MACHINED TYPE NEEDLE ROLLER BEARINGS

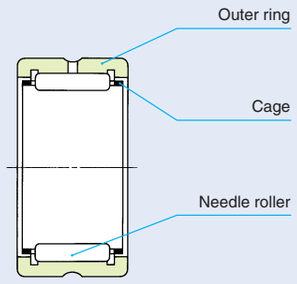
- **Machined Type Caged Needle Roller Bearings**
- **Machined Type Guide Needle Roller Bearings**
- **Capilube Machined Type Needle Roller Bearings**

Structure and Features

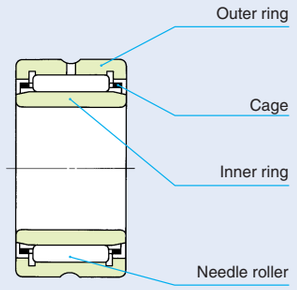
IKO Machined Type Needle Roller Bearings are bearings with a low sectional height and large load ratings. The outer ring has high rigidity and can easily be used even for light alloy housings. These bearings are available in metric series and inch series, both of which have the caged type and the full complement type. It is therefore possible to select a suitable bearing for use under various conditions such as heavy loads and high-speed or low-speed rotations. In addition, there are bearings with and without an inner ring. As the type without inner ring uses a shaft as the raceway surface, a compact design is possible.

Structures of Machined Type Needle Roller Bearings

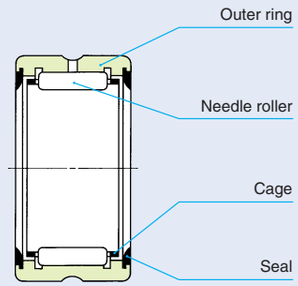
RNA49 · TAF



NA49 · TAFI

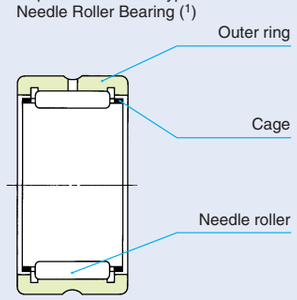


RNA49···UU · TAF···UU

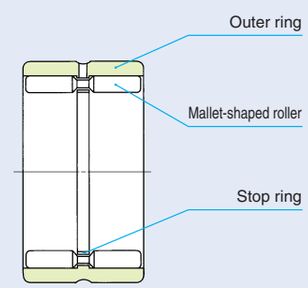


TAF···/SG

Capilube Machined Type
Needle Roller Bearing (1)



GTR



Note(1) For the details of Capilube, please refer page A55

Types

Machined Type Needle Roller Bearings are available in various types shown in Table 1.

Table 1.1 Type of bearing (Standard type)

Series \ Type		Caged Needle Roller Bearings		Guide Needle Roller Bearings	
		Without inner ring	With inner ring	Without inner ring	With inner ring
Metric series	Dimension series 49	RNA 49	NA 49	GTR	GTRI
	Dimension series 69	RNA 69	NA 69		
	Dimension series 48	RNA 48	NA 48		
	For heavy duty	TR	TRI		
	For light duty	TAF	TAFI		
Inch series		BR	BRI	GBR	GBRI

Table 1.2 Type of bearing (With seal)

Series \ Type			Caged Needle Roller Bearings		Guide Needle Roller Bearings	
			Without inner ring	With inner ring	Without inner ring	With inner ring
Metric series	Dimension series 49	Two side seals	RNA 49···UU	NA 49···UU	—	—
		One side seal	RNA 49···U	NA 49···U		
	Dimension series 69	Two side seals	RNA 69···UU	NA 69···UU		
		One side seal	RNA 69···U	NA 69···U		
Inch series		Two side seals	BR ···UU	BRI ···UU	GBR···UU	GBRI···UU
		One side seal	BR ···U	BRI ···U	GBR···U	GBRI···U

Caged Needle Roller Bearings

This type of bearing combines a collared outer ring with the IKO's unique lightweight rigid cage and needle rollers. During operation, needle rollers are guided precisely by the cage, and an ideal load distribution is obtained.
The metric series consists of the NA48 and NA49 series of ISO Standard, NA69 and TAFI series which are based on the international dimension series, and the heavy duty TRI series which is widely used in Japan. The TAFI series has a sectional height as low as that of the shell type and is used for light loads.
The inch series or BRI series is based on the specifications of ANSI Standard of USA.

Caged Needle Roller Bearings without Inner Ring
As shown in the section "Design of shaft and housing" on page A44, any desired radial clearance can be selected by assembling this type of bearing with a shaft which is heat-treated and finished by grinding.
These bearings are free from the effects on dimensional accuracy caused by assembling an inner ring, so that the rotational accuracy is improved. Also, the shaft rigidity can be improved as the shaft diameter can be increased by an amount corresponding to the inner ring thickness.

Caged Needle Roller Bearings with Inner Ring
This type of bearing is used when the shaft cannot be heat-treated and finished by grinding. The outer and inner rings are separable and a small relief clearance is provided on both sides of the inner ring raceway to facilitate bearing mounting. In the TRI and BRI series, the width of the inner ring is larger than that of the outer ring.
Due to heat expansion during operation or mounting errors, the inner or outer ring may be shifted axially and the whole length of the rollers may not be in contact with the raceway. Therefore, attention should be paid to the allowable axial shift S as shown in the table of dimensions.

Needle Roller Bearings with Seal
These bearings are sealed types of the NA49, NA69 and BRI series bearings, in which a seal is installed on one side (type with one seal) or both sides (type with two seals) of the bearing. The seal is made of special synthetic rubber and effectively prevents dust penetration and grease leakage.

Guide Needle Roller Bearings

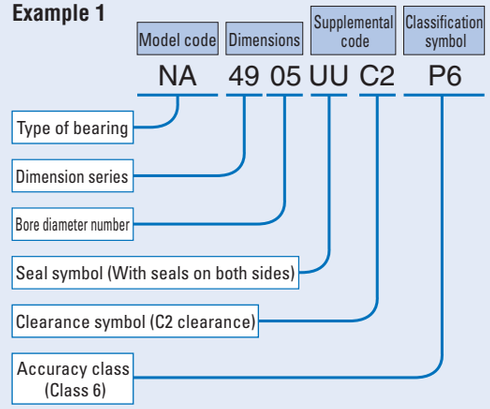
These bearings are full complement type bearings and use mallet-shaped rollers which are guided accurately by the guide rail located at the center of the outer ring raceway and the guide groove of the mallet-shaped roller. This minimizes skewing (tilting of the roller from its rotating axis), which is normally a weak point of full complement bearings, and improves the rotational accuracy. This type of bearing is especially suitable for heavy loads, shock loads and oscillating motions.
The bearings are available in metric and inch series. Bearings with and without inner rings are available in both series. In bearings with an inner ring, the width of the inner ring is larger than that of the outer ring.
The GBRI series of the inch series includes types with a seal or seals which are incorporated on one or both sides.

Identification Number

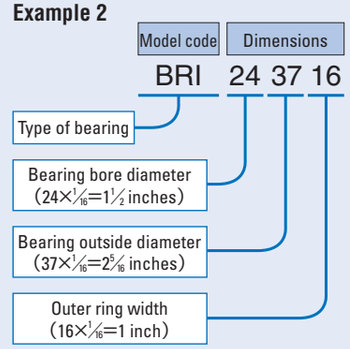
The identification number of Machined Type Needle Roller Bearings consists of a model code, dimensions, any supplemental codes and a classification symbol. Examples are shown below.

Examples of identification number

Example 1



Example 2



Accuracy

Machined Type Needle Roller Bearings are manufactured based on JIS (See page A31.). The tolerances for the smallest single roller set bore diameter of bearings without inner ring are based on Table 14 on page A33. For BR and BRI series, the accuracy is based on Table 2 and the tolerances for the smallest single roller set bore diameter are based on Table 3.

Table 2 Accuracy of inner and outer rings of inch series BR and BRII (1)

unit: μm

d or D Nominal bearing bore dia. or outside dia. mm		Δ_{dmp} Single plane mean bore diameter deviation		Δ_{Dmp} Single plane mean outside diameter deviation		Δ_{Bs} (Δ_{Cs}) Deviation of a single inner (or outer) ring width		K_{ia} Radial runout of assembled bearing inner ring	K_{ea} Radial runout of assembled bearing outer ring
Over	Incl.	High	Low	High	Low	High	Low	Max.	Max.
—	19.050	0	−10	—	—	0	−130	10	—
19.050	30.162	0	−13	0	−13	0	−130	13	15
30.162	50.800	0	−13	0	−13	0	−130	15	20
50.800	82.550	0	−15	0	−15	0	−130	20	25
82.550	120.650	0	−20	0	−20	0	−130	25	35
120.650	184.150	—	—	0	−25	0	−130	30	45

Remark d for Δ_{dmp}, Δ_{Bs}, Δ_{Cs} and K_{ia}, and D for Δ_{Dmp} and K_{ea}
Note(1) For GBR, GBRI, refer to Metric series tables on page A31-A32.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Table 3 Tolerances for smallest single roller set bore diameter $F_{ws\,min}$ of inch series BR(1) unit: μm

F_w Nominal roller set bore diameter mm		$\Delta_{Fws\,min}$ Deviation of smallest single roller set bore diameter	
Over	Incl.	High	Low
—	18.034	+43	+20
18.034	30.226	+46	+23
30.226	41.910	+48	+25
41.910	50.038	+51	+25
50.038	70.104	+53	+28
70.104	80.010	+58	+28
80.010	102.108	+61	+31

Note(1) For GBR, refer to Metric series tables on page A33.

Clearance

Radial internal clearances of Machined Type Needle Roller Bearings are made to the CN clearance shown in Table 18 on page A37. Radial internal clearances of BRI series are based on Table 4.

Table 4 Radial internal clearance of inch series BRI (1) unit: μm

F_w Nominal roller set bore diameter mm		Radial internal clearance	
Over	Incl.	Min.	Max.
—	18.034	33	66
18.034	25.908	41	76
25.908	30.226	46	82
30.226	35.052	48	86
35.052	41.910	50	89
41.910	50.038	50	92
50.038	70.104	56	99
70.104	80.010	56	104
80.010	100.076	63	117
100.076	102.108	68	127

Note(1) For GBRI, refer to Metric series tables on page A37.

Table 5 Bearings with prepacked grease ○: With prepacked grease ×: Without prepacked grease

Bearing type			Standard type	With seals on both sides	With a seal on one side
Caged Needle Roller Bearings	Metric series	RNA, NA	×	○	×
		TR, TRI	×	—	—
		TAF, TAFI	×	—	—
	Inch series	BR, BRI	×	○	×
Guide Needle Roller Bearings	Metric series	GTR, GTRI	×	—	—
	Inch series	GBR, GBRI	×	○	×

Fit

The recommended fits for Machined Type Needle Roller Bearings are shown in Tables 22 to 24 on pages A41 and A42.

Lubrication

Bearings with prepacked grease are shown in Table 5. ALVANIA GREASE S2 (SHELL) is prepacked as the lubricating grease.

In the case of bearings without prepacked grease, perform proper lubrication. Operating them without lubrication will increase the wear of the rolling contact surfaces and shorten their lives.

Oil Hole

Table 6.1 shows the number of oil holes of the outer ring and Table 6.2 shows the number of oil holes of the inner ring.

When an outer ring with an oil hole is especially required for the type without an oil hole, add "－OH" before the clearance symbol in the identification number. When an outer ring with an oil hole and an oil groove is required for the type without an oil hole, attach "－OG" before the clearance symbol.

Example: TAFI 203216－OH C2 P6

When an outer ring with multiple oil holes or an inner ring with an oil hole(s) is required, please consult IKO.

Table 6.1 Number of oil holes of the outer ring

Bearing type				Number of oil holes of the outer ring		
			Nominal roller set bore diameter F_w mm	Standard type	With seals on both sides	With a seal on one side
Caged Needle Roller Bearings	Metric series	RNA, NA		1	1	1
		TR, TRI		1	—	—
		TAF, TAFI	$F_w \leqq 26$	0	—	—
			$26 < F_w$	1	—	—
	Inch series	BR, BRI	$F_w \leqq 69.850$	1	1	1
			$69.850 < F_w$	2	1	1
Guide Needle Roller Bearings	Metric series	GTR, GTRI		1	—	—
	Inch series	GBR, GBRI		1	1	1

Remark The type with an oil hole(s) is provided with an oil groove.

Table 6.2 Number of oil holes of the inner ring

Bearing type				Number of oil holes of the inner ring		
			Nominal bearing bore diameter d mm	Standard type	With seals on both sides	With a seal on one side
Caged Needle Roller Bearings	Metric series	NA		0	0	0
		TRI		0	0	0
		TAFI		0	—	—
	Inch series	BRI	$d \leqq 76.200$	1	1	1
			$76.200 < d$	2	1	1
Guide Needle Roller Bearings	Metric series	GTRI		0	—	—
	Inch series	GBRI		0	0	0

Remark The type with an oil hole(s) is provided with an oil groove.

Matched Set Bearings

When using two or more Machined Type Needle Roller Bearings adjacent to each other on the same shaft, it is necessary to obtain an even load distribution. On request, a set of bearings is available, in which bearings are matched to obtain an even load distribution.

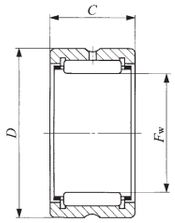
Mounting

Mounting dimensions for Machined Type Needle Roller Bearings are shown in the table of dimensions.

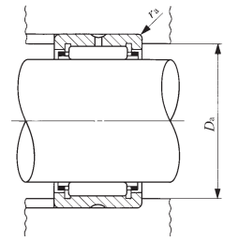
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

MACHINED TYPE NEEDLE ROLLER BEARINGS

Without Inner Ring, Inch Series



BR



Shaft dia. 15.875 — 47.625mm

Shaft dia. mm (inch)	Identification number	Mass (Ref.) g	Boundary dimensions mm(inch) F_w	D	C	Standard mounting dimensions mm D_a Max.	$r_{as\ max}$ (1)	Basic dynamic load rating C N	Basic static load rating C_0 N	Allowable rotational speed(2) rpm
15.875 (5/8)	**BR 101812**	49	15.875 (5/8)	28.575 (1 1/8)	19.050 (3/4)	24.5	0.6	18 900	19 700	25 000
19.050 (3/4)	**BR 122012**	56	19.050 (3/4)	31.750 (1 1/4)	19.050 (3/4)	26.5	1	21 700	24 400	20 000
	BR 122016	75	19.050 (3/4)	31.750 (1 1/4)	25.400 (1)	26.5	1	27 600	33 100	20 000
22.225 (7/8)	**BR 142212**	63	22.225 (7/8)	34.925 (1 3/8)	19.050 (3/4)	29.7	1	23 000	27 100	18 000
	BR 142216	84.5	22.225 (7/8)	34.925 (1 3/8)	25.400 (1)	29.7	1	29 100	36 800	18 000
25.400 (1)	**BR 162412**	69	25.400 (1)	38.100 (1 1/2)	19.050 (3/4)	32.9	1	25 300	31 900	16 000
	BR 162416	92.5	25.400 (1)	38.100 (1 1/2)	25.400 (1)	32.9	1	32 100	43 300	16 000
28.575 (1 1/8)	**BR 182616**	102	28.575 (1 1/8)	41.275 (1 5/8)	25.400 (1)	36	1	34 900	49 900	14 000
	BR 182620	128	28.575 (1 1/8)	41.275 (1 5/8)	31.750 (1 1/4)	36	1	43 200	65 600	14 000
31.750 (1 1/4)	**BR 202816**	110	31.750 (1 1/4)	44.450 (1 3/4)	25.400 (1)	39.2	1	36 000	53 500	13 000
	BR 202820	138	31.750 (1 1/4)	44.450 (1 3/4)	31.750 (1 1/4)	39.2	1	44 600	70 300	13 000
34.925 (1 3/8)	**BR 223016**	119	34.925 (1 3/8)	47.625 (1 7/8)	25.400 (1)	42.4	1	38 500	60 000	11 000
	BR 223020	149	34.925 (1 3/8)	47.625 (1 7/8)	31.750 (1 1/4)	42.4	1	47 700	78 900	11 000
38.100 (1 1/2)	**BR 243316**	149	38.100 (1 1/2)	52.388 (2 1/16)	25.400 (1)	45.1	1.5	43 700	66 900	11 000
	BR 243320	187	38.100 (1 1/2)	52.388 (2 1/16)	31.750 (1 1/4)	45.1	1.5	54 200	88 200	11 000
41.275 (1 5/8)	**BR 263516**	158	41.275 (1 5/8)	55.562 (2 3/16)	25.400 (1)	48.3	1.5	44 800	70 900	9 500
	BR 263520	199	41.275 (1 5/8)	55.562 (2 3/16)	31.750 (1 1/4)	48.3	1.5	55 600	93 400	9 500
44.450 (1 3/4)	**BR 283716**	170	44.450 (1 3/4)	58.738 (2 5/16)	25.400 (1)	51.5	1.5	47 500	78 200	9 000
	BR 283720	215	44.450 (1 3/4)	58.738 (2 5/16)	31.750 (1 1/4)	51.5	1.5	58 900	103 000	9 000
	BR 283820	250	44.450 (1 3/4)	60.325 (2 3/8)	31.750 (1 1/4)	53.1	1.5	58 900	103 000	9 000
47.625 (1 7/8)	**BR 303920**	225	47.625 (1 7/8)	61.912 (2 7/16)	31.750 (1 1/4)	54.7	1.5	60 100	108 000	8 500

Notes(1) Maximum permissible corner radius of the housing
(2) Allowable rotational speed applies to oil lubrication. For grease lubrication, a maximum of 60% of this value is allowable.
Remarks1. The outer ring has an oil groove and an oil hole.
2. No grease is prepacked. Perform proper lubrication.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch