3	13.500	18.700	21.000	NKI17/16	0,043
17	21	29	20	0,3	17.100	25.500	21.000	NKI17/20	0,054
20	24	32	16	0,3	15.000	22.300	18.000	NKI20/16	0,049
20	24	32	20	0,3	19.000	30.500	18.000	NKI20/20	0,061
22	26	34	16	0,3	15.300	23.600	17.000	NKI22/16	0,052
22	26	34	20	0,3	19.400	32.000	17.000	NKI22/20	0,065
25	29	38	20	0,3	21.900	34.000	15.000	NKI25/20	0,080
25	29	38	30	0,3	32.500	57.000	15.000	NKI25/30	0,120
28	32	42	20	0,3	23.100	37.500	14.000	NKI28/20	0,097
28	32	42	30	0,3	34.500	63.000	14.000	NKI28/30	0,150
30	35	45	20	0,3	24.300	41.500	13.000	NKI30/20	0,110
30	35	45	30	0,3	36.500	69.000	13.000	NKI30/30	0,170
32	37	47	20	0,3	24.900	43.500	12.000	NKI32/20	0,120
32	37	47	30	0,3	37.000	73.000	12.000	NKI32/30	0,180

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

Machined-ring needle roller bearings with inner ring series NKI








Boundary dimensions					Basic load ratings		Limiting speed	Bearing numbers	Mass
mm					dynamic	static			
<i>d</i>	<i>F</i>	<i>D</i>	<i>B</i>	<i>r</i> s min ¹⁾	<i>C_r</i>	<i>C_{0r}</i>	oil		(approx.)
35	40	50	20	0,3	26.000	47.000	11.000	NKI35/20	0,13
35	40	50	30	0,3	39.000	79.000	11.000	NKI35/30	0,19
38	43	53	20	0,3	27.000	51.000	11.000	NKI38/20	0,14
38	43	53	30	0,3	40.500	85.000	11.000	NKI38/30	0,21
40	45	55	20	0,3	27.500	53.000	10.000	NKI40/20	0,14
40	45	55	30	0,3	41.000	88.000	10.000	NKI40/30	0,22
42	47	57	20	0,3	28.500	56.000	10.000	NKI42/20	0,15
42	47	57	30	0,3	43.000	94.000	10.000	NKI42/30	0,22
45	50	62	25	0,6	38.000	74.000	9.000	NKI45/25	0,23
45	50	62	35	0,6	50.000	106.000	9.000	NKI45/35	0,32
50	55	68	25	0,6	40.000	82.000	8.500	NKI50/25	0,27
50	55	68	35	0,6	53.000	118.000	8.500	NKI50/35	0,38
55	60	72	25	0,6	42.000	90.000	7.500	NKI55/25	0,27
55	60	72	35	0,6	56.000	130.000	7.500	NKI55/35	0,38
60	68	82	25	0,6	43.500	89.000	7.000	NKI60/25	0,40
60	68	82	35	0,6	62.000	139.000	7.000	NKI60/35	0,55
65	73	90	25	1,0	53.000	100.000	6.500	NKI65/25	0,47
65	73	90	35	1,0	75.000	156.000	6.500	NKI65/35	0,66
70	80	95	25	1,0	56.000	119.000	6.000	NKI70/25	0,52
70	80	95	35	1,0	78.000	184.000	6.000	NKI70/35	0,74
75	85	105	25	1,0	69.000	123.000	5.500	NKI75/25	0,64
75	85	105	35	1,0	98.000	193.000	5.500	NKI75/35	0,91
80	90	110	25	1,0	72.000	132.000	5.000	NKI80/25	0,68
80	90	110	35	1,0	103.000	208.000	5.000	NKI80/35	0,96
85	95	115	26	1,0	73.000	137.000	4.800	NKI85/26	0,75
85	95	115	36	1,0	107.000	223.000	4.800	NKI85/36	1,05
90	100	120	26	1,0	76.000	146.000	4.600	NKI90/26	0,78
90	100	120	36	1,0	111.000	237.000	4.600	NKI90/36	1,10

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

**Machined-ring needle roller bearings with inner ring
series NKI**


Boundary dimensions					Basic load ratings		Limiting speed	Bearing numbers	Mass
mm					dynamic	static			
<i>d</i>	<i>F</i>	<i>D</i>	<i>B</i>	<i>r</i> s min ¹⁾	<i>C_r</i>	<i>C_{or}</i>	rpm		kg
95	105	125	26	1,0	78.000	155.000	4.400	NKI95/26	0,82
95	105	125	36	1,0	114.000	250.000	4.400	NKI95/36	1,15
100	110	130	30	1,1	98.000	210.000	4.200	NKI100/30	1,00
100	110	130	40	1,1	127.000	290.000	4.200	NKI100/40	1,35

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

	Technical Information		Product Information
 AXK11	88~89	AXK11 Series	90~91
 AS	88~89	AS Series	90~91
 WS	88~89	WS Series	90~91
 GS	88~89	GS Series	90~91
 LS	88~89	LS Series	92
 K811 K812	88~89	K811, K812 Series	93~94



1. Types and designs

SYI® Roller and Cage Thrust Assemblies are available in the series AXK, which has needle rollers; and in series K811, K812, each of which incorporates cylindrical rollers. Each pocket of the series K811 and K812 has a single row of cylindrical rollers. Series AXK bearings, which have needle rollers, use a pressed-steel cage. Series K811, and K812 they can optionally employ a pressed-steel cage or a cage of molded polyamide reinforced with glass fiber or carbon fiber (suffix T2). The T2 cage features a maximum allowable operating temperature of 120°C and maximum allowable continuous operating temperature of 100°C.

The bearing washers for **SYI**® 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 K811 and K812 with the associated model WS or GS bearing washer.

They are standard series bearings whose dimension series, specified in JIS B 1512 (ISO 104) (Boundary dimensions for rolling bearings), are 11, 12, and 93, respectively.



Fig. 1 Series AXK

Fig. 2 Series K811, K812

Fig. 3 Series AsT1

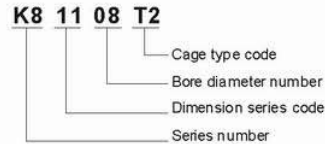
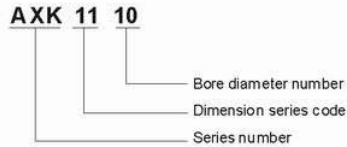
Fig. 4 Series W 911

Fig. 5 Series W 511

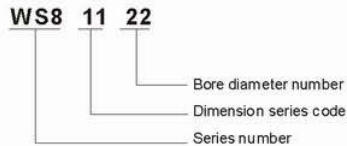
2. Interpreting bearing numbers

The bearing numbers of **SYI**® 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 [Sec. 6 "Bearing Tolerances,"](#) The bore (Del) of roller and cage thrust assemblies (series AXK, K811, K812) 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 K811, K812 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

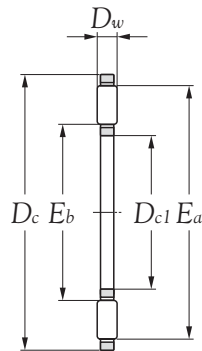
Characteristics	Requirement
Squareness (max.)	IT6 (IT4)
Surface roughness	0.4 a
Surface hardness	HRC58~64

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

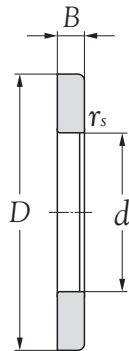
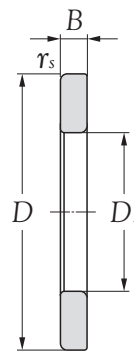
Bearing washer	Shaft	Housing
Series AS	h10	H11
Series WS	h6	—
Series GS	—	H7

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

Type AXK

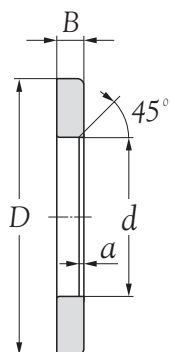
Type AS

Boundary dimensions mm												Bearing numbers			
D_{c1}	D_c	D_w	D_p	D_{p1}	$S^{2)}$	d	d_1	D	D_1	B	$r_s \text{ min}^{1)}$	thrust needle roller and cage assembly (consistent with cylindrical)	Washer	Inner ring	Outer ring
$E11$	$C12$	0 $-0,01$	$e13$	$E12$	$\pm 0,05$		$-0,2$ $-0,5$		$-0,2$ $-0,5$						
10	24	2	24	10	1	10	24	24	10	2,75 ⁰ _{-0,060}	0,3	AXK1100	AS1100	WS1100	GS1100
12	26	2	26	12	1	12	26	26	12	2,75 ⁰ _{-0,060}	0,3	AXK1101	AS1101	WS1101	GS1101
15	28	2	28	15	1	15	28	28	16	2,75 ⁰ _{-0,060}	0,3	AXK1102	AS1102	WS1102	GS1102
17	30	2	30	17	1	17	30	30	18	2,75 ⁰ _{-0,060}	0,3	AXK1103	AS1103	WS1103	GS1103
20	35	2	35	20	1	20	35	35	21	2,75 ⁰ _{-0,060}	0,3	AXK1104	AS1104	WS1104	GS1104
25	42	2	42	25	1	25	42	42	26	3,00 ⁰ _{-0,060}	0,6	AXK1105	AS1105	WS1105	GS1105
30	47	2	47	30	1	30	47	47	32	3,00 ⁰ _{-0,060}	0,6	AXK1106	AS1106	WS1106	GS1106
35	52	2	52	35	1	35	52	52	37	3,50 ⁰ _{-0,075}	0,6	AXK1107	AS1107	WS1107	GS1107
40	60	3	60	40	1	40	60	60	42	3,50 ⁰ _{-0,075}	0,6	AXK1108	AS1108	WS1108	GS1108
45	65	3	65	45	1	45	65	65	47	4,00 ⁰ _{-0,075}	0,6	AXK1109	AS1109	WS1109	GS1109
50	70	3	70	50	1	50	70	70	52	4,00 ⁰ _{-0,075}	0,6	AXK1110	AS1110	WS1110	GS1110
55	78	3	78	55	1	55	78	78	57	5,00 ⁰ _{-0,075}	0,6	AXK1111	AS1111	WS1111	GS1111
60	85	3	85	60	1	60	85	85	62	4,75 ⁰ _{-0,075}	1,0	AXK1112	AS1112	WS1112	GS1112
65	90	3	90	65	1	65	90	90	67	5,25 ⁰ _{-0,075}	1,0	AXK1113	AS1113	WS1113	GS1113
70	95	4	95	70	1	70	95	95	72	5,25 ⁰ _{-0,075}	1,0	AXK1114	AS1114	WS1114	GS1114
75	100	4	100	75	1	75	100	100	77	5,75 ⁰ _{-0,075}	1,0	AXK1115	AS1115	WS1115	GS1115
80	105	4	105	80	1	80	105	105	82	5,75 ⁰ _{-0,075}	1,0	AXK1116	AS1116	WS1116	GS1116
85	110	4	110	85	1	85	110	110	87	5,75 ⁰ _{-0,075}	1,0	AXK1117	AS1117	WS1117	GS1117
90	120	4	120	90	1	90	120	120	92	6,50 ⁰ _{-0,090}	1,0	AXK1118	AS1118	WS1118	GS1118
100	135	4	135	100	1	100	135	135	102	7,00 ⁰ _{-0,090}	1,0	AXK1120	AS1120	WS1120	GS1120
110	145	4	145	110	1	110	145	145	112	7,00 ⁰ _{-0,090}	1,0	AXK1122	AS1122	WS1122	GS1122
120	155	4	155	120	1	120	155	155	122	7,00 ⁰ _{-0,090}	1,0	AXK1124	AS1124	WS1124	GS1124
130	170	5	170	130	1	130	170	170	132	9,00 ⁰ _{-0,090}	1,0	AXK1126	AS1126	WS1126	GS1126
140	180	5	180	140	1	140	178	180	142	9,50 ⁰ _{-0,090}	1,0	AXK1128	AS1128	WS1128	GS1128
150	190	5	190	150	1	150	188	190	152	9,50 ⁰ _{-0,090}	1,0	AXK1130	AS1130	WS1130	GS1130
160	200	5	200	160	1	160	198	200	162	9,50 ⁰ _{-0,090}	1,0	AXK1132	AS1132	AS1132	GS1132

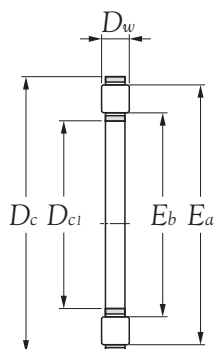
Notes: 1) These values are the allowable minimum dimensions of the chamfer dimension r.
2) Measured axial load is more than 20kgf.

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

Type WS

Type GS

Basic load ratings		Basic load ratings		Limiting speeds		Reference dimensions		Mass		
dynamic	static	dynamic	static	rpm		mm		kg (approx.)		
N		kgf								
C_a	C_{oa}	C_a	C_{oa}	grease	oil	E_b	E_a	AXK11	AS11	WS811 GS811
9.150	25.300	935	2.580	3.500	14.000	11	21	0,0028	0,0030	0,008
9.850	28.900	1.010	2.940	3.300	13.000	13	23	0,0030	0,0033	0,009
11.300	36.000	1.150	3.700	2.800	11.000	17	27	0,0035	0,0035	0,010
11.900	39.500	1.220	4.050	2.500	10.000	19	29	0,0040	0,0038	0,011
13.200	46.500	1.340	4.750	2.100	8.500	22	34	0,0050	0,0051	0,014
14.600	58.000	1.490	5.900	1.800	7.000	29	41	0,0070	0,0070	0,021
16.300	69.500	1.660	7.100	1.500	6.000	35	46	0,0080	0,0080	0,025
17.800	81.500	1.820	8.300	1.400	5.500	40	51	0,0010	0,0091	0,033
27.400	110.000	2.790	11.300	1.200	4.700	45	58	0,0185	0,0123	0,044
29.800	128.000	3.050	13.100	1.100	4.300	50	63	0,0205	0,0136	0,055
31.500	143.000	3.250	14.500	1.000	3.900	55	68	0,0235	0,0148	0,060
38.000	186.000	3.850	19.000	900	3.500	60	76	0,0308	0,0189	0,095
44.500	234.000	4.550	23.900	800	3.200	65	83	0,0390	0,0223	0,101
46.500	254.000	4.750	25.900	750	3.000	70	88	0,0400	0,0239	0,125
53.500	253.000	5.500	25.800	750	2.900	74	93	0,0600	0,0254	0,134
55.000	266.000	5.650	27.100	700	2.700	79	98	0,0610	0,0270	0,155
56.500	279.000	5.750	28.400	650	2.600	84	103	0,0630	0,0284	0,163
57.500	291.000	5.900	29.700	600	2.400	89	108	0,0668	0,0301	0,175
71.000	390.000	7.250	39.500	600	2.300	94	118	0,0860	0,0388	0,250
90.500	550.000	9.200	56.500	500	2.000	105	133	0,1120	0,0505	0,350
93.500	590.000	9.550	60.500	480	1.900	115	143	0,1220	0,0549	0,385
99.000	650.000	10.100	66.500	430	1.700	125	153	0,1310	0,0592	0,415
140.000	900.000	14.300	92.000	400	1.600	136	167	0,2050	0,0740	0,663
145.000	960.000	14.800	97.500	380	1.500	146	177	0,2190	0,0790	0,749
149.000	1.020.000	15.200	104.000	350	1.400	156	187	0,2320	0,0840	0,796
154.000	1.070.000	15.700	110.000	330	1.300	166	197	0,2460	0,0890	0,842

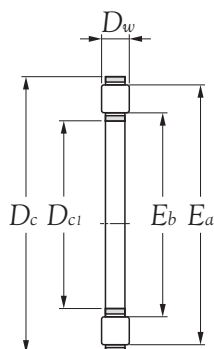
**Thrust needle roller bearings
series LS**


Boundary dimensions mm				Roll path size		Basic load ratings dynamic static N		Limiting speed $n_{\text{lgrease}} \approx$ min^{-1}	Bearing numbers
d	D	B	$a_{\text{min.}}$	E_b	E_a	C_r	C_{or}		
6	19	2,75	0,3	7	18	6.800	15.500	16.000	LS0619
8	21	2,75	0,3	9	20	7.800	19.400	15.000	LS0821
10	24	2,75	0,3	12	23	9.200	25.500	14.000	LS1024
12	26	2,75	0,3	14	25	9.900	29.000	13.000	LS1226
15	28	2,75	0,3	17	27	11.300	36.000	11.000	LS1528
17	30	2,75	0,3	19	29	11.900	39.500	10.000	LS1730
20	35	2,75	0,3	22	34	13.100	46.500	8.500	LS2035
25	42	3,00	0,6	29	41	14.700	58.000	7.000	LS2542
30	47	3,00	0,6	34	46	16.300	70.000	6.000	LS3047
35	52	3,50	0,6	39	51	17.800	81.000	5.500	LS3552
40	60	3,50	0,6	45	58	28.000	114.000	4.700	LS4060
45	65	4,00	0,6	50	63	30.000	128.000	4.300	LS4565
50	70	4,00	0,6	55	68	32.000	143.000	3.900	LS5070
55	78	5,00	0,6	60	76	38.000	186.000	3.500	LS5578
60	85	4,75	1,0	65	83	44.500	234.000	3.200	LS6085
65	90	5,25	1,0	70	88	46.500	255.000	3.000	LS6090
70	95	5,25	1,0	74	93	54.000	255.000	2.900	LS7095
75	100	5,75	1,0	79	98	55.000	265.000	2.700	LS75100
80	105	5,75	1,0	84	103	56.000	280.000	2.600	LS80105
85	110	5,75	1,0	89	108	58.000	290.000	2.400	LS85110
90	120	6,50	1,0	94	118	73.000	405.000	2.300	LS90120
100	135	7,00	1,0	105	133	91.000	560.000	2.000	LS100135
110	145	7,00	1,0	115	143	97.000	620.000	1.900	LS110145

**Thrust needle roller bearings
series K811**


Boundary dimensions			Reference dimensions		Basic load ratings				Limiting speeds		Bearing numbers			Mass
mm			mm		dynamic	static	dynamic	static	rpm		thrust needle roller and cage assembly			kg
$D_{c1}^{(1)}$	D_c	D_w	E_b	E_a	C_r	C_{or}	C_r	C_{or}	grease	oil		Inner ring	Outer ring	(approx.)
$_{E11}$	$_{0,13}$	$_{-0,010}^0$			N		kgf							
10	24	3,5	12	23	10.800	21.500	1.110	2.190	3.400	13.000	K81100	WS81100	GS81100	0,0035
12	26	3,5	14	25	11.500	23.900	1.170	2.430	3.000	12.000	K81101	WS81101	GS81101	0,0040
15	28	3,5	16	27	12.900	28.600	1.310	2.920	2.800	11.000	K81102	WS81102	GS81102	0,0060
17	30	3,5	18	29	13.400	31.000	1.370	3.150	2.500	10.000	K81103	WS81103	GS81103	0,0080
20	35	4,5	21	34	20.200	46.500	2.060	4.700	2.100	8.500	K81104	WS81104	GS81104	0,0120
25	42	5,0	27	40	27.300	68.000	2.780	6.900	1.800	7.000	K81105	WS81105	GS81105	0,0180
30	47	5,0	32	45	27.800	72.500	2.840	7.400	1.500	6.000	K81106	WS81106	GS81106	0,0200
35	52	5,0	37	50	31.000	87.000	3.150	8.900	1.400	5.500	K81107	WS81107	GS81107	0,0240
40	60	6,0	42	58	43.000	121.000	4.350	12.400	1.200	4.800	K81108	WS81108	GS81108	0,0350
45	65	6,0	47	63	45.500	135.000	4.650	13.800	1.100	4.400	K81109	WS81109	GS81109	0,0400
50	70	6,0	52	68	48.000	150.000	4.900	15.300	1.000	4.000	K81110	WS81110	GS81110	0,0450
55	78	6,0	57	76	62.500	215.000	6.350	21.900	900	3.600	K81111	WS81111	GS81111	0,0600
60	85	7,5	63	82	69.000	215.000	7.000	21.900	830	3.300	K81112	WS81112	GS81112	0,0830
65	90	7,5	68	87	73.000	236.000	7.400	24.100	780	3.100	K81113	WS81113	GS81113	0,0900
70	95	7,5	73	92	76.500	257.000	7.800	26.200	730	2.900	K81114	WS81114	GS81114	0,0970
75	100	7,5	78	97	78.000	268.000	7.950	27.300	680	2.700	K81115	WS81115	GS81115	0,1150
80	105	7,5	83	102	79.500	279.000	8.100	28.400	650	2.600	K81116	WS81116	GS81116	0,1190
85	110	7,5	88	107	83.000	300.000	8.450	30.500	630	2.500	K81117	WS81117	GS81117	0,1250
90	120	9,0	93	117	112.000	395.000	11.400	40.500	580	2.300	K81118	WS81118	GS81118	0,1700

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

**Thrust needle roller bearings
series K812**


Boundary dimensions			Reference dimensions		Basic load ratings				Limiting speeds		Bearing numbers			Mass
mm			mm		dynamic	static	dynamic	static	rpm		thrust needle roller and cage assembly			kg
$D_{ci}^{1)}$	D_c	D_w	E_b	E_a	C_r	C_{or}	C_r	C_{or}	grease	oil	Inner ring	Outer ring	(approx.)	
E_{11}	0,13	$\begin{matrix} 0 \\ -0,010 \end{matrix}$												
30	52	7,5	32	50	53.500	129.000	5.450	13.100	1.500	6.000	K81206	WS81206	GS81206	0,050
35	62	7,5	37	60	54.500	139.000	5.550	14.200	1.200	4.900	K81207	WS81207	GS81207	0,065
40	68	9,0	43	66	74.500	190.000	7.600	19.400	1.100	4.400	K81208	WS81208	GS81208	0,085
45	73	9,0	48	71	82.000	222.000	8.350	22.600	1.000	4.100	K81209	WS81209	GS81209	0,100
50	78	9,0	53	76	85.000	238.000	8.650	24.200	950	3.800	K81210	WS81210	GS81210	0,105
55	90	11,0	58	87	121.000	340.000	12.300	34.500	830	3.300	K81211	WS81211	GS81211	0,190
60	95	11,0	64	92	125.000	365.000	12.800	37.000	780	3.100	K81212	WS81212	GS81212	0,200
65	100	11,0	69	97	130.000	385.000	13.200	39.500	730	2.900	K81213	WS81213	GS81213	0,215
70	105	11,0	74	102	134.000	410.000	13.700	42.000	680	2.700	K81214	WS81214	GS81214	0,225
75	110	11,0	79	107	138.000	435.000	14.100	44.500	650	2.600	K81215	WS81215	GS81215	0,240
80	115	11,0	84	112	142.000	460.000	14.500	47.000	630	2.500	K81216	WS81216	WS81216	0,250

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

	Technical Information		Product Information
 NKX NKX..Z	96~97	NKX, NKX..Z Series	98~99
 NKXR NKXR..Z	96~97	NKXR, NKXR..Z Series	100~101
 NKIA 59	96~97	NKIA59 Series	102~103
 NKIB 59	96~97	NKIB59 Series	104~105



1. Types and designs

Depending on the thrust bearing type that is combined with a radial needle roller bearing, **SYI**® 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 (Fw) with needle roller bearings is class F6, the same as with machined ring needle roller bearings.

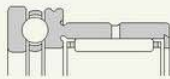


Fig. 1 Series NKX

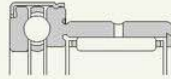


Fig. 2 Series NKX.Z

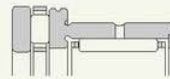


Fig. 3 Series NKXR

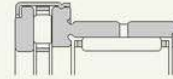


Fig. 4 Series NKXR.Z

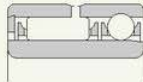
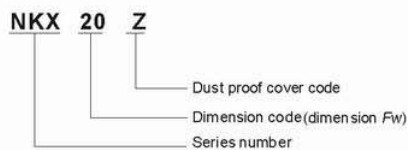


Fig. 5 Series NKIA

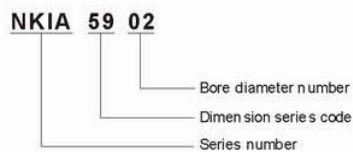
2. Interpreting bearing numbers

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

Series NKX, NKXR



Series NKIA



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 D₁ or D₂ of the bearing washer.

Table 1 Fit to shaft and housing

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

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

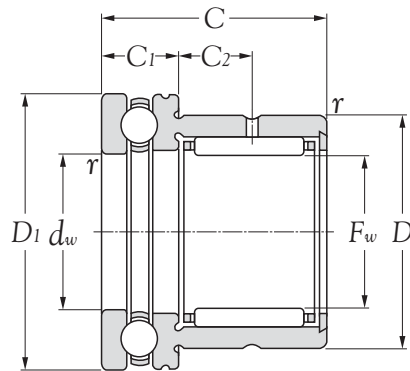
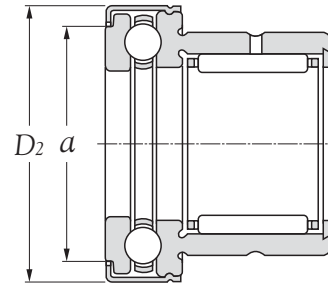
4. Rating life calculation

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.

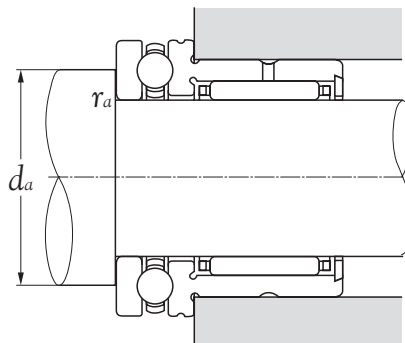
Calculate the rating life (*L_a*) of the thrust bearing according to the working axial load.

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

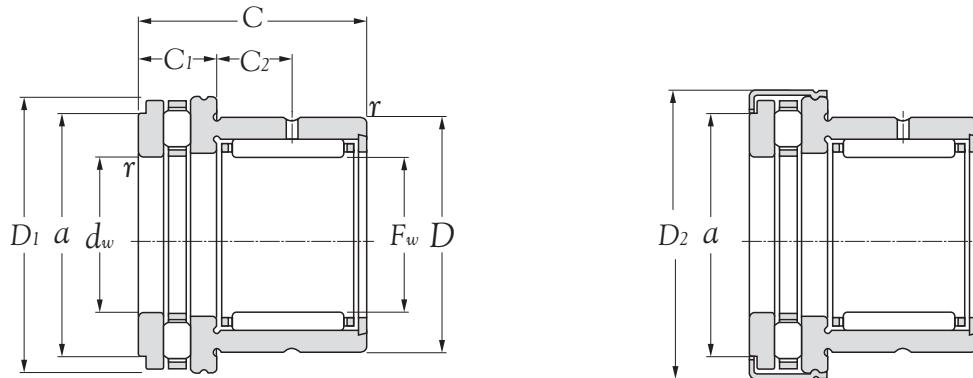
**Needle roller bearings with thrust ball bearings
series NKX, NKX..Z**

**Type NKX
(Open type)**

**Type NKX..Z
(With cover)**

Boundary dimensions										Basic load ratings				Bearing numbers			
F_w	d_w	D	D_1	mm			a	r s min ¹⁾	dynamic N	static kgf	dynamic N	static kgf					
				D_2	C	C_1									C_2	Radial	
					0 $-0,25$	0 $-0,20$											
10	$^{+0,022}$ $_{-0,013}$	10	$^{+0,040}$ $_{+0,025}$	19	24	25,0	23	9	6,5	19,7	0,3	5.450	6.450	555	660	NKX10T2	NKX10T2Z
12	$^{+0,027}$ $_{+0,016}$	12	$^{+0,050}$ $_{+0,032}$	21	26	27,0	23	9	6,5	21,7	0,3	6.000	7.700	615	785	NKX12T2	NKX12T2Z
15	$^{+0,027}$ $_{+0,016}$	15	$^{+0,050}$ $_{+0,032}$	24	28	29,0	23	9	6,5	23,7	0,3	8.250	10.200	840	1.040	NKX15T2	NKX15T2Z
17	$^{+0,027}$ $_{+0,016}$	17	$^{+0,050}$ $_{+0,032}$	26	30	31,0	25	9	8,0	25,7	0,3	10.400	14.400	1.060	1.460	NKX17T2	NKX17T2Z
20	$^{+0,033}$ $_{+0,020}$	20	$^{+0,061}$ $_{+0,040}$	30	35	36,0	30	10	10,5	30,7	0,3	16.400	27.100	1.670	2.760	NKX20T2	NKX20T2Z
25	$^{+0,033}$ $_{+0,020}$	25	$^{+0,061}$ $_{+0,040}$	37	42	43,0	30	11	9,5	37,7	0,6	14.200	24.000	1.450	2.450	NKX25T2	NKX25T2Z
30	$^{+0,033}$ $_{+0,020}$	30	$^{+0,061}$ $_{+0,040}$	42	47	48,0	30	11	9,5	42,7	0,6	22.300	39.500	2.280	4.000	NKX30T2	NKX30T2Z
35	$^{+0,041}$ $_{+0,025}$	35	$^{+0,075}$ $_{+0,050}$	47	52	53,0	30	12	9,0	47,7	0,6	20.000	36.000	2.040	3.650	NKX35T2	NKX35T2Z
40	$^{+0,041}$ $_{+0,025}$	40	$^{+0,075}$ $_{+0,050}$	52	60	61,0	32	13	10,0	55,7	0,6	25.900	52.500	2.650	5.350	NKX40	NKX40Z
45	$^{+0,041}$ $_{+0,025}$	45	$^{+0,075}$ $_{+0,050}$	58	65	66,5	32	14	9,0	60,5	0,6	27.600	59.000	2.810	6.000	NKX45	NKX45Z
50	$^{+0,041}$ $_{+0,025}$	50	$^{+0,075}$ $_{+0,050}$	62	70	71,5	35	14	10,0	65,5	0,6	27.900	62.000	2.850	6.300	NKX50	NKX50Z
60	$^{+0,049}$ $_{+0,030}$	60	$^{+0,090}$ $_{+0,060}$	72	85	86,5	40	17	12,0	80,5	1,0	29.800	71.500	3.050	7.300	NKX60	NKX60Z
70	$^{+0,049}$ $_{+0,030}$	70	$^{+0,090}$ $_{+0,060}$	85	95	96,5	40	18	11,0	90,5	1,0	36.500	86.000	3.700	8.750	NKX70	NKX70Z

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

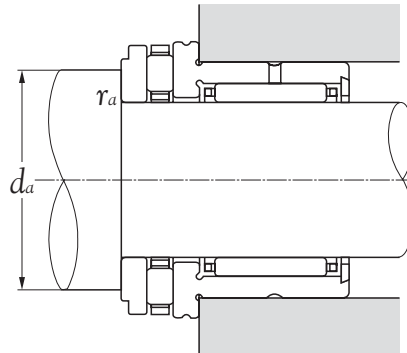
Needle roller bearings with thrust ball bearings
series NKX, NKX..Z


Basic load ratings				Abutment dimensions		Limiting speeds		Bearing numbers		Mass	
dynamic	static	dynamic	static	\$d_a\$ min	\$r_{as}\$ max	rpm				kg (approx.)	
N		Axial	kgf			grease	oil			Type NKX	Type NKX..Z
\$C_a\$	\$C_{oa}\$	\$C_a\$	\$C_{oa}\$								
10.000	14.000	1.020	1.420	18	0,3	6.700	9.500	NKX10T2	NKX10T2Z	0,037	0,039
10.300	15.400	1.050	1.570	20	0,3	6.400	9.200	NKX12T2	NKX12T2Z	0,042	0,044
10.500	16.800	1.070	1.710	23	0,3	6.200	8.800	NKX15T2	NKX15T2Z	0,044	0,048
10.800	18.200	1.100	1.850	25	0,3	6.000	8.500	NKX17T2	NKX17T2Z	0,051	0,056
14.200	24.700	1.450	2.520	29	0,3	5.200	7.500	NKX20T2	NKX20T2Z	0,085	0,090
19.600	37.000	1.990	3.800	35	0,6	4.600	6.500	NKX25T2	NKX25T2Z	0,125	0,132
20.400	42.000	2.080	4.300	40	0,6	4.300	6.200	NKX30T2	NKX30T2Z	0,140	0,148
20.400	44.500	2.080	4.550	45	0,6	3.900	5.600	NKX35T2	NKX35T2Z	0,167	0,175
26.900	63.000	2.740	6.400	52	0,6	3.500	5.000	NKX40	NKX40Z	0,216	0,225
27.900	69.000	2.840	7.050	57	0,6	3.200	4.600	NKX45	NKX45Z	0,252	0,265
28.800	75.500	2.930	7.700	62	0,6	3.100	4.500	NKX50	NKX50Z	0,302	0,318
41.500	113.000	4.200	11.500	75	1,0	2.600	3.700	NKX60	NKX60Z	0,465	0,484
43.000	127.000	4.400	12.900	85	1,0	2.400	3.400	NKX70	NKX70Z	0,612	0,635

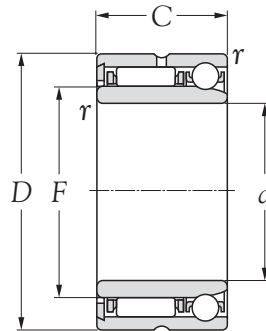
Needle roller bearings with thrust cylindrical roller bearings series NKXR, NKXR..Z


Boundary dimensions										Basic load ratings				Bearing numbers			
F_w	d_w	D	mm				a	r	$s \text{ min}^{1)}$	dynamic N	static		dynamic static				
			D_1	D_2	C	C_1					C_2	C_r	C_{or}	C_r	C_{or}		
15	$^{+0,027}_{-0,016}$	15	$^{+0,050}_{+0,032}$	24	28	29,0	23	9	6,5	23,7	0,3	8.250	10.200	840	1.040	NKXR15T2	NKXR15T2Z
17	$^{+0,027}_{-0,016}$	17	$^{+0,050}_{+0,032}$	26	30	31,0	25	9	8,0	25,7	0,3	10.400	14.400	1.060	1.460	NKXR17T2	NKXR17T2Z
20	$^{+0,033}_{+0,020}$	20	$^{+0,061}_{+0,040}$	30	35	36,0	30	10	10,5	30,7	0,3	16.400	27.100	1.670	2.760	NKXR20T2	NKXR20T2Z
25	$^{+0,033}_{+0,020}$	25	$^{+0,061}_{+0,040}$	37	42	43,0	30	11	9,5	37,7	0,6	14.200	24.000	1.450	2.450	NKXR25T2	NKXR25T2Z
30	$^{+0,033}_{+0,020}$	30	$^{+0,061}_{+0,040}$	42	47	48,0	30	11	9,5	42,7	0,6	22.300	39.500	2.280	4.000	NKXR30T2	NKXR30T2Z
35	$^{+0,041}_{+0,025}$	35	$^{+0,075}_{+0,050}$	47	52	53,0	30	12	9,0	47,7	0,6	20.000	36.000	2.040	3.650	NKXR35T2	NKXR35T2Z
40	$^{+0,041}_{+0,025}$	40	$^{+0,075}_{+0,050}$	52	60	61,0	32	13	10,0	55,7	0,6	25.900	52.500	2.650	5.350	NKXR40T2	NKXR40T2Z
45	$^{+0,041}_{+0,025}$	45	$^{+0,075}_{+0,050}$	58	65	66,5	32	14	9,0	60,5	0,6	27.600	59.000	2.810	6.000	NKXR45T2	NKXR45T2Z
50	$^{+0,041}_{+0,025}$	50	$^{+0,075}_{+0,050}$	62	70	71,5	35	14	10,0	65,5	0,6	27.900	62.000	2.850	6.300	NKXR50T2	NKXR50T2Z

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

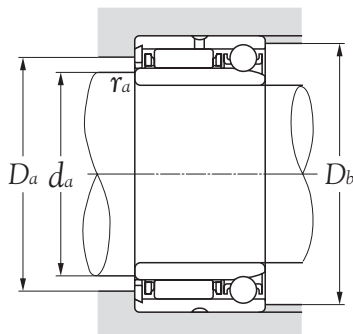
**Needle roller bearings with thrust cylindrical roller bearings
series NKXR, NKXR..Z**


Basic load ratings				Abutment dimensions		Limiting speeds		Bearing numbers		Mass kg (approx.)	
dynamic	static	dynamic	static	\$d_a\$ min	\$r_{as}\$ max	rpm				Type NKXR	Type NKXR..Z
N	kgf	Axial				grease	oil				
\$C_a\$	\$C_{oa}\$	\$C_a\$	\$C_{oa}\$								
12.900	28.600	1.310	2.920	25	0,3	2.800	11.000	NKXR15T2	NKXR15T2Z	0,048	0,052
13.400	31.000	1.370	3.150	27	0,3	2.500	10.000	NKXR17T2	NKXR17T2Z	0,050	0,053
20.200	46.500	2.060	4.700	32	0,3	2.100	8.500	NKXR20T2	NKXR20T2Z	0,090	0,095
27.300	68.000	2.780	6.900	39	0,6	1.800	7.000	NKXR25T2	NKXR25T2Z	0,128	0,135
27.800	72.500	2.840	7.400	44	0,6	1.500	6.000	NKXR30T2	NKXR30T2Z	0,162	0,169
31.000	87.000	3.150	8.900	49	0,6	1.400	5.500	NKXR35T2	NKXR35T2Z	0,184	0,195
43.000	121.000	4.350	12.400	56	0,6	1.200	4.800	NKXR40T2	NKXR40T2Z	0,226	0,237
45.500	135.000	4.650	13.800	61	0,6	1.100	4.400	NKXR45T2	NKXR45T2Z	0,267	0,286
48.000	150.000	4.900	15.300	66	0,6	1.000	4.000	NKXR50T2	NKXR50T2Z	0,309	0,329

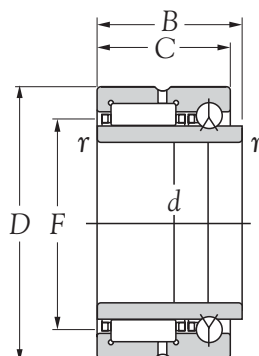
**Needle roller bearings with angular contact ball bearings
series NKIA 59**


Boundary dimensions					Basic load ratings								Bearing numbers
mm					dynamic	static	dynamic	static	dynamic	static	dynamic	static	
d	D	C	F	r _s min ^{b)}	N	kgf	kgf	kgf	N	kgf	kgf	kgf	
					Radial				Axial				
					C _r	C _{or}	C _r	C _{or}	C _a	C _{oa}	C _a	C _{oa}	
15	28	18	20	0,3	9.500	13.400	970	1.370	2.340	3.050	239	310	NKIA5902
17	30	18	22	0,3	10.100	14.900	1.030	1.520	2.530	3.550	258	360	NKIA5903
20	37	23	25	0,3	16.500	22.100	1.680	2.250	4.700	6.150	480	625	NKIA5904
22	39	23	28	0,3	17.500	24.800	1.790	2.530	4.900	6.750	500	690	NKIA59/22
25	42	23	30	0,3	17.400	25.000	1.770	2.550	5.100	7.350	520	750	NKIA5905
30	47	23	35	0,3	19.400	30.500	1.980	3.100	5.400	8.550	550	870	NKIA5906
35	55	27	42	0,6	25.700	46.000	2.630	4.700	7.400	12.300	755	1.260	NKIA5907
40	62	30	48	0,6	31.000	61.000	3.150	6.250	7.750	14.000	790	1.430	NKIA5908
45	68	30	55	0,6	33.000	69.500	3.350	7.100	8.500	17.100	870	1.740	NKIA5909
50	72	30	60	0,6	33.500	73.500	3.450	7.500	8.800	18.700	900	1.910	NKIA5910
55	80	34	63	1,0	44.500	95.500	4.500	9.700	14.300	33.000	1.460	3.350	NKIA5911
60	85	34	68	1,0	45.500	101.000	4.600	10.300	14.800	36.000	1.510	3.650	NKIA5912
65	90	34	75	1,0	46.000	106.000	4.700	10.800	15.200	39.000	1.550	4.000	NKIA5913
70	100	40	80	1,0	62.500	146.000	6.350	14.900	18.600	47.500	1.890	4.850	NKIA5914

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

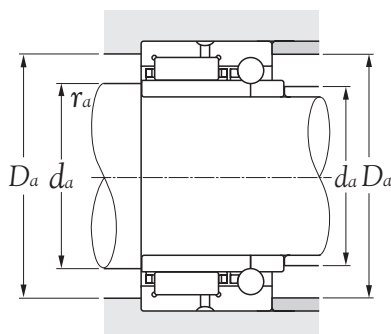
**Needle roller bearings with angular contact ball bearings
series NKIA 59**


Limiting speeds rpm		Abutment dimensions mm				Bearing numbers	Mass kg (approx.)
grease	oil	d _a min	D _a max	D _b max	r _{as} max		
13.000	20.000	17,5	22,0	25,5	0,3	NKIA5902	0,050
12.000	18.000	19,5	24,0	27,5	0,3	NKIA5903	0,056
11.000	16.000	22,5	28,0	34,5	0,3	NKIA5904	0,111
9.500	14.000	24,5	31,0	36,5	0,3	NKIA59/22	0,120
8.500	13.000	27,5	33,0	39,5	0,3	NKIA5905	0,130
7.500	11.000	32,5	38,0	44,5	0,3	NKIA5906	0,147
6.500	9.500	40,0	45,0	50,0	0,6	NKIA5907	0,243
5.500	8.500	45,0	51,0	57,0	0,6	NKIA5908	0,347
5.000	7.500	50,0	58,0	63,0	0,6	NKIA5909	0,401
4.300	6.500	55,0	63,0	67,0	0,6	NKIA5910	0,410
4.300	6.500	61,0	66,5	74,0	1,0	NKIA5911	0,590
4.000	6.000	66,0	71,5	79,0	1,0	NKIA5912	0,632
3.700	5.500	71,0	78,5	84,0	1,0	NKIA5913	0,708
3.300	5.000	76,0	84,0	94,0	1,0	NKIA5914	1,050

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


Boundary dimensions						Basic load ratings							
mm						dynamic	static	dynamic	static	dynamic	static	dynamic	static
						N		kgf		N		kgf	
						Radial				Axial			
d	D	B	C	F	r <small>min¹⁾</small>	C_r	C_{or}	C_r	C_{or}	C_a	C_{oa}	C_a	C_{oa}
15	28	20	18	20	0,3	10.800	13.600	1.100	1.390	2.750	4.200	280	430
17	30	20	18	22	0,3	11.200	14.600	1.140	1.490	2.960	4.900	300	495
20	37	25	23	25	0,3	21.300	25.500	2.170	2.600	4.650	7.400	475	755
22	39	25	23	28	0,3	23.200	29.300	2.360	2.990	5.000	8.650	510	880
25	42	25	23	30	0,3	24.000	31.500	2.450	3.200	5.150	9.250	525	945
30	47	25	23	35	0,3	25.500	35.500	2.600	3.600	5.600	11.200	570	1.140
35	55	30	42	42	0,6	32.000	50.000	3.300	5.100	7.050	14.900	720	1.520
40	62	34	48	28	0,6	43.500	66.500	4.450	6.800	8.700	19.400	890	1.980
45	68	34	52	52	0,6	46.000	73.000	4.700	7.450	9.100	21.400	925	2.180
50	72	34	58	58	0,6	48.000	80.000	4.900	8.150	9.600	24.300	980	2.480
55	80	38	63	63	1,0	58.500	99.500	6.000	10.100	11.400	29.400	1.170	3.000
60	85	38	68	68	1,0	61.500	108.000	6.250	11.000	11.800	32.000	1.200	3.250
65	90	38	72	72	1,0	62.500	112.000	6.350	11.400	12.100	34.000	1.240	3.500
70	100	45	80	80	1,0	85.500	156.000	8.750	15.900	15.900	44.500	1.620	4.550

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

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


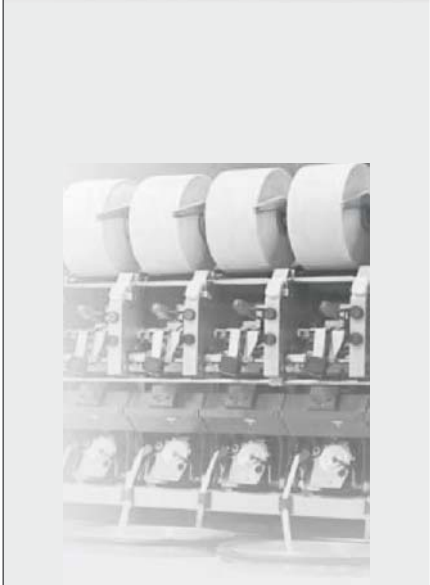
Limiting speeds rpm		Abutment dimensions mm			Bearing numbers	Mass kg (approx.)
grease	oil	d_a min	D_a max	r_a max		
13.000	20.000	17,5	25,5	0,3	NKIB5902R	0,052
12.000	18.000	19,5	27,5	0,3	NKIB5903R	0,058
11.000	16.000	22,5	34,5	0,3	NKIB5904R	0,107
9.500	14.000	24,5	36,5	0,3	NKIB59/22R	0,122
8.500	13.000	27,5	39,5	0,3	NKIB5905R	0,134
7.500	11.000	32,5	44,5	0,3	NKIB5906R	0,151
6.500	9.500	40,0	50,0	0,6	NKIB5907R	0,247
5.500	8.500	45,0	57,0	0,6	NKIB5908R	0,320
5.000	7.500	50,0	63,0	0,6	NKIB5909R	0,380
4.300	6.500	55,0	67,0	0,6	NKIB5910R	0,385
4.300	6.500	61,0	74,0	1,0	NKIB5911R	0,555
4.000	6.000	66,0	79,0	1,0	NKIB5912R	0,595
3.700	5.500	71,0	84,0	1,0	NKIB5913R	0,640
3.300	5.000	76,0	94,0	1,0	NKIB5914R	0,985



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Using applications



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Power tools

Rail vehicles

Toys, pedal cycles and sports equipment






Iron and steel industry

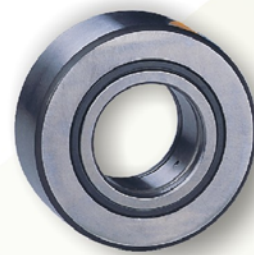
Internal combustion engines for gardening and forestry equipment, outboard motors

Machine tools and production systems

Electrical household appliances



	Technical Information		Product Information
 NATR	108~110	NATR Series	112~113
 NATV	108~110	NATV Series	114~115
 NUTR	108~110	NUTR Series	116~117
 NA22..2RS	108~110	NA22..2RS Series	118~119
 RNA22..	108~110	RNA22.. Series	118~119



1. Types and designs

SYI Yoke-type Track Rollers include the series RNA22 (without inner ring) and series NA22 (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 RNA22 and NA22, 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.

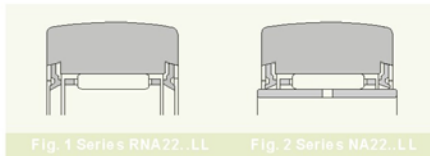


Fig. 1 Series RNA22..LL

Fig. 2 Series NA22..LL

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 **SYI** 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 LL) incorporates a synthetic rubber seal between the outer ring and inner ring.

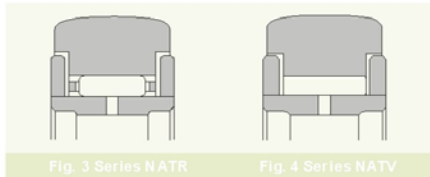


Fig. 3 Series NATR

Fig. 4 Series NATV

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.

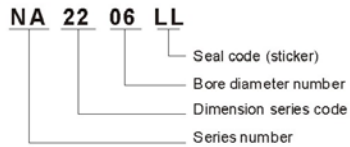


Fig. 5 Series NUTR

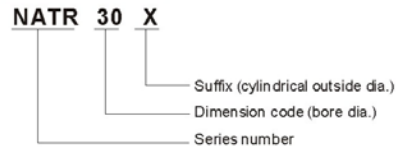
2. Interpreting bearing numbers

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

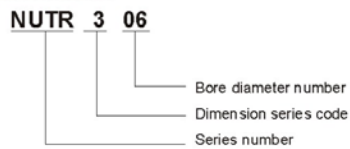
Series RNA, NA



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 RNA22), the tolerance class of the shaft must be k5 (k6). Usually, the outer ring of an **SYI**® 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 RNA22 series or NA22 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.

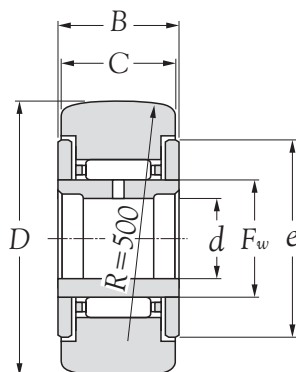
5. Lubrication

Rollers having a synthetic rubber seal (suffix LL) 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.

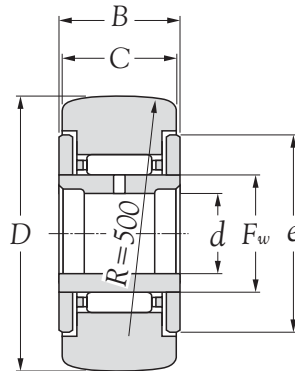
The internal bearing grease can be replenished through a lubrication hole on the inner ring.

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.

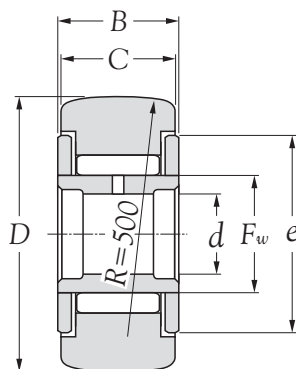
**Roller followers yoke type truck rollers
series NATR**


Boundary dimensions						Basic load ratings				Bearing numbers		
D ₀ ⁰ _{-0,05}	B	mm				F _w	dynamic	static	dynamic	static		
		C	d	e	N		kgf	Cor	Cor			
16	12 _{-0,180} ⁰	11	5	12	8,0	3.850	3.950	395	400	NATR5	NATR5 2RS	
19	12 _{-0,180} ⁰	11	6	14	10,0	4.500	5.100	460	520	NATR6	NATR6 2RS	
24	15 _{-0,180} ⁰	14	8	19	12,0	6.600	7.300	675	745	NATR8	NATR8 2RS	
30	15 _{-0,180} ⁰	14	10	23	15,0	7.500	9.100	765	930	NATR10	NATR10 2RS	
32	15 _{-0,180} ⁰	14	12	25	17,0	8.500	11.100	865	1.130	NATR12	NATR12 2RS	
35	19 _{-0,210} ⁰	18	15	27	20,0	13.000	20.100	1.320	2.050	NATR15	NATR15 2RS	
40	21 _{-0,210} ⁰	20	17	32	22,0	13.600	22.100	1.390	2.250	NATR17	NATR17 2RS	
47	25 _{-0,210} ⁰	24	20	37	25,0	20.300	33.000	2.070	3.350	NATR20	NATR20 2RS	
52	25 _{-0,210} ⁰	24	25	42	30,0	22.300	39.500	2.280	4.000	NATR25	NATR25 2RS	
62	29 _{-0,210} ⁰	28	30	51	38,0	35.000	64.000	3.600	6.550	NATR30	NATR30 2RS	
72	29 _{-0,210} ⁰	28	35	58	44,5	38.000	74.500	3.850	7.600	NATR35	NATR35 2RS	
80	32 _{-0,250} ⁰	30	40	66	50,0	48.500	90.000	4.950	9.150	NATR40	NATR40 2RS	
85	32 _{-0,250} ⁰	30	45	71	55,0	50.500	97.500	5.150	9.950	NATR45	NATR45 2RS	
90	32 _{-0,250} ⁰	30	50	76	60,0	52.000	105.000	5.300	10.700	NATR50	NATR50 2RS	

**Roller followers yoke type truck rollers
series NATR**


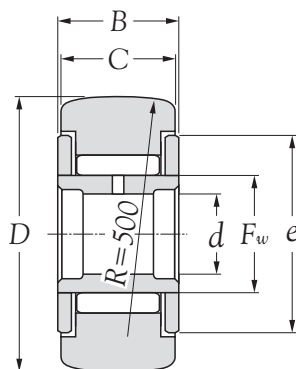
Load ratings of truck				Limiting speeds		Bearing numbers		Mass
Spherical outer ring	N Cylindrical outer ring	Spherical outer ring	kgf Cylindrical outer ring	rpm				kg (approx.)
				grease	oil			
1.080	3.400	110	350	※19.000	※25.000	NATR5	NATR5 2RS	0,018
1.380	4.050	141	415	※15.000	※20.000	NATR6	NATR6 2RS	0,025
1.900	6.650	193	680	※12.000	※16.000	NATR8	NATR8 2RS	0,042
2.620	7.700	267	785	10.000	※13.000	NATR10	NATR10 2RS	0,061
2.860	8.200	291	835	9.000	※12.000	NATR12	NATR12 2RS	0,069
3.200	11.900	325	1.220	7.500	10.000	NATR15	NATR15 2RS	0,098
3.850	14.500	390	1.480	7.000	9.000	NATR17	NATR17 2RS	0,140
4.700	21.000	480	2.150	6.000	8.000	NATR20	NATR20 2RS	0,246
5.500	23.300	565	2.370	5.000	6.500	NATR25	NATR25 2RS	0,275
6.950	33.000	710	3.350	4.000	5.500	NATR30	NATR30 2RS	0,470
8.050	37.000	820	3.750	3.300	4.500	NATR35	NATR35 2RS	0,635
9.800	44.500	1.000	4.500	3.000	4.000	NATR40	NATR40 2RS	0,875
10.400	47.000	1.060	4.800	2.700	3.600	NATR45	NATR45 2RS	0,910
11.400	50.000	1.160	5.100	2.500	3.300	NATR50	NATR50 2RS	0,960

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

**Roller followers yoke type truck rollers
series NATV**


Type NATV
(Full complement type)

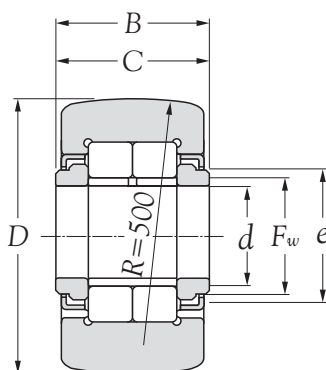
Boundary dimensions						Basic load ratings				Bearing numbers		
D	B	mm				F _w	dynamic	static	dynamic	static		
		C	d	e	N		kgf	kgf				
0 $-0,05$						C _r	C _{or}	C _r	C _{or}			
16	12 ⁰ _{-0,180}	11	5	12	8,0	6.250	8.900	640	910	NATV5	NATV5 2RS	
19	12 ⁰ _{-0,180}	11	6	14	10,0	7.200	11.200	735	1.140	NATV6	NATV6 2RS	
24	15 ⁰ _{-0,180}	14	8	19	12,0	10.300	15.500	1.050	1.580	NATV8	NATV8 2RS	
30	15 ⁰ _{-0,180}	14	10	23	15,0	11.700	19.500	1.190	1.980	NATV10	NATV10 2RS	
32	15 ⁰ _{-0,180}	14	12	25	17,0	12.600	22.100	1.280	2.250	NATV12	NATV12 2RS	
35	19 ⁰ _{-0,210}	18	15	27	20,0	18.000	37.000	1.830	3.750	NATV15	NATV15 2RS	
40	21 ⁰ _{-0,210}	20	17	32	22,0	18.900	40.500	1.930	4.150	NATV17	NATV17 2RS	
47	25 ⁰ _{-0,210}	24	20	37	25,0	28.400	60.000	2.900	6.100	NATV20	NATV20 2RS	
52	25 ⁰ _{-0,210}	24	25	42	30,0	31.000	72.000	3.150	7.350	NATV25	NATV25 2RS	
62	29 ⁰ _{-0,210}	28	30	51	38,0	46.500	112.000	4.750	11.400	NATV30	NATV30 2RS	
72	29 ⁰ _{-0,210}	28	35	58	44,5	51.000	130.000	5.200	13.300	NATV35	NATV35 2RS	
80	32 ⁰ _{-0,250}	30	40	66	50,0	67.500	167.000	6.850	17.100	NATV40	NATV40 2RS	
90	32 ⁰ _{-0,250}	30	50	76	60,0	74.500	200.000	7.600	20.400	NATV50	NATV50 2RS	

**Roller followers yoke type truck rollers
series NATV**


Type NATV
(Full complement type)

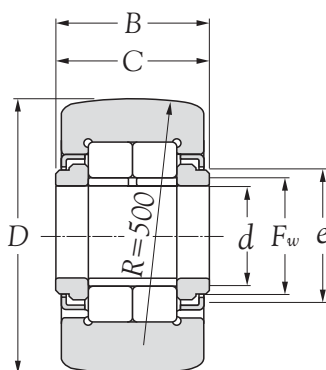
Load ratings of truck				Limiting speeds		Bearing numbers		Mass
Spherical outer ring	N Cylindrical outer ring	Spherical outer ring	kgf Cylindrical outer ring	rpm				kg (approx.)
				grease	oil			
1.080	3.400	110	350	※13.000	※16.000	NATV5	NATV52RS	0,020
1.380	4.050	141	415	10.000	※13.000	NATV6	NATV62RS	0,027
1.900	6.650	193	680	8.500	※11.000	NATV8	NATV82RS	0,044
2.620	7.700	267	785	6.500	8.500	NATV10	NATV102RS	0,065
2.860	8.200	291	835	6.000	7.500	NATV12	NATV122RS	0,074
3.200	11.900	325	1.220	5.000	6.500	NATV15	NATV152RS	0,102
3.850	14.500	390	1.480	4.500	6.000	NATV17	NATV172RS	0,145
4.700	21.000	480	2.150	4.000	5.000	NATV20	NATV202RS	0,254
5.500	23.300	565	2.370	3.300	4.500	NATV25	NATV252RS	0,285
6.950	33.000	710	3.350	2.600	3.500	NATV30	NATV302RS	0,481
8.050	37.000	820	3.750	2.200	2.900	NATV35	NATV352RS	0,647
9.800	44.500	1.000	4.500	2.000	2.600	NATV40	NATV402RS	0,890
11.400	50.000	1.160	5.100	1.600	2.100	NATV50	NATV502RS	0,990

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

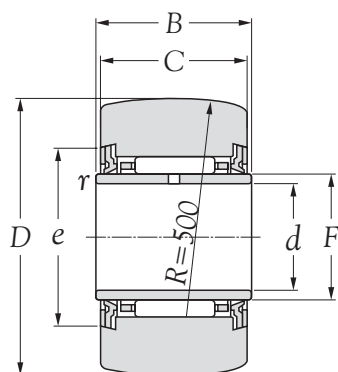
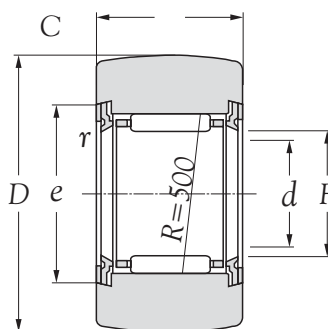
**Roller followers yoke type truck rollers
series NUTR**


Boundary dimensions							Basic load ratings				Bearing numbers
D	B	C	d	e	F _w	r _s min ¹⁾	dynamic N	static	dynamic kgf	static	
0 $-0,05$		mm					C _r	C _{or}	C _r	C _{or}	
35	19 ⁰ _{-0,210}	18	15	20	19,0	0,3	22.300	25.700	2.280	2.620	NUTR202
40	21 ⁰ _{-0,210}	20	17	22	21,5	0,3	24.100	29.100	2.450	2.970	NUTR203
42	19 ⁰ _{-0,210}	18	15	20	19,0	0,3	22.300	25.700	2.280	2.620	NUTR302
47	21 ⁰ _{-0,210}	20	17	22	21,5	0,3	24.100	29.100	2.450	2.970	NUTR303
47	25 ⁰ _{-0,210}	24	20	27	25,5	0,3	38.500	48.000	3.950	4.900	NUTR204
52	25 ⁰ _{-0,210}	24	20	27	25,5	0,3	38.500	48.000	3.950	4.900	NUTR304
52	25 ⁰ _{-0,210}	24	25	31	30,0	0,3	42.500	57.500	4.350	5.850	NUTR205
62	25 ⁰ _{-0,210}	24	25	31	30,0	0,3	42.500	57.500	4.350	5.850	NUTR305
62	29 ⁰ _{-0,210}	28	30	38	35,0	0,3	56.500	72.500	5.750	7.400	NUTR206
72	29 ⁰ _{-0,210}	28	30	38	35,0	0,3	56.500	72.500	5.750	7.400	NUTR306
72	29 ⁰ _{-0,210}	28	35	44	41,5	0,6	62.000	85.500	6.350	8.700	NUTR207
80	29 ⁰ _{-0,210}	28	35	44	41,5	0,6	62.000	85.500	6.350	8.700	NUTR307
80	32 ⁰ _{-0,250}	30	40	51	47,5	0,6	87.000	125.000	8.850	12.700	NUTR208
85	32 ⁰ _{-0,250}	30	45	55	52,5	0,6	92.000	137.000	9.350	14.000	NUTR209
90	32 ⁰ _{-0,250}	30	40	51	47,5	0,6	87.000	125.000	8.850	12.700	NUTR308
90	32 ⁰ _{-0,250}	30	50	60	57,0	0,6	96.500	150.000	9.800	15.300	NUTR210
100	32 ⁰ _{-0,250}	30	45	55	52,5	0,6	92.000	137.000	9.350	14.000	NUTR309
110	32 ⁰ _{-0,250}	30	50	60	57,0	0,6	96.500	150.000	9.800	15.300	NUTR310

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

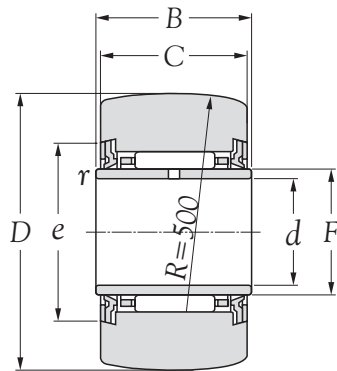
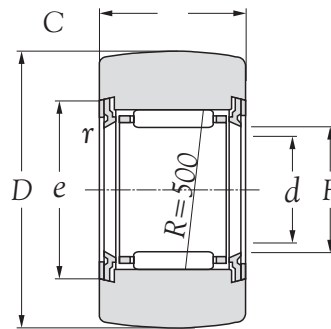
**Roller followers yoke type truck rollers
series NUTR**


Load ratings of truck				Limiting speeds rpm	Bearing numbers	Mass kg (approx.)
N		kgf				
Spherical outer ring	Cylindrical outer ring	Spherical outer ring	Cylindrical outer ring	grease		
3.200	11.900	325	1.220	5.500	NUTR202	0,100
3.850	14.500	390	1.480	4.700	NUTR203	0,147
4.100	14.300	415	1.460	5.500	NUTR302	0,160
4.700	17.000	480	1.740	4.700	NUTR303	0,222
4.700	21.000	480	2.150	4.000	NUTR204	0,245
5.550	23.300	565	2.370	4.000	NUTR304	0,321
5.550	23.300	565	2.370	3.300	NUTR205	0,281
6.950	27.800	710	2.830	3.300	NUTR305	0,450
6.950	33.000	710	3.350	2.900	NUTR206	0,466
8.050	38.500	820	3.900	2.900	NUTR306	0,697
8.050	37.000	820	3.750	2.400	NUTR207	0,630
9.800	41.000	1.000	4.150	2.400	NUTR307	0,840
9.800	44.500	1.000	4.500	2.100	NUTR208	0,817
10.400	47.000	1.060	4.800	1.900	NUTR209	0,883
11.400	50.000	1.160	5.100	2.100	NUTR308	1,130
11.400	50.000	1.160	5.100	1.800	NUTR210	0,950
13.000	55.500	1.330	5.650	1.900	NUTR309	1,400
14.700	61.000	1.500	6.200	1.800	NUTR310	1,690

**Roller followers yoke type truck rollers sealed type
series NA22..2RS, RNA22..2RS**

**Type NA22..2RS
(With inner ring)**

**Type RNA22..2RS
(Without inner ring)**

Boundary dimensions								Basic load ratings				Bearing numbers	
mm								dynamic	static	dynamic	static		
D	B	C	d	F_w	e	F	$r_s \text{ min}^{1)}$	N	N	kgf	kgf		
0 $-0,05$				$^{+0,022}$ $^{+0,013}$				C_r	C_{or}	C_r	C_{or}		
19	12	11,8	6	$^{+0,022}$ $^{+0,013}$	16	10	0,3	4.300	3.950	435	405	NA22/6 2RS	RNA22/6 2RS
24	12	11,8	8	$^{+0,027}$ $^{+0,016}$	18	12	0,3	4.850	4.900	495	500	NA22/8 2RS	RNA22/8 2RS
30	14	13,8	10	$^{+0,027}$ $^{+0,016}$	20	14	0,3	7.200	8.500	735	865	NA2200 2RS	RNA2200 2RS
32	14	13,8	12	$^{+0,027}$ $^{+0,016}$	22	16	0,3	7.750	9.700	795	990	NA2201 2RS	RNA2201 2RS
35	14	13,8	15	$^{+0,033}$ $^{+0,020}$	26	20	0,3	9.500	13.400	970	1.370	NA2202 2RS	RNA2202 2RS
40	16	15,8	17	$^{+0,033}$ $^{+0,020}$	28	22	0,3	10.100	14.900	1.030	1.520	NA2203 2RS	RNA2203 2RS
47	18	17,8	20	$^{+0,033}$ $^{+0,020}$	33	25	0,3	16.500	22.100	1.680	2.250	NA2204 2RS	RNA2204 2RS
52	18	17,8	25	$^{+0,033}$ $^{+0,020}$	38	30	0,3	17.400	25.000	1.770	2.550	NA2205 2RS	RNA2205 2RS
62	20	19,8	30	$^{+0,041}$ $^{+0,025}$	43	35	0,3	20.900	33.500	2.130	3.400	NA2206 2RS	RNA2206 2RS
72	23	22,7	35	$^{+0,041}$ $^{+0,025}$	50	42	0,6	25.700	46.000	2.630	4.700	NA2207 2RS	RNA2207 2RS
80	23	22,7	40	$^{+0,041}$ $^{+0,025}$	57	48	0,6	27.800	53.500	2.830	5.450	NA2208 2RS	RNA2208 2RS
85	23	22,7	45	$^{+0,049}$ $^{+0,030}$	62	52	0,6	28.600	57.000	2.920	5.800	NA2209 2RS	RNA2209 2RS
90	23	22,7	50	$^{+0,049}$ $^{+0,030}$	68	58	0,6	30.500	64.000	3.100	6.500	NA2210 2RS	RNA2210 2RS

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

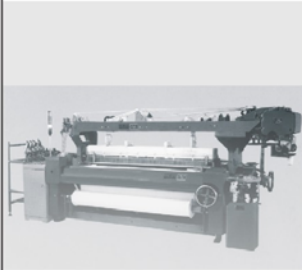
Roller followers yoke type truck rollers sealed type series NA22..2RS, RNA22..2RS

Type NA22..2RS
 (With inner ring)

Type RNA22..2RS
 (Without inner ring)

Load ratings of truck				Limiting speeds rpm grease	Bearing numbers		Mass kg (approx.)	
N		Kgf					Type NA22..2RS	Type RNA22..2RS
Spherical outer ring	Cylindrical outer ring	Spherical outer ring	Cylindrical outer ring					
1.380	4.400	141	445	10.000	NA22/6LL	RNA22/6LL	0,023	0,018
1.900	5.500	193	565	10.000	NA22/8LL	RNA22/8LL	0,035	0,027
2.620	7.550	267	770	10.000	NA2200LL	RNA2200LL	0,060	0,052
2.860	8.050	291	820	9.500	NA2201LL	RNA2201LL	0,067	0,057
3.200	8.800	325	900	7.500	NA2202LL	RNA2202LL	0,075	0,060
3.850	10.900	390	1.110	7.000	NA2203LL	RNA2203LL	0,113	0,094
4.700	14.800	480	1.510	6.000	NA2204LL	RNA2204LL	0,176	0,152
5.550	16.400	565	1.670	5.000	NA2205LL	RNA2205LL	0,209	0,179
6.950	22.200	710	2.260	4.300	NA2206LL	RNA2206LL	0,322	0,284
8.050	28.700	820	2.930	3.600	NA2207LL	RNA2207LL	0,506	0,432
9.800	32.000	1.000	3.250	3.100	NA2208LL	RNA2208LL	0,623	0,530
10.400	34.000	1.060	3.450	2.900	NA2209LL	RNA2209LL	0,638	0,545
11.400	36.000	1.160	3.650	2.600	NA2210LL	RNA2210LL	0,682	0,563



NEEDLE ROLLER BEARINGS

Using applications



Expand all sectors

Power transmission and electrical engineering

Construction, building materials and mining machinery, offshore engineering, civil engineering

Precision engineering and medical equipment



Conveying trucks, conveying and warehousing equipment

Rubber and plastics processing machinery, machinery for the chemical industry

Hydraulic and pneumatic engineering

Agricultural machinery

Assembly, handling and industrial robots

Passenger and estate cars, automotive supplier industry

Power tools

Rail vehicles

Toys, pedal cycles and sports equipment

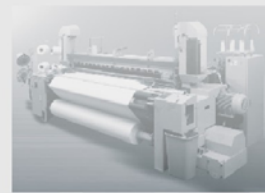
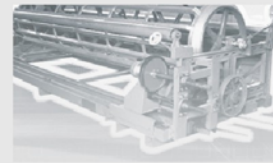
Iron and steel industry






Internal combustion engines for gardening and forestry equipment, outboard motors

Machine tools and production systems

Electrical household appliances

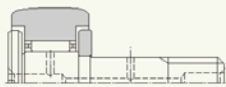


	Technical Information		Product Information
 KR	122~123	KR Series	124~125
 KRV	122~123	KRV Series	126~127
 NUKR	122~123	NUKR Series	128~129



1. Types and designs

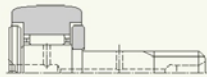
SYI Stud-type Track Rollers are available in three basic series: the series KR, whose rolling elements are needle rollers retained and guided by a cage; the full-complement series KRV lacking a cage, whose rolling elements are needle rollers; and the series NUKR, a full-complement type whose rolling 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 fiber (suffix T2) may be used. The T2 cage features a maximum allowable operating temperature of 120°C and a 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 LL) with a synthetic rubber seal located between the outer ring, flange, and side plate.



Series KR

Fig. 1

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 LL) with a seal is also available. Because this bearing holds less grease, the relubrication intervals for this type are shorter.



Series KRV

Fig. 2

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.

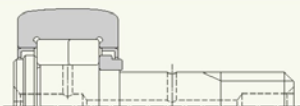
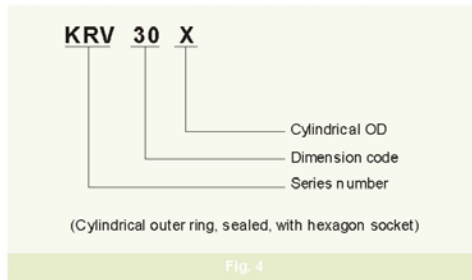


Fig. 3 Series NUKR

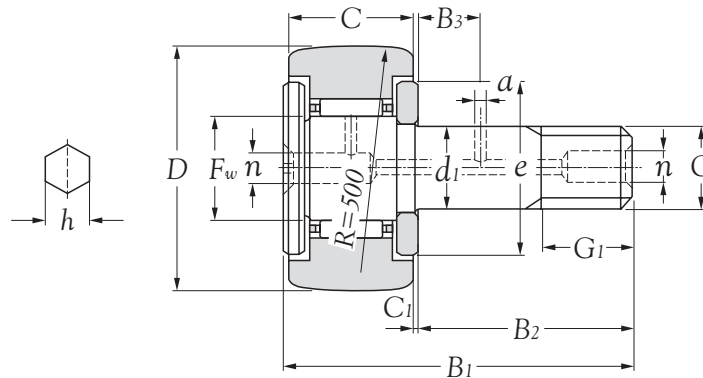
2. Interpreting bearing numbers

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

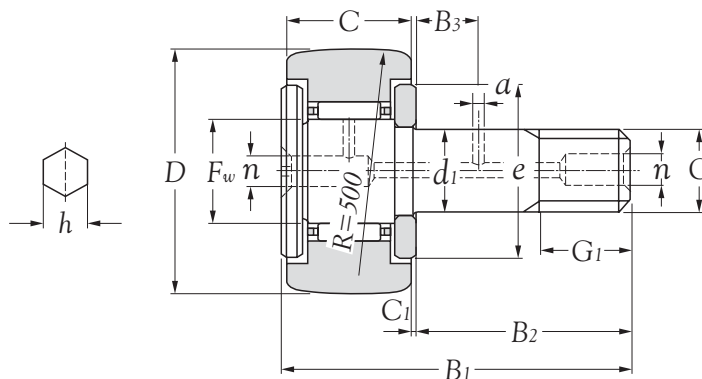


3. Lubrication

The rollers having a synthetic rubber seal (suffix LL) 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 hole 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.

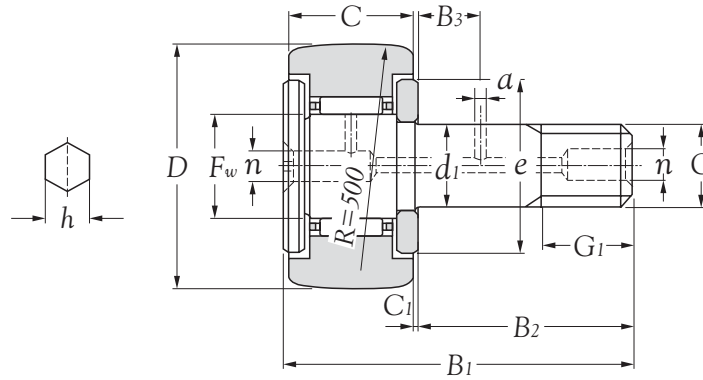
**Cam followers stud type truck rollers
series KR**


Boundary dimensions													Bearing numbers	
D	C	d ₁	F _w	B ₁	B ₂	G	G ₁	C ₁	n	B ₃	a	e		h
mm														
$10^{0}_{-0,050}$	7	$3^{0}_{-0,010}$	4,00	17	9,0	M 3 X 0,5	5,0	0,5	-	-	-	7,0	2,5 ³⁾	KR10
12	8	$4^{0}_{-0,012}$	4,80	20	11,0	M 4 X 0,7	6,0	0,5	-	-	-	8,5	2,5 ³⁾	KR12
13	9	$5^{0}_{-0,012}$	5,75	23	13,0	M 5 X 0,8	7,5	0,5	-	-	-	9,5	3 ³⁾	Kr13
16	11	$6^{0}_{-0,012}$	8,00	28	16,0	M 6 X 1	8,0	0,6	4 ²⁾	-	-	12,0	3	KR16
19	11	$8^{0}_{-0,015}$	10,00	32	20,0	M 8 X 1,25	10,0	0,6	4 ²⁾	-	-	14,0	4	KR19
22	12	$10^{0}_{-0,015}$	12,00	36	23,0	M 10 X 1,25	12,0	0,6	4	-	-	17,0	4	KR22
26	12	$10^{0}_{-0,015}$	12,00	36	23,0	M 10 X 1,25	12,0	0,6	4	-	-	17,0	4	KR26
30	14	$12^{0}_{-0,018}$	15,00	40	25,0	M 12 X 1,25	13,0	0,6	6	6	3	23,0	6	KR30
32	14	$12^{0}_{-0,018}$	15,00	40	25,0	M 12 X 1,25	13,0	0,6	6	6	3	23,0	6	KR32
35	18	$16^{0}_{-0,018}$	18,00	52	32,5	M 16 X 1,5	17,0	0,8	6	8	3	27,0	6	KR35
40	20	$18^{0}_{-0,018}$	22,00	58	36,5	M 18 X 1,5	19,0	0,8	6	8	3	32,0	6	KR40
47	24	$20^{0}_{-0,021}$	25,00	66	40,5	M 20 X 1,5	21,0	0,8	8	9	4	37,0	8	KR47
52	24	$20^{0}_{-0,021}$	25,00	66	40,5	M 20 X 1,5	21,0	0,8	8	9	4	37,0	8	KR52
62	29	$24^{0}_{-0,021}$	30,00	80	49,5	M 24 X 1,5	25,0	0,8	8	11	4	44,0	8	KR62
72	29	$24^{0}_{-0,021}$	30,00	80	49,5	M 24 X 1,5	25,0	0,8	8	11	4	44,0	8	KR72
80	35	$30^{0}_{-0,021}$	38,00	100	63,0	M 30 X 1,5	32,0	1,0	8	15	4	53,0	8	KR80
85	35	$30^{0}_{-0,021}$	38,00	100	63,0	M 30 X 1,5	32,0	1,0	8	15	4	53,0	8	KR85
90	35	$30^{0}_{-0,021}$	38,00	100	63,0	M 30 X 1,5	32,0	1,0	8	15	4	53,0	8	KR90

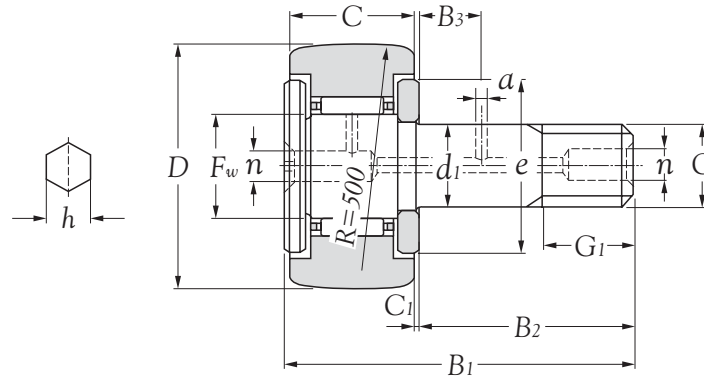
**Cam followers stud type truck rollers
series KR**


Basic load ratings				Load ratings of truck				Limiting speeds		Maximum tightening torque		Bearing numbers	Mass kg (approx.)	Stud diameter mm
dynamic N	static kgf	dynamic N	static kgf	N		kgf		rpm		N.m	Kgf.m			
C_r	C_{or}	C_r	C_{or}	Spherical outer ring	Cylindrical outer ring	Spherical outer ring	Cylindrical outer ring	grease	oil					
1.510	1.140	154	116	560	1.360	57	139	※27.000	※40.000	0,5	0,05	KR10	0,005	3
2.030	1.550	207	159	725	1.790	74	183	※25.000	※36.000	1,0	0,10	KR12	0,008	4
2.480	2.070	253	211	805	2.220	82	226	※23.000	※33.000	2,0	0,20	KR13	0,010	5
3.850	3.950	395	400	1.080	3.400	110	350	※19.000	※25.000	3,0	0,30	KR16	0,019	6
4.500	5.100	460	520	1.380	4.050	141	415	※15.000	※20.000	8,0	0,80	KR19	0,031	8
5.050	6.250	515	635	1.690	5.150	172	525	※12.000	※16.000	15,0	1,50	KR22	0,046	10
5.050	6.250	515	635	2.120	6.100	216	620	※12.000	※16.000	15,0	1,50	KR26	0,059	10
7.500	9.100	765	930	2.620	7.700	267	785	10.000	※13.000	22,0	2,20	KR30	0,087	12
7.500	9.100	765	930	2.860	8.200	291	835	10.000	※13.000	22,0	2,20	KR32	0,097	12
11.800	17.300	1.210	1.760	3.200	11.900	325	1.220	8.000	※11.000	58,0	5,80	KR35	0,169	16
13.600	22.100	1.390	2.250	3.850	14.500	390	1.480	7.000	9.000	87,0	8,70	KR40	0,248	18
20.300	33.000	2.070	3.350	4.700	21.000	480	2.150	6.000	8.000	120,0	12,00	KR47	0,386	20
20.300	33.000	2.070	3.350	5.550	23.300	565	2.370	6.000	8.000	120,0	12,00	KR52	0,461	20
29.100	55.000	2.960	5.650	6.950	34.500	710	3.500	5.000	6.500	220,0	22,00	KR62	0,790	24
29.100	55.000	2.960	5.650	8.050	38.500	820	3.900	5.000	6.500	220,0	22,00	KR72	1,040	24
44.000	86.500	4.500	8.800	9.800	53.000	1.000	5.400	4.000	5.500	450,0	45,00	KR80	1,550	30
44.000	86.500	4.500	8.800	10.400	56.000	1.060	5.750	4.000	5.500	450,0	45,00	KR85	1,740	30
44.000	86.500	4.500	8.800	11.400	59.000	1.160	6.100	4.000	5.500	450,0	45,00	KR90	1,950	30

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

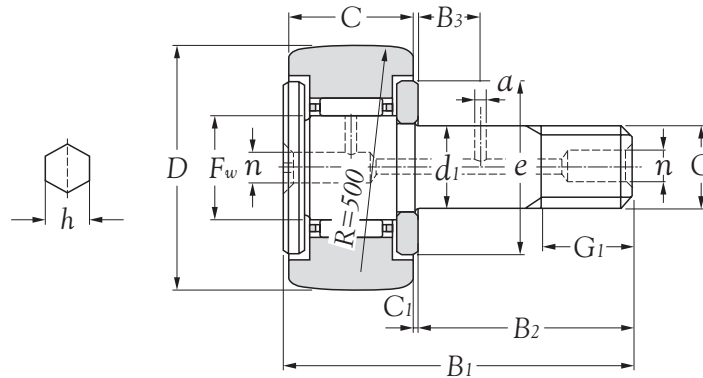
**Cam followers stud type truck rollers
series KRV**


Boundary dimensions													Bearing numbers	
mm														
D	C	d ₁	F _w	B ₁	B ₂	G	G ₁	C ₁	n	B ₃	a	e	h	
10 ⁰ _{-0,050}	7	3 ⁰ _{-0,010}	4,00	17	9,0	M 3 X 0,5	5,0	0,5	-	-	-	7,0	2,5 ³⁾	KRV10
12	8	4 ⁰ _{-0,012}	4,80	20	11,0	M 4 X 0,7	6,0	0,5	-	-	-	8,5	2,5 ³⁾	KRV12
13	9	5 ⁰ _{-0,012}	5,75	23	13,0	M 5 X 0,8	7,5	0,5	-	-	-	9,5	3,0 ³⁾	KRV13
16	11	6 ⁰ _{-0,012}	8,00	28	16,0	M 6 X 1	8,0	0,6	4 ²⁾	-	-	12,0	3,0	KRV16
19	11	8 ⁰ _{-0,015}	10,00	32	20,0	M 8 X 1,25	10,0	0,6	4 ²⁾	-	-	14,0	4,0	KRV19
22	12	10 ⁰ _{-0,015}	12,00	36	23,0	M 10 X 1,25	12,0	0,6	4	-	-	17,0	4,0	KRV22
26	12	10 ⁰ _{-0,015}	12,00	36	23,0	M 10 X 1,25	12,0	0,6	4	-	-	17,0	4,0	KRV26
30	14	12 ⁰ _{-0,018}	15,00	40	25,0	M 12 X 1,5	13,0	0,6	6	6	3	23,0	6,0	KRV30
32	14	12 ⁰ _{-0,018}	15,00	40	25,0	M 12 X 1,5	13,0	0,6	6	6	3	23,0	6,0	KRV32
35	8	16 ⁰ _{-0,018}	18,00	52	32,5	M 16 X 1,5	17,0	0,8	6	8	3	27,0	6,0	KRV35
40	20	18 ⁰ _{-0,018}	22,00	58	36,5	M 18 X 1,5	19,0	0,8	6	8	3	32,0	6,0	KRV40
47	24	20 ⁰ _{-0,021}	25,00	66	40,5	M 20 X 1,5	21,0	0,8	8	9	4	37,0	8,0	KRV47
52	24	20 ⁰ _{-0,021}	25,00	66	40,5	M 20 X 1,5	21,0	0,8	8	9	4	37,0	8,0	KRV52
62	29	24 ⁰ _{-0,021}	30,00	80	49,5	M 24 X 1,5	25,0	0,8	8	11	4	44,0	8,0	KRV62
72	29	24 ⁰ _{-0,021}	30,00	80	49,5	M 24 X 1,5	25,0	0,8	8	11	4	44,0	8,0	KRV72
80	35	30 ⁰ _{-0,021}	38,00	100	63,0	M 30 X 1,5	32,0	1,0	8	15	4	53,0	8,0	KRV80
90	35	30 ⁰ _{-0,021}	38,00	100	63,0	M 30 X 1,5	32,0	1,0	8	15	4	53,0	8,0	KRV90

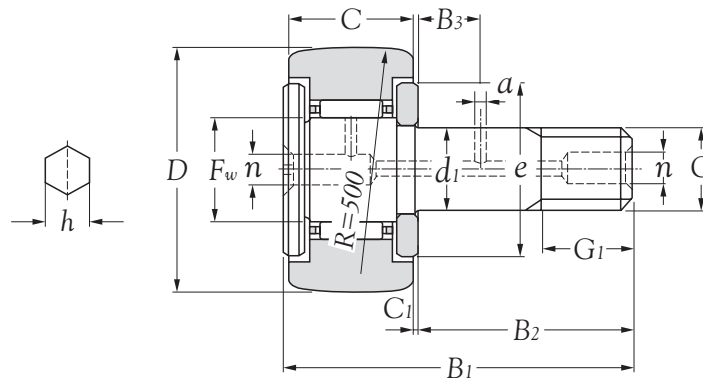
**Cam followers stud type truck rollers
series KRV**


Basic load ratings				Load ratings of truck				Limiting speeds		Maximum tightening torque		Bearing numbers	Mass kg (approx.)	Stud diameter mm
dynamic N	static kgf	dynamic N	static kgf	N		kgf		rpm		N.m	Kgf.m			
C_r	C_{or}	C_r	C_{or}	Spherical outer ring	Cylindrical outer ring	Spherical outer ring	Cylindrical outer ring	grease	oil					
2.330	2.400	238	244	560	1.360	57	139	※25.000	※32.000	0,5	0,05	KRV10	0,005	3
3.350	3.550	340	360	725	1.790	74	183	※20.000	※27.000	1,0	0,10	KRV12	0,008	4
4.300	5.050	435	510	805	2.220	82	226	※17.000	※22.000	2,0	0,20	KRV13	0,011	5
6.250	8.900	640	910	1.080	3.400	110	350	※13.000	※16.000	3,0	0,30	KRV16	0,020	6
7.200	11.200	735	1.140	1.380	4.050	141	415	10.000	※13.000	8,0	0,80	KRV19	0,032	8
7.900	13.300	810	1.360	1.690	5.150	172	525	8.500	※11.000	15,0	1,50	KRV22	0,047	10
7.900	13.300	810	1.360	2.120	6.100	216	620	8.500	※11.000	15,0	1,50	KRV26	0,061	10
11.700	19.500	1.190	1.980	2.620	7.700	267	785	6.500	8.500	22,0	2,20	KRV30	0,089	12
11.700	19.500	1.190	1.980	2.860	8.200	291	835	6.500	8.500	22,0	2,20	KRV32	0,100	12
17.200	33.000	1.750	3.400	3.200	11.900	325	1.220	5.500	7.000	58,0	5,80	KRV35	0,172	16
18.900	40.500	1.930	4.150	3.850	14.500	390	1.480	4.500	6.000	87,0	8,70	KRV40	0,252	18
28.300	60.000	2.890	6.100	4.700	21.000	480	2.150	4.000	5.000	120,0	12,00	KRV47	0,390	20
28.300	60.000	2.890	6.100	5.550	23.300	565	2.370	4.000	5.000	120,0	12,00	KRV52	0,465	20
39.000	96.500	3.950	9.850	6.950	34.500	710	3.500	3.300	4.500	220,0	22,00	KRV62	0,800	24
39.000	96.500	3.950	9.850	8.050	38.500	820	3.900	3.300	4.500	220,0	22,00	KRV72	1,050	24
57.000	144.000	5.800	14.700	9.800	53.000	1.000	5.400	2.600	3.500	450,0	45,00	KRV80	1,560	30
57.000	144.000	5.800	14.700	11.400	59.000	1.160	6.100	2.600	3.500	450,0	45,00	KRV90	1,970	30

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

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

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

Boundary dimensions														Bearing numbers	
mm															
D	C	d ₁	F _w	B ₁	B ₂	G	G ₁	C ₁	n	m	B ₃	a	e	h	
$35^{0}_{-0,050}$	18	$16^{0}_{-0,018}$	19,0	52	32,5	M 16 X 1,5	17	0,8	6	-	8	3	21	6	NUKR35
40	20	$18^{0}_{-0,018}$	21,5	58	36,5	M 18 X 1,5	19	0,8	6	-	8	3	23	6	NUKR40
47	24	$20^{0}_{-0,021}$	25,5	66	40,5	M 20 X 1,5	21	0,8	8	-	9	4	27	8	NUKR47
52	24	$20^{0}_{-0,021}$	30,0	66	40,5	M 20 X 1,5	21	0,8	8	-	9	4	31	8	NUKR52
62	29	$24^{0}_{-0,021}$	35,0	80	49,5	M 24 X 1,5	25	0,8	8	-	11	4	38	8	NUKR62
72	29	$24^{0}_{-0,021}$	41,5	80	49,5	M 24 X 1,5	25	0,8	8	-	11	4	44	8	NUKR72
80	35	$30^{0}_{-0,021}$	47,5	100	63,0	M 30 X 1,5	32	1,0	8	-	15	4	51	8	NUKR80
90	35	$30^{0}_{-0,021}$	47,5	100	63,0	M 30 X 1,5	32	1,0	8	-	15	4	51	8	NUKR90

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


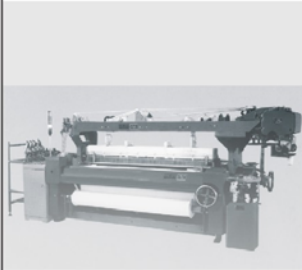
Type NUKR(D<100mm) (Double row type full complement with seal)

Basic load ratings				Load ratings of truck				Limiting speeds rpm	Maximum tightening torque		Bearing numbers	Mass kg	Stud diameter mm
dynamic N	static kgf	dynamic N	static kgf	N		kgf			N,m	Kgf,m			
C_r	C_{or}	C_r	C_{or}	Spherical outer ring	Cylindrical outer ring	Spherical outer ring	Cylindrical outer ring	grease					(approx.)
22.300	25.700	2.280	2.620	3.200	11.900	325	1.220	5.500	58	5,8	NUKR35	0,165	16
24.100	29.100	2.450	2.970	3.850	14.500	390	1.480	4.700	87	8,7	NUKR40	0,242	18
38.500	48.000	3.950	4.900	4.700	21.000	480	2.150	4.000	120	12,0	NUKR47	0,380	20
42.500	57.500	4.350	5.850	5.550	23.300	565	2.370	3.300	120	12,0	NUKR52	0,450	20
56.500	72.500	5.750	7.400	6.950	34.500	710	3.500	2.900	220	22,0	NUKR62	0,795	24
62.000	85.500	6.350	8.700	8.050	38.500	820	3.900	2.400	220	22,0	NUKR72	1,010	24
101.000	151.000	10.300	15.400	9.800	53.000	1.000	5.400	2.100	450	45,0	NUKR80	1,540	30
101.000	151.000	10.300	15.400	11.400	59.000	1.160	6.100	2.100	450	45,0	NUKR90	1,960	30



NEEDLE ROLLER BEARINGS

Using applications



Expand all sectors

Power transmission and electrical engineering

Construction, building materials and mining machinery, offshore engineering, civil engineering

Precision engineering and medical equipment



Conveying trucks, conveying and warehousing equipment

Rubber and plastics processing machinery, machinery for the chemical industry

Hydraulic and pneumatic engineering

Agricultural machinery

Assembly, handling and industrial robots

Passenger and estate cars, automotive supplier industry

Power tools

Rail vehicles

Toys, pedal cycles and sports equipment

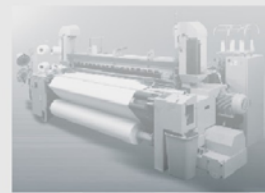
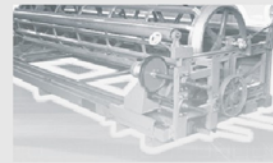
Iron and steel industry



Internal combustion engines for gardening and forestry equipment, outboard motors

Machine tools and production systems

Electrical household appliances





	Technical Information		Product Information
 A schematic symbol for a bearing, showing a horizontal line with a vertical line extending downwards from its right end, labeled 'IR'.	132	IR Series	133~144

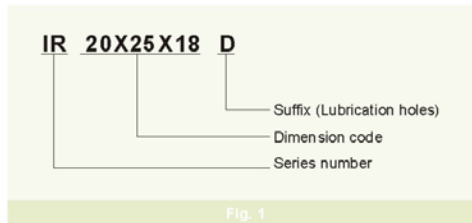


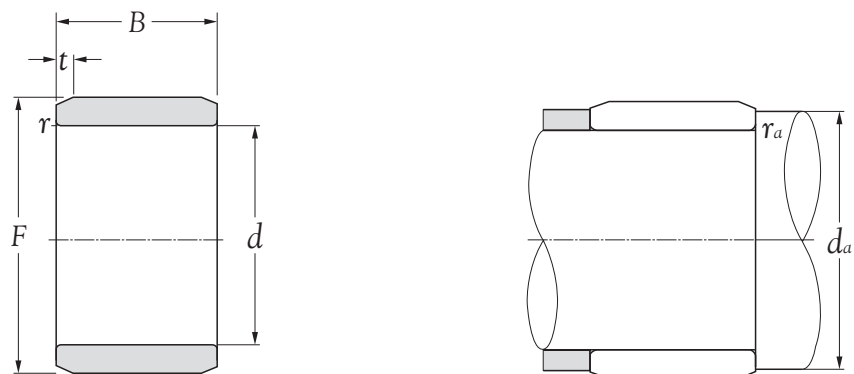
1. Types and designs

SYI 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. **SYI** 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, **SYI** can supply an inner ring whose raceway surface allows for grinding. For details, contact **SYI** Engineering.

2. Interpreting inner ring numbers

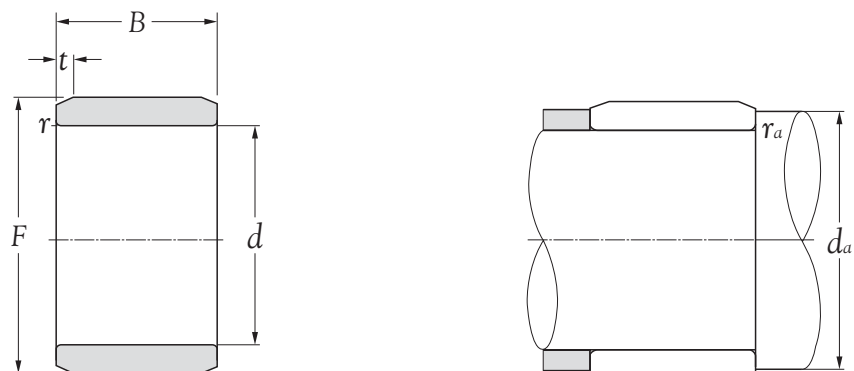
The inner ring numbers of **SYI** Inner Rings comprise of a series number (IR), dimension code (inside dia. (*d*) × raceway dia. (*F*) × width (*B*), and a suffix.



**Inner rings
series IR**


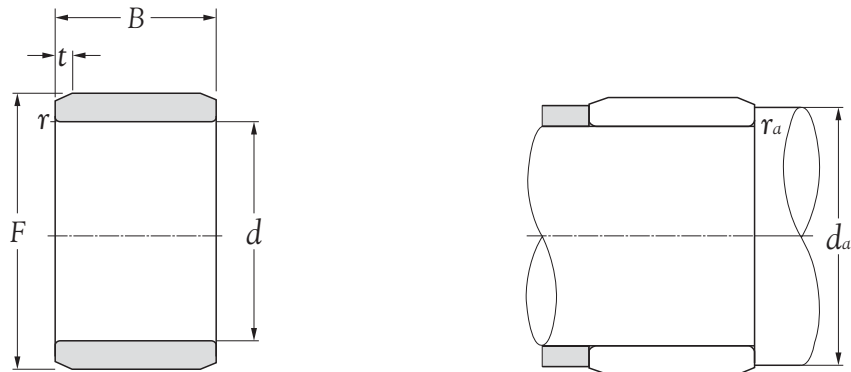
Boundary dimensions					Bearing numbers	Abutment dimensions		Mass kg (approx.)
mm						mm		
d	$F^{1)}$	B	$r_s \text{ min}^{2)}$	t		d_a min	r_{as} max	
5	7 ⁰ _{-0,006}	10,0	0,15	1	IR5X7X10	6,2	0,15	0,0014
5	8 ⁰ _{-0,006}	12,0	0,30	1	IR5X8X12	7,0	0,30	0,0028
5	8 ⁰ _{-0,006}	16,0	0,30	-	IR5X8X16	7,0	0,30	0,0038
6	8 ⁰ _{-0,006}	10,0	0,15	1	IR6X8X10	7,2	0,15	0,0017
6	9 ⁰ _{-0,006}	12,0	0,30	1	IR6X9X12	8,0	0,30	0,0032
6	9 ⁰ _{-0,006}	16,0	0,30	1	IR6X9X16	8,0	0,30	0,0043
6	10 ⁰ _{-0,006}	10,0	0,30	1	IR6X10X10	8,0	0,30	0,0037
6	10 ⁰ _{-0,006}	12,0	0,30	-	IR6X10X12	8,0	0,30	0,0046
6	10 ⁰ _{-0,006}	13,0	0,30	1	IR6X10X13	8,0	0,30	0,0050
7	9 ⁰ _{-0,006}	10,0	0,15	1	IR7X9X10	8,2	0,15	0,0019
7	10 ⁰ _{-0,006}	10,5	0,30	1	IR7X10X10,5	9,0	0,30	0,0031
7	10 ⁰ _{-0,006}	12,0	0,30	1	IR7X10X12	9,0	0,30	0,0036
7	10 ⁰ _{-0,006}	16,0	0,30	1	IR7X10X16	9,0	0,30	0,0049
7	12 ⁰ _{-0,008}	16,0	0,30	1	IR7X12X16	9,0	0,30	0,0093
8	10 ⁰ _{-0,006}	11,0	0,15	1	IR8X10X11	9,2	0,15	0,0024
8	12 ⁰ _{-0,008}	10,0	0,30	1	IR8X12X10	10,0	0,30	0,0048
8	12 ⁰ _{-0,008}	10,5	0,30	1	IR8X12X10,5	10,0	0,30	0,0050
8	12 ⁰ _{-0,008}	12,0	0,30	-	IR8X 2X12	10,0	0,30	0,0057
8	12 ⁰ _{-0,008}	12,5	0,30	1	IR8X12X12,5	10,0	0,30	0,0059
8	14 ⁰ _{-0,008}	16,0	0,30	1	IR8X14X16	10,0	0,30	0,0130
9	12 ⁰ _{-0,008}	11,0	0,30	1	IR9X12X11	11,0	0,30	0,0041
9	12 ⁰ _{-0,008}	12,0	0,30	1	IR9X12X12	11,0	0,30	0,0045
9	12 ⁰ _{-0,008}	16,0	0,30	1	IR9X12X16	11,0	0,30	0,0061
9	15 ⁰ _{-0,008}	16,0	0,30	1	IR9X15X16	11,0	0,30	0,0140
10	13 ⁰ _{-0,008}	12,5	0,30	1	IR10X13X12,5	12,0	0,30	0,0052
10	14 ⁰ _{-0,008}	12,0	0,30	1	IR10X14X12	12,0	0,30	0,0073
10	14 ⁰ _{-0,008}	13,0	0,30	1	IR10X14X13	12,0	0,30	0,0074
10	14 ⁰ _{-0,008}	14,0	0,30	-	IR10X14X14	12,0	0,30	0,0080

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 .

**Inner rings
series IR**


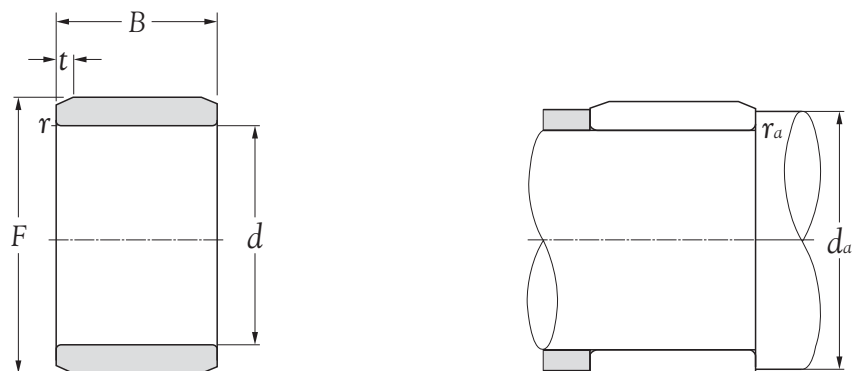
Boundary dimensions					Bearing numbers	Abutment dimensions		Mass kg (approx.)
mm						mm		
<i>d</i>	<i>F</i> ¹⁾	<i>B</i>	<i>r_s min</i> ²⁾	<i>t</i>		<i>d_a min</i>	<i>r_{as} max</i>	
10	14 ⁰ _{-0,008}	16,0	0,3	—	IR10X14X16	12	0,3	0,0092
10	14 ⁰ _{-0,008}	20,0	0,3	1,0	IR10X14X20	12	0,3	0,0120
10	15 ⁰ _{-0,008}	15,5	0,3	1,0	IR10X15X15,5	12	0,3	0,0120
10	15 ⁰ _{-0,008}	20,5	0,3	1,0	IR10X15X20,5	12	0,3	0,0150
10	16 ⁰ _{-0,008}	16,0	0,3	1,0	IR10X16X16	12	0,3	0,0150
12	15 ⁰ _{-0,008}	12,0	0,3	1,0	IR12X15X12	14	0,3	0,0058
12	15 ⁰ _{-0,008}	12,5	0,3	1,0	IR12X15X12,5	14	0,3	0,0061
12	15 ⁰ _{-0,008}	16,0	0,3	1,0	IR12X15X16	14	0,3	0,0078
12	15 ⁰ _{-0,008}	16,5	0,3	—	IR12X15X16,5	14	0,3	0,0080
12	15 ⁰ _{-0,008}	22,5	0,3	—	IR12X15X22,5	14	0,3	0,0110
12	16 ⁰ _{-0,008}	12,0	0,3	1,5	IR12X16X12	14	0,3	0,0079
12	16 ⁰ _{-0,008}	13,0	0,3	1,5	IR12X16X13	14	0,3	0,0087
12	16 ⁰ _{-0,008}	14,0	0,3	—	IR12X16X14	14	0,3	0,0095
12	16 ⁰ _{-0,008}	16,0	0,3	1,5	IR12X16X16	14	0,3	0,0110
12	16 ⁰ _{-0,008}	20,0	0,3	1,5	IR12X16X20	14	0,3	0,0140
12	16 ⁰ _{-0,008}	22,0	0,3	1,5	IR12X16X22	14	0,3	0,0150
12	17 ⁰ _{-0,008}	20,5	0,3	1,5	IR12X17X20,5	14	0,3	0,0190
12	17 ⁰ _{-0,008}	25,5	0,3	1,5	IR12X17X25,5	14	0,3	0,0240
12	18 ⁰ _{-0,008}	16,0	0,3	1,5	IR12X18X16	14	0,3	0,0180
14	17 ⁰ _{-0,008}	17,0	0,3	1,5	IR14X17X17	16	0,3	0,0095
15	18 ⁰ _{-0,008}	12,5	0,3	1,5	IR15X18X12,5	17	0,3	0,0072
15	18 ⁰ _{-0,008}	16,0	0,3	1,5	IR15X18X16	17	0,3	0,0093
15	18 ⁰ _{-0,008}	16,5	0,3	1,5	IR15X18X16,5	17	0,3	0,0096
15	18 ⁰ _{-0,008}	17,5	0,3	1,5	IR15X18X17,5	17	0,3	0,0100
15	18 ⁰ _{-0,008}	20,5	0,3	1,5	IR15X18X20,5	17	0,3	0,0120
15	18 ⁰ _{-0,008}	25,5	0,3	1,5	IR15X18X25,5	17	0,3	0,0150
15	19 ⁰ _{-0,009}	16,0	0,3	1,5	IR15X19X16	17	0,3	0,0130
15	19 ⁰ _{-0,009}	20,0	0,3	1,5	IR15X19X20	17	0,3	0,0160

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.

**Inner rings
series IR**


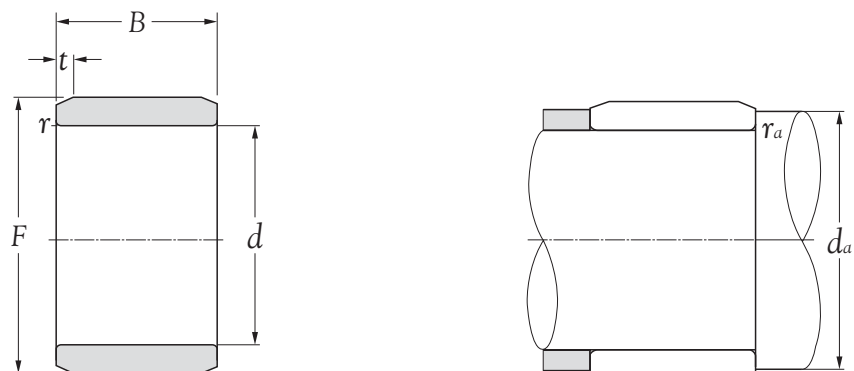
Boundary dimensions					Bearing numbers	Abutment dimensions		Mass kg (approx.)
mm						mm		
d	$F^{1)}$	B	$r_s \min^{2)}$	t		d_a <i>min</i>	r_a <i>max</i>	
15	20 ⁰ _{-0,009}	12,0	0,3	1,5	IR15X20X12	17	0,3	0,012
15	20 ⁰ _{-0,009}	13,0	0,3	1,5	IR15X20X13	17	0,3	0,014
15	20 ⁰ _{-0,009}	14,0	0,3	-	IR15X20X14	17	0,3	0,015
15	20 ⁰ _{-0,009}	18,0	0,3	1,5	IR15X20X18	17	0,3	0,019
15	20 ⁰ _{-0,009}	20,5	0,3	1,5	IR15X20X20,5	17	0,3	0,021
15	20 ⁰ _{-0,009}	23,0	0,3	-	IR15X20X23	17	0,3	0,024
15	20 ⁰ _{-0,009}	26,0	0,3	1,5	IR15X20X26	17	0,3	0,027
15	20 ⁰ _{-0,009}	30,5	0,3	1,5	IR15X20X30,5	17	0,3	0,032
15	22 ⁰ _{-0,009}	20,0	0,6	1,5	IR15X22X20	19	0,6	0,032
17	20 ⁰ _{-0,009}	16,0	0,3	1,5	IR17X20X16	19	0,3	0,011
17	20 ⁰ _{-0,009}	16,5	0,3	1,5	IR17X20X16,5	19	0,3	0,011
17	20 ⁰ _{-0,009}	20,0	0,3	1,5	IR17X20X20	19	0,3	0,014
17	20 ⁰ _{-0,009}	20,5	0,3	-	IR17X20X20,5	19	0,3	0,014
17	20 ⁰ _{-0,009}	30,5	0,3	-	IR17X20X30,5	19	0,3	0,021
17	21 ⁰ _{-0,009}	16,0	0,3	1,5	IR17X21X16	19	0,3	0,014
17	21 ⁰ _{-0,009}	20,0	0,3	-	IR17X21X20	19	0,3	0,018
17	22 ⁰ _{-0,009}	13,0	0,3	1,5	IR17X22X13	19	0,3	0,015
17	22 ⁰ _{-0,009}	14,0	0,3	-	IR17X22X14	19	0,3	0,016
17	22 ⁰ _{-0,009}	16,0	0,3	-	IR17X22X16	19	0,3	0,019
17	22 ⁰ _{-0,009}	18,0	0,3	1,5	IR17X22X18	19	0,3	0,021
17	22 ⁰ _{-0,009}	20,5	0,3	1,5	IR17X22X20,5	19	0,3	0,024
17	22 ⁰ _{-0,009}	23,0	0,3	-	IR17X22X23	19	0,3	0,027
17	22 ⁰ _{-0,009}	26,0	0,3	1,5	IR17X22X26	19	0,3	0,030
17	22 ⁰ _{-0,009}	32,0	0,3	1,5	IR17X22X32	19	0,3	0,036
17	24 ⁰ _{-0,009}	20,0	0,6	1,5	IR17X24X20	21	0,6	0,034
20	24 ⁰ _{-0,009}	16,0	0,3	1,8	IR20X24X16	22	0,3	0,017
20	24 ⁰ _{-0,009}	20,0	0,3	-	IR20X24X20	22	0,3	0,021
20	24 ⁰ _{-0,009}	28,5	0,3	-	IR20X24X28,5	22	0,3	0,030

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 .

**Inner rings
series IR**


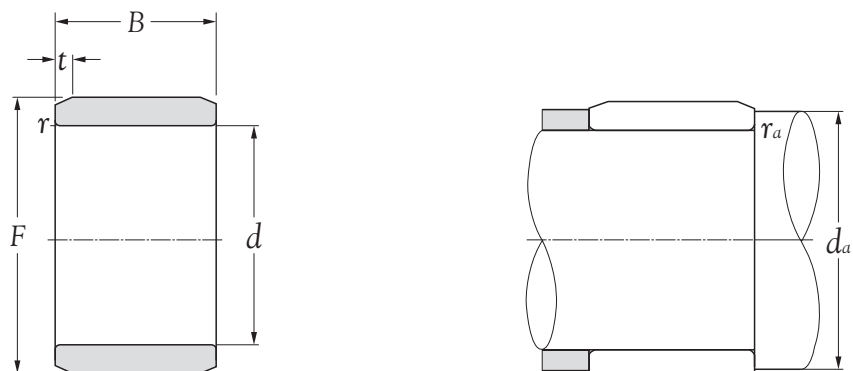
Boundary dimensions					Bearing numbers	Abutment dimensions		Mass kg (approx.)
mm						mm		
<i>d</i>	<i>F</i> ¹⁾	<i>B</i>	<i>r_s min</i> ²⁾	<i>t</i>		<i>d_a min</i>	<i>r_{as} max</i>	
20	25 ⁰ _{-0,009}	12,5	0,3	1,8	IR20X25X12,5	22	0,3	0,016
20	25 ⁰ _{-0,009}	16,0	0,3	-	IR20X25X16	22	0,3	0,021
20	25 ⁰ _{-0,009}	16,5	0,3	1,8	IR20X25X16,5	22	0,3	0,022
20	25 ⁰ _{-0,009}	17,0	0,3	1,8	IR20X25X17	22	0,3	0,022
20	25 ⁰ _{-0,009}	18,0	0,3	-	IR20X25X18	22	0,3	0,024
20	25 ⁰ _{-0,009}	20,0	0,3	-	IR20X25X20	22	0,3	0,027
20	25 ⁰ _{-0,009}	20,5	0,3	1,8	IR20X25X20,5	22	0,3	0,028
20	25 ⁰ _{-0,009}	23,0	0,3	1,8	IR20X25X23	22	0,3	0,031
20	25 ⁰ _{-0,009}	26,0	0,3	1,8	IR20X25X26	22	0,3	0,034
20	25 ⁰ _{-0,009}	26,5	0,3	-	IR20X25X26,5	22	0,3	0,036
20	25 ⁰ _{-0,009}	30,0	0,3	1,8	IR20X25X30	22	0,3	0,041
20	25 ⁰ _{-0,009}	32,0	0,3	1,8	IR20X25X32	22	0,3	0,041
20	25 ⁰ _{-0,009}	38,5	0,3	-	IR20X25X38,5	22	0,3	0,053
20	28 ⁰ _{-0,009}	20,0	0,6	1,8	IR20X28X20	24	0,6	0,045
22	26 ⁰ _{-0,009}	16,0	0,3	1,8	IR22X26X16	24	0,3	0,017
22	26 ⁰ _{-0,009}	20,0	0,3	-	IR22X26X20	24	0,3	0,022
22	28 ⁰ _{-0,009}	17,0	0,3	1,8	IR22X28X17	24	0,3	0,030
22	28 ⁰ _{-0,009}	20,0	0,3	1,8	IR22X28X20	24	0,3	0,035
22	28 ⁰ _{-0,009}	20,5	0,3	1,8	IR22X28X20,5	24	0,3	0,036
22	28 ⁰ _{-0,009}	23,0	0,3	1,8	IR22X28X23	24	0,3	0,042
22	28 ⁰ _{-0,009}	30,0	0,3	-	IR22X28X30	24	0,3	0,054
25	29 ⁰ _{-0,009}	20,0	0,3	-	IR25X29X20	27	0,3	0,026
25	29 ⁰ _{-0,009}	30,0	0,3	1,8	IR25X29X30	27	0,3	0,039
25	30 ⁰ _{-0,009}	12,5	0,3	1,8	IR25X30X12,5	27	0,3	0,020
25	30 ⁰ _{-0,009}	16,0	0,3	1,0	IR25X30X16	27	0,3	0,024
25	30 ⁰ _{-0,009}	16,5	0,3	1,8	IR25X30X16,5	27	0,3	0,026
25	30 ⁰ _{-0,009}	17,0	0,3	1,8	IR25X30X17	27	0,3	0,027
25	30 ⁰ _{-0,009}	18,0	0,3	-	IR25X30X18	27	0,3	0,030

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 *t*.

**Inner rings
series IR**


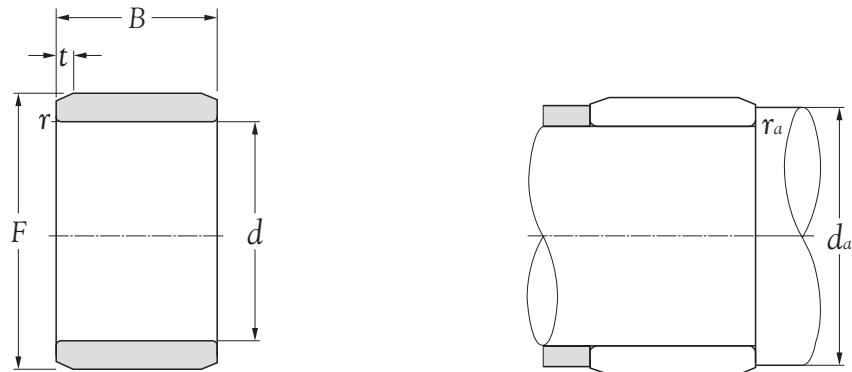
Boundary dimensions					Bearing numbers	Abutment dimensions		Mass kg (approx.)
mm						mm		
<i>d</i>	<i>F</i> ¹⁾	<i>B</i>	<i>r_s min</i> ²⁾	<i>t</i>		<i>d_a</i> <i>min</i>	<i>r_{as}</i> <i>max</i>	
25	30 ⁰ _{-0,009}	20,0	0,3	1,8	IR25X30X20	27	0,3	0,033
25	30 ⁰ _{-0,009}	20,5	0,3	1,8	IR25X30X20,5	27	0,3	0,034
25	30 ⁰ _{-0,009}	23,0	0,3	1,8	IR25X30X23	27	0,3	0,038
25	30 ⁰ _{-0,009}	26,0	0,3	1,8	IR25X30X26	27	0,3	0,041
25	30 ⁰ _{-0,009}	26,5	0,3	-	IR25X30X26,5	27	0,3	0,043
25	30 ⁰ _{-0,009}	30,0	0,3	1,8	IR25X30X30	27	0,3	0,050
25	30 ⁰ _{-0,009}	32,0	0,3	1,0	IR25X30X32	27	0,3	0,054
25	30 ⁰ _{-0,009}	38,5	0,3	-	IR25X30X38,5	27	0,3	0,064
25	32 ^{+0,008} _{-0,002}	22,0	0,6	1,8	IR25X32X22	29	0,6	0,052
25	32 ^{+0,008} _{-0,002}	30,5	0,6	1,8	IR25X32X30,5	29	0,6	0,072
28	32 ^{+0,008} _{-0,002}	17,0	0,3	1,8	IR28X32X17	30	0,3	0,025
28	32 ^{+0,008} _{-0,002}	20,0	0,3	1,8	IR28X32X20	30	0,3	0,028
28	32 ^{+0,008} _{-0,002}	23,0	0,3	1,8	IR28X32X23	30	0,3	0,034
28	32 ^{+0,008} _{-0,002}	30,0	0,3	-	IR28X32X30	30	0,3	0,044
29	32 ^{+0,008} _{-0,002}	13,0	0,3	1,8	IR29X32X13	31	0,3	0,015
30	35 ^{+0,008} _{-0,002}	12,5	0,3	1,8	IR30X35X12,5	32	0,3	0,024
30	35 ^{+0,008} _{-0,002}	13,0	0,3	1,3	IR30X35X13	32	0,3	0,025
30	35 ^{+0,008} _{-0,002}	16,0	0,3	-	IR30X35X16	32	0,3	0,031
30	35 ^{+0,008} _{-0,002}	16,5	0,3	1,8	IR30X35X16,5	32	0,3	0,032
30	35 ^{+0,008} _{-0,002}	17,0	0,3	1,8	IR30X35X17	32	0,3	0,032
30	35 ^{+0,008} _{-0,002}	18,0	0,3	-	IR30X35X18	32	0,3	0,035
30	35 ^{+0,008} _{-0,002}	20,0	0,3	-	IR30X35X20	32	0,3	0,038
30	35 ^{+0,008} _{-0,002}	20,5	0,3	1,8	IR30X35X20,5	32	0,3	0,039
30	35 ^{+0,008} _{-0,002}	23,0	0,3	1,8	IR30X35X23	32	0,3	0,044
30	35 ^{+0,008} _{-0,002}	26,0	0,3	1,8	IR30X35X26	32	0,3	0,050
30	35 ^{+0,008} _{-0,002}	30,0	0,3	-	IR30X35X30	32	0,3	0,059
30	35 ^{+0,008} _{-0,002}	32,0	0,3	1,8	IR30X35X32	32	0,3	0,063
30	37 ^{+0,008} _{-0,002}	18,0	0,3	1,8	IR30X37X18	32	0,3	0,050

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 *t*.

**Inner rings
series IR**


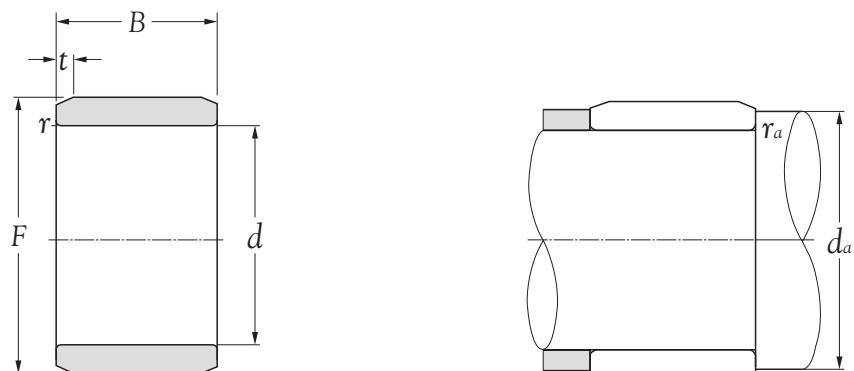
Boundary dimensions					Bearing numbers	Abutment dimensions		Mass kg (approx.)
mm						mm		
<i>d</i>	<i>F</i> ¹⁾	<i>B</i>	<i>r_s min</i> ²⁾	<i>t</i>		<i>d_a min</i>	<i>r_{as} max</i>	
30	37 ^{+0,008} / _{-0,002}	22,0	0,6	1,8	IR30X37X22	34	0,6	0,061
30	38 ^{+0,008} / _{-0,002}	20,0	0,6	-	IR30X38X20	34	0,6	0,065
32	37 ⁰ / _{-0,011}	20,0	0,3	2,0	IR32X37X20	34	0,3	0,040
32	37 ⁰ / _{-0,011}	30,0	0,3	-	IR32X37X30	34	0,3	0,063
32	38 ⁰ / _{-0,011}	32,0	0,3	2,0	IR32X38X32	34	0,3	0,082
32	40 ⁰ / _{-0,011}	20,0	0,6	2,0	IR32X40X20	36	0,6	0,068
32	40 ⁰ / _{-0,011}	27,0	0,6	2,0	IR32X40X27	36	0,6	0,092
32	40 ⁰ / _{-0,011}	36,0	0,6	2,0	IR32X40X36	36	0,6	0,124
33	37 ⁰ / _{-0,011}	13,0	0,3	2,0	IR33X37X13	35	0,3	0,022
35	40 ⁰ / _{-0,011}	12,5	0,3	2,0	IR35X40X12,5	37	0,3	0,027
35	40 ⁰ / _{-0,011}	16,5	0,3	2,0	IR35X40X16,5	37	0,3	0,037
35	40 ⁰ / _{-0,011}	17,0	0,3	2,0	IR35X40X17	37	0,3	0,038
35	40 ⁰ / _{-0,011}	20,0	0,3	2,0	IR35X40X20	37	0,3	0,044
35	40 ⁰ / _{-0,011}	20,5	0,3	2,0	IR35X40X20,5	37	0,3	0,046
35	40 ⁰ / _{-0,011}	30,0	0,3	-	IR35X40X30	37	0,3	0,068
35	40 ⁰ / _{-0,011}	34,0	0,3	1,8	IR35X40X34	37	0,3	0,079
35	40 ⁰ / _{-0,011}	40,0	0,3	2,0	IR35X40X40	37	0,3	0,091
35	42 ⁰ / _{-0,011}	20,0	0,6	1,8	IR35X42X20	39	0,6	0,064
35	42 ⁰ / _{-0,011}	21,0	0,6	-	IR35X42X21	39	0,6	0,068
35	42 ⁰ / _{-0,011}	23,0	0,6	-	IR35X42X23	39	0,6	0,074
35	42 ⁰ / _{-0,011}	27,0	0,6	2,0	IR35X42X27	39	0,6	0,080
35	42 ⁰ / _{-0,011}	36,0	0,6	2,0	IR35X42X36	39	0,6	0,117
35	43 ⁰ / _{-0,011}	22,0	0,6	2,0	IR35X43X22	39	0,6	0,081
38	43 ⁰ / _{-0,011}	20,0	0,3	1,8	IR38X43X20	40	0,3	0,048
38	43 ⁰ / _{-0,011}	30,0	0,3	-	IR38X43X30	40	0,3	0,074
40	45 ⁰ / _{-0,011}	16,5	0,3	2,0	IR40X45X16,5	42	0,3	0,042
40	45 ⁰ / _{-0,011}	17,0	0,3	2,0	IR40X45X17	42	0,3	0,043
40	45 ⁰ / _{-0,011}	20,0	0,3	2,0	IR40X45X20	42	0,3	0,051

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*.

**Inner rings
series IR**


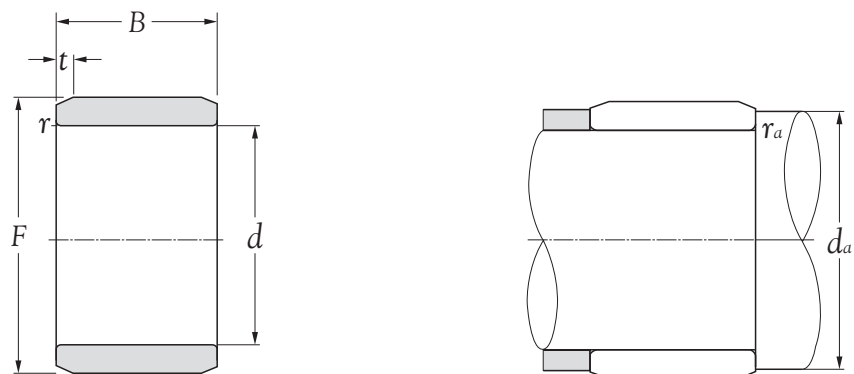
Boundary dimensions					Bearing numbers	Abutment dimensions		Mass kg (approx.)
mm						mm		
d	$F^{1)}$	B	$r_s \min^{2)}$	t		d_a \min	r_a \max	
40	45 $^0_{-0,011}$	20,5	0,3	2,0	IR40X45X20,5	42	0,3	0,053
40	45 $^0_{-0,011}$	26,5	0,3	-	IR40X45X26,5	42	0,3	0,068
40	45 $^0_{-0,011}$	30,0	0,3	2,0	IR40X45X30	42	0,3	0,077
40	45 $^0_{-0,011}$	34,0	0,3	2,0	IR40X45X34	42	0,3	0,088
40	45 $^0_{-0,011}$	40,0	0,3	2,0	IR40X45X40	42	0,3	0,106
40	48 $^0_{-0,011}$	22,0	0,6	2,0	IR40X48X22	44	0,6	0,092
40	48 $^0_{-0,011}$	23,0	0,6	-	IR40X48X23	44	0,6	0,097
40	48 $^0_{-0,011}$	30,0	0,6	2,0	IR40X48X30	44	0,6	0,123
40	48 $^0_{-0,011}$	40,0	0,6	2,0	IR40X48X40	44	0,6	0,170
40	50 $^0_{-0,011}$	20,0	0,3	0,8	IR40X48X20	44	0,3	0,106
40	50 $^0_{-0,011}$	22,0	1,0	2,0	IR40X50X22	45	1,0	0,118
42	47 $^0_{-0,011}$	20,0	0,3	2,0	IR42X47X20	44	0,3	0,053
42	47 $^0_{-0,011}$	30,0	0,3	2,0	IR42X47X30	44	0,3	0,080
45	50 $^0_{-0,011}$	20,0	0,3	2,0	IR45X50X20	47	0,3	0,057
45	50 $^0_{-0,011}$	25,0	0,6	2,0	IR45X50X25	49	0,6	0,071
45	50 $^0_{-0,011}$	25,5	0,3	-	IR45X50X25,5	47	0,3	0,074
45	50 $^0_{-0,011}$	32,0	0,6	-	IR45X50X32	49	0,6	0,092
45	50 $^0_{-0,011}$	35,0	0,6	2,0	IR45X50X35	49	0,6	0,101
45	50 $^0_{-0,011}$	40,0	0,3	1,5	IR45X50X40	47	0,3	0,115
45	52 $^{+0,008}_{-0,004}$	22,0	0,6	2,0	IR45X52X22	49	0,6	0,088
45	52 $^{+0,008}_{-0,004}$	23,0	0,6	-	IR45X52X23	49	0,6	0,093
45	52 $^{+0,008}_{-0,004}$	30,0	0,6	2,0	IR45X52X30	49	0,6	0,123
45	52 $^{+0,008}_{-0,004}$	40,0	0,6	2,0	IR45X52X40	49	0,6	0,164
45	55 $^{+0,008}_{-0,004}$	20,0	0,6	2,0	IR45X55X20	49	0,6	0,116
45	55 $^{+0,008}_{-0,004}$	22,0	1,0	2,0	IR45X55X22	50	1,0	0,130
45	55 $^{+0,008}_{-0,004}$	40,0	0,6	2,0	IR45X55X40	49	0,6	0,173
50	55 $^{+0,008}_{-0,004}$	20,0	0,6	2,0	IR50X55X20	54	0,6	0,063
50	55 $^{+0,008}_{-0,004}$	25,0	0,6	2,0	IR50X55X25	54	0,6	0,780

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 t .

**Inner rings
series IR**


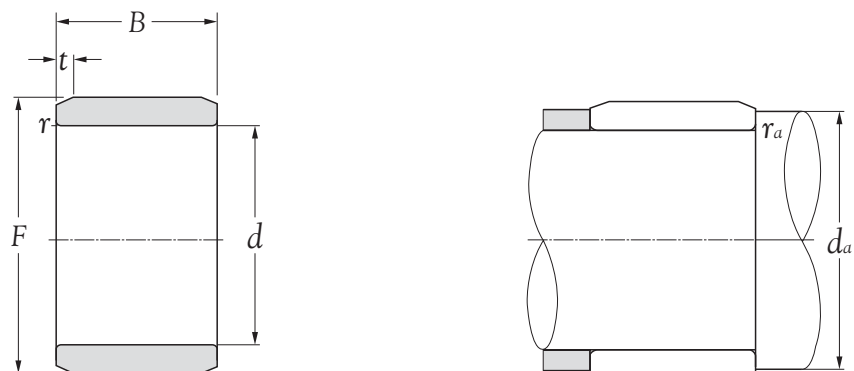
Boundary dimensions					Bearing numbers	Abutment dimensions		Mass kg (approx.)
mm						mm		
<i>d</i>	<i>F</i> ¹⁾	<i>B</i>	<i>r_s min</i> ²⁾	<i>t</i>		<i>d_a min</i>	<i>r_{as} max</i>	
50	55 ^{+0,008} / _{-0,004}	35	0,6	2,0	IR50X55X35	54,0	0,6	0,112
50	55 ^{+0,008} / _{-0,004}	40	0,6	2,0	IR50X55X40	54,0	0,6	0,128
50	58 ^{+0,008} / _{-0,004}	22	0,6	2,0	IR50X58X22	54,0	0,6	0,113
50	58 ^{+0,008} / _{-0,004}	23	0,6	-	IR50X58X23	54,0	0,6	0,119
50	58 ^{+0,008} / _{-0,004}	30	0,6	2,0	IR50X58X30	54,0	0,6	0,159
50	58 ^{+0,008} / _{-0,004}	40	0,6	2,0	IR50X58X40	54,0	0,6	0,209
50	60 ^{+0,008} / _{-0,004}	20	1,0	2,0	IR50X60X20	55,0	1,0	0,129
50	60 ^{+0,008} / _{-0,004}	25	1,0	2,0	IR50X60X25	55,0	1,0	0,163
50	60 ^{+0,008} / _{-0,004}	28	1,1	2,0	IR50X60X28	56,5	1,0	0,183
50	60 ^{+0,008} / _{-0,004}	40	1,0	2,0	IR50X60X40	55,0	1,0	0,262
55	60 ⁰ / _{-0,013}	25	0,6	2,2	IR55X60X25	59,0	0,6	0,086
55	60 ⁰ / _{-0,013}	35	0,6	2,0	IR55X60X35	59,0	0,6	0,121
55	63 ⁰ / _{-0,013}	25	1,0	2,0	IR55X63X25	60,0	1,0	0,141
55	63 ⁰ / _{-0,013}	34	1,0	2,2	IR55X63X34	60,0	1,0	0,192
55	63 ⁰ / _{-0,013}	45	1,0	2,2	IR55X63X45	60,0	1,0	0,256
55	65 ⁰ / _{-0,013}	28	1,1	2,2	IR55X65X28	61,5	1,0	0,206
55	65 ⁰ / _{-0,013}	30	1,0	2,2	IR55X65X30	60,0	1,0	0,220
55	65 ⁰ / _{-0,013}	60	1,0	1,5	IR55X65X60	60,0	1,0	0,440
60	68 ⁰ / _{-0,013}	25	1,0	2,2	IR60X68X25	65,0	1,0	0,152
60	68 ⁰ / _{-0,013}	34	1,0	2,2	IR60X68X34	65,0	1,0	0,206
60	68 ⁰ / _{-0,013}	35	0,6	2,2	IR60X68X35	64,0	0,6	0,213
60	68 ⁰ / _{-0,013}	45	1,0	2,2	IR60X68X45	65,0	1,0	0,270
60	70 ⁰ / _{-0,013}	25	1,0	2,2	IR60X70X25	65,0	1,0	0,195
60	70 ⁰ / _{-0,013}	28	1,1	2,2	IR60X70X28	66,5	1,0	0,216
60	70 ⁰ / _{-0,013}	30	1,0	2,2	IR60X70X30	65,0	1,0	0,232
60	70 ⁰ / _{-0,013}	60	1,0	2,2	IR60X70X60	65,0	1,0	0,463
65	72 ⁰ / _{-0,013}	25	1,0	2,2	IR65X72X25	70,0	1,0	0,142
65	72 ⁰ / _{-0,013}	34	1,0	2,2	IR65X72X34	70,0	1,0	0,193

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 *t*.

**Inner rings
series IR**


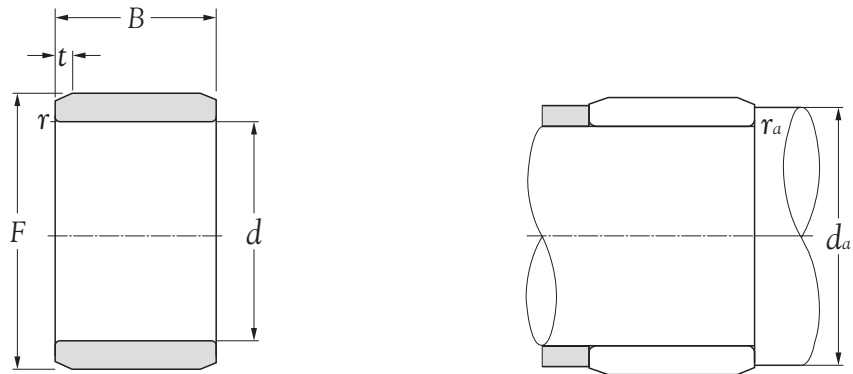
Boundary dimensions					Bearing numbers	Abutment dimensions		Mass kg (approx.)
mm						mm		
<i>d</i>	<i>F</i> ¹⁾	<i>B</i>	<i>r</i> s min ²⁾	<i>t</i>		<i>d</i> _a <i>min</i>	<i>r</i> _a <i>max</i>	
65	72 ⁰ _{-0,013}	45	1,0	2,2	IR65X72X45	70,0	1,0	0,259
65	73 ⁰ _{-0,013}	25	0,6	2,2	IR65X73X25	69,0	0,6	0,164
65	73 ⁰ _{-0,013}	35	0,6	2,2	IR65X73X35	69,0	0,6	0,232
65	75 ⁰ _{-0,013}	28	1,1	2,2	IR65X75X28	71,5	1,0	0,240
65	75 ⁰ _{-0,013}	30	1,0	2,2	IR65X75X30	70,0	1,0	0,256
65	75 ⁰ _{-0,013}	60	1,0	2,2	IR65X75X60	70,0	1,0	0,513
70	80 ⁰ _{-0,013}	25	1,0	2,2	IR70X80X25	75,0	1,0	0,224
70	80 ⁰ _{-0,013}	28	1,1	2,2	IR70X80X28	76,5	1,0	0,250
70	80 ⁰ _{-0,013}	30	1,0	2,2	IR70X80X30	75,0	1,0	0,267
70	80 ⁰ _{-0,013}	35	1,0	2,2	IR70X80X35	75,0	1,0	0,313
70	80 ⁰ _{-0,013}	40	1,0	2,2	IR70X80X40	75,0	1,0	0,358
70	80 ⁰ _{-0,013}	54	1,0	2,2	IR70X80X54	75,0	1,0	0,483
70	80 ⁰ _{-0,013}	56	1,0	2,2	IR70X80X56	75,0	1,0	0,502
70	80 ⁰ _{-0,013}	60	1,0	2,2	IR70X80X60	75,0	1,0	0,540
75	85 ⁰ _{-0,015}	25	1,0	2,2	IR75X85X25	80,0	1,0	0,238
75	85 ⁰ _{-0,015}	30	1,0	2,2	IR75X85X30	80,0	1,0	0,287
75	85 ⁰ _{-0,015}	35	1,0	2,2	IR75X85X35	80,0	1,0	0,336
75	85 ⁰ _{-0,015}	40	1,0	2,2	IR75X85X40	80,0	1,0	0,385
75	85 ⁰ _{-0,015}	54	1,0	2,2	IR75X85X54	80,0	1,0	0,515
75	90 ⁰ _{-0,015}	32	1,1	2,2	IR75X90X32	81,5	1,0	0,480
80	90 ⁰ _{-0,015}	25	1,0	2,2	IR80X90X25	85,0	1,0	0,254
80	90 ⁰ _{-0,015}	30	1,0	2,2	IR80X90X30	85,0	1,0	0,304
80	90 ⁰ _{-0,015}	35	1,0	2,2	IR80X90X35	85,0	1,0	0,355
80	90 ⁰ _{-0,015}	40	1,0	2,2	IR80X90X40	85,0	1,0	0,408
80	90 ⁰ _{-0,015}	54	1,0	2,2	IR80X90X54	85,0	1,0	0,543
80	95 ⁰ _{-0,015}	32	1,1	2,2	IR80X95X32	86,5	1,0	0,510
85	95 ⁰ _{-0,015}	26	1,0	2,5	IR85X95X26	90,0	1,0	0,280
85	95 ⁰ _{-0,015}	30	1,0	2,5	IR85X95X30	90,0	1,0	0,323

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 *t*.

**Inner rings
series IR**


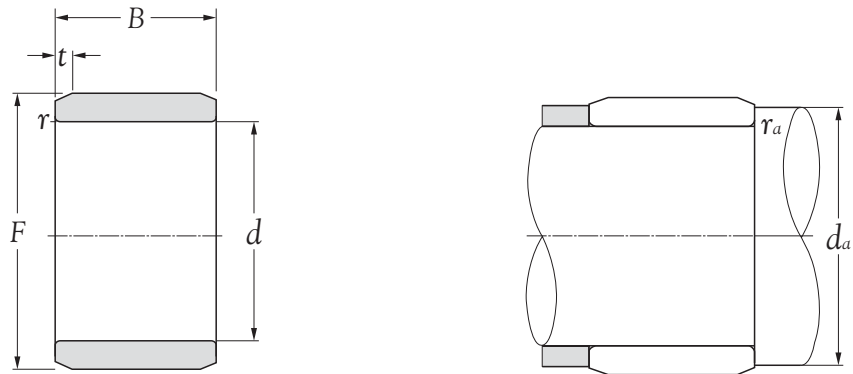
Boundary dimensions					Bearing numbers	Abutment dimensions		Mass kg (approx.)
mm						mm		
<i>d</i>	<i>F</i> ¹⁾	<i>B</i>	<i>r_s min</i> ²⁾	<i>t</i>		<i>d_a min</i>	<i>r_{as} max</i>	
85	95 ⁰ _{-0,015}	36	1,0	2,5	IR85X95X36	90,0	1	0,398
85	100 ⁰ _{-0,015}	32	1,1	2,5	IR85X100X32	91,5	1	0,530
85	100 ⁰ _{-0,015}	35	1,1	2,5	IR85X100X35	91,5	1	0,580
85	100 ⁰ _{-0,015}	46	1,1	2,5	IR85X100X46	91,5	1	0,760
85	100 ⁰ _{-0,015}	63	1,1	2,5	IR85X100X63	91,5	1	1,050
90	100 ⁰ _{-0,015}	26	1,0	2,5	IR90X100X26	95,0	1	0,294
90	100 ⁰ _{-0,015}	30	1,0	2,5	IR90X100X30	95,0	1	0,340
90	100 ⁰ _{-0,015}	36	1,0	2,5	IR90X100X36	95,0	1	0,406
90	105 ⁰ _{-0,015}	32	1,1	2,5	IR90X105X32	96,5	1	0,560
90	105 ⁰ _{-0,015}	35	1,1	2,5	IR90X105X35	96,5	1	0,610
90	105 ⁰ _{-0,015}	46	1,1	2,5	IR90X105X46	96,5	1	0,800
90	105 ⁰ _{-0,015}	63	1,1	2,5	IR90X105X63	96,5	1	1,110
95	105 ⁰ _{-0,015}	26	1,0	2,5	IR95X105X26	100,0	1	0,313
95	105 ⁰ _{-0,015}	36	1,0	2,5	IR95X105X36	100,0	1	0,430
95	110 ⁰ _{-0,015}	32	1,1	2,5	IR95X110X32	101,5	1	0,590
95	110 ⁰ _{-0,015}	35	1,1	2,5	IR95X110X35	101,5	1	0,640
95	110 ⁰ _{-0,015}	46	1,1	2,5	IR95X110X46	101,5	1	0,850
95	110 ⁰ _{-0,015}	63	1,1	2,5	IR95X110X63	101,5	1	1,170
100	110 ⁰ _{-0,015}	30	1,1	2,5	IR100X110X30	106,5	1	0,375
100	110 ⁰ _{-0,015}	40	1,1	2,5	IR100X110X40	106,5	1	0,505
100	115 ⁰ _{-0,015}	32	1,1	2,5	IR100X115X32	106,5	1	0,620
100	115 ⁰ _{-0,015}	40	1,1	2,5	IR100X115X40	106,5	1	0,775
100	115 ⁰ _{-0,015}	54	1,1	2,5	IR100X115X54	106,5	1	1,090
110	120 ⁰ _{-0,015}	30	1,0	2,5	IR110X120X30	115,0	1	0,440
110	120 ⁰ _{-0,015}	40	1,1	2,5	IR110X120X40	116,5	1	0,580
110	125 ⁰ _{-0,018}	40	1,1	2,5	IR110X125X40	116,5	1	0,840
110	125 ⁰ _{-0,018}	54	1,1	2,5	IR110X125X54	116,5	1	1,160
120	130 ⁰ _{-0,018}	30	1,0	2,2	IR120X130X30	125,0	1	0,440

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*.

**Inner rings
series IR**


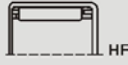

Boundary dimensions					Bearing numbers	Abutment dimensions		Mass kg (approx.)
mm						mm		
<i>d</i>	<i>F</i> ¹⁾	<i>B</i>	<i>r_s min</i> ²⁾	<i>t</i>		<i>d_a min</i>	<i>r_{as} max</i>	
120	130 ^{0 -0,018}	40	1,1	2,5	IR120X130X40	126,5	1,0	0,590
120	135 ^{0 -0,018}	40	2,0	2,5	IR120X135X40	129,0	2,0	0,870
120	135 ^{0 -0,018}	45	1,1	2,5	IR120X135X45	126,5	1,0	0,980
120	135 ^{0 -0,018}	60	1,1	2,5	IR120X135X60	126,5	1,0	1,250
130	145 ^{0 -0,018}	32	1,5	3,0	IR130X145X32	138,0	1,5	0,780
130	145 ^{0 -0,018}	35	1,1	3,0	IR130X145X35	136,5	1,0	0,855
130	145 ^{0 -0,018}	42	1,5	3,0	IR130X145X42	138,0	1,5	1,050
130	150 ^{0 -0,018}	50	1,5	3,0	IR130X150X50	138,0	1,5	1,690
130	150 ^{0 -0,018}	52	2,0	3,0	IR130X150X52	139,0	2,0	1,750
130	150 ^{0 -0,018}	67	1,5	3,0	IR130X150X67	138,0	1,5	2,250
140	155 ^{0 -0,018}	32	1,5	3,0	IR140X155X32	148,0	1,5	0,840
140	155 ^{0 -0,018}	35	1,1	3,0	IR140X155X35	146,5	1,0	0,917
140	155 ^{0 -0,018}	42	1,5	3,0	IR140X155X42	148,0	1,5	1,100
140	160 ^{0 -0,018}	50	1,5	3,0	IR140X160X50	148,0	1,5	1,700
140	160 ^{0 -0,018}	52	2,0	3,0	IR140X160X52	149,0	2,0	1,780
140	160 ^{0 -0,018}	67	1,5	3,0	IR140X160X67	148,0	1,5	2,300
150	165 ^{-0,017 -0,035}	32	1,5	3,0	IR150X165X32	158,0	1,5	0,900
150	165 ^{-0,017 -0,035}	40	1,1	3,0	IR150X165X40	156,5	1,0	1,120
150	165 ^{-0,017 -0,035}	42	1,5	3,0	IR150X165X42	158,0	1,5	1,180
150	170 ^{-0,017 -0,035}	52	2,0	3,0	IR150X170X52	159,0	2,0	2,000
150	170 ^{-0,017 -0,035}	60	2,0	3,0	IR150X170X60	159,0	2,0	2,350
160	175 ^{-0,017 -0,035}	40	1,1	3,0	IR160X175X40	166,5	1,0	1,200
160	180 ^{-0,017 -0,035}	60	2,0	3,0	IR160X180X60	169,0	2,0	2,500
170	185 ^{-0,013 -0,043}	45	1,1	3,0	IR170X185X45	176,5	1,0	1,450
170	190 ^{-0,013 -0,043}	60	2,0	3,0	IR170X190X60	179,0	2,0	2,650
180	195 ^{-0,013 -0,043}	45	1,1	3,0	IR180X195X45	186,5	1,0	1,510
180	205 ^{-0,013 -0,043}	69	2,0	3,0	IR180X205X69	189,0	2,0	4,100
190	210 ^{-0,020 -0,050}	50	1,5	3,5	IR190X210X50	198,0	1,5	2,410

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 *t*.

**Inner rings
series IR**


Boundary dimensions					Bearing numbers	Abutment dimensions		Mass kg (approx.)
mm						mm		
<i>d</i>	<i>F</i> ¹⁾	<i>B</i>	<i>r</i> s min ²⁾	<i>t</i>		<i>d</i> _a min	<i>r</i> _a max	
190	215 ^{-0,020 -0,050}	69	2,0	3,5	IR190X215X69	199	2,0	4,10
200	220 ^{-0,020 -0,050}	50	1,5	3,5	IR200X220X50	208	1,5	2,49
200	225 ^{-0,020 -0,050}	80	2,1	3,5	IR200X220X80	211	2,0	5,10
220	240 ^{-0,033 -0,063}	50	1,5	3,5	IR220X240X50	228	1,5	2,75
220	245 ^{-0,033 -0,063}	80	2,1	3,5	IR220X245X80	231	2,0	5,70
240	265 ^{-0,037 -0,069}	60	2,0	3,5	IR240X265X60	249	2,0	4,60
240	265 ^{-0,037 -0,069}	80	2,1	3,5	IR240X265X80	251	2,0	6,30
260	285 ^{-0,064 -0,092}	60	2,0	4,0	IR260X285X60	269	2,0	4,98
260	290 ^{-0,064 -0,092}	100	2,1	4,0	IR260X290X100	271	2,0	10,0
280	305 ^{-0,064 -0,092}	69	2,0	4,0	IR280X305X69	289	2,0	6,20
280	310 ^{-0,064 -0,092}	100	2,1	4,0	IR280X310X100	291	2,0	10,80
300	330 ^{-0,062 -0,098}	80	2,1	4,0	IR300X330X80	311	2,0	9,30
300	340 ^{-0,062 -0,098}	118	3,0	4,0	IR300X340X118	313	2,5	18,50
320	350 ^{-0,062 -0,098}	80	2,1	5,0	IR320X350X80	331	2,0	9,80
320	360 ^{-0,062 -0,098}	118	3,0	5,0	IR320X360X118	333	2,5	20,00
340	370 ^{-0,062 -0,098}	80	2,1	5,0	IR340X370X80	351	2,0	10,10
340	380 ^{-0,062 -0,098}	118	3,0	5,0	IR340X380X118	353	2,5	22,00
360	390 ^{-0,090 -0,126}	80	2,1	5,0	IR360X390X80	371	2,0	10,90
360	400 ^{-0,090 -0,126}	118	3,0	5,0	IR360X400X118	373	2,5	22,00
380	415 ^{-0,080 -0,120}	100	2,1	5,0	IR380X415X100	391	2,0	18,50
380	430 ^{-0,080 -0,120}	140	4,0	5,0	IR380X430X140	396	3,0	35,00
400	450 ^{-0,080 -0,120}	140	4,0	5,0	IR400X450X140	416	3,0	36,50
420	470 ^{-0,105 -0,145}	140	4,0	5,0	IR420X470X140	436	3,0	38,20
440	490 ^{-0,105 -0,145}	160	4,0	5,0	IR440X490X160	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 Information		Product Information
 HF	146	HF Series	147
 HFL	146	HFL Series	148



1. Types and designs

SYI 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.

SYI Engineering.

All of **SYI**'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

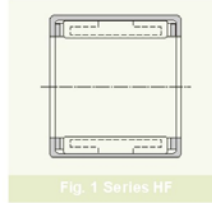


Fig. 1 Series HF

2. Interpreting clutch numbers

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

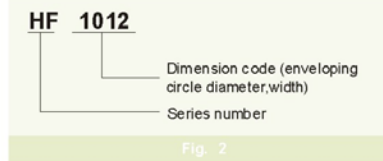


Fig. 2

3. Lubrication

Oil is the best lubrication for **SYI** 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.

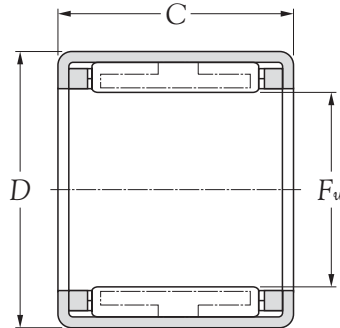
4. Mounting practices

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 NHF, 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.

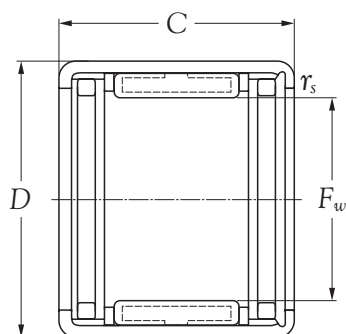
Transmission direction (direction of engagement)

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**


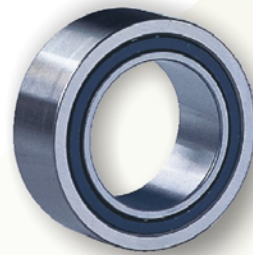
Boundary dimensions			Torque capacity Md		Part number by radial load		Bearing numbers	Mass kg (approx.)
mm			N · m	kgf · m	needle roller bearing	oil retaining bearing		
F_w	D	C						
6	10	12	1,76	0,18	HK0609T2	B-S6-22	HF0612	0,0030
8	12	12	3,15	0,32	HK0810	B-S8-25	HF0812	0,0035
10	14	12	5,30	0,54	HK1010	B-S10-21	HF1012	0,0040
12	18	16	12,20	1,24	HK1212	B-S12-32	HF1216	0,0116
14	20	16	17,30	1,76	HK1412	B-S14-13	HF1416	0,0130
16	22	16	20,50	2,09	HK1612	B-S16-13	HF1616	0,0140
18	24	16	24,10	2,46	HK1812	B-S18-8	HF1816	0,0155
20	26	16	28,50	2,91	HK2012	B-S20-19	HF2016	0,0170
25	32	20	66,00	6,73	HK2512	B-S25-11	HF2520	0,0309
30	37	20	90,00	9,18	HK3012	B-S30-19	HF3020	0,0360
35	42	20	121,00	12,30	HK3512	B-S35-7	HF3520	0,0400

**Drawn cup needle clutch
series HFL**


Boundary dimensions			Basic load ratings		Limiting speed		Rotation torque	Bearing numbers
mm			dynamic	static	rpm		Nm	
F_w	D	C	C_r	C_{or}	n	nl^{**}		
4	8	8	1.270	1.740	34.000	14.000	0,34	HFL0408
6	10	15	1.650	2.030	23.000	13.000	1,76	HFL0615
8	12	20	4.050	4.150	17.000	12.000	3,15	HFL0822
10	14	22	4.300	4.650	14.000	11.000	5,30	HFL1022
12	18	26	6.300	6.500	11.000	8.000	12,20	HFL1226
14	20	26	6.300	6.500	9.500	8.000	17,30	HFL1426
16	22	26	7.300	8.400	8.500	7.500	20,50	HFL1626
18	24	26	8.200	10.300	7.500	7.500	24,10	HFL1826
20	26	26	8.300	10.400	7.000	6.500	28,50	HFL2026
25	32	30	10.900	14.100	5.500	5.500	66,00	HFL2530
30	37	30	12.600	17.600	4.500	4.500	90,00	HFL3030
35	42	30	13.000	19.300	3.900	3.900	121,00	HFL3530



	Technical Information		Product Information
 RNAO	150	RNAO Series	152~155
 NAO	150	NAO Series	156~159

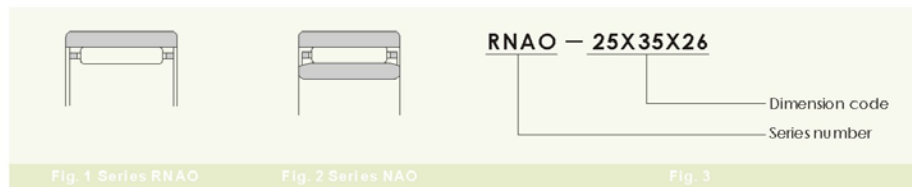


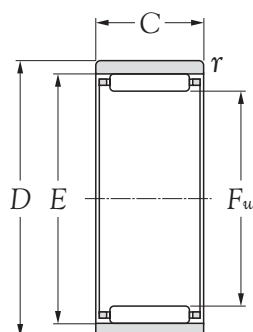
1. Types and designs

The available **SYI** Machined Ring Needle Roller Bearings, Separable, include the series RNAO (without inner ring) and series NAO (with inner ring). The cage used for **SYI** 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 T2) may be used. The T2 cage features a maximum allowable operating temperature of 120°C and maximum allowable continuous operating temperature of 100°C.

2. Interpreting bearing numbers

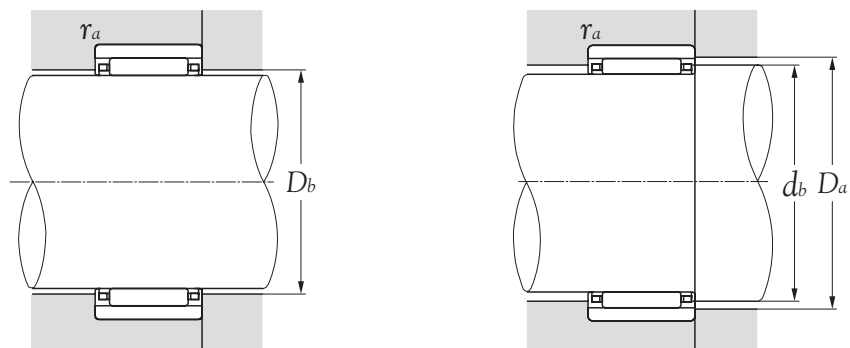
The bearing numbers of **SYI** Machined Ring Needle Roller Bearings, Separable, comprise a series number (RNAO, NAO), dimension code (inscribed enveloping circle diameter or bore diameter X outside diameter X width), and suffix (Fig. 1~3).



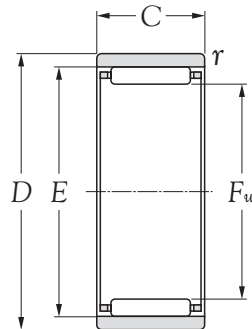
Machined-ring needle roller bearings, separable series RNAO


Boundary dimensions					Basic load ratings				Bearing numbers
mm					dynamic	static	dynamic	static	
F_w	D	C	$r_s \text{ min}^{(1)}$	E	N	C_{or}	kgf	C_{or}	
					C_r	C_{or}	C_r	C_{or}	
5	$^{+0,018}_{-0,010}$ 10	8,0	0,15	8	2.640	2.190	269	224	RNAO5X10X8
6	$^{+0,018}_{-0,010}$ 13	8,0	0,30	9	2.660	2.280	272	233	RNAO6X13X8
7	$^{+0,022}_{-0,013}$ 14	8,0	0,30	10	2.670	2.350	272	239	RNAO7X14X8
8	$^{+0,022}_{-0,013}$ 15	10,0	0,30	11	4.000	4.100	410	420	RNAO8X15X10
10	$^{+0,022}_{-0,013}$ 17	10,0	0,30	13	4.550	5.100	460	520	RNAO10X17X10
10	$^{+0,022}_{-0,013}$ 20	12,0	0,30	16	7.100	5.950	720	610	RNAO10X20X12
12	$^{+0,027}_{-0,016}$ 19	13,5	0,30	15	6.000	7.700	615	785	RNAO12X19X13,5
12	$^{+0,027}_{-0,016}$ 22	12,0	0,30	18	8.650	8.000	880	815	RNAO12X22X12
14	$^{+0,027}_{-0,016}$ 22	13,0	0,30	18	8.300	10.100	845	1.030	RNAO14X22X13
14	$^{+0,027}_{-0,016}$ 26	12,0	0,30	20	9.350	9.150	955	930	RNAO14X26X12
15	$^{+0,027}_{-0,016}$ 23	13,0	0,30	19	8.250	10.200	840	1.040	RNAO15X23X13
16	$^{+0,027}_{-0,016}$ 24	13,0	0,30	20	9.050	11.800	925	1.200	RNAO16X24X13
16	$^{+0,027}_{-0,016}$ 28	12,0	0,30	22	11.700	12.500	1.190	1.280	RNAO16X28X12
17	$^{+0,027}_{-0,016}$ 25	13,0	0,30	21	9.400	12.600	960	1.280	RNAO17X25X13
18	$^{+0,027}_{-0,016}$ 26	13,0	0,30	22	8.900	11.900	910	1.210	RNAO18X26X13
18	$^{+0,027}_{-0,016}$ 30	12,0	0,30	24	12.300	13.800	1.250	1.410	RNAO18X30X12
20	$^{+0,033}_{-0,020}$ 28	13,0	0,30	24	10.000	14.300	1.020	1.460	RNAO20X28X13
20	$^{+0,033}_{-0,020}$ 32	12,0	0,30	26	12.900	15.100	1.320	1.540	RNAO20X32 X12
22	$^{+0,033}_{-0,020}$ 30	13,0	0,30	26	10.200	15.200	1.040	1.550	RNAO22X30X13
22	$^{+0,033}_{-0,020}$ 35	16,0	0,30	29	18.700	22.700	1.910	2.310	RNAO22X35X16
25	$^{+0,033}_{-0,020}$ 35	17,0	0,30	29	14.200	24.000	1.450	2.450	RNAO25X35X17
25	$^{+0,033}_{-0,020}$ 37	16,0	0,30	32	19.500	24.700	1.990	2.520	RNAO25X37X16
26	$^{+0,033}_{-0,020}$ 39	13,0	0,30	30	11.800	19.200	1.200	1.960	RNAO26X39X13
28	$^{+0,033}_{-0,020}$ 40	16,0	0,30	35	21.200	28.400	2.160	2.900	RNAO28X40X16
30	$^{+0,033}_{-0,020}$ 40	17,0	0,30	35	19.400	32.500	1.970	3.350	RNAO30X40X17
30	$^{+0,033}_{-0,020}$ 42	16,0	0,30	37	21.900	30.500	2.230	3.100	RNAO30X42X16
32	$^{+0,041}_{-0,025}$ 42	13,0	0,30	37	14.500	23.000	1.480	2.350	RNAO32X42X13
35	$^{+0,041}_{-0,025}$ 45	13,0	0,30	40	15.200	25.100	1.550	2.560	RNAO35X45X13

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

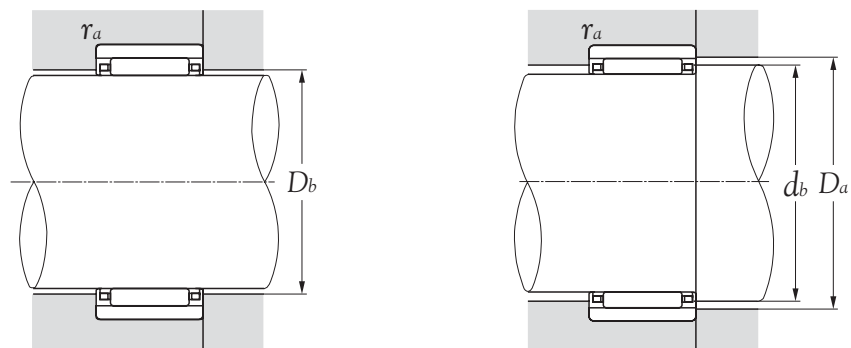
Machined-ring needle roller bearings, separable series RNAO


Abutment dimensions				Limiting speeds rpm		Bearing numbers	Mass kg (approx.)
D_b min	D_a max	d_b min	r_a max	grease	oil		
7,7	8,8	5,3	0,15	27.000	40.000	RNAO5X10X8	0,003
8,7	11,0	6,3	0,30	25.000	37.000	RNAO6X13X8	0,006
9,7	12,0	7,3	0,30	23.000	34.000	RNAO7X14X8	0,006
10,7	13,0	8,3	0,30	21.000	32.000	RNAO8X15X10	0,008
12,7	15,0	10,3	0,30	19.000	28.000	RNAO10X17X10	0,010
15,7	18,0	10,3	0,30	19.000	28.000	RNAO10X20X12	0,018
14,7	17,0	12,3	0,30	17.000	26.000	RNAO12X19X13,5	0,015
17,6	20,0	12,3	0,30	17.000	26.000	RNAO12X22X12	0,019
17,6	20,0	14,4	0,30	16.000	24.000	RNAO14X22X13	0,018
19,6	24,0	14,4	0,30	16.000	24.000	RNAO14X26X12	0,029
18,6	21,0	15,4	0,30	15.000	23.000	RNAO15X23X13	0,020
19,6	22,0	16,4	0,30	15.000	23.000	RNAO16X24X13	0,021
21,6	26,0	16,4	0,30	15.000	23.000	RNAO16X28X12	0,032
20,6	23,0	17,4	0,30	15.000	22.000	RNAO17X25X13	0,022
21,6	24,0	18,4	0,30	14.000	21.000	RNAO18X26X13	0,022
23,6	28,0	18,4	0,30	14.000	21.000	RNAO18X30X12	0,035
23,6	26,0	20,4	0,30	13.000	20.000	RNAO20X28X13	0,025
25,6	30,0	20,4	0,30	13.000	20.000	RNAO20X32 X12	0,038
25,6	28,0	22,4	0,30	12.000	18.000	RNAO22X30X13	0,027
28,4	33,0	22,4	0,30	12.000	18.000	RNAO22X35X16	0,059
28,4	33,0	25,6	0,30	11.000	16.000	RNAO25X35X17	0,053
31,4	35,0	25,6	0,30	11.000	16.000	RNAO25X37X16	0,060
29,4	37,0	26,6	0,30	10.000	15.000	RNAO26X39X13	0,060
34,4	38,0	28,6	0,30	9.500	14.000	RNAO28X40X16	0,061
34,4	38,0	30,6	0,30	9.000	13.000	RNAO30X40X17	0,060
36,4	40,0	30,6	0,30	9.000	13.000	RNAO30X42X16	0,069
36,4	40,0	32,6	0,30	8.500	13.000	RNAO32X42X13	0,049
39,4	43,0	35,6	0,30	7.500	11.000	RNAO35X45X13	0,053

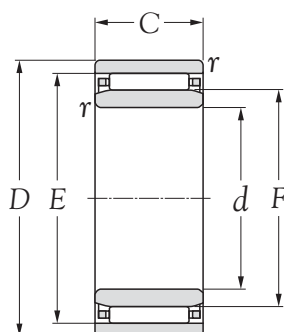
Machined-ring needle roller bearings, separable series RNAO


Boundary dimensions					Basic load ratings				Bearing numbers
mm					dynamic	static	dynamic	static	
F_w	D	C	$r_s \text{ min}^{1)}$	E	N		kgf		
					C_r	C_{or}	C_r	C_{or}	
35	$^{+0,041}_{+0,025}$ 45	17	0,3	40	20.000	36.000	2.040	3.650	RNAO35X45X17
35	$^{+0,041}_{+0,025}$ 47	16	0,3	42	24.100	36.000	2.450	3.650	RNAO35X47X16
35	$^{+0,041}_{+0,025}$ 47	18	0,3	42	24.700	37.000	2.510	3.750	RNAO35X47X18
37	$^{+0,041}_{+0,025}$ 47	13	0,3	42	15.900	27.100	1.620	2.770	RNAO37X47X13
37	$^{+0,041}_{+0,025}$ 52	18	0,3	44	26.300	41.000	2.680	4.150	RNAO37X52X18
40	$^{+0,041}_{+0,025}$ 50	17	0,3	45	21.800	41.500	2.220	4.250	RNAO40X50X17
40	$^{+0,041}_{+0,025}$ 55	20	0,3	47	31.000	51.500	3.150	5.250	RNAO40X55X20
45	$^{+0,041}_{+0,025}$ 55	17	0,3	50	22.300	44.500	2.280	4.550	RNAO45X55X17
45	$^{+0,041}_{+0,025}$ 62	20	0,3	53	36.000	59.000	3.650	6.000	RNAO45X62X20
50	$^{+0,041}_{+0,025}$ 62	20	0,3	55	27.900	62.000	2.850	6.300	RNAO50X62X20
50	$^{+0,041}_{+0,025}$ 65	20	0,3	58	38.500	67.500	3.950	6.850	RNAO50X65X20
55	$^{+0,049}_{+0,060}$ 68	20	0,6	60	28.800	66.500	2.940	6.750	RNAO55X68X20
55	$^{+0,049}_{+0,030}$ 68	25	0,6	63	50.500	97.500	5.150	9.950	RNAO55X68X25
55	$^{+0,049}_{+0,030}$ 72	20	0,6	63	39.000	70.000	3.950	7.100	RNAO55X72X20
60	$^{+0,049}_{+0,030}$ 78	20	1,0	68	40.000	75.000	4.100	7.650	RNAO60X78X20
65	$^{+0,049}_{+0,030}$ 85	30	1,0	73	61.000	132.000	6.200	13.400	RNAO65X85X30
70	$^{+0,049}_{+0,030}$ 90	30	1,0	78	65.500	149.000	6.700	15.200	RNAO70X90X30
75	$^{+0,049}_{+0,030}$ 95	30	1,0	83	67.500	157.000	6.850	16.100	RNAO75X95X30
80	$^{+0,049}_{+0,030}$ 95	30	1,0	86	57.000	159.000	5.800	16.200	RNAO80X95X30
80	$^{+0,049}_{+0,030}$ 100	30	1,0	88	69.000	166.000	7.050	17.000	RNAO80X100X30
85	$^{+0,058}_{+0,036}$ 105	25	1,0	93	61.500	146.000	6.250	14.900	RNAO85X105X25
85	$^{+0,058}_{+0,036}$ 105	30	1,0	93	71.000	175.000	7.200	17.900	RNAO85X105X30
90	$^{+0,058}_{+0,036}$ 105	26	1,0	98	64.000	157.000	6.550	16.000	RNAO90X105X26
90	$^{+0,058}_{+0,036}$ 110	30	1,0	98	72.500	184.000	7.400	18.800	RNAO90X110X30
95	$^{+0,058}_{+0,036}$ 115	30	1,0	103	74.000	193.000	7.550	19.600	RNAO95X115X30
100	$^{+0,058}_{+0,035}$ 120	30	1,0	108	76.000	201.000	7.700	20.500	RNAO100X120X30

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

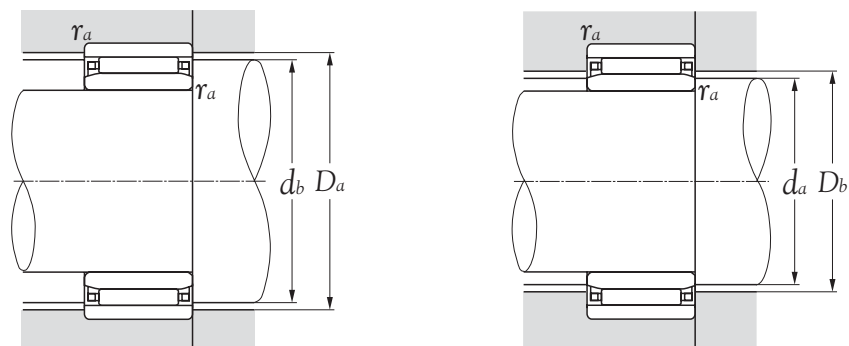
Machined-ring needle roller bearings, separable series RNAO


Abutment dimensions				Limiting speeds rpm		Bearing numbers	Mass kg (approx.)
D_b min	D_a max	d_b min	r_a max	grease	oil		
39,4	43	35,6	0,3	7.500	11.000	RNAO35X45X17	0,069
41,4	45	35,6	0,3	7.500	11.000	RNAO35X47X16	0,078
41,4	45	35,6	0,3	7.500	11.000	RNAO35X47X18	0,089
41,4	45	37,6	0,3	7.000	11.000	RNAO37X47X13	0,056
43,4	50	37,6	0,3	7.000	11.000	RNAO37X52X18	0,125
44,4	48	40,6	0,3	6.500	10.000	RNAO40X50X17	0,074
46,2	53	40,6	0,3	6.500	10.000	RNAO40X55X20	0,145
49,2	53	45,6	0,3	6.000	9.000	RNAO45X55X17	0,083
52,2	60	45,6	0,3	6.000	9.000	RNAO45X62X20	0,175
54,2	60	50,6	0,3	5.500	8.000	RNAO50X62X20	0,140
57,2	63	50,6	0,3	5.500	8.000	RNAO50X65X20	0,168
59,4	64	55,8	0,6	4.800	7.500	RNAO55X68X20	0,166
62,4	64	55,8	0,6	4.800	7.500	RNAO55X68X25	0,200
62,4	68	55,8	0,6	4.800	7.500	RNAO55X72X20	0,216
67,2	73	60,8	1,0	4.400	6.500	RNAO60X78X20	0,255
72,2	80	66,0	1,0	4.100	6.000	RNAO65X85X30	0,464
77,2	85	71,0	1,0	3.800	5.500	RNAO70X90X30	0,199
82,2	90	76,0	1,0	3.600	5.500	RNAO75X95X30	0,520
85,2	90	81,0	1,0	3.300	5.000	RNAO80X95X30	0,405
87,2	95	81,0	1,0	3.300	5.000	RNAO80X100X30	0,580
92,2	100	86,0	1,0	3.100	4.700	RNAO85X105X25	0,459
92,2	100	86,0	1,0	3.100	4.700	RNAO85X105X30	0,585
97,2	100	91,0	1,0	3.000	4.400	RNAO90X105X26	0,373
97,2	105	91,0	1,0	3.000	4.400	RNAO90X110X30	0,610
102,2	110	96,0	1,0	2.800	4.200	RNAO95X115X30	0,640
107,2	115	101,0	1,0	2.700	4.000	RNAO100X120X30	0,694

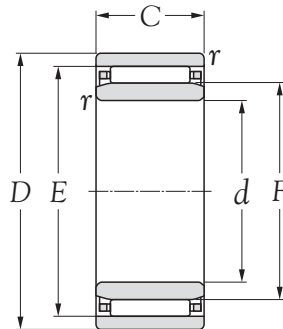
Machined-ring needle roller bearings, separable series NAO


Boundary dimensions						Basic load ratings				Bearing numbers
mm						dynamic	static	dynamic	static	
d	D	C	$r_s \text{ min}^1$	F	E	N		kgf		
d	D	C	$r_s \text{ min}^1$	F	E	C_r	C_{or}	C_r	C_{or}	
6	17	10	0,3	10	13	4.550	5.100	460	520	NAO6X17X10
7	20	12	0,3	10	16	7.100	5.950	720	610	NAO7X20X12
9	22	12	0,3	12	18	8.650	8.000	880	815	NAO9X22X12
10	22	13	0,3	14	18	8.300	10.100	845	1.030	NAO10X22X13
10	26	12	0,3	14	20	9.350	9.150	955	930	NAO10X26X12
12	24	13	0,3	16	20	9.050	11.800	925	1.200	NAO12X24X13
12	28	12	0,3	16	22	11.700	12.500	1.190	1.280	NAO12X28X12
15	28	13	0,3	20	24	10.000	14.300	1.020	1.460	NAO15X28X13
15	32	12	0,3	20	26	12.900	15.100	1.320	1.540	NAO15X32X12
17	30	13	0,3	22	26	10.200	15.200	1.040	1.550	NAO17X30X13
17	35	16	0,3	22	29	18.700	22.700	1.910	2.310	NAO17X35X16
20	35	17	0,3	25	29	14.200	24.000	1.450	2.450	NAO20X35X17
20	37	16	0,3	25	32	19.500	24.700	1.990	2.520	NAO20X37X16
25	40	17	0,3	30	35	19.400	32.500	1.970	3.350	NAO25X40X17
25	42	16	0,3	30	37	21.900	30.500	2.230	3.100	NAO25X42X16
29	42	13	0,3	32	37	14.500	23.000	1.480	2.350	NAO29X42X13
30	45	13	0,3	35	40	15.200	25.100	1.550	2.560	NAO30X45X13
30	45	17	0,3	35	40	20.000	36.000	2.040	3.650	NAO30X45X17
30	47	16	0,3	35	42	24.100	36.000	2.450	3.650	NAO30X47X16
30	47	18	0,3	35	42	24.700	37.000	2.510	3.750	NAO30X47X18
30	52	18	0,3	37	44	26.300	41.000	2.680	4.150	NAO30X52X18
33	47	13	0,3	37	42	15.900	27.100	1.620	2.770	NAO33X47X13
35	50	17	0,3	40	45	21.800	41.500	2.220	4.250	NAO35X50X17
35	55	20	0,3	40	47	31.000	51.500	3.150	5.250	NAO35X55X20
40	55	17	0,3	45	50	22.300	44.500	2.280	4.550	NAO40X55X17
40	62	20	0,3	45	53	36.000	59.000	3.650	6.000	NAO40X62X20
40	65	20	0,3	50	58	38.500	67.500	3.950	6.850	NAO40X65X20
45	62	20	0,3	50	55	27.900	62.000	2.850	6.300	NAO45X62X20

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

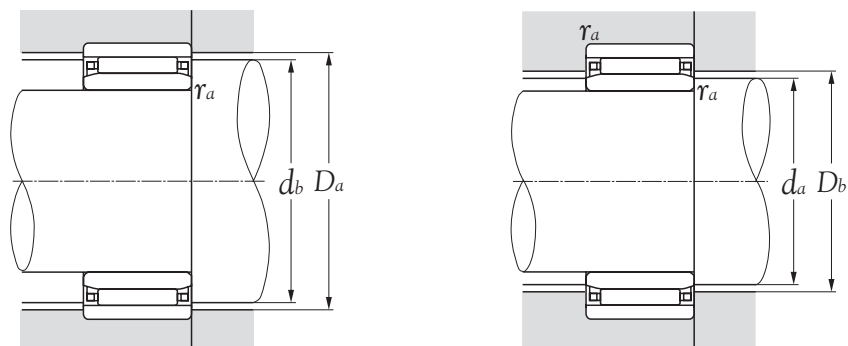
Machined-ring needle roller bearings, separable series NAO


Abutment dimensions					Limiting speeds rpm		Bearing numbers	Mass kg (approx)
d_a min	d_b	D_a max	D_b	r_a min	grease	oil		
8	12,7	15	10,3	0,3	19.000	28.000	NAO6X17X10	0,014
9	15,7	18	10,3	0,3	19.000	28.000	NAO7X20X12	0,022
11	17,6	20	12,3	0,3	17.000	26.000	NAO9X22X12	0,024
12	17,6	20	14,4	0,3	16.000	24.000	NAO10X22X13	0,026
12	19,6	24	14,4	0,3	16.000	24.000	NAO10X26X12	0,036
14	19,6	22	16,4	0,3	15.000	23.000	NAO12X24X13	0,030
14	21,6	26	16,4	0,3	15.000	23.000	NAO12X28X12	0,040
17	23,6	26	20,4	0,3	13.000	20.000	NAO15X28X13	0,029
17	25,6	30	20,4	0,3	13.000	20.000	NAO15X32X12	0,050
19	25,6	28	22,4	0,3	12.000	18.000	NAO17X30X13	0,042
19	28,4	33	22,4	0,3	12.000	18.000	NAO17X35X16	0,078
22	28,4	33	25,6	0,3	11.000	16.000	NAO20X35X17	0,076
22	31,4	35	25,6	0,3	11.000	16.000	NAO20X37X16	0,082
27	34,4	38	30,6	0,3	9.000	13.000	NAO25X40X17	0,088
27	36,4	40	30,6	0,3	9.000	13.000	NAO25X42X16	0,086
31	36,4	40	32,6	0,3	8.500	13.000	NAO29X42X13	0,062
32	39,4	43	35,6	0,3	7.500	11.000	NAO30X45X13	0,077
32	39,4	43	35,6	0,3	7.500	11.000	NAO30X45X17	0,102
32	41,4	45	35,6	0,3	7.500	11.000	NAO30X47X16	0,109
32	41,4	45	35,6	0,3	7.500	11.000	NAO30X47X18	0,119
32	43,4	50	37,6	0,3	7.000	11.000	NAO30X52X18	0,177
35	41,4	45	37,6	0,3	7.000	11.000	NAO33X47X13	0,085
37	44,4	48	40,6	0,3	6.500	10.000	NAO35X50X17	0,113
37	46,2	53	40,6	0,3	6.500	10.000	NAO35X55X20	0,190
42	49,2	53	45,6	0,3	6.000	9.000	NAO40X55X17	0,127
42	52,2	60	45,6	0,3	6.000	9.000	NAO40X62X20	0,230
42	57,2	63	50,6	0,3	5.500	9.000	NAO40X65X20	0,279
47	54,2	60	50,6	0,3	5.500	8.000	NAO45X62X20	0,192

Machined-ring needle roller bearings, separable series NAO


Boundary dimensions						Basic load ratings				Bearing numbers
mm						dynamic	static	dynamic	static	
d	D	C	$r_s \text{ min}^1$	F	E	N		kgf		
						C_r	C_{or}	C_r	C_{or}	
45	72	20	0,6	55	63	39.000	70.000	3.950	7.100	NAO45X72X20
50	68	20	0,6	55	60	28.800	66.500	2.940	6.750	NAO50X68X20
50	78	20	1,0	60	68	40.000	75.000	4.100	7.650	NAO50X78X20
55	85	30	1,0	65	73	61.000	132.000	6.200	13.400	NAO55X85X30
60	90	30	1,0	70	78	65.500	149.000	6.700	15.200	NAO60X90X30
65	95	30	1,0	75	83	67.500	157.000	6.850	16.100	NAO65X95X30
70	95	30	1,0	80	86	57.000	159.000	5.800	16.200	NAO70X95X30
70	100	30	1,0	80	88	69.000	166.000	7.050	17.000	NAO70X100X30
75	105	25	1,0	85	93	61.500	146.000	6.250	14.900	NAO75X105X25
75	105	30	1,0	85	93	71.000	175.000	7.200	17.900	NAO75X105X30
80	110	30	1,0	90	98	72.500	184.000	7.400	18.800	NAO80X110X30
85	115	30	1,0	95	103	74.000	193.000	7.550	19.600	NAO85X115X30
90	120	30	1,0	100	108	76.000	201.000	7.700	20.500	NAO90X120X30

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

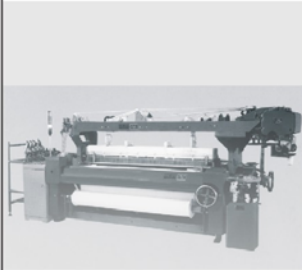
Machined-ring needle roller bearings, separable series NAO


Abutment dimensions					Limiting speeds rpm		Bearing numbers	Mass kg (approx)
d_a min	d_b	D_a max	D_b	r_a min	grease	oil		
49	62,4	68	55,8	0,6	4.800	7.500	NAO45X72X20	0,335
54	59,4	64	55,8	0,6	4.800	7.500	NAO50X68X20	0,230
55	67,2	73	60,8	1,0	4.400	6.500	NAO50X78X20	0,410
60	72,2	80	66,0	1,0	4.100	6.000	NAO55X85X30	0,680
65	77,2	85	71,0	1,0	3.800	5.500	NAO60X90X30	0,720
70	82,2	90	76,0	1,0	3.600	5.500	NAO65X95X30	0,770
75	85,2	90	81,0	1,0	3.300	5.000	NAO70X95X30	0,675
75	87,2	95	81,0	1,0	3.300	5.000	NAO70X100X30	0,850
80	92,2	100	86,0	1,0	3.100	4.700	NAO75X105X25	0,700
80	92,2	100	86,0	1,0	3.100	4.700	NAO75X105X30	0,880
85	97,2	105	91,0	1,0	3.000	4.400	NAO80X110X30	0,920
90	102,2	110	96,0	1,0	2.800	4.200	NAO85X115X30	0,960
95	107,2	115	101,0	1,0	2.700	4.000	NAO90X120X30	1,040



NEEDLE ROLLER BEARINGS

Using applications



Expand all sectors

Power transmission and electrical engineering

Construction, building materials and mining machinery, offshore engineering, civil engineering

Precision engineering and medical equipment



Conveying trucks, conveying and warehousing equipment

Rubber and plastics processing machinery, machinery for the chemical industry

Hydraulic and pneumatic engineering

Agricultural machinery

Assembly, handling and industrial robots

Passenger and estate cars, automotive supplier industry

Power tools

Rail vehicles

Toys, pedal cycles and sports equipment

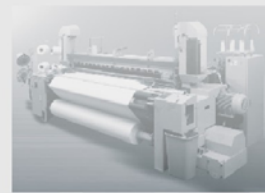
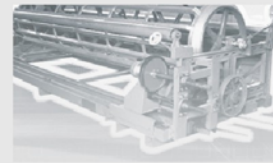
Iron and steel industry



Internal combustion engines for gardening and forestry equipment, outboard motors

Machine tools and production systems

Electrical household appliances



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 **SYI** 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 GD, which has a double lip. For special operating conditions, such as an operating temperature exceeding 120°C , consult **SYI** 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 6m/s for the doublelip series GD.

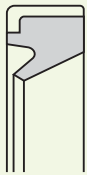


Fig. 1 Series G

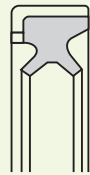


Fig. 2 Series GD

3. Interpreting seal numbers

Seal numbers comprise a series number (G or GD) and a dimension code (inside diameter X outside diameter X width.)

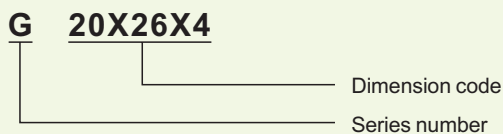


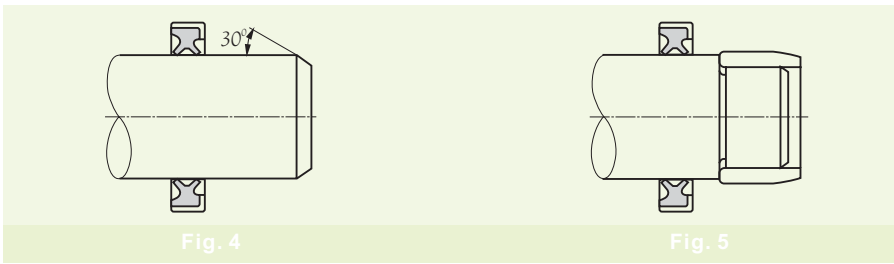
Fig. 3

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.

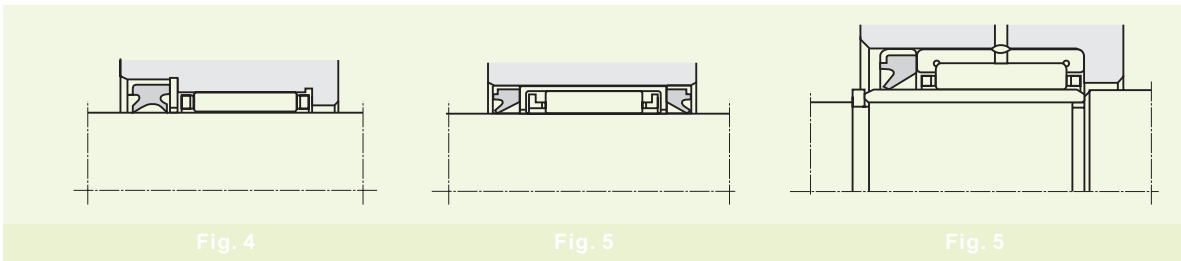
To prevent the seal lip and outside surface of the seal from being damaged during mounting, the shaft end or housing end should be tapered (Fig.4). If the shaft end lacks a taper or rounding, use of the mounting jig as shown in Fig.5 is recommended. Sufficient interference between the seal and housing will be obtained from an ordinary housing tolerance of G7 to R7.

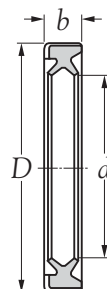
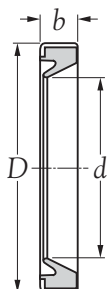
To lubricate the lip, apply lubricant to the lip before mounting the seal.



5. Typical seal applications

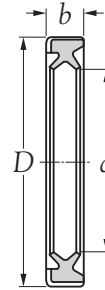
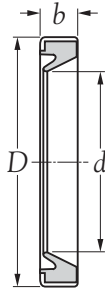
Fig. 6 to 8 illustrate typical designs of seals for needle roller bearings.



Sealing rings
series G, GD


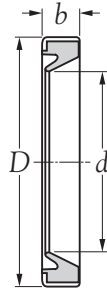
Boundary dimensions			Bearing numbers		Mass	
<i>d</i>	mm <i>D</i> ¹⁾	<i>b</i> _{+0,2 0}	Type G	Type GD	X 10 ⁻³ kg	
					G	GD
4	8 ^{+0,081 +0,023}	2	G4X8X2	-	0,18	-
5	9 ^{+0,081 +0,023}	2	G5X9X3	-	0,19	-
5	10 ^{+0,081 +0,023}	2	G5X10X2	-	0,22	-
6	10 ^{+0,081 +0,023}	2	G6X10X2	-	0,21	-
6	12 ^{+0,098 +0,028}	2	G6X12X2	-	0,38	-
7	11 ^{+0,098 +0,028}	2	G7X11X2	-	0,25	-
7	14 ^{+0,098 +0,028}	2	G7X14X2	-	0,52	-
8	12 ^{+0,098 +0,028}	3	G8X12X3	-	0,41	-
8	15 ^{+0,098 +0,028}	3	G8X15X3	-	0,74	-
9	13 ^{+0,098 +0,028}	3	G9X13X3	-	0,44	-
9	16 ^{+0,098 +0,028}	3	G9X16X3	-	0,69	-
10	14 ^{+0,098 +0,028}	3	G10X14X3	-	0,50	-
10	17 ^{+0,098 +0,028}	3	G10X17X3	-	0,87	-
12	16 ^{+0,098 +0,028}	3	G12X16X3	-	0,56	-
12	18 ^{+0,098 +0,028}	3	G12X18X3	-	0,86	-
12	19 ^{+0,119 +0,035}	3	G12X19X3	-	0,94	-
13	19 ^{+0,119 +0,035}	3	G13X19X3	-	0,87	-
14	20 ^{+0,119 +0,035}	3	G14X20X3	GD14X20X3	0,96	0,99
14	21 ^{+0,119 +0,035}	3	G14X21X3	GD14X21X3	1,10	1,10
14	22 ^{+0,119 +0,035}	3	G14X22X3	GD14X22X3	1,30	1,30
15	21 ^{+0,119 +0,035}	3	G15X21X3	GD15X21X3	1,00	1,00
15	23 ^{+0,119 +0,035}	3	G15X23X3	GD15X23X3	1,30	1,30
16	22 ^{+0,119 +0,035}	3	G16X22X3	GD16X22X3	1,30	1,10
16	24 ^{+0,119 +0,035}	3	G16X24X3	GD16X24X3	1,30	1,30
16	25 ^{+0,119 +0,035}	3	G16X25X3	GD16X25X3	1,60	1,60
17	23 ^{+0,119 +0,035}	3	G17X23X3	GD17X23X3	1,30	1,10
17	25 ^{+0,119 +0,035}	3	G17X25X3	GD17X25X3	1,50	1,40
18	24 ^{+0,119 +0,035}	3	G18X24X3	GD18X24X3	1,20	1,20

Notes: 1) The tolerance of the outside diameter is an average of two measurements taken at equally spaced points on the outside surface.

Sealing rings
series G, GD


Boundary dimensions			Bearing numbers		Mass	
<i>d</i>	mm <i>D</i> ¹⁾	<i>b</i> _{+0,2 0}	Type G	Type GD	X 10 ⁻³ kg	
					G	GD
18	26 ^{+0,119 +0,035}	4	G18X26X4	GD18X26X4	1,8	1,8
19	27 ^{+0,119 +0,035}	4	G19X27X4	GD19X27X4	2,0	1,9
20	26 ^{+0,119 +0,035}	4	G20X26X4	GD20X26X4	1,8	1,8
20	28 ^{+0,119 +0,035}	4	G20X28X4	GD20X28X4	2,1	2,1
21	29 ^{+0,119 +0,035}	4	G21X29X4	GD21X29X4	2,2	2,1
22	28 ^{+0,119 +0,035}	4	G22X28X3	GD22X28X3	1,8	1,9
22	30 ^{+0,119 +0,035}	4	G22X30X3	GD22X30X3	2,2	2,3
24	32 ^{+0,143 +0,043}	4	G24X32X4	GD24X32X4	2,5	2,4
25	32 ^{+0,143 +0,043}	4	G25X32X4	GD25X32X4	2,3	2,2
25	33 ^{+0,143 +0,043}	4	G25X33X4	GD25X33X4	2,5	2,5
25	35 ^{+0,143 +0,043}	4	G26X34X4	GD26X34X4	2,6	2,6
26	34 ^{+0,143 +0,043}	4	G28X35X4	GD28X35X4	2,6	2,6
28	35 ^{+0,143 +0,043}	4	G28X37X4	GD28X37X4	2,4	2,5
28	37 ^{+0,143 +0,043}	4	G28X37X4	GD28X37X4	3,1	2,8
29	37 ^{+0,143 +0,043}	4	G29X37X4	GD29X37X4	2,7	2,7
29	38 ^{+0,143 +0,043}	4	G29X38X4	GD29X38X4	3,2	2,9
30	37 ^{+0,143 +0,043}	4	G30X37X4	GD30X37X4	2,7	2,6
30	40 ^{+0,143 +0,043}	4	G30X40X4	GD30X40X4	3,6	3,3
32	42 ^{+0,143 +0,043}	4	G32X42X4	GD32X42X4	3,7	3,9
32	45 ^{+0,143 +0,043}	4	G32X45X4	GD32X45X4	5,1	5,2
35	42 ^{+0,143 +0,043}	4	G35X42X4	GD35X42X4	3,0	2,9
35	45 ^{+0,143 +0,043}	4	G35X45X4	GD35X45X4	4,1	3,6
37	47 ^{+0,143 +0,043}	4	G37X47X4	GD37X47X4	4,0	3,8
38	48 ^{+0,143 +0,043}	4	G38X48X4	GD38X48X4	4,4	4,0
40	47 ^{+0,143 +0,043}	4	G40X47X4	GD40X47X4	3,3	3,5
40	50 ^{+0,143 +0,043}	4	G40X50X4	GD40X50X4	4,6	4,0
40	52 ^{+0,173 +0,053}	5	G40X52X4	GD40X52X4	4,8	4,7
42	52 ^{+0,173 +0,053}	4	G42X52X4	GD42X52X4	4,7	4,2

Notes: 1) The tolerance of the outside diameter is an average of two measurements taken at equally spaced points on the outside surface.

Sealing rings
 series G, GD


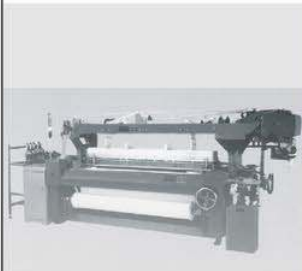
Boundary dimensions			Bearing numbers		Mass	
d	mm $D^{1)}$	b $^{+0,2}$ $_0$	Type G	Type GD	$\times 10^{-3}$ kg	
					G	GD
43	53 ^{+0,173} _{+0,053}	4	G43X53X4	GD43X53X4	4,8	4,3
45	52 ^{+0,173} _{+0,053}	4	G45X52X4	GD45X52X4	3,8	3,8
45	55 ^{+0,173} _{+0,053}	4	G45X55X4	GD45X55X4	5,2	5,5
50	58 ^{+0,173} _{+0,053}	4	G50X58X4	GD50X58X4	4,5	5,2
50	62 ^{+0,173} _{+0,053}	4	G650X62X5	GD650X62X5	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.



NEEDLE ROLLER BEARINGS

Using applications

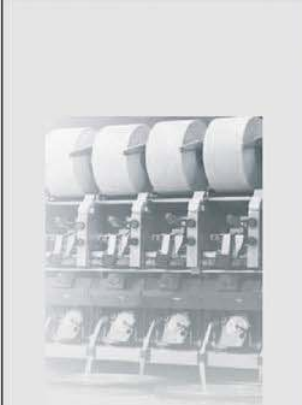


Expand all sectors

Power transmission and electrical engineering

Construction, building materials and mining machinery, offshore engineering, civil engineering

Precision engineering and medical equipment



Conveying trucks, conveying and warehousing equipment

Rubber and plastics processing machinery, machinery for the chemical industry

Hydraulic and pneumatic engineering

Agricultural machinery

Assembly, handling and industrial robots

Passenger and estate cars, automotive supplier industry

Power tools

Rail vehicles

Toys, pedal cycles and sports equipment



Iron and steel industry

Internal combustion engines for gardening and forestry equipment, outboard motors

Machine tools and production systems

Electrical household appliances

